# ASOR Cultural Heritage Initiative

## QGIS

## Module 02.10: Georeferencing Rasters

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# ASOR QGIS Module 02.10 – Georeferencing Rasters

QGIS is a free and open source Geographic Information System (GIS), or geodatabase, licensed under the GNU General Public License. QGIS runs on Linux, Unix, Mac OSX, Windows and Android and supports numerous vector, raster, and database formats and functionalities.  Download QGIS here: https://qgis.org/.

QGIS users can view, edit, and analyze spatial information through its free software toolkit.

This **ASOR Tutorial (02.10)** introduces georeferencing techniques in QGIS.

# KEY CONCEPTS

- Control Points – Georeferencing requires control points with known longitude and latitude coordinates to align raster images accurately.
- Using Google Earth – Users create and save control points (A–E) in Google Earth, export them as a KMZ file, and also save the corresponding satellite image for use in QGIS.
- Adding to QGIS – In QGIS, import the control points as a vector layer, label them, and then load the raster image into the Georeferencer tool to begin alignment.
- Georeferencing Process – Match each control point on the raster with its location on the basemap, adjust transformation settings (e.g., Linear, Nearest Neighbor), and run georeferencing to link the raster to spatial coordinates.

# CONTROL POINTS

Control points ensure the accuracy of your georeferenced raster.

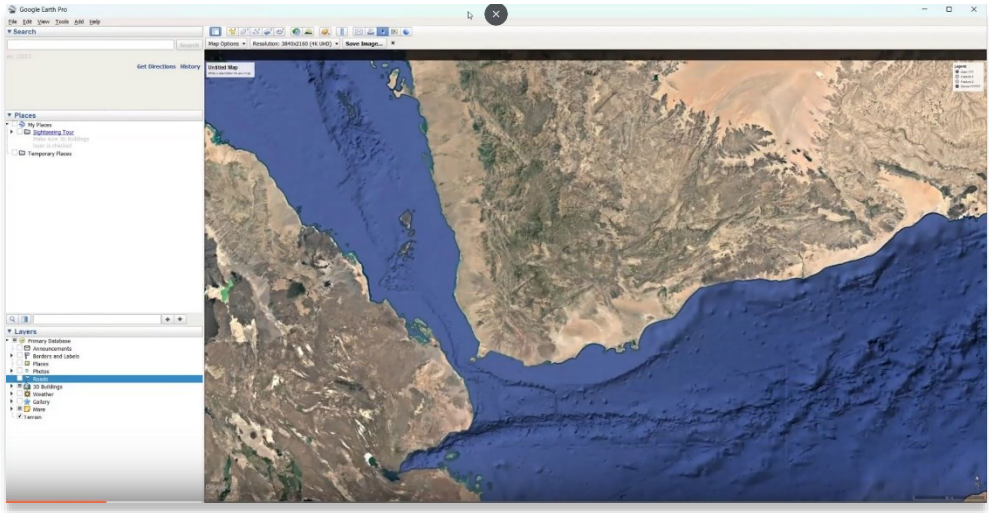
Control points only need known longitude and latitude coordinates

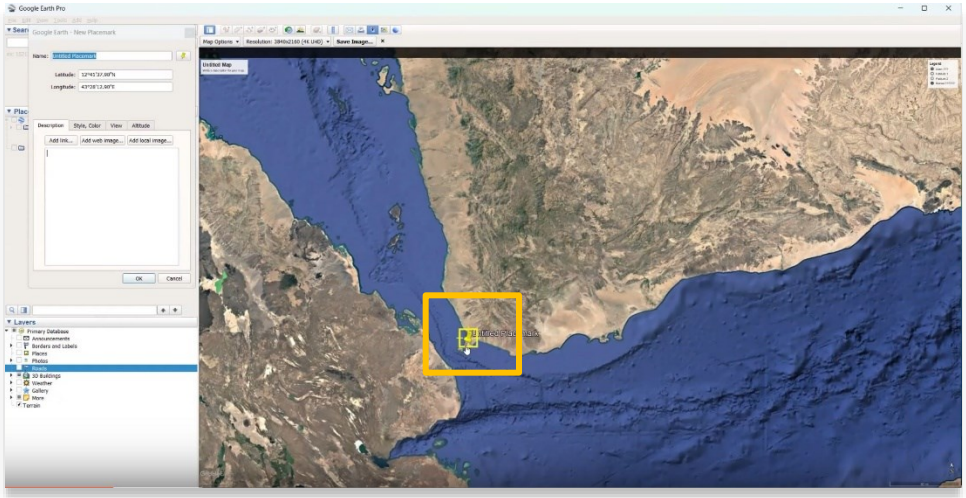
# GOOGLE EARTH

Download Google Earth to your computer.

Then navigate to your region of interest.

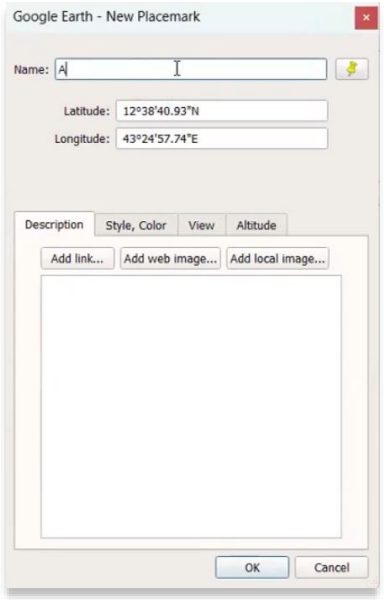
Press “R” on your keyboard to remove any tilt.
Select the “Placemarker” icon from the top menu bar.





Place the marker (control point) on the map).

Name the first marker “A”

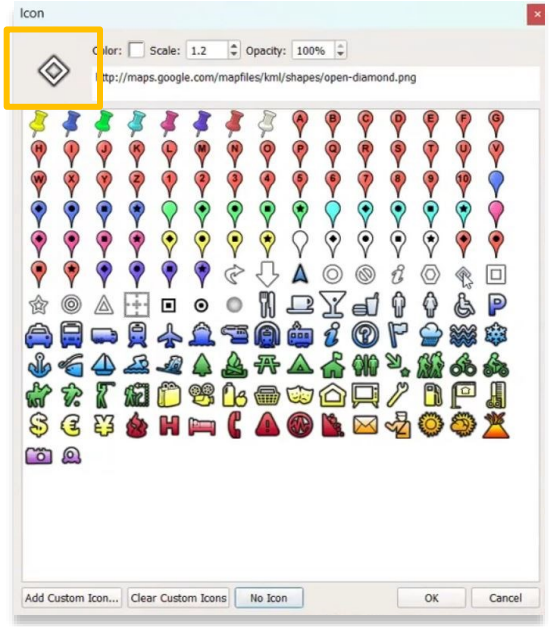


Change the style to a geometric shape.

IMPORTANT | Choose an icon that is symmetrical.

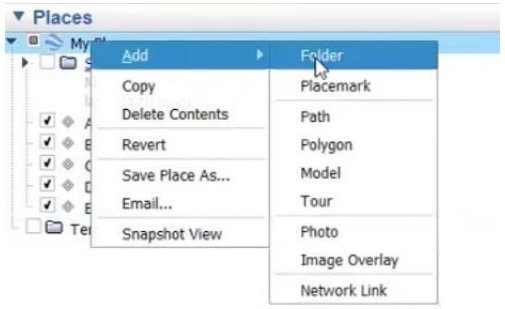
This will improve your marker's accuracy in later steps.

Select "OK" when finished.




Create 4 more markers (B through E).

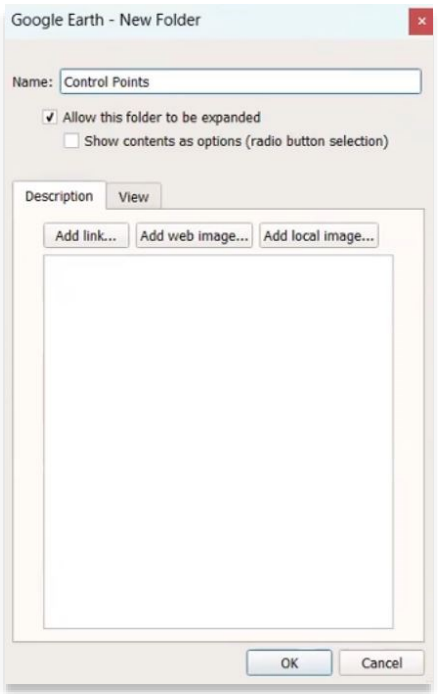
NOTE | Spread the markers evenly on the map.



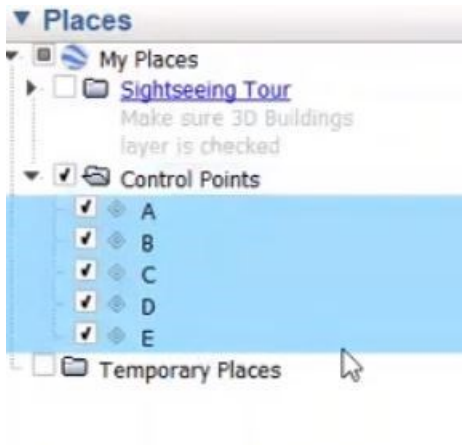

Next, save the control points as a separate file.

Right-click on “My Places” > Add > Folder

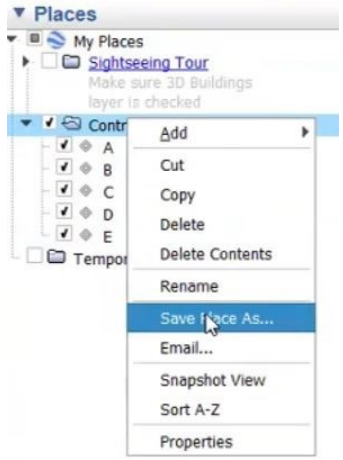
Name the folder “Control Points”



Select all markers and drag them into “Control Points”




Right-click “Control Points” > Save Place As




Save as KMZ file
Finally, export the satellite raster image

File > Save > Save Image

Or choose the “Save Image” icon in the top menu bar

MORE OPTIONS | Unselect all elements

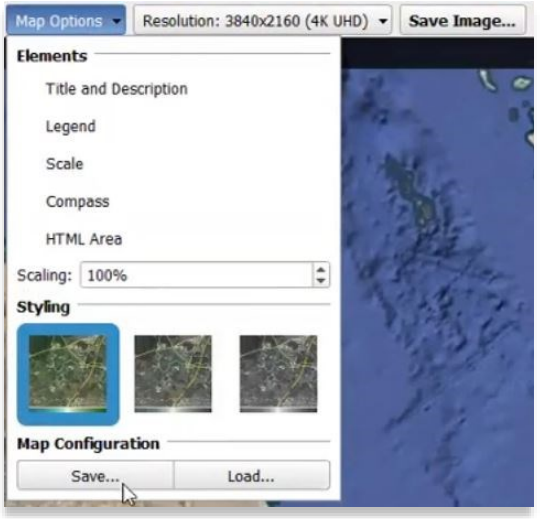
Choose the maximum resolution

Then, “Save Image”

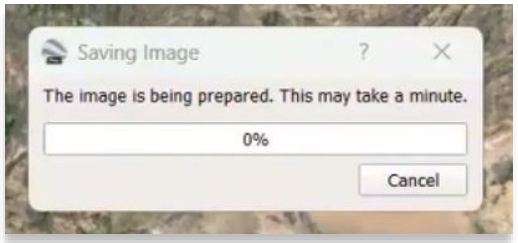
It may take a few minutes for the image to process

Check the files on your local computer

You may need to unzip some of the raster images



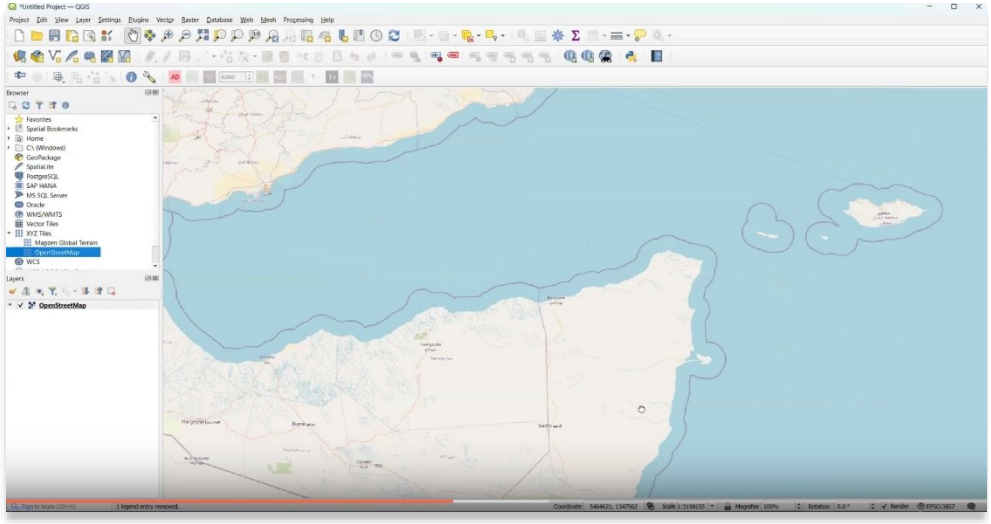




# GEOREFERENCING

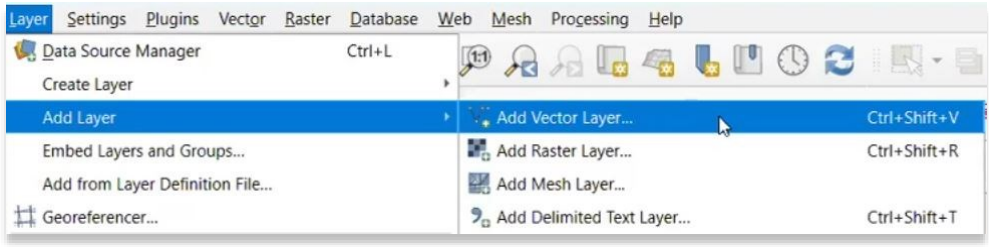
Return to QGIS and add a basemap.

This will serve as a guide during the georeferencing process.



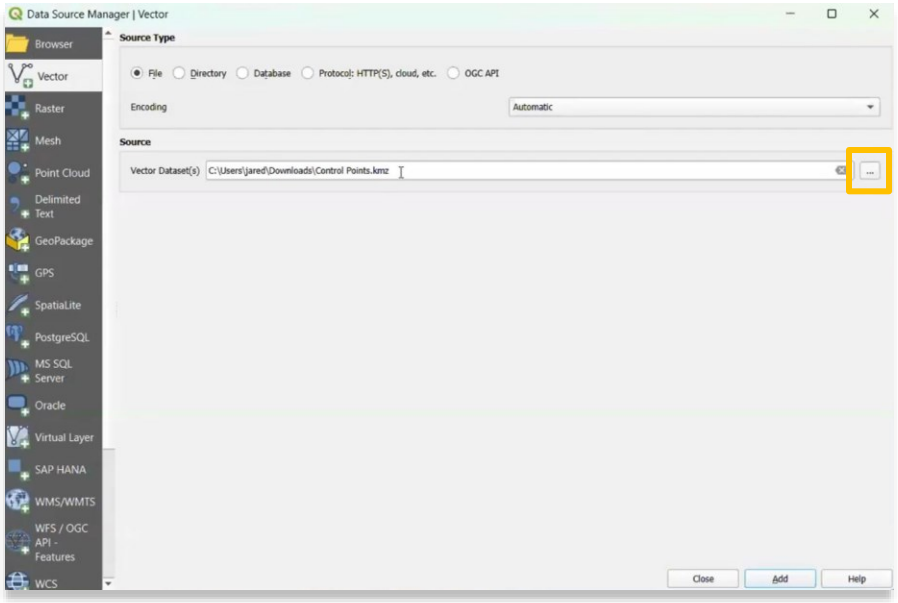
To begin, add your control points to the basemap.

Layer > Add Layer > Add Vector layer

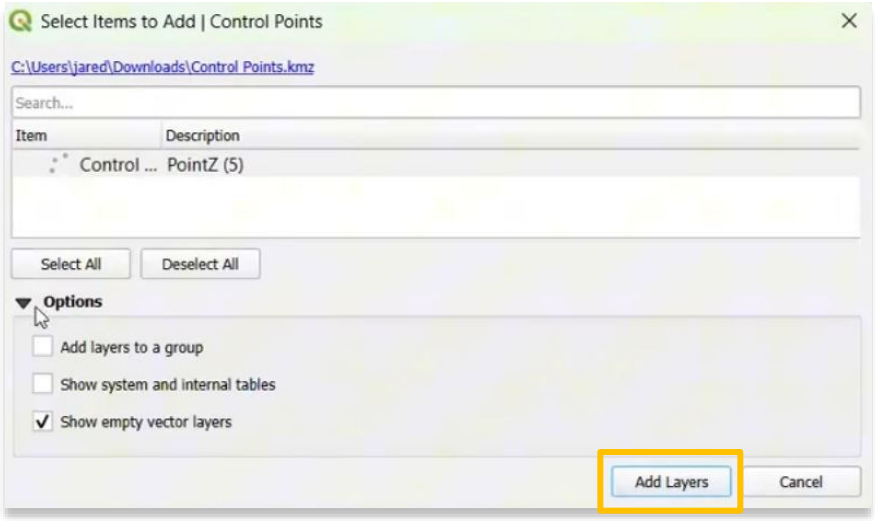


Locate the Control Points KMZ file from Google Earth.

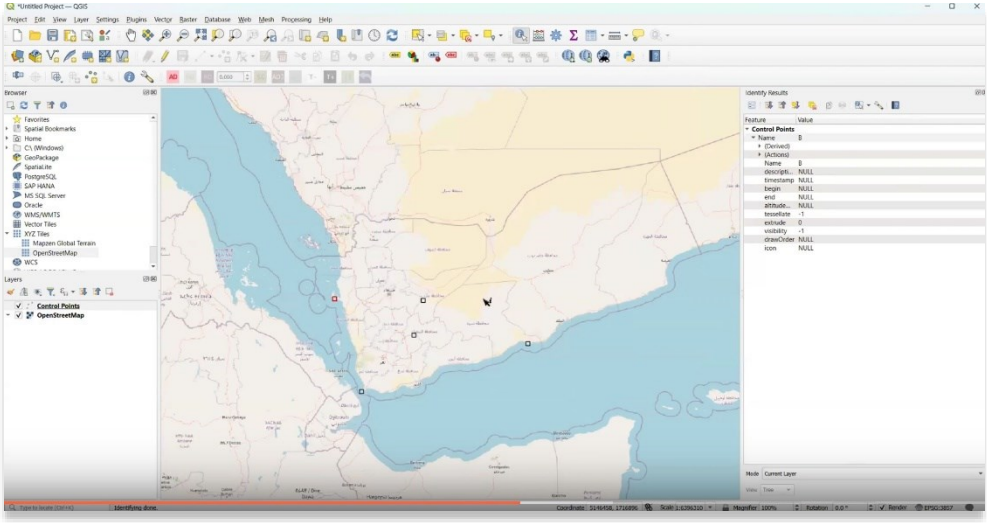
Keep default settings.




Select “Add” > Add Layers



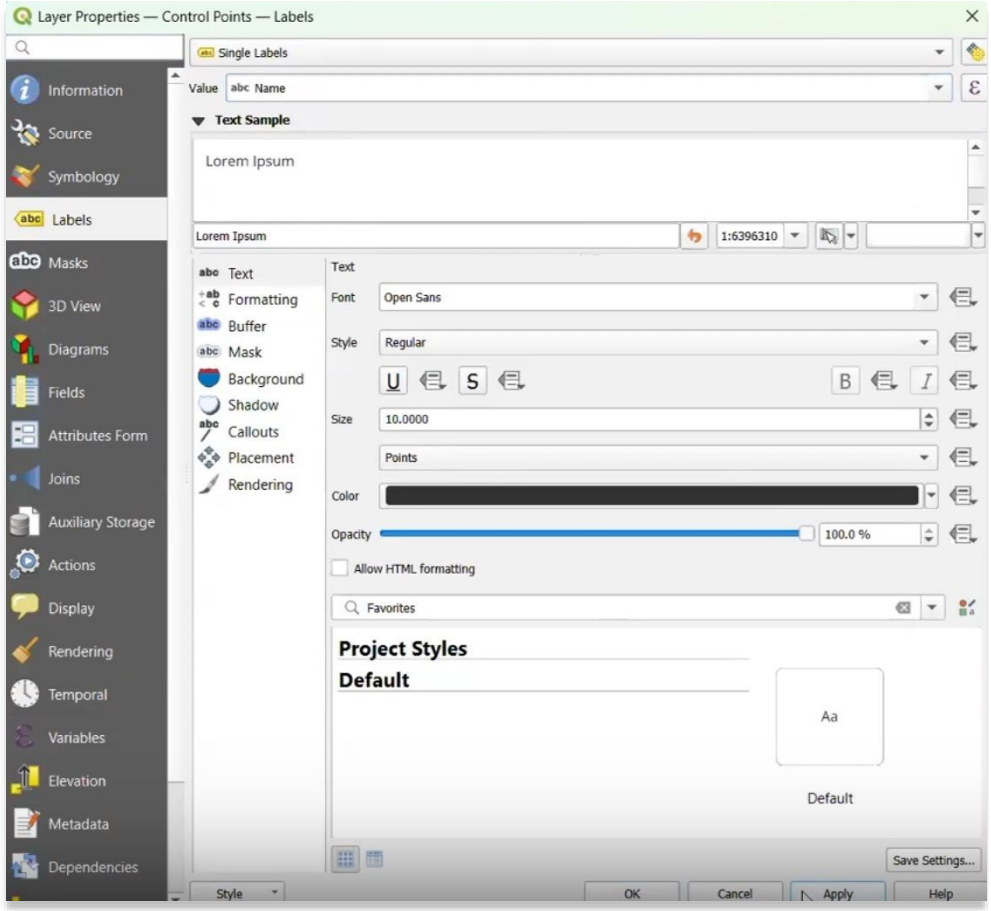
Close the pop-up and notice a new layer on your map.



Double-click on the Control points layer to open properties.

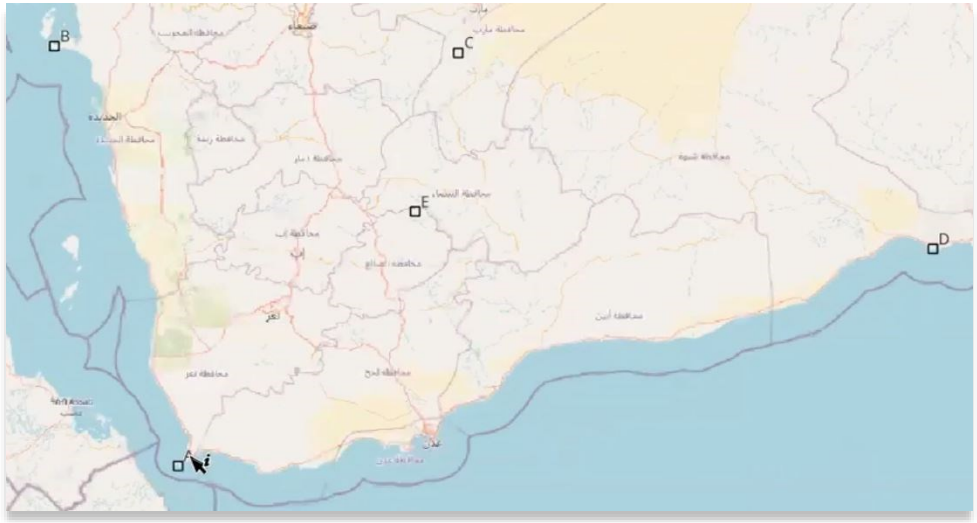
In the Labels section, choose “Single Labels” from the drop-down.

Value = Name



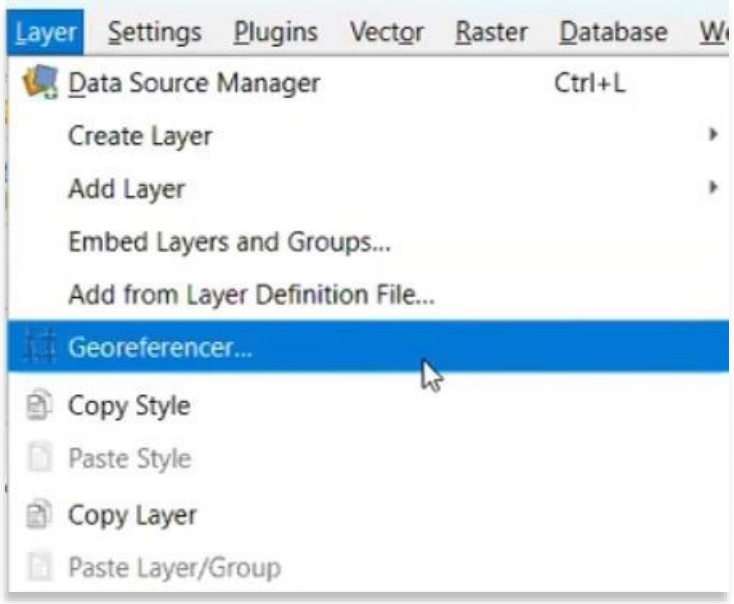
Select Apply and close the pop-up.

NOTICE | Each control point now has its name next to it

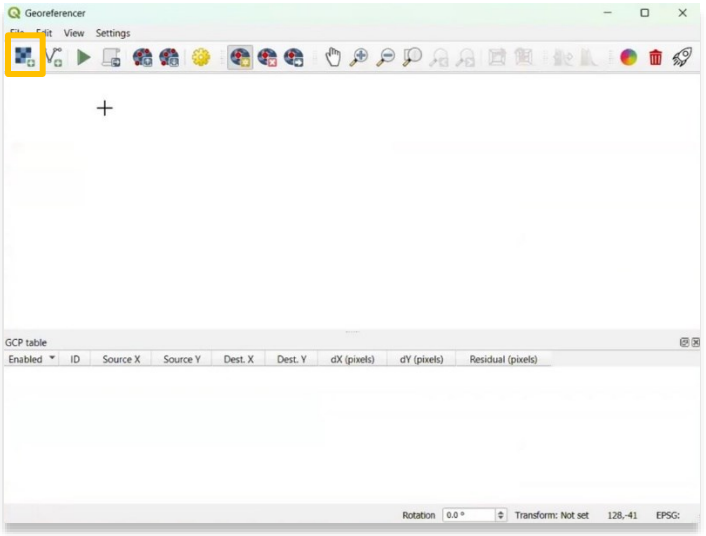



Open the Georeferencer tool (from ‘Layers”). This tool is automatically installed on newer versions of QGIS.

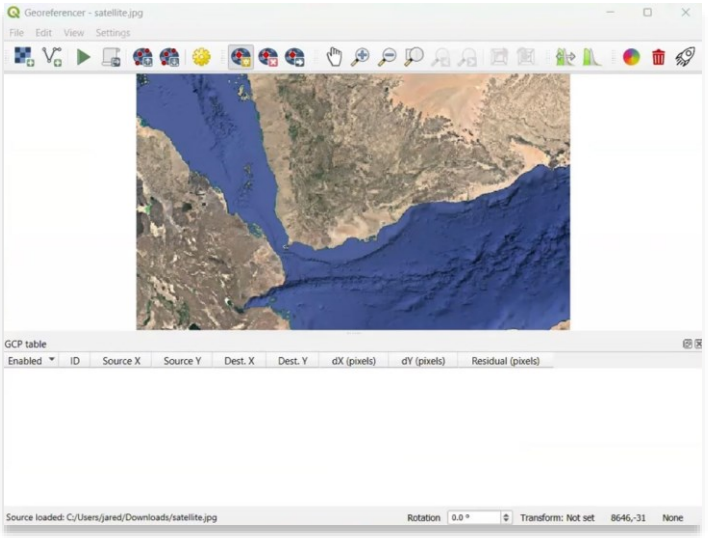
If you don’t see it, download it from the Plugins section.



Add your raster image.

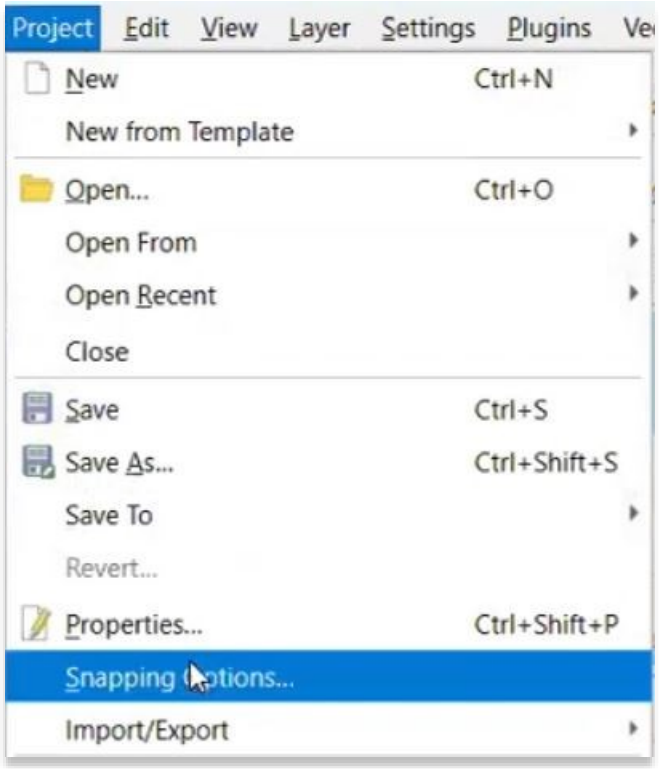


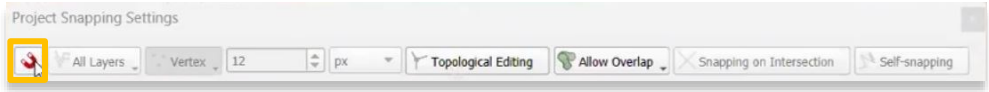

NOTICE | This image includes the control points created in Google Earth.

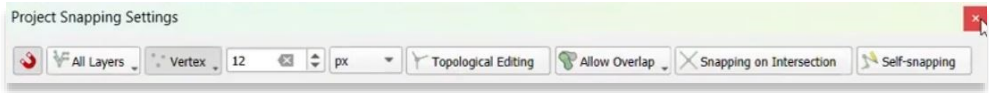


Turn on Snapping to help with selecting points.

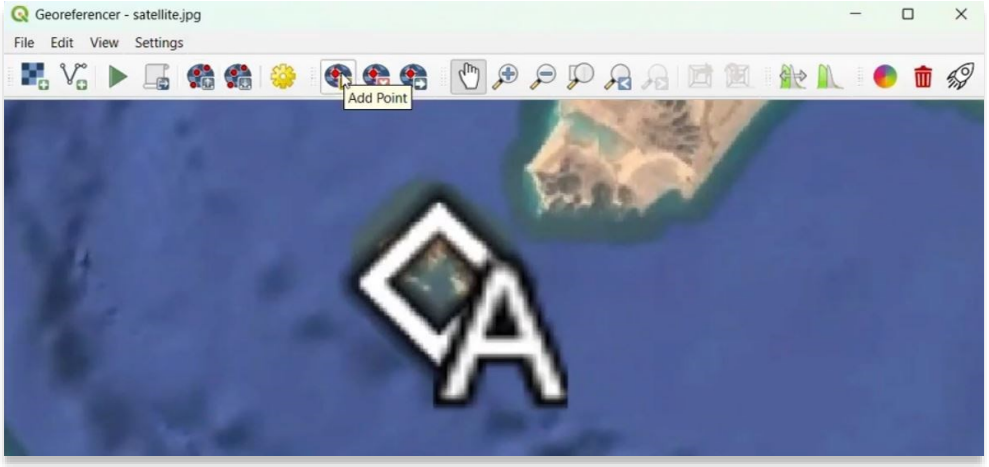
Project > Snapping Options > Magnet Icon



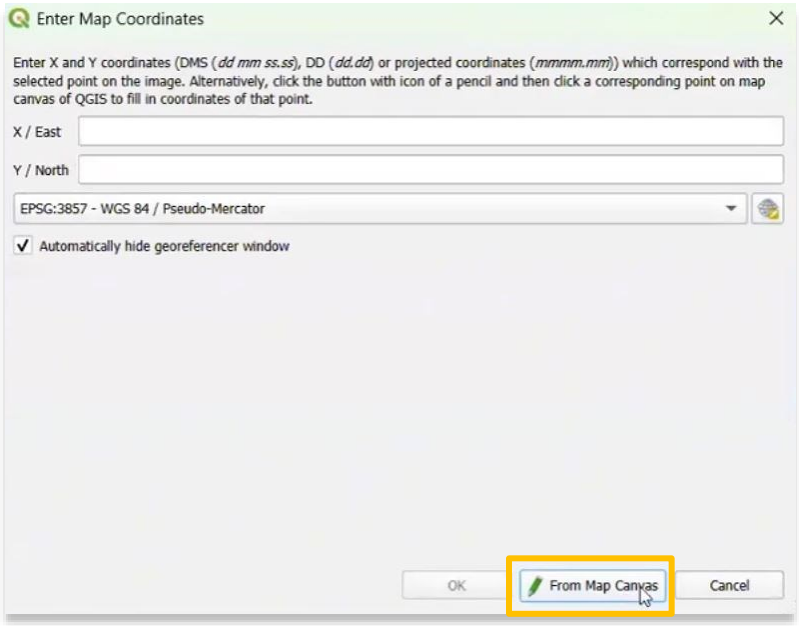



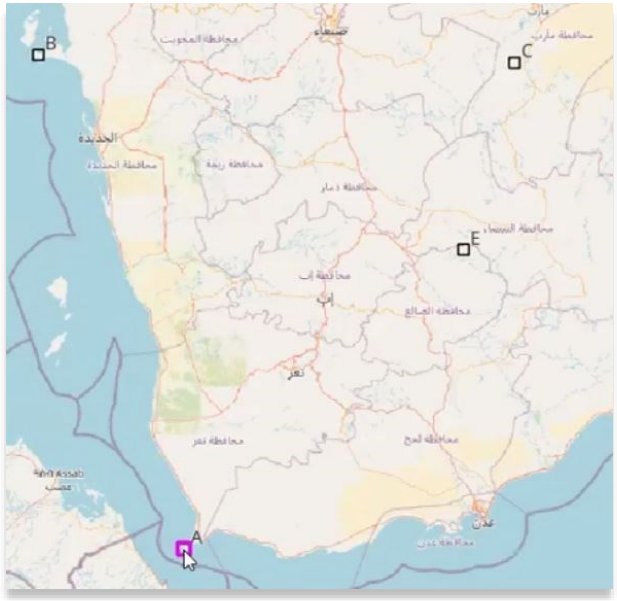
Locate Point A on the image. Choose the “Add Point” tool from the toolbar and add a point in the center of Point A.



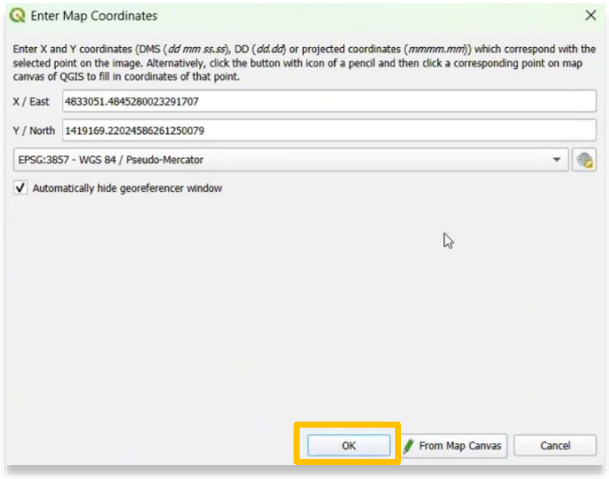

Choose “From map Canvas”



Find and select point A on the basemap. Notice the long/lat coordinates are automatically filled in.

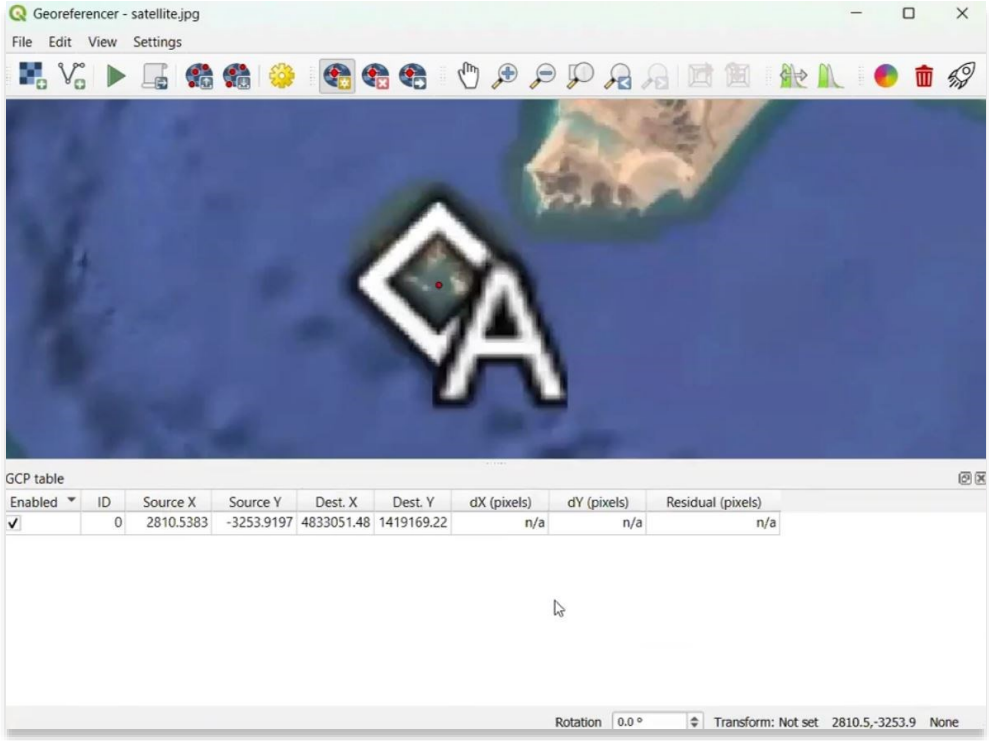



Select OK.



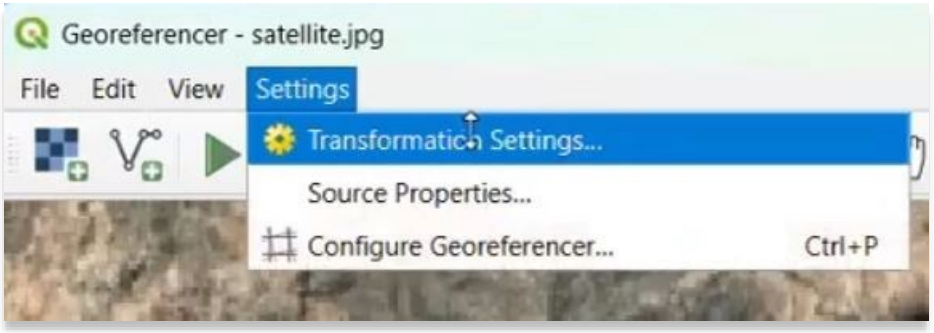
A red dot appears over Point A. Now your control points and raster images are linked by Point A.

Repeat for points B through E.

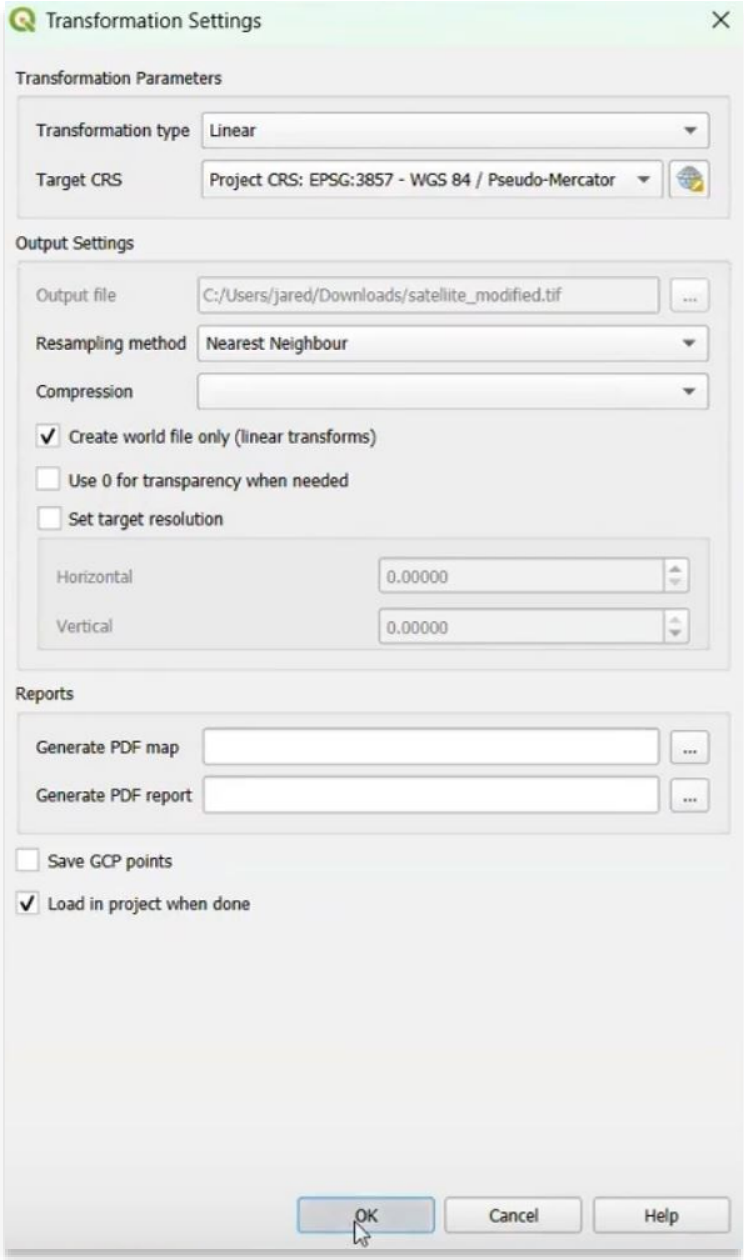



The last step is to initiate the georeferenced process. But first you need to adjust a few settings:

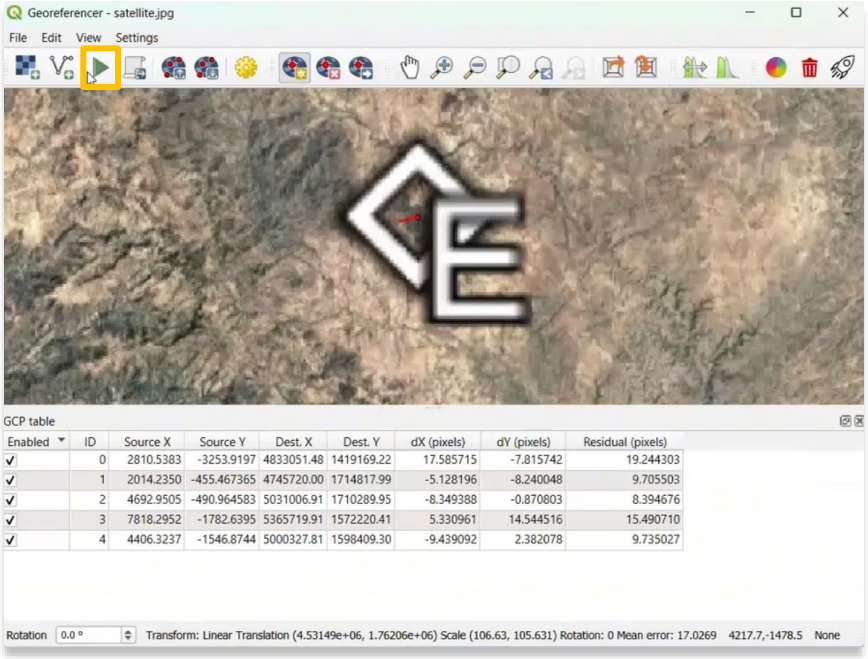
Select “Transformation Settings”



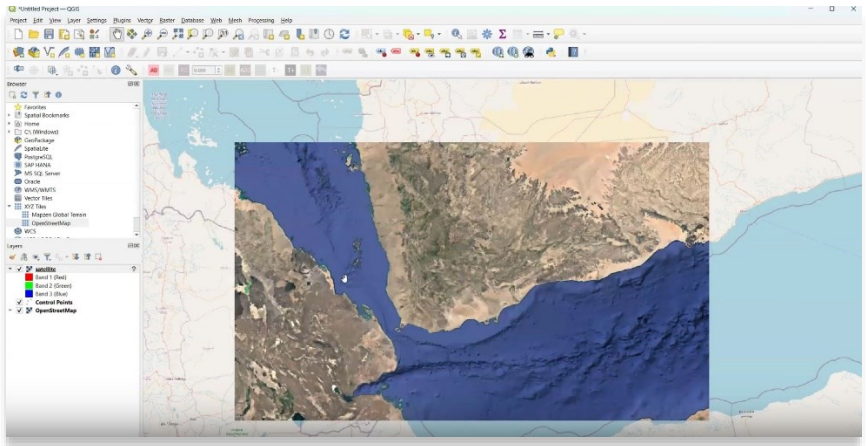
Transformation Type = Linear
Check that the Target CRS is the same as the project CRS
Change save location if needed
Resampling Method = Nearest Neighbor
Check “Create world file only (linear transformations)”
Check “Load in project when done”
Select OK



Start Georeferencing (green arrow icon).




Return to your map and check on accuracies using control points.



# RESOURCES

QGIS Download: https://qgis.org/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