

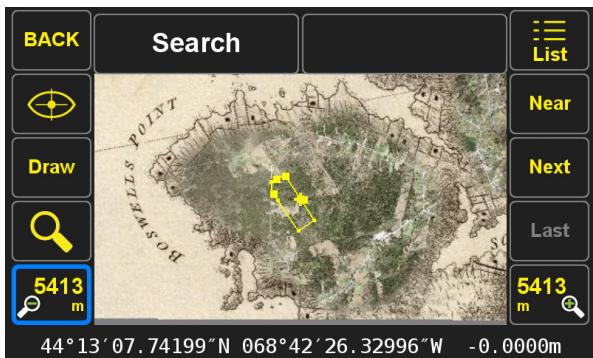


GETTING BACKGROUND MAPS ONTO THE TRIUMPH-LS

Table of Contents

Table of Contents.....	2
Getting Background Maps onto the Triumph-LS	2
Introduction.....	3
Free Third Party Software	3
JustinLink.....	3
Mobile Atlas Creator	4
Map Sources in MOBAC.....	7
Enabling the Background Map	8
Global Mapper	10
Exporting RMaps.....	10
Creating Custom Maps	12
Manual Rectification.....	15

Getting Background Maps onto the Triumph-LS



Introduction

A background map is an image made up of pixels, generally referred to as a raster image and differs from a vector image; that is, an image made from points, lines and polygons (areas), like your CAD drawings.

The raster images intended to be used as background maps must have already been georeferenced. Most GIS data sources already provide the user with georeferenced imagery such as georeferenced ortho photos. Other raster images, such as a scan of an ancient map and that has not been previously georeferenced, can be rectified and spatially defined using third-party software.

Caution should be used when selecting map sources as not all georeferenced imagery is created equal. Knowing the source of the imagery will help you know its limitations. Ortho rectified imagery that has gone through the necessary photogrammetric procedures will have produced imagery with a stated precision and suitability for mapping at a given scale and projection. Other aerial imagery, often of unknown date and projection, without the benefit of surveyed photogrammetric control, corrections made for the pitch, roll and yaw of the aircraft may be off from reality by meters.

www.javad.com

Free Third Party Software

Before placing the georeferenced raster image onto your **TRIUMPH-LS**, it will need to be converted into tiles to allow the **TRIUMPH-LS** to optimally handle different zoom levels. Also, these tiles must be saved in a format that will behave quickly and efficiently with the underlying architecture of *J-Field*; SQLite. This necessary step can be completed using various third party options including *JustinLink* and *Mobile Atlas Creator*, to name just a couple. Some are free, like *JustinLink*, and *Mobile Atlas Creator*, while others aren't.

The SQLite database architecture enhances performance on mobile devices, but size does matter. For optimal performance, curtail the size of the area covered by your background maps on a project by project basis. Likewise, choose the number of zoom levels that will satisfy detailed views and the viewable extents.



JustinLink

JustinLink¹ is a free Windows application designed for data exchange with the **TRIUMPH-VS** and the **TRIUMPH-LS** receivers connected to your PC via a USB cable. JustinLink has an interface similar to *Justin* post processing software.

The procedure for rectifying raster images that have not previously been georeferenced is outlined in the *JustinLink Software Manual* in Section 14.

The procedure for exporting raster images from JustinLink and uploading onto the **TRIUMPH-LS** is already outlined in the *JustinLink Software Manual* in Section 15.

¹ <http://www.javad.com/jgnss/products/software/justinlink.html>

For additional information on the operation of JustinLink, please refer to the *JustinLink Software Manual* available at our website: http://www.javad.com/downloads/javadgnss/manuals/JustinLink/Justin_Link_Software_Manual.pdf



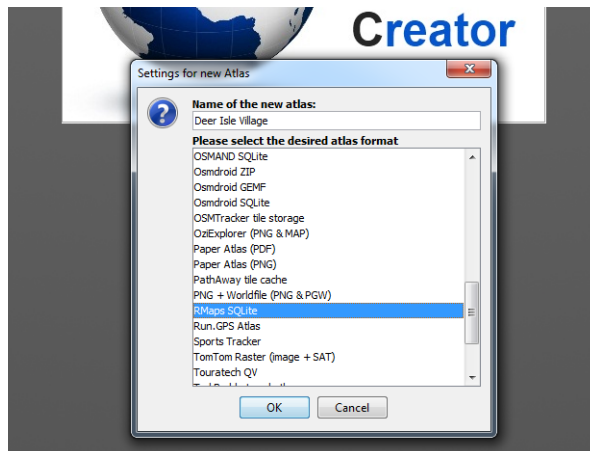
Mobile Atlas Creator

Mobile Atlas Creator² (MOBAC) is a free, open source program for creating offline atlases for GPS handhelds, cell phone applications and other Android and WindowsCE based applications including *J-Field*.

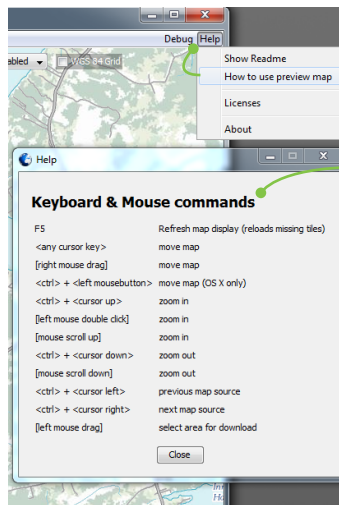
MOBAC runs on various platforms and accordingly, only needs to be installed in its own discrete directory (folder). Download the archive and place it in a new folder; e.g. c:\MOBAC. Extract the contents to this folder.

Launch the application with a double click on **Mobile Atlas Creator.exe**. Name the new atlas that you'll be creating. In this example, it's been named *Deer Isle Village*.

Next, select a format for the atlas. Some of these choices work better than others. In this example, **RMaps SQLite** has been chosen because it will allow the user to define jpeg compression settings



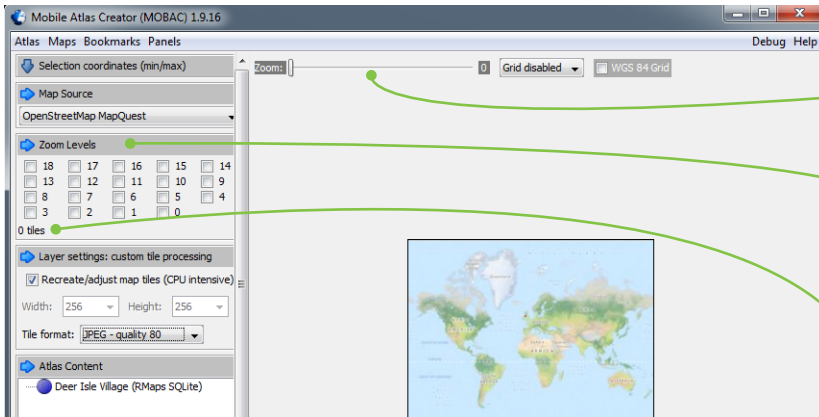
When MOBAC runs for the first time, you'll see the graphic user interface maximized with the world map centered on Europe.



As you familiarize yourself with the GUI, there are a few things worth noting early on.

Navigation hints are easy to recall from Help, *How to use preview map*. And additional information including how to work with *Custom Maps* are discussed in the (local) interactive Readme document.

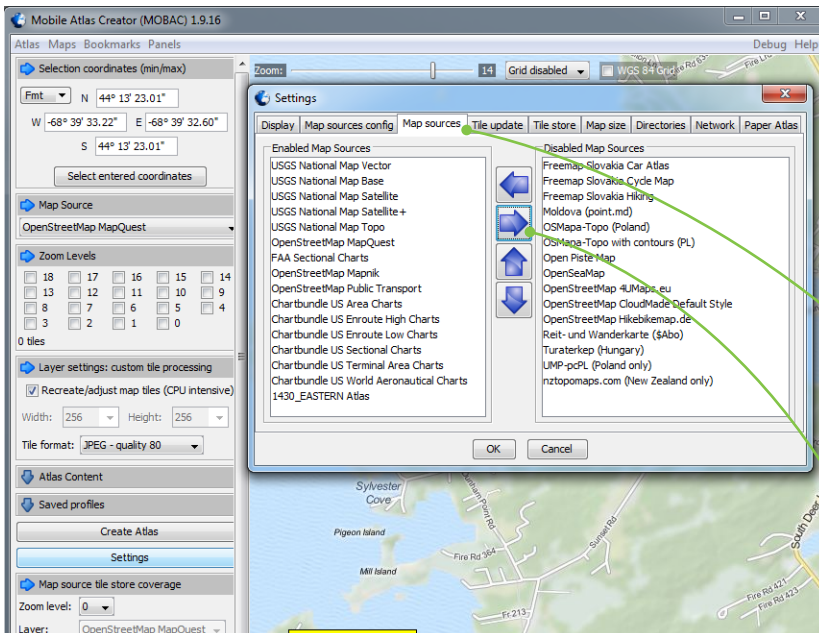
² <http://mobac.sourceforge.net/>
4



The Zoom levels nomenclature used range with zero having the least amount of detail with the slider along the top relating to the GUI's display of the map.

The zoom levels check boxes in the left side panel similarly relate to an overview (0) to the greatest amount of detail (e.g., 18) when creating tiles.

The resulting number of tiles correlates to file sizes and ultimately performance on the **TRIUMPH-LS**.

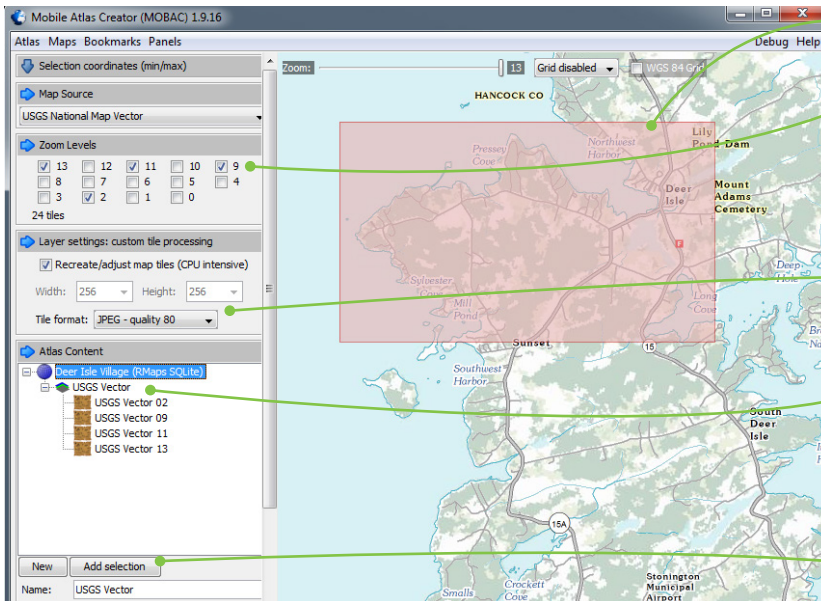


The procedure of creating a background map begins with your selection of the **Map Source** using freely available data sources that are directly accessed through the application.

Many sources are listed which may not be applicable for your region of interest. MOBAC allows the user to winnow the list down by clicking first on **Settings**, and then the **Map Sources** tab.

Use the Ctrl and Shift keys when clicking multiple selections to be moved over to the Disabled Map Sources list. Once satisfied with the selection, click on the **right arrow** button.

Note that the order of selected map sources can similarly be moved up or down in the list.



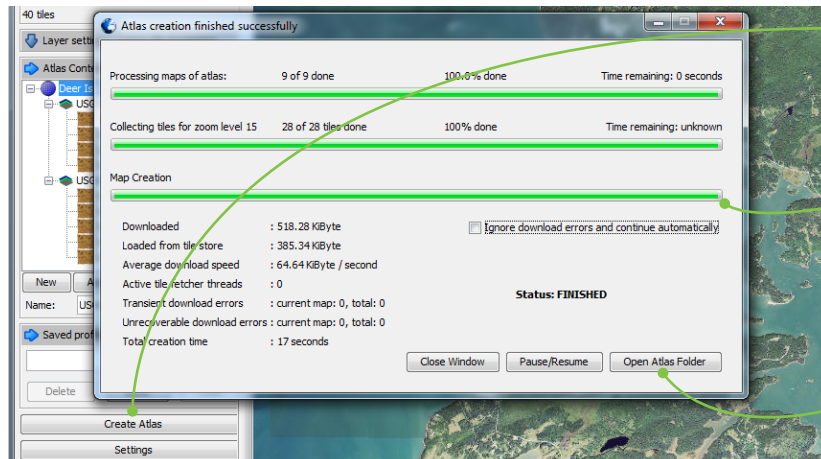
Define the area to be tiled with a left click and drag.

Choose the zoom levels for tile creation. It's good practice to have a low zoom level for times when the screen is zoomed way out from your project area.

Adjust jpeg compression if necessary. Note, always choose the largest tile size as possible.

Name the layer if you like. Helpful when creating multiple layers for other devices. *J-Field* will only display the layer visible at the time of tile creation.

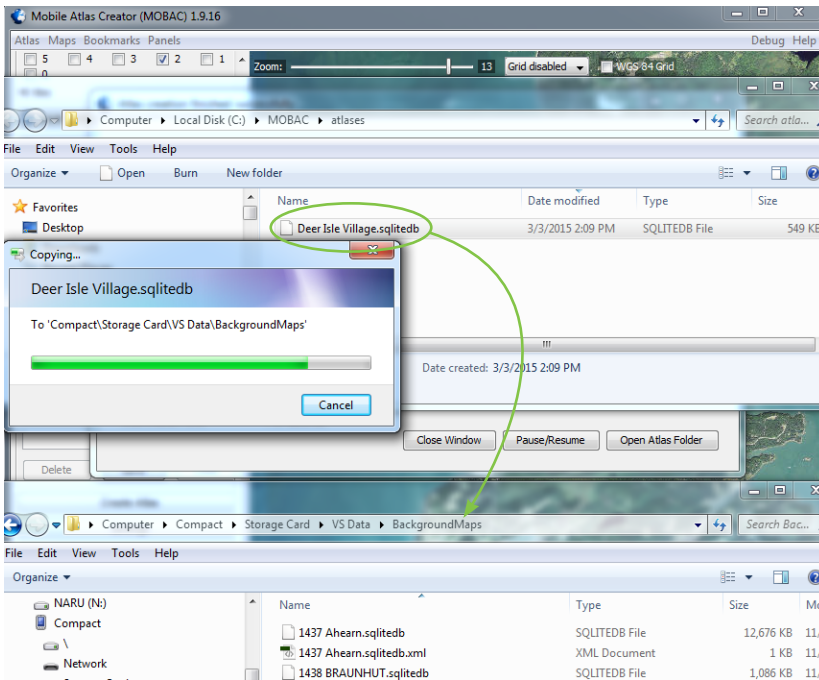
Click **Add section**.



Click **Create Atlas**

Monitor progress

When finished, click on **Open Atlas Folder**.



Connect the **TRIUMPH-LS** to your PC using a USB cable and if necessary refer to the [Users Guide to the Triumph-LS](#) for details when working with Windows Mobile Device Center (WMDC).

Using *Windows Explorer*, on the **TRIUMPH-LS**, navigate to the microSD storage card. Under the parent directory *VS Data*, create a new folder called **BackgroundMaps**.

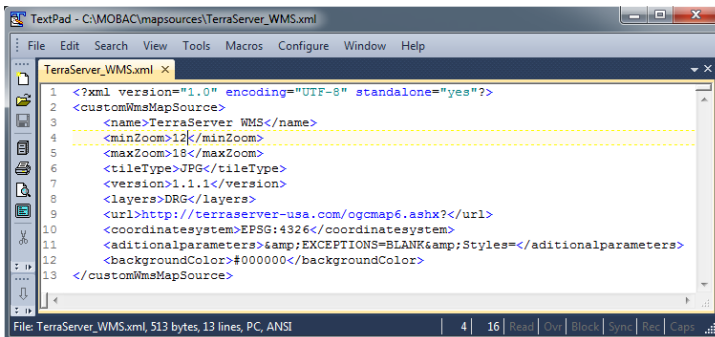
Then simply drag and drop the newly created atlas onto the **TRIUMPH-LS** in the new folder called **BackgroundMaps**.

Once the atlas (background map) has been put into use, *J-Field* will create its associated .xml file automatically.

3 <http://www.javad.com/downloads/javadgnss/manuals/hardware/Triumph-LS-Users-Guide.pdf>

Map Sources in MOBAC

MOBAC allows users to create custom maps through the use of an xml file. An xml file is typically not intended for reading by humans. It contains *extended markup language*; terse information in plain ASCII which follows certain formatting rules and that gives an application additional details to act upon. Editing is accomplished using a plain text editor like Notepad or TextPad.



Example Web Mapping Service in custom map source xml file

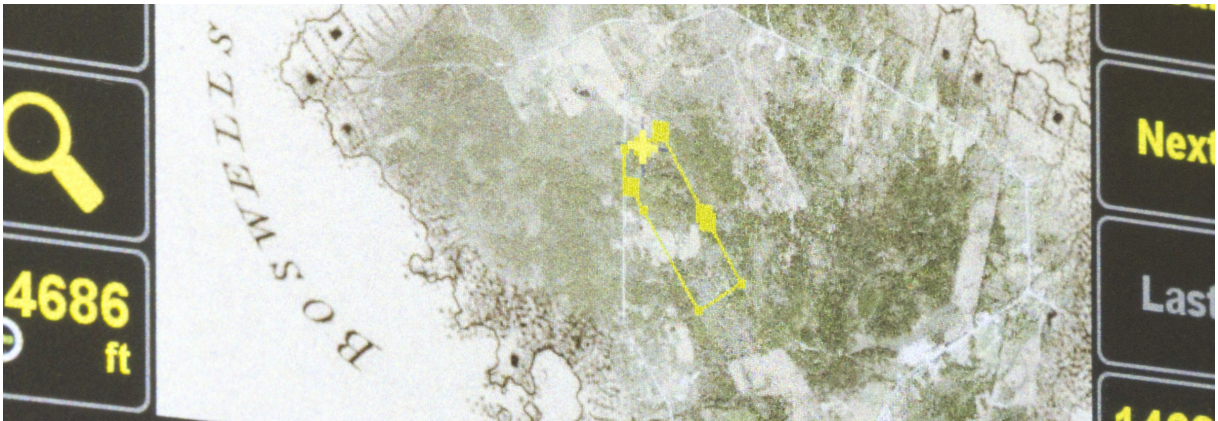
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Background Maps on the Triumph-LS



While this discussion is not going to get into the nitty gritty of writing xml, you will want to be aware that this is available. Additional information and details concerning adding your own custom map sources can be found in the *ReadMe* file that comes with MOBAC as well as the wiki¹.

¹ http://mobac.sourceforge.net/wiki/index.php/Custom_XML_Map_Sources



Enabling the Background Map

From Home screen¹, tap on **Collect**, to create a new project or to open an existing project. Under Project Settings, tap on **Background Map**.

Note that the background map associated with a given project, stays with that project. Likewise, the selection of None in the Background Map setting will follow that project.

Project Settings

Project Name	Prj.2015-03-02 12.28.51
Project Coordinate System	NAD83(2011) / UTM zone 19N - 72-66° W
Background Map	None

Esc

Tap to highlight the desired background map (or None) to *Select it* and then tap on **Select** (or **OK**)

Background Maps

Storage Card/VS
Data/BackgroundMaps/Deer Isle
Village.sqitedb

Select

Delete

None

WorldLite

Stonington

1437 Ahearn

1438 BRAUNHUT

Panocea Labs

BubbleBrook

TheDali

My test map for Vlad

Cape Elizabeth

Deer Isle with Des Barres

Deer Isle with Des Barres - 7 zoom levels

Deer Isle Village

Cancel

OK

Prj.2015-03-02
12.28.51

Subject Parcel

NAD83(2011)

1. Project

2. Page

Coordinate System

DefTag

DefCode

3. Tag

Code

4. Code Attributes

Point1

5.06 ft

5. Point Name

6. Point Description

7. Antenna Height

Review

View

MDOT

06:54

Next

BACK

Search

Draw

1490
m

1490
m

1490
m

1490
m

Assuming that you already have something to review; i.e., either *Design* points, lines or polygons; or, *Survey* data gathered in the field, you should now see it displayed on top of your new background map.



Global Mapper

Global Mapper¹, a product of Blue Marble Geographics, is an affordable and powerful GIS application that offers professional land surveyors access to a variety of spatial datasets.

If you are already a Global Mapper user and have your raster image ready, you can quickly create custom background maps for the **TRIUMPH-LS**.

A couple of notes

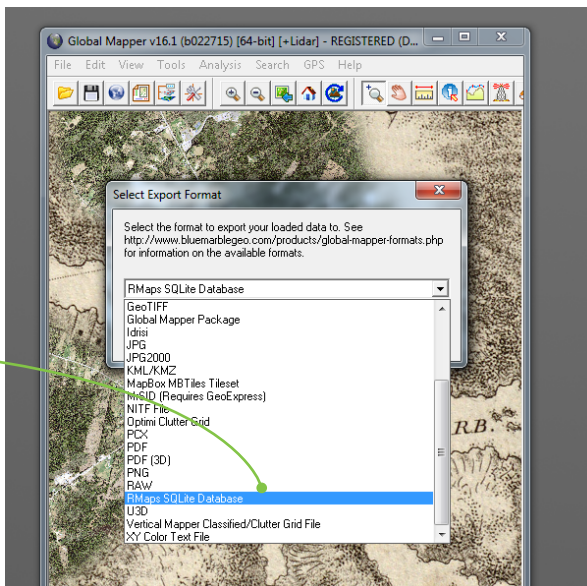
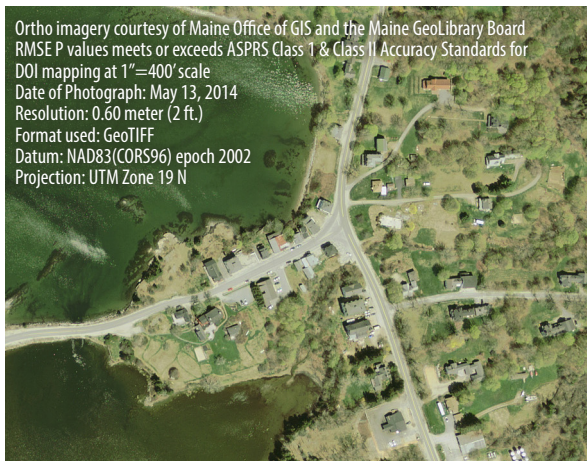
- You should also keep in mind the area size; rarely will you want to export *All Loaded Data*. Huge background maps will slow *J-Field's* performance
- Export your vector data separately.

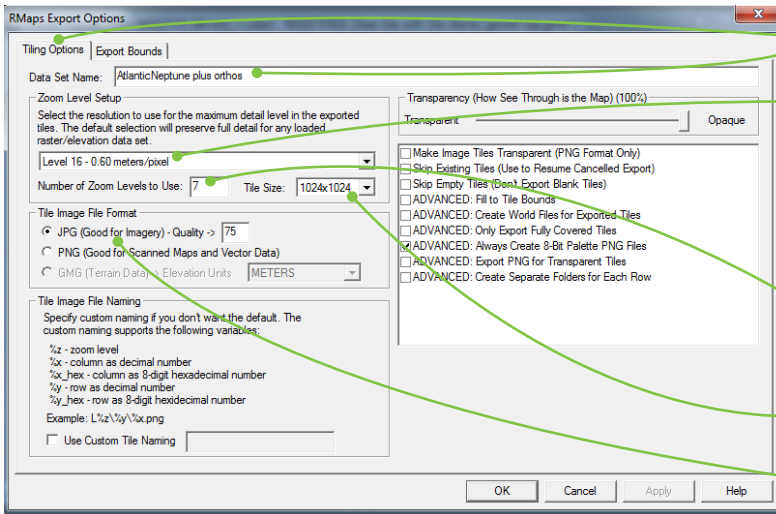
Exporting RMaps

Begin from Global Mapper's main menu, File, Export, Export Raster/Image Format...

On the pull down list, scroll until you see RMaps SQLite Database, select it and click **OK**

¹ <http://www.blumarblegeo.com/products/global-mapper.php>





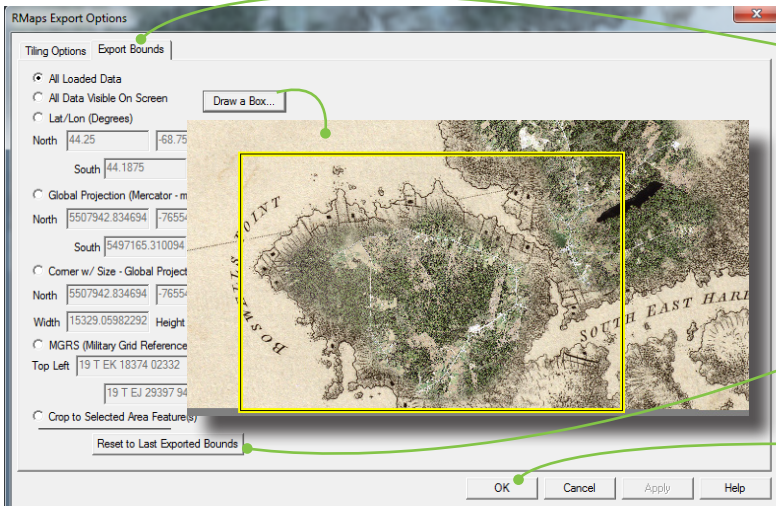
On the RMaps Export Options, Tiling Options tab, start by naming your data set.

The Zoom Level Setup will most generally and automatically have chosen a resolution commensurate with the pixel resolution of your existing data. In this example, we're using GeoLibrary's 2014, 60 cm (2 ft.) ortho imagery.

Number of Zoom Levels to Use: an integer between 1 and 18; the higher the number, the higher your view (zoomed out more).

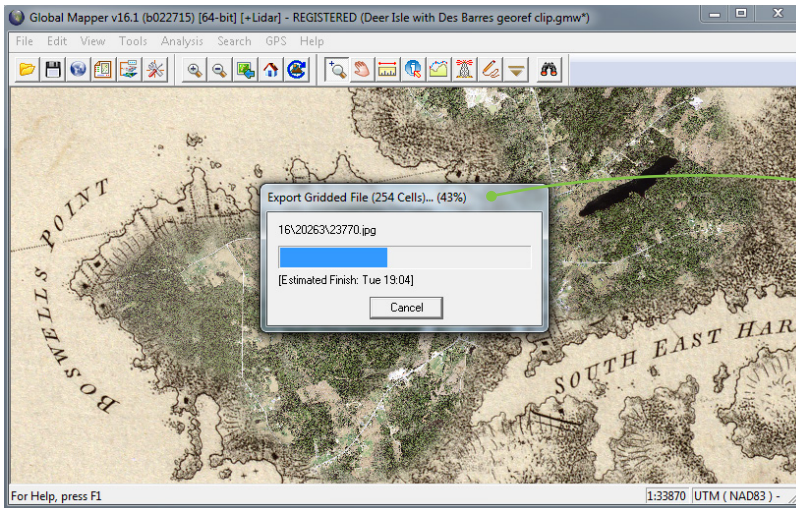
Tile size: always choose the largest.

Tile Image Format: In general, use JPG whenever dealing with tonal gradients imagery and be mindful of image quality.



On the RMaps Export Options, Export Bounds tab, define the area of your background map by either drawing a box, All Data Visible On Screen, explicitly defining the corners of the box, cropping to a previously selected area feature or by using the previously defined export bounds.

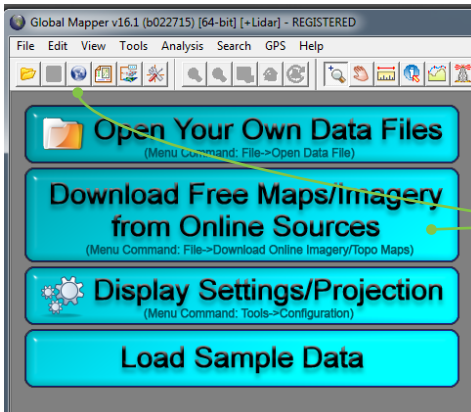
When ready, click **OK**



Monitor progress

When finished, transfer the newly created RMaps SQLite background map onto your **TRIUMPH-LS** as previously described above.

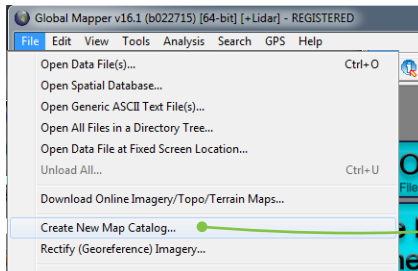
Creating Custom Maps



If you're already a Global Mapper user but haven't yet created your custom raster image, you can quickly create background maps for the **TRIUMPH-LS** from a wide ranging number of freely available data sources including your local and state offices of GIS, national and federal data warehouses².

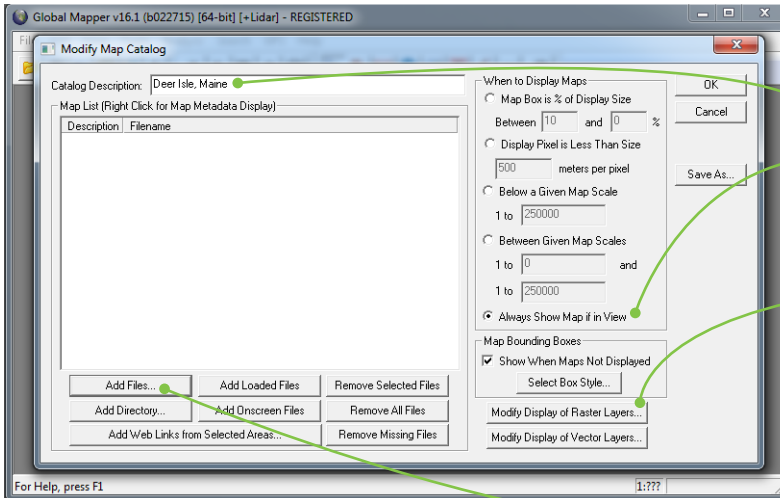
Many of these online sources are already linked from Global Mapper. Explore them.

² http://ncl.sbs.ohio-state.edu/5_sdata.html



For this exercise, geotiff images from the Maine Office of GIS have already been stored locally and will be used. If only a few images were needed, they could be loaded individually, but for this example, (9) 3-kilometer square tiles will be loaded in the project. To improve performance, a Map Catalog will be created from the main menu:

File, **Create New Map Catalog...**



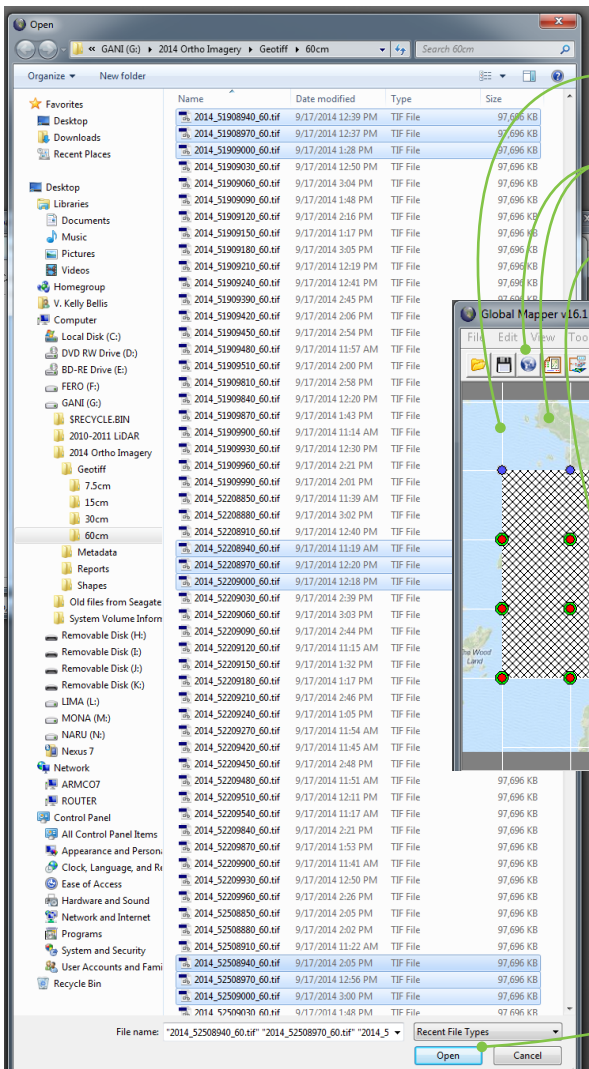
A few items worth noting before loading up the images:

Give a brief description

Decide when or at what zoom level map catalog items are to be seen. In this example, the orthos images will always be seen when in view.

Control aspects of the raster images including opacity (translucence). This will be used later in the discussion.

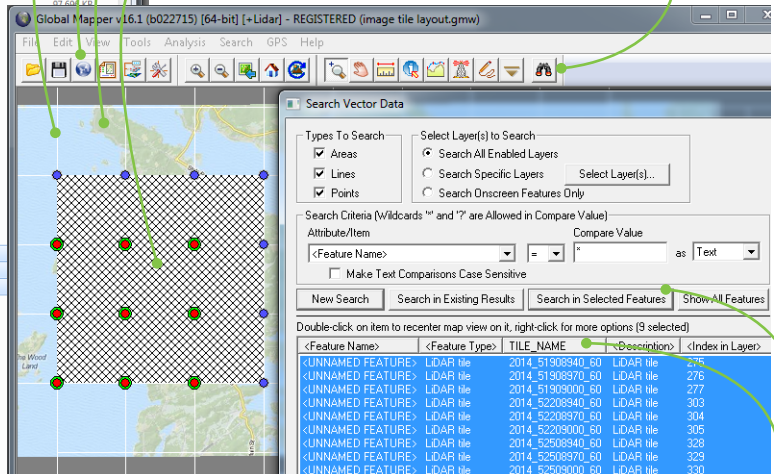
When you're ready to load the images, click **Add Files...**



Finding out ahead of time which tiles to load is easily handled by Global Mapper if you've gotten the shapefile of the *tile index layout* loaded into your project.

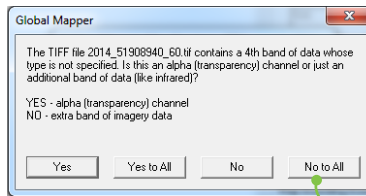
With the tile layout layer visible, get a general sense of location by opening *MapQuest OpenStreetMap* using the free online downloads source.

Then select those tiles of interest and click the **Search** icon.

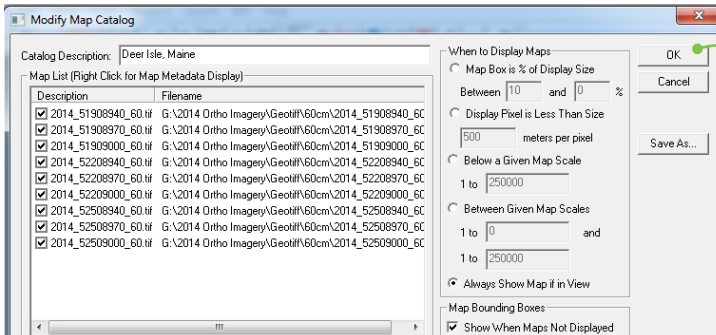


Winnow down the list to just those selected tiles before clicking on the column heading **TILE_NAME**

To Add Files... to the Map Catalog, select the needed tiles and then click **Open**



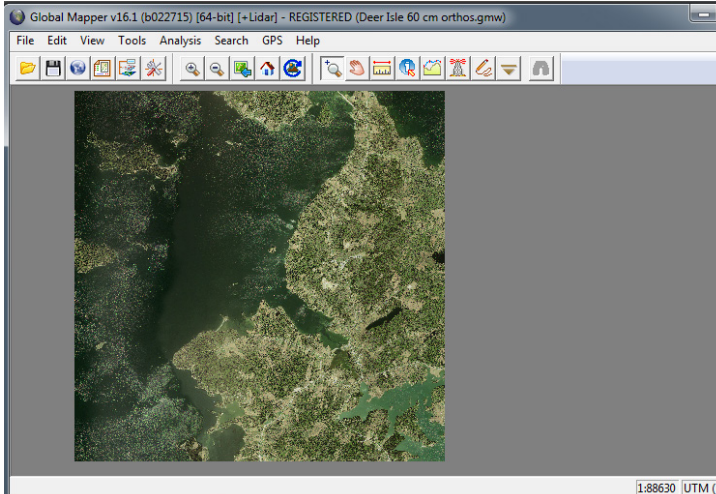
There's sometimes more than just red, green and blue (RGB) colored pixels in a raster file. When Global Mapper loads files containing this extra information, it will prompt the user for their instruction. In this case, we're not dealing transparency, but infrared and the fact we just have loaded (9) tiles, **No to All** is the thing to click.



Confirm all tiles have been loaded and click **OK**

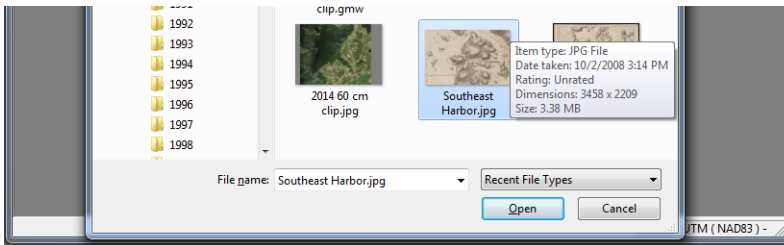
That's it for creating a custom raster image and now it's ready to be exported as outlined earlier in the section "Exporting RMaps" on page 10

Manual Rectification



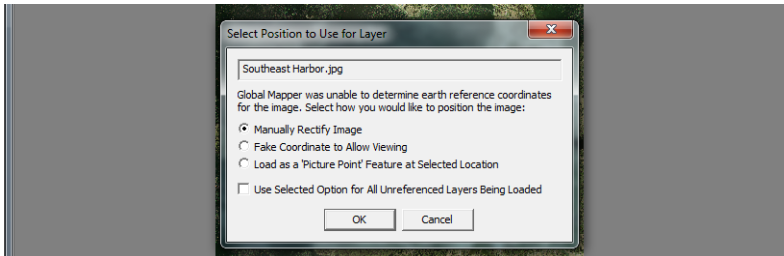
Rectification is the process by which a pixel in a given raster image is assigned a particular spatial location; a control point. With a sufficient number of such assignments and having these points judiciously placed, the image can be referred to as being georeferenced, or rectified.

This process can be done crudely with just eye-balling or very precisely with great care using real on-the-ground survey data. For this quick introduction, we'll focus on the former and leave discussion of the latter to a good text on photogrammetry. In both cases; however, errors contained within the defining polygon formed by these control points will be relatively small when compared to errors outside of that polygon as will be seen when you're finished.



For this mini tutorial on rectification, a section of a 240-year old map has been chosen in the same vicinity of the ortho photos. Let's open that scanned ancient map and add it to the project.

From the main menu, click on **File, Open Data Files...** (*Ctrl+ O*), select the image and then click **Open**



Global Mapper recognizing no spatial data associated with the image will prompt the user.

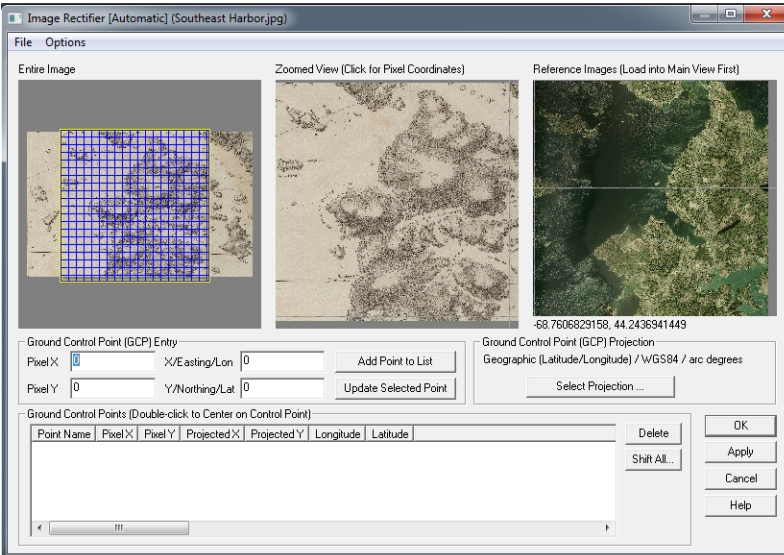
Select *Manually Rectify Image* and click

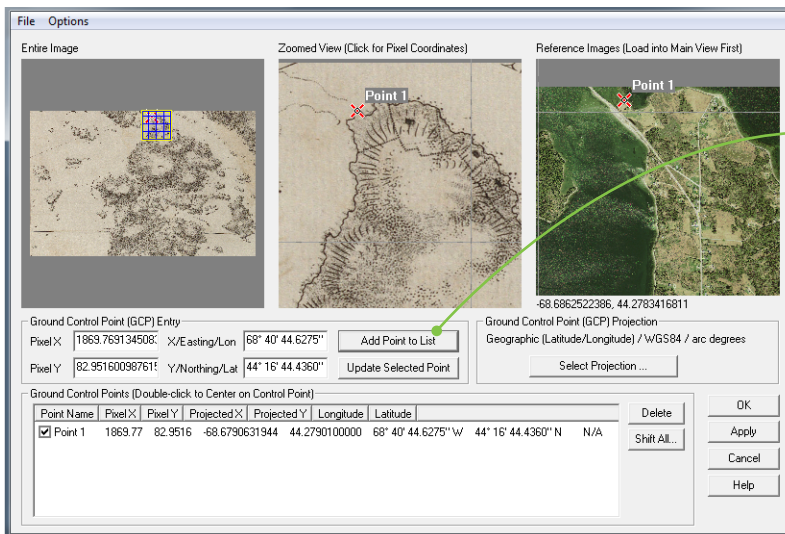
OK

The *Image Rectifier* will open with three maps displayed in the upper portion of the window for ground control entry with its textual counterpart in the lower part.

Begin by selecting; i.e., a single left click of the mouse, a point in either the middle map; the image being rectified, or the reference image on the right. The order in which you do this doesn't matter, just that you end up with a control point on both images representing the same point in space.

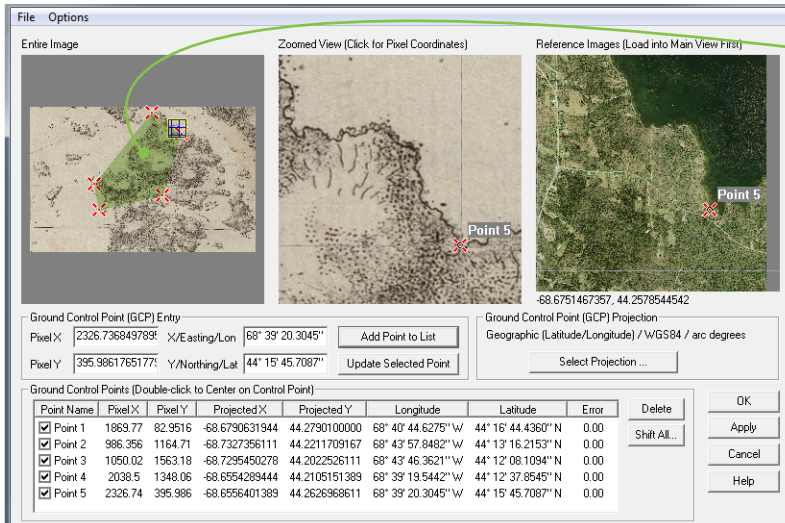
Then select a corresponding point on the other map.





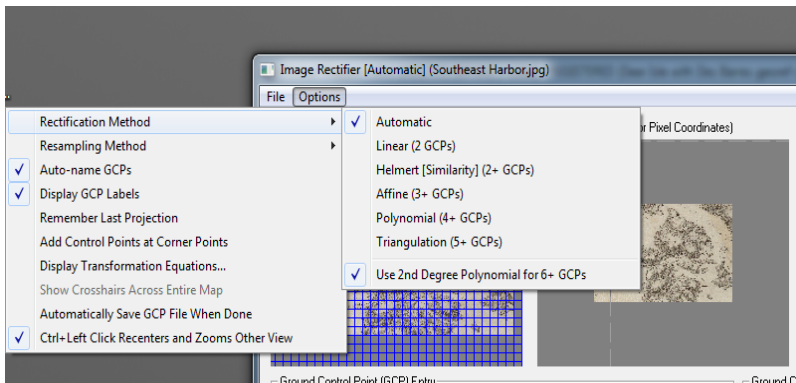
As you visually evaluate, or eye-ball if you like, navigate, zoom and pan as necessary and once satisfied that the two points spatially coincide, click on **Add Point to List**

You'll notice then, the table of control points will be populated. If you are a land surveyor unfamiliar with Cartesian coordinates in the context of *computer graphics*, please note that the origin (0,0) is typically the upper left corner of an image, x values increase positively towards the right and y values increase positively downward. Such is the case here in Global Mapper.



Proceed adding points rimming around the project area sufficient in providing a good fit inside that project area.

Depending upon how poorly the image being rectified conforms with reality and how close you wish to distort that image into conformity, many control points may be required. In general; however, the fewer control points, the better; least constrained.

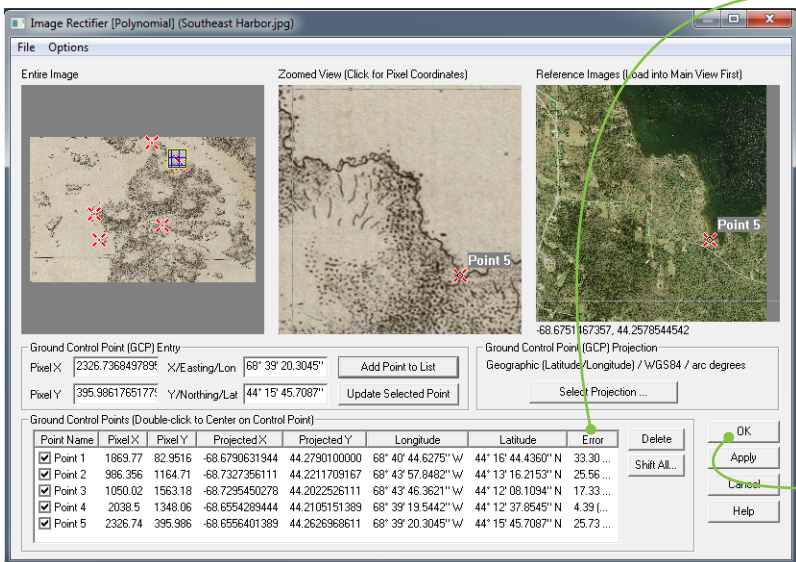


By default, Global Mapper will *auto-matically* choose the best mathematical method when applying the control points to the image. However, the user is free to choose any available method they like from the list accessed under the menu item *Options, Rectification Method*.

Having previously added the requisite minimum number of control points and chosen a method other than Automatic, the *Error* column will be populated with the post-adjustment residuals in units of pixels.

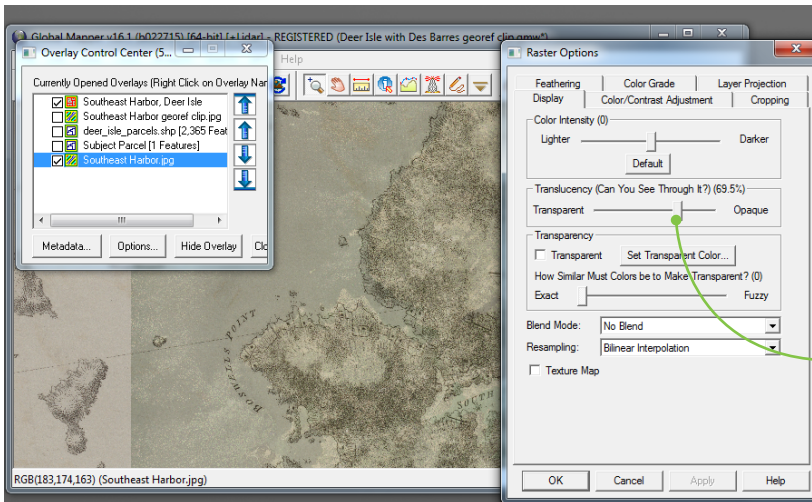
This then becomes a metric of sorts in analyzing the suitability of the image chosen for georeferencing.

In this instance, constrained within the bounds of these 5 points, the results are impressive when weighed into consideration the fact that the scanned plan was from the survey by James Grant under the direction of Samuel Holland in the summer of 1772³.



When finished adding control points, click on **OK**

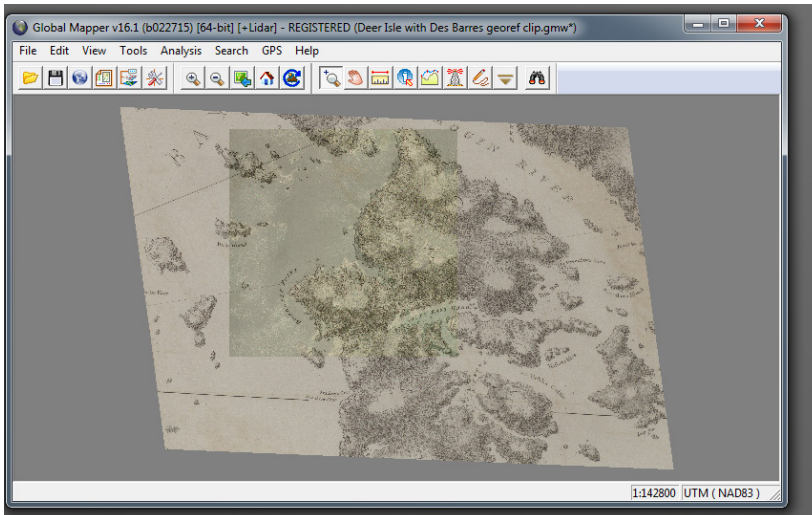
³ Hornsby, S., & Stege, H. (2011). *Surveyors of empire Samuel Holland, J.W.F. Des Barres, and the making of the Atlantic Neptune*. Montréal [Que.: McGill-Queen's University Press.



A quick way to check and see how your newly rectified image compares with the reference image is to change its opacity (translucence).

Begin by highlighting the layer that the image is on in the *Overlay Control Center*. If it isn't displayed, **Alt+C** will quickly open it up. Then click on **Options** and in the *Raster Options* window, the **Display** tab.

Use the slider to allow the reference image below to be seen, evaluate your success, and if necessary repeat the process of control point entry until satisfied with the results.



The other thing to evaluate is how did the area outside of the control points get distorted; zoom extents, Home icon or Home key on the keyboard.

Even though the area falling outside of the control points shouldn't be used, it is sometimes helpful to illustrate trouble spots.

Once satisfied with the result, reset the opacity to 100% and export your custom map as outlined earlier in the section "Exporting RMaps" on page 10.



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