Tile Image Formats

TNTmips Pro can prepare standard web tilesets whose structure conforms to those described by Google, Microsoft, and NASA for their popular viewers. These include:

- Tile Overlays for Google Maps
- Super-Overlays for Google Earth
- Custom Tile Layers for Microsoft Bing Maps
- Tile Layers for NASA's World Wind

TNTmips can also create TNT raster object tilesets accessed via TNT Project Files for use in MicroImages' commercial products. Each of these standard tilesets must conform to its vendor's specific file naming and directory structure. Each directory level contains tile files of specified size, image file format, and zoom level. These tileset structures are designed to ensure rapid retrieval and display of the required tiles at any zoom level.

The Export Raster Tilesets, Auto Mosaic, and Convert Tileset processes in TNTmips allow you to choose from the allowed range of image formats and tile sizes for the tileset structure you select from the Target menu. The options on the Image Format and Tile Size menus in these processes are summarized in Table 1 below. Compression and transparency characteristics of the different image formats are summarized in Table 2.

Image Formats

Tiles in a Google Maps, Microsoft Bing Maps, or NASA World Wind web tileset are JPEG and/or PNG files. Google Earth is more flexible with regard to tile formats, allowing TIFF files as an alternative to JPEG and PNG.. The JPEG + PNG format options (described herein) that are provided for these tileset structures create an optimal combination of these tile formats for most uses.

A TNT tileset raster object in a Project File links to tile files in a single format chosen from PNG, GeoTIFF, or JPEG2000 (GeoJP2) image formats.

JPEG Format

JPEG is a 24-bit color format that provides greater compression than PNG or TIFF, reducing the storage required for the tileset, but the compression is always lossy and

thus most appropriate for continuous-tone images. If you choose the JPEG User Defined format or either JPEG + PNG format option, you can specify the desired compression quality using the Quality numeric field. JPEG files do not support transparency. If there are non-image areas (whether set to null or left black) within or around the edge of the input image set, JPEG tiles that cross these boundaries are black in the non-image area. These marginal
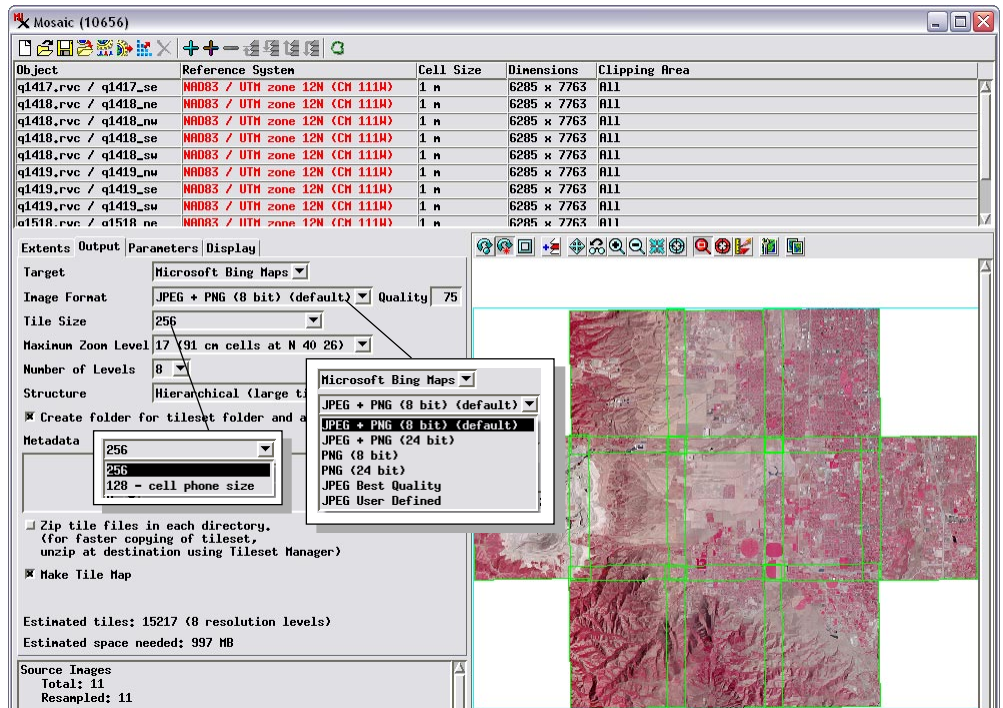
Mosaic window showing input color-infrared orthoimages, with target set to Microsoft Bing Maps. Insets show image format and tile size options for Bing Maps. These format and size options are also summarized for all tileset structures in the table below. Bing Maps tilesets made from this layout using different file format options are shown on the reverse.

Table 1. Image formats and tile sizes available for different tileset structures.

Tileset Structure	Tile Image Format				Tile Sizes (width & height in cells)
	JPEG	PNG	GeoTIFF	GeoJP2	
Google Maps Tile Overlay	Yes	Yes			256, 128*
Bing Maps Custom Tile Layer	Yes	Yes			256, 128*
NASA World Wind Tile Layer	Yes	Yes			512
Google Earth Super Overlay	Yes	Yes	Yes		256, 512, 1024, 2048
TNT tileset raster object		Yes	Yes	Yes	256, 512, 1024, 2048, 4096, 8192

* option for tileset display on cell phones

Table 2. Characteristics of different tile file image formats in tilesets.

Format Characteristics	JPEG	PNG	TIFF	GeoTIFF	GeoJP2
Color depth (bits)	24	24,8	24	24	24, 16, 8
Compression	Lossy	Lossless	Lossless	Lossless	Lossless or Lossy
Transparency	No	Yes	No	Yes†	Yes†

† TNT tileset transparency in the TNT products via null mask
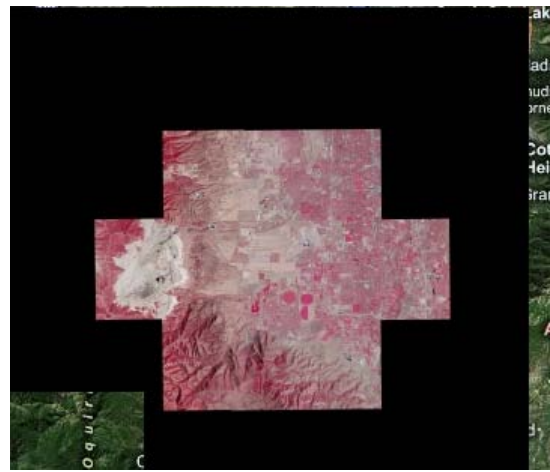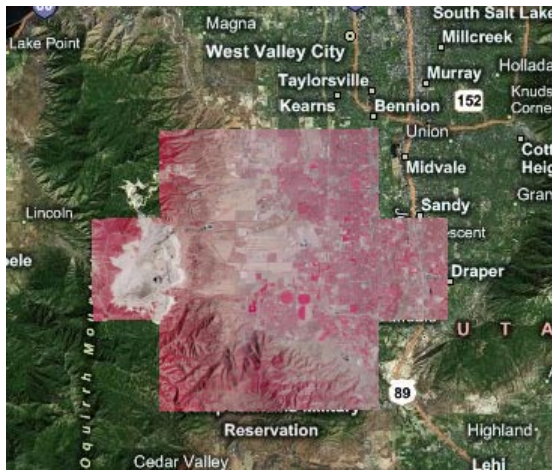
Microsoft Bing Maps Custom Tile Layers created from the mosaic layout shown on the front side of this page. The tile overlay on the left was created using the JPEG + PNG (8-bit) format option, which uses JPEG format for complete image tiles and automatically switches to 8-bit PNG format for tiles that cross the edge of the image, providing transparency for null areas while minimizing stored size. The tile overlay on the right was created with the JPEG Best Quality format option. Non-image pixels around the edges of the image in the tile overlay are black. In zoomed-out views these marginal black areas may extend far beyond the edges of the image because Bing Maps tiles have a fixed size of 256 by 256 cells at all zoom levels and are aligned on a predetermined grid for faster display.

black areas are larger at lower-numbered zoom levels in the output tileset because web tilesets have fixed tile sizes at all zoom levels, and tile edges are constrained to a predetermined global grid for faster display (see the illustration above right). The format options that mix JPEG and PNG tiles provide an optimal solution to this situation.

PNG Format

Unlike JPEG and TIFF formats, PNG tiles can incorporate transparency. When TNT processes create tilesets using PNG format, each PNG tile that includes the boundary of the image area (or of the bounding area you specify) is automatically set to be transparent over the non-image area of the tile. This edge transparency provides an attractive edge for image tilesets. PNG format should also be used for tilesets that are rendered from geometric data (lines and polygons) to provide transparency for the areas between the map features.

PNG tiles can be either 8-bit indexed color (using a color palette) or 24-bit RGB color. PNG 24-bit tiles provide full color fidelity for continuous-color images. However, 8-bit PNG files are only a third the stored size of 24-bit files, and the slight color loss associated with conversion to 8-bit is barely noticeable for many aerial and satellite images. The smaller size of 8-bit PNG files means that they download and display much faster in a geobrowser than 24-bit PNG tiles. The smaller 8-bit PNG tiles are definitely preferred for map tilesets with few colors and large areas of uniform color.

Both 24-bit and 8-bit PNG tiles are automatically compressed using a lossless compression scheme that is appropriate for continuous-tone images as well as map images. However, PNG tiles of continous-tone images at either color depth are usually significantly larger than JPEG tiles, which use lossy compression. For example, a fully populated image tile might be 10 to 20 KB in size in JPEG format, 50 to 89 KB as 8-bit PNG, and 150 to 175 KB in 24-bit PNG format.

JPEG + PNG Format Options

TNT processes that create standard web tilesets provide two for-mat options that combine JPEG and PNG formats. These options use JPEG User Defined format for interior, fully-opaque tiles to provide maximum compression (smallest stored tile size) and automatically switch to PNG format for edge tiles to provide transparency for non-image areas. You can choose either JPEG + PNG 8-bit (the default option) or JPEG + PNG 24-bit options. The JPEG + PNG 8-bit option is the optimal choice for image tilesets, providing attractive edge transparency while minimizing the stored size of the tiles, which also maximizes the speed of download and display of the tileset.

TIFF and GeoTIFF Formats

You can use TIFF files in a Google Earth tileset. They are actually GeoTIFF tiles that can also be used directly as georeferenced images in other processes. You can also select the GeoTIFF tile format for TNT tileset raster objects. TIFF and GeoTIFF format options include uncompressed and two lossless compression options (PackBits and LZW). TIFF format is suitable for any type of image but provides less compression than JPEG or GeoJP2 and does not provide transparency for non-image pixels when used in Google Earth tilesets. If you wish to use a format with lossless compression and/or transparency for Google Earth tiles, PNG format is thus preferable to TIFF.

JPEG2000 (GeoJP2) Format

JPEG2000 (GeoJP2) image format is available for use in TNT tileset raster objects accessed via Project Files within the TNT products. JPEG2000 is an advanced image format that provides either lossless or lossy compression that is superior to that found in JPEG and TIFF formats. Menu options for JPEG2000 format include Lossless and two lossy compression options, Best Quality and User-Defined. If you choose User-Defined lossy compression you can set the desired compression ratio using the Ratio field (see the Technical Guide entitled *Mosaic Directly into JPEG2000*).

Although GeoTIFF and GeoJP2 tile formats do not directly support transparency, TNT Tileset Rasters provide transparency for non-image areas by means of a null mask that is stored with the tileset and used automatically when the tileset is displayed.