User Manual

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2 ABOUT .VEC FILES

In Orbiter versions 2010 and up, the Map MFD makes use of coordinate-based vector files for drawing the imagery of planetary surface maps. This file format is a .vec file and is stored in a planet's 'Data' folder in Orbiter's Config folder (for Earth this is "Root\Config\Earth\Data\"). This file will either be named 'coast.vec' or 'contour.vec'. The only real distinguishing differences between the two are the color the map will be drawn in on the MFD. Contour files will be draw in orange (#C07000), and coasts will be drawn in purple (#8080FF). A planet can have both a contour and coast file, and both will be drawn in the map MFD.
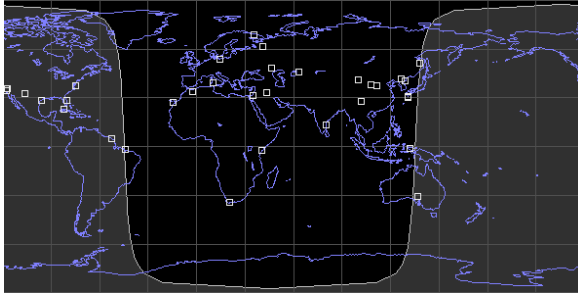

Earth's map is 'coast.vec' and is purple
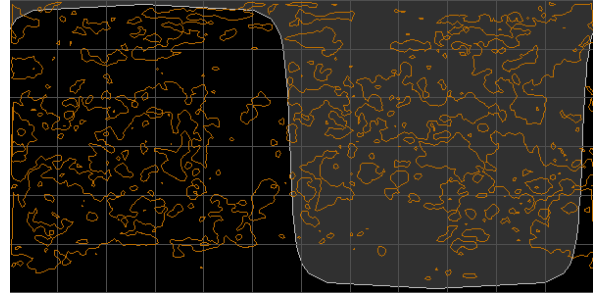
Venus's map is 'contour.vec', so is orange

.vec files break this data down into two main components; segments and vertices. The top line of a .vec file declares the total number of vertices defined, the second line declares the total number of segments. After this, the next line declares the total number of vertices for the following segment, followed by each vertices' coordinates line-by-line. At the end of that segment, the exact format continues for the next segment. (see image below for reference).
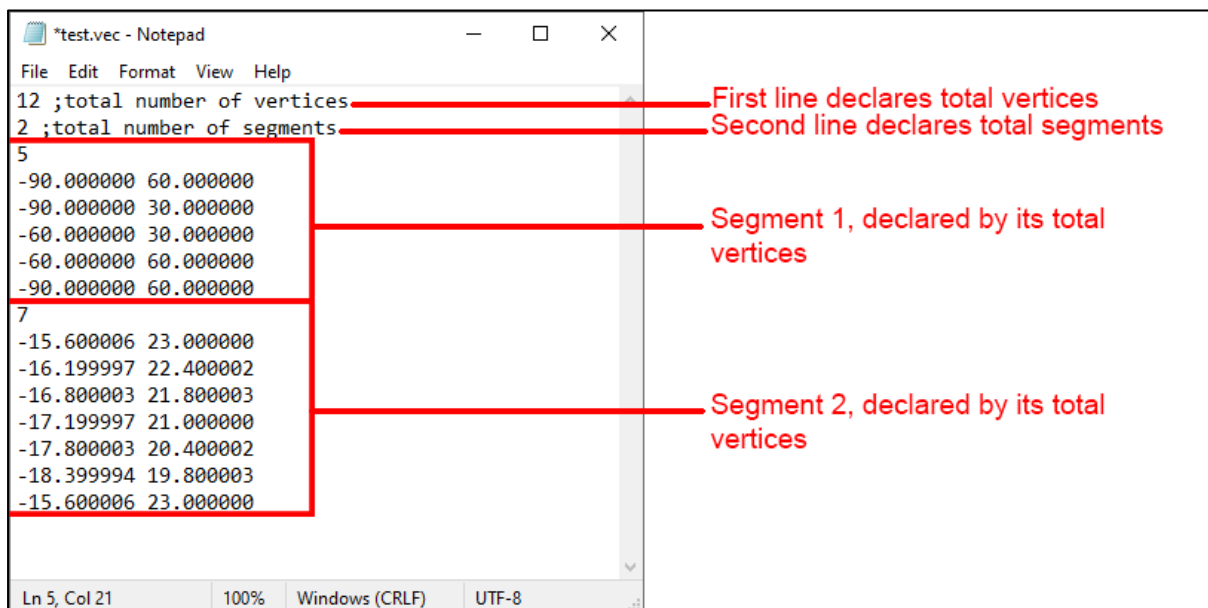

Note: The first segment defined here is a square, however there are five vertices declared. Counterintuitively, .vec maps require a **closing vertex** for each shape. Note the last vertex is the same as the first. Without this closing vertex, the shape will appear as a triangle in the Map MFD.

VecMapper is a tool which allows users to draw lines over an image which can be converted to this .vec format.

3 BASIC OPERATION

VecMapper's main display consists of a top menu bar, a side toolbar, a bottom info pane, and the main mapping area.
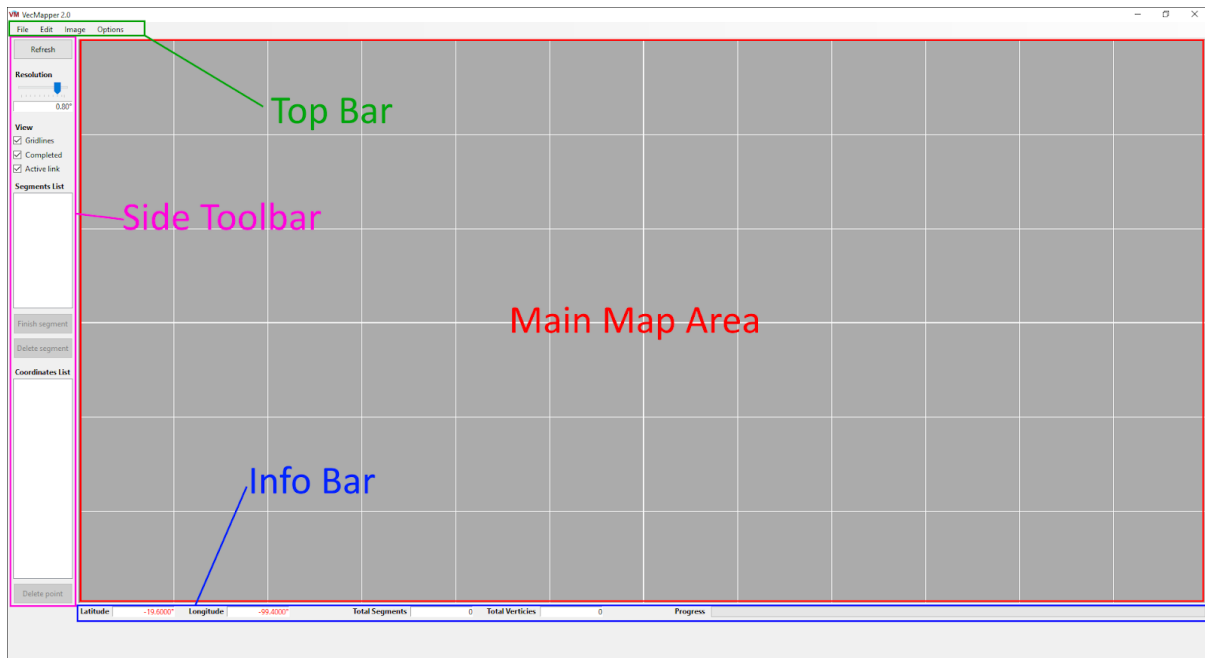
3.1 Top Menu Bar

The top menu bar consists of the following:

File Menu
- **New Project** – start a new .vec project
- **Load** – to load a .vec file into VecMapper
- **Save/Save As** – for saving the current .vec file

Edit
- **Finish Segment** – complete the current drawing segment. This will start a new segment when the user commences drawing
- **Delete Segment** – delete the currently active segment
- **Delete Point** – delete the currently selected point (vertex)
- **Close all Segments** – add a closing vertex to all segments without one (see About .vec Files)
- **Shift Longitude** – Shift the entire project longitudinally
- **Flip** – flip the entire project along either X or Y axis
- **View Resolution Properties** – view the resolution details for the current project
- **Reduce Resolution** – reduce the resolution of the current project

Image
- **Import Image** – import an image file (accepted formats are .jpg, .jpeg, .gif, .bmp) into the main map area. This image can be used as a reference when drawing lines.
- **Clear** – Clears the image in the mapping area

Options
- **Settings** – opens the settings window (see Settings)
- **About** – about VecMapper 2.0

3.2 Info Bar
- **Latitude and Longitude** – displays the latitude and longitude coordinates of the cursor over the mapping area
- **Total Segments** – displays the total segment count in the current project
- **Total Vertices** – displays the total vertex count in the current project
- **Progress** – progress bar for current load operation

3.3 Side Toolbar
- **Refresh Button** – force refresh VecMapper. This may need to be done after minimizing and reopening the program

- **Resolution Trackbar** – adjust the current drawing resolution (in degrees)
- **View Gridlines** – toggle display gridlines over the map
- **View Completed** – toggle view completed segments on/off
- **View Active Line** – toggle drawing the 'closing' line between the last drawn vertex and next/first
- **Segments List** – list of segments on project. Each segment is labelled in its sequential order with its total number of vertices.
- **Finish Segment Button** – click to mark the currently active segment as complete. This will create a new segment when the user commences drawing
- **Delete Segment Button** – delete the currently active segment.
- Coordinates List - list of vertices in the currently active segment
- **Delete Point Button** – delete the currently selected point (vertex)

3.4 Main Map Area

The main mapping area is where all line-drawing takes place.
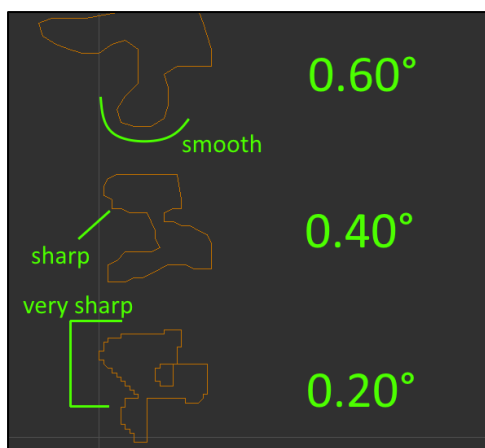
4 DRAWING

4.1 Importing an Image

Although entirely possible to draw a map without a reference image, it is obviously recommended to use a reference image to trace over for accuracy. Any image can be chosen, but for ease, it is recommended to use a height map, adjusted to display only a few colours. The image below of a Mars map edited like this should give a good example; this format would be very easy to identify where lines should be traced:
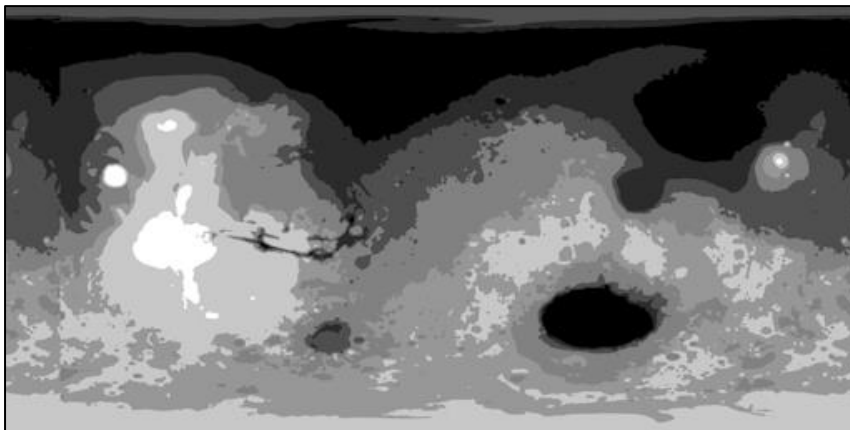
4.2 Choosing a Draw Resolution

Draw resolution can be adjusted with the resolution trackbar in the side toolbar. Resolution is displayed in degrees. Although draw resolution can be set as high as 0.20°, the highest recommended resolution is 0.60°, as higher values can lead to pixel artifacts from drawing (seen below).

For reference, the average resolution of Orbiter's default maps is below:

Earth	0.5919°
Moon	1.0932°
Mars	1.1099°
Venus	1.0739°

4.3 Drawing

Once ready to draw, click and drag in the mapping area to draw a line. It is recommended the cursor speed be adjusted to very low for this. Immediately on drawing, the drawn path will be visible, and the coordinates list will start populating with the drawn vertices.

The next point in the segment after the last drawn point will be the first drawn point, as all segments are 'closed' in Orbiter's map MFD. A blue open square will mark the next point, and a blue closed square will mark the selected/last drawn point. A blue line links the two as they will appear in map MFD:
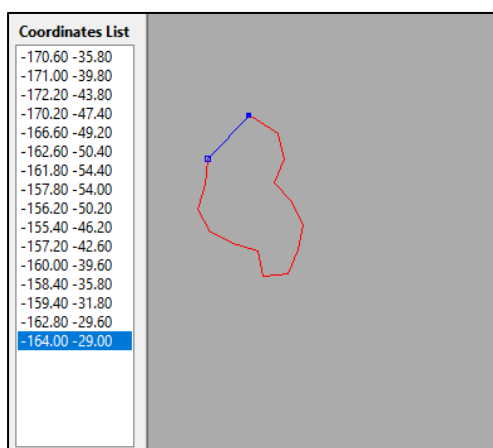
Note the blue linkline can be hidden by toggling the 'Active Link' checkbox in the side toolbar.

Selecting Points
Any point in the coordinates list can be selected, and any new line will then be drawn from the selected point. Note below, the blue active-link line is now at the 6th point drawn:
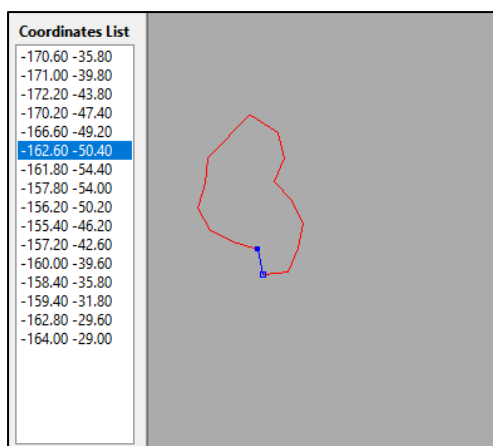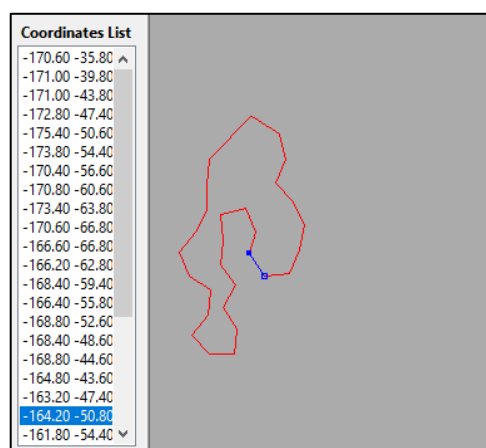
Deleting Points

VecMapper does not support undo/redo, but mistakes can be easily undone by deleting points. Simply press the delete key or click the 'Delete Point' button to delete. Any point in the point list can be deleted in this way.
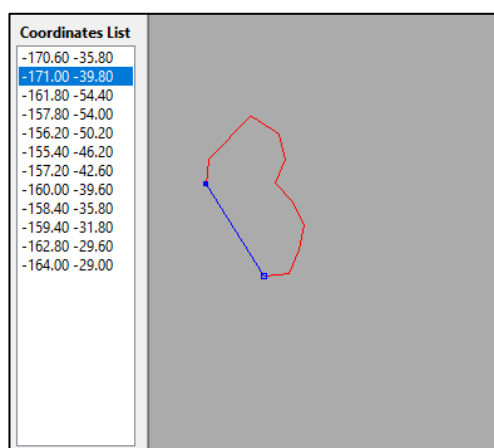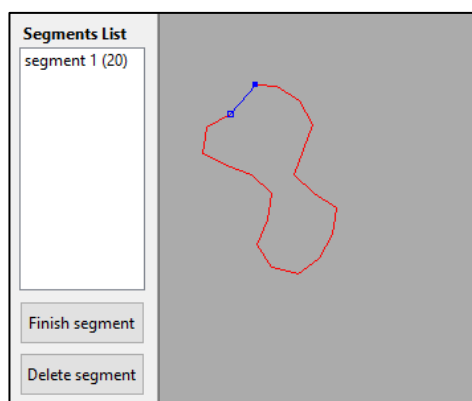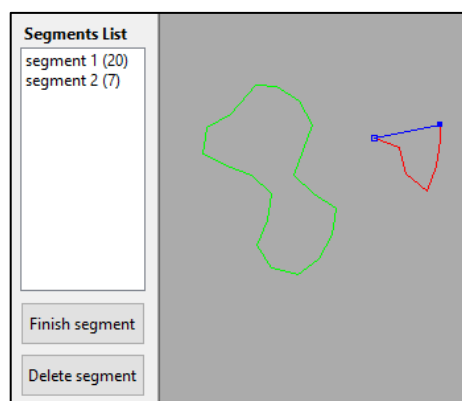

We deleted some points

And drew a new path

4.4 Segments

After completing a line, the segment can be completed by clicking the 'Finish Segment' button. After this, any new line will be drawn in a new segment (see below). Active segments will be drawn in red, and complete segments in green.
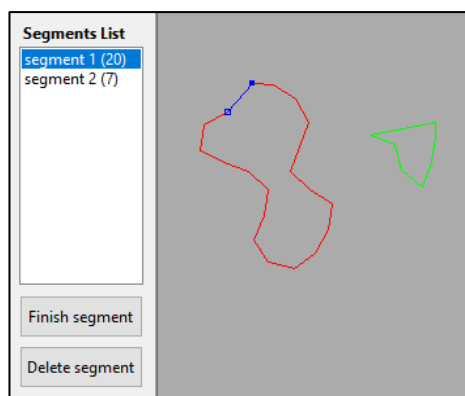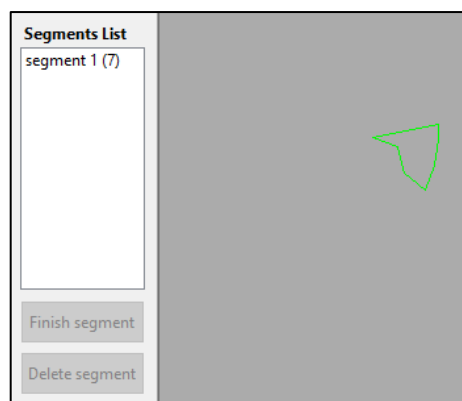

Incomplete segment

Segment completed and new segment started

Editing and Deleting Segments

Segments can be selected from the segments list by **double clicking** them. Points in the selected segment can then be drawn just as before (see Drawing), or can be deleted entirely.

Our first segment was selected again…   … and deleted

4.5   Drawing at the Edge of the Map

Oftentimes a segment will need to be drawn across the edge of the map, say for example if the centre of the continental United States was at -180°, the east coast would be drawn towards the left side of the map, and the west coast drawn on the right.

In this case, it is important to ensure the lines 'line up'. In the example below, we trace a circle that sits at the edge of the map as described:
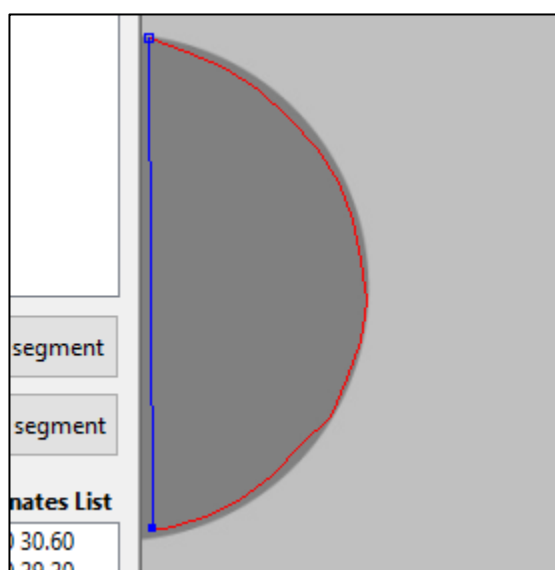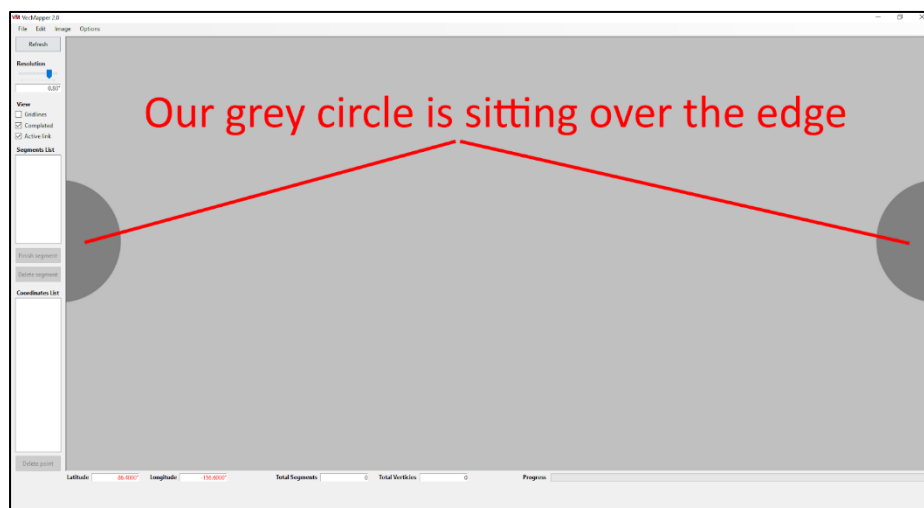
Note here we have started drawing on the left side, from the top of our circle.
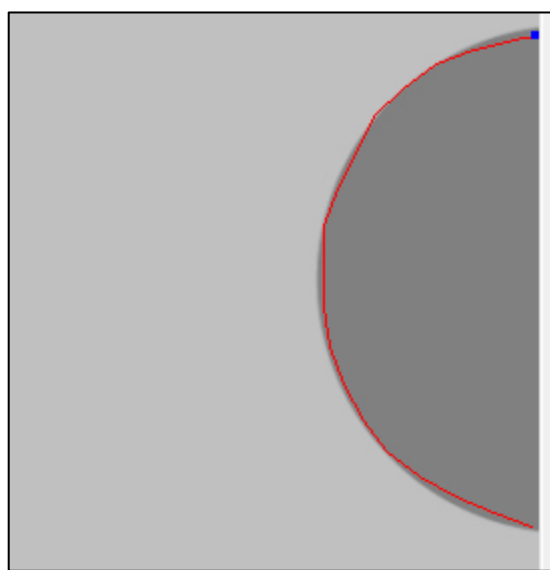
Therefore on the right side, we will start drawing from the bottom, to meet again at the top.
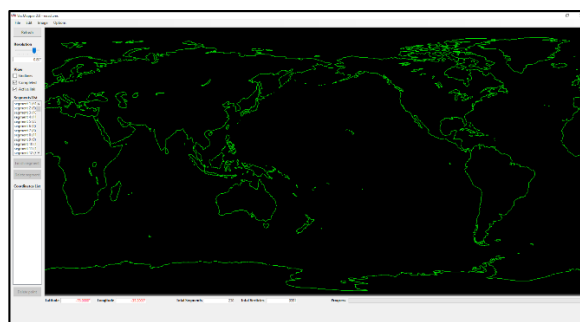
Note here as well, there are no lines linking these two arcs across the map. This is because the closest link between these points will be over the **edge of the map**.

5   SHIFT LONGITUDE TOOL

The shift Longitude tool can be accessed from the 'edit' tab of the top toolbar. It can be used to shift the entire map longitudinally by given degrees.
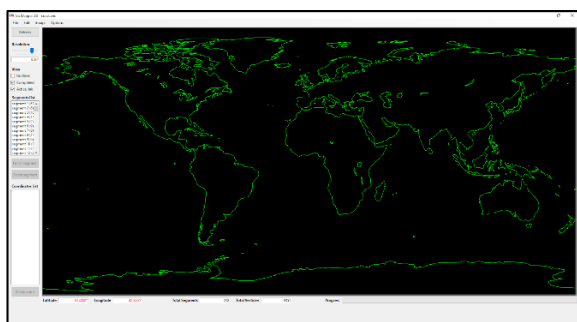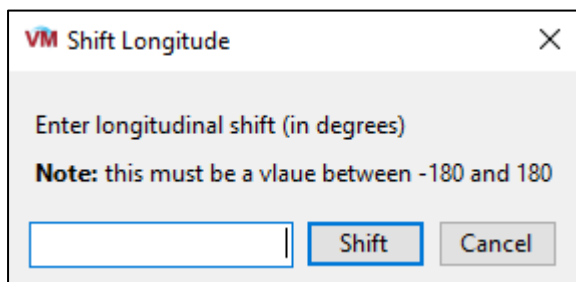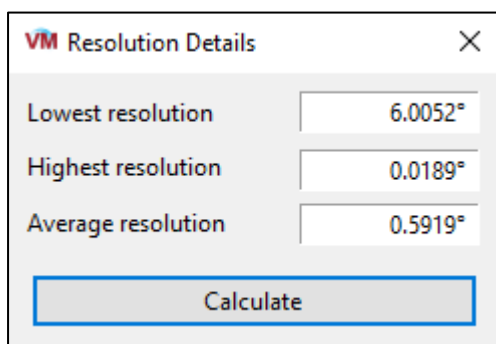

Before longitudinal shift

After a longitudinal shift of 180°

6   RESOLUTION PROPERTIES

A project's resolution details can be viewed by selecting **Edit → View resolution properties** from the top menu bar. This will display the lowest, highest, and average drawn resolution in the current project.

7   REDUCE RESOLUTION

The resolution of an entire project can be reduced via the reduce resolution tool (see Choosing a Draw Resolution). This can be useful for creating low-resolution maps for slower PCs.
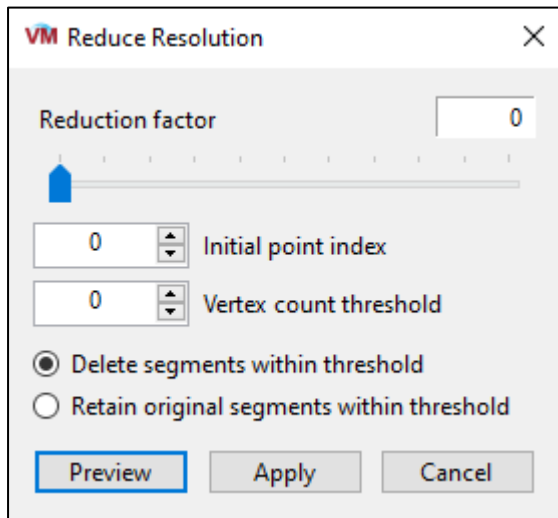
Reduction Factor
This is the 'factor' by which the resolution is reduced. A factor of 1 will keep one vertex in each segment, then delete the following vertex, then repeat. A factor of 2 will keep one vertex, then delete two vertices, then repeat.

Initial Point Index
This is the index of the initial point in each segment to retain on reduction. For example an initial point index of 2 will retain the third (0,1,**2**) vertex in each segment, and begin the reduction from there (see Reduction Factor).

Vertex Count Threshold
The vertex counts of segments to be ignored/deleted in the reduction. Oftentimes reducing the resolution of small segments (less than 9 vertices) will generate unpleasant results.

Delete/Retain Radio Buttons
Select to either delete segments with a vertex count below the threshold (see above), or retain their original resolution (skip)

8 SETTINGS

Settings can be edited by selecting **Options** → **Settings** from the top menu bar.
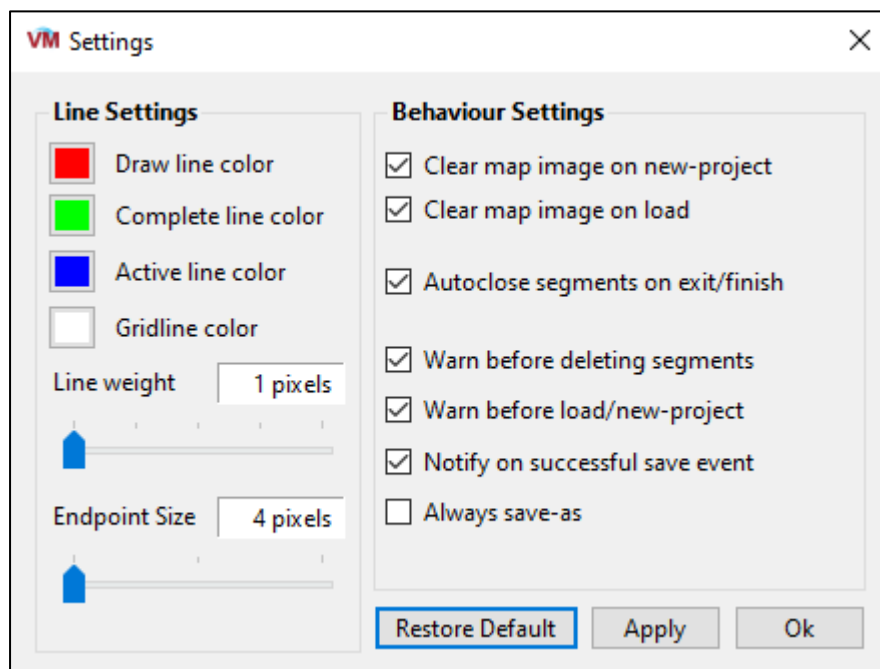
8.1 Line Settings

Line colour and thickness, and endpoint (and reference squares) size can be edited from settings.

8.2 Behaviour Settings

Clear map on new project
Determines whether the imported reference image will be cleared every time the user starts a new project.

Clear map image on load
Determines whether the imported reference image will be cleared every time the user loads another .vec file.

Autoclose segments on exit/finish
Toggle whether to automatically add a closing vertex to the end of each segment completed (see About .vec Files)

Warn before deleting segments
Determines whether VecMapper will warn users when deleting segments, to prevent accidental deletion.

Warn before load/new project
Determines whether VecMapper will warn of unsaved changes before loading/starting any new projects.

Notify on successful save event
Determines whether VecMapper will notify the user every time a save is successful.

Always save-as
Asks to save-as on every save event.

9   ENDNOTES AND LIMITATIONS

VecMapper 2.0 is an improved version of the very primitive VecMapper 1, and the concept is still in its early-stages. This version of VecMapper, though an improvement on the last, still does have limitations. Main limitations currently are:

- No zoom or pan feature. This is possibly the most prominent limitation
- Window does not scale well on displays outside of 1920p x 1080p.
- No undo/redo capability
- No easier method of drawing lines over the edge of the map than that described in Drawing at the Edge of the Map

If VecMapper 2.0 is popular and something users would like to see further developed, please let me know via the Orbiter Forum. Depending on feedback, I would like to eventually address some of the limitations of this version, along with eventually implementing a bitmap image conversion feature.

I ask that any bugs also be reported on the Orbiter Forum, along with any suggestions for future updates.

I would like to extend my deepest thanks to the Orbiter community, from whom I have gained so much knowledge and enjoyment. I hope that VecMapper can be a meaningful contribution to the community I love.

Tomas Gershevitch

(MrMartian)