

# QuickZone Network Editor User's Guide

**Version 0.1**

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# Foreword

This User's Guide describes how to use QZEd (the QuickZone Network Editor). ITT Industries, Inc., Systems Division developed and is maintaining QZEd under the direction of the Federal Highway Administration (FHWA) on Contract Number DTFH61-01-C-00005.



# Abstract

QZEd (QuickZone Network Editor) is distributed as part of, and is designed to operate efficiently in conjunction with, FHWA's QuickZone Delay Estimation Program. QZEd is used to create models of traffic networks using a point-and-click, graphical user interface. The goal of QZEd is to allow traffic engineers to quickly and easily layout and build construction zone networks without having to know the internal workings of the analysis tool that will be used to perform analysis. By displaying, editing, and storing the data in a manner that makes sense to a traffic engineer, QZEd allows the engineer to spend time analyzing the data and making decisions rather than learning how to make the tool work. There is a very complicated relationship between the data and network. QZEd attempts to hide these relationships where possible.

This guide:

- Introduces users to the capabilities and features of QZEd.
- Explains in detail how to use QZEd and how to access all of its functionality.



# Contents

<b>1</b>	<b>About QZEd .....</b>	<b>1-1</b>
1.1	Welcome to QZEd .....	1-1
1.2	Introduction.....	1-1
<b>2</b>	<b>The Basics of QZEd .....</b>	<b>2-1</b>
2.1	Overview .....	2-1
2.2	The Physical Layout.....	2-1
2.3	The QZEd Network Window .....	2-1
2.4	QZEd Menu Bar.....	2-2
2.4.1	File Menu.....	2-2
2.4.2	Edit Menu .....	2-3
2.4.3	View Menu .....	2-4
2.4.4	Network Menu .....	2-6
2.4.5	Window Menu .....	2-8
2.4.6	Help Menu .....	2-10
2.5	QZEd Toolbar .....	2-11
2.6	Status Bar.....	2-14
2.7	Traffic Model Objects .....	2-14
2.7.1	Link Objects .....	2-14
2.7.2	Node Objects .....	2-15
<b>3</b>	<b>Working with QZEd Files and Networks.....</b>	<b>3-1</b>
3.1	Opening an Existing File .....	3-1
3.2	Opening a New File .....	3-1
3.3	Saving the Network .....	3-1
3.4	Closing the Network Window.....	3-1
3.5	Changing the View of the Network .....	3-2
3.6	Preferences .....	3-2
3.6.1	Preferences: Link Defaults .....	3-2
3.6.2	Preferences: Graphics .....	3-3
<b>4</b>	<b>Working with Network Objects .....</b>	<b>4-1</b>
4.1	Overview .....	4-1
4.2	Creating Links .....	4-1
4.3	Creating Nodes .....	4-2
4.4	Selecting Objects.....	4-2
4.4.1	Selecting a Single Object.....	4-2
4.4.2	Selecting Multiple Objects .....	4-2
4.5	Moving Objects .....	4-2
4.6	Deleting Objects .....	4-3
4.7	Cutting Objects .....	4-3
4.8	Copying Objects .....	4-3
4.9	Pasting Objects .....	4-3
4.10	Editing Links .....	4-3
4.10.1	Link Properties .....	4-4

## Table of Contents

4.10.2	Editing Multiple Links .....	4-5
4.11	Editing Nodes .....	4-5
4.11.1	Node Properties .....	4-6
4.12	Importing Images .....	4-6
4.12.1	Selecting a Bitmap .....	4-6
4.12.2	Loading a Background Image .....	4-6
4.12.3	Adjusting the Bitmap Background .....	4-8
4.12.4	Hiding the Bitmap Background .....	4-8
4.12.5	Deleting the Bitmap Background .....	4-8
4.13	TIGER/Line Data .....	4-8
4.13.1	Loading TIGER/Line Data .....	4-8
4.13.2	Using TIGER/Line Data to Populate a Network.....	4-9
4.13.3	Hiding TIGER/Line Data .....	4-9
<b>5</b>	<b>Glossary of Terms .....</b>	<b>5-1</b>
<b>6</b>	<b>Index.....</b>	<b>6-1</b>



# 1 About QZEd

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## 1.1 Welcome to QZEd

This User's Guide supports traffic engineers using QZEd to create and modify a traffic network. The guide describes neither the technical aspects of QuickZone, nor the types of analyses that can be performed using the tool.

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## 1.2 Introduction

This document describes the QuickZone Network Editor known as QZEd.

QZEd is used to create traffic networks using a point-and-click, graphical user interface. It is designed to support users of the Federal Highway Administration's (FHWA's) QuickZone Delay Estimation Program, a construction zone traveler delay analysis tool. The goal of QZEd is to allow traffic engineers to quickly and easily layout and build traffic networks without having to know the internal workings of the tool that will be used to perform analysis. By displaying, editing, and storing the data in a manner that makes sense to a traffic engineer, QZEd allows the engineer to spend time analyzing the data and making decisions rather than learning how to use the traffic analysis tool. There is a very complicated relationship between the data and network. QZEd attempts to hide these relationships where possible.

QZEd stores data in an object-oriented manner rather than using the spreadsheet-oriented structure of QuickZone's Excel file format. QZEd is laying the foundation for the future of traffic network layout. As the inputs change, QZEd can be easily modified to handle the changes. QZEd's object model includes some data, such as geometric detail, that is not currently used by QuickZone. These details will assist QZEd in drawing the network properly but may not be necessary for the analysis tool.

In addition to hiding details about the analysis tool, QZEd provides many nice features not found in other traffic network editors. Some of the features include:

- Extending a network by dragging links out from existing nodes
- Split an existing link into two links by dropping a node on the link
- Layout a network using a bitmap background as a guide to place nodes and links.

QZEd is a stand-alone program. No other program is necessary to create networks. In order to perform analysis, Microsoft Excel, and the QuickZone tool, which is a series of Microsoft Excel Macros, are required.

Expert users that have taken many years to learn the format and usage of the QuickZone analysis tool may find it useful to layout the initial network with QZEd and thereafter edit the Excel file with Excel. There are some network editing tasks that can be done faster with Excel by expert users.

## About QZEd

There are many features that we have identified that would be nice to include in QZEd. As time and resources permit these features may be added to QZEd as FHWA dictates. Some of the features include:

- More file formats for the bitmap background (JPEG, CAD, etc.)
- More graphical field entries
- Create certain types of interchanges from a script

## 2 The Basics of QZEd

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### 2.1 Overview

QZEd is a tool for creating and editing traffic networks. The following activities might occur during a typical session with QZEd:

- Create a new file with QZEd, or open an existing file. Each file represents a traffic network, which may include surface streets and freeways, and parameters such as capacity and jam density.
- Create links and nodes based on a bitmap underlay.
- Create new links, nodes, and other objects "from scratch" using a pointing device (such as a mouse).
- Edit properties of objects like links and nodes.
- Save the traffic network.
- Close the network file.

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### 2.2 The Physical Layout

QZEd has the following physical components:

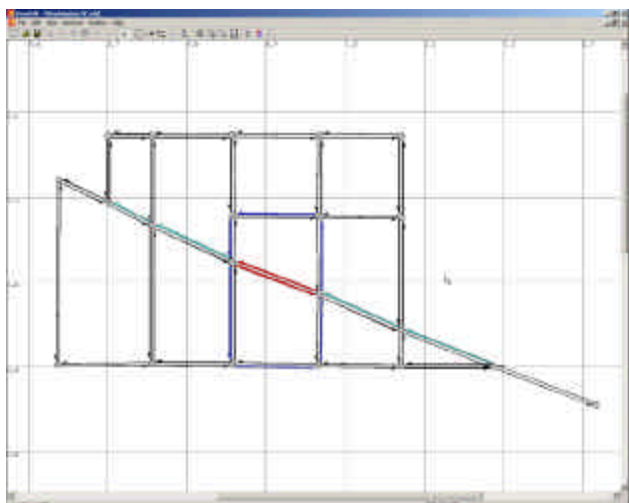
- Title Bar
- Menu Bar
- Toolbars
- Status Bar
- Network Window (displaying a QZEd network)

The physical components will be described in the following sections.

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### 2.3 The QZEd Network Window

The Network Window displays the actual file opened, as illustrated below.



The following is a partial list of actions that can be performed within the window to create and manipulate a traffic network:

- Create traffic network objects.
- Zoom in or out of the Network Window.
- Edit the properties of an object.
- Move objects within the Network Window.
- Delete objects.
- Cut, Copy, and Paste objects both within a single Network Window and between Network Windows.

You can have more than one network open at a time. In general, menu commands, such as File | Save, and hot keys, such as Ctrl+S, only affect the active window.

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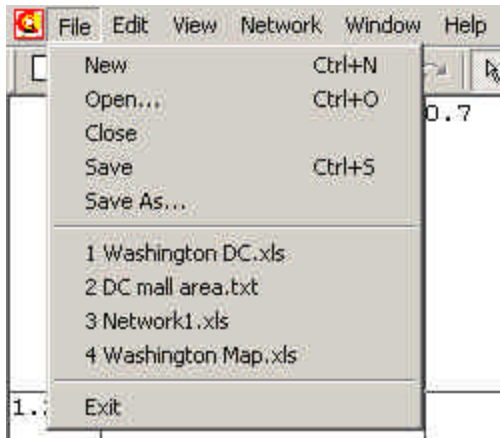
## 2.4 QZEd Menu Bar

The QZEd menu bar is a normal Windows menu bar.



### 2.4.1 File Menu

The following is the QZEd File menu. Refer to the QZEd Toolbar for alternate ways to invoke these commands.



## File | New Ctrl+N

Selecting the File | New menu command or pressing Ctrl+N will create a new, empty Traffic Network file.

## File | Open Ctrl+O

Selecting the File | Open menu command or pressing Ctrl+O will bring up a standard File Open dialog to select the file to open. If a file is selected and the dialog dismissed with OK, the selected file will load into a new Traffic Network window.

## File | Close

Selecting the File | Close menu command will close the currently active document. If the document has unsaved changes, the user will be given the opportunity to save the file.

## File | Save Ctrl+S

Selecting the File | Save menu command or pressing Ctrl+S will save the currently active document. If the file has not been saved before, a standard File Save dialog will appear to allow the user to set the file name.

## File | Save As

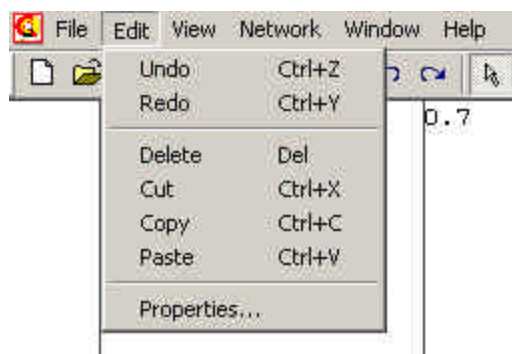
Selecting the File | Save As menu command will bring up a standard File Save dialog to select the file name. If a file name is selected and the dialog dismissed with OK, the active document will be saved with that name.

## File | Exit

Selecting the File | Exit menu command will close all active documents and the QZEd application. If any documents have unsaved changes, the user will be given the opportunity to save them.

## 2.4.2 Edit Menu

The following is the QZEd Edit menu. Refer to the QZEd Toolbar for alternate ways to invoke these commands.



### Edit | Undo Ctrl+Z

Selecting the Edit | Undo menu command or pressing Ctrl+Z will undo the last editing action. This can be done multiple times to undo multiple commands.

### Edit | Redo Ctrl+Y

Selecting the Edit | Redo menu command or pressing Ctrl+Y will redo the last undone editing action. This can be done multiple times to redo multiple undone commands.

### Edit | Delete Del

Selecting the Edit | Delete menu command or pressing the Del button will delete the current selection.

### Edit | Cut Ctrl+X

Selecting the Edit | Cut menu command or pressing Ctrl+X will copy the selected object(s) and their properties to the clipboard and delete them from the active Traffic Network document.

### Edit | Copy Ctrl+C

Selecting the Edit | Copy menu command or pressing Ctrl+C will copy the selected object(s) and their properties to the clipboard.

### Edit | Paste Ctrl+V

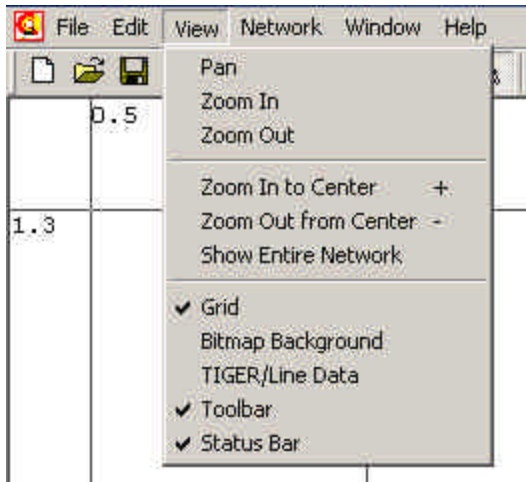
Selecting the Edit | Paste menu command or pressing Ctrl+V will paste the clipboard's contents into the currently active document. This command will only be enabled if the clipboard contains QZEd Traffic Network objects.

### Edit | Properties

Selecting the Edit | Properties menu command invokes the selected object(s) property dialog. Refer to Working with Network Objects for descriptions of these dialogs.



## 2.4.3 View Menu

The following is the QZEd View menu. Refer to the QZEd Toolbar for alternate ways to invoke these commands.





Since a network may be too big to fit in the available space at a sufficient level of detail, QZEd provides various commands for changing the view, described below. These commands do not modify the network itself, they only affect the visible area.

## View | Pan



The cursor has now changed to the Pan cursor. It repositions the network's display without affecting the current zoom level. Repeated "pans" can be done without accessing the menu option. To free the cursor from this "Pan" state, press the Select  button, press the Pan toggle  button again, right-click on an open area of the network, or press the ESC key.

Note: The user can use the View | Pan menu command to view outside the current extent of the network.

## View | Zoom In

The cursor has now changed to the Zoom In cursor. From this point, there are two different methods for implementing the Zoom In command; each providing different results. One method is to place the cursor on a specific point in the network and press and release the left mouse button. This will cause that point to become the center of an updated view, zoomed to a higher magnification level. The other method uses a "rubber band" to mark off the boundaries of a region, which will become the new view of the network. To perform this operation, place the cursor on a point you want to become the corner of a zoomed-in view. Press down and hold the left mouse button and drag the "rubber band" box to the point that forms the opposite corner of the new view. When you release the mouse button, the area within the "rubber band" will be expanded to fill the active window. Repeated zooms can be done without accessing the menu option. To free the cursor from this "Zoom In" state, press the Select  button, press the Zoom In  button again, right-click on the open area of the network or press the ESC key.

## View | Zoom Out

The cursor has now changed to the Zoom Out cursor. Place the cursor on a specific point in the network and press and release the left mouse button. This will cause that point to become the center of an updated view, zoomed to a lower magnification level. Repeat zooms can be done without accessing the menu option. To free the cursor from this "Zoom Out" state, press the Selection  button, press the Zoom Out  button again, right-click on the open area of the network, or press the ESC key.

Note: The user can use the View | Zoom Out menu command to view outside the current extent of the network.

## **View | Zoom In to Center +**

This is a one-time version of the Zoom In mode. The network zooms in at a fixed level to the center point of the window. The + key is a short-cut key for this command.

## **View | Zoom Out from Center -**

This is a one-time version of the Zoom Out mode. The network zooms out at a fixed level keeping the center point of the window. The - key is a short-cut key for this command.

Note: The user can use View | Zoom Out of Center menu command to view outside the extent of the network.

## **View | Show Entire Network**

Displays the entire network. The view will be re-centered and zoomed in or out as necessary so that the network fills the window. If other options, such as a bitmap background, are shown, the view will change to show the largest area.

## **View | Grid**

Hides or shows the grid on the network in the display. The grid value can be changed with the Network | Preferences menu item.

## **View | Bitmap Background**

Hides or shows the bitmap background on the network in the display. Refer to Importing Images for more information on bitmaps.

## **View | TIGER/Line Data**

Hides or shows the TIGER/Line data on the network in the display. Refer to TIGER/Line Data for more information.

## **View | Tool Bar**

Hides or shows the QZEd Tool Bar.

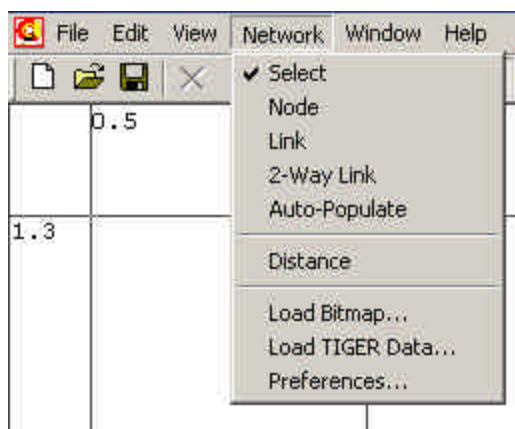
## **View | Status Bar**

Hides or shows the Status Bar at the bottom of the QZEd application window.


## **2.4.4 Network Menu**

The following is the QZEd Network menu. Refer to the QZEd Toolbar for alternate ways to invoke these commands. These are the tools for building and editing a network.









## Network | Select

The default functionality is selection. To free the cursor from any other state, press the Select  button, right-click in an open area of the network, or press the ESC key.

## Network | Node

The cursor has changed to the Node cursor. Point the cursor at the location where you want the node and click the left mouse button. You can continue creating nodes by clicking the left mouse button until you select a different functionality. You can accurately position a new node by holding down the left mouse button as you drag the mouse. An outline of the node will appear until you release the left mouse button. The X and Y position of the node will be shown in the status bar. To free the cursor from this state, press the Select  button, press the Node  button again, right-click in an open area of the network, or press the ESC key.

## Network | Link

The cursor has changed to the Link cursor. A single (one-way) link will be created when you click to create the starting location and then click again to create the ending location. Alternately, you can click and drag the link from start to end. As you drag the link to its end position, the status bar will update with the position of the cursor, the length of the link, and the direction from the starting point. If the start point or end point is a node, the link will be connected to that node. If either the start point or end point or both points are not on existing nodes, nodes will be created automatically. If you drag the end point outside the current view, the view will scroll to include the new end point. To free the cursor from this state, press the Select  button, press the Link  button again, right-click in an open area of the network, or press the ESC key.

## Network | 2-Way Link



The cursor has changed to the Two-Way Link cursor. A pair of links running in opposite directions will be created when you click to create the starting location and then click again to create the ending location. Alternately, you can click and drag the links from start to end. As you drag the link to its end position, the status bar will update with the position of the cursor, the length of the link, and the direction from the starting point. If the start point or end point is a node, the links will be connected to that node. If either the start point or end point or both points are not on existing nodes, nodes will be created automatically. If you drag the end point outside the current view, the view will scroll to include the new end point. To free the cursor from this

state, press the Select  button, press the 2-Way Link  button again, right-click in an open area of the network, or press the ESC key.

## Network | Autopopulate

The autopopulate tool allows the user to use TIGER/Line data displayed in the network window to quickly populate a network. Refer to Using TIGER/Line Data to Populate a Network for more information.

## Network | Distance

The Distance Tool allows the user to measure distances in the network. To begin measuring, click the Distance Tool menu. The cursor has now changed to the distance tool cursor. Click the distance tool cursor on the location where you want to begin measuring. As the cursor is moved away from that location the distance measured is displayed in the status bar. Click the cursor again to create a “way” point. Moving the cursor again will measure the cumulative distance from the starting point. This technique can be continued to measure the distance along a path in the network with many changes in direction. To start measuring again from a new starting point, double click the cursor. The cursor can then be moved to the new starting location where you will click the cursor to start again. To free the cursor from this "Distance Measuring" state, press the Select  button, press the Distance Tool toggle  button again, right-click in an open area of the network, or press the ESC key.

## Network | Load Bitmap...

You can load an image, such as an aerial photograph or a street map, which can be used as a background for the traffic network being modeled. An image can serve as a visual reference for laying out the network, as a visual reference for observers, or just as an attractive background. Laying out a network from a bitmap is a very quick way to develop a traffic network of streets and intersections. Refer to Importing Images for more information.

## Network | Load TIGER Data...

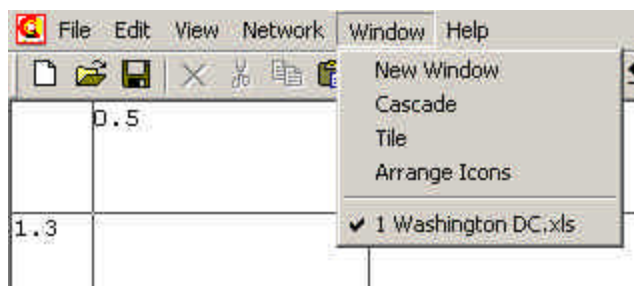
You can load TIGER/Line data into the network and use it to populate the network objects. Refer to TIGER/Line Data for more information.

## Network | Preferences...

Displays the Preference Dialog. Refer to Preferences for more information.

## 2.4.5 Window Menu

The following is the QZEd Window menu. The Window menu contains standard windowing commands.

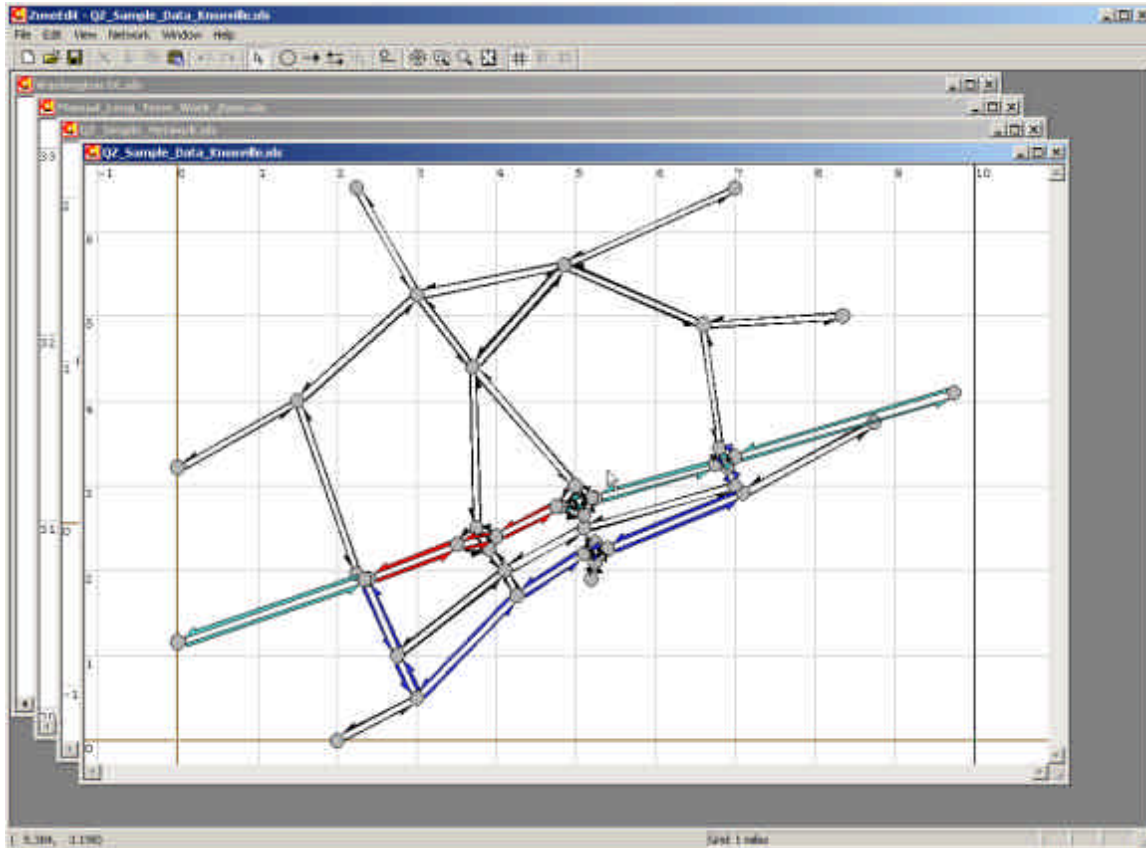


## New Window

Creates a new window displaying the currently active document. All windows displaying the same network will update as changes are made to the network from any window.

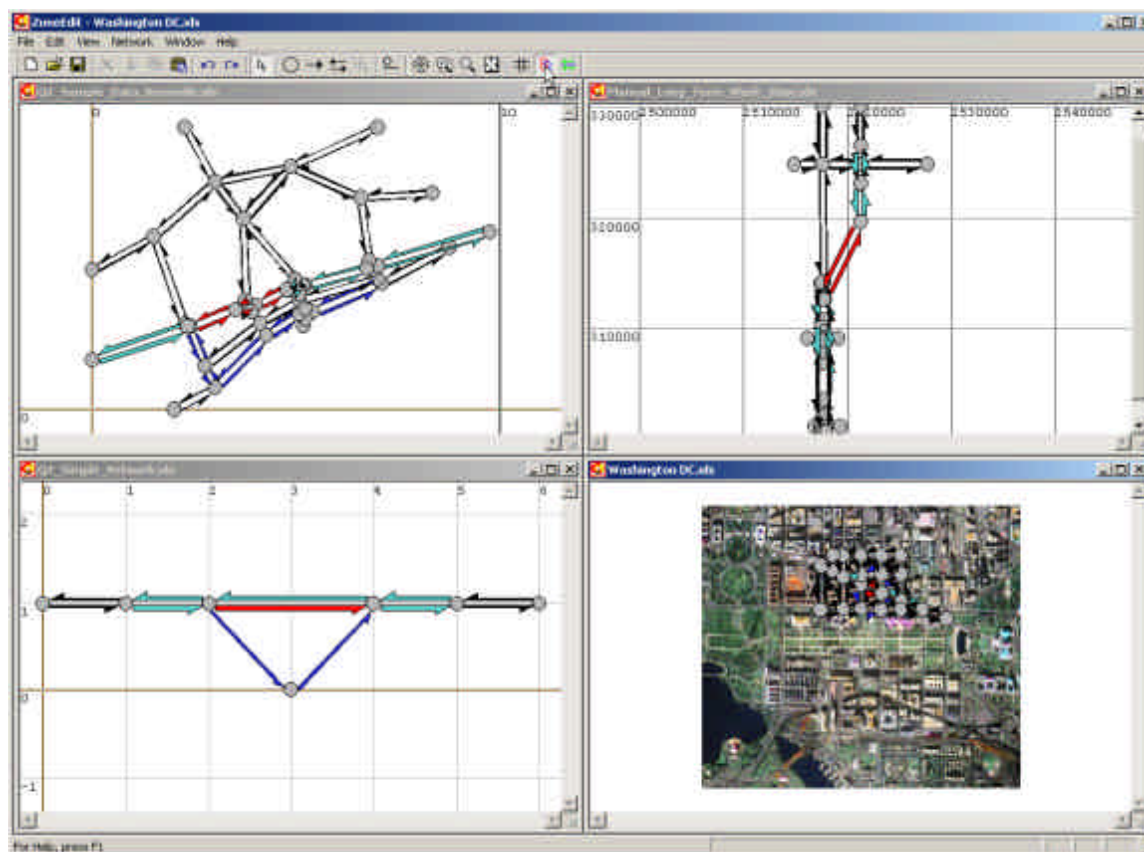
## Cascade

Arranges the existing windows such that all the title bars are visible.



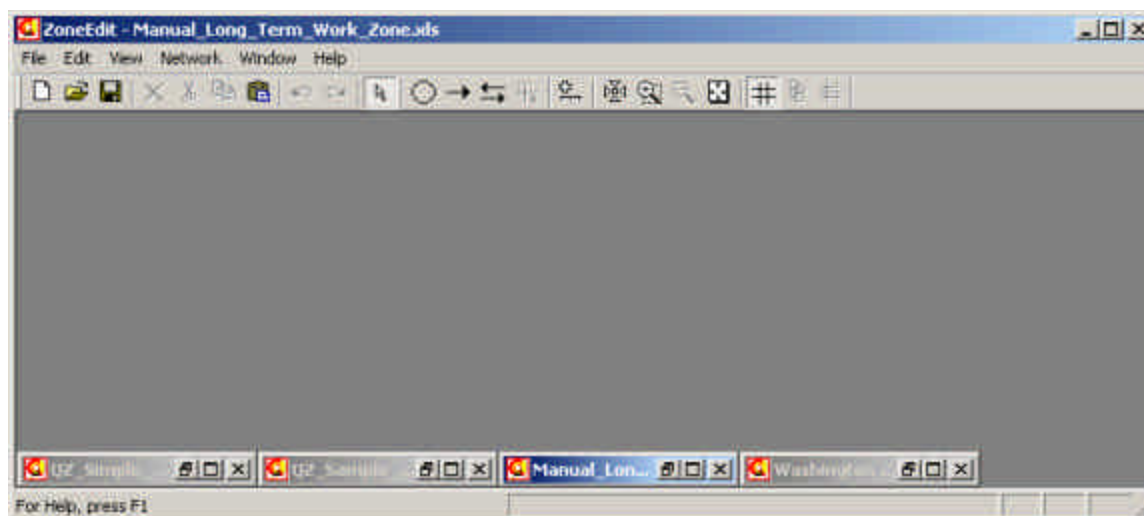
## Tile

Arranges and resizes the document windows so they cover the available space within the QZEd application window, are roughly the same size, entirely visible and not overlapping.



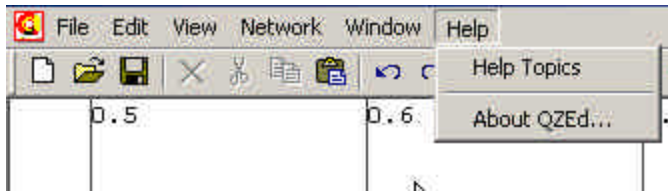
## Arrange Icons

Arranges the minimized document windows so they're aligned along the bottom edge of the QZEd window.



## 2.4.6 Help Menu

The following is the QZEd Help menu. It contains online help commands.



## Help Topics

Brings up the main application help window.

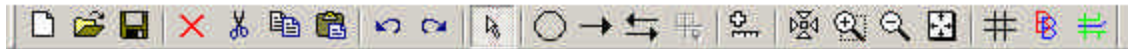
## About QZEd...

Brings up the about box containing QZEd's version and copyright information.

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## 2.5 QZEd Toolbar

Most of QZEd's menu commands can also be accessed from the toolbar.



### New

Create a new file.

### Open

Open an existing file.

### Save

Save the currently active document.

### Delete

Delete the selected object(s).

### Cut

Remove the selected object(s) from the network and put them on the clipboard.

### Copy

Copy the selected object(s) to the clipboard.

### Paste

Paste the clipboard contents into the currently active document.


## Undo

Undo the last change to the Network.



## Redo

Redo the last action that was undone.



## Select

The default state is selection. To free the cursor from any other state, press the Select  button, right-click in an open area of the network, or press the ESC key.



## Node

The cursor has changed to the Node cursor. Point the cursor at the location where you want the node and click the left mouse button. You can continue creating nodes by clicking the left mouse button until you select a different functionality. You can accurately position a new node by holding down the left mouse button as you drag the mouse. An outline of the node will appear until you release the left mouse button. The X and Y position of the node will be shown in the status bar. To free the cursor from this state, press the Select  button, press the Node  button again, right-click in an open area of the network, or press the ESC key.



## Link

The cursor has changed to the Link cursor. A single (one-way) link will be created when you click to create the starting location and then click again to create the ending location. Alternately, you can click and drag the link from start to end. As you drag the link to its end position, the status bar will update with the position of the cursor, the length of the link, and the direction from the starting point. If the start point or end point is a node, the link will be connected to that node. If either the start point or end point or both points are not on existing nodes, nodes will be created automatically. If you drag the end point outside the current view, the view will scroll to include the new end point. To free the cursor from this state, press the Select  button, press the Link  button again, right-click in an open area of the network, or press the ESC key.



## Two-Way Link

The cursor has changed to the Two-Way Link cursor. A pair of links running in opposite directions will be created when you click to create the starting location and then click again to create the ending location. Alternately, you can click and drag the links from start to end. As you drag the link to its end position, the status bar will update with the position of the cursor, the length of the link, and the direction from the starting point. If the start point or end point is a node, the links will be connected to that node. If either the start point or end point or both points are not on existing nodes, nodes will be created automatically. If you drag the end point outside the current view, the view will scroll to include the new end point. To free the cursor from this state, press the Select  button, press the Two-Way Link  button again, right-click in an open area of the network, or press the ESC key.



## Autopopulate

Quickly create links from TIGER/Line data. See Using TIGER/Line Data to Populate a Network for more information. To free the cursor from this state, press the Select  button, press the Autopopulate  button again, right-click in an open area of the network, or press the ESC key.

## Distance



The Distance Tool allows the user to measure distances in the network. To begin measuring, click the Distance Tool button. The cursor has now changed to the distance tool cursor. Click the distance tool cursor on the location where you want to begin measuring. As the cursor is moved away from that location the distance measured is displayed in the status bar. Click the cursor again to create a "way" point. Moving the cursor again will measure the cumulative distance from the starting point. This technique can be continued to measure the distance along a path in the network with many changes in direction. To start measuring again from a new starting point, double click the cursor. The cursor can then be moved to the new starting location where you will click the cursor to start again. To free the cursor from this "Distance Measuring" state, press the Select  button, press the Distance Tool toggle  button again, right-click in an open area of the network, or press the ESC key.

## Pan



Repositions the network's display without affecting the current zoom level. Repeated pans can be done without accessing the menu option. To free the cursor from this "Pan" state, press the Select  button, press the Pan toggle  button again, right-click in an open area of the network, or press the ESC key.

Note: The user can use the pan button to view outside the current extent of the network.

## Zoom In

The cursor has now changed. From this point, there are two different methods for implementing the Zoom In command; each providing different results. One method is to place the cursor on a specific point in the network and click the left mouse button. This will cause that point to become the center of an updated view, zoomed to a higher magnification level. The other method uses a "rubber band" to mark off the boundaries of a region, which will become the new view of the network. To perform this operation, place the cursor on a point you want to become the corner of a zoomed-in view. Press down on the left mouse button and drag the "rubber band" box to the point that forms the opposite corner of the new view. When you release the mouse button, the area within the "rubber band" will be expanded to fill the active window. Repeated zooms can be done without accessing the menu option. To free the cursor from this "Zoom In" state, press the Select  button, press the Zoom In  button again, right-click on the open area of the network, or press the ESC key.

## Zoom Out

The cursor has now changed. Place the cursor on a specific point in the network and click the left mouse button. This will cause that point to become the center of an updated view, zoomed to a lower magnification level. Repeated zooms can be done without accessing the menu option. To free the cursor from this "Zoom Out" state, press the Select  button, press the Zoom Out  button again, right-click on the open area of the network, or press the ESC key.

Note: The user can use the zoom out button to view outside the current extent of the network.

### Show Entire Network

Displays the entire network. The view will be re-centered and zoomed in or out as necessary so that the network fills the window. If other options, such as a bitmap background, are shown, the view will change to show the largest area.

### Grid

Hides or shows the grid on the network in the display.

### Bitmap

Hides or shows the bitmap behind the network in the display. Refer to Importing Images for more information on bitmaps.

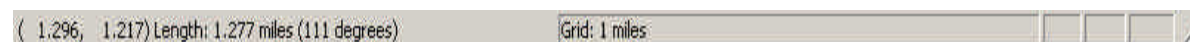
### TIGER Data

Hides or shows the TIGER/Line Data on the network in the display. Refer to TIGER/Line Data for more information.

---

## 2.6 Status Bar

The status bar forms the bottom edge of QZEd. When the cursor rests on a toolbar button or menu choice, the status bar displays a brief description of the command performed by the button or menu. When editing networks, it also displays the x-y grid coordinates of the cursor. If the user is creating a link its length and angle from North are also displayed.



---

## 2.7 Traffic Model Objects

Traffic model objects are simply the elements that make up a traffic network. These include links and nodes. Links and nodes determine the geometry of the network.

Editing their properties in their respective property dialogs can alter traffic model objects, once created, or they can be manipulated graphically within the network window.

### 2.7.1 Link Objects

A link represents a one-way, non-branching stretch of road where properties such as number of lanes, free-flow speed, etc. are constant. Links are always connected to exactly one node at the upstream end and exactly one node at the downstream end. Links are drawn as arrows, with the arrowhead at the downstream end of the link. QZEd uses color to distinguish between links of different types. Mainline and ramp links are drawn cyan, work zone links are drawn red, detour links are drawn blue, and links that don't fit any of those categories are drawn black.

The length of the link is a very important property. During layout of the network, QZEd determines the length of the link based on the upstream node to downstream node distance. This length can be changed to reflect the distance along a curved link.



In this version of QZEd links are shown as straight lines, even when they are curved.  
Also refer to [Creating Links](#) and [Editing Links](#).

## **2.7.2 Node Objects**

Broadly speaking, a node is a point where something of interest occurs along a roadway.  
Also refer to [Creating Nodes](#) and [Editing Nodes](#).



## 3 Working with QZEd Files and Networks

---

### 3.1 Opening an Existing File

An existing traffic network file can be opened by selecting the File | Open menu command or the Open button on the toolbar.

Traffic network files created by QZEd have either an .xls filename extension (Excel file) or a .txt extension (Text file).

---

### 3.2 Opening a New File

To create a new traffic network file, select the File | New menu command or the New button on the toolbar. A new file initially contains no traffic model objects.

---



### 3.3 Saving the Network

To save a traffic network to a file, press the Save  button or choose the File | Save menu command. If the network has not been previously saved to a file, a standard "Save As..." dialog box will appear so that you can choose a filename. Otherwise, the network will be saved to the file named in the title bar.

If a previously saved file is to be saved to a different filename, choose the File | SaveAs menu command.

---

### 3.4 Closing the Network Window

To close a Network Window, either choose the File | Close menu command or click on the close  button located at the far right of the Network Window's title bar. Note that QZEd, which contains the Network Window, has its own close  button, clicking that button exits QZEd rather than just closing the Network Window.

When closing a network with unsaved changes, a dialog appears asking if the work is to be saved. Pressing the Yes button will save the network to an Excel or Text file before closing the window. Pressing the No button will discard unsaved changes and close the window. Pressing the Cancel button will leave the Network Window open.

---

## 3.5 Changing the View of the Network

Since a network may be too big to fit in the available screen space at a sufficient level of detail, QZEd provides various commands for changing the view. These commands do not modify the network itself; they only affect the visible display. The user can use menu commands, toolbar buttons, and scroll bars to change the view of the network in the Network Window. Refer to the View Menu for details on how to change the view of the network with menu commands. Refer to the QZEd Toolbar for details on how to change the view of the network with buttons. Refer to the Window's User Guide for details on how to use scroll bars. Note: the only way to view outside of the network is with the Zoom Out command, the Pan command or if the scrollbars are shown use the scroll buttons (arrows) to change the view.

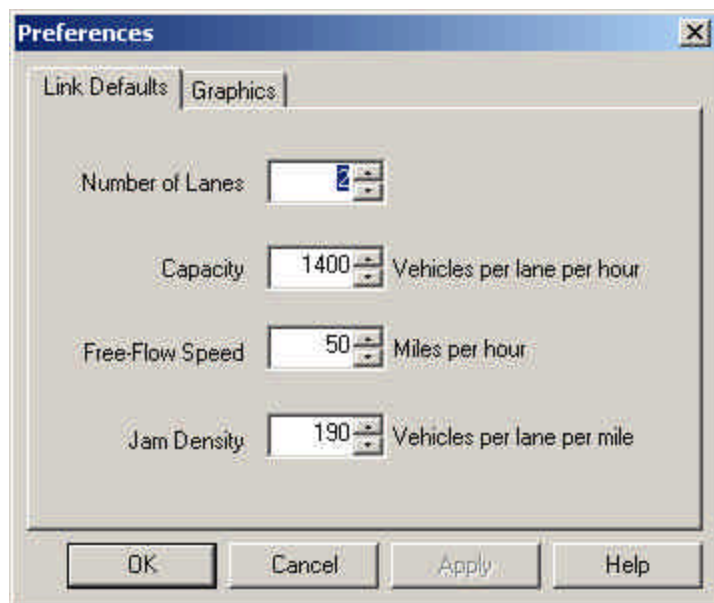
---

## 3.6 Preferences...

Selecting the Network | Preferences menu command will open a tabbed dialog from which QZEd preference parameters can be specified. These values are saved in the registry for the current user and used as default for all new cases or new traffic objects.

### 3.6.1 Preferences: Link Defaults

To display the Link Defaults tabbed page, open the Preferences dialog and then click on Link Defaults page.



### Number of Lanes

The default number of lanes is set for all newly-created links.

### Capacity

The default capacity, in vehicles per lane per hour, is set for all newly-created links.

### Free-Flow Speed

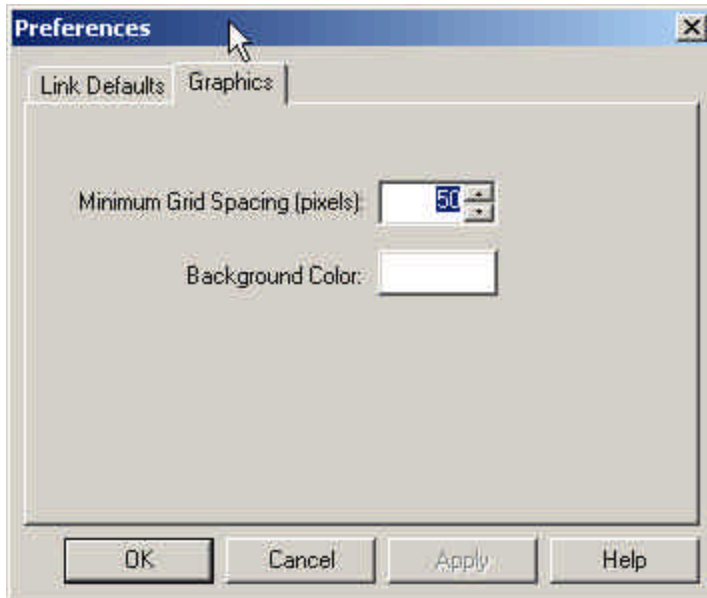
The default free-flow speed, in miles per hour, is set for all newly-created links.

## Jam Density

The default jam density, in vehicles per lane per mile, is set for all newly-created links.

### 3.6.2 Preferences: Graphics

To display the Graphics tabbed page, open the Preferences dialog and then click on Graphics page.



#### Minimum Grid Spacing

This is the minimum distance between grid lines, measured in screen pixels. The lower the value, the closer together the grid lines will be drawn.

#### Background Color

This is the color the background will be drawn. To pick a new background color, click on the colored button. A standard Color Dialog will appear for choosing the color. If the color dialog is dismissed with OK, the new background color will appear on the button. When the Preferences dialog is dismissed the background color will change.



# 4 Working with Network Objects

---

## 4.1 Overview


Pointing and clicking in the Network Window creates most types of traffic model objects. You select a menu command from the Network Menu, or press the equivalent toolbar button from the QZEd Toolbar, to put QZEd in a mode for creating objects of the chosen type. Then point to the desired location for the object in the Network Window and click the left mouse button to create an object. You can continue creating more objects of the chosen type until a different tool is chosen from the toolbar.


Each network traffic object has properties that can be edited. For instance, links have properties such as the number of lanes or the free-flow speed, etc. Each type of network object has a dialog for editing the object's properties.

Creating, selecting, deleting, moving, and editing traffic objects are discussed in more detail in the following sections.

---

## 4.2 Creating Links

There are many ways to create new links. To create links, first decide whether you want a single (one-way) link or a pair of links running in opposite directions. For a single link, press the Link  button or the

Network | Link menu command from the menu. For a pair of opposing links, press the Two-Way Link  button or the Network | Two-Way Link menu command from the menu.

After choosing single or double links, specify the start and end positions of the link(s). This can be done in two ways:


- Click on the location you want the link to start. This can be on a node or not on a node. Now click on the location you want the link to end. Again, this can be on a node or not. A link will be created between these two locations.
- Alternatively, you can press and hold the mouse button at the location you want the link to start. Keeping the button pressed, move the mouse to the location you want the link to end. Release the button and a link will be created between the two locations.

If either endpoint does not already have a node, one will be created. If nodes already exist at the endpoints, the link will be connected to them.

When drawing links, the drag line will highlight as the mouse pointer moves over a node. The location of the cursor, the distance drawn, and the direction from the start point will be displayed in the status bar.

---

## 4.3 Creating Nodes

To create nodes, press the Node  button or select the Network | Node menu command from the menu bar. Then point the cursor at the location where you want the node and click the left mouse button. You can continue creating nodes by clicking the left mouse button until you select a different toolbar button. You can accurately position a new node by holding down the left mouse button as you drag the mouse. An outline of the node will appear until you release the left mouse button. The outline of a selected node will be magenta. An unselected node is outlined in black.

Nodes can be inserted into existing links. If a newly created node intersects an existing link, the link is broken. New links are then automatically connected to the new node. The new links have the same properties as the existing link, except length, which is reset to default (node to node distance).


---

## 4.4 Selecting Objects

Selecting an object makes it the focus of subsequent commands such as editing properties, moving to another location, copying, and/or deleting the object. Once an object is selected, its appearance is highlighted magenta.

### 4.4.1 Selecting a Single Object

The steps to select an object are:

1. Press the Select  button or choose the Network | Select menu command, if the cursor is not currently drawn as an arrow. Or, you can right-click the mouse in the background area on the grid and the arrow tool will then be the cursor.
2. Position the cursor over the object and click the left mouse button. The object will be drawn with a magenta border to indicate that it is selected.

### 4.4.2 Selecting Multiple Objects

Multiple objects can be selected at once. To add or remove an object from the current selection, hold down the **Ctrl** key while clicking on the object with the selection cursor. You can select many items with the selection cursor by clicking the left mouse button and dragging a box around the items you want to select. All the items within the box will be selected.

---

## 4.5 Moving Objects

Links are moved only by moving the nodes they are connected to. Nodes can be moved graphically, or by editing their locations in their Properties dialogs. To move nodes graphically, select the nodes to be moved. With the cursor positioned over one of the selected objects, press the left mouse button down and continue holding the button down while moving the cursor to a new location. The status bar displays the location of the cursor as it moves. Also, The QZEd Network Window displays a coordinate grid, which aids in positioning nodes. Release the mouse button when the cursor is at the desired new location. The nodes are now displayed at their new locations. If multiple nodes are selected, they maintain their relative positions during the movement. Any links connected to the nodes will be moved along with them, regardless of whether or not they are selected. Links that are selected will not actually be moved unless the node(s) they are connected to



are moved. If only one node connected to the link is selected, the link will be stretched or shrunk as the selected node is moved.

---

## 4.6 Deleting Objects

To delete an object or set of objects, select the object(s) to be deleted. Press the Delete key, select the Edit | Delete menu command, or press the Delete button. All selected objects will be deleted. Note that nodes that still have links attached cannot be deleted. They can be deleted simultaneously along with the links attached to them. If unselected links are still attached to any selected nodes, a message box will inform the user that some nodes could not be deleted. Those nodes will not be deleted, and will remain selected to identify them.

---

## 4.7 Cutting Objects

To cut an object or set of objects, select the object(s) to be cut. Press Ctrl+X, select the Edit | Cut menu command, or press the Cut button. The selected object(s) are removed from the network and copied to the clipboard. As with Delete, nodes that have uncut links still attached to them cannot be removed. Copies of any such nodes are still placed on the clipboard.

---

## 4.8 Copying Objects

To copy an object or set of objects to the clipboard, select the object(s) to be copied. Press Ctrl+C, select the Edit | Copy menu command, or press the Copy button. The selected object(s) are copied to the clipboard.

---

## 4.9 Pasting Objects

To paste the clipboard contents into the currently active document, press Ctrl+V, select the Edit | Paste menu command, or press the Paste button. The traffic network objects on the clipboard are copied into the currently active document at the location where they were cut or copied from. You may need to Show Entire Network to see the newly pasted objects. The pasted objects remain selected after they are pasted.

---

## 4.10 Editing Links

To bring up a link's Properties dialog select the link and choose the Edit | Properties menu command, or double-click on the link in select mode, or right-click on the link and choose the Properties menu command from the pop-up menu.

In the properties dialog for a link, you can specify data such as the number of lanes, capacity, and free-flow speed.

The Link Properties dialog is described in more detail in the following section.

### 4.10.1 Link Properties

#### Number of Lanes

This entry specifies the number of lanes on the link. The default value is set by selecting the Network | Preferences menu command, and selecting the Link Defaults page.

#### Capacity

This entry specifies the capacity of the link or the number of vehicles that can travel on one lane of the road for one hour (vehicles per lane per hour). The default value is set by selecting the Network | Preferences menu command, and selecting the Link Defaults page.

#### Length

This entry specifies the length of the link. Note if the user has not changed the length, dragging a node on either end will reset the link length. If the length has been changed from the node to node length, dragging a node will **not** reset the link length.

#### Reset Length

This button resets the link length to the default length of the link. The default length of the link is the node to node distance.

## Free-Flow Speed

This entry specifies the free-flow speed or the speed at which vehicles travel on the link during free flow conditions. The default value is set by selecting the Network | Preferences menu command, and selecting the Link Defaults page.

## Jam Density

This entry specifies the jam density or the number of standing vehicles that will fit on one lane of the road in one-mile length (vehicles per mile per lane). The default value is set by selecting the Network | Preferences menu command, and selecting the Link Defaults page.

## Direction

This radio button group specifies the direction as Inbound or Outbound. This designation is used for the conservation of flow calculations. The default value is Inbound.

## Type

This radio button group specifies the link type. Links are defined as one of six types: Mainline, Workzone, Detour 1, Detour 2, Ramp and blank (for links that are none of the five types). At minimum, a QuickZone network must include a Mainline, Workzone and Detour 1 designation. The Mainline cannot be the initial link on the network. Also, the Workzone must be between two Mainline designations. The Ramp designation is only used if Ramp Metering will be used as one of the mitigation strategies. The default value is None.

## Description

This field allows the user to associate descriptive text with the link.

### 4.10.2 Editing Multiple Links

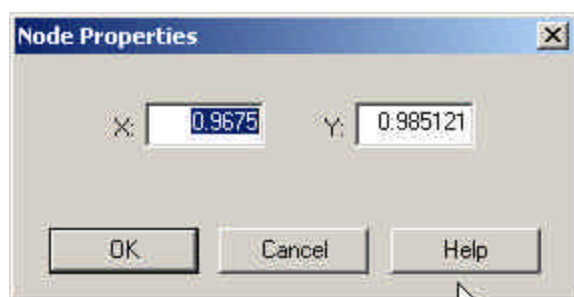
Multiple links can be edited simultaneously. To edit multiple links at once, select all the links to be edited by holding the **Ctrl** key while clicking on the links. Bring up the Link Properties dialog by choosing the Edit | Properties menu item, or right-click on one of the selected links and choose the Properties command from the pop-up menu. Properties that are common to all the selected links will be displayed in the dialog. Properties not common to all the links will remain blank. Any properties set in the dialog will be set for all the selected links when the dialog is exited. Properties not set (i.e., the dialog fields are still blank) will remain at their current values for all links.

---

## 4.11 Editing Nodes

To bring up a node's Properties dialog select node and choose the Edit | Properties menu command, or double-click on the node in select mode, or right-click on the node and choose the Properties menu command from the pop-up menu.

### 4.11.1 Node Properties



#### X, Y

This is the position of the node, in miles, located relative to other points in the network. The x, y origin is in the bottom left corner of the grid.

---

## 4.12 Importing Images

You can load an image, such as an aerial photograph or a street map, which can be used as a background for the traffic network being modeled. An image can serve as a visual reference for laying out the network, as a visual reference for observers, or just as an attractive background. Laying out a network from a bitmap is a very quick way to develop a traffic network of streets and intersections. Currently, a bitmap image (BMP file) is the only type of image that can be used as a background for a network. Other image formats may be supported in the future.

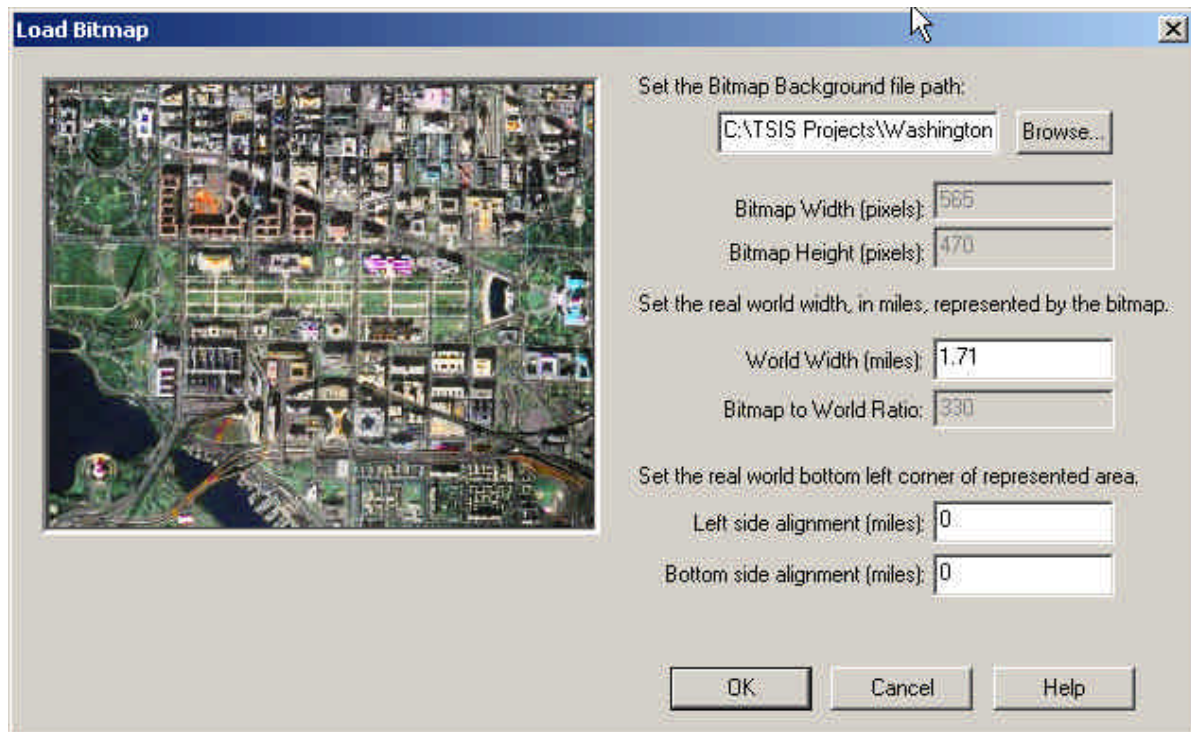
### 4.12.1 Selecting a Bitmap

The accuracy of a traffic network developed with a background bitmap relies on the accuracy of the bitmap chosen. The bitmap must have the same resolution in the X (East West) direction as it does in the Y (North South) direction (some aerial photos may not adhere to this rule). The orientation of the map is not important to QZEd. However, if the network is developed with a line drawn map, and then for presentation purposes, an aerial photo is associated with the network, the two bit maps must have the same orientation. QZEd does not have any functionality built in to edit the bitmap. If you wish to change the bitmaps orientation or drawing objects you must edit the bitmap outside of QZEd with a graphics program. You may wish to edit out unwanted lines or objects or add objects, such as buildings or text, to the bitmap.

There are many types of bitmaps that may be used as a background for a traffic network. Aerial photographs may be used but may be hard to accurately select node locations if the world to bitmap ratio is very high. Many computer-mapping programs allow exporting a desired view to a bitmap format. These are very easy to use but may lack the accuracy you desire. Some CAD programs may allow you to export data to a bitmap. Scanning a paper map, such as a street map and saving it as a bitmap, is also a viable option.

### 4.12.2 Loading a Background Image

To load a bitmap image (BMP file) select the Network | Load Bitmap menu command. The Load Bitmap dialog (below) will be presented. This dialog will assist you with the task of loading, positioning, and scaling the bitmap. This process associates a bitmap with a network and the association will remain until you remove the association.



## Set the Bitmap Background file path

The first task is to input the file name and path to the bitmap file. You may type in the path and file name directly to the edit box or browse to it via a standard File Selection dialog that pops up when the Browse button is pushed. When the file is selected, the bitmap will be displayed in the left pane. The bitmap dimensions will be filled in and the scale will be initially set to one mile per pixel. For example, initially a 500 pixel wide bitmap represents 500 miles in the real world.

## Bitmap Width and Height

In order for the bitmap to provide an accurate background, the World Width must be set by you to reflect the actual number of miles represented by the width of the bitmap. This step is critical to the accuracy of the traffic network. If the scale is not set accurately, the length of links created by referencing the bitmap may be off by many miles. This value can be determined by using known distances within the bitmap or using the scale of the map that generated the map. One method for determining the scale is as follows:

1. Print out the full bitmap.
2. Using a ruler, measure the distance between two points on the bitmap that you know the corresponding real world straight-line distance. For example, two intersections on a map that you know the distance between, or a football field (.057 miles or .068 if you include the endzones) on an aerial photograph make good points of reference.
3. Create a ratio of the real world distance in miles to inches or millimeters on the printout.
4. Measure the full width of the bitmap in inches or millimeters with the ruler.
5. Multiply the ratio and the bitmap width to get the number of miles represented by the width of the bitmap.
6. Enter this value in the World Width field on the Load Bitmap dialog.

You may need to adjust this value after you have created a few streets on the network. If the lengths of the links are not correct, enter a value that better represents the real world width of the bitmap. You may have to adjust the positions of nodes after the ratio has been reset.

## **Set the real world bottom left corner represented area: Left side alignment and Bottom side alignment**

Setting the position of the bitmap is critical to aligning an existing network with a new bitmap. The default values for a new bitmap are set to the zero left value and a zero bottom value. This places the bottom left corner at the crossing point of the major axes. This is a good place to start a new network. For existing networks, you may have to move the bitmap behind the network by adjusting the left and bottom alignment points. These values are in network (real world) coordinates (miles).

### **4.12.3 Adjusting the Bitmap Background**

A bitmap may need to be adjusted because the scale or the position was not input correctly. The bitmap background may be adjusted after it has been associated with a network by using the Load Bitmap dialog. The Network | Load Bitmap menu item will display the Load Bitmap dialog with the existing bitmap, file name and path, scale, and position information shown. You may select a different bitmap if desired. You may choose a different scale by adjusting the World Width value. You may also adjust the position of the bitmap by setting the Left and Bottom alignment values.

### **4.12.4 Hiding the Bitmap Background**

The bitmap may be hidden using the View | Bitmap Background menu item. The association of the bitmap to the network will remain but the bitmap background will not draw behind the network until you click the menu item again or you reload the network. You may delete the association between the network and the bitmap by following the Deleting the Bitmap Background instructions.

### **4.12.5 Deleting the Bitmap Background**

You may end the association between the bitmap and the network by removing the path and file name from the Load Bitmap dialog. The Network | Load Bitmap menu item will display the Load Bitmap dialog with the existing bitmap, file name and path, scale, and position information shown. Simply highlight the path and file name of the existing bitmap and delete it from the edit box. Select OK and the bitmap will no longer be associated with the network. The bitmap itself will not actually be deleted, just the association.

---

## **4.13 TIGER/Line Data**

TIGER/Line files are created and distributed by the U.S. Bureau of the Census. You can load TIGER/Line data into the document window to facilitate rapid creation of links and nodes.

### **4.13.1 Loading TIGER/Line Data**

Select the Network | Load TIGER Data menu command. A standard File Open dialog appears for selecting the TIGER/Line file. Only the type 1 card files (.f61 extension) are needed by QZEd. Any other card files will be ignored. The bottom left corner of the TIGER/Line data will be at location 0, 0 in Network coordinates.

Multiple TIGER/Line files can be read in. Simply load in additional files exactly as the first. Their data will be added to the network. The first file loaded will set the origin. The rest of the files will be automatically adjusted to the correct positions relative to the first.

### 4.13.2 Using TIGER/Line Data to Populate a Network

Using the data to populate a network is simple. To enter autopopulate mode, press the Autopopulate button or select the Network | Autopopulate menu command. There are two ways to populate the network.

1. Click on a road line. A link (or link pair) will be created to match this line. If there are nodes at the endpoints, the link will be connected to them. If there are no nodes at the endpoints, nodes will be created.
2. Press and hold the left mouse button, and drag out a box. All road lines within the box will have links created to match them. As above, existing nodes will be used where possible. New nodes will be created as necessary.

Due to the structure of TIGER/Line data, nodes exist everywhere two road lines cross, even where the roads do not actually intersect. When this occurs, it is better to manually draw these links using the TIGER/Line data like a map, rather than relying on automatic population.

### 4.13.3 Hiding TIGER/Line Data

The TIGER/Line Data may be hidden using the View | TIGER menu item. It will still be available, but will not draw until you click the menu item again. While the data is not visible, the Autopopulate function will not operate.





# 5 Glossary of Terms

## **active window**

When several windows are open, clicking the left mouse button anywhere in a window makes that the active window. The active window is indicated by a highlighted title bar. Also, the filename of the active window is displayed in the title bar of the main QZEd window.

## **ATMS**

Advanced Traffic Management Systems

## **DOT**

Department of Transportation

## **FHWA**

Federal Highway Administration. Sponsor for the development of the QuickZone work zone delay estimation program.

## **graphical user interface**

A interface between a user and a software tool, consisting of graphical elements and controls, e.g., windows, dialogs, buttons.

## **GUI**

Graphical User Interface

## **HTML**

Hypertext Markup Language is a system of marking up or tagging a document so that it can be published on the World Wide Web. It is used to display on-line help.

## **QuickZone**

QuickZone is the work zone delay estimation program developed by MitreTek Systems.

## **TIGER**

Topologically Integrated Geographic Encoding and Referencing.

## **tool tip**

A small rectangular pop-up window that displays a brief description of a command bar (toolbar) button's purpose.

# 6 Index

## A

About QZEd 1-1, 2-11  
 Adjusting  
   Bitmap Background 4-8  
 Arrange Icons 2-10  
 Autopopulate 2-8, 2-13, 4-9

## B

Bitmap Background 2-6, 2-14  
   Adjusting 4-8  
   Deleting 4-8  
   Hiding 4-8  
   Loading 4-6  
   Scale 4-7  
   Selecting 4-6

## C

Capacity 4-4  
 Cascade 2-9  
 Changing the View 3-2  
 Close 2-3  
 Closing 3-1  
 Copy 2-4, 2-11  
 Copying Objects 4-3  
 Creating  
   Links 4-1  
   Nodes 4-2  
 Cut 2-4, 2-11  
 Cutting Objects 4-3

## D

Delete 2-4, 2-11  
 Deleting  
   Bitmap Background 4-8  
 Deleting Objects 4-3  
 Description 4-5  
 Direction 4-5

Distance 2-8  
 Distance Tool 2-13

## E

Edit 2-3  
   Copy 2-4  
   Cut 2-4  
   Delete 2-4  
   Paste 2-4  
   Properties 2-4  
   Redo 2-4  
   Undo 2-4  
 Editing  
   Links 4-3  
   Nodes 4-5  
 Editing Multiple Links 4-5  
 Entire Network 2-6  
 Exit 2-3

## F

Federal Highway Administration 5-1  
 File  
   Close 2-3  
   Exit 2-3  
   New 2-3  
   Open 2-3  
   Save 2-3  
   Save As 2-3  
 File Menu 2-2  
 Free Flow Speed 4-5

## G

Grid 2-6, 2-14

## H

Help  
   About QZEd 2-11  
   Help Topics 2-11  
 Help Menu 2-10  
 Help Topics 2-11  
 Hiding  
   Bitmap Background 4-8

## I

Importing Images 4-6

## J

Jam Density 4-5

## Index

### L

- Lanes 4-4
- Length 4-4
- Link 2-7, 2-14
  - Capacity 4-4
  - Description 4-5
  - Direction 4-5
  - Editing Multiple Links 4-5
  - Free Flow Speed 4-5
  - Jam Density 4-5
  - Length 4-4
  - Number of Lanes 4-4
  - Properties 4-4
  - Type 4-5
- Link Defaults 3-2
- Links 4-3
  - Creating 4-1
  - Editing 4-3
  - Selecting 4-2
- Load Bitmap 2-8
- Load TIGER Data 2-8
- Loading
  - Bitmap Background 4-6
- Location
  - Node 4-6

### M

- Menu Bar 2-2
  - Edit 2-3
  - File 2-2
  - Network 2-6
  - View 2-4
- Microsoft 1-1
- Microsoft Windows 1-1
- Moving Objects 4-2

### N

- Network 2-6
  - Autopopulate 2-8
  - Distance 2-8
  - Link 2-7
  - Load Bitmap 2-8
  - Load TIGER Data 2-8
  - Node 2-7
  - Preferences 2-8
  - Select 2-7
  - Two-way Link 2-7
- Network Objects 4-1
- Network Window 2-1
- New 2-3, 2-11
- New Window 2-9
- Node 2-7, 2-12, 2-15
- Node Location 4-6

- Nodes
  - Creating 4-2
  - Editing 4-5
- Number of Lanes 4-4

### O

- Objects 4-1
  - Copying 4-3
  - Cutting 4-3
  - Deleting 4-3
  - Moving 4-2
  - Pasting 4-3
  - Selecting 4-2
- One-Way Link 2-12
- Open 2-3, 2-11
- Opening 3-1
  - Existing 3-1
  - New 3-1

### P

- Pan 2-5, 2-13
- Paste 2-4, 2-11
- Pasting Objects 4-3
- Preferences 2-8, 3-2
  - Graphics 3-3
  - Link Defaults 3-2
- Properties 2-4

### Q

- QuickZone 1-1

### R

- Redo 2-4, 2-12

### S

- Save 2-3, 2-11
- Save As 2-3
- Saving 3-1
- Scale
  - Bitmap Background 4-7
- Select 2-7, 2-12
- Selecting
  - Bitmap Background 4-6
  - Links 4-2
  - Objects 4-2
- Show Entire Network 2-14
- Status Bar 2-6, 2-14

### T

- The Basics of QZEd 2-1

- The Physical Layout 2-1
- Tiger Data 2-14
- Tiger/Line Data 2-6, 4-8
  - Autopopulate 4-9
  - Hiding 4-9
  - Loading 4-8
- Tile 2-9
- Tool Bar 2-6
- Toolbar 2-11
  - Autopopulate 2-13
  - Bitmap Background 2-14
  - Copy 2-11
  - Cut 2-11
  - Delete 2-11
  - Distance 2-13
  - Grid 2-14
  - New 2-11
  - Node 2-12
  - One-Way Link 2-12
  - Open 2-11
  - Pan 2-13
  - Paste 2-11
  - Redo 2-12
  - Save 2-11
  - Select 2-12
  - Show Entire Network 2-14
  - Tiger Data 2-14
  - Two-Way Link 2-12
  - Undo 2-12
  - Zoom In 2-13
  - Zoom Out 2-13
- toolbars 5-2
- tools 5-1, 5-2
- Traffic Model Objects 2-14
  - Link 2-14
  - Node 2-15
- Two-way Link 2-7
- Two-Way Link 2-12
- Type 4-5

## U

- Undo 2-4, 2-12

## V

- View 2-4, 3-2
  - Bitmap Background 2-6
  - Entire Network 2-6
  - Grid 2-6
  - Pan 2-5
  - Status Bar 2-6
  - Tiger/Line Data 2-6
  - Tool Bar 2-6
  - Zoom In 2-5
  - Zoom In to Center 2-6

- Zoom Out 2-5
- Zoom Out from Center 2-6

## W

- Window
  - Arrange Icons 2-10
  - Cascade 2-9
  - New Window 2-9
  - Tile 2-9
- Window Menu 2-8
- Working with QZEd Files and Networks 3-1

## Z

- Zoom In 2-5, 2-13
- Zoom In to Center 2-6
- Zoom Out 2-5, 2-13
- Zoom Out from Center 2-6