



Heightmap Translator v1.0

User Guide

Document Version 1.0

This is a brief User Guide for the Heightmap Translator included with the WaxLab tool set. For information regarding installation, licensing or general WaxLab usage, please refer to the "WaxLab3d v1 - User Guide.pdf" file.

Heightmap Translator

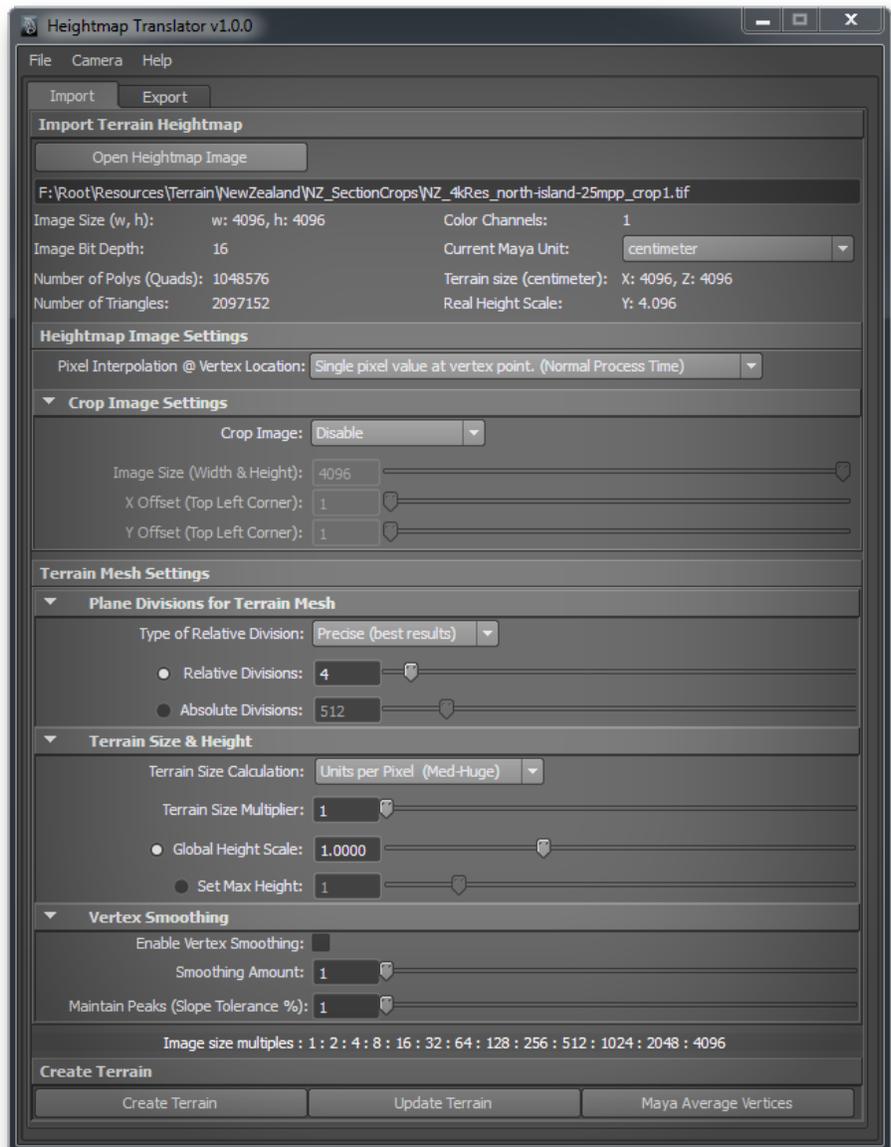
As an added bonus to the WaxLab tool set, the Heightmap Translator brings a fast and easy workflow to importing and exporting height-map based polygonal terrain. Work with any Maya compatible image plus 16-bit Gray-scale Tiffs and PGM files for use in game-engines such as CryEngine® or Unreal Engine®. To clarify, 16-bit gray-scale images have over 65,000 levels of height resolution versus 8-bits per channel gray-scales (*standard 24-bit JPEG etc.*) containing just 256 levels. Since almost all geographical height data that is available online is already in 16-bit gray-scale format, it makes sense to take advantage of that.

Base Maya does have ways of handling displacement mapping from images, but it is a slow, manual process and yet, does not provide the same results.

Importing

The heightmap translator creates a polygonal plane with divisions and sizes based on the image's resolution filtered through the various parameters. Then translates each vertex vertically based on the gray-scale value of each corresponding pixel in the image. There are several different parameters for both the image and the polygonal terrain. The image parameters dictate how much of the image to use and how to interpret the pixels of the image. The plane parameters allow you set size and divisions as multiples of the resolution, the vertical height and if to smooth out peaks.

Once loaded, If you are not satisfied with the results, instead of editing the plane transform or shape node, simply delete and recreate it with new settings.



Import Tab

This tab handles everything to do with importing and creation of heightmap generated terrain.

Import Terrain Heightmap

Here you can load the heightmap image through the **Open Heightmap Image** button. The image's path will be displayed in the field immediately below the button. This should populate the information below containing all the relevant statistics for the image and future terrain.

Statistics Display

This shows the information of both the image and the resulting polygonal plane created from it. This will update with every change made to the import parameters. You can also change the Maya units here.

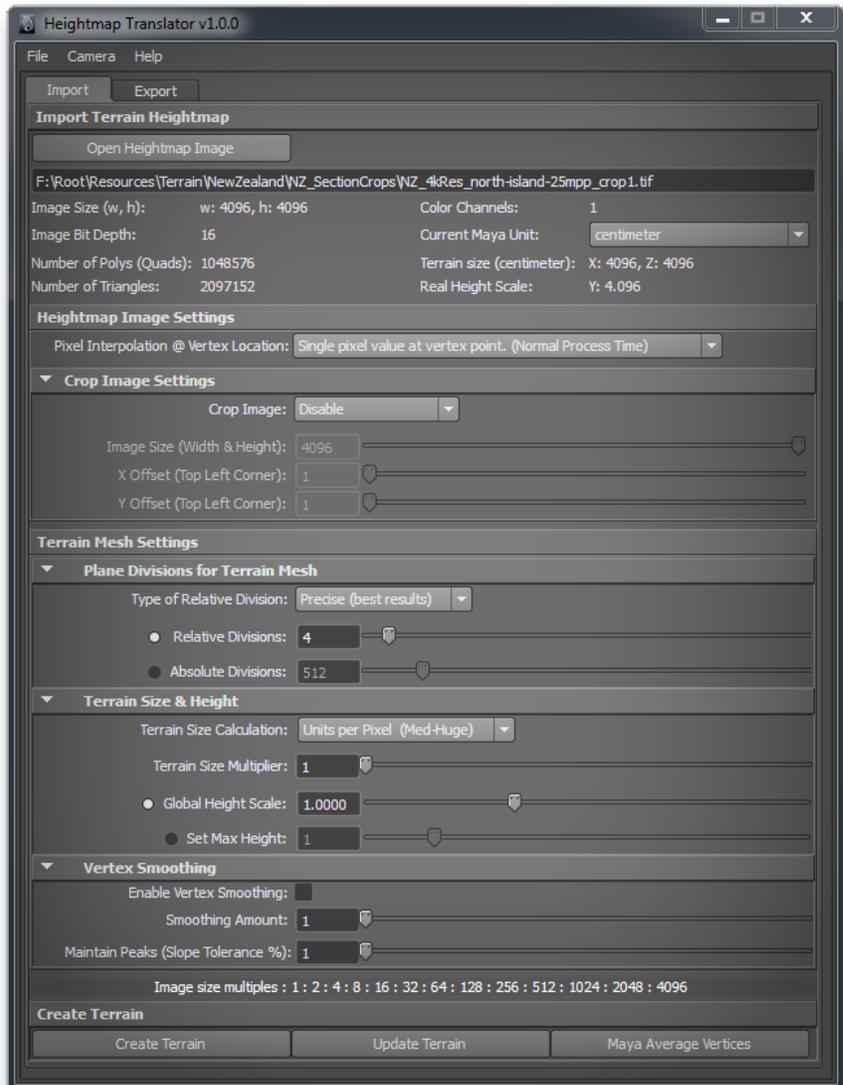
Heightmap Image Settings

Here are the image conversion settings, which can:

- Change the pixel interpolation at each vertex location. This can average out pixel areas or load the pixels untouched. Averaging can help when terrain is of a lower resolution than the image. Hovering your cursor over the menu provides explanations of each option.
- Crop your image to define a smaller area if using a large image, or if you need to crop a few pixels off to change the image resolution to provide more plane division options.

Terrain Mesh Settings

This is where the poly-plane settings exist. With most of these settings, hovering your cursor over the control will display a pop-up containing more instructions about itself.



Plain divisions for Terrain Mesh

Sets the plane's divisions based on image resolution.

Terrain Size & Height

Sets the plane's size based on image resolution, sets the height scale or to use a maximum height.

Vertex Smoothing

This is for smoothing out jagged peaks on the mesh itself, post image loading.

Recommended settings to try -

Smoothing Amount: 1

Maintain Peaks: 99

Create Terrain (Button)

Creates the Terrain with the chosen image and settings.

Update Terrain

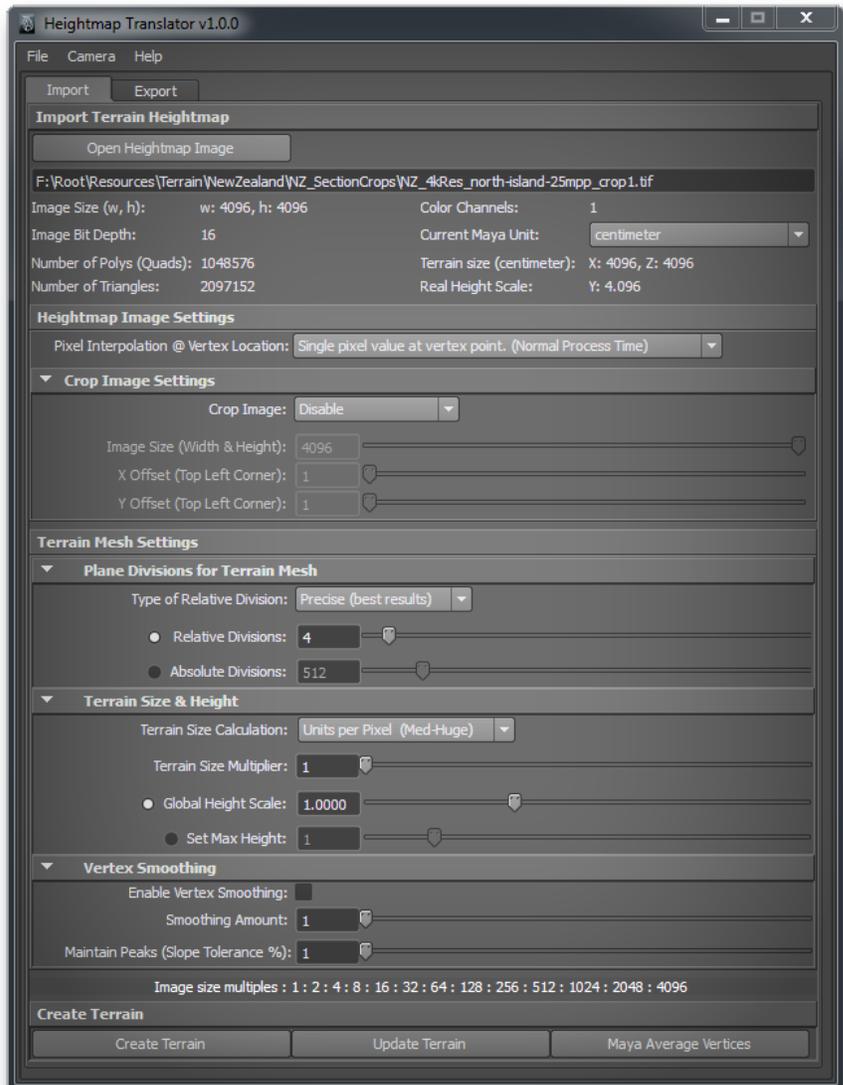
Reloads the heightmap image onto the existing plane without creating a new one. This is for when the image is updated and you wish to refresh the terrain with the same settings. This is the same effect as deleting the terrain mesh and pressing Create Terrain.

Maya Average Vertices

Opens the native Maya *Average Vertices* dialog.

Export Tab

Exporting an image does not involve image rendering but actually reads each vertex vertical position and interprets each pixel's value. It can export 8-bit and 16-bit per channel images (*always use 16-bit if game engine or other destination supports it*). You can only export terrain created with this tool, you cannot substitute a Maya built model. If you wish to create a terrain from scratch, just load a black image as a terrain and start vertically manipulating (*only vertically*) vertices. See [Waxlab Work-flows: New Terrain](#).



Export Terrain Heightmap

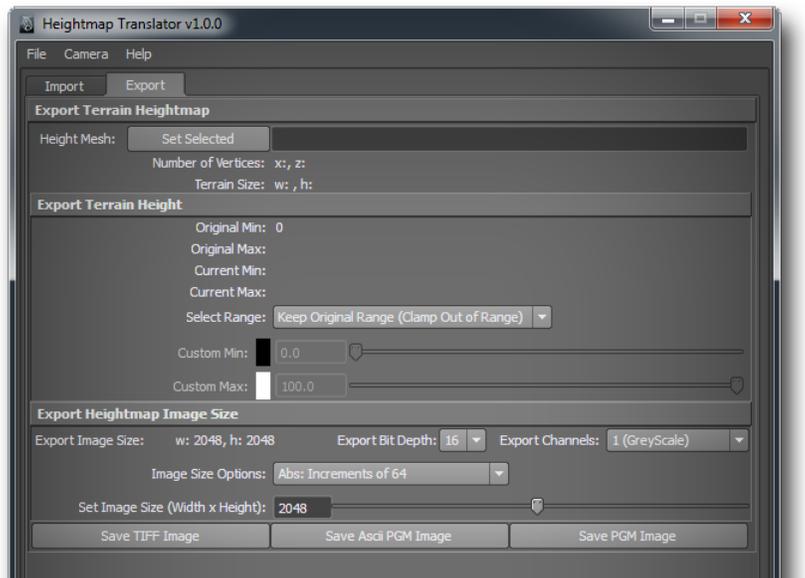
Select your terrain mesh (*only those built with Heightmap Translator*) and press the **Set Selected** button. This should populate the information below the name field.

Export Terrain Height

Here you can change how to interpret the vertical range of the terrain. Black being the lowest point, white being the highest.

In the **Select Range** menu you have the options:

- **Keep Original Range**
If you do not exceed the original height of the terrain that was originally loaded, or if you need to stay in that range while clamping outside values, select this.
- **Mesh Defines Range**
This takes the tallest point in your mesh and make that the max height value (white), then bases all other height values on that.
- **Custom Range**
This setting allows you so use the sliders to define the black to white ranges.



Export Heightmap Image Size

This is where you can set the image parameters for heightmap exporting. First is the **Export Image Size**, which relays what the image size will be based on the other settings. Next is **Export Bit Depth** which can be switched between **8** and **16-bits**. The far right is **Export Channels**, this selects the number of channels in the image. Normally you would leave this set to 1 channel – gray-scale, since that is the only information that used, but if you need an RGB image, select 3.

Image Size Options (Menu)

Here you can change the image resolution. Each menu option changes the behavior of the **Set Image Size** slider below it (referred to, for now, as the "slider"). Since terrain loaded with the Heightmap Translator is square, the height and width resolutions will always be the same.

Menu Options

Abs (Absolute): *Absolute options are independent from the terrain divisions and size.*

Rel (Relative): *Relative options set the resolution by using either the terrain size or divisions as references*

- **Abs: Increments of 64**

The slider now steps in increments of 64. *Absolute options are independent from the terrain divisions and size.*

- **Abs: Increments of 80**

The slider now steps in increments of 80.

- **Abs: Base 2 Increments (2 to the Nth Power)**

The slider now steps by 2^n power. Starting with $2^3 (= 8)$, then $2^4 (= 16)$, $2^5 (= 32)$, and so on.

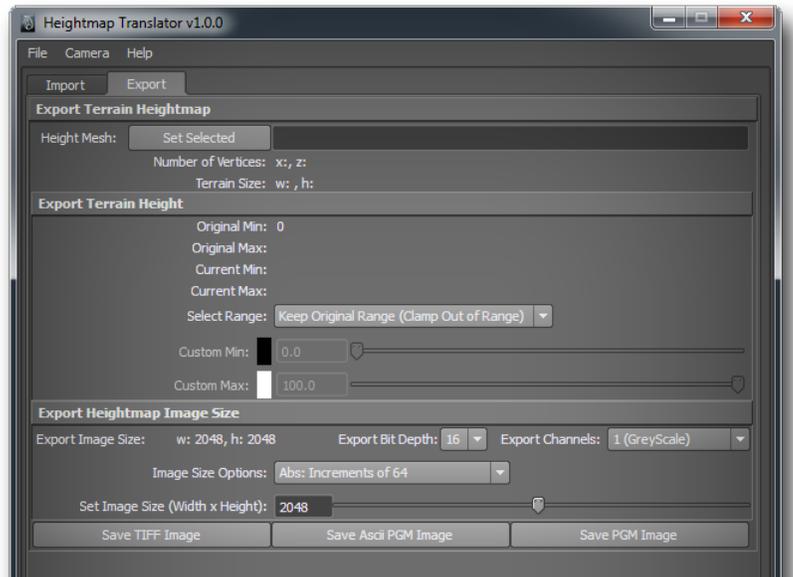
- **Rel: Pixels per Vertex (Mesh)**

Sets the image resolution to be the amount of horizontal vertices *times* the slider setting. *For example*, if the terrain has 512 vertices horizontally, and the slider is set to 2, that means the width of the image will be $512 \times 2 = 1024$ pixels. Since the terrain will always be square, then height = width, meaning the image dimensions will be h:1024, w: 1024.

- **Rel: Pixels per Unit (Mesh)**

Sets the image resolution to be the horizontal size, in the current units, of the terrain times the slider setting.

For example, if the terrain is 1024 cm horizontally, and the slider is set to 2, that means the width of the image will be $1024 \times 2 = 2048$ pixels. Since the terrain will always be square, then height = width, meaning the image dimensions will be h:2048, w: 2048.

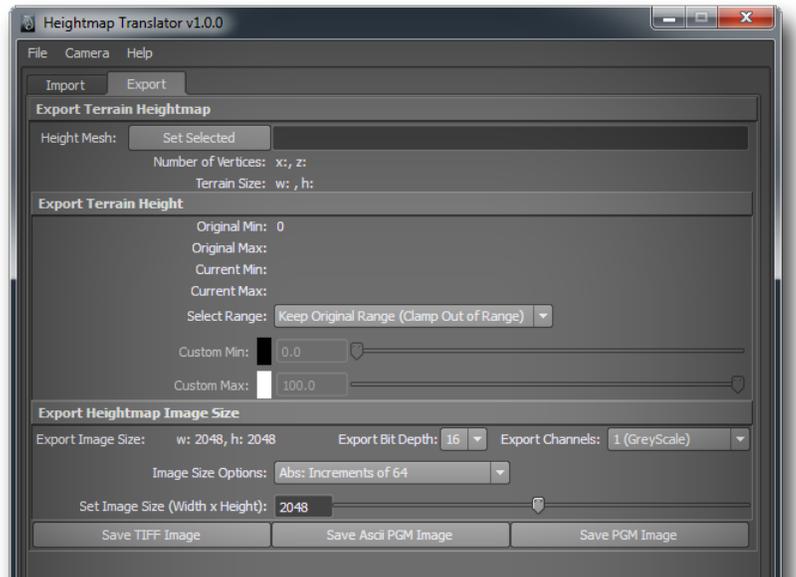


Saving Terrain to Image

As stated earlier, the generated image is a precise reading of each vertex height relative to the range set in the **Export Terrain Height** section and the desired **Bit Depth**, then translated into a pixel value for the image.

- **Save TIFF Image (Button)**
Opens a dialog window to set the file name and path of the generated image in TIFF format.

- **Save ASCII PGM Image (Button)**
Opens a dialog window to set the file name and path of the generated image in PGM - ASCII format. The PGM format is an open source, easy to implement variant of the PBM image format. The ASCII PBM version is actually a text file with all the pixel values in legible, easy to read numbers, it is also one of the formats that CryEngine supports.



- **Save PGM Image (Button)**
Opens a dialog window to set the file name and path of the generated image in PGM (binary) format. This binary version of the PGM (PBM format variant) format is inherently smaller than the ASCII version, but as such, is not legible in a text editor.

WaxLab Work-flow: New Terrain

Here are some directions on how to make a terrain from scratch by using the Heightmap Translator with WaxLab.

- In your image editing software, create a square image, preferably with a size relative to Base 2 (512, 1024, 2048 or 4096).
- Set the color to be all black and save; If your image is 16-bit (preferably) then you must use the TIFF file format.
- Load this terrain as a height-map.
- From here you can set the size and division count, be aware that high divisions can be a little slower to sculpt, so for now, try an image of 512x512 and load it on a terrain with a 1:1 vertex to pixel count. Your terrain will look completely flat.
- Select the terrain and press the WaxLab button on it's shelf, then use the WaxLab tool set to create your hills, mountains, cliffs, flat lands, etc. **Be sure to lock the vector to the Up-Axis** (Y Axis, if using Y-up) since only vertical data is used - Refer to the WaxLab User-Guide regarding vector overriding to lock to an Axis.

Here are some recommended uses for brushes and tools to create new terrain:

- **Extrude**
This can be used for creating anything from large hills or mountains to small detailed rocky bumps. Try editing the falloff curve to create different hill profiles.
- **Grab**
When just translating vertically, you can use this to move entire areas creating canyons or hills, or adjust the falloff curve and pull out different shapes from the surface.
- **Flatten**
Use this to flatten areas that might be too vertical or if you wish to create a plateau, lake or road. Give it a try, experiment with different settings to value and falloff.
- **Stenciling**
Try is using a Stencil with a mountain range or landscape loaded, from here use an extrude brush with a locked Up-Axis. Set the falloff as a smooth Ease In/Out (or find works for you) to place the land detail and it's size wherever you want.

Other brushes are not recommended since they involve moving the vertices horizontally, which can give you a false impression of the final exported terrain.

Once you're done, before you export, remember to set **Select Range** to **Mesh Defines Range** in order to redefine where the white and black values lie in the new terrain. Also be sure to **save the Maya file!**

WaxLab Work-flow: Existing Terrain

This is quite simple, with the terrain selected press the WaxLab shelf button and go ahead and sculpt the existing terrain. Since terrain meshes can be quite dense, perhaps it would be best, at first, to experiment on a medium dense model, say around 512x512 vertices. Also, just like with new terrain, be sure to lock the vector to the Up-Axis (*Y Axis, if using Y-up*) since only vertical data is used - Refer to the WaxLab User-Guide regarding vector overriding to lock to an Axis.

Here are some added recommendations from above for brushes on existing terrain:

- **Flatten**
Roads: Set this to a smaller radius and high value (4.0), in some cases, you can try switching from the Up-Axis Override Lock to using Center Normal T. Average for slightly vertical roads, just be aware of not moving vertices too much horizontally.

Lakes & Plateaus: Set this to a larger radius and high value (4.0), locking to the Up-Axis.

Tips: Try Not To...

- Move Vertices horizontally, at least not too much. It doesn't matter to the export process, but it will give you a misconception of what the terrain will look like when exported. So any edits to the terrain would be different than if you didn't have any horizontally moved vertices. If you find yourself with too many horizontally offset vertices, simply export an image and re-load and re-create (do not update) the terrain.
- Vertically Scale the terrain: Once again, this will give you an inaccurate representation of the terrain since all vertices are translated based on their local coordinates on export, not global. Instead of scaling the mesh, simply delete the terrain and generate it again with new height scale settings.

This concludes the Heightmap Translator User guide.

*If you did not find the information you were looking for, please refer to the **WaxLab3D v1 – User Guide.pdf** or email support@sigrasoft.com*

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