Geometric KML Structure

MicroImages' KML geometric tilesets allow you to present large vector map data on the web in Google Maps and in 3D in the Google Earth browser plug-in. KML geometric tilesets use a tiled form of the Google Earth KML file format to store vector graphics and associated attribute information that can be presented on the web at different resolutions over a range of zoom levels. Because of this tiled, multiresolution structure, only a few tiles with a limited number of elements are needed for any particular view, allowing this limited data to be processed and rendered efficiently by the web browser. As a result, you can present map data over areas of any size at multiple zoom levels without degrading browser performance. You can use the Export Geometric Tileset process in TNTmips to render styled vector points, lines, and polygons to KML geometric tilesets that can be used in Google Maps geomashups that also include standard (raster) web tilesets and SVG geometric tilesets. KML geometric tilesets can also be viewed locally in the Google Earth desktop application.

KML Format

KML files, the native file format for Google Earth overlays, are XML-based text files that can define points, lines, and closed polygons using two- or three-dimensional coordinates (in the latitude-longitude system referenced to the WGS84 datum). The geometric elements can have attributes in the form of a name and description, which are shown in an information window ("info balloon") when the element is clicked on in Google Earth or Google Maps.

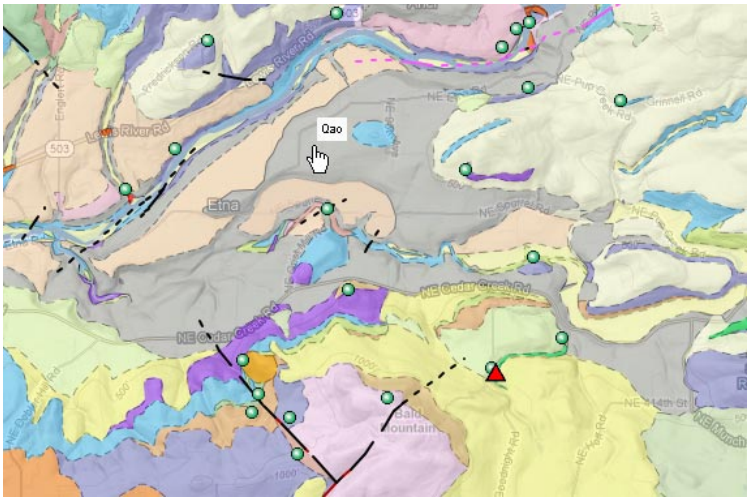
The Export Geometric Tileset process renders styled points, lines, and polygons in an input vector object into a tiled KML form (see the Technical Guide entitled *Tilesets: Export Geometric Structures*). Symbols for point elements in the TNT vector object are rendered to very small PNG image files that are automatically linked to the output KML files. Vector lines and polygons are written directly into the KML tile files along with their style information and attributes. KML provides limited options for styling lines and polygon borders: it can encode the color and width of solid lines. Complex line patterns and CartoScript renderings in the input vector object thus are not readily reproducible in KML. It is best to use solid line styles with varying widths and colors in vector objects that you plan to convert to KML geometric tilesets. Although KML does not support dashed line styles, Export Geometric Tileset converts dashed lines to multigeometry elements in KML, creating an individual line element for each dash but grouping them together to

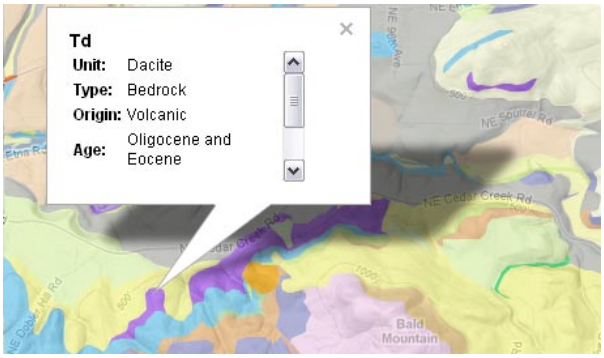
(over)

Portion of Google Maps Geomashup of a Geologic Map using Several KML Geometric Tilesets

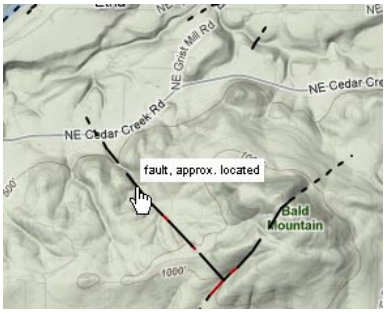
http://www.microimages.com/geodata/rho/AmboyArielGeolMap/AmboyArielGeolMapMashup.htm

The illustration to the left shows a sample use of KML Geometric Tilesets to depict several data layers for a geologic map. The individual KML tileset layers are shown below draped over the Google Maps terrain basemap. These layers include partially transparent filled polygons, solid and dashed lines, and points. All tilesets were created in TNTmips using the Export Geometric Tileset process. The illustration also shows that pausing the cursor (hand symbol) over one of the map unit polygons in the browser reveals the map unit symbol. This mouse-over text shows the element attribute that was transferred to the "name" attribute in the KML files from the polygon's DataTip in TNTmips. This geomashup also includes an SVG geometric tileset (Contact lines) and a simple KML file (Geochronology points).

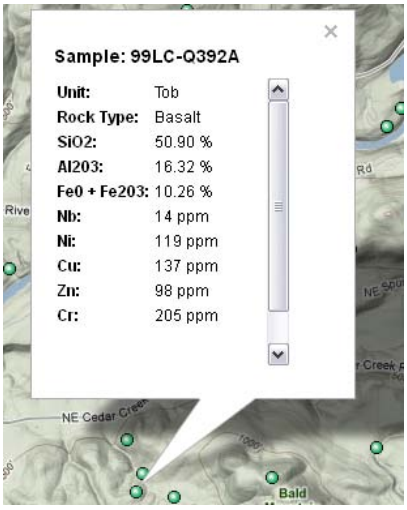




KML geometric tileset of Map Unit polygons. The Google info balloon (opened by left-left-click) shows a listing of attribute information that was transferred to the KML tile files for each polygon from a TNT multi-line DataTip.



Fault lines using solid and dashed line styles in several colors, with the fault type shown on mouse-over.



Points identifying locations of rock samples with geochemical analyses. The Google info balloon shows an extract of the analysis results transferred to KML from a TNT multi-line DataTip.

share the same style and a single set of attributes. Dashed lines add significantly to the size of the output KML files and to the time required in the browser to interpret and render the elements, and so should be used sparingly.

Vector text labels also can be selected for conversion in the Export Geometric Tileset process, but in a KML geometric tileset these labels are converted to point elements styled with a default point symbol. The text of the label is set as the element name so that this text appears in the Google info window.

KML Geometric Tilesets

The KML geometric tilesets created by the Export Geometric Tileset process are variants of the KML Super-Overlay structure, Google's term for a tiled, multi-resolution KML dataset. This basic structure can be created in TNTmips using either image data, as in Google Earth standard web tilesets, or using geometric data. Each KML geometric tileset you export is created with a specified range of numeric Google Maps zoom levels, with a subdirectory for each level (see the TechGuide entitled *Tilesets: Google Earth Structure*). Each zoom level directory contains a tiled set of KML files, with tile boundaries matching the Google Maps global grid. The Export Geometric Tileset process independently renders the KML tiles at each zoom level from the source vector object starting with the maximum zoom level. Lines in the source vector are automatically simplified (thinned) prior to creating each successively lower zoom level to provide levels of detail appropriate for viewing each level.

The KML files in each zoom level are organized in tile row subdirectories and named by their tile column. Geometric elements are stored in each tile using the required latitude-longitude coordinates, along with a region element that records the tile's geographic extents. At all but the most detailed zoom level, each KML file also contains network links to the KML files covering the same area at the next-higher zoom level. When a KML geometric tileset is viewed in Google Earth (or in geomashups using the Google Earth browser plugin), these regions and network links are used along with level-of-detail settings to determine which tiles should be loaded for any particular 3D viewing geometry. In a Google Maps geomashup, MicroImages' JavaScript library places the tile files in their correct map positions at each zoom level using their tile row and column numbers

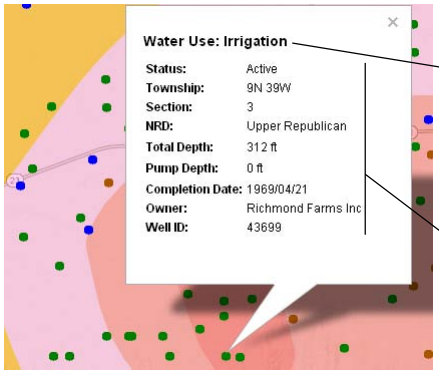
Each KML geometric tileset is represented by a master KML file that links to the structure, and which can be used to display the tileset in Google Earth. A TileSet Definition (TSD) file is also created to describe the tileset contents. A sample HTML/JavaScript file that loads the tileset in Google Maps is also produced to allow immediate local viewing of the tileset in your browser.

Element Attributes in KML Geometric Tilesets

The Export Geometric Tileset process transfers attribute information from elements in the input vector object to the KML tile files based on the DataTip settings in the input vector object. If the TNT DataTip that has been set for an element type (designated database field plus prefix and suffix) produces only a single line of text, then that text is transferred to each KML element as its name attribute. That KML name is shown in the Google info window when the element is clicked on. In a Google Maps geomashup, the name attribute is also shown automatically in the browser view as a mouse-over event, as illustrated on the front side of this page.

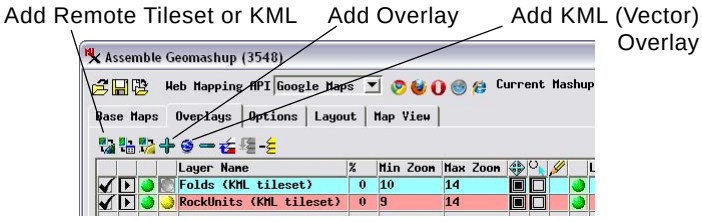
A TNT DataTip can also be based on a string-expression database field that produces multiline text showing a list of attribute values. In this case the KML name and description are determined by HTML formatting in the DataTip string expression. Any line or lines of DataTip text enclosed in an HTML heading tag are transferred to the KML element's name attribute. Other lines of DataTip text are transferred to the KML element's description attribute. The resulting Google info window shows the name attribute at the top (in bold text), with the description text shown below it, as shown in the illustration below.

Google Maps info balloon for a point in a KML geometric tileset depicting groundwater well locations. The attributes in the info window were transferred to KML from an HTML-formatted string expression used in the vector point database table in TNTmips to create a multiline DataTip for the points. The Google info window shows the KML element name at the top followed by the KML description.



KML Geometric Tilesets in Geomashups

You can use KML geometric tilesets as overlays in Google Maps and Google Earth geomashups you create in the TNT Assemble Geomashup process. To add a KML geometric tileset posted on the web as an overlay, on the Overlays tabbed panel press the *Add Remote Tileset or KML* icon button (see illustration below), then simply choose the master KML file or the TSD file that links to the tileset. Procedures for selecting custom layers you have posted on the web are outlined in the TechGuide entitled *Geomedia Publishing: Adding Custom Web Layers to Geomashups*. To add a KML geometric tileset from a local drive, press the *Add KML (Vector) Overlay* icon button and choose the master KML file, or press the *Add Overlay* icon button and choose the tileset's TSD file.



In a Google Maps geomashup, the KML files to be loaded for any view must be interpreted (parsed) and converted to a graphic form that can be displayed by the browser. To use a KML geometric tileset in Google Maps, **you must choose** the MicroImages GeoXML parser for this task (see the TechGuide entitled *Geomedia Publishing: Using KML Overlays in Geomashups* for more details). Because of this parsing or conversion procedure, KML geometric tilesets may not load in the browser as quickly as SVG geometric tilesets of comparable complexity.