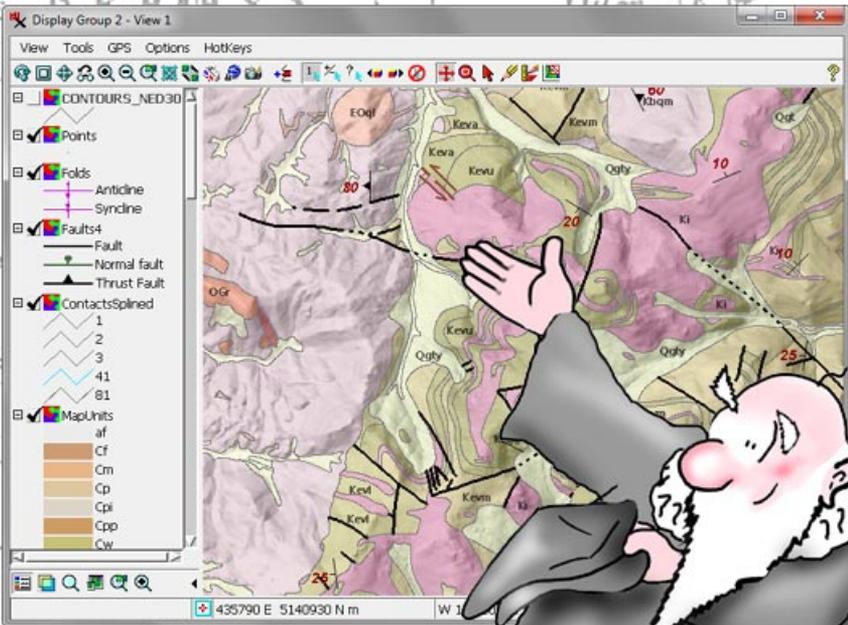


Tutorial



Introduction to the Display Interface



in

TNTmips[®]

TNTedit[™]

TNTview[®]

Before Getting Started

The geospatial Display process is common to TNTmips, TNTedit, and TNTview. This tutorial is an overview of the user interface for this process. It introduces basic concepts, controls, and operating procedures that you can use while displaying any type of geospatial data. Techniques specific to particular data layer and display types are introduced in the companion tutorial *Displaying Geospatial Data* and covered in more detail in other tutorials on specific aspects of the process.

Prerequisite Skills This booklet assumes that you have read and completed the exercises in the tutorial booklet *Getting Started with TNTmips, TNTedit, and TNTview*. That booklet introduces the general program interface, the TNTgis Project File, spatial object types, and essential skills such as selecting data. These concepts are not covered again here. Please consult that booklet and other TNTgis reference materials (installed or on MicroImages' web site) for any review you need.

Sample Data The exercises presented in this booklet use sample data that is distributed with the TNTgis software. If you do not have access to a TNTgis DVD, you can download the data from MicroImages' web site. In particular, this booklet uses sample files in the PARKWAY and VIEW3D data folders.

More Documentation This booklet is intended only as an introduction to displaying geospatial data. Consult the Technical Guides on MicroImages' web site for more information about the Display process.

TNTmips® License Levels TNTmips (the Map and Image Processing System) comes in three versions: the professional version of TNTmips (TNTmips Pro), the low-cost TNTmips Basic version, and the TNTmips Free version. All versions run exactly the same code from the TNT products DVD and have nearly the same features. If you did not purchase the professional version (which requires a software license key) or TNTmips Basic, then TNTmips operates in TNTmips Free mode.

All the exercises can be completed in TNTmips Free using the sample geodata provided.

Randall B. Smith, Ph.D., 21 April 2015

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You can print or read this booklet from MicroImages' web site. The web site is also your source for the newest tutorial booklets on other topics. You can download an installation guide, sample data, and the latest version of TNTmips.

<http://www.microimages.com>

Welcome to Using the Display Interface

The geospatial Display process is common to TNTmips, TNTedit, and TNTview. This core process enables you to display all types of map, image, and terrain data and provides many tools that enable you to explore the characteristics and database attributes of your geodata.

You can display spatial objects stored in MicroImages Project Files or in many other file formats. In the professional TNTgis software you can also display web layers such as Bing Maps and MapQuest maps and images, KML files, Web Map Server and ArcIMS layers, and custom web tilesets hosted by MicroImages or your own website.

The Display interface allows you to work with spatial data georeferenced to different spatial reference systems. You can overlay multiple geodata layers, and any layers with different georeferencing are automatically reprojected to register correctly with the target reference system.

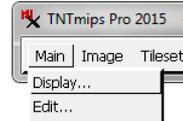
This tutorial introduces you to basic concepts, controls, and operating procedures that you can use to display and explore your geospatial data. We focus here on the general tools and controls that are applicable to most types of data layers, such as how to zoom and pan the View window, how to view and explore the database information associated with geodata layers, and how to make measurements and add annotations to your data. We also briefly introduce some of the more complex display options such as layouts and 3D perspective views, which are covered in more detail in other tutorials.

Once you are comfortable with the Display interface, we recommend that you continue with the *Displaying Geospatial Data* tutorial, where you will learn how to display different types of geospatial data layers and how to use more advanced display tools and techniques.

STEPS

In TNTmips:

- Start TNTmips
- choose Main / Display to start the Display process



In TNTedit:

- Start TNTedit
- press the TNTview icon button in the toolbar



In TNTview:

- Start TNTview

The basics of the Display process interface are introduced on pages 4-5. Basic operations such as zooming and panning the View as well as other handy View sidebar tools are covered on pages 6-11. Pages 12-17 introduce techniques for accessing the attribute information associated with the elements in your spatial objects. Pages 18-22 cover techniques for making measurements from your geospatial views and how to add and save annotations. Display option settings and procedures for taking snapshots of the View are introduced on pages 23-25, and the tutorial concludes by introducing layouts and 3D groups on pages 26-27.

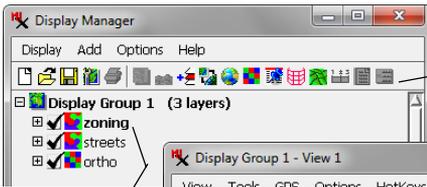
Display Manager and View

STEPS

- ☑ press the Add Objects icon  in the Display Manager window
- ☑ in the *Select objects to display* window, navigate into the folder containing your TNTgis Sample Data
- ☑ navigate into the PARKWAY folder, then into the PARKWAY Project File
- ☑ in the Browse list, left-click on the icons for the ORTHO, STREETS, and zoning OBJECTS (in that order) to select them
- ☑ press the OK button on the *Select objects* window

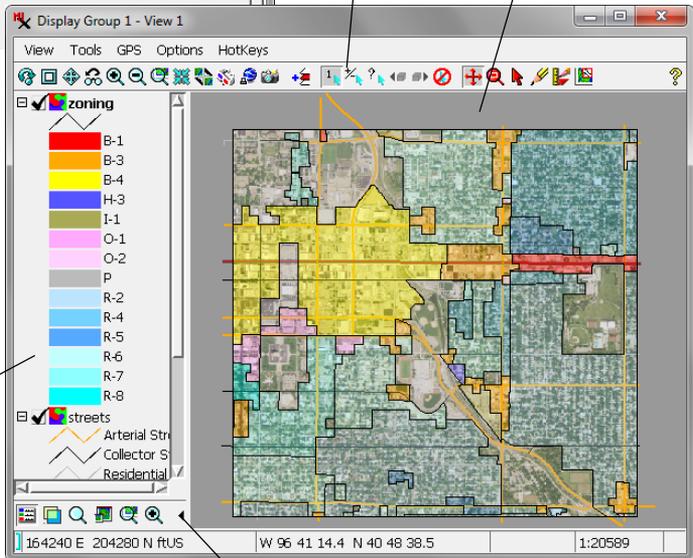
The main elements of the Display interface are the *Display Manager* and the *View* window. The *Display Manager* provides menus and a toolbar with icon buttons for adding spatial layers and shows a list of the layers that have been added to the display. These layer entries also provide controls for setting display options for the layer, hiding or showing the layer, examining attribute tables, and other functions.

The *View* window has a view canvas in which the layers are displayed and menus and toolbar icons that allow you to manipulate the view area and activate tools for exploring the data being displayed. An optional sidebar can display layer legends, a locator pane, a magnifier, and other viewing aids. A small triangular icon button opens and closes the sidebar.



The last layer added is the default **active layer** (name in bold font). Click on any layer entry to make it the active layer.

The **sidebar** in the *View* window can show layer legends, a locator, and other viewing aids.



toolbars The **view canvas** in the *View* window displays the spatial data layers.

This icon button closes and opens the sidebar.

Display Manager Layer List

In the previous exercise you selected three spatial objects: one color-composite image (raster object) and two vector objects. Each of these objects was added as a separate layer entry to the list in the Display Manager. They were also added to the View canvas. Layers are named by default with the name of the contained object.

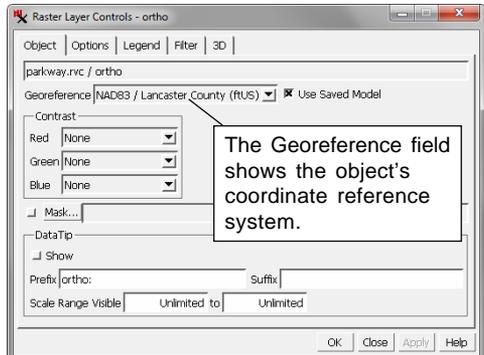
The icon shown to the left of each layer name in the Display Manager list indicates the type of object in the layer. If you place the cursor over one of these icons you will see a “Layer Controls...” ToolTip. Each of these icons also serves as a button that opens a Layer Controls window specific to the type of layer. This window lets you adjust the display parameters for each layer; these settings are automatically saved with the layer’s object. Layer-specific display settings are covered in the *Displaying Geospatial Data* tutorial.

The “check mark” icon button to the left of each layer icon is the Show/Hide button. Left-click on the button to hide the layer (check mark not shown) and click again to show the layer (check mark shown).

The layers are listed and displayed in the same order in which you selected their objects: the first object you selected (ORTHO) is the bottom layer and the last object you selected (ZONING) is the top layer. You can move a layer up or down in the list by dragging its entry. (You can also right-click on the layer name to open a right mouse-button menu and choosing one of the layer movement options: Raise, Lower, To Bottom, or To Top; some options may not be active due to the current position of the layer).

STEPS

- left-click on the Layer Controls icon button for the ORTHO layer in the Display Manager 
- note the entry in the Georeference field in the Raster Layer Controls window, then press the OK button.
- left-click on the Show / Hide icon  button for any of the layers to hide it; left-click again to show it.



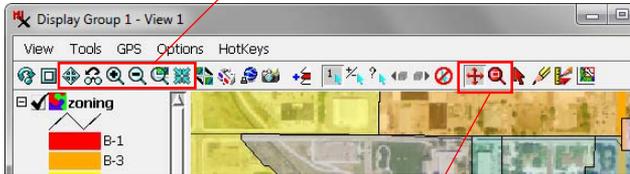
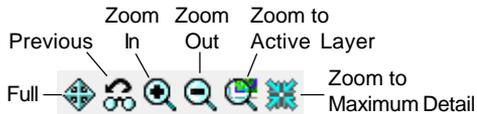
- left-click on the layer name “streets” in the Display Manager and drag the entry to the top of the list

Zooming and Panning the View

STEPS

- ☑ press the Zoom In icon button in the View window toolbar 
- ☑ place the cursor over the View and press the  key to zoom in at the cursor location
- ☑ with the View Position tool  active, left-click and drag to pan the View contents
- ☑ press the  key to scroll the view upward
- ☑ if you have a mouse with a scroll wheel, roll the wheel to zoom in and out
- ☑ press the Full icon button to zoom out to the full extents of the layers 
- ☑ press the Zoom Box tool icon button 
- ☑ left-click and drag open a box in the View to zoom in to the boxed area

The icon buttons on the left side of the View window toolbar zoom the view canvas. The Zoom In and Zoom Out buttons change the view scale by a factor of two while keeping the same view center location (except when near the edge of the data). Keyboard shortcuts that zoom at the cursor position are also provided. The Previous button returns to the zoom and position just prior to the previous redraw. The Full icon button zooms the canvas to show the full extents of all layers. Zoom to Active Layer zooms to show the extents of the active layer in the View; this is useful if layers with different extents are being displayed. For displays with raster layers, the Zoom to Maximum detail button zooms so that one image cell occupies each screen pixel.



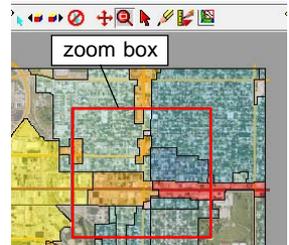
Keyboard Shortcuts

-  zoom in (at cursor)
-  zoom out (at cursor)
-  zoom to full view
-  zoom to 1X (maximum image detail)
-  zoom to 2X
-  scroll 90% in arrow direction

To see more shortcuts open the HotKeys menu in the View window.

View Position Tool  Zoom Box Tool 

The icon buttons on the right end of the toolbar activate tools that let you directly manipulate the view. Use the default View Position tool to drag the view in any direction or use the arrow keys to pan left, right, up, and down. Use the Zoom Box tool to drag open an elastic box; when you release the mouse button the display zooms to the extents of the box.



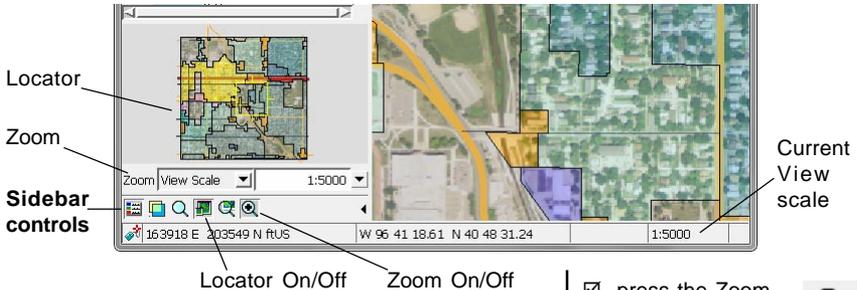
Sidebar Locator and Zoom Panels

Icon buttons at the bottom of the View window sidebar allow you to show or hide sets of additional controls in the sidebar. In this exercise we use two of these, the sidebar Locator and Zoom panels.

The Locator panel shows a reduced-size view of the full extents of all of the layers being displayed. An elastic box in the Locator indicates the portion of the display that is currently visible in the View. You can drag the box in the Locator in any direction to pan the view. You can also resize the box by dragging an edge or corner to zoom the View. Making the box bigger zooms out; making the box smaller zooms in. You can make the size of the Locator panel

STEPS

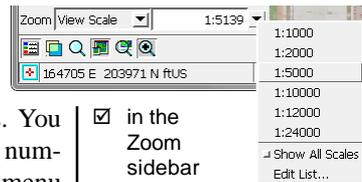
- press the Locator icon button at the bottom of the View sidebar (skip this step if the Locator is already shown) 
- if the View is at full extents, zoom in using any of the zoom methods
- drag the box in the Locator panel to pan the view
- drag an edge or corner of the box to resize it and zoom the View



itself larger by dragging the top of the Locator upward and/or by dragging the edge of the sidebar into the View canvas. You can open a separate Locator window by choosing Display / Open Locator View in the Display Manager.

- press the Zoom icon button at the bottom of the View sidebar (skip this step if the sidebar zoom controls are already shown) 

The sidebar Zoom panel has a pair of menus. When the menu on the left is set to View Scale, you can use the menu on the right to choose a new map scale at which to display the layers. You can also enter a map scale or scale factor (the number after “1:”) in the field to the left of the menu button. If you choose the View Width or View Height option from the menu on the left, you can enter a ground distance in the zoom field using units selected from the menu on the right.



- in the Zoom sidebar panel, press the arrow icon button to the right of the numeric scale value and choose 1:5000 from the menu

Magnifier and Layer Transparency

STEPS

- turn off the Locator and Zoom panels in the View sidebar
- turn on the Magnifier in the sidebar 
- move the cursor to different locations in the View
- use the + and - icon buttons in the Magnifier to change the magnification level
- turn off the Magnifier
- turn on the Transparency panel in the sidebar 
- in the Display Manager, left-click on the ZONING layer entry to make it the active layer
- move the Transparency slider to see the effect on the View
- return the Transparency slider to 0
- turn off the Transparency panel

The Magnifier panel provides a zoomed rendering of the portion of the View around the current position of the screen cursor, allowing you to examine details of local areas of the View. The Magnifier updates continuously as you move the cursor over the View. The current magnification level is shown in the upper left corner of the Magnifier pane. The minimum magnification is 2X, and you can vary the magnification using the small icon buttons above and below the magnification label.

The Transparency panel lets you vary the transparency of the active layer in the View. The panel has a slider and an accompanying numeric field that shows the current transparency value (between 0 and 100%). You can either move the slider or type a desired transparency value into the numeric field.

Transparency applied using the sidebar panel is in addition to any transparency set for the layer in its Layer Controls or in the styles of individual elements. For example, polygon styles in the ZONING object set a transparency value of 60% for each fill color, while the lines corresponding to polygon borders are opaque. The sidebar Transparency setting increases the polygon fill transparency and applies transparency to the originally-opaque lines.



Zoning layer with additional 50% transparency applied.

Display Group and Georeference

Note the entry at the top of the layer list in the Display Manager that is named Display Group 1. Display Group 1 was automatically created to contain the three layers we added in the first exercise (note that the layer entries in the list are indented relative to the group entry). The View window opened to display this group, so it is titled *Display Group 1 - View 1* (you can open additional views of a particular group by choosing Display / Open View).

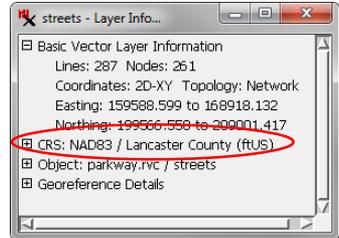
In the Display process a *group* is a set of one or more layers that are displayed together. Any spatial view has at least one group. A group can contain spatial data layers and map grids, or (in map layouts) individual layout elements such as legends, scale bars, and text.

In a group with georeferenced layers, all layers are drawn to match a particular coordinate reference system (CRS) and are positioned relative to each other using that CRS. The spatial objects we have been viewing are all georeferenced to the same CRS, “NAD 83 / Lancaster County (ftUS)”, which is therefore the group CRS. You can see the name of the CRS for a layer in its Layer Controls window (see page 5) or in the Layer Info window illustrated here.

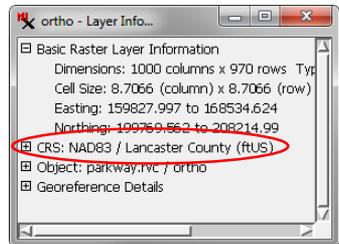
The layers in a group do not have to reference the same coordinate reference system. Any layers georeferenced to different coordinate reference systems are automatically reprojected in the View to match the group CRS. In a later exercise we will see how the group CRS can be set in such cases.

STEPS

- right-click on the STREETS layer entry in the Display Manager
- choose Layer Info from the right mouse-button menu
- note the CRS name in the Layer Info window



- close the Layer Info window
- repeat for the ZONING and ORTHO layers

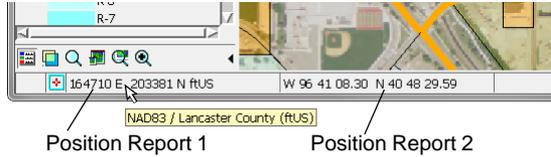


The name of a coordinate reference system consists of: [geodetic datum name] / [coordinate system name]. The objects in this exercise are georeferenced to the planar coordinate system defined for Lancaster County, Nebraska, which uses a Transverse Mercator map projection with locations specified in feet. A geodetic datum specifies a particular mathematical model of the shape of the Earth. The Parkway objects are referenced to the North American Datum 1983 (NAD83). For more background see the tutorials entitled *Coordinate Reference Systems* and *Introduction to Map Projections*.

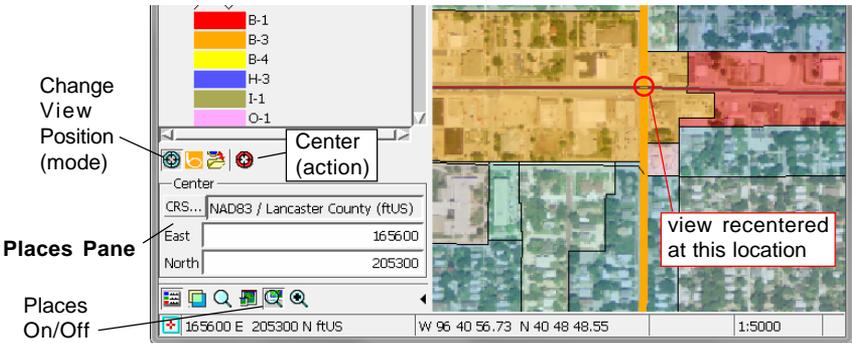
Position Reports and the Places Panel

STEPS

- move the cursor over the View canvas and note the changing values in the Position Report fields at the bottom of the View window
- turn on the Places icon button at the bottom of the sidebar
- in the Places panel, enter value 165600 in the East field and 205300 in the North field
- press the Center icon button in the Places panel



Two Position Report fields are included at the bottom of the View window. These fields show coordinates for the current position of the cursor in the View. Position Report 1 (on the left) defaults to the current group coordinate reference system. (Place the cursor over the field to see a ToolTip with the name of the CRS as shown in the illustration above.) Position Report 2 defaults to geographic (longitude/latitude) coordinates. The Options menu on the View window provides an entry for each position report that allows you to change the CRS for the report and/or the format to use for geographic coordinates (see page 23).



- turn off the Places panel in the sidebar

For more uses of the Places panel, see the *Set View Positions with Places Panel* and *Save Locations with Places Panel* Technical Guides.

The Places sidebar panel lets you change the position of the View in several ways. Three icon buttons at the top of the Places panel let you choose a mode for repositioning. The default Change View Position mode provides fields in which you can enter new coordinates for the center of the View. After entering coordinates, press the Center action button to recenter the View. You can change the CRS to use for the entered coordinates by pressing the CRS pushbutton above the coordinate fields.

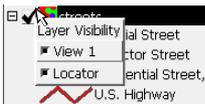
Sidebar Legend

The STREETS and ZONING vector objects each have a number of display styles that are keyed to the values of attributes in associated database tables. Samples of these styles are listed in the sidebar *Legend*. Like the Display Manager, the Legend has an entry for each layer in the display. The STREETS legend shows line styles for different types of streets, and the ZONING legend shows polygon fill colors assigned to different zoning districts. You can collapse or expand each layer entry to hide or show its legend. You can also hide or show the entire legend as needed using the Legend icon button at the bottom of the sidebar.

Turning a layer's Show / Hide checkbox in the Legend on or off only affects layer visibility in the View canvas; it does not affect the Locator (unlike the checkbox in the Display Manager). You can right-click on the Show / Hide checkbox in either the Legend or the Display Manager to show a menu with visibility toggle choices for the Locator and each open View.

STEPS

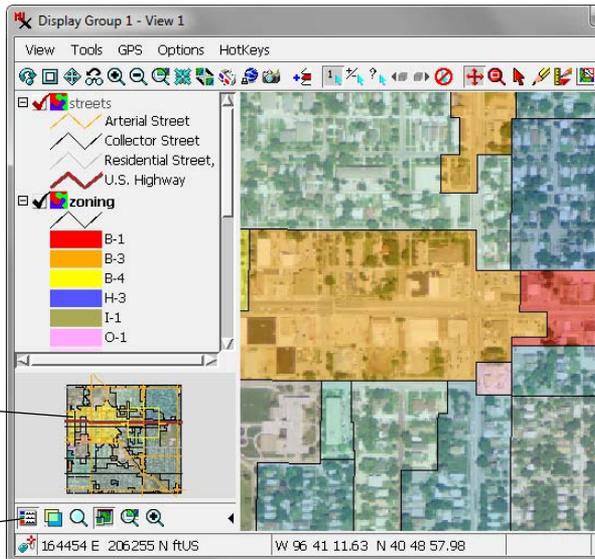
-  streets
 -  Arterial Street
 -  Collector Street
 -  Residential Street, Private
 -  U.S. Highway
- press the  icon button for the STREETS layer in the sidebar Legend to collapse the layer's legend
 - streets
 - zoning
- press this icon button again (now looks like ) to expand the STREETS legend
- turn on the sidebar Locator panel
- turn the Show / Hide checkbox for the STREETS layer entry in the Legend off and then on; note that only the main View is affected



Right mouse-button menu for the Show / Hide checkbox

STREETS layer still shown in Locator while hidden in the main View canvas after using the Show / Hide checkbox in the Legend.

Legend On/Off



View Database Tables

STEPS

- zoom the View out to full extents 



- in the Display Manager, press the expand icon button (⊕) for the STREETS layer



- in the expanded entry for STREETS, press the expand icon button (⊕) for lines



- turn on the Show / Hide Table checkbox for the *streets* and *StreetType* tables as illustrated below



The layer entries in the Display Manager list are also provided with expand/collapse controls (⊕ ⊖).

Expanding the layer entry for a vector layer reveals a list entry for each type of vector element that is included in the object and chosen for display. In the case of the STREETS layer in this exercise, the expanded layer entry shows a listing for line elements, which also shows the number of lines in the object.

Each vector element entry in the Display Manager list can also be expanded to show an entry for each database table (if any) that is associated with these elements in the object. In the STREETS layer there are two tables, *streets* and *StreetType*. These tables have been set to appear in *tabular view*, like a spreadsheet, in which each record occupies a row and each column is a data field in the table.

The *streets* table has one record for each line element in the vector object, and each of these records is *attached* to its corresponding line and shows attributes specific to that line. The *StreetType* table, on the other hand, has one record for each *type* of street. Its records are not directly attached to line elements, but instead are *related* to records in the *streets* table (and thus indirectly related to the line elements) by common values in the *TYPE* field in each table.

STREETS_ID	TYPE	COLOR	NEWST	STPRE	STNAME	STTYPE	ADOLL	ADDHL
133	70	7	N	14TH	ST	501	599	
152	70	7	N	VINE	ST	1200	1398	
171	20	2	O		ST	2100	2198	
801	40	4	N	17TH	ST	201	299	
802	40	4	N	17TH	ST	101	199	
804	40	6	N	ANTELOPE VALLEY	PKWY	201	299	
805	40	6	N	ANTELOPE VALLEY	PKWY	101	199	
810	20	2	O		ST	1700	1798	
811	20	2	O		ST	1800	1898	
813	20	2	O		ST	1900	1998	
837	20	2	O		ST	2200	2298	
838	20	2	O		ST	2300	2398	
839	20	2	O		ST	2400	2498	
854	20	2	O		ST	2000	2098	
855	40	4	S	17TH	ST	900	998	

267 of 267 records shown

DataTips

You can show attribute information for geodata layers interactively in the View using *DataTips*. You choose a field in a table to provide text for a DataTip box that appears temporarily in the View when you hold the mouse cursor over an element in the layer. Controls for choosing the DataTip field are in the Layer Controls window for the layer. The STREETS and ZONING vector objects in the View each have a designated DataTip field (for lines and polygons, respectively); when the cursor is on both a street line and a zoning polygon, information about both appears in the DataTip. The STREETS line DataTip provides the street name, type of street, and the speed limit. The database field referenced by the STREETS DataTip is a Computed Text field that con-

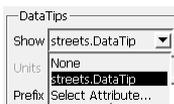
STEPS

- ✓ place the mouse cursor over one of the street lines in the View
- ✓ note the DataTip that appears
- ✓ in the Display Manager, press the Layer Controls icon button for the STREETS layer
- ✓ click on the Lines tab in the Vector Layer Controls window
- ✓ note the selection in the Show menu in the DataTip section
- ✓ close the Vector Layer Controls window

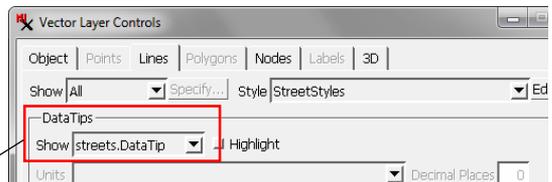


DataTip with information about the street line and the zoning district polygon at the cursor location

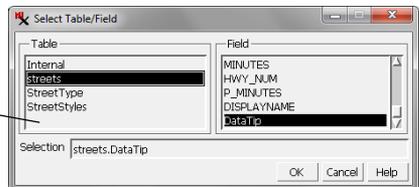
catenates information from several fields in the *streets* table. The DataTip for the ZONING polygons also references a Computed Text Field. You can learn about Computed Text fields in the *Managing Geoattributes* tutorial.



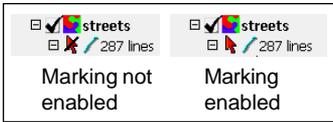
The *Select Attribute* option in the Show menu for DataTips opens the Select Table/Field window so you can choose a table and field to provide element-specific text for DataTips.



The Layer Controls window for vector, CAD, and shape objects provides controls for setting element DataTips.



Mark Elements in the View



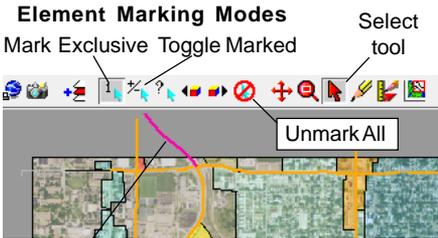
The Select Tool in the View window toolbar allows you to *mark* (select) elements in the View window. Marked elements are shown in special colors in the View. Records that are attached or related to the marked element(s) are also highlighted in any open views of the layer's database tables. This allows you to examine all of the database attributes associated with the marked element.

STEPS

- ☑ turn on the Select tool in the View window toolbar 
- ☑ left-click on one of the lines in the STREETS vector layer in the View
- ☑ note the records highlighted in the streets and StreetType tables
- ☑ press the Unmark All icon button in the View 

In order to mark a vector layer's elements in the View, marking must be enabled for that particular element type. A red arrow icon button next to the element entry in the Display Manager controls this behavior (see illustration above left). Marking is initially disabled by default for elements in a vector layer but is enabled automatically when you open a database

table view for that element type (as it was for the STREETS layer in our View).



Icon buttons in the View toolbar control element marking behavior. The Mark Exclusive mode marks one and only one element at a time (a marked element is unmarked automatically when another one is marked). The Toggle Marked mode allows you mark any number of individual elements by left-clicking on them. Clicking on a marked element unmarks it.

Line element in the STREETS vector layer marked in the View.

Records attached or related to the marked element are highlighted in the table views.

STREETS_ID	TYPE	COLOR	NEWS	STRE	STNAME	STTYPE	ADDLL	ADDLH
6807	60	6	S	14TH	ST	1400	1498	
14645	40	4		NORMAL	BLVD	3200	3299	
16244	40	4		Q	ST	1300	1398	
16245	40	4		Q	ST	1400	1598	
16248	60	6	N	14TH	ST	301	399	
16249	50	5	N	14TH	ST	301	299	
16250	50	5	N	14TH	ST	101	199	
18384	40	4	N	17TH	ST	801	999	
19197	40	4	200901N	ANTELOPE VALLEY	PKWY	801	999	
19200	40	4	200901N	ANTELOPE VALLEY	PKWY	501	799	
19262	40	4	200906N	ANTELOPE VALLEY	PKWY	301	499	

287 of 287 records shown - 1 related to selected elements

Records attached or related to the marked element are highlighted in the table views.

TYPE	DESCRIPTION
20	U.S. Highway
40	Arterial Street
50	Collector Street
60	Residential Street
70	Private Street

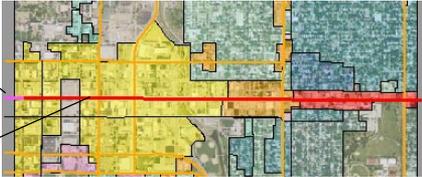
5 of 5 records shown - 1 related to selected elements

Using Attributes to Mark Elements

You can also invert the procedure from the last exercise and use a selected record or records in a table to mark the associated elements in the View. The Mark Elements and Exclusive buttons in the table window both mark all elements that are associated with the selected records. The Exclusive button also unmarks any previously marked elements, while the Mark Elements button merely adds the new elements to the marked set.

Active element

Marked elements

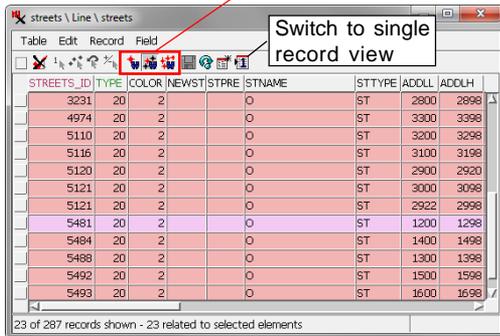


In a set of marked elements, one element is always designated as the *active* element, which is shown in a different color (default magenta) than the remaining marked elements (default red). (The Colors selection on the View window's Options menu opens a Select Colors window that lets you choose colors for marked and active elements; see page 23). Icon buttons in tabular views of database tables let you set whether to list all records, only marked element records, or just the records for the active element.

Show Active Element Records

Show Marked Element Records

Show All Records



STEPS

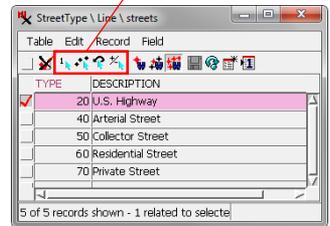
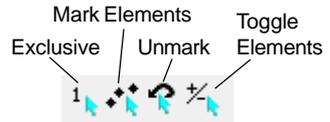
- ☑ in the *StreetType* table, left click on the gray box to the left of the record with "U.S. Highway" in the *DESCRIPTION* field
- ☑ note that a red checkmark appears in the box



- ☑ press the Mark Elements icon button in the *StreetType* table window toolbar
- ☑ note that the line listing for the STREETS layer in the Display Manager indicates 23 lines are marked



- ☑ in the *streets* table window toolbar, press the *Show marked element records* icon button



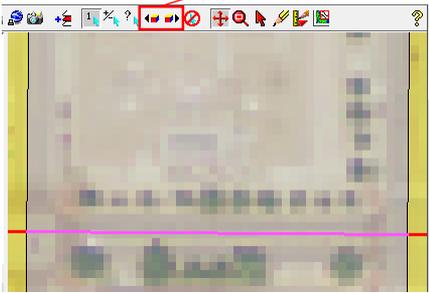
Single Record Database Table View

STEPS

- in the *streets* table window toolbar, press the *Switch to single record* view icon button 
- in the View window toolbar, press the Next Marked icon button several times 

An alternate way to view a database table is *single record view*. As the name implies, this mode of viewing a table shows only a single record at a time. The names of all of the fields are shown in the left-hand Name column, and the values of the fields in the current record are shown in the center Value column. The Units column shows the units assigned to any numeric fields and also shows the format for date and date/time fields. Single record view is useful when a table includes many fields, as all of the field values for a particular record can be seen at a glance. Tabular view requires scrolling the window horizontally to see all of the values for a record with many fields but allows seeing multiple records at once so that values can be compared.

Previous Marked   Next Marked



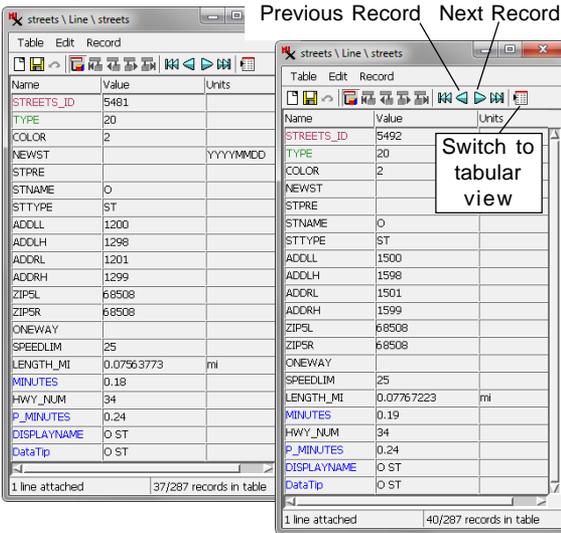
The View automatically zooms and recenters on the active element when using the Next Marked or Previous Marked icon buttons.

When elements are marked in the View, a single record table view by default shows the record for the active element. You can use the Next Marked and Previous Marked icon buttons on the View to step through the marked element set; the single record table view updates automatically to show the current active element record. You can also use the Previous Record and Next Record icon buttons on the table window to step through all of the records in the table without regard to marked or active elements.

When elements are marked in the View, a single record table view by default shows the record for the active element.

You can use the Next Marked and Previous Marked icon buttons on the View to step through the marked element set; the single record table view updates automatically to show the current active element record. You can also use the Previous Record and Next Record icon buttons on the table window to step through all of the records in the table without regard to marked or active elements.

Previous Record  Next Record 



Name	Value	Units
STREETS_ID	5481	
TYPE	20	
COLOR	2	
NEWST		YYYYMMDD
STPRE		
STNAME	O	
STTYPE	ST	
ADDLL	1200	
ADDLH	1298	
ADDRL	1201	
ADDRH	1299	
ZIPSL	68508	
ZIPSR	68508	
ONEWAY		
SPEEDLIM	25	
LENGTH_MI	0.07563773	mi
MINUTES	0.18	
HWY_NUM	34	
P_MINUTES	0.24	
DISPLAYNAME	O ST	
DataTip	O ST	

Name	Value	Units
STREETS_ID	5492	
TYPE	20	
COLOR	2	
NEWST		
STPRE		
STNAME	O	
STTYPE	ST	
ADDLL	1500	
ADDLH	1598	
ADDRL	1501	
ADDRH	1599	
ZIPSL	68508	
ZIPSR	68508	
ONEWAY		
SPEEDLIM	25	
LENGTH_MI	0.07767223	mi
MINUTES	0.19	
HWY_NUM	34	
P_MINUTES	0.24	
DISPLAYNAME	O ST	
DataTip	O ST	

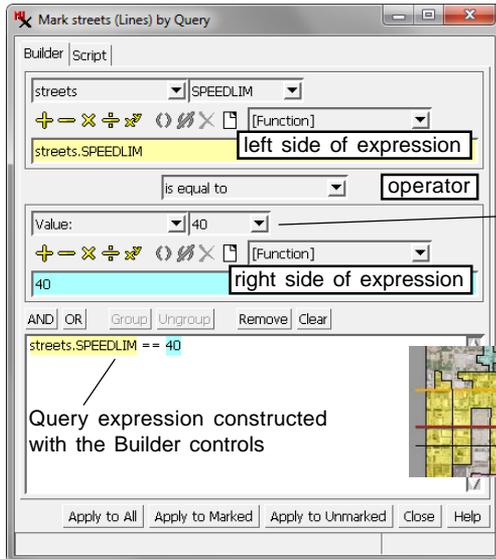
Mark Elements by Database Query

We chose the current set of marked elements by manually selecting the record for U.S. Highways in the `STREETTYPE` table. A more flexible method for identifying database records to mark elements is to use a *database query* to specify records with a particular attribute or combination of attributes. The Query Builder provides a handy set of interactive controls that let you construct a query expression.

The `SPEEDLIM` field in the `streets` table specifies the legal speed limit (in miles per hour) for each street line. Our query in this exercise identifies street lines with a speed limit equal to 40 miles per hour:

```
streets.SPEEDLIM == 40
```

We could apply this query to all elements, but by choosing to apply this query only to the previously marked elements, we refine our previous selection of U.S. Highway segments to those with a speed limit of 40 miles per hour. You can learn more about using database queries in the tutorial entitled *Building and Using Queries* and the *Interactive Query Builder Technical Guide*.



Query expression constructed with the Builder controls



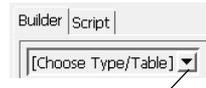
U.S. Highway line segments with speed limit = 40 miles per hour.

STEPS

- zoom out Full but keep the marked element set from the previous exercise
- in the View window toolbar, press the Mark by Query icon button



In the *Mark streets (Lines) by Query* window:



- press the arrow icon button on the Choose Type/Table menu at the top of the Builder tabbed panel
- from this menu choose the table `streets`



- open the Choose Field menu; scroll down in the menu and choose field `SPEEDLIM`
- choose 40 from the menu of values in the middle of the window
- press the *Apply to Marked* pushbutton at the bottom of the Builder panel

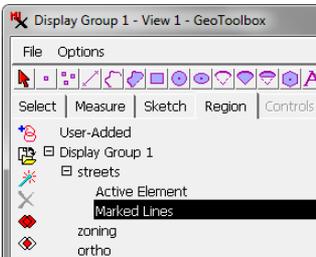
Measurements from Marked Elements

STEPS

- press [Close] on the Query Builder window but keep the marked element set from the previous exercise
- in the View window toolbar, press the GeoToolbox icon 
- in the GeoToolbox window, click on the Region tab
- on the Region panel click the expand button for Display Group 1 to show an entry for each layer in the View 
- expand the entry for the STREETS layer 
- left-click on the Marked Lines entry under STREETS

Suppose that we want to know the aggregate length of the street lines that we have marked in the View in order to know how many 40 mph speed limit signs are needed for that section. We can find the total length quickly using the GeoToolbox. The GeoToolbox provides a collection of drawing tools that can be used for measurement and sketching. It also serves as the management center for *regions*, which are temporary or saved objects that can be used for measurement and element selection. The typical region is a set of one or more polygons that outline an area of interest. But a collection of lines or points can also define a region for purposes of measurement.

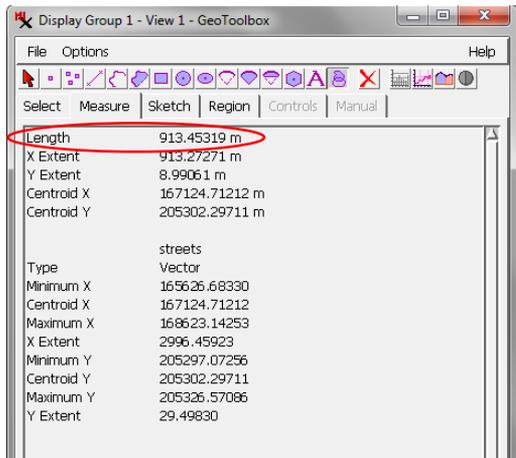
When elements are marked in the View, the active element and the set of marked elements each define a temporary region that can be selected on the Region tabbed panel in the GeoToolbox. The Measure panel shows the map extents and centroid position for the selected region and for the layer as a whole. For line elements it also shows the total length of the lines, and for marked polygons it shows the total perimeter and area.



- note the changed highlight color for the marked lines (the color may be different on your installation from the one illustrated)



- left-click on the Measure tab to see the length measurement

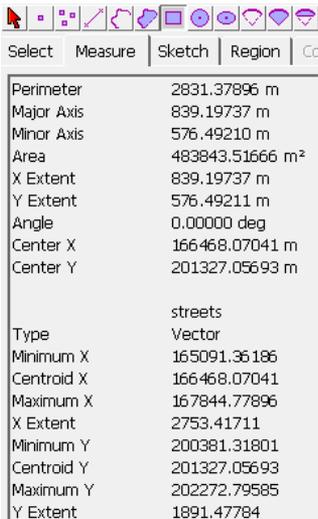


Measuring with GeoToolbox Tools

The GeoToolbox provides an extensive set of drawing tools accessed from its toolbar. You can draw points, straight ruler lines, complex lines and polygons, and various regular geometric shapes. Drawn elements can be used for measurements, saved as region objects, and added to sketch layers. For a more complete survey of the GeoToolbox tools, refer to the tutorial *Sketching and Measuring*.

The ruler tool lets you draw a simple two-point elastic line in the View that you can resize, reorient, and reposition as needed. The screen cursor shape changes as you interact with the ruler line. A pointing hand cursor appears when positioned over the line interior, allowing you to left-click and drag to reposition the line. A cross-hair cursor appears when positioned near either end of the line, allowing you to drag the end to resize and reorient the line. With the Rectangle tool, a double arrow cursor appears when over an edge or corner, allowing you to adjust the size and shape of the rectangle.

Values on the Measure panel update as you adjust



Select		Measure		Sketch		Region		Cc	
Perimeter	2831.37896 m								
Major Axis	839.19737 m								
Minor Axis	576.49210 m								
Area	483843.51666 m ²								
X Extent	839.19737 m								
Y Extent	576.49211 m								
Angle	0.00000 deg								
Center X	166468.07041 m								
Center Y	201327.05693 m								
Type	streets								
Type	Vector								
Minimum X	165091.36186								
Centroid X	166468.07041								
Maximum X	167844.77896								
X Extent	2753.41711								
Minimum Y	200381.31801								
Centroid Y	201327.05693								
Maximum Y	202272.79585								
Y Extent	1891.47784								

the graphic in the View. You can change the measurement units shown by choosing Options / Measure / Units on the GeoToolbox window.



STEPS

- press the Unmark All icon button in the View toolbar



Ruler Tool

- select the Ruler tool from the GeoToolbox toolbar
- left-click and drag to draw an elastic line in the View
- left-click and drag on the line to reposition it
- left-click and drag an endpoint to resize or reorient the line
- note the measurement values in the GeoToolbox Measure panel

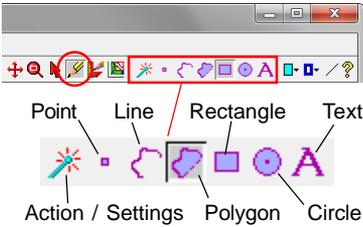


Rectangle Tool

- select the Rectangle Tool in the GeoToolbox
- left-click and drag in the View to draw an elastic box
- drag on the interior of the rectangle to reposition it
- drag an edge or corner of the rectangle to resize it
- note the measurement values in the GeoToolbox Measure panel
- close the GeoToolbox window when you have completed this exercise



Annotate Tool



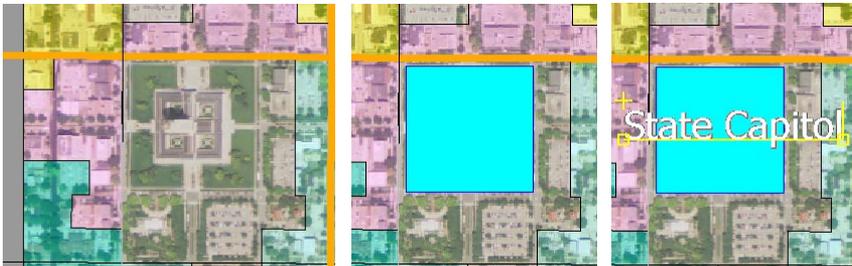
The Annotate tool allows you to quickly add simple graphic and text annotations over your other data layers in the View window. You can draw points, lines, polygons, rectangles, circles, and text while setting colors, line/border weights, and fonts. If you wish to reuse the annotations later, you can save the annotation layer as a

CAD object in one of your Project Files.

STEPS

- turn on the Zoom Box tool in the View and zoom in on the Nebraska State Capitol building (near the center left edge of the ortho image)
- turn on the Annotate tool
- turn on the Rectangle tool in the Annotate toolbar
- draw a box outlining the Capitol building and grounds, then right-click

When the Annotate tool is activated, icon buttons are added to the right end of the View toolbar so you can choose the drawing mode. (You may have to make the View window wider to see all of the icon buttons.) After drawing an element or placing text, and making any needed adjustments, press the right mouse-button to add the element to the annotation layer. One or more additional icon buttons also appear in the toolbar for each drawing mode so you can choose options such as color, line or border weight, and font.



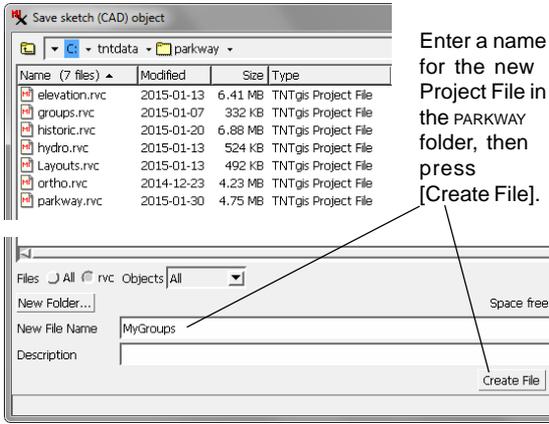
- turn on the Text annotate tool
- left-click in the View to the left of the Capitol box and type "State Capitol", then right-click

The Annotate toolbar also includes an Action / Settings button that opens a menu. The *Delete Last Annotation* option deletes the last element you added to the current annotation layer. The *Clear Drawing Tool* option clears the current tool graphic. Use the *Save to* option to save the annotation layer as a CAD object in a Project File and the *Open* option to open an existing saved CAD object for modification. For more information see the *Annotate Tool Technical Guide*.

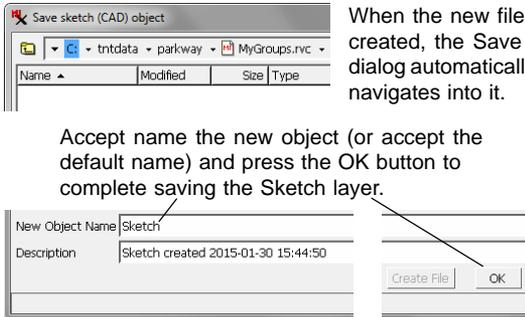
Note that a layer named "Sketch" was added to the Display Manager and View legend for the annotations.

Save Sketch and Group

We can save our annotation layer as an object in a Project File, then create a *saved group* that includes the original three data layers and the new annotation layer. A saved group can be reopened later, which automatically loads all of the layers that were included in the original group. The display settings



When the new file is created, the Save dialog automatically navigates into it.



for each layer are also saved with the group, so when it is reopened each of its layers appear just as they did when the group was saved, even if the display settings for individual layers have been changed after the group was saved.

NOTE: Since the new group references objects in both the PARKWAY and MYGROUPS Project Files, these files must be kept together (if moved) in order for the group to maintain valid links to all of its layers.

NOTE: more extensive drawing and sketching capabilities are included in the GeoToolbox, as described in the *Sketching and Measuring* tutorial.

STEPS

Save the Sketch

- press the Action / Settings icon  button in the Annotate toolbar and choose *Save to* from the menu

In the *Save sketch (CAD) object* window:

- navigate to the PARKWAY folder
- in the New File Name field, enter "MyGroups"
- press [Create File]
- accept the text in the New Object Name field and press [OK]

Save the Group

- in the Display Manager, press the Save Display icon  button

In the *Select object to save group* as window:

- navigate to the PARKWAY folder and into the MYGROUPS Project File you created
- accept the text in the New Object Name field and press [OK]

Close the Group

- in the Display Manager, right-click on the Display Group 1 list entry
- choose Close Group from the right mouse-button menu

Change Group Coordinate Reference

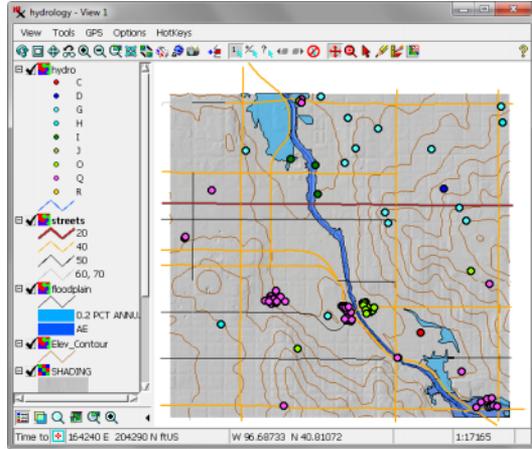
STEPS

Open a Saved Group

- ☑ press the Open Display icon  button in the Display Manager
- ☑ in the Select Objects window, navigate into the PARKWAY folder in your TNTgis sample data sets
- ☑ navigate into the GROUPS Project File
- ☑ select the group named hydrology and press [OK]

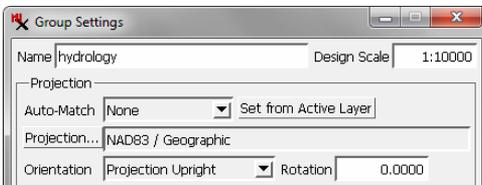
Change the Group CRS

- ☑ left-click on the ELEV_CONTOUR layer entry in the Display Manager or View sidebar to make it the active layer
 - 
- ☑ in the Display Manager press the Settings icon button for the HYDROLOGY group 
- ☑ in the Projection controls in the Group Settings window, choose None from the Auto-Match menu
- ☑ press the Set from Active Layer pushbutton
- ☑ press [OK] in the Group Settings window



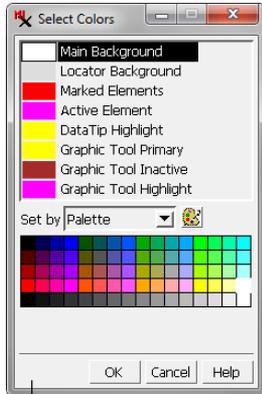
Although most of the layers in the *hydrology* group that we open in this exercise are georeferenced to the Lancaster County coordinate reference system described earlier, the *ELEV_CONTOUR* layer is georeferenced to NAD83 / Geographic. The group CRS by default is set to automatically match the first layer in the group, which in this case means that the group CRS is the Lancaster County CRS.

The Auto-Match menu in the Projection controls in the Group Settings window allows you to auto-match the group CRS to either the First Layer or the First Image Layer. You can turn off auto-matching by choosing None from the menu, which activates the other Projection controls. You can set the group CRS from the active layer, which in this exercise reprojects all layers to NAD83 / Geographic. You can also press the Projection button to open a dialog window that allows you to choose from the hundreds of coordinate reference system combinations provided in the TNTgis products. See the *Coordinate Reference Systems* tutorial for instructions on choosing a CRS.



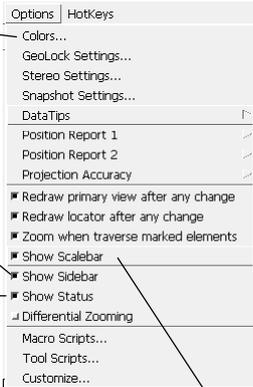
View Window Options Menu

The Options menu on the View window lets you make a number of changes to the layout and functioning of the View window. Among other options, you can change the background colors of the main View and the Locator as well as the colors used for marking elements and for graphic tools shown in the View. You can choose to show or hide a scalebar in the View. The Position Report options let you set the spatial reference system and geographic coordinate format for the Position Reports. The DataTip submenu lets you set which layers in the View contribute information to DataTips in the View.



Select background, marking, and graphic tool colors

Hide or show the View sidebar

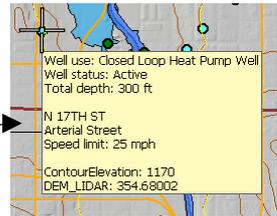


STEPS

- ❑ open the Group Settings window, set the Auto-Match menu to First Layer, and press [OK]
- ❑ open the Options menu on the View window, examine the options, and choose the Colors option
- ❑ in the Select Colors window, change the color of the Main Background if desired and press [OK]
- ❑ open the Options menu again and move the cursor over DataTips and Position Report 1 entries to see their submenus



Choose whether to show either Position Report, choose the spatial reference system for the coordinates, and the format for geographic coordinates if applicable.



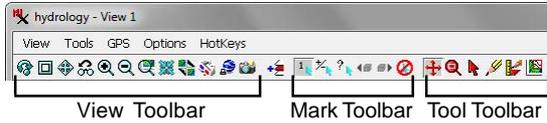
The *Maximum* option on the DataTips submenu shows information at the cursor location for all layers that have DataTips set. Other options include the Active or Top layer, or only visible layers.



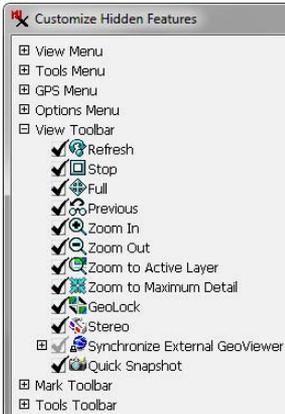
Customize the View Toolbar and Menus

STEPS

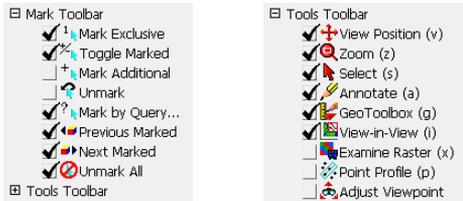
- choose *Customize* from the Options menu in the View
- in the Customize Hidden Features window, expand the entries for the View, Mark, and Tools toolbars
- close the Customize window



The View and Tools menus and the icon buttons on the View toolbar let you perform actions in the View and to activate graphic tools. The View, Mark, and Tools toolbars in the default installation provide a selection of the most frequently-used actions and tools. You can choose which selections appear in the View, Tools, and Options menus and which icon buttons appear in the toolbars using the Customize Hidden Features window, which you open from the View window's Options menu.



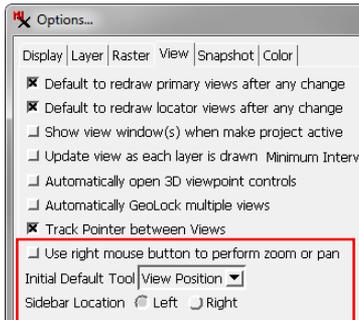
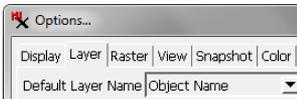
View Toolbar Options



Mark Toolbar Options Tools Toolbar Options

The Options window opened from the Display Manager (Options / View Options) allows you to set a large number of display options. The Layer panel lets you choose the source of the default layer name shown in the Display Manager and sidebar legend (object name, object description, or file and object name).

- choose Options / View Options from the Display Manager
- click on the View tab in the Options window and examine the options
- close the Options window



The View panel lets you choose the tool that is initially set as active when the View window opens, and to choose the sidebar location (left or right of the View canvas).

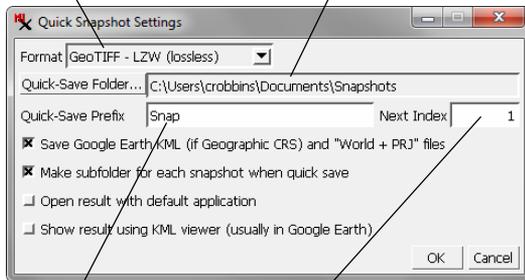
Quick Snapshots of View Contents

The Quick Snapshot icon button in the View window's View toolbar allows you to save images of the View contents that you can use for presentations or publications. Snapshots are captured as a composite of all of the layers currently visible in the View at the resolution of the screen. The snapshot is saved as a 24-bit image in a file format and folder location that you specify using the Quick Snapshot Settings window, which you can open by choosing Options / Snapshot Settings in the View window.

You can save snapshots as RVC raster objects in Project Files, or as (Geo)JP2, (Geo)TIFF, JPEG, or PNG format, with several compression options for most formats. Georeference information is automatically saved with snapshots to GeoJP2, GeoTIFF, or RVC, and you can choose to save supplementary georeference files (Arc World, PRJ, and KML) when saving to these or other external formats.

Choose format

Choose snapshot folder



Choose filename prefix

Set the starting index number

Use the Quick-Save Folder pushbutton in the Settings window to choose a folder where snapshots will be automatically saved. Files are named using the text you provide in the Quick-Save Prefix field followed by a number that is automatically incremented by 1 starting with the value in the Next Index field. You can change these settings at any time to direct a new series of snapshots to a new location on your hard drive.

STEPS

- choose Options / Snapshot Settings from the View window

In the Quick Snapshot Settings window:

- use the Format menu to choose an image format
- press the Quick-Save Folder pushbutton to choose a folder in which to save the snapshot files
- enter a root name for the snapshot files in the Quick-Save Prefix field
- Edit the Next Index field if desired to set a starting index number for the auto-incremented snapshot file names
- press [OK]

In the View window:

- zoom in on an area of interest
- press the Quick Snapshot icon button 

Note: the Quick Snapshot Settings window opens automatically when you press the Quick Snapshot icon button if you have not yet specified snapshot settings.

For more information see the *Quick Snapshot of View Contents* and *Quick Snapshot for Google Earth* Technical Guides.

Layouts

STEPS

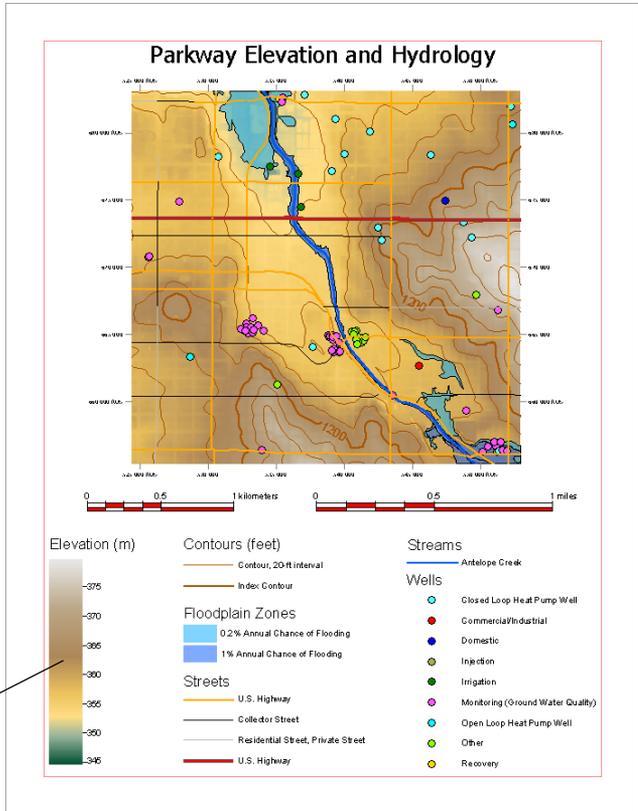
- in the Display Manager, right-click on the HYDROLOGY group entry
- choose Close Group from the right mouse-button menu
- press [No] in the Question dialog concerning changes to the group
- press the Open Display icon  button
- navigate out of the GROUPS Project File, into the PARKWAY folder
- navigate into the LAYOUTS Project File
- choose object HYDROLAYOUT and press [OK]

A layout is a more complex display that can include multiple groups. You can create and save several different types of layouts. *Page layouts* are intended for printing; you choose a media size, place groups on this virtual page, and have the option to add scale bars, legends, and text annotations (see illustration below). Display layouts and tiled layouts are intended for on-screen use. In a display layout, multiple spatial groups (usually with coincident or overlapping geographic extents) are superimposed and registered to each other in the View; these layouts are useful in the design of electronic atlases. A tiled layout contains a tiled array of spatial groups in the View.

To create a new layout, press the New icon  button and choose Tiled Layout, Display Layout, or Page Layout

For more information about layouts, see the *Displaying Geospatial Data* and *Making Map Layouts* tutorials.

Page layout designed for print media, with map grid, scale bars, and legend.

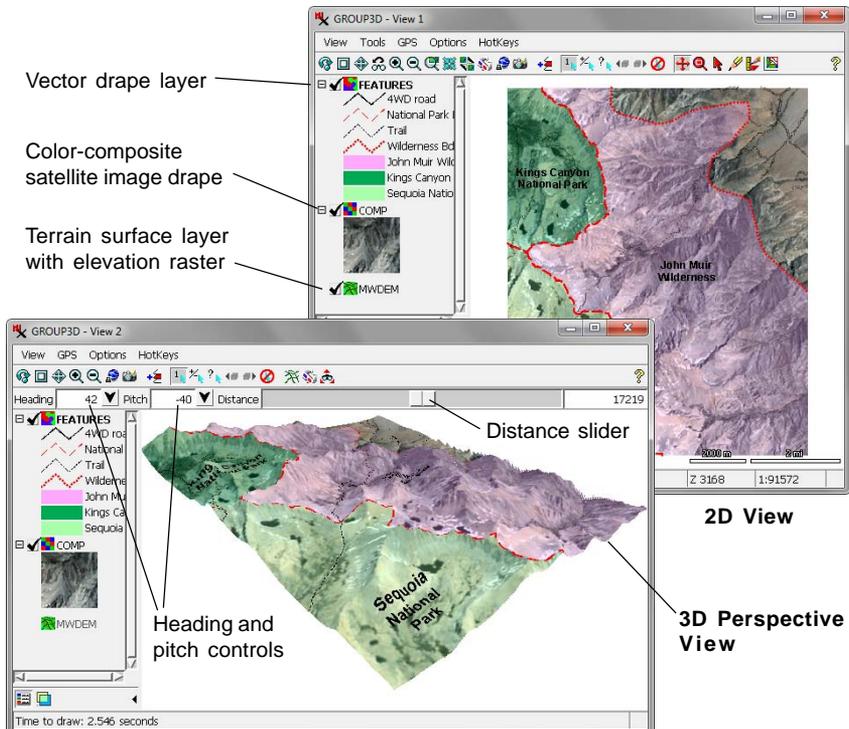


3D Perspective Views

The Display process also allows you to create and save groups that include both regular 2D views and 3D perspective views of the data. A 3D group includes a *terrain* or *surface* layer that contains a raster object whose cell values are used as elevation values to define a 3D surface. Other layers containing image or geometric objects are then draped over this surface in the 3D perspective view. The perspective view provides controls to let you set the direction of view and the distance between the viewpoint and the data. You can find more information about 3D groups in the *3D Perspective Visualization* tutorial.

STEPS

- close the HYDROLAYOUT layout
- press the Open Display icon 
- in the Select window, navigate out of the LAYOUTS Project File and out of the PARKWAY folder
- navigate into the VIEW3D folder, then into the view3D Project File
- select GROUP3D and press [OK]



What Next? Your next step in learning about the Display process in the TNTgis software products should be the tutorial booklet *Displaying Geospatial Data*, which provides more detailed information about displaying different types of geospatial data.

Advanced Software for Geospatial Analysis

MicroImages, Inc. publishes a complete line of professional software for advanced geospatial data visualization, analysis, and publishing. Contact us or visit our web site for detailed product information.

TNTmips Pro TNTmips Pro is a professional system for fully integrated GIS, image analysis, CAD, TIN, desktop cartography, and geospatial database management.

TNTmips Basic TNTmips Basic is a low-cost version of TNTmips for small projects.

TNTmips Free TNTmips Free is a free version of TNTmips for students and professionals with small projects. You can download TNTlite from MicroImages' web site.

TNTedit TNTedit provides interactive tools to create, georeference, and edit vector, image, CAD, TIN, and relational database project materials in a wide variety of formats.

TNTview TNTview has the same powerful display features as TNTmips and is perfect for those who do not need the technical processing and preparation features of TNTmips.

TNTatlas TNTatlas lets you publish and distribute your spatial project materials on CD or DVD at low cost. TNTatlas CDs/DVDs can be used on any popular computing platform.

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