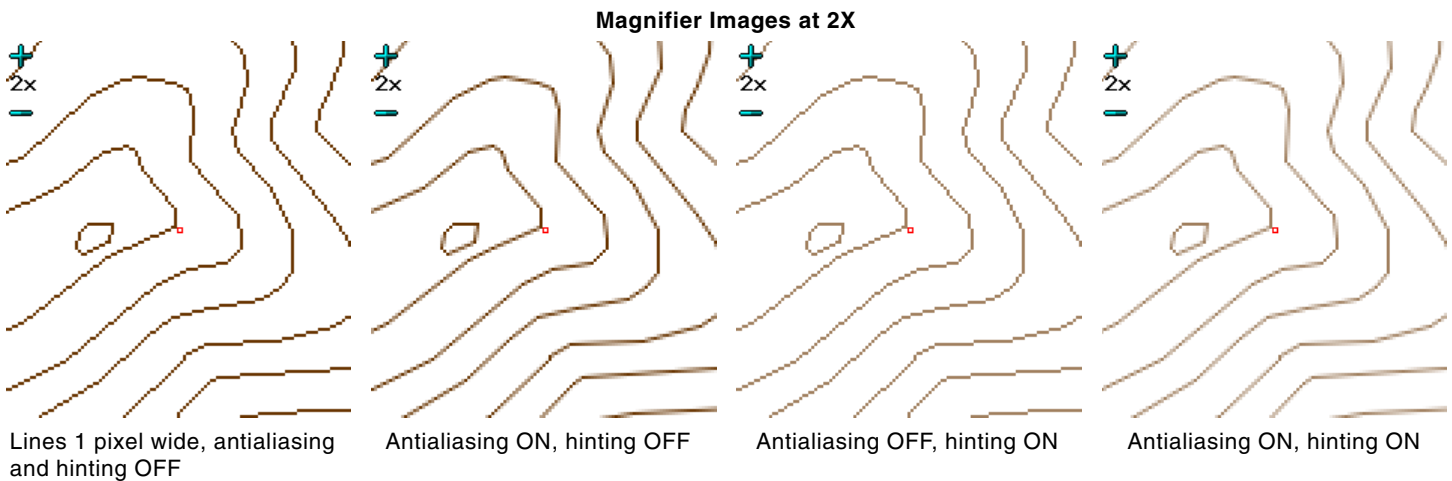# Enhanced Line Rendering

Antialiasing and Hinting of Thin Lines

Line elements in geometric objects drawn with a uniform color on the computer screen are represented by collections of screen pixels of fixed size, which can lead to visual artifacts. Diagonal lines and smooth curves are subject to *aliasing*, in which the sampling of the smooth line to the square screen pixels producing a jagged stairstep effect (see illustration below). In addition, thin lines cannot be drawn thinner than 1 screen pixel wide, so thin lines of differing intended widths have the same width.
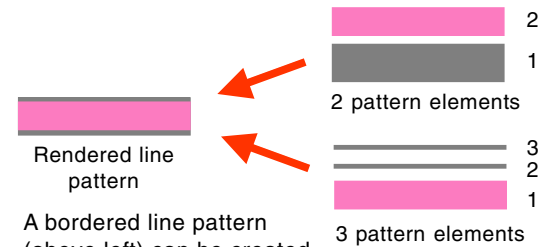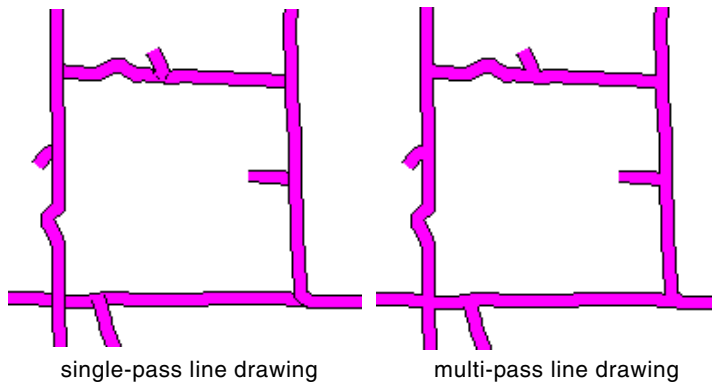
In TNTgis you can compensate for these rendering artifacts using *antialiasing* and *hinting*. Antialiasing produces lines with a smoother appearance by setting varying color transparency for the pixels along and adjacent to the line. Antialiasing is applied to any line or polygon border that has a width of less than 1.5 pixels at the scale being drawn. Hinting sets a uniform transparency value for a line that would be less than one pixel wide at the current scale. The degree of transparency is proportional to the scaled width of the line. Antialiasing and hinting can be set independently or in combination for lines in a vector, CAD, shape, or TIN object using the *Antialias* and *Hint thin line widths* toggles on the Object tabbed panel in the Layer Controls window.

Magnifier Images at 2X

Lines 1 pixel wide, antialiasing and hinting OFF

Antialiasing ON, hinting OFF

Antialiasing OFF, hinting ON
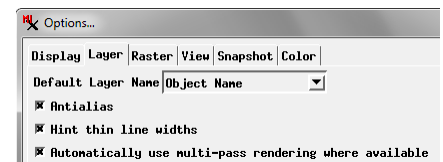
Antialiasing ON, hinting ON

Multi-pass Line Drawing

Lines can be styled using patterns made up of multiple pattern elements in a number of configurations. For example, a wide line style with contrasting border colors can be created using line patterns with either two or three pattern elements (see illustration to the right). When lines are styled with line patterns such as "bordered" lines, intersections of line elements may include undesirable rendering artifacts. For certain line patterns, rendering of line intersections in vector objects can be improved by turning on the *Use multi-pass for improved style joining* toggle on the Lines tabbed panel of the Vector Layer Controls window as described below.

Multi-pass line drawing draws the first pattern element for all the line elements, then the second pattern element for all, and so on until all pattern elements have been drawn. For a two-element bordered line pattern in which the wider first pattern element creates the "borders", this means that apparent line borders meet cleanly at line

intersections without one pair of borders continuing across the intersection (see illustrations below). However, a three-element pattern with separate border elements overlying the main line element does not benefit from multi-pass line rendering.

A bordered line pattern (above left) can be created using either two or three pattern elements (above right). A bordered line pattern made from two elements benefits from multi-pass line drawing; the pattern made from three elements drawn in this order does not.

single-pass line drawing   multi-pass line drawing

You can use toggles on the Layer tabbed panel of the view Options window (Options / View Options from the Display Manager) to set initial defaults for antialiasing, hinting, and multi-pass rendering for layers that not been previously drawn. These defaults are superseded by settings in the Layer Controls windows.