Encompass Feature Editing Tools

Prepared for users of Encompass applications.

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Table of Contents

Document Notation

This is the notation style used throughout this document.

Bold text refers to menu lines on figures on the page.

Tips and techniques are generally located on the lower left of the page.

Press-slide-release a.k.a. **dragging** actions are indicated by a pair of arrow pointers.

Mouse button clicks and snaps are indicated by an arrow pointer.

The Select Tool

The Select tool is used to choose one or more features to make them available for subsequent edit operations.

Clear Selected Features releases the selected features. This action is only enabled when there are one or more currently selected features.

Select By Click or Drag Box sets the selection mode to select features using clicked positions or dragged rectangles.

Select By Polygon sets the selection mode to select features using a polygon. The first click on the map starts the polygon input. Use either the **End Input** menu, the enter key, or double-click to end the polygon construction and select features.

The current mode is checked on the menu and the tool button is changed to ⊾ for the click or drag mode or ⊿ for the polygon mode.

When using the dragged box or polygon, features from the current layer that are inside or overlapping the box or polygon boundary are selected.

Hold the shift key down while selecting to keep the currently selected features in the list.

Features are selected from the current layer.

Use a snap instead of a left-click to pick up only one feature when there are several in close proximity.

The drag box may be used on a rotated map.

click to select features at a single position

drag a box to select multiple features

draw a polygon to select multiple features in an irregular area

Avec Training > Sketching > Tools > Select   Page 14

press ···· **slide** ····▶ **release**

When a clicked position is adjusted by a snap the adjusted position is indicated by a red circle.

Menu hierarchies are shown as *Parent > Child* (like **Edit > Align > Tops**).
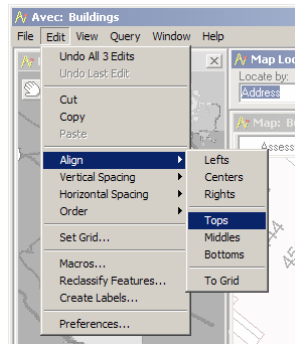
Left-mouse-button a.k.a. **primary button**. A click on this button is referred to as a **left-click**.

Right-mouse-button a.k.a. **secondary button**. A click on this button is referred to as a **right-click**.

A press of the **enter key** a.k.a. **carriage return** is indicated by a button icon.

⏎enter

Features and Primitives

A feature is a graphic digital representation of a real world entity. Examples of features are manholes, water mains, Assessor's parcels, doors, room areas, street centerlines, and street name labels. Like features are grouped into feature classes. Features in the same feature class have the same attributes, edit methods, and edit authorities.

A primitive is a single graphic element. Features may contain one or more primitives.

Features fall into one of five feature types: (1) point, (2), line, (3) polygon, (4) text, or (5) composite. A composite type may contain any combination of primitive types. All feature types may contain annotation and leaders.

A feature is stored as a single record in a table in an relational database (like Microsoft's Access or SqlServer). This record may contain attribute columns as well as the columns that contain the feature geometry

Primitive Types

Point	Must have only one vertex. A point has no length or area.
Line	Must have at least two vertexes. A line has a length, but no area. Lines may be closed (meaning it may look like a polygon). A segment is the portion of a line between two vertexes.
Polygon	Must have a minimum of three vertexes if there is at least one curved segment. If there are no curved segments, there must be at least four vertexes. The first and last vertex on a polygon are always coincident. A circle is a three vertex polygon with two segments that are each half circles.
Text	Must have only one vertex which is located at the text justification point. One text primitive may contain multiple lines of text.
Annotation	Like *text*, but must be in a feature that also has at least one point, line, polygon, or text primitive.
Data Annotation	Like *annotation* but refers to one or more database fields for text content.
Leader	Like *line*, but must be in a feature that also has at least one point, line, polygon, or text primitive.

Annotation, *data annotation*, and *leaders* are only displayed when the layer's Display Annotation flag is set.

GIS Feature Data Hierarchy

Catalog: servers containing databases for multiple jurisdictions (may be distributed over a network).
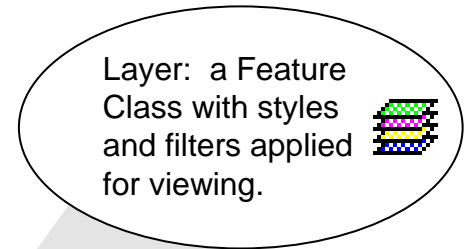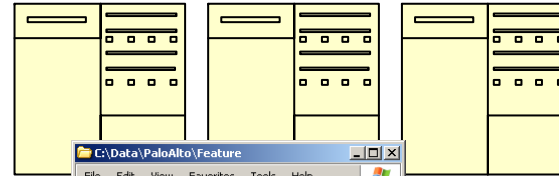
Feature Dictionary: a set of folders containing database files for a single jurisdiction (may be distributed over a network). Contains multiple groups.

Group: a set of tables in a database with a common owner and prefix. Contains multiple feature classes

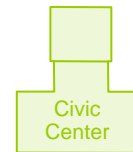Feature Class: a table in a database containing feature records.

Feature: one record in a table containing attribute fields and a geometry field.

Feature Geometry: BLOB from the geometry field in the feature record. Contains one or more primitives.

Graphic Primitive: a single graphic element. The constituent parts of a feature geometry.

Layer: a Feature Class with styles and filters applied for viewing.

Mouse Interaction

Press-Slide-Release

This is a simple action where the entire edit operation is accomplished with one mouse down and one mouse up action with the pointer being moved in between. This provides for quick and easy user interaction but not much precision. The term "dragging" is used synonymously with press-slide-release.
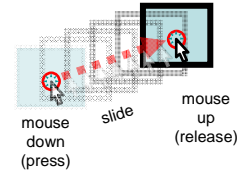
Multiple Click Positions

The multi-click approach uses a sequence of mouse clicks, one for every position needed by the edit method. A click is a mouse down and mouse up action in a short amount of time without moving the pointer in between. This approach allows for precise input techniques like the use of snapping and relative position entry.
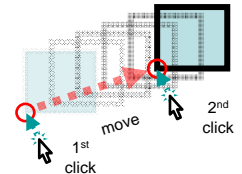
Right-Mouse-Button Click

The right-mouse-button may cause either a menu or a dialog (a.k.a. window) to pop up depending on pointer location and context.

The toolbar dialogs are used primarily to set properties for edit operations (like fillet radius or graduation tick length) and secondarily to provide extended functionality for more advanced users (like clearing the selected feature list). Tool dialogs are sensitive to the tool over which the pointer is located.

The popup menu is used either to (1) fine-tune mouse positions (like snapping to a line or setting a relative position) when the user is in the middle of executing an operation, (2) take an action (like ending the input of a line feature), (3) set properties for the edit tool, or (4) invoke a new (commonly used) edit tool (like delete or move). The popup menu is sensitive to the current edit tool as well as where the user is in the input sequence. For example, the "Close" option is only offered for the "add line" tool and only if the user has entered more than two vertices for the line under construction.

Repeating Snaps

Depending on the mouse hardware and driver software, the third button may be programmed to repeat the most recent snap type. This is useful for input sequences that use the same snap repeatedly.

Precision Input

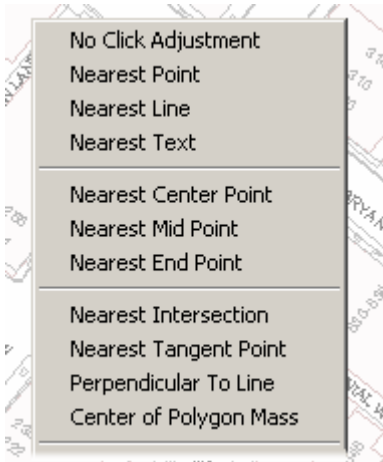There are several methods for precisely defining vertex positions and line geometries:

- new or existing vertexes may be added or moved to a position on an existing geometry using a variety of snapping techniques (like **Nearest Point**) using the tool popup menu,

- vertexes may be added or moved by defining their position relative to the last clicked position using the **Adjust Position** dialog,

- vertexes may be added or moved to an exact coordinate position using either State Plane coordinates or Latitude and Longitude using the **Adjust Position** dialog, and

- new line geometries may be constructed (a.k.a. "traversed") using a COGO (Coordinate Geometry) entry method through the **Traverse** dialog.

Snapping

Snapping adjusts the clicked position precisely to an existing feature. The exact position on the feature is determined by the snap method used:

No Click Adjustment uses the last clicked position without making any adjustments.

Nearest Point snaps to the nearest point or vertex on a line or polygon boundary.

Nearest Line snaps to the nearest line or polygon boundary.

Nearest Text snaps to the nearest of the nine justification points on a text feature.

Nearest Center Point snaps to the center of an arc segment or circle.

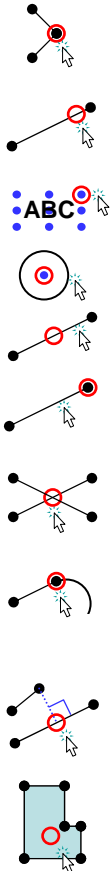**Nearest Mid Point** snaps to the mid-point of a line or arc segment.

Nearest End Point snaps to the end point of a line or arc segment that is closest to the clicked point.

Nearest Intersection snaps to the point where two lines or arcs cross but may not have vertexes at the intersection point..

Nearest Tangent Point snaps to the tangent point between a straight line and an arc or circle, or between two arcs or circles.

Perpendicular To Line snaps to the position on a line or arc segment that creates a right angle from the previously entered vertex. This snap type is only available when drawing lines after the first vertex is defined.

Center of Polygon Mass snaps to the center of mass of a polygon (a weighted average of the polygon vertexes).

Launch the snap menu with a right-mouse-button click on the map.

Snap tolerance is 6 pixels.

For snapping on a grid see the Grid Tool.

For snapping priority see the Select Tool.

Each geometry tool may add tool-specific menu items to the bottom of the popup menu.

Adjust Position

Adjust Position… displays the *Position Dialog* for adjusting the position relative to the previously entered position or to an exact coordinate.

Use **Absolute** to enter an **X** and **Y** in State Plane coordinates. Check **Use Northings and Eastings** to alter the coordinate labels to **Easting** and **Northing**.

Use **Relative** to enter a position that is offset from the previously entered position by the values entered in **X** and **Y.** Positive **X** and **Y** values adjust the position to the right and up, negative values adjust the position to the left and down.

Use **Bearing & Distance** to enter an **Angle** in degrees, minutes, and seconds, and a **Distance** to define a vector whose end is relative to the previously entered position. An angle of N 0° 0' 0" E or W is up, S 0° 0' 0" E or W is down, N 90° 0' 0" E or S 90° 0' 0" E is to the right, and N 90° 0' 0" W or S 90° 0' 0" W is to the left.

Use **Lat/Long (deg-min-sec)** to enter **Latitude** and **Longitude** in a degrees, minutes and decimal seconds format. Use **Lat/Long (decimal deg)** to enter **Latitude** and **Longitude** in a decimal degree format.

Networks – Links and Nodes

A link/node network is a model of a system through which there is flow.

Link: a linear conveyance that connects two nodes. Examples of links are main, lateral and service pipes, ductbeams, electric distribution conductors, and road centerlines.

Node: a point structure that is connected at the end of at least one link. Examples of nodes are manholes, valves, catch basins, vaults, switches, and road intersections. Network connectivity may be interrupted or redirected at a node.

Point Tap: a connection from one link end to any position along a second link that is not at the end. Examples of point taps are wye and tee fittings that connect laterals to a main pipe, and gas taps that connect a service line to a main.

Network Rules

- Nodes must be at link ends.
- A link must connect to at least one node at one of its ends and at most to two nodes, one at each end.
- A node must have at least one link and may have any number of links connected to it.
- A point tap must lie along the link that is being tapped. The point tap may not be at the link end.
- Links are drawn in the direction of flow. In a pressure system, this is the direction of normal operation. For road centerlines this is in the direction of ascending addresses.
- Links should not pass through nodes.
- There should never be more than one node or point tap at the same position.

point tap

node

flow direction
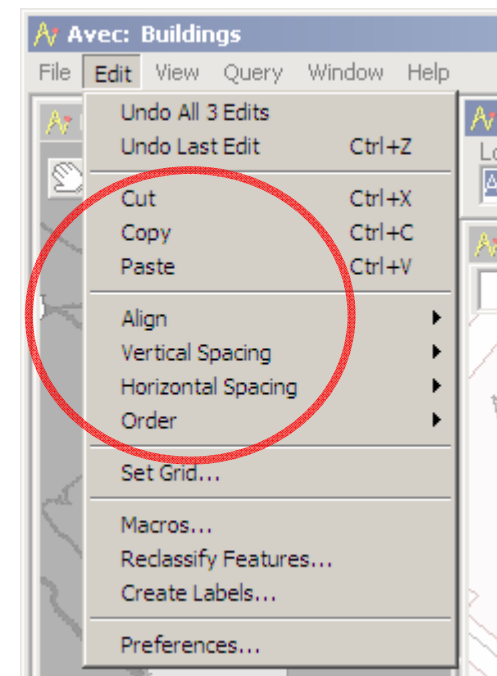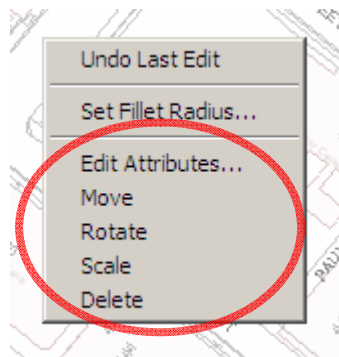
link
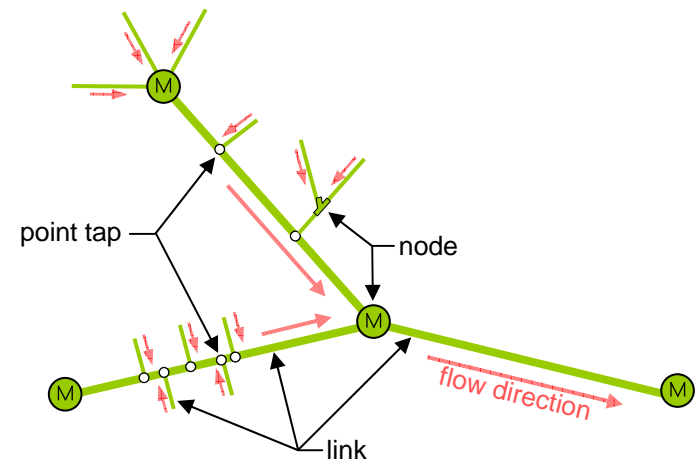
Setting An Edit Tool

Feature Edit Tool

The *Editing Toolbar* is the primary means for setting the tools that are used to edit features. The *Editing Toolbar* is displayed when the *Sketch* tool on the *Map Toolbar* is clicked and hidden when the *Pan, Zoom In, Zoom Out, Measure,* or *Identify* tools on the *Map Toolbar* are clicked.

Editing tools are enabled based on the spatial feature type of the current layer and the rules defined for the feature class. For example, a feature class that only allows polygons may only enable the tools for adding new features that generate polygons.

Some menu entries on the **Edit** menu and on the tool popup menus also set tools. In the case of the **Edit** menu, the tool setting is implicit. For example, aligning the selected features starts the **Move** tool. In the case of the popup menus, the tools that may be set are listed at the bottom of the menu if the current edit is in a state that allows the tool be switched.

Changing tools generally does not clear the selected feature list so multiple edits may be run sequentially on the same set of features. The exceptions to this rule are the tools that add new features.

⌨ The Select Tool

Use the *Select* tool to choose one or more features to make them available for subsequent edit operations.

Clear Selected Features releases the selected features. This action is only enabled when there are one or more currently selected features.

Select By Click or Drag Box sets the selection mode to select features using clicked positions or dragged rectangles.

Select By Polygon sets the selection mode to select features using a polygon. The first click on the map starts the polygon input. Use either the **End Input** menu, the enter key ⏎enter , or double-click to end the polygon construction and select features.

The current mode is checked on the popup menu and the tool button is changed to ⌨ for the click or drag mode or ⌕ for the polygon mode.

When using the dragged box or polygon, features from the current layer that are inside or overlapping the box or polygon boundary are selected.

The feature select priority is (1) the current layer, (2) all other layers based on the current layer's feature class in reverse display order, and (3) all other layers in reverse display order. If layers are set to non-selectable or are outside their display threshold, they are not tested for selectable.
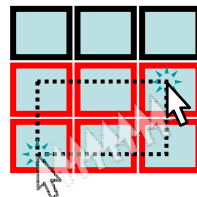
Hold the shift key down while selecting to keep the currently selected features in the list.

Features are selected first from the current layer.

Use a snap instead of a left-click to pick up only one feature when there are several in close proximity.
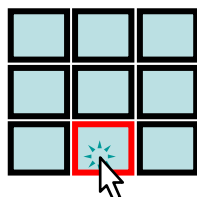
The drag box may be used on a rotated map.

Click to select features at a single position.

Drag a box to select multiple features.
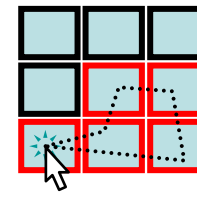
Draw a polygon to select multiple features in an irregular area.

The Attribute Tool

The **Attribute** column displays the name and the **Value** column displays the value of each attribute for the selected feature. If more than one feature is selected and the values for an attribute are not identical, the **Value** column displays "(mixed)" for that row.

Mandatory attributes (attributes that must have a value in order for the feature to be valid) are indicated by bold **Attribute** names. A grayed background in the **Value** column indicates that the attribute value is not editable.
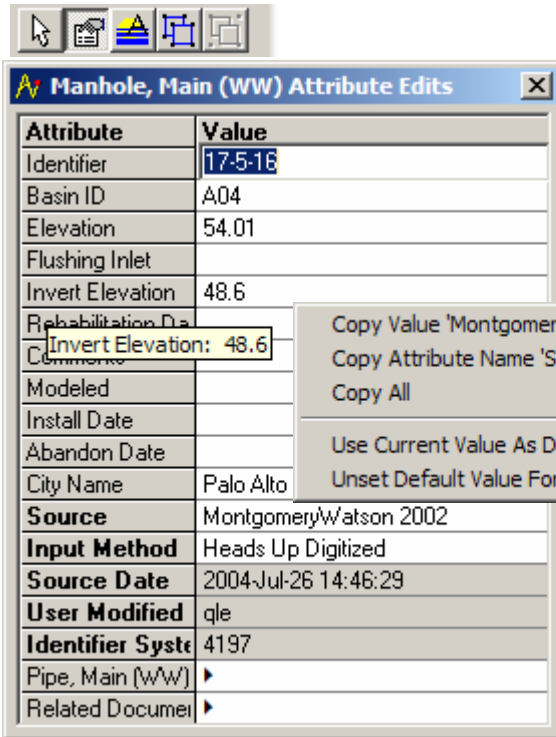

When editing attribute values, the current cell appears recessed and is either a text entry box or, if there is a set of legal values defined for the attribute, a dropdown list.

Validation for an entered value is performed either when the enter key is pressed, when leaving the cell by using the arrow keys or clicking on another cell, or when closing the Attribute Edit window.

To copy an attribute name, value, or all the contents of the Attribute Edit window to the Windows clipboard, use **Copy Attribute '***abc***'** , **Copy Value '***abc***',** or **Copy All.**

Use Current Value As Default sets the default value for the clicked row so that subsequent new features have that default value automatically applied. **Unset Default Value For '***abc***'** removes the default value for the clicked row.

Click on a A **Value** cell with and arrow to expand the window to include related feature data. See The Attribute Tool - Related Features.

Hold the mouse over any cell to see the full attribute name and value displayed in a tool tip.

Dropdown lists may not be in alphabetical order. Typing into the dropdown cell when the list is displayed jumps to the closed value in the list.

Set default values for attributes when adding several similar features.

⊞ The Attribute Tool - Related Features
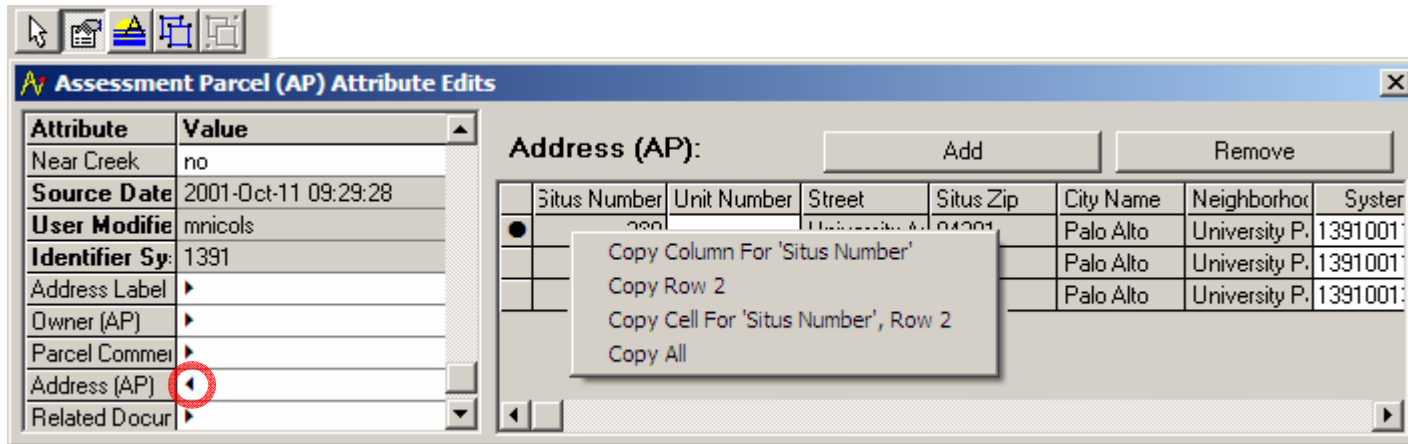
Click on an arrow ▶ in the **Value** column to expand the window to include related feature data.

The **Add** button is enabled only if the relationship allows it. Clicking the **Add** button either adds a new row to be filled out at the bottom of the grid or displays another grid from which a feature to be related may be picked.

The attribute window may only be expanded to include related feature data when a single feature is selected.

Note the arrow in the Value column is reversed for the expanded related features. Clicking on the reversed arrow collapses the window.

Use the arrow keys to move the focus around the grid.

Use the escape key or click on the lightened part of the window to close the add feature list.
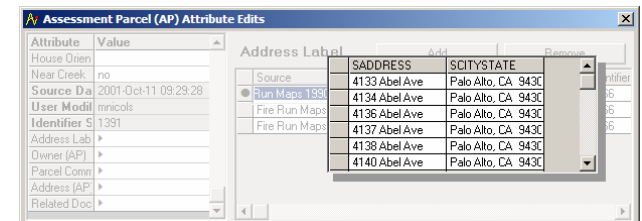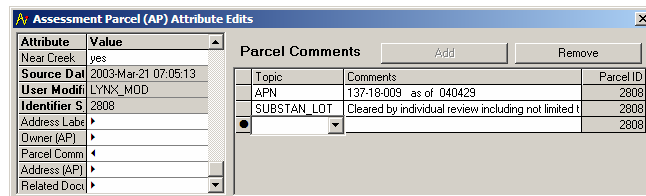
The **Remove** button is enabled only if the current row in the grid may be removed.

The Popup menu has options for copying a single value, a single row, a single column, or all of the grid to the Windows clipboard.

▣ The Attribute Tool - Related Documents

To relate documents to specific features, first use the *Select* tool to select one or more features, then start the *Attribute* tool to display the *Edit Attribute* window. Documents may then be associated to the selected feature in either of two ways:

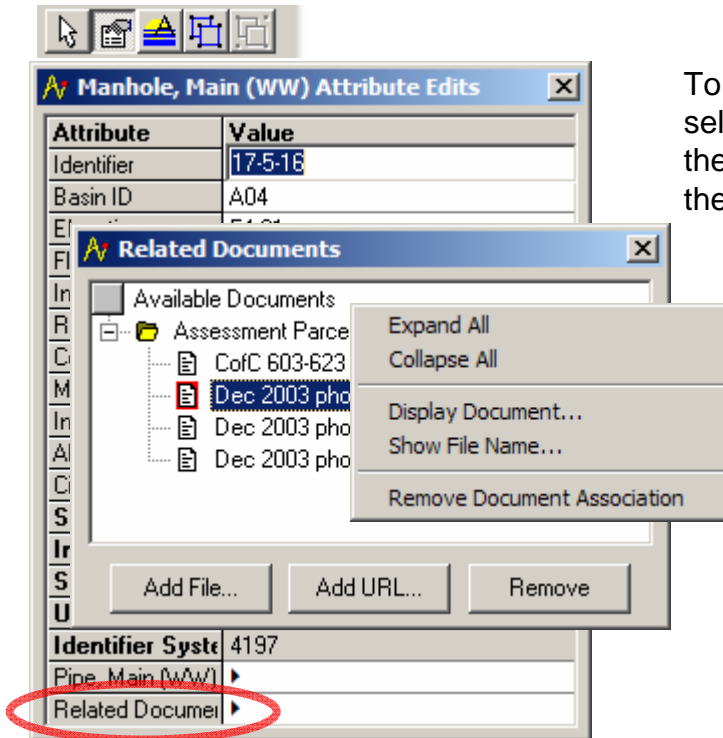- documents may then be dragged from any Window's Explorer window and dropped onto the Edit Attribute window, or

- click on the **Related Documents** row of the grid [Related Documents ▶] to the display the *Related Documents* window and click the **Add File** button to browse to a file to associate.

To remove existing relationships between documents and features, click on the **Related Documents** row of the grid to the display the *Related Documents* window, select the document, and either click the **Remove** button or click **Remove Document Association** from the popup menu. This action does not delete the document, it just removes the relationship between the selected features and the document.

Web pages may also be associated with features through the *Related Documents* window. There is no drag-and-drop method for URL associations. Use the **Add URL** button to display the *Associate URL* window. Type or paste the web page URL into the text box and click OK to define the relationship. Use the **Remove** button to remove the URL association.

When editing, clicking on the document in the Related Documents window does not display the document. When using the Identify tool, clicking on a document in the list does display it.

Use **Display Document** on the popup menu to display the document. Clicking on the document while editing just selects it for an edit operation.

The Style Tool

The *Style* window is used by Encompass applications to edit the feature styles where a feature class allows feature-by-feature style edits as well as for modifying how features are displayed in layers on the map.

Use the *Style* tool to set the style for new features or to change the style of the selected features.

Tabs on the Style Dialog are enabled based on the feature type.

Annotation and Leader tabs are only enabled if the feature class supports embedded annotation.

When used for modifying map display styles, the *Style* window includes two boxes in the upper left corner. When **Override Feature's Style** is checked, the display styles of the features for that layer may be altered. Changing a style in this context does not cause an edit to the features in the layer.

To display the Style window for map content alterations, click on the layer's icon on the legend in the Map Contents window.

Most managed feature classes do not allow feature-by-feature style edits. Personal feature classes typically do allow feature style edits.

The Style Tool - Line

To set the line pattern select from the **Pattern** dropdown list.

Use **Width** to set the line width in map units (like feet). A width of zero (0) produces a one-pixel wide hairline. The line width must be zero or greater than zero.

The end marks for line patterns such as arrow heads grow proportionally in size to the width of the line.

Some line style examples:

Use the (invisible) pattern to hide the line without deleting it.

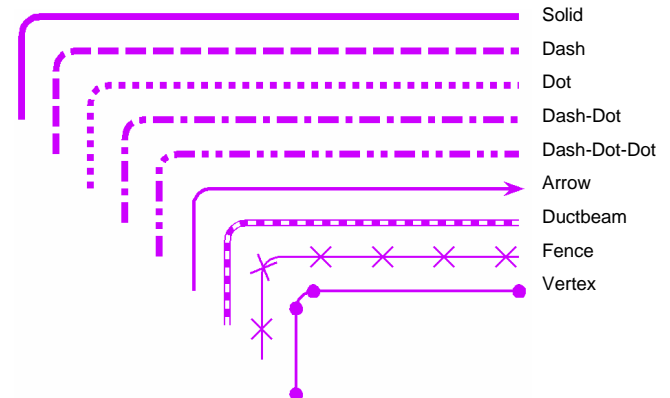*Entering a line width of -1 sets the pattern to invisible and the line width to 0.*

A line with a width of zero displays thinner on a printer than on the screen because of the one-pixel width.

⛰ The Style Tool - Polygon

Use **Outline Color** to set the polygon boundary color and **Fill Color** to set the polygon area color. **Fill Color** is ignored if the **Fill Style** is transparent or multi-colored.

To set the polygon outline pattern select from the **Line Pattern** dropdown list. Use "(invisible)" to display the polygon without an outline (only the filled area displays).
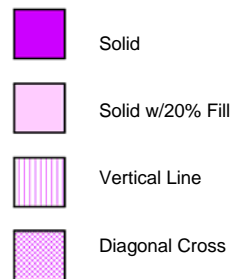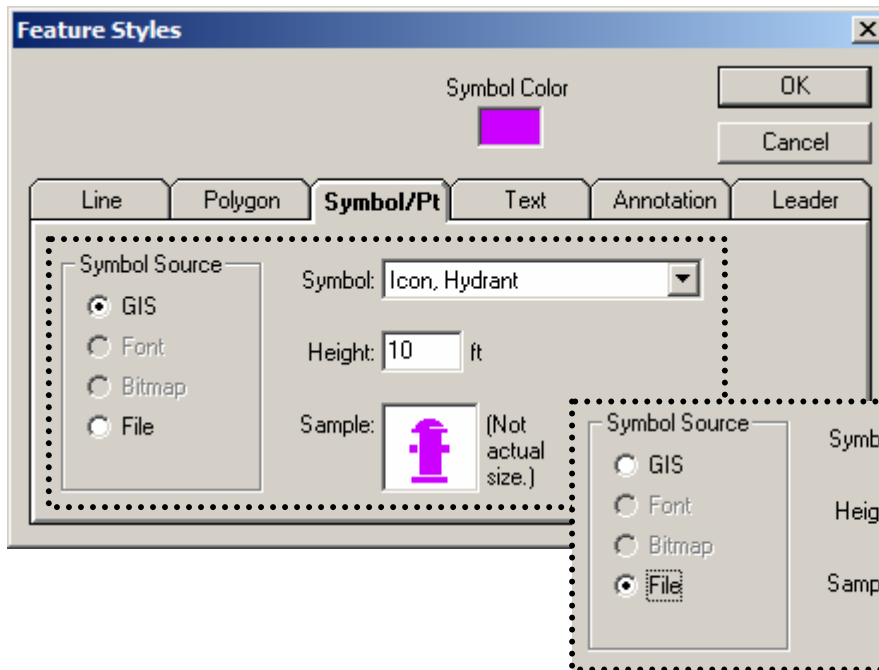
Use **Line Width** to set the polygon outline line width in map units (like feet). A width of zero (0) produces a one-pixel wide hairline. A width of -1 makes the outline invisible regardless of the line pattern. Otherwise, the line width must be zero or greater.

To set the polygon fill pattern select from the **Fill Style** dropdown list. Use "Transparent" to display only the polygon outline.

Some fill styles may be sized. In these cases, use **Fill Height** to set the vertical fixed interval used for the repetition of the fill pattern.

If the fill style is not sizable, the fill color may be adjusted to include a percentage of the map background color using the slider bar.

Set the pattern fill height to the map scale (e.g. if the map scale is 1" = 200', set the fill height to 200).

20% background color makes a pleasant looking pastel fill color.

- Solid
- Solid w/20% Fill
- Vertical Line
- Diagonal Cross

🌅 The Style Tool - Symbol

Use **Symbol Source** to set the list of available symbols shown in the **Symbol** dropdown list. Select **GIS** to select a symbol that is drawn using the **Symbol Color**. Select **File** to select a symbol that is an icon (.ico), bitmap (.bmp), or Windows Meta File (.wmf).

Bitmap file symbols always mask graphics over the rectangular extent of the bitmap. GIS symbols and icon and Windows Meta Files allow transparency where there are no symbol graphics.

Use **Height** to set the symbol height in map units (like feet). Height must be greater than zero.

File symbols do not show point rotation (that always draw as if the point rotation is zero).

Click on the Symbol control and use the up and down arrow keys to step through the symbol list and view the symbols in the Sample box.

● (default)

★ Icon, Star

◎ Luminaire

Ⓚ Knox Box

▶◀ Gate Valve

🧯 Fire Extinguisher

The Style Tool - Text

Use **Font** to set the Windows font. Check the **Bold** and/or **Italic** boxes to alter the selected font's properties.

Use **Height** to set the text height in map units (like feet). Height must be greater than zero.

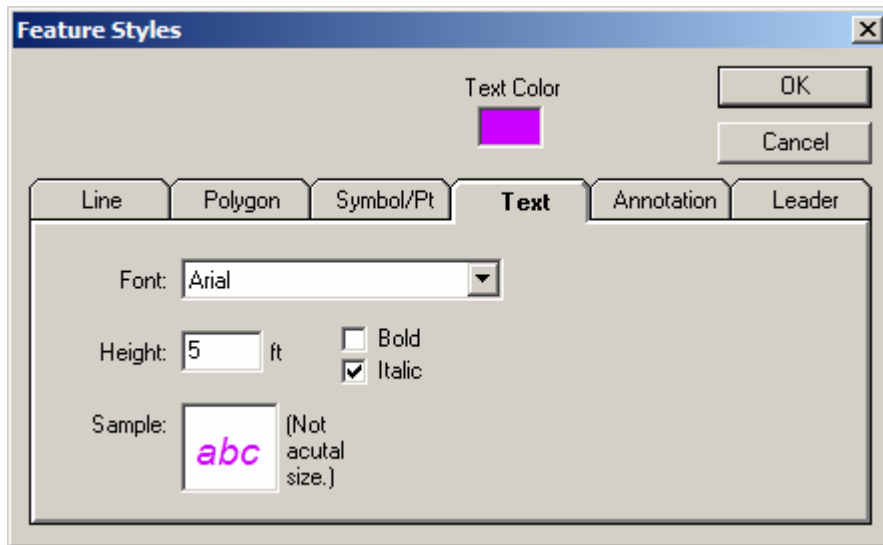|	
ABC abc	Arial
ABC abc	Arial Italic
ABC abc	Arial Bold
ABC abc	Arial Italic Bold
ABC abc	Courier New
ABC abc	Times New Roman
ABC abc	Book Antiqua
	Wingdings

2/3 Font Height (actual capital letter height) ____ ABC abc ____ Font Height (includes space for super and sub script text)

Font height includes space above and below the text, so a capital letter height will be approximately 2/3 the height of the style.

The Style Tool - Annotation and Leader
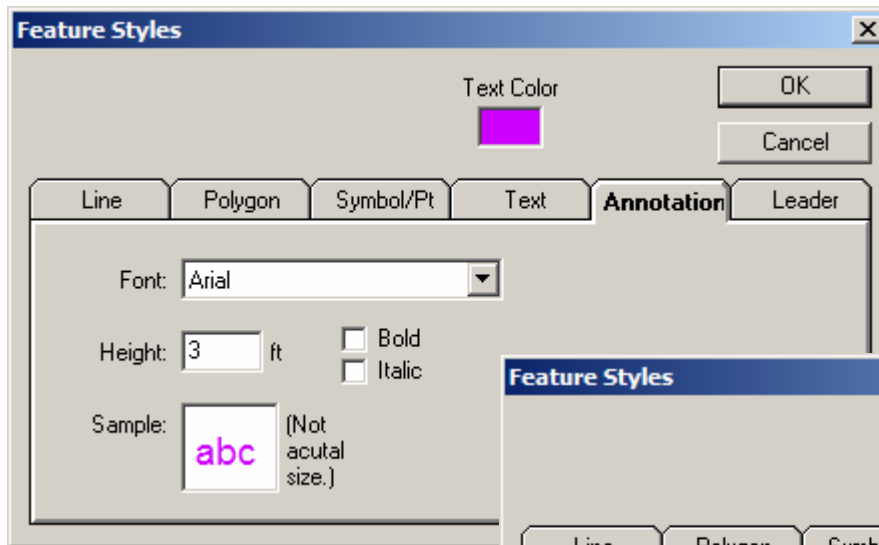
The **Annotation** and **Leader** Tabs are enabled when the feature class being edited supports embedded annotation.

The **Annotation** style setting behaves identically to the **Text** style and **Leader** behaves identically to **Line** style.
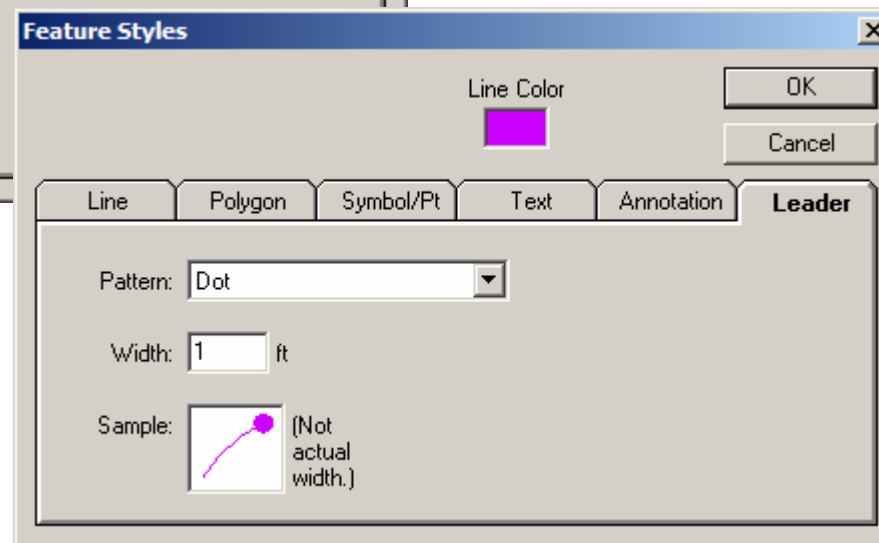
Use Annotation to set the value display of a luggage tag.

The Ungroup Tool

The *Ungroup* tool is enabled when a single feature is selected that is either a standard feature or a sketch feature that contains two or more primitives.

Ungrouping a standard feature allows parts of it (like annotation or leader lines) to be edited independently. When a standard feature is ungrouped, the first primitive in the feature is automatically selected. Use the *Select* tool to select a different primitive. Only one primitive at a time may be selected and edited on an ungrouped standard feature.
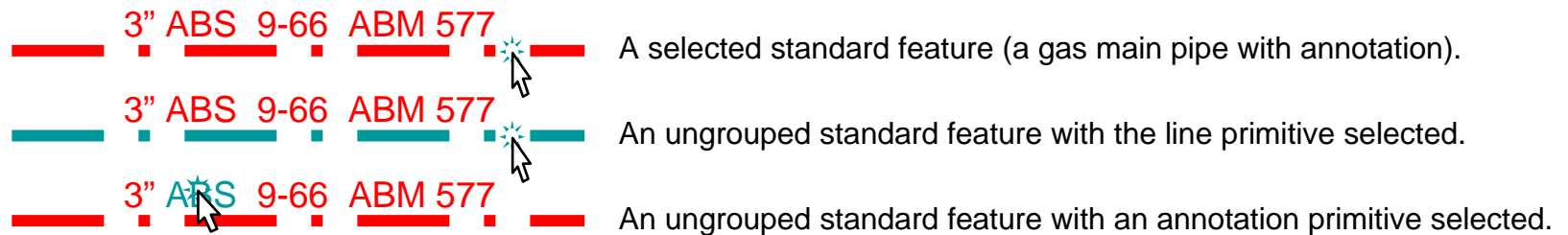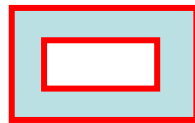
When a sketch feature is ungrouped, it is split into multiple features, each containing one primitive per feature. Attribute values on the new single-primitive features are copied from the original multi-primitive feature. All of the single-primitive features remain selected after the ungroup operation is performed.

3" ABS 9-66 ABM 577 — A selected standard feature (a gas main pipe with annotation).

3" ABS 9-66 ABM 577 — An ungrouped standard feature with the line primitive selected.

3" ABS 9-66 ABM 577 — An ungrouped standard feature with an annotation primitive selected.

Use Nearest Text snapping to select annotation primitives when ungrouped.

A selected sketch multi-primitive feature (a nested polygon a.k.a. a polygon with a hole in it).

When a standard feature is ungrouped, it must be regrouped before another feature may be selected.
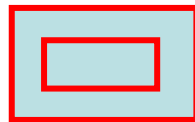
An ungrouped sketch feature turns into two single polygon features that are both selected.

The Group/Regroup Tool

The *Regroup* tool is enabled when a standard feature is ungrouped. An ungrouped standard feature must be regrouped before another feature may be selected. When the Regroup tool is clicked the feature is reassembled after which other edit operations such as selecting other features and saving or undoing edits become available.

The *Group* tool is enabled when more than one sketch feature is selected. When the *Group* tool is clicked, the graphics from all the selected features are added to the first feature and all but the first feature are deleted.

Polygons may be nested when being grouped or regrouped when:

- there are more than one polygon in the feature being regrouped or more than one polygon in the selected features being grouped,

- at least one polygon is contained by another, and

- the feature class allows multi-loop polygons.

If these conditions are met, a dialog is displayed to offer a choice in how the polygons are combined. Click **Yes** to nest the polygons. In this case, an inside loop creates a hole in the polygon. Click **No** to stack the polygons without creating holes.
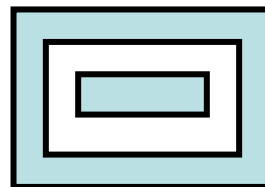
Nested polygons after grouping.
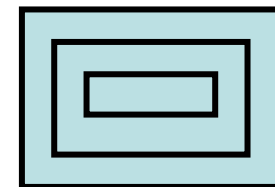
Stacked polygons after grouping.

When selecting features to be grouped, use the shift key and select the features one at a time. The attributes for the first feature selected are retained after grouping.

The Symbol Tool

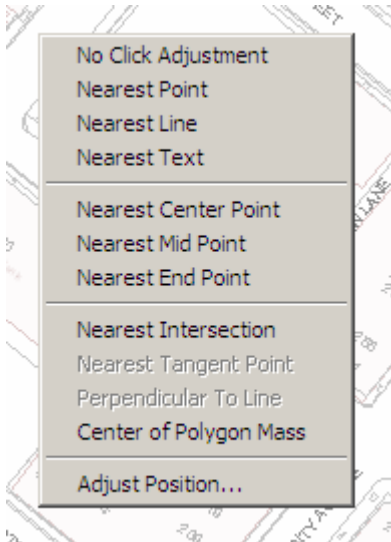*Symbol* creates point features in the current feature class. When the *Symbol* button is clicked, a symbol representing new point feature is attached to the pointer at the symbol insertion point and dragged until a drop position is specified. The drop position is indicated by a click on the map, a snap, or a precise location using **Adjust Position**. All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.

Insertion point for the default symbol
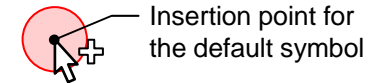
When a standard feature is created, if there are required attribute values and default values for them are not defined, the *Edit Attributes* dialog is displayed. If this dialog is canceled or all of the required values are not entered, the feature is not added.

Depending on the feature class, a point feature may be free standing (like a survey control point), a node in a network (like a manhole), or a tap in a network (like a service connection on a main pipe). If the new point feature represents a node or a tap and no suitable link is within the snap tolerance of the new position, a dialog is displayed. Click **Yes** to add the feature even though there is no link nearby, or **No** to cancel the edit. Node features are only allowed at the end of links. Taps must be on a link but are not allowed at the link ends.

A symbol is a graphic representation of a point feature.

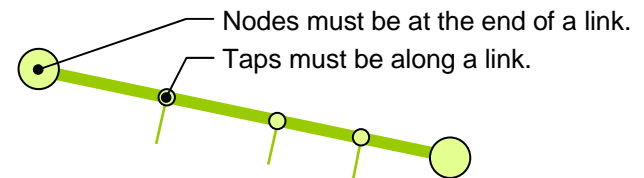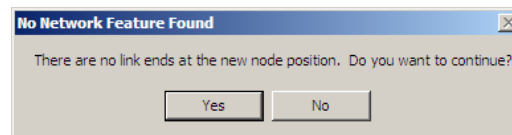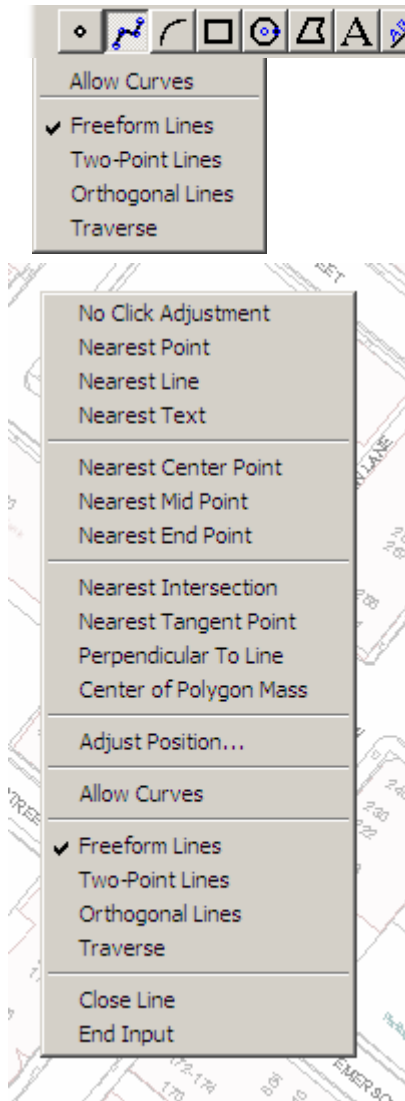*Set default attribute values to speed up entry of multiple point features.*

Use the escape to cancel an unfinished add change the current tool to Select.

No Network Feature Found

There are no link ends at the new node position. Do you want to continue?

Yes   No

Nodes must be at the end of a link.
Taps must be along a link.

The symbol for a standard point feature is pre-defined. The symbol for a sketch feature is defined on a feature-by-feature basis at the time the point feature is created.

Menu options:
No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

⤴The Line Tool

Line creates line features in the current feature class. The first click or snap on the map starts the line input. Subsequent clicks add vertexes. If **Allow Curves** is checked, an arc shape point is placed at the mouse up position when the mouse button is held down instead of clicked.
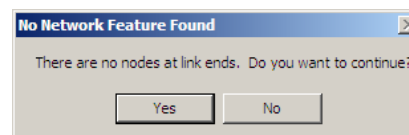
There are four line construction methods:

Freeform Lines creates multi-segment lines using a series of input positions.

Two-Point Lines creates a single segment line using two click or a press-slide-release action.

Orthogonal Lines is like freeform lines but always creates lines that are horizontal or vertical to the map window edges regardless of the map view rotation.

Traverse displays a spreadsheet-like grid for defining line using coordinate geometry (a.k.a. COGO).

Nearest Tangent Point and **Perpendicular To Line** snaps are available after the first vertex is defined.

To complete the line input, either double-click on the map, press the enter key, or click **Close Line** or **End Input** on the popup menu.

Depending on the feature class, a line feature may be free standing (like a curb edge), or a link in a network (like a water main pipe). If the new line feature represents a link and no suitable node is within the snap tolerance of the new position, a dialog is displayed. Click **Yes** to add the feature even though there is no node nearby, or **No** to cancel the edit.

The Line Tool - Construction Methods

mouse up completes the arc

mouse down defines arc shape point

1st click
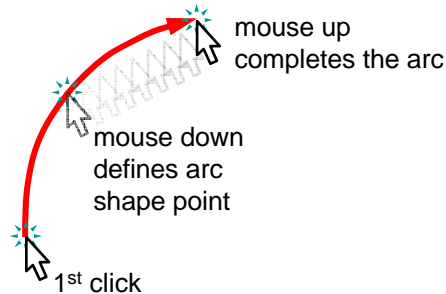
Freeform line construction with **Allow Curves** turned on using a press-slide-release action.

2nd click

3rd click

4th click

5th click

1st click

Freeform line construction with multiple sequential clicks.

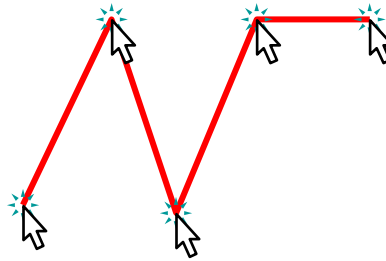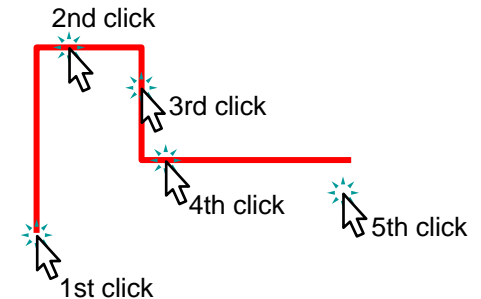**Orthogonal** line construction with multiple sequential clicks.

Line features may be closed, but they do not form polygons.

To draw a multi-segment line with a precisely defined curve in it, draw a straight line between the ends of the arc and use the Shape tool to set the radius of the arc segment

Use freeform lines with Allow Curves to draw clouds.

mouse up defines end point

mouse down defines start point
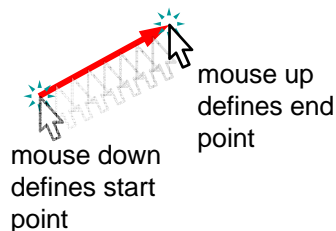
Two-Point line construction using a press-slide-release action. If **Allow Curves** is on, this draw an arc.

second click defines end point

first click defines start point
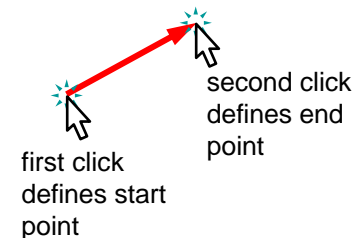
Two-Point line construction using two clicks. If **Allow Curves** is on, use a press-slide-release on the second click to create an arc.

The Line Tool - Traverse

The *Line Traverse* tool constructs a line or polygon features based on coordinate geometry entered into a spreadsheet-like grid. Each row in the grid represents a single segment (a.k.a. course) in the traverse. Leaving a row in the grid either by using the arrow keys or clicking on another row causes the geometry for that row to be calculated (or recalculated) which then adjusts all the subsequent rows in the traverse accordingly.

The entire traverse can be rotated by setting the angle in **Bearing Rotation Adjustment**. If this is a non-zero value, the traverse is rotated in a counter-clockwise direction around the first vertex in the traverse.

Traverse closure information is described in **Closure Status**. The Traverse tool does not perform closure adjustments (like root-mean-square).

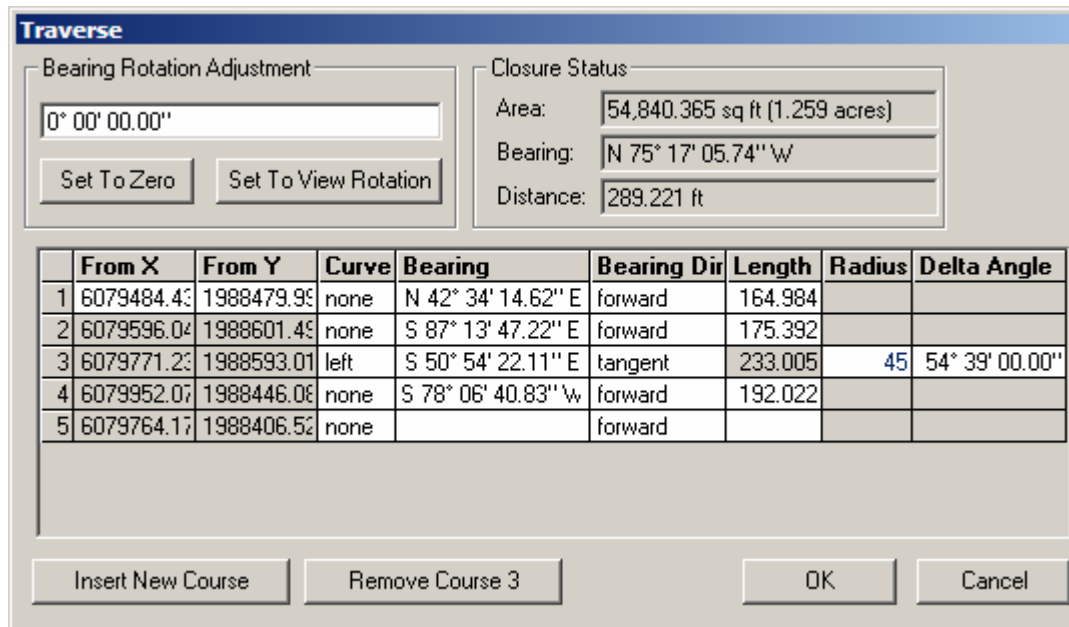A click on the map adds a coordinate to the traverse grid. If the grid is empty, the click on the map is the start position of the traverse and the coordinates are entered into the first **From X** and **From Y**. If there is at least one row defined in the grid, a click on the map adds a row.

See The Traverse Tool – Defining Geometry for details on entering coordinate geometry using the grid.

The **OK** button ends the input, closes the dialog, and saves the new line to the database, the **Cancel** button closes the dialog and discards the line.

Traverse

Bearing Rotation Adjustment

0° 00' 00.00''

Set To Zero | Set To View Rotation

Closure Status

Area: 54,840.365 sq ft (1.259 acres)
Bearing: N 75° 17' 05.74'' W
Distance: 289.221 ft

	From X	From Y	Curve	Bearing	Bearing Dir	Length	Radius	Delta Angle
1	6079484.43	1988479.99	none	N 42° 34' 14.62'' E	forward	164.984		
2	6079596.04	1988601.49	none	S 87° 13' 47.22'' E	forward	175.392		
3	6079771.23	1988593.01	left	S 50° 54' 22.11'' E	tangent	233.005	45	54° 39' 00.00''
4	6079952.07	1988446.08	none	S 78° 06' 40.83'' W	forward	192.022		
5	6079764.17	1988406.52	none		forward			

Insert New Course | Remove Course 3 | OK | Cancel

The Line Tool - Traverse Geometry

From X and **From Y** contain the coordinates for the first vertex of the segment.

The value in the **Curve** column indicates that the row represents a straight segment or a circular arc that curves either to the left or right of the direction the traverse is drawn.

Bearing indicates the bearing of a straight segment or the bearing of a tangent line at the starting point of a curved segment. The **Bearing Dir** indicates the direction of the segment or arc reference line relative to the value in **Bearing**. For straight segments the possible values are "forward", "reverse", "90° right", and "90° left". For curved segments, the possible values are "tangent", "back tangent", "radial to center", and "radial from center".

The length of a straight segment is set in the **Length** column. This value is calculated for curved segments and is not editable. Curve geometry is defined in the **Radius** and **Delta Angle** columns.

The view rotation is added to the bearings entered in the Traverse Dialog. Keep it simple by setting the view rotation to 0.

The traverse entry may not be interrupted with a pan or zoom.

Arrow keys move the input focus around the spreadsheet. A carriage return behaves like a right-arrow key.

The closure bearing and distance may be copied using ctrl-c and then pasted into the bearing and distance cells.
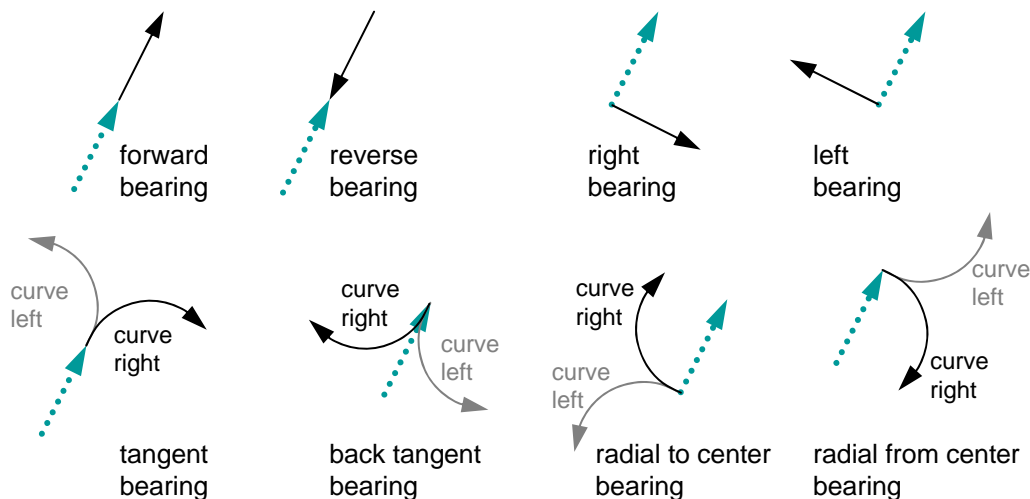
The Arc Tool

Arc creates curved single segment line features in the current feature class. The first click or snap on the map starts the arc input, the second position defines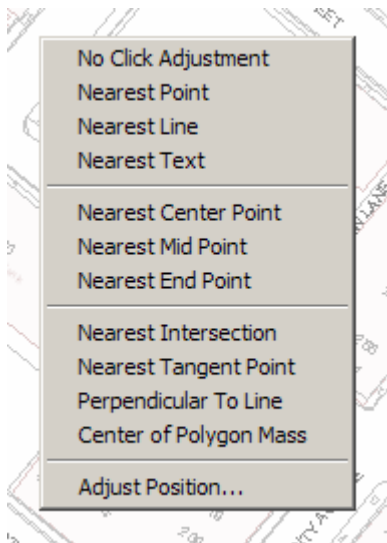 a point along the arc, and the third position defines the arc end. The curve of the arc appears after the second position is defined.

Nearest Tangent Point and **Perpendicular To Line** snaps are available after the first vertex is defined.

There is no toolbar popup menu for Arc.

2nd click

3rd click

1st click

3-point arc construction.
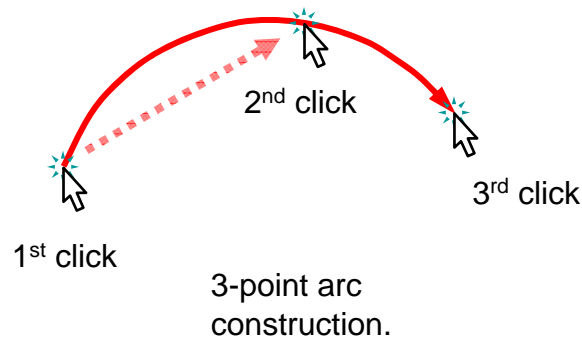
Arc is useful for rapidly drawing arced leader lines.

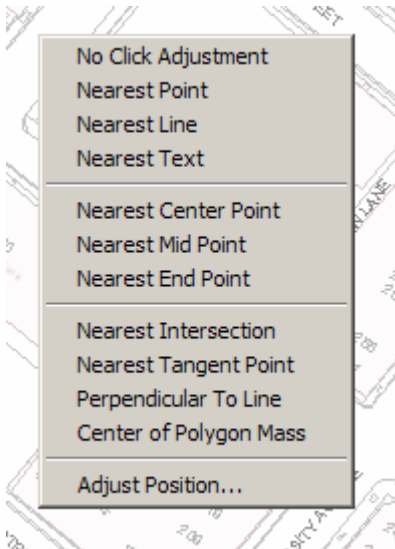*Use a Perpendicular to Line snap on the third position to create a quarter circle.*
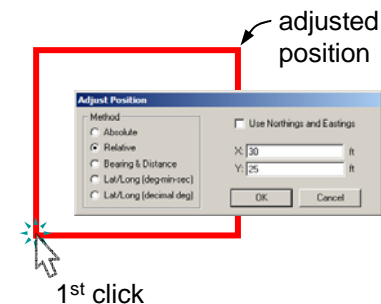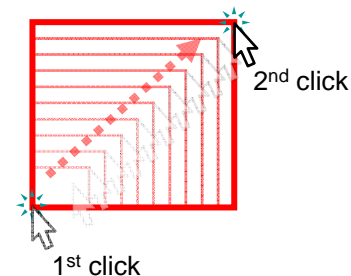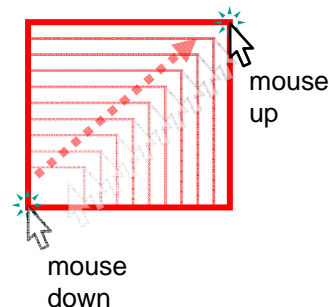
□ The Rectangle Tool

Rectangle creates rectangular polygon features in the current feature class. The first click or snap on the map defines one corner of the rectangle and the second position defines the diagonally opposite corner. The first position may be on any of the four corners.

Nearest Tangent Point and **Perpendicular To Line** snaps are only available for the second position.

The rectangle is always drawn orthogonal to the map window. To draw a rotated rectangle, first rotate the view.

Use **Adjust Position** on the second vertex to define a rectangle with a specific width and height.

There is no toolbar popup menu for *Rectangle*.

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

mouse up

mouse down

2nd click

1st click

adjusted position

Adjust Position

Method
Absolute
Relative
Bearing & Distance
Lat/Long [deg-min-sec]
Lat/Long [decimal deg]

Use Northings and Eastings

X: 30   ft
Y: 25   ft

OK   Cancel

1st click

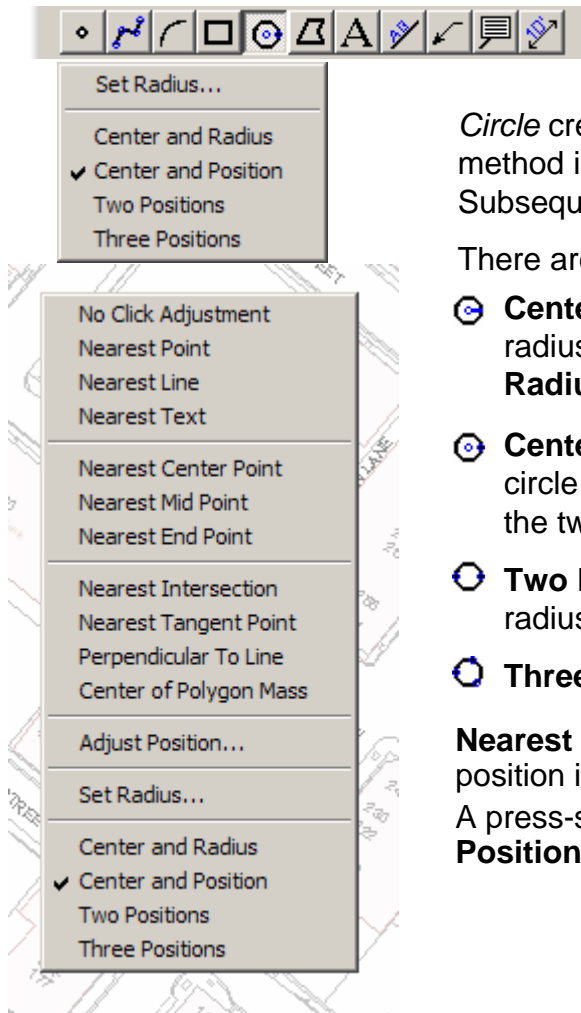*When using **Adjust Position**, use a negative **X** value to draw the rectangle to the left and a negative **Y** value to draw the rectangle downward.*

Drag from the mouse-down position to the mouse-up position.

Click or snap on the "first corner" position and then on the "opposite corner" position.

Click or snap on the "first corner" position and then use Adjust Position to specify the rectangle size.

⊙The Circle Tool

Set Radius...

Center and Radius
✔ Center and Position
Two Positions
Three Positions

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

Set Radius...

Center and Radius
✔ Center and Position
Two Positions
Three Positions

Circle creates polygon features in the current feature class. Unless the construction method is **Center and Radius**, the first click or snap on the map starts the circle input. Subsequent clicks define points on the circle's circumference

There are four circle construction methods:

Circle Radius

Enter a radius in feet.

OK

Cancel

12.5

- ⊙ **Center and Radius** creates a circle of a specified radius at the first (and only) clicked position. Use **Set Radius** to specify the radius for the circle.

- ⊙ **Center and Position** locates the circle center at the first position and a point on the circle circumference at the second position. The circle radius is the distance between the two positions.

- ⊙ **Two Positions** creates a circle from two diametrically opposed positions. The circle radius is half the distance between the two positions

- ⊙ **Three Positions** creates a circle from three positions on the circle circumference.
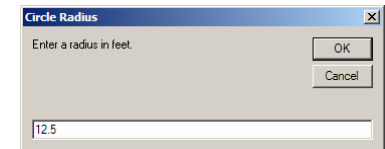
Nearest Tangent Point and **Perpendicular To Line** snaps are available after the first position is defined.

A press-slide-release action may be used on the **Center and Position** and **Two Positions** methods.

◉The Circle Tool – Construction Methods
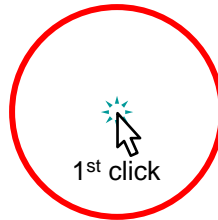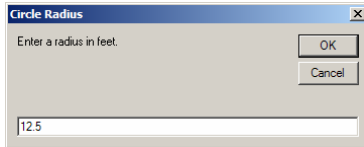
Center and Radius construction. The radius must be set before the circle is created.
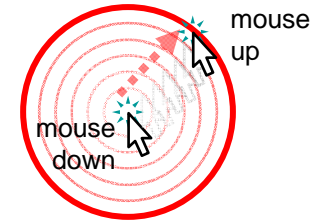
Center and Position construction using a press-slide-release action.
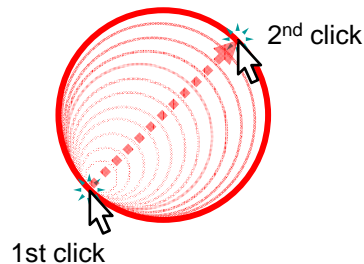
Two Positions construction.
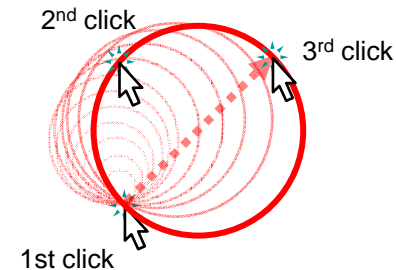
Three Positions construction.

*Use **Adjust Position** to create precisely defined circles as an alternate to **Center and Radius**.*

⊿ The Polygon Tool

Allow Curves

✔ **Freeform Lines**
  Traverse

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

Allow Curves

✔ Freeform Lines
  Traverse

End Input

Polygon creates polygon features in the current feature class. The first click or snap on the map starts the polygon input. Subsequent clicks add vertexes. If **Allow Curves** is checked, an arc shape point is placed at the mouse up position when the mouse button is held down instead of clicked.

There are two polygon construction methods:

⊿ **Freeform Lines** creates multi-segment polygons using a series of input positions.

🗒 **Traverse** displays a spreadsheet-like grid for defining line using coordinate geometry (a.k.a. COGO). For more detail on using the Traverse method, see the *Line* tool.
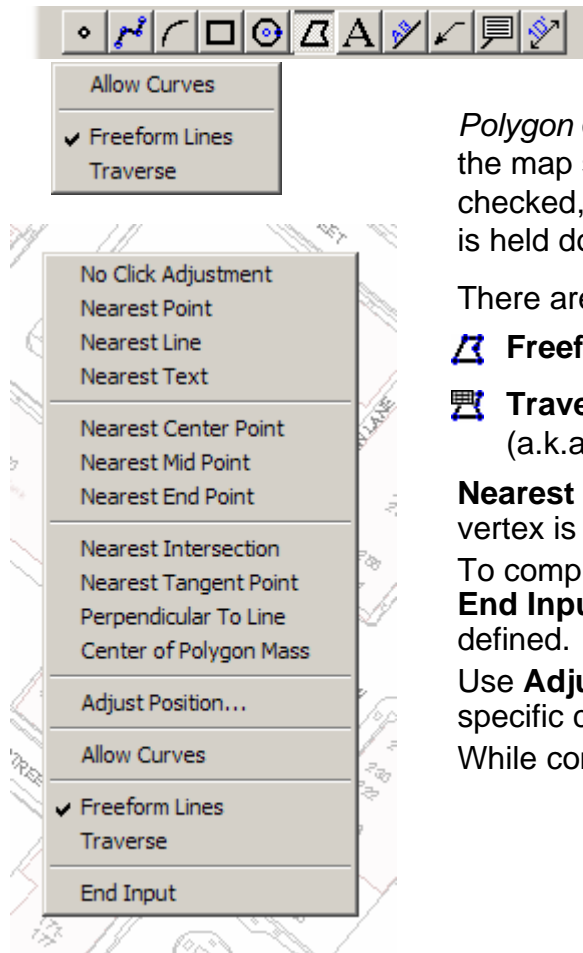
Nearest Tangent Point and **Perpendicular To Line** snaps are available after the first vertex is defined.

To complete the line input, either double-click on the map, press the enter key, or click **End Input** on the popup menu. **End Input** is available once three vertexes have been defined.
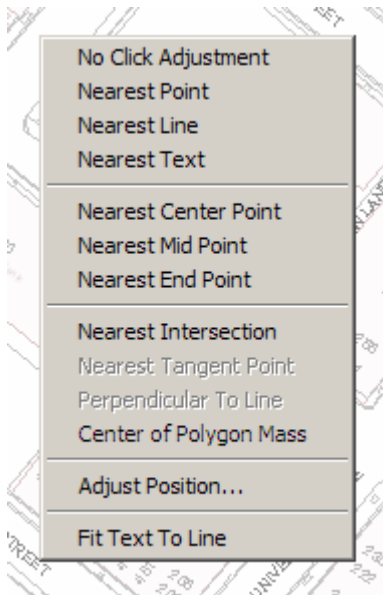
Use **Adjust Position** to position vertexes precisely relative to the last vertex or at a specific coordinate.

While constructing polygons, the closing segment is drawn automatically.

2nd click   3rd click

1st click   4th click
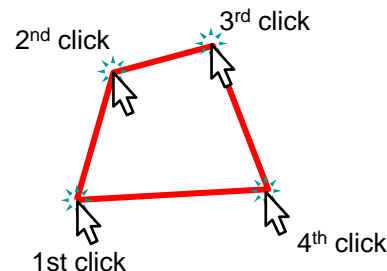
Freeform polygon construction with multiple sequential clicks.

ᴀ The Text Tool

Text creates text features in the current feature class. A click on the toolbar or map displays the **Enter New Text** window. To create multi-line text, use an underscore character or a carriage return ⎯⏎enter⎯ between lines. When an underscore character is used, the line breaks do not show in the **Enter New Text** window.
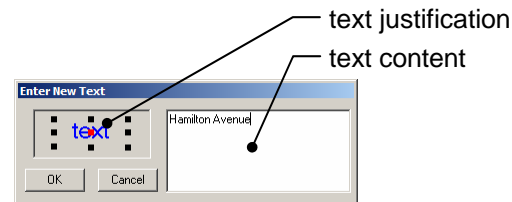
Set the new text justification by clicking on one of the nine points in the justification part of the **Enter New Text** window. See the *Edit Justification* tool for more.

Click **OK** to attach the new text feature to the pointer at its justification point and drag it until a drop position is specified. To precisely locate the new feature use a right-click with a snap method or **Adjust Position.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.

After the new text feature is added, the **Enter New Text** window displays again so another new text feature may be added. To discontinue text entry, click **Cancel** or press the escape key.

There is no toolbar popup menu for *Text*

See the *Annotation* tool for adding annotation and data annotation primitives to features.

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position…

Fit Text To Line

text justification

text content

Enter New Text
text
Hamilton Avenue
OK   Cancel

To add text at an angle, rotate the view before starting the Text *tool.*

$\mathbb{A}$ The Text Tool – Text Along a Line
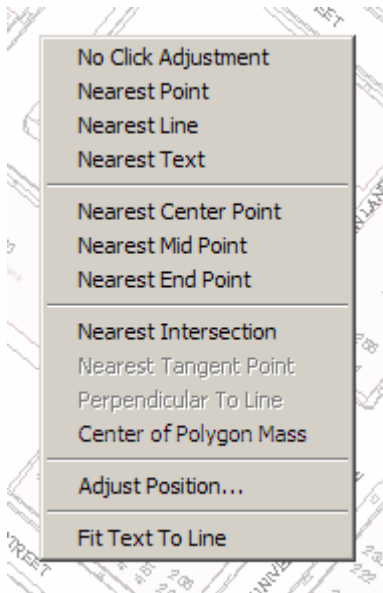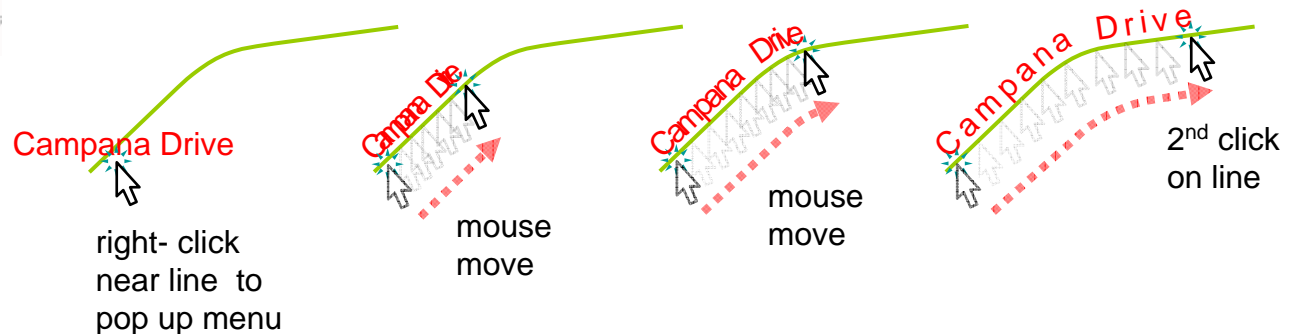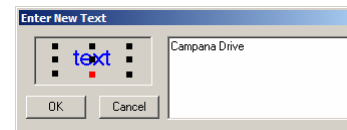
After entering the new text content and clicking the **OK** button on the **Enter New Text** window, use a right-click on the map to display the popup menu and click **Fit Text To Line** to distribute the text content along an existing line or polygon boundary.

The right click that popped up the menu also defines the position of the first character. The second click on the line defines the position of the last character. The other characters are then evenly spaced between the first and last with each character justification point located on the line.

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position…

Fit Text To Line

Enter New Text

text

Campana Drive

OK   Cancel

Campana Drive

right- click near line to pop up menu

Campana Drive

mouse move

Campana Drive

mouse move

Campana Drive

2nd click on line

Use top-center, center-center, or bottom-center justification for the best spacing when placing text along a line.
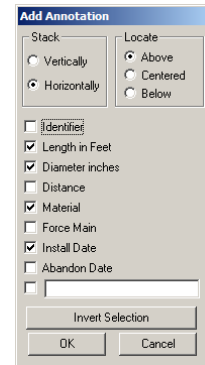
✎ The Annotation Tool
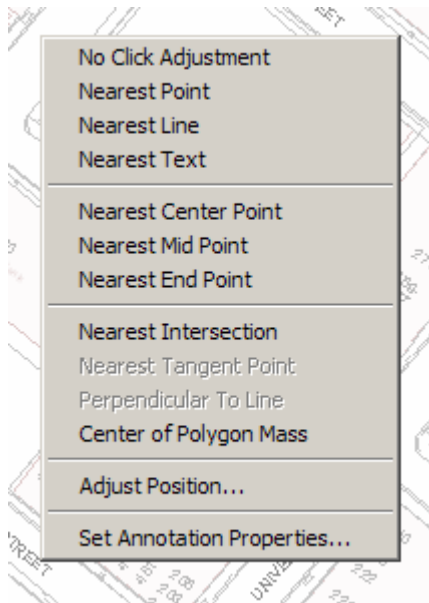
Annotation and data annotation primitives that may be embedded into features that contain at least one point, line, polygon, or text primitive. Data annotation displays one or more values from database fields and may be mixed with literal text. Annotation only contains literal text.

Annotation is displayed on the map by checking **Show Entry's Annotation** on the popup menu for the legend in the Map Contents window.

The *Annotation* tool is only available when single feature is selected.

To configure the annotation, either right-click on the tool button or click **Set Annotation Properties** from the popup menu. Use the **Stack** and **Locate** options to orient the text, check database fields to include, and/or enter literal text into the text box.

As the new annotation is dragged into position, it automatically rotates it to align to the feature being annotated. Holding the shift key down while dragging maintains the annotation rotation.

Menu (left panel)

- No Click Adjustment
- Nearest Point
- Nearest Line
- Nearest Text
- Nearest Center Point
- Nearest Mid Point
- Nearest End Point
- Nearest Intersection
- Nearest Tangent Point
- Perpendicular To Line
- Center of Polygon Mass
- Adjust Position...
- Set Annotation Properties...

Add Annotation dialog

Stack: ○ Vertically ● Horizontally
Locate: ● Above ○ Centered ○ Below

- ☐ Identifier
- ☑ Length in Feet
- ☑ Diameter inches
- ☐ Distance
- ☑ Material
- ☐ Force Main
- ☑ Install Date
- ☐ Abandon Date
- ☐ [____]

[Invert Selection]
[OK] [Cancel]

Use horizontal stacking for annotating lines and vertical stacking for points and polygons.
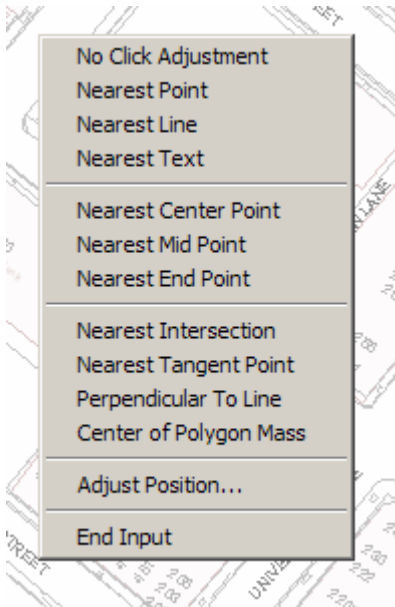
27' 4" ABS Jan 2006

Dropping annotation off of the feature keeps it orthogonal.

27' 4" ABS Jan 2006
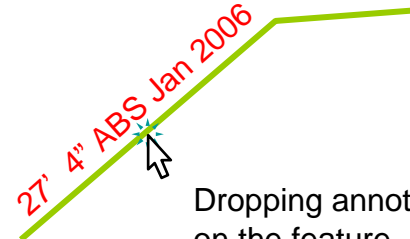
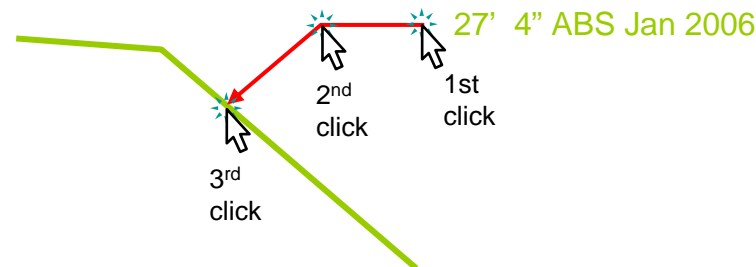Dropping annotation on the feature rotates it.

The Leader Tool

Leader primitives may be embedded into features that contain at least one point, line, polygon, or text primitive. Leaders are typically used to graphically connect annotation to the feature being annotated when the annotation is not close enough to be unambiguously associated with the feature.

Leaders, like annotation, are displayed on the map by checking **Show Entry's Annotation** on the popup menu for the legend in the Map Contents window.

The *Leader* tool is only available when single feature is selected.
Nearest Tangent Point and **Perpendicular To Line** snaps are available after the first vertex is defined.

To complete the leader input, either double-click on the map, press the enter key, or click **End Input** on the popup menu.
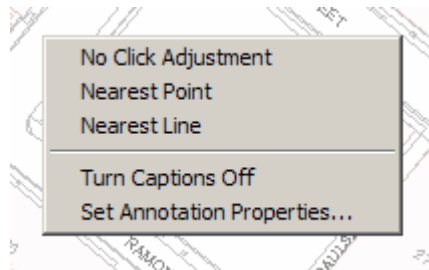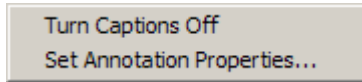
No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

End Input

27' 4" ABS Jan 2006

2nd click

1st click

3rd click

Add a leader after annotation is placed.

Draw leaders from the annotation to the feature.

Use the Shape *tool to make curved leaders.*

🗩 The Luggage Tag Tool

Turn Captions Off
Set Annotation Properties…

No Click Adjustment
Nearest Point
Nearest Line

Turn Captions Off
Set Annotation Properties…
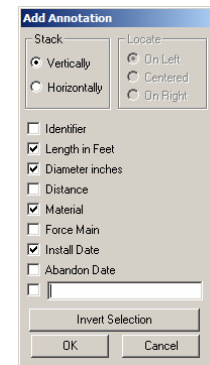
Luggage tags combine text, data annotation, a enclosing polygon, and a leader in a single feature that annotates another feature. For example, a luggage tag may be used to annotate a manhole, valve, or parcel. Unlike annotation and leaders, luggage tags are not embedded into the feature they annotate.

To configure the luggage tag, either right-click on the tool button or click **Set Annotation Properties** from the popup menu. Use the **Stack** to orient the text either vertically or horizontally.

Use **Turn Captions On** or **Turn Captions Off** to include or exclude captions from the luggage tag. Captions don't show when luggage tag is oriented horizontally

Add Annotation

Stack
- ◉ Vertically
- ○ Horizontally

Locate
- ◉ On Left
- ○ Centered
- ○ On Right

- ☐ Identifier
- ☑ Length in Feet
- ☑ Diameter inches
- ☐ Distance
- ☑ Material
- ☐ Force Main
- ☑ Install Date
- ☐ Abandon Date
- ☐ |

[Invert Selection]

[OK] [Cancel]

Control the fonts, fills, and line styles through Map Contents.

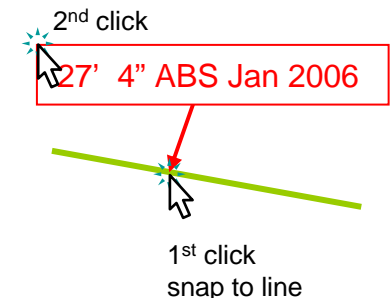*Use a line or point snap on the feature being annotated.*

*Luggage tag contents may be changed while it is being dragged by right-clicking on the map to display the popup menu, clicking on **Set Annotation Properties**, and altering the settings in the **Annotation** window.*
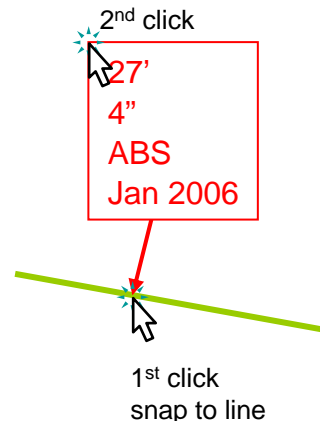
2nd click

27'
4"
ABS
Jan 2006

1st click
snap to line

Vertical stacking with captions turned off.

2nd click

Length: 27'
Diameter: 4"
Material: ABS
Install Date: Jan 2006

1st click
snap to line

Vertical stacking with captions turned on.

2nd click

27' 4" ABS Jan 2006

1st click
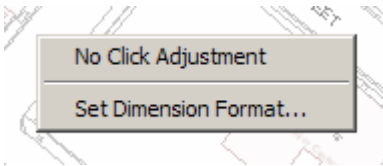snap to line
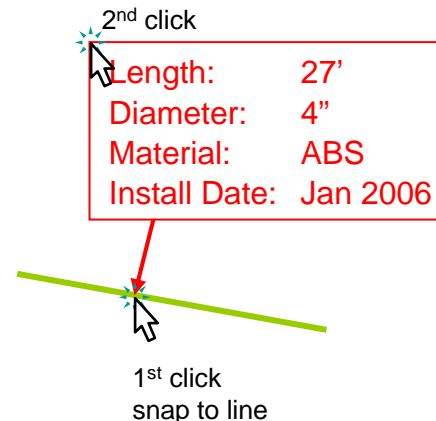
Horizontal stacking.
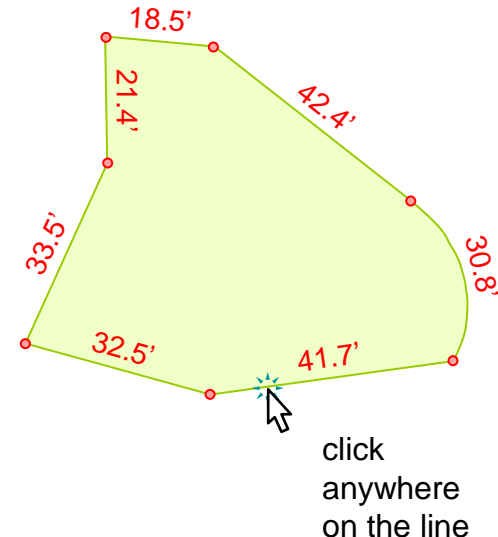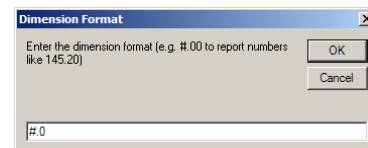
The Dimension Tool

Dimension creates a multi-primitive feature in the current feature class that dimensions another feature. The dimension feature contains one text primitive located at the mid point of each segment plus one small circle located at every vertex of the dimensioned feature.
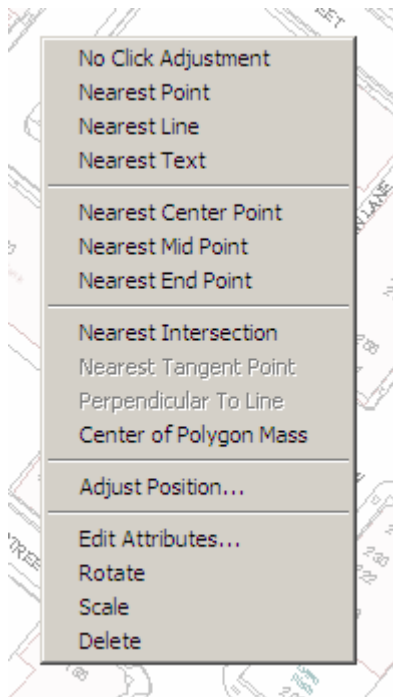
Once the *Dimension* tool is started, a click anywhere on a feature adds dimensions. No snaps are required.

Use **Set Dimension Format** to control how the dimension text is displayed:

Dimension Format	Source Number	Formatted Number
#	2.5	2
#.##	2.5	2.5
#.00	2.5	2.50

No Click Adjustment

Set Dimension Format...

Dimension Format

Enter the dimension format (e.g. #.00 to report numbers like 145.20)

OK

Cancel

#.0

18.5'

21.4'

42.4'

33.5'

30.8'

32.5'

41.7'

click anywhere on the line

✥ The Move Tool

Use the *Move* tool to reposition one or more features. Once selected, features may be dragged or repositioned precisely. When dragging, the mouse-down position must be on a selected feature.

To precisely move features use two clicks with snap methods or **Adjust Position.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.

If the mouse-down or first clicked position is not on a selected feature, a new feature selection at the clicked position is attempted. The mouse-down or first clicked position attaches the selected feature to the pointer at the clicked position.

After moving annotation in an ungrouped feature, a dialog is displayed when there are multiple annotation primitives. Click **Yes** to move all the annotation by the same distance and in the same direction.
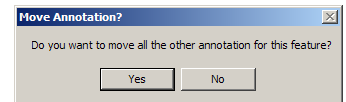
The *Move* tool re-selects. Right-click on the map to display the popup menu.

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

Edit Attributes...
Rotate
Scale
Delete

Move Annotation?
Do you want to move all the other annotation for this feature?
Yes   No

Use a snap instead of a left click to pick up only one feature when there are several in close proximity.

Drag from the mouse-down position to the mouse-up position.

1st click

2nd click

Click or snap on the "move from" position and then on the "move to" position.

The Copy Tool

Use the *Copy* tool to copy a single feature. The feature being copied is selected on the first mouse action. It may be on any selectable layer in the view, including the current layer. The selected feature is copied to the current layer at the position defined by the second mouse action.

If the current layer does not allow the geometry type being copied, a warning message is displayed and the feature is not copied.

To precisely copy features use two clicks with snap methods or **Adjust Position.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.

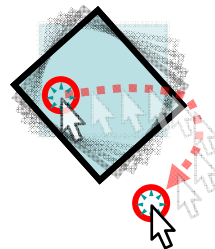The *Copy* tool re-selects. Right-click on the map to display the popup menu.

Popup menu

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

Edit Attributes...
Rotate
Scale
Delete

Use **Edit > Copy** *and* **Edit > Paste** *to copy multiple features. The features are pasted into the current layer.*

Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
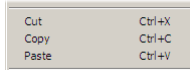
To position the copied feature on top of the original, use **Adjust Position** *with a relative* **X** *= 0 and* **Y** *= 0 position.*

Drag from the mouse-down position on the feature being copied to the mouse-up position.

2nd click
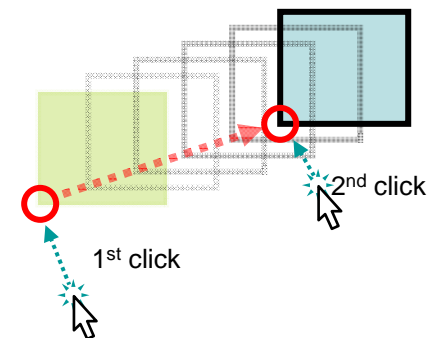
1st click

Click or snap on the "copy from" position and then on the "copy to" position.
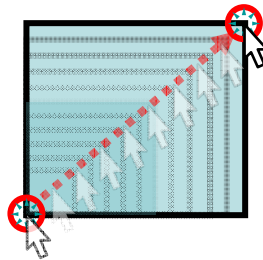
⛶ The Rotate Tool
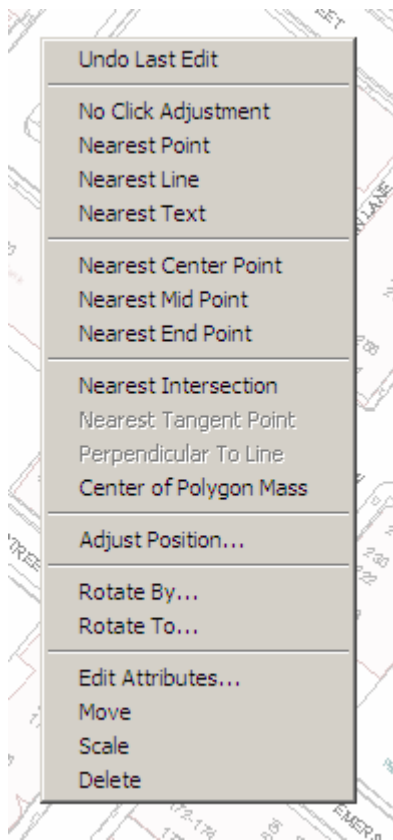
Use the *Rotate* tool to rotate one or more features. Once selected, features may be rotated either by dragging, with a series of three clicks, or by specifying a "rotate by" or "rotate to" angle. When dragging, the mouse-down position must be on a selected feature.

To rotate features precisely about an anchor point, use three clicks with snap methods or **Adjust Position.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.
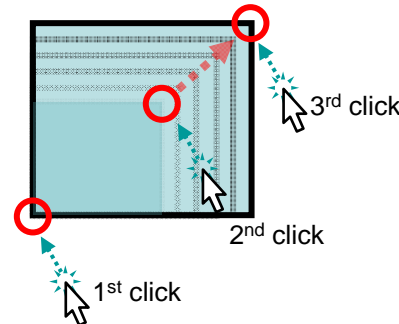
To rotate features by a specific amount, use **Rotate By…**. Enter a number between -360 and 360 to specify the rotation in degrees. A positive angle rotates features counter-clockwise. Features are rotated about the center of their extents.
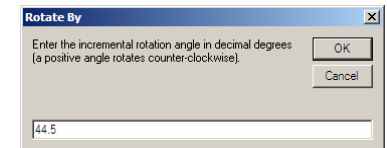
Use **Rotate To…** to specifically set the rotation angle for point or text features. A value of 0 un-rotates features.
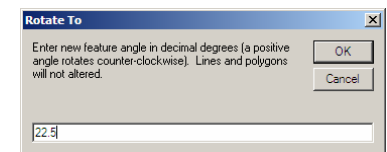
The *Rotate* tool re-selects. Right-click on the map to display the popup menu.

Menu

- Undo Last Edit
- No Click Adjustment
- Nearest Point
- Nearest Line
- Nearest Text
- Nearest Center Point
- Nearest Mid Point
- Nearest End Point
- Nearest Intersection
- Nearest Tangent Point
- Perpendicular To Line
- Center of Polygon Mass
- Adjust Position…
- Rotate By…
- Rotate To…
- Edit Attributes…
- Move
- Scale
- Delete

Rotate By
Enter the incremental rotation angle in decimal degrees (a positive angle rotates counter-clockwise).
44.5
OK   Cancel

Rotate To
Enter new feature angle in decimal degrees (a positive angle rotates counter-clockwise). Lines and polygons will not altered.
22.5
OK   Cancel

Use a snap instead of a left click to pick up only one feature when there are several in close proximity.

Drag from the mouse-down position to the mouse-up position.

2nd click
1st click
3rd click

Click or snap on the "anchor" position, then on the "rotate from" position, and finally on the "rotate to" position.

⊡ The Scale Tool

Use the *Scale* tool to resize one or more features. Once selected, features may be resized either by dragging, with a series of three clicks, or by specifying a scale ratio. When dragging, the mouse-down position must be on a selected feature.

To scale features precisely about an anchor point, use three clicks with snap methods or **Adjust Position.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.
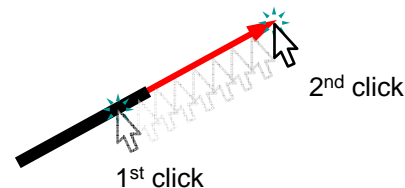
To scale features by a specific amount, use **Set Scale By Ratio**. Enter a number greater than 1 to make features larger or less than 1 to make them smaller. Features are scaled about the center of their extents.
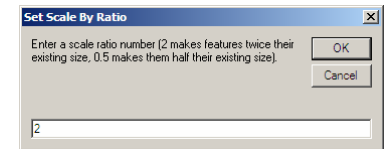
The *Scale* tool re-selects. Right-click on the map to display the popup menu.

Menu items:
- Undo Last Edit
- No Click Adjustment
- Nearest Point
- Nearest Line
- Nearest Text
- Nearest Center Point
- Nearest Mid Point
- Nearest End Point
- Nearest Intersection
- Nearest Tangent Point
- Perpendicular To Line
- Center of Polygon Mass
- Adjust Position...
- Set Scale By Ratio...
- Edit Attributes...
- Move
- Rotate
- Delete

Set Scale By Ratio dialog:
Enter a scale ratio number (2 makes features twice their existing size, 0.5 makes them half their existing size).
OK   Cancel
2

To scale multiple features and not change their relative position, use **Set Scale By Ratio***.*

Drag from the mouse-down position to the mouse-up position.

Click or snap on the "anchor" position, then on the "scale from" position, and finally on the "scale to" position. (1st click, 2nd click, 3rd click)
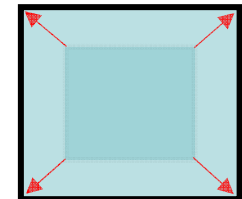
Set Scale By Ratio resizes the feature around the extent center.
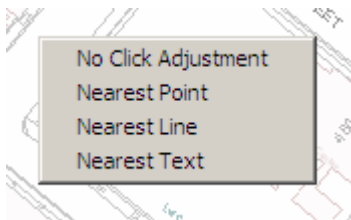
✗ The Delete Tool

Use the *Delete* tool to remove one or more features from the database. Delete operates on the selected set of features or on any feature that is clicked while the tool is current.

A warning message is displayed before any features are deleted. Click **OK** to delete the features.
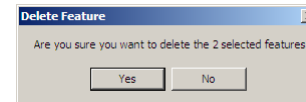
Related data records may also be deleted when they are exclusively associated with the deleted features. For example, if a pipe is deleted and it has a related luggage tag, the luggage tag is also deleted.

As with all other feature edits, the changes to the database are permanent after the *File > Save Feature Edits* menu is clicked.

The *Delete* tool re-selects. Right-click on the map to display the popup menu.

Use a snap instead of a left click to pick up only one feature when there are several in close proximity.

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

⚗ The Extend Tool

Use the *Extend* tool to shorten or lengthen a straight or curved line segment. The end of the segment that is extended is the closest end to the first mouse click or mouse down position.

To precisely set the length of a segment, use a snap method or **Adjust Position** with the second click**.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.

Undo Last Edit

No Click Adjustment
Nearest Point
Nearest Line
Nearest Text

Nearest Center Point
Nearest Mid Point
Nearest End Point

Nearest Intersection
Nearest Tangent Point
Perpendicular To Line
Center of Polygon Mass

Adjust Position...

Extend Line By...
Set Line Length To...

Edit Attributes...
Move
Rotate
Scale
Delete

Use **Extend Line By…** to lengthen or shorten the selected segment by a specific amount. A positive number lengthens the line by the specified amount, a negative number shortens the segment.

Extend Line By

Enter the length to add or remove from the segment (a positive distance lengthens the line a negative distance shortens it).

OK   Cancel

`25`

Use **Set Line Length To...** to set the segment to a specific length.

Set Line Length To

Enter the new line length.

OK   Cancel

`50.2`

The *Extend* tool re-selects. Right-click on the map to display the popup menu.

1st click

2nd click

Shorten line segment

1st click

2nd click

Lengthen line segment

2nd click

1st click
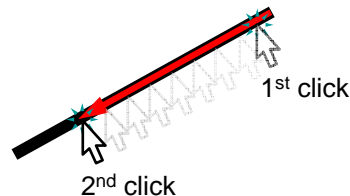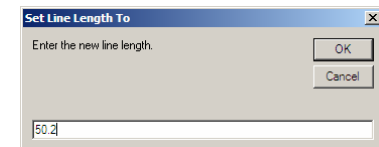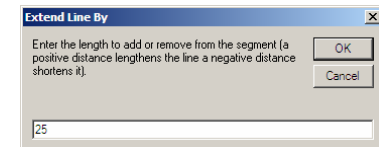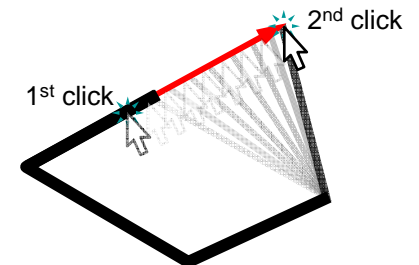
Lengthen line segment in a polygon

Snap to the nearest line to extend the current line segment to the intersection point of the two lines.
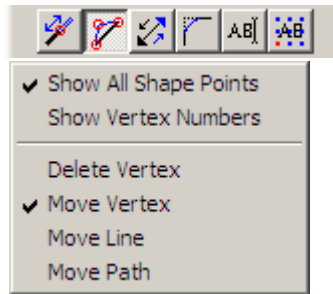
The Shape Tool

Use the *Shape* tool to add, move, or delete one or more vertexes in a line or polygon features or to change the geometry type of a feature from a line to a polygon or a polygon to a line.

When **Show All Shape Points** is checked, every vertex on the selected features is marked with a square and the mid-point of every segment is marked with a circle. If it is unchecked, only the current vertex and its adjacent vertexes are marked.
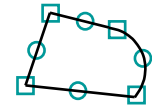
When **Show Vertex Numbers** is checked, every vertex of the selected features are labeled with their sequence number.

Use **Delete Vertex** to remove clicked vertexes from the feature.
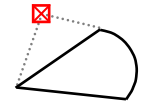
Use **Move Vertex** to change the position of selected vertexes, straighten curved segments or curve straight segments, and change the radius of curved segments.
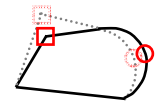
Use **Move Line** to move the two vertexes at the end of the selected segment in one operation.
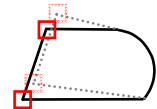
Use **Move Path** to insert vertexes at two clicked positions and move all the vertexes between the two clicked positions in one operation.

*When editing features with a lot of vertexes, to improve the display speed of the selected features, either zoom in so the entire feature is not displayed or uncheck **Show All Shape Points**.*

To select multiple vertexes, hold the shift key down while clicking on vertexes.

Note how the pointer changes while the mouse moves over selected features. The pointer symbol indicates the operation that will be performed when a click is made.

The Shape Tool - Popup Menu
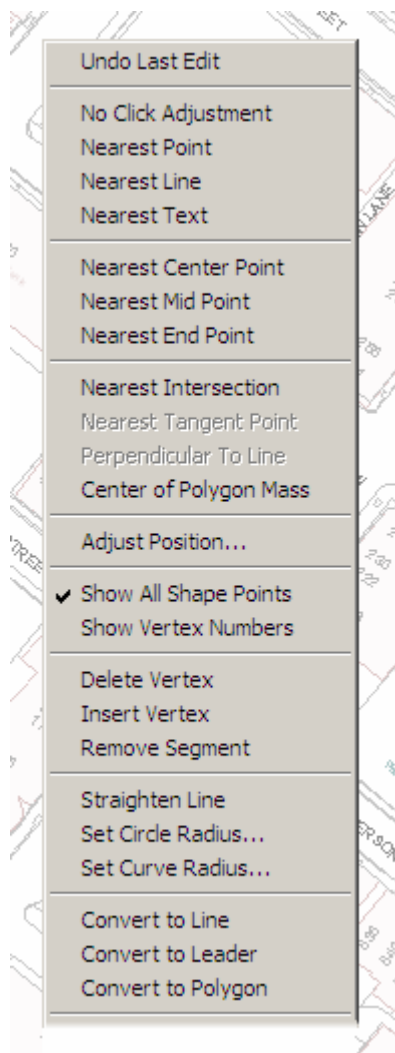
To precisely position a vertex, use a snap method or **Adjust Position** with the second click**.** All snap methods are available except **Nearest Tangent Point** and **Perpendicular To Line**.

Use **Delete Vertex** to remove the current vertex or vertexes.   **Delete Vertex** is enabled only when a right-click is made while the mouse is over a vertex.

Use **Insert Vertex** to add a vertex at the clicked position. **Insert vertex** is enabled only when a right-click is made while the mouse is <u>not</u> over a vertex or the segment mid-point.

Remove Segment deletes the two vertexes at the ends of the clicked segment.

If the clicked segment is curved, use **Straighten Line** to turn the curved segment into a straight segment. **Straighten Line** is enabled only when a right-click is made while the mouse is over curved segment.

If a right-click is made while the mouse is over curved segment, **Set Curve Radius** may be used to precisely define the curve's radius. The radius can not be less than half the straight-line distance between the two segment ends. The segment's current radius is displayed as a default value. If the curved segment is part of a circle, **Set Circle Radius** is available.
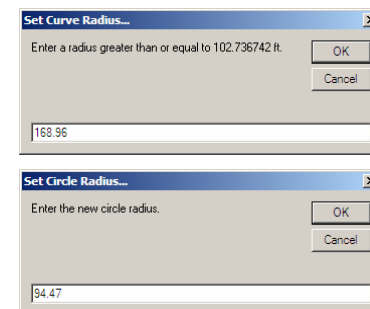
Geometry types may be changed depending on the geometry type of the selected feature. Use **Convert to Line** to change the selected geometry from a polygon or a leader to a line, use **Convert to Leader** to change a line to a leader, or use **Convert to Polygon** to change a line to a polygon.

The *Shape* tool re-selects. Right-click on the map to display the popup menu.
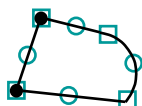
The Shape Tool - Pointers

The mouse pointer used by the *Shape* tool changes as it is moved around the map to indicate the action that will be taken when the mouse button is clicked.
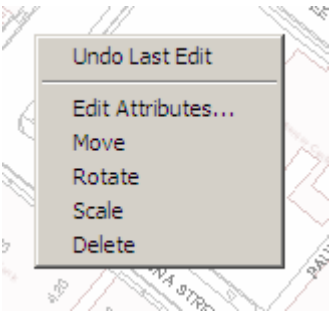
Select Vertex: the mouse is <u>not</u> over a selected feature. If a click is made, a re-select is attempted and if successful, an action appropriate to the part of the geometry that was clicked is started. For example, if a re-select is made at the end of a line feature, a vertex move action is started.

Move Vertex: the mouse is over a vertex on a selected feature. A click attaches the vertex to the mouse so it may be moved into a new position.

Change Curve: the mouse is over the mid-point of a segment on a selected feature. A click attaches a curve point to the mouse. When the mouse is moved, a new three-point curve is drawn that is fixed at the segment ends and passes through the curve point.

Insert Vertex: the mouse is over a selected feature but is not on a vertex or mid-point. A click adds a vertex at the clicked position and attaches the new vertex to the mouse so it may be moved.

To insert a vertex without also moving it, use **Insert Vertex** *on the popup menu.*

Selected vertexes are marked with black dots:

Delete Vertex: the mouse is over a vertex on a selected feature. A click removes the vertex from the feature. This pointer is only displayed while the **Delete Vertex** method is active.

Move Line: the mouse is over a selected feature but not at a vertex. A click selects the segment's two vertexes and attached the segment to the mouse so it may be moved into a new position. This pointer is only displayed while the **Move Line** method is active.

Move Path: the mouse is over a selected feature but not at a vertex. The first click defines the path start position and inserts vertexes as required, the second click defines the path end position, inserts vertexes as required, and attaches the path to the mouse so it may be moved into a new position. This pointer is only displayed while the **Move Path** method is active.
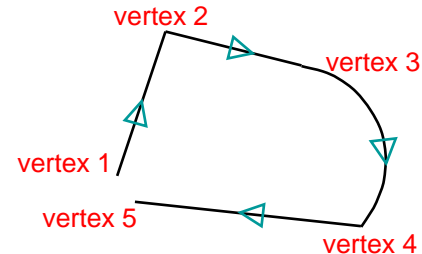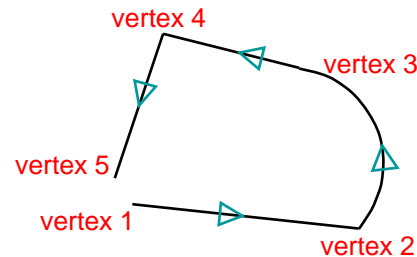
The Reverse Tool

Use the *Reverse* tool to reverse the vertex order on one or more features. If there are selected features when the *Reverse* tool is started, their vertex order is immediately reversed. The vertex reverse action is also taken when a feature is selected while the *Reverse* tool is current.

Arrows drawn at the mid-point of each segment indicate the direction the line geometry is drawn (from the lowest vertex number to the highest).
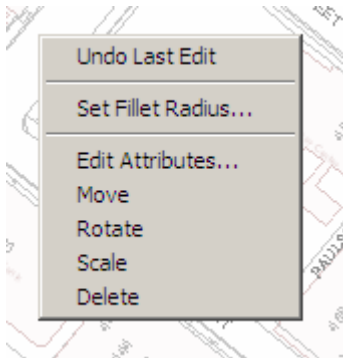
There are no snap methods available for *Reverse*.

The *Reverse* tool re-selects. Right-click on the map to display the popup menu.

Click anywhere on a selected feature to reverse the vertex order.

The reverse action is applied immediately when clicking on features while the Reverse *tool is active.*

The Fillet Tool

Use the *Fillet* tool to add a fillet of a specified radius at any vertex along a multi-segment line except the line end points.

The fillet radius may not be greater than the segment lengths between which the fillet is located. If the fillet does not fit at the clicked vertex, a warning message is displayed.

To set the fillet radius, either right-click on the fillet tool button or select **Set Fillet Radius** from the popup menu.
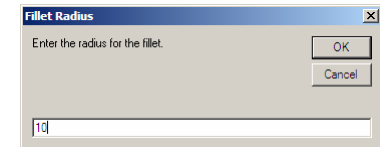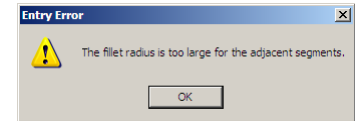
There are no snap methods available to the *Fillet* tool. A point snap is implicit when a left-click occurs near a suitable vertex.

The *Fillet* tool re-selects. Right-click on the map to display the popup menu.

Fillets may not be added at line ends or at vertexes where the adjacent segments are too short.

click near a vertex to insert a fillet
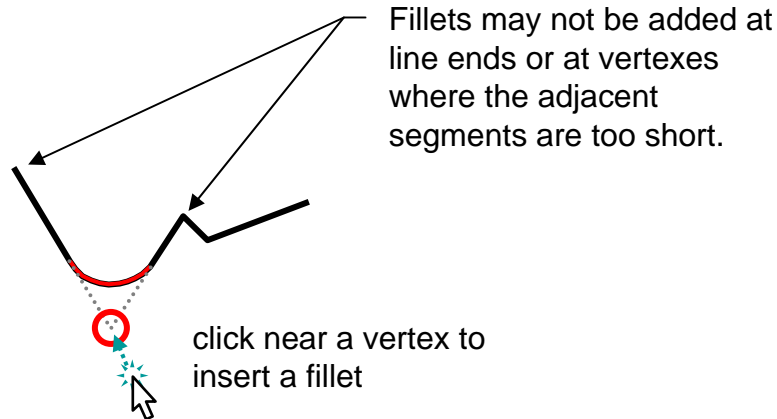
To add a fillet between two features, first use the Join Line *tool to connect the features at the fillet point.*

Undo Last Edit

Set Fillet Radius...

Edit Attributes...
Move
Rotate
Scale
Delete

Entry Error
The fillet radius is too large for the adjacent segments.
OK

Fillet Radius
Enter the radius for the fillet.
OK
Cancel
10

AB The Edit Text Tool
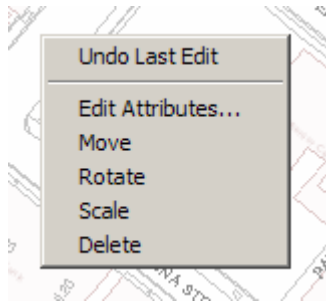
Use the *Edit Text* tool to alter text content in existing text, annotation, and data annotation. To edit multiple features, select them before starting the *Edit Text* tool. If the selected features do not contain editable text, a message is displayed. If multiple features are selected before starting the *Edit Text* tool, the text content from the last feature clicked is used as a default when the **Edit Text** window is displayed.
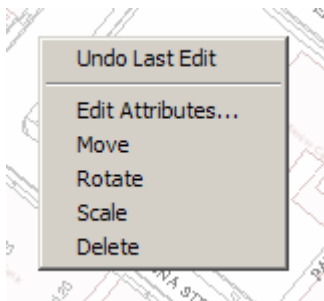
To create multi-line text, use an underscore character or a carriage return [↵enter] between lines. When an underscore character is used, the line breaks do not show in the **Edit Text** window.

To edit data annotation, the feature must first be ungrouped. Text and annotation primitives may be edited whether or not the feature is ungrouped. The **Edit Text** window caption differentiates between text, annotation, and data annotation. When editing data annotation, a list of annotatable database fields is displayed. Click on a field name to add it to the text content.

Data annotation text may be a combination of text that is displayed literally and references to database fields in the feature's record. To distinguish column name from literal text, bracket the column name with curly braces.

There are no snap methods available to the *Edit Text* tool. A text snap is implicit when a left-click occurs near a suitable text primitive.

The *Edit Text* tool re-selects. Right-click on the map to display the popup menu.
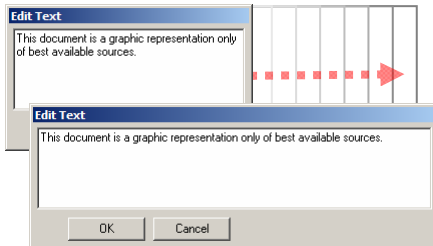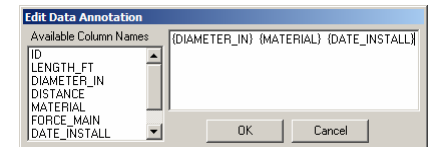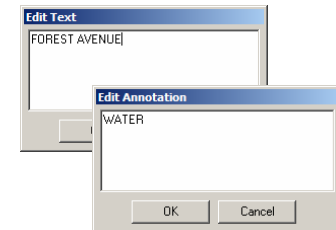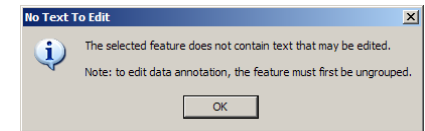
Text wraps in the Edit Text *window, so to distinguish between wrapping text and multi-line text when the text content is long, widen the window by dragging the right edge.*

The Edit Justification Tool

Use the *Edit Justification* tool to change the justification point of text primitives. To edit multiple features, select them before starting the *Edit Justification* tool. If the selected features do not contain text, a message is displayed.
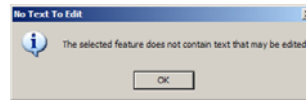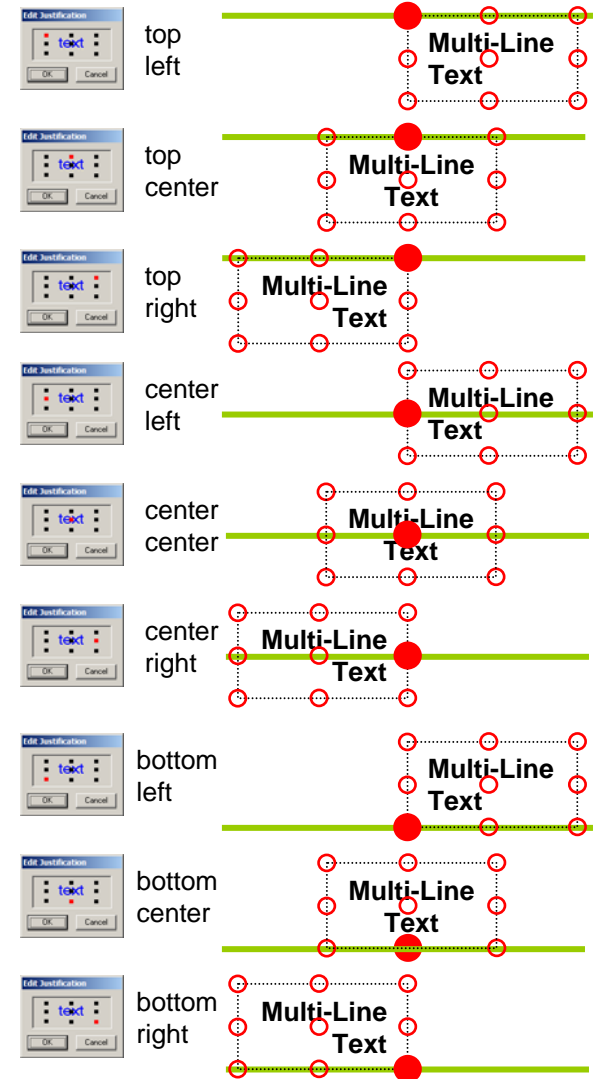
If multiple features are selected before starting the *Edit Justification* tool, the justification from the last feature clicked is used as a default when the *Edit Justification* window is displayed.

The position of the text relative to its anchor point changes when the justification is changed.

When text size is changed, the justification point remains in the same position. This has the effect of sizing around the justification point.

There are no snap methods available to the *Edit Justification* tool. A text snap is implicit when a left-click occurs near a suitable text primitive.

The *Edit Justification* tool re-selects. Right-click on the map to display the popup menu.

When text is placed near a point feature, set the justification to be closest to the point feature.

When text is placed along a line feature, set the justification to be top or bottom and position it on the line feature.

When text is placed inside a polygon feature, set the justification to the center.

Undo Last Edit

Edit Attributes...
Move
Rotate
Scale
Delete

top left

top center

top right

center left

center center

center right

bottom left

bottom center

bottom right

Multi-Line Text

The Graduate Tool

Use the *Graduate* tool to create a series of perpendicular lines (a.k.a. tickmarks) that are spaced a specific distance along another feature (a.k.a. the reference line). Each tickmark is a two-vertex straight line and is always oriented perpendicularly to the reference line. The *Graduate* tool creates a multi-primitive feature in the current feature class.

To start the graduation, click on a line feature or polygon boundary. As the mouse is moved along the line, tick marks appear as the mouse moves the specified distance away from the previous tickmark. The second click or a carriage return ⏎enter finalizes the tickmark positions. A tick mark is not drawn at the start click point.
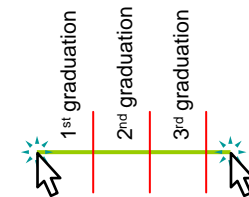
To set the graduation spacing and the tick mark length, either right-click on the tool button or click **Set Tick Properties** from the popup menu.
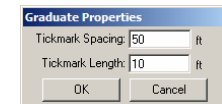
To start a graduation at a precise location or relative to the last clicked position, use **Adjust Position** with the second click.

Only **Nearest Point**, **Line**, **Mid Point**, **End Point**, and **Intersection** snap methods are available.

When using a **Nearest Intersection** *snap where there are two features that cross, the feature that is drawn on top is used as the reference feature.*

1st click on line

mouse move

2nd click on line
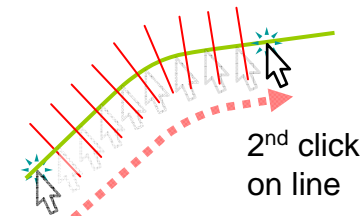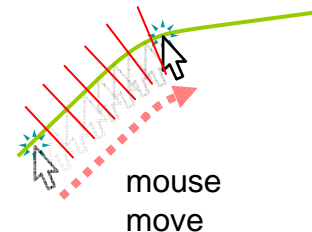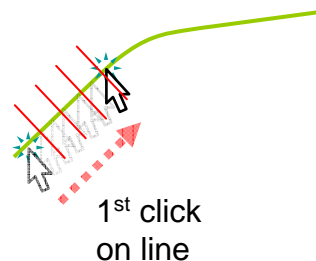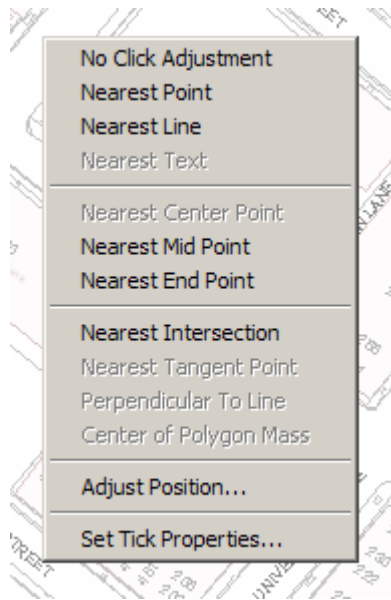
The Divide Tool

Use the *Divide* tool to create a series of perpendicular lines (a.k.a. tickmarks) that evenly divides the length between two clicked positions along another feature (a.k.a. the reference line). Each tickmark is a two-vertex straight line and is always oriented perpendicularly to the reference line. The *Divide* tool creates a multi-primitive feature in the current feature class.

To start the division, click on a line feature or polygon boundary. As the mouse is moved along the line, the tick marks spread out to evenly to divide the space between the fist click and the mouse position. A second click or a carriage return ⏎enter finalizes the tickmark positions. Tick marks are not drawn at the start or end click positions.
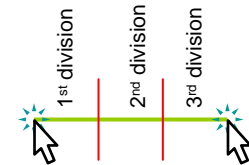
To set the number of divisions and the tick mark length, either right-click on the tool button or click **Set Tick Properties** from the popup menu. The number of tickmarks drawn is always one less than the value specified in **Number of Divisions**.
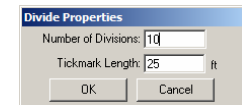
To start a division at a precise location or relative to the last clicked position, use **Adjust Position** with the second click.

Only **Nearest Point**, **Line**, **Mid Point**, **End Point**, and **Intersection** snap methods are available.

*When using a **Nearest Intersection** snap where there are two features that cross, the feature that is drawn on top is used as the reference feature.*
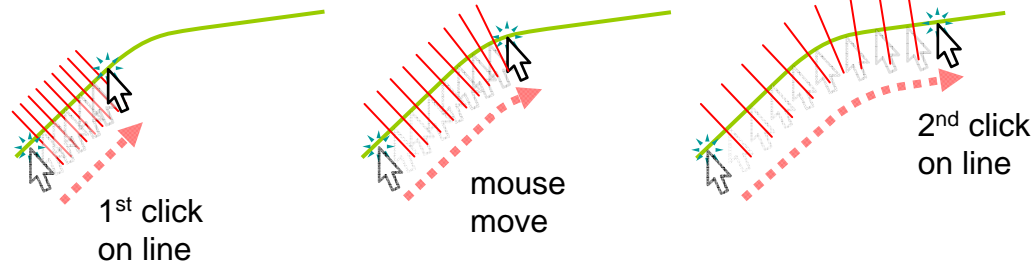
The Trace Tool
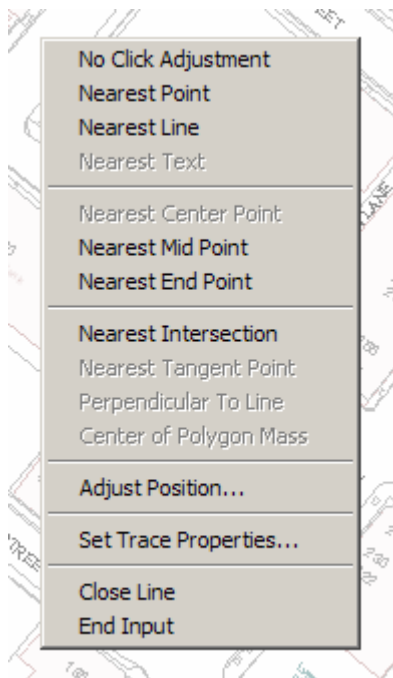
Use the *Trace* tool to create a line that lies along or is offset a specific distance from one or more features (a.k.a. the reference features). New trace lines are created in the current feature class.
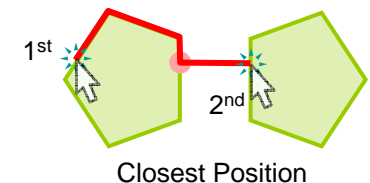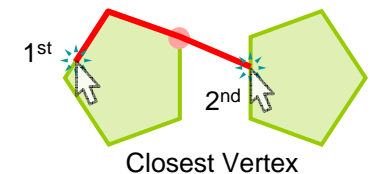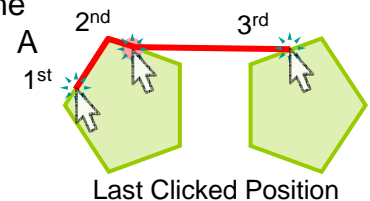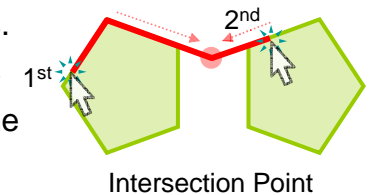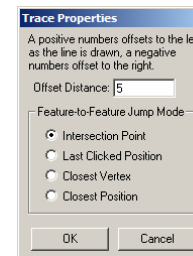
To set the trace offset distance and the feature jump mode, either right-click on the tool button or click **Set Trace Properties** from the popup menu.

An **Offset Distance** of 0 traces directly on top of the reference features. A positive distance offsets the traced line to the left of the reference features relative to the direction the line is being drawn. A negative value offsets the traced line to the right.

Click one of the **Feature-to-Feature Jump Mode** options specify how the traced line behaves when jumping from one feature to another.

To complete the trace line input, use **End Input** or a carriage return ⏎enter, or to join the ends of the trace line to form a polygon, use **Close Line**.
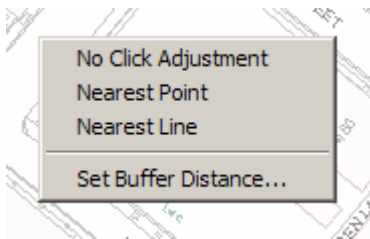
Only **Nearest Point**, **Line**, **Mid Point**, **End Point**, and **Intersection** snap methods are available.

Popup menu options:

- No Click Adjustment
- Nearest Point
- Nearest Line
- Nearest Text
- Nearest Center Point
- Nearest Mid Point
- Nearest End Point
- Nearest Intersection
- Nearest Tangent Point
- Perpendicular To Line
- Center of Polygon Mass
- Adjust Position...
- Set Trace Properties...
- Close Line
- End Input

Trace Properties

A positive numbers offsets to the left as the line is drawn, a negative numbers offset to the right.

Offset Distance: 5

Feature-to-Feature Jump Mode
- ● Intersection Point
- ○ Last Clicked Position
- ○ Closest Vertex
- ○ Closest Position

OK   Cancel

When tracing around a polygon, the shortest path is take. To force a specific direction, use several intermediate clicks.

Intersection Point

Last Clicked Position

Closest Vertex

Closest Position

1st click on line

mouse move

2nd click on line
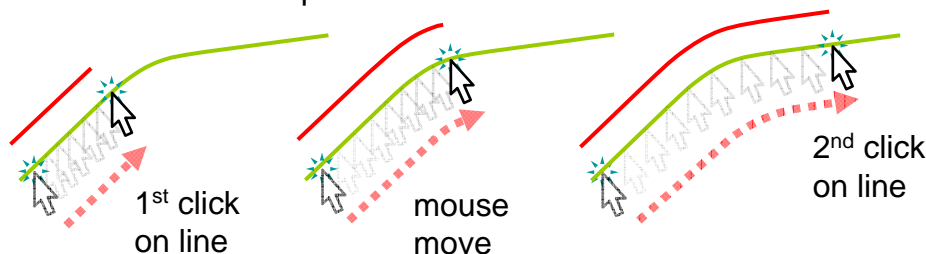
⚖ The Buffer Tool

A buffer is the region that is a specified distance around a feature. Use the *Buffer* tool to create buffer polygons around a point, line, or polygon feature (a.k.a. the reference feature). A distance measured perpendicularly form any point on a reference feature to the buffer polygon boundary always equals the buffer distance.

Once the *Buffer* tool is started, a click anywhere on a feature adds a buffer polygon using the specified buffer distance in the current feature class. No snaps are required.

To set the buffer distance, either right-click on the tool button or click **Set Buffer Distance** from the popup menu.
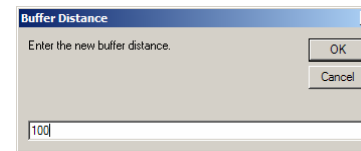
Buffer on a
point feature.
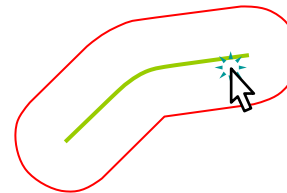
Buffer on a
line feature.
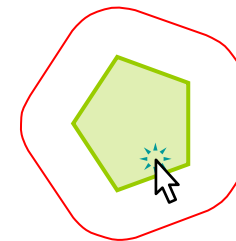
Buffer on a
polygon feature.

Buffers are polygons – if the polygon style is set to be filled, the new buffer will mask the reference feature.

The Join Line Tool

✔ Join Two Ends with Staight Line
Intersect Two Ends
Assemble into Polygon

✔ Join Two Ends with Staight Line
Intersect Two Ends
Assemble into Polygon

Edit Attributes...
Move
Rotate
Scale
Delete
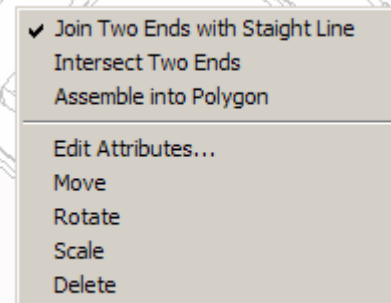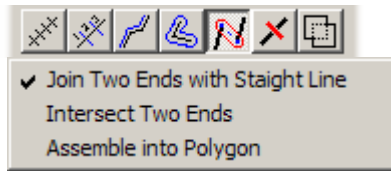
Use the *Join Line* tool to connect two or more line features into one. When two line features are joined, the attributes on the line feature that is selected first are retained. The entire record for the second line feature is deleted after the join is made. The two features must be in the same feature class to be eligible for joining.

If there are multiple line features selected when the *Join Line* tool is started, a dialog is displayed. Click **Yes** to join or intersect the selected lines into one continuous feature.

Connect Selected Features
Do you want to connect all the selected lines?
Yes | No
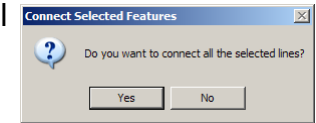
There are three *Join Line* methods:

Join Two Ends with Straight Line joins the clicked ends with a straight line.

Intersect Two Ends extends the two clicked ends to their intersection point.
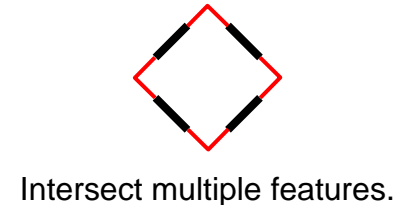
Assemble into Polygon forms a polygon from the selected lines. This is only available if all the selected lines have coincident ends.
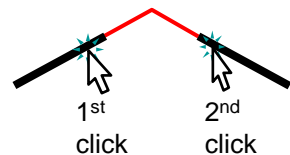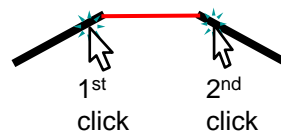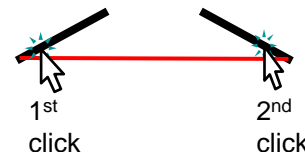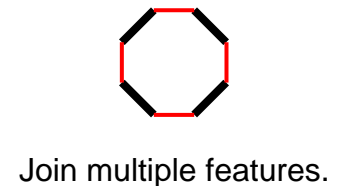
1st click 2nd click
Intersect close ends.
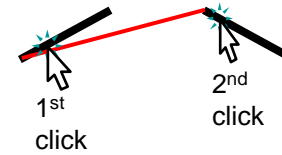
1st click 2nd click
Join far end and close end.

Intersect multiple features.

When selecting a line to join, click near a line end, not at an end or in the middle.
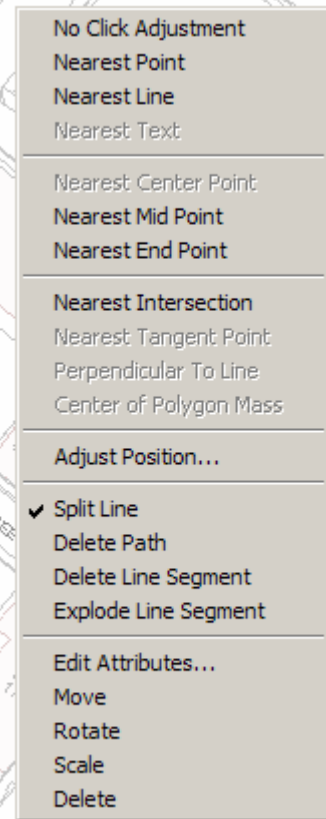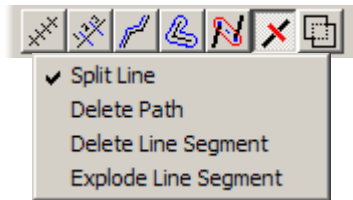
1st click 2nd click
Join close ends.

1st click 2nd click
Join far ends.

Join multiple features.

✗ The Split Line Tool

Use the *Split Line* tool to break a line feature into two or more features. Features created from the split are created in the same feature class as the feature being split. All attribute values are copied from the source feature to the new features.

There are four *Split Line* methods:

✗ **Split Line** breaks a feature at the clicked position. Positions at the first and last vertex of a line are invalid.

Split Line

✗ **Delete Path** breaks a feature at the first clicked position and starts the new second feature at the second position. This has the effect of creating a gap between the two positions.

Delete Path

☒ **Delete Line Segment** breaks a feature at the beginning of the clicked segment and starts the new second feature at the end of the clicked segment. This has the effect of creating a gap by removing the entire segment.

Delete Line Segment

☒ **Explode Line Segments** breaks a feature at every vertex creating single segment features.

Explode Line Segments

Except for **Explode Line Segments**, the new feature is selected at the end of the operation. After an explode, all the single segment features are selected.

Only **Nearest Point**, **Line**, **Mid Point**, **End Point**, and **Intersection** snap methods are available.
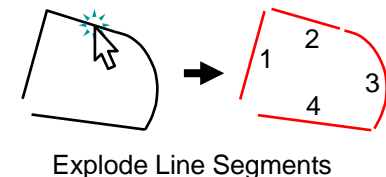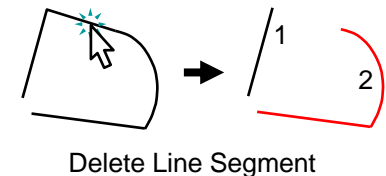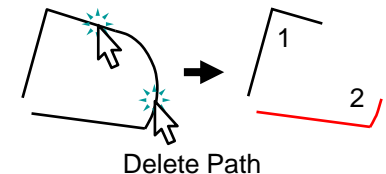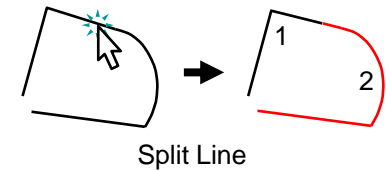
The Join Polygon Tool
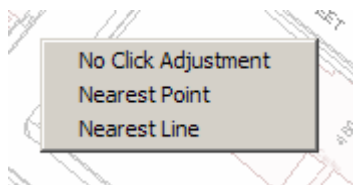
Use the *Join Polygon* tool to modify a selected polygon by merging it with adjacent or overlapping polygons. Any polygon in a selectable feature class that is adjacent to the selected polygon is eligible for joining. The features that contain the polygons that are merged are not altered.

The *Join Polygon* tool is only available if a single feature that contains a polygon is selected.

To join polygons, first, using the *Select* tool, select a single feature that contains a polygon. This is the feature that will be modified. Next, click on an adjacent polygon. If it is on a selectable layer and either shares a boundary with the original polygon or overlaps it, the two polygons are merged, modifying only the original feature. If there is no connection between the polygons, a warning message is displayed.
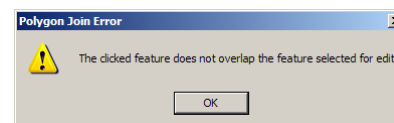
Although point and line snaps are available, a left-click is sufficient to identify polygons to be joined.
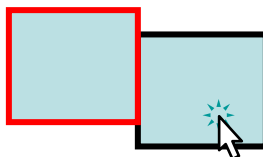
Click on an adjacent polygon to join it to the selected polygon.

The selected polygon is altered. The second polygon is unaltered.

To join two polygons that do not overlap or share a boundary, create a third polygon that overlaps both and join to it first.