

# Shoreline Extraction

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**ITCOOcean Training Program**

**on**

**“Coastal Vulnerability Mapping and Analysis using QGIS”**

**Organized by**

**International Training Center for Operational Oceanography (ITCOO)**

**INCOIS, Hyderabad, India**

**Nov 20 – 24, 2023**



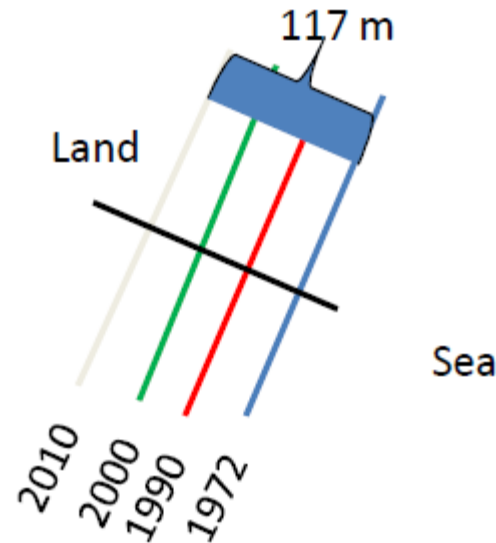
- What is shoreline?
- The *shoreline* is the place where a large body of water, like an ocean, lake, or river, meets the land

What is shoreline change?

Shoreline change refers to the loss or gain of land area or changes to the landscape on the marine edge.

The shoreline is constantly influenced by sea level variations, climate and ecosystems that occur over a wide range of time scales.

The processes of erosion, accretion, sedimentation, patterns of wind, wave, and sea level rise caused shoreline changes,



## Satellite data selection for shoreline extraction

- Select Cloud-free satellite data (Jan to March )
- Select high tide duration satellite passes (use wxtide software)

<http://www.wxtide32.com/>

[https://semiautomaticclassificationmanual.readthedocs.io/en/latest/faq.html?fbclid=IwAR2zxlsF4gqQw8D5f8RM3bRiSZFu6hnsDKbnc\\_B0aPxzLXxePkbbjTd7m2s#can-i-use-the-previous-version-7-of-scp](https://semiautomaticclassificationmanual.readthedocs.io/en/latest/faq.html?fbclid=IwAR2zxlsF4gqQw8D5f8RM3bRiSZFu6hnsDKbnc_B0aPxzLXxePkbbjTd7m2s#can-i-use-the-previous-version-7-of-scp)

Useful links:

QGIS Older versions: <https://download.qgis.org/downloads/>

QGIS Plugins: <https://plugins.qgis.org/plugins/>

<https://www.usgs.gov/landsat-missions/landsat-collection-2>

<https://www.usgs.gov/landsat-missions/landsat-science-products>



# Satellite image Download (Landsat data)

- Go to <http://earthexplorer.usgs.gov/> and create new user account → Login

The screenshot shows the Earth Explorer website interface. The top navigation bar includes links for Home, Search Criteria, Data Sets, Additional Criteria, Results, Login, Register, RSS, Feedback, and Help. The main content area is divided into two sections: 'Search Criteria Summary' and 'Map'. The 'Search Criteria Summary' section shows a list of data sets with checkboxes for selection. The 'Map' section displays a satellite image of a coastal area with various landmarks labeled. A 'Download Options' panel is visible on the right, listing different download options for the selected data set. A 'Save As' dialog box is open at the bottom, showing the file name and the save location.

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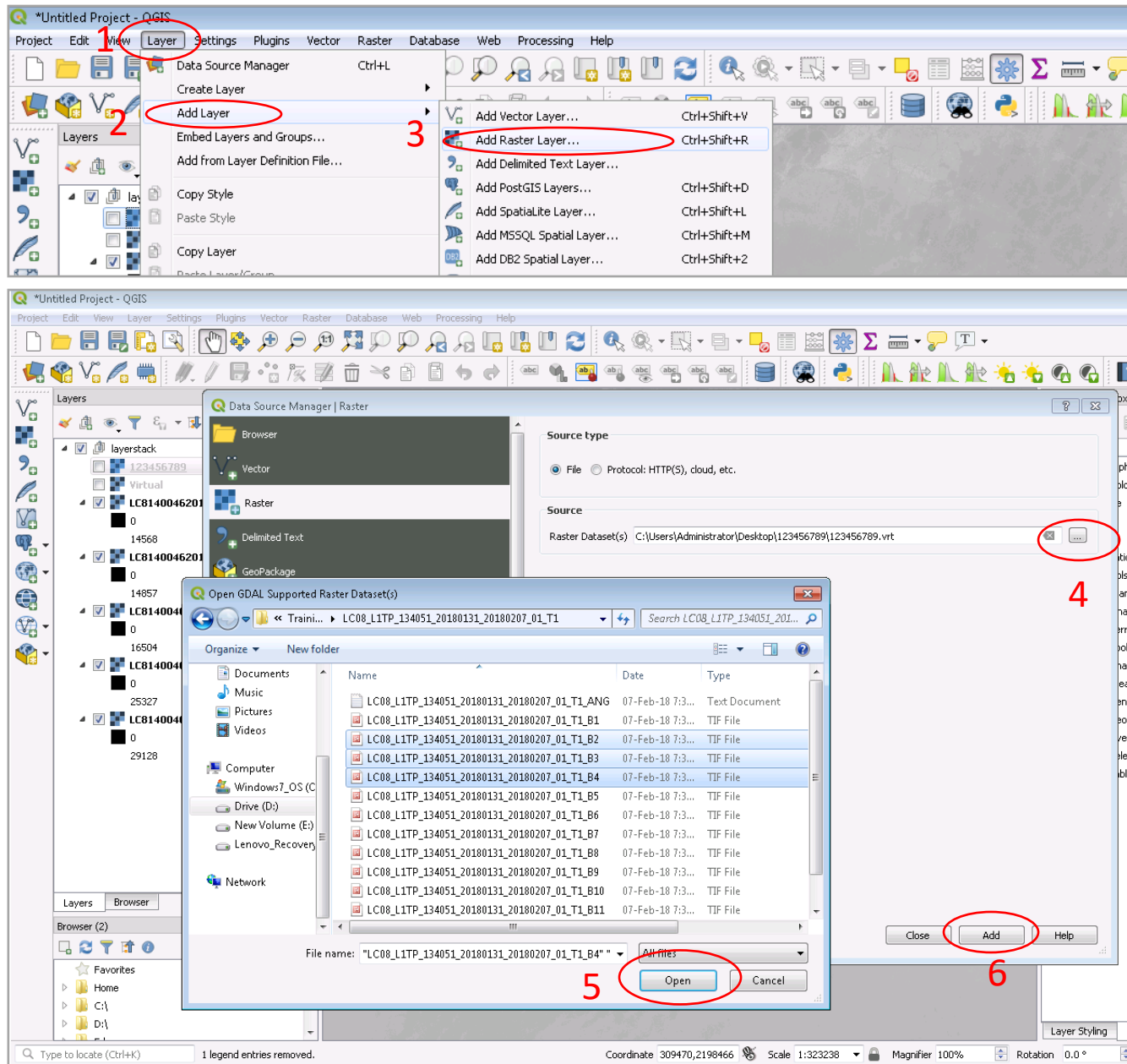
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## Method 01

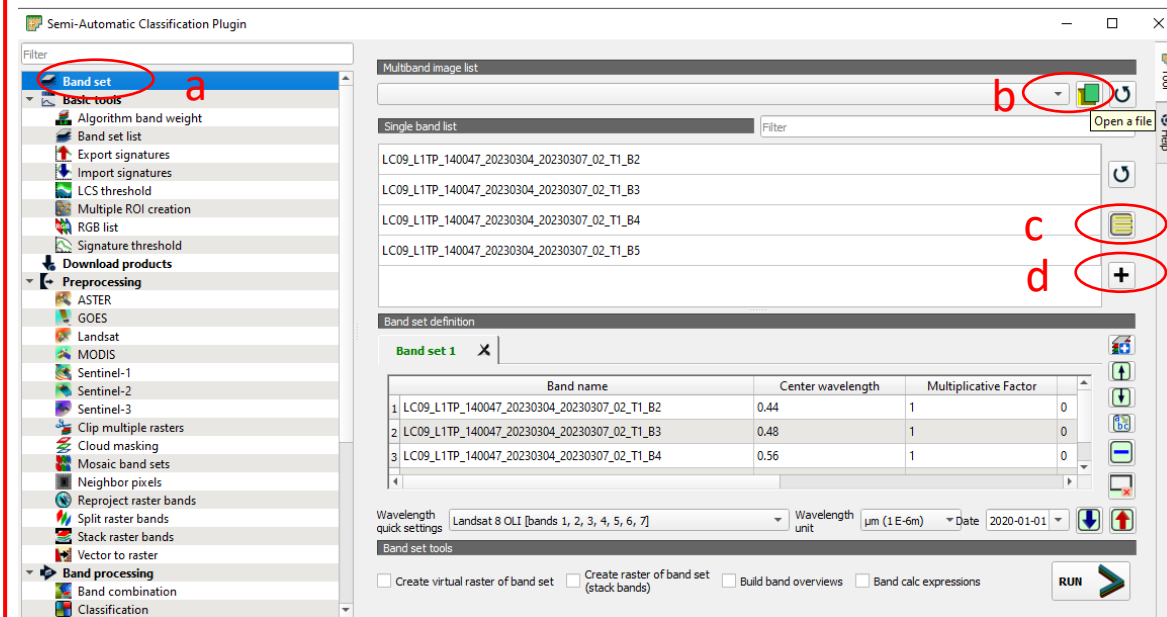


## Method 02

Go to SCP tool → Band set, → click on Open a file → browse and select bands → Open

**Add bands to band set:**

After the above step → click on select all bands → click on Add band to band set.



# Adding data to multiple band sets:

➤ Go to SCP click on band set → SCP plugin window opens.

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Band name	Center wavelength	Multiplicative Factor
1 LC09_L1TP_140047_20230304_20230307_02_T1_B2	0.44	1
2 LC09_L1TP_140047_20230304_20230307_02_T1_B3	0.48	1
3 LC09_L1TP_140047_20230304_20230307_02_T1_B4	0.56	1
4 LC09_L1TP_140047_20230304_20230307_02_T1_B5	0.655	1

Wavelength quick settings: Landsat 8 OLI [bands 1, 2, 3, 4, 5, 6, 7] Wavelength unit:  $\mu\text{m}$  (1 E-6m) Date: 2020-01-01

Band set tools: ☐ Create virtual raster of band set ☒ Create raster of band set (stack bands) ☐ Build band overviews ☐ Band calc expressions **RUN**

In the last slide, one band set is created  
If we want to create more band sets and  
Add different bands to them.

Create new band set and add bands:

Click on add a new band set → and select  
that new band to Add bands to that band set  
→ select Bands and click on add bands  
to band set.

Add or remove bands from the band set:

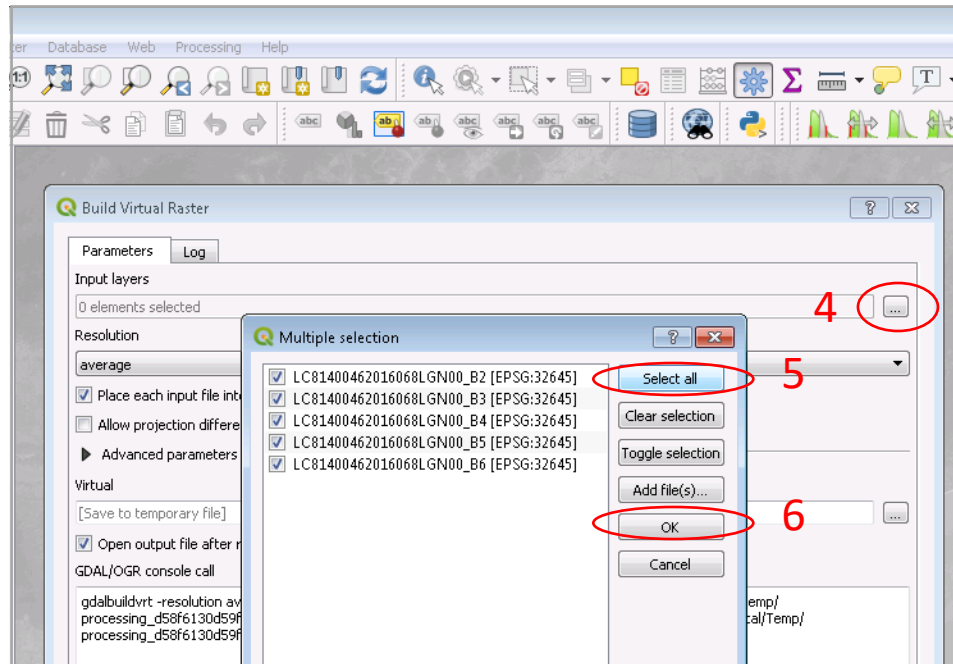
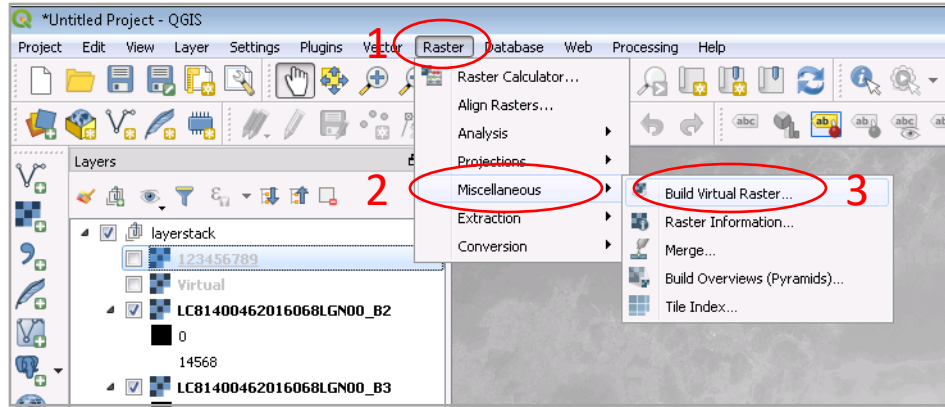
select bands in the band set to remove  
For that band, click on the delete row.

To remove all bands from band set → click  
on reset.

Select band set and select bands in single  
band and click on add bands to band set.



## Method -01

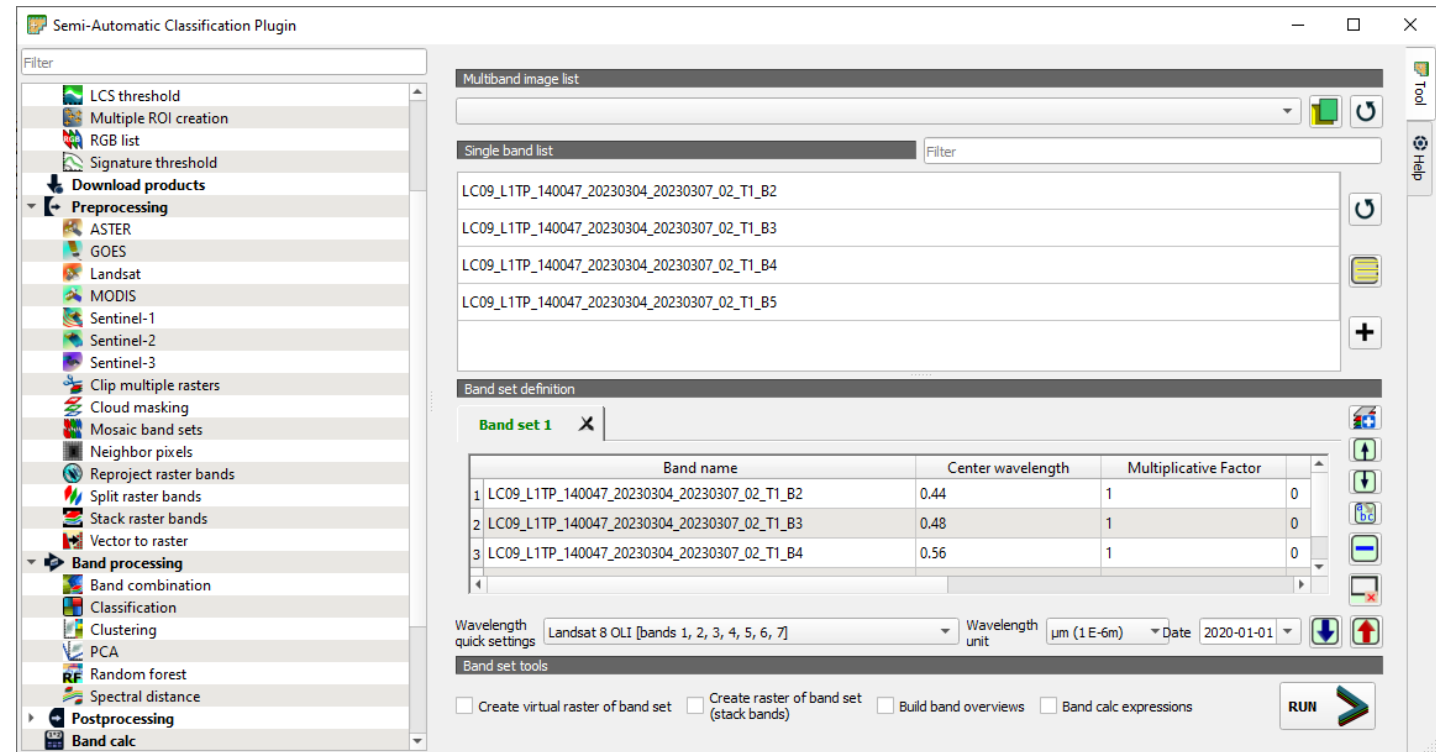


Go to Raster Miscellaneous → Build Virtual Raster → Input layers, select our bands → go to Virtual → save file → give the name and path → run

## Method -02

Go to SCP tools → bands are added to band set → click on create raster of band set (stack bands) → click on run → give output folder or

Go to Preprocessing → Stack Raster Bands → Select bands set → Run → Give path and name.

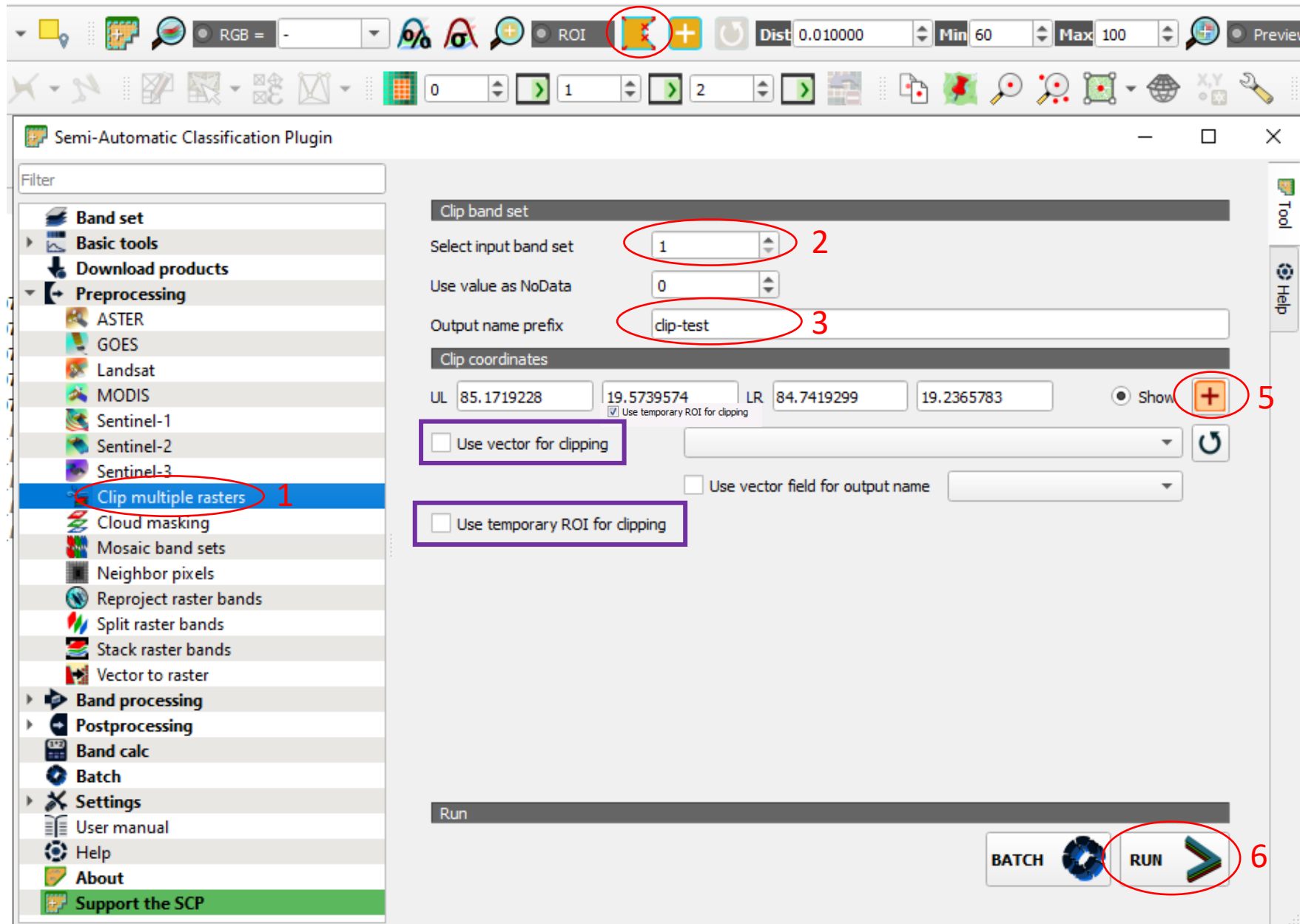




# Change the band combination

➤ Select the FCC image → right click → properties

The screenshot illustrates the steps to change the band combination of a layer in QGIS. The process involves selecting the layer in the 'Layers' panel, right-clicking to open the context menu, and selecting 'Properties...'. This opens the 'Layer Properties - 123456789 | Symbology' dialog box. In the 'Symbology' tab, the 'Band rendering' section is configured with 'Multiband color' as the render type. The 'Red band' is set to 'Band 4', the 'Green band' is set to 'Band 4', and the 'Blue band' is set to 'Band 2'. The 'Color rendering' section shows 'Blending mode' set to 'Normal'. The 'OK' button is highlighted, indicating the final step to apply the changes.



➤ Go to SCP → preprocessing → Clip multiple rasters → Select band set → Use value as no data: 0 → O/P name: give any name → to select RIO click on set an area in the map, → put points on the map, → click on the run → give output folder name.

## Select ROI using a vector file:

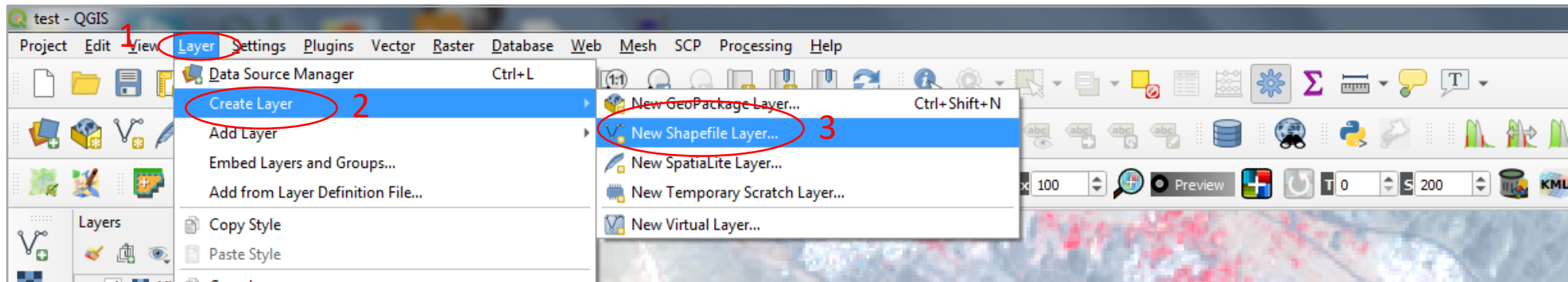
If you have an ROI vector file we can use that file to clip the raster image → open the vector file in map window → just check the use vector for clipping: select our vector file → and run give o/p path.

## Select ROI using temporary ROI:

Using the ROI tool in the map window draw ROI on the map/ image. Now in SCP Check use temporary ROI for clipping → run → give output path.

# Line Shapefile creation:

- Go to layer → Create Layer → New shapefile Layer



Direct click on create new shape file icon



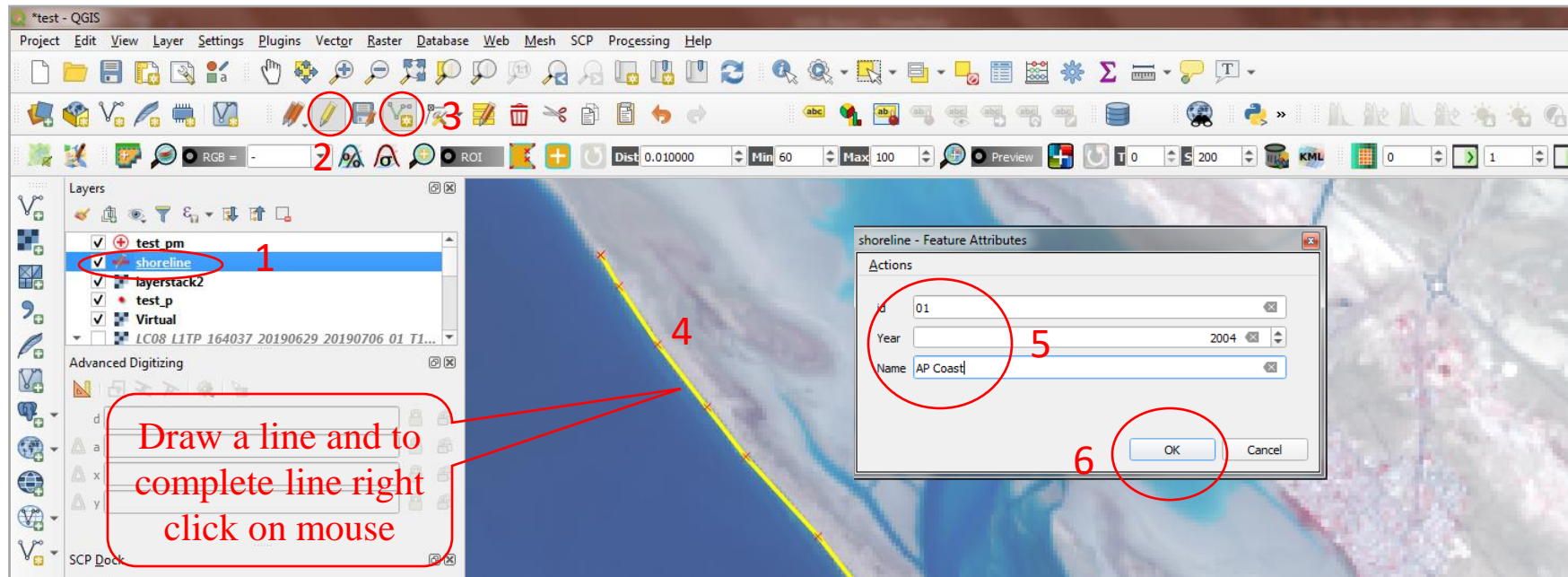
A screenshot of the 'New Shapefile Layer' dialog box. The 'File name' field is circled in red and labeled with a red '4'. The 'File encoding' dropdown is set to 'UTF-8'. The 'Geometry type' dropdown is set to 'Line' and is circled in red, labeled with a red '5'. The 'Additional dimensions' section has 'None' selected. The 'CRS' dropdown is set to 'EPSG:32639 - WGS 84 / UTM zone 39N' and is circled in red, labeled with a red '6'. The 'New Field' section has 'Name' set to 'Length' (circled in red, labeled with a red '7'), 'Type' set to '1.2 Decimal number', and 'Length' set to '10' (circled in red, labeled with a red '8'). The 'Add to Fields List' button is circled in red and labeled with a red '9'. The 'Fields List' table at the bottom shows the following data:

Name	Type	Length	Precision
id	Integer	10	
Year	Integer	5	

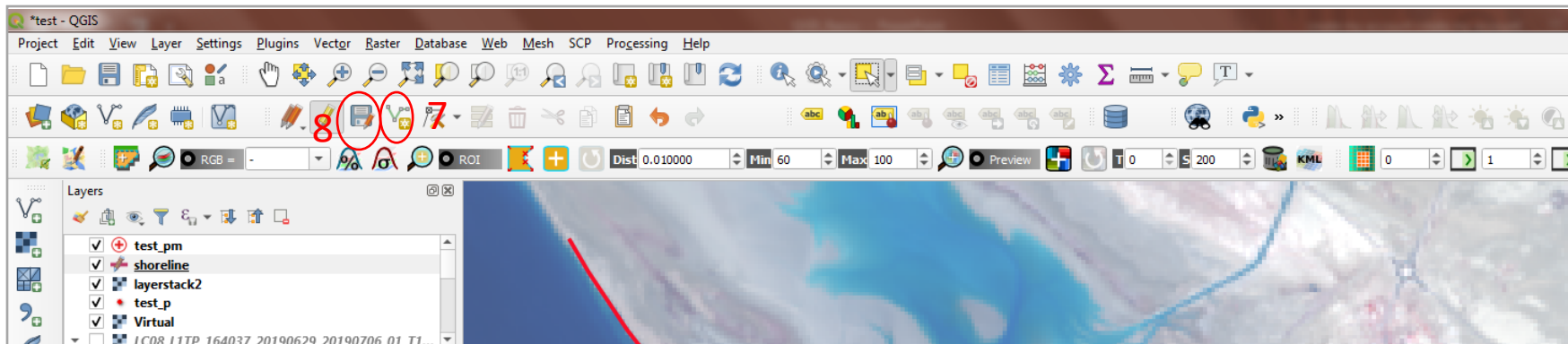
The 'OK' button at the bottom right is circled in red and labeled with a red '10'.

# Line Shapefile Editing :

- Select line shape file
- Click on Toggle editing → add line feature → draw a line on image



- To save edited data click on save layer edits.
- To stop editing click on Toggle editing





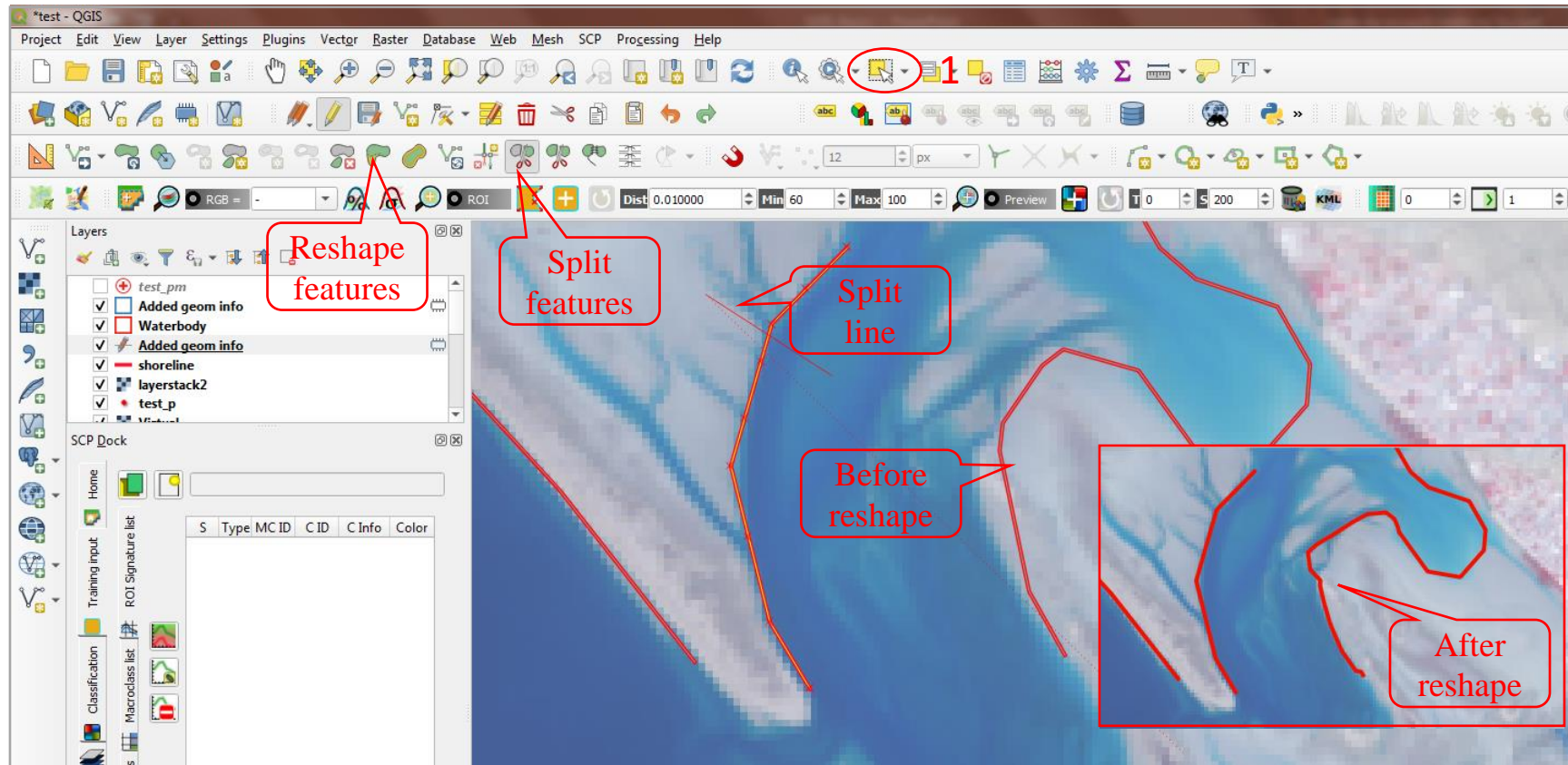
**Split line feature :**

- Select the line which you want to split using select features by area or a single click
- Click on split features → draw a line where you want to split and right-click to complete the line

**Reshape Line feature:**

- Select the line which you want to split using select features by area or a single click
- Click on the reshape feature → draw a line where you want to split and right-click to complete the line

Note: Drawing a line in reshape the feature line first point and the last point should touch the line feature



## Method: 02

NDWI Calculation:

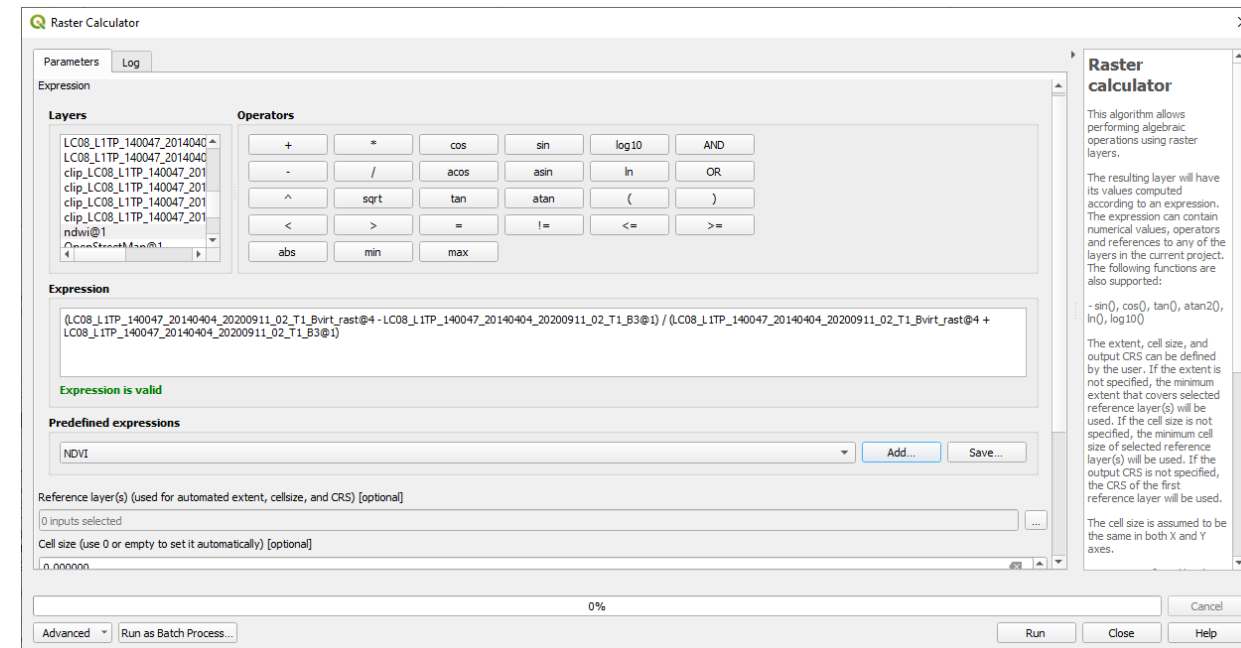
$$\text{NDWI} = (\text{Green} - \text{NIR}) / (\text{Green} + \text{NIR})$$

Convert to binary:  $\text{NDWI} > 0.01$  / -0.03

Convert binary to shapefile

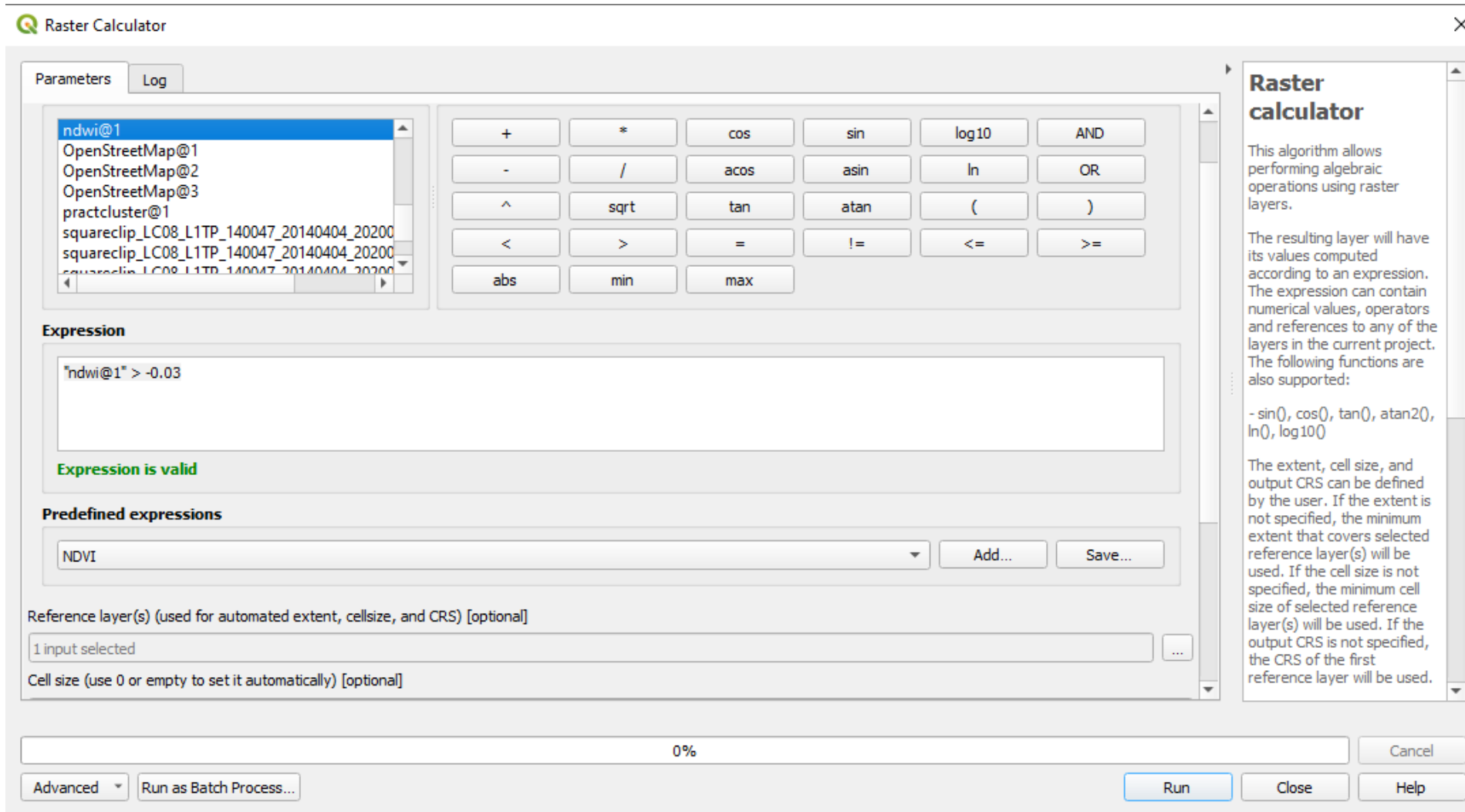
Convert raster to Vector

Smooth line and edit



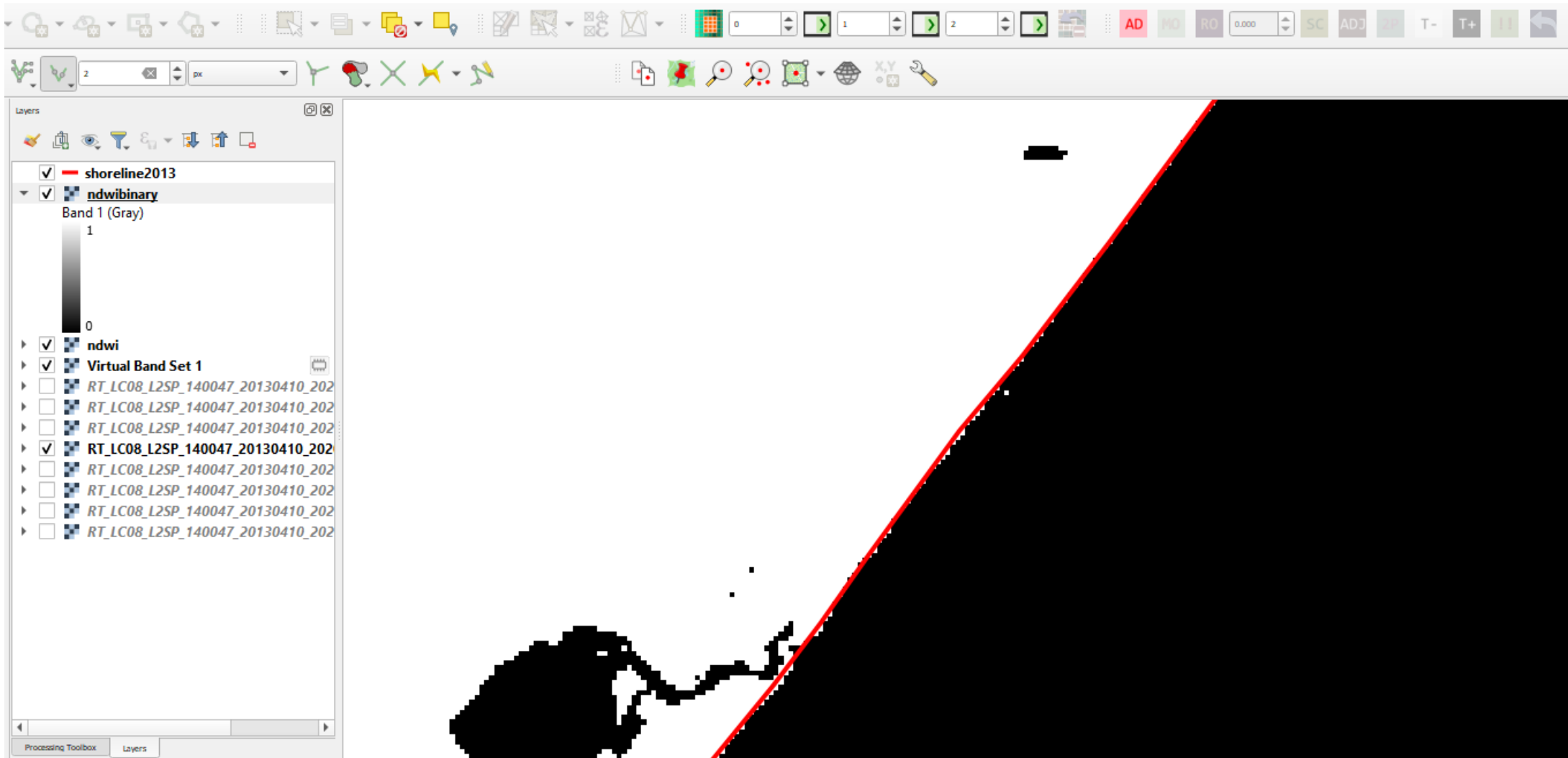
Now set the water and land NDWI range → and convert it into binary(0,1) data.

Go to processing toolbox → Raster Analysis → Raster Calculator → Write threshold (ex: "ndwi@1" > -0.03) → Reference → select our layer CRS → give output Name and path → Run





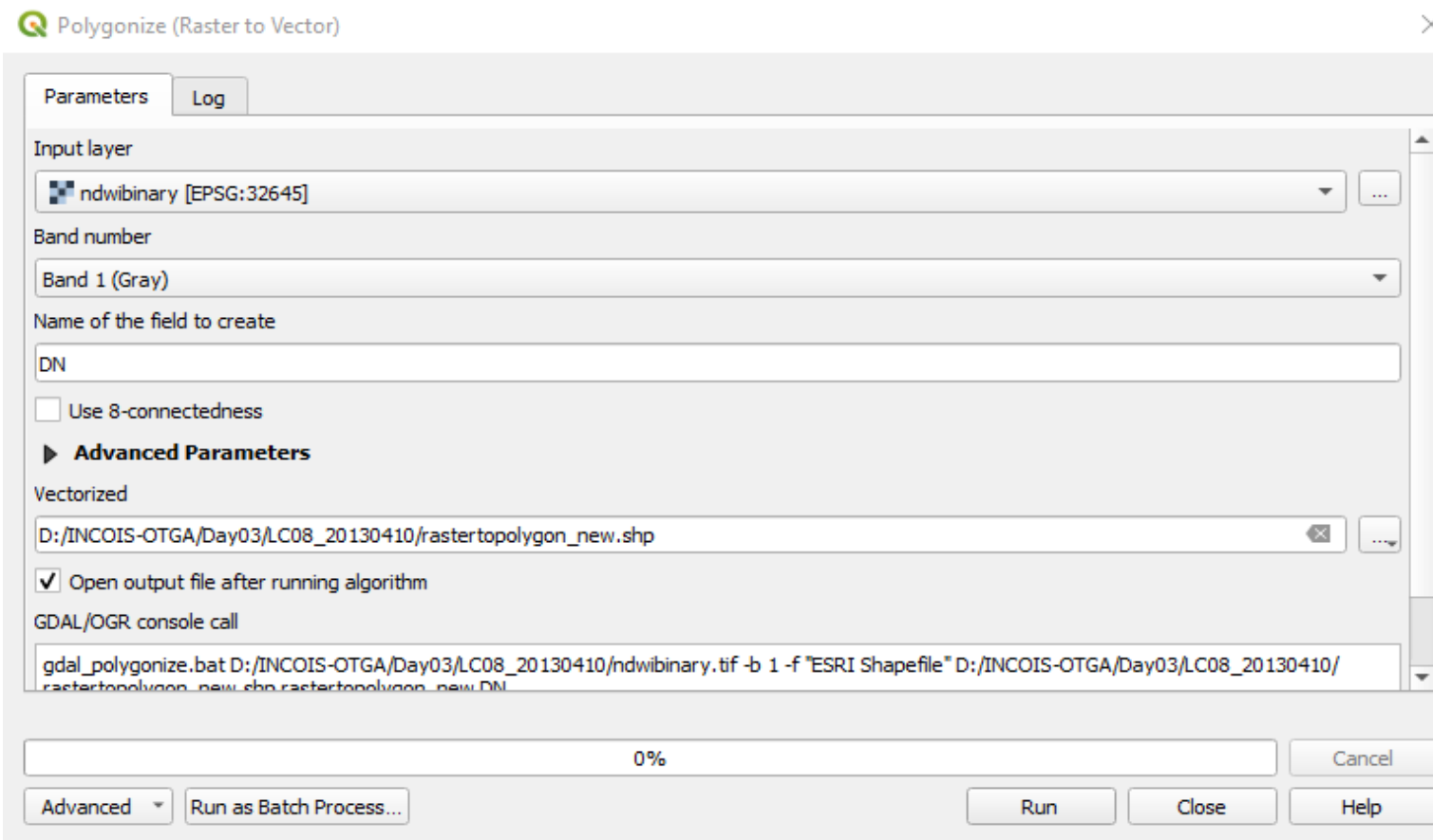
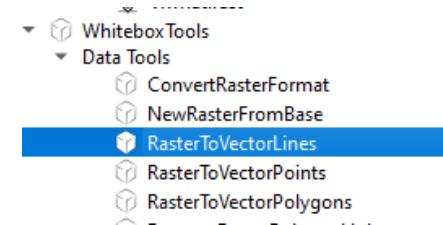
NDWI to Binary conversion output. Here zero is the ocean (water body) part and one is the land part



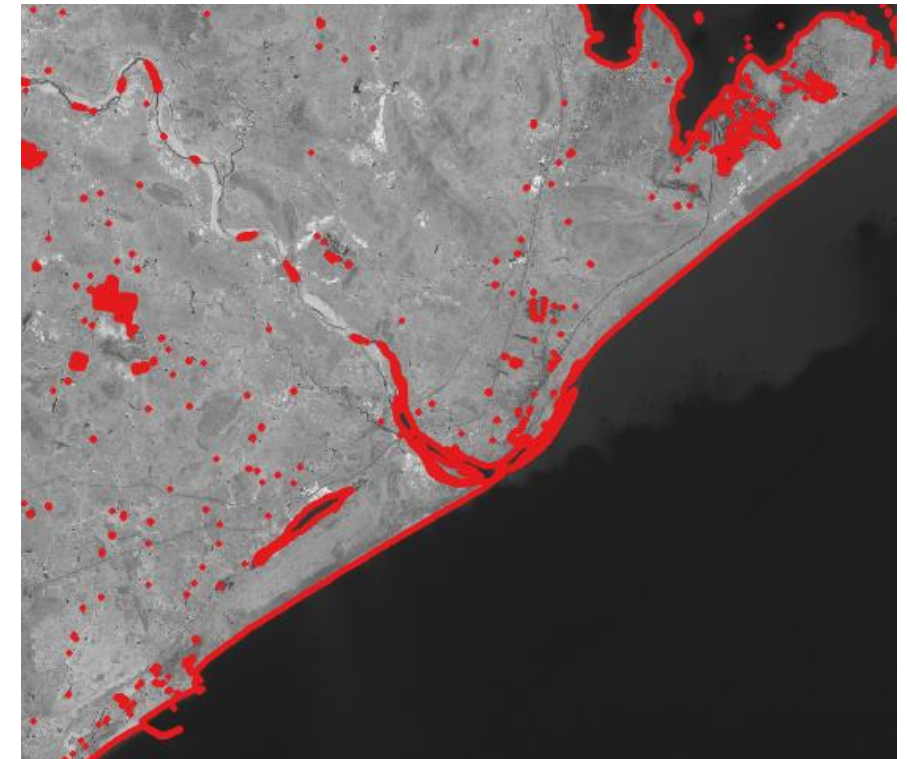
Convert from binary to polygon: Go to Raster → Conversion → Polygonise (Raster to Vector) → input select our ndwibinary file, give output path and name → run

Or

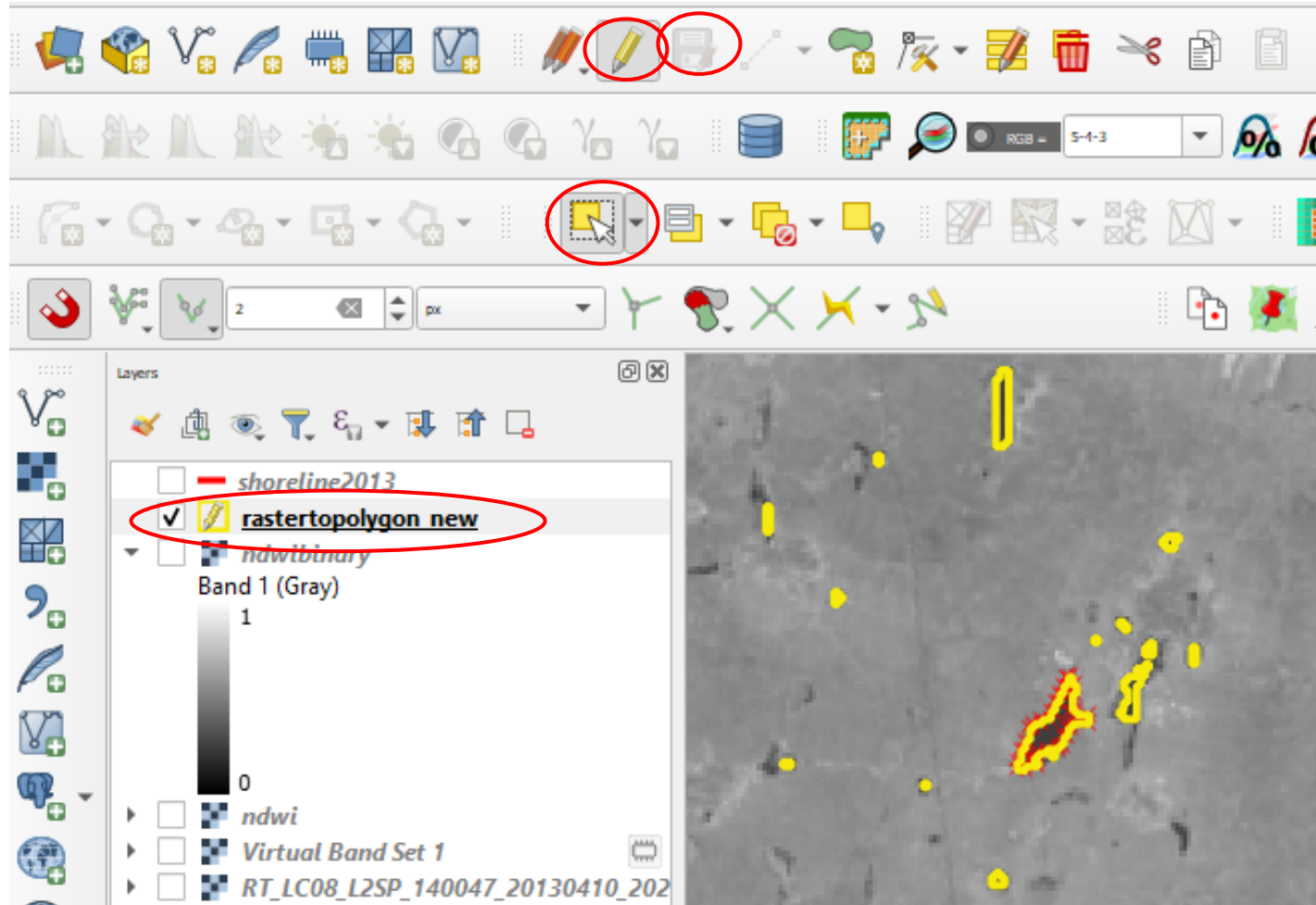
Directly convert raster to line feature: Go to processing toolbox → whitebox tools → data tools → RasterToVectorLines



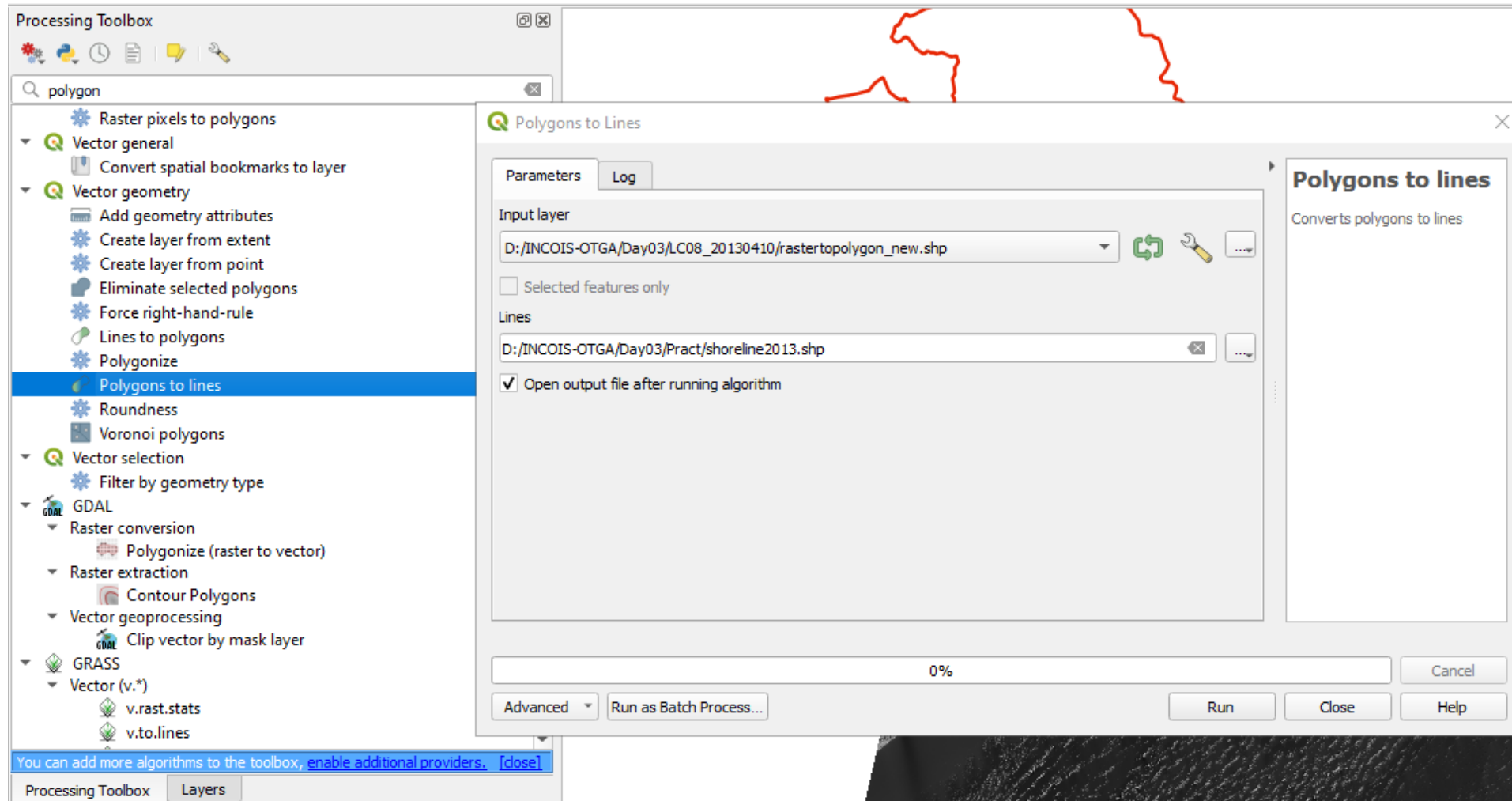
Output of the raster to vector conversion



Now select rastertovector polygon file → click on toggle editing → select the and part polygons and delete, keeping only ocean part polygons → click on save → click on toggle edit to stop edit.

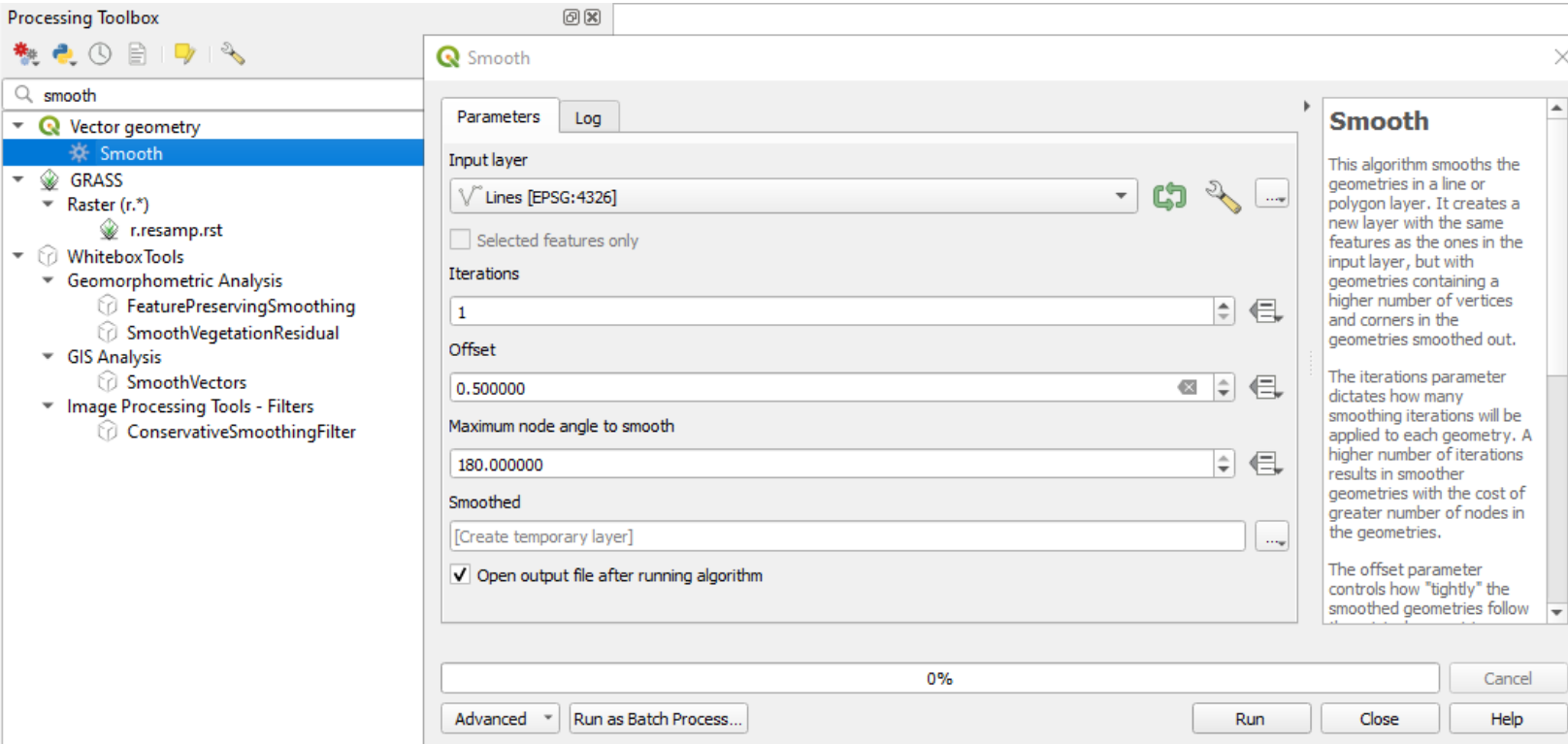


Now convert the polygon file to a line file: Go to processing toolbox → Vector geometry → select input file (raster to vector) → give path and output → run

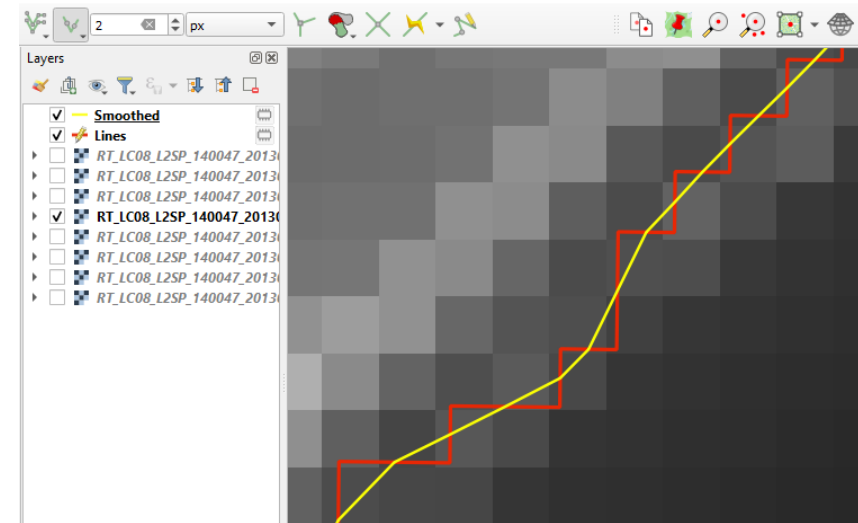




Line smooth: Go to processing toolbox → Vector geometry → smooth → give input our line (shore line) feature → give offset 0.25 or 0.5 (see the changes) → give output path and name → run



Line smooth Output



A scenic view of a beach with waves crashing onto the shore under a blue sky with white clouds. The text "Thank You" is overlaid in the center in a black, italicized serif font.

*Thank You*