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PRACTICAL NO:- 1

AIM : - Creating and Managing Vector Data:

a) Adding vector layer

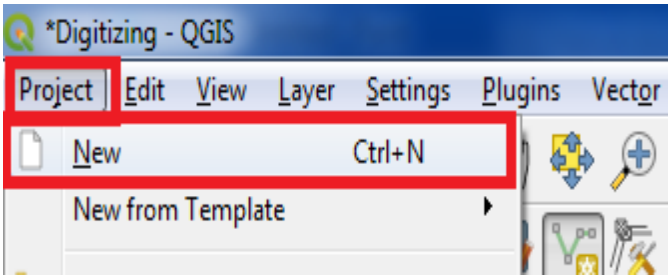
b) Setting properties

c) Vector Layer Formatting

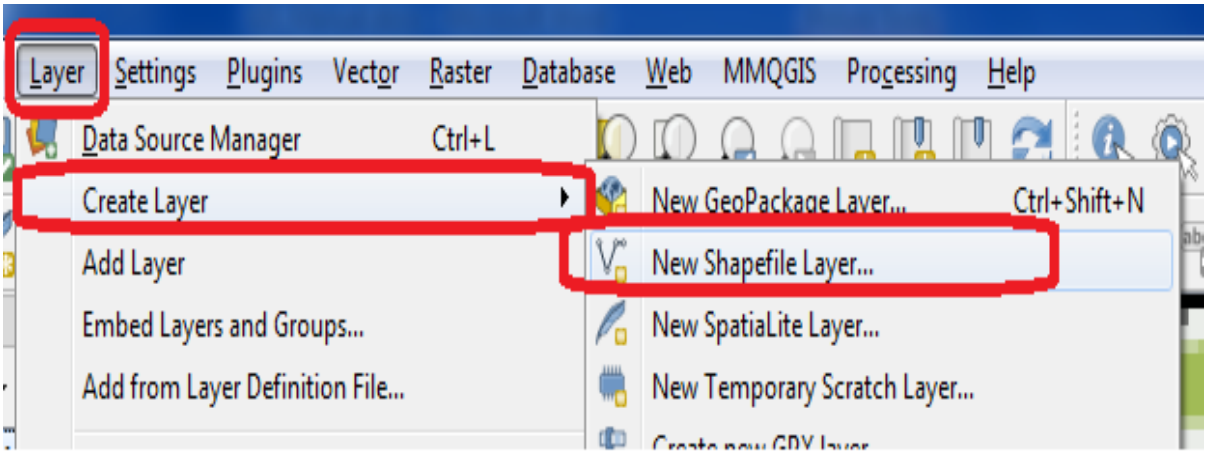
Procedure:

a) Creating Polygon vector layer

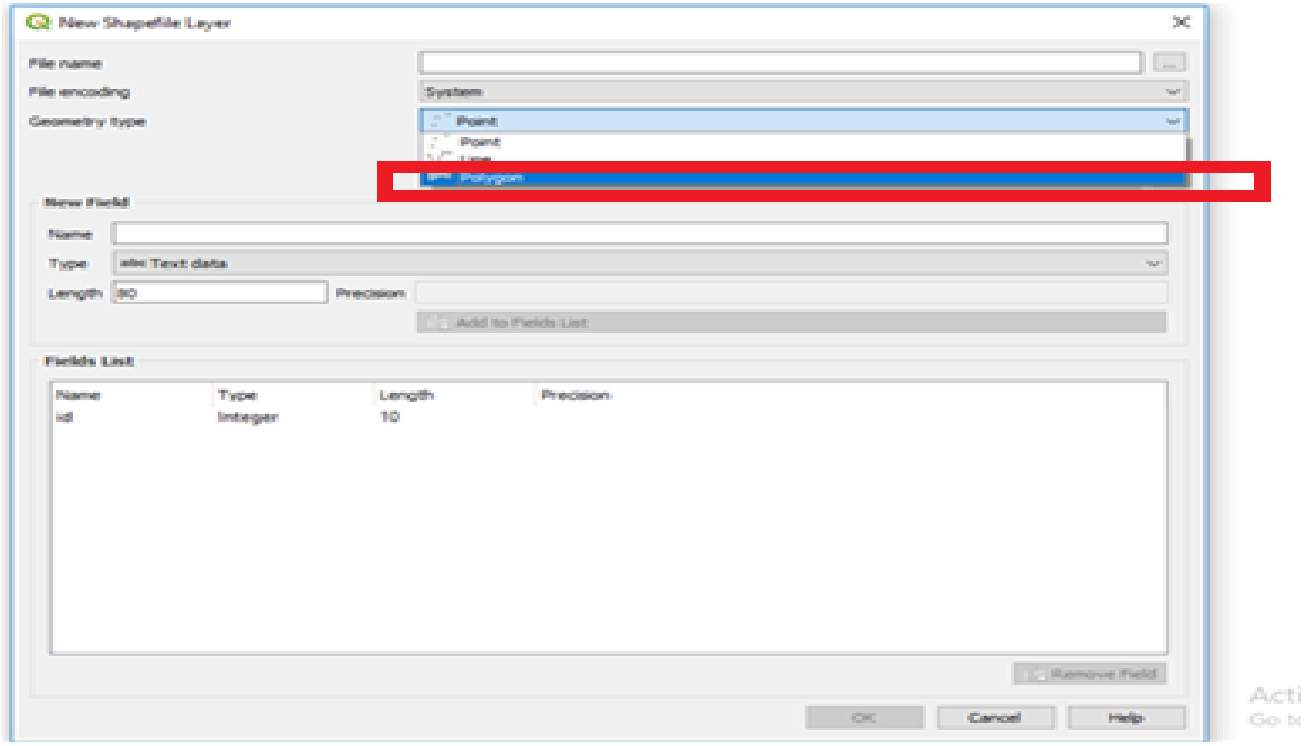
- Select **Project >New**



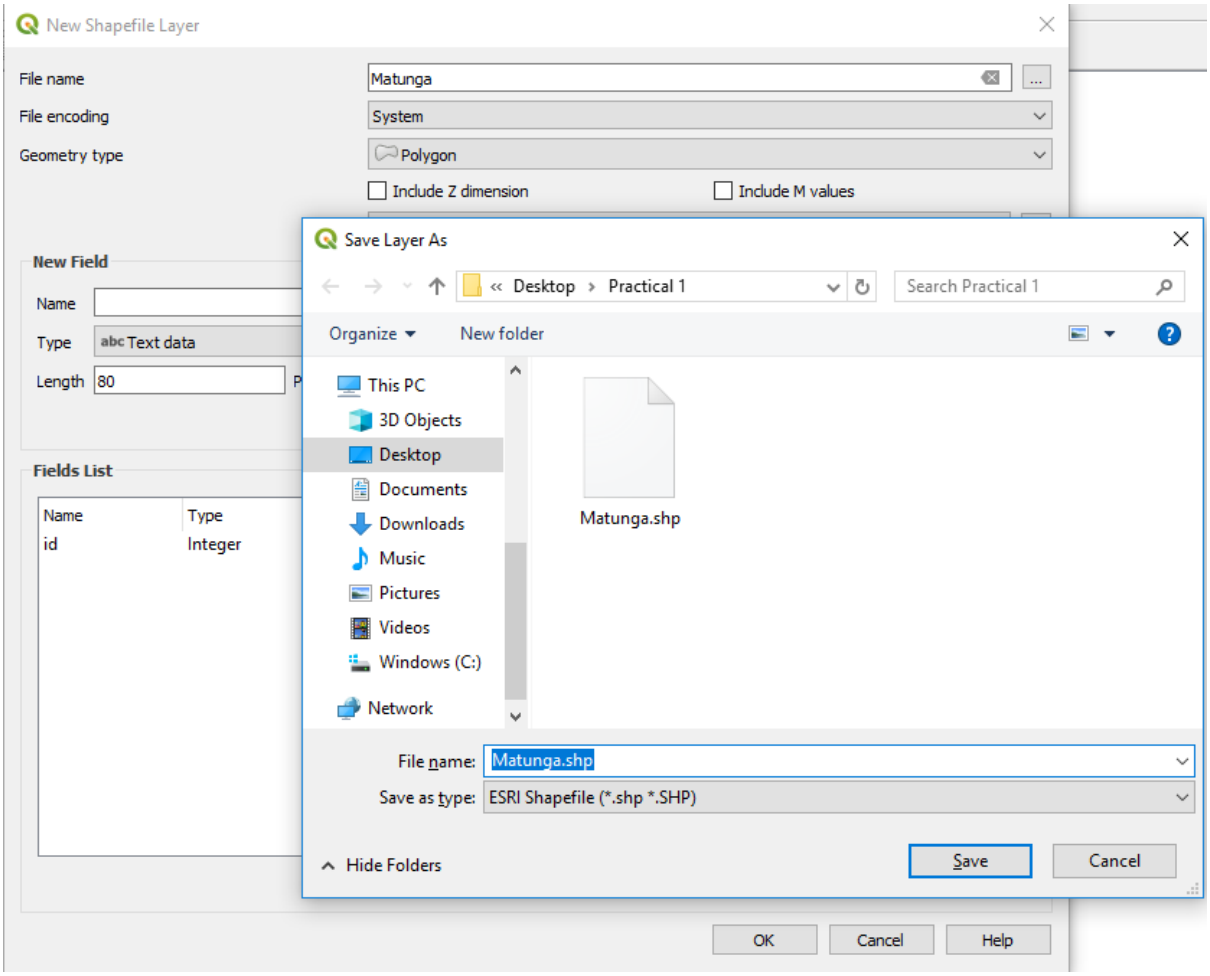
- Select **Layer > Create Layer > New Shapefile Layer**



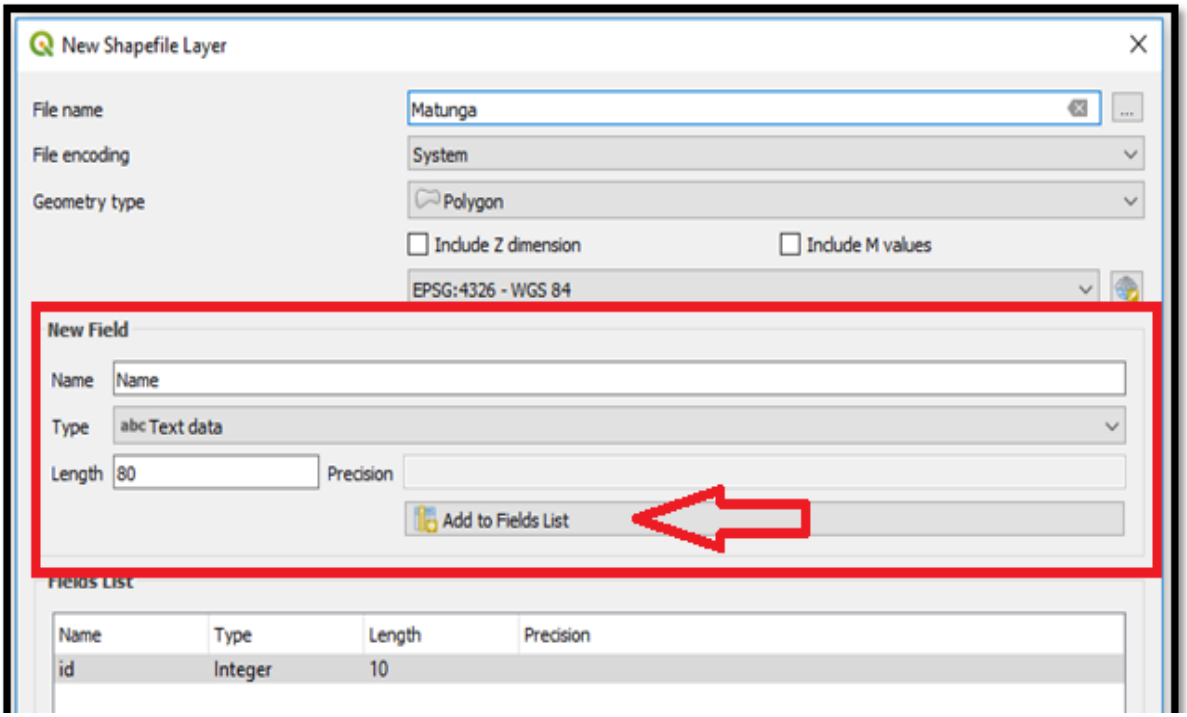
- Following dialog box will appear on the screen. Select Polygon option from Geometry type.



- Fill the appropriate information in each text box.
    - File name :
        - By default the file will be saved in bin folder.
        - To avoid it click on following button to change the location of file.

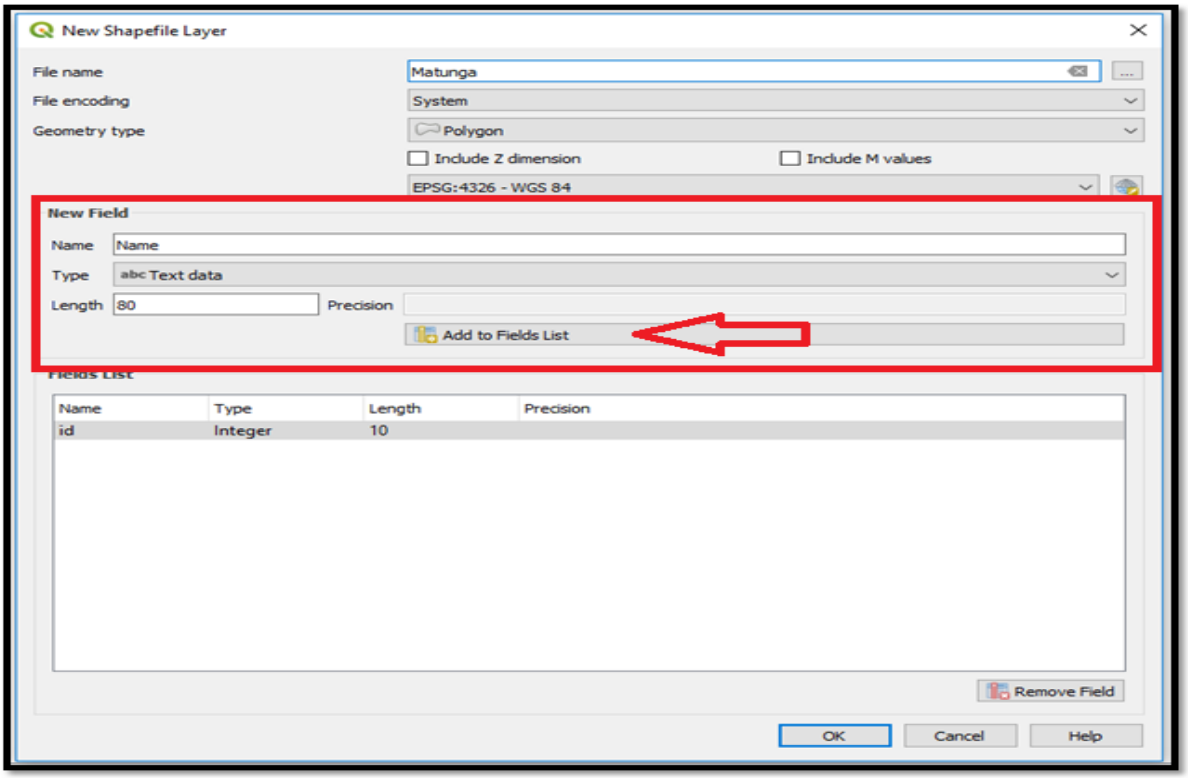


- Field Panel
    - Add the **Attribute** you want to show. (**Column Name** for Table)
    - Specify **Type (DataType:**Text Data/Decimal Data/Whole Number/Date**)** of Attribute
    - Specify the **Length** of the Attribute. Specify **Precision** (If **Data Type** is **Decimal**)



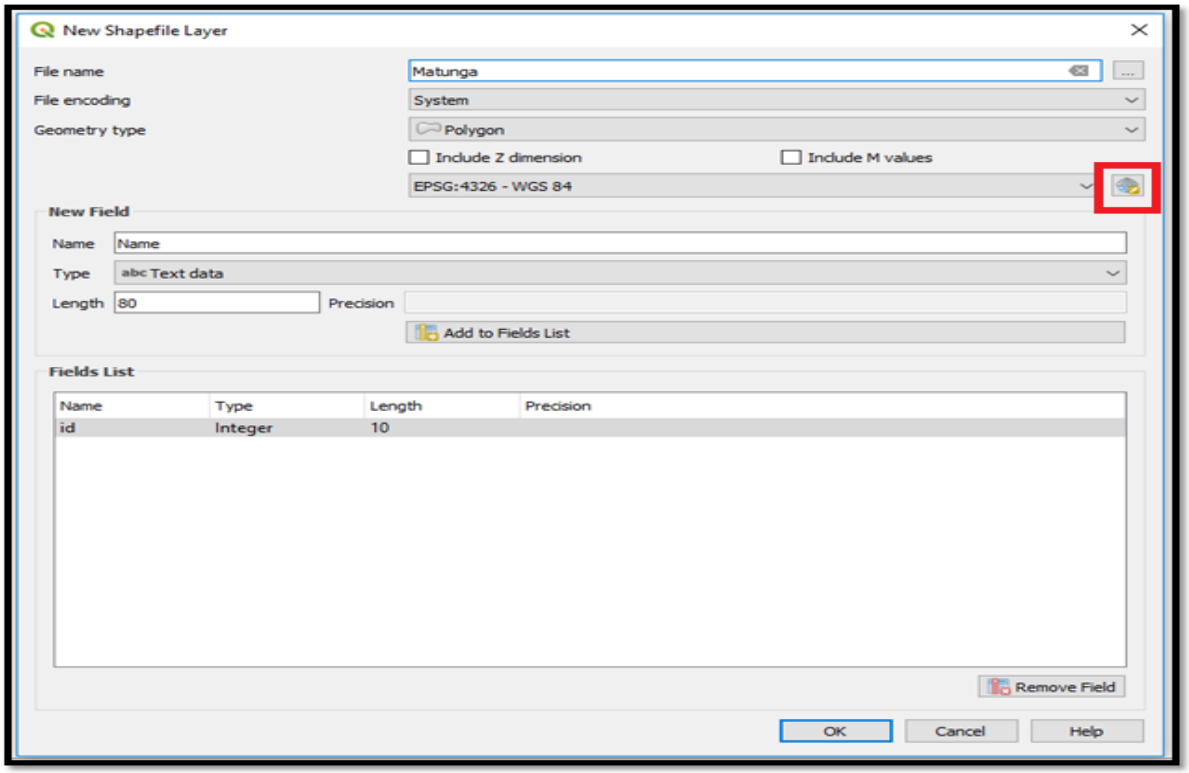
- Click on **Add to Field List** Button**.**

- You can add as many **fields (Column Name)** as you want for the layer.

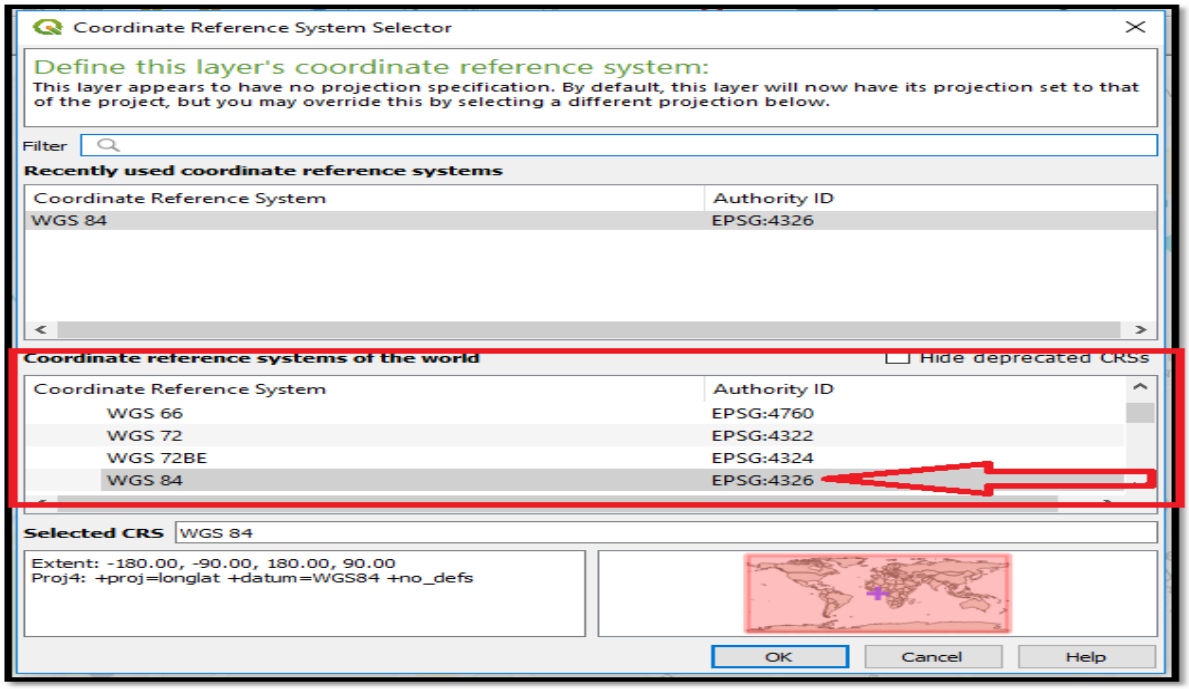


- Select Geometry Type as follows

- Click on the following button

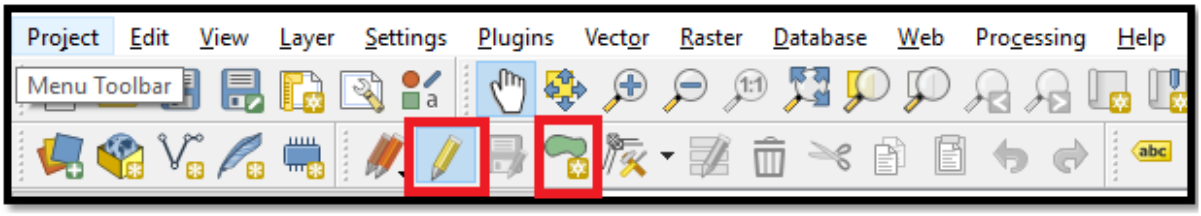


- The CRS dialog box will appear on screen. Click on the WGS84 option and it will be selected as follows. click on **OK**



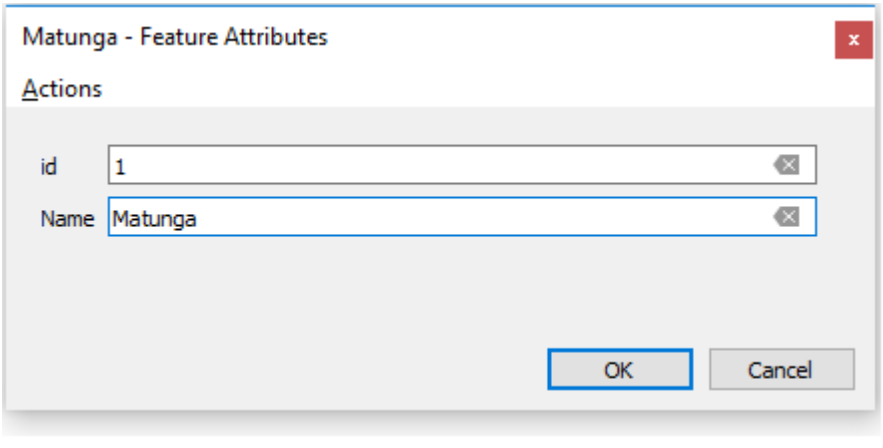
a) Follow the steps to plot **Polygon features.**

i. Select the **Polygon Feature(** In our case it is **Matunga** for **background)** from layer panel



- Click **Toggle Editing Button >>**Click on **Add Polygon >>** Now place the cursor at the location where you want to place the polygon. for **polygon** layer **minimum 3 points** should be selected

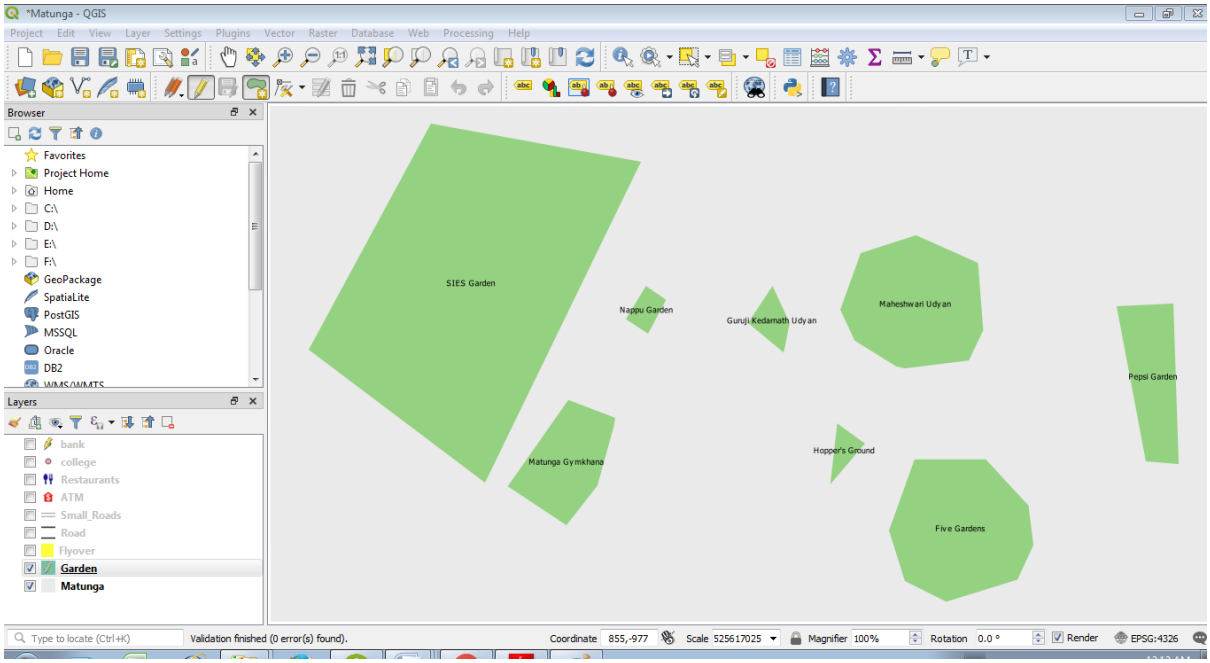
- Save the newly added polygon as follows.



- Set **style** for polygon by using property window(**Right click** on Matunga Layer)

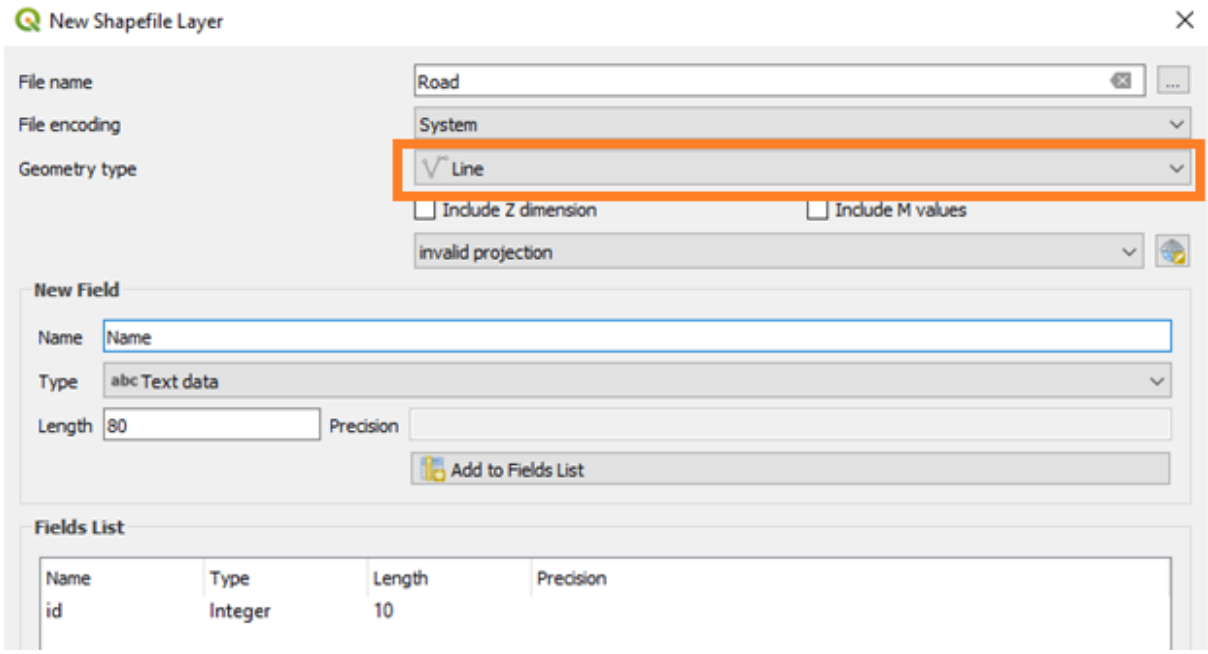
- Select **pattern** as you want and **click** on **OK**.

- Same way we can add one more polygon layer for Gardens.



b) Creating Line vector layer

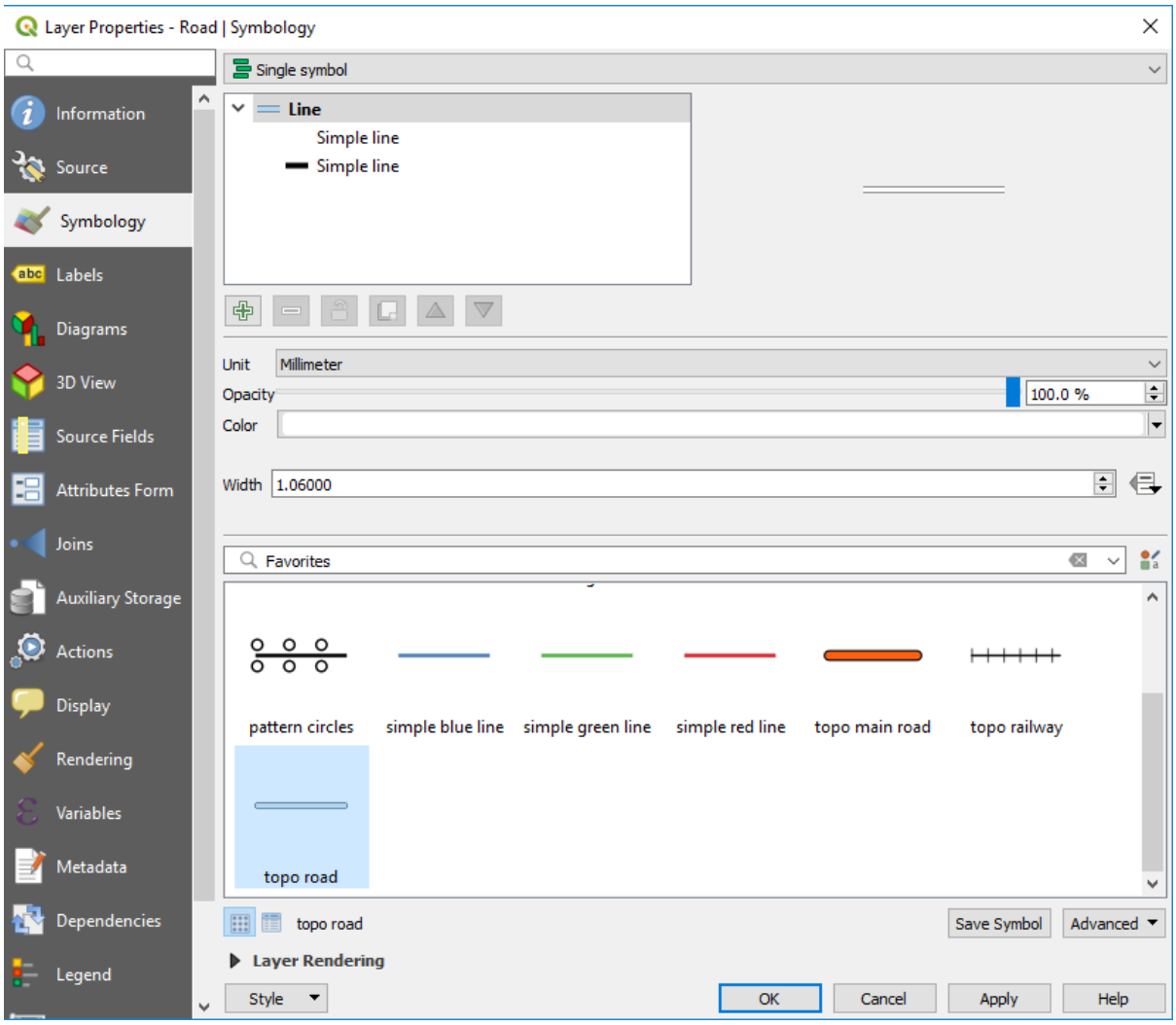
- Repeat the same steps as we have done for polygon layer.
- Select geometry type Line.



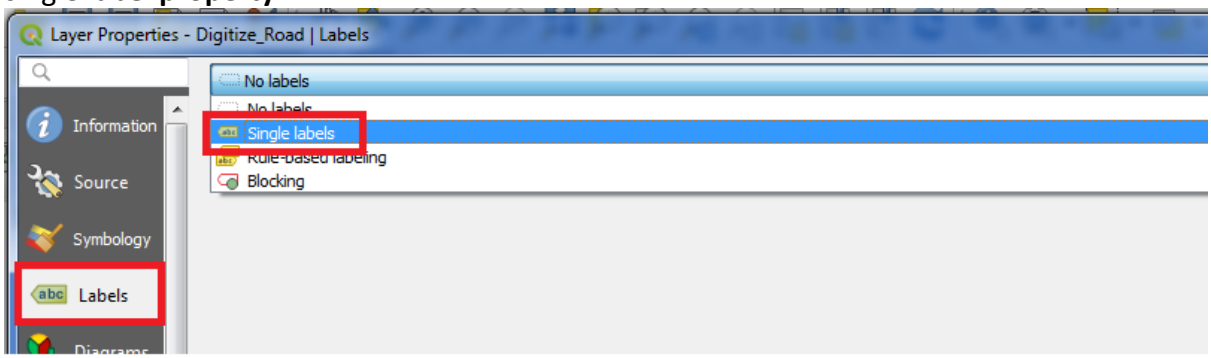
➔ **Road layer** :

- To plot road **click** on **Add Line Feature**.

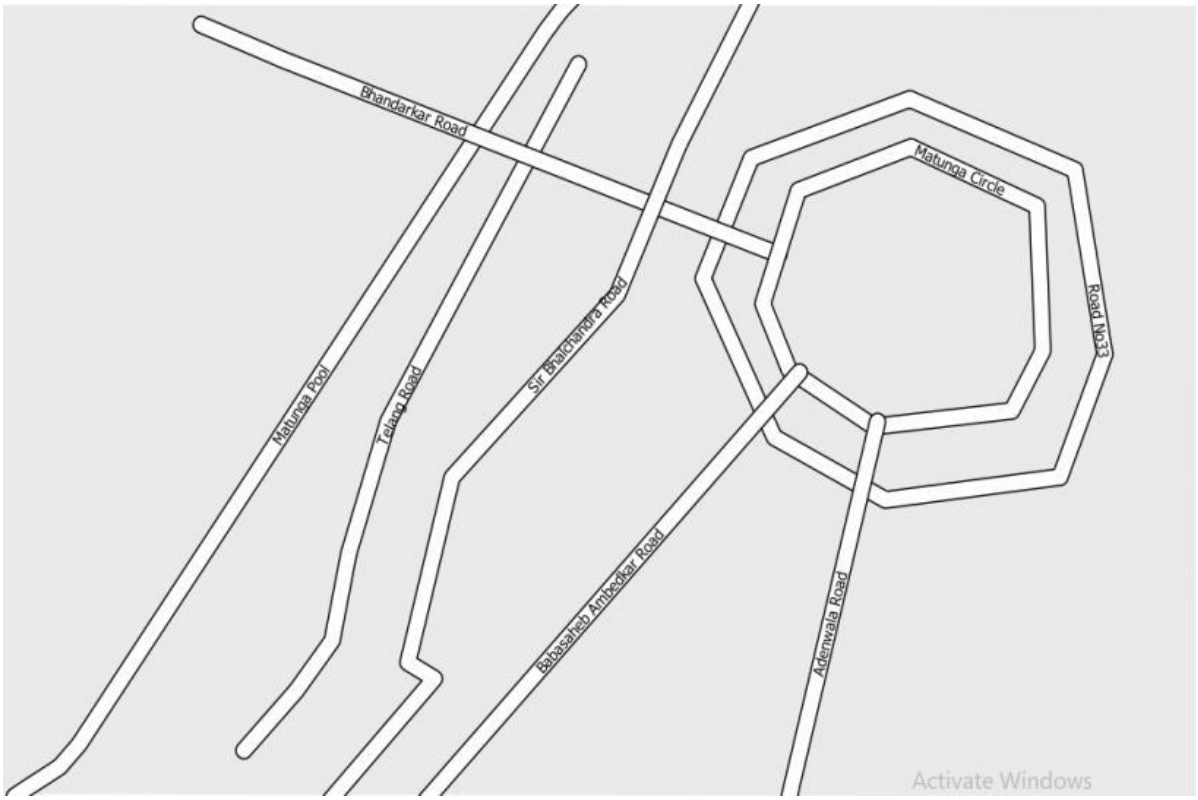
- Click on the map where you want to draw line.
- Once you are done then **right click** on map (**Dotted line** turn into **solid line**)
- save your data
- set **style** for Roads in the same way as we have done for polygon



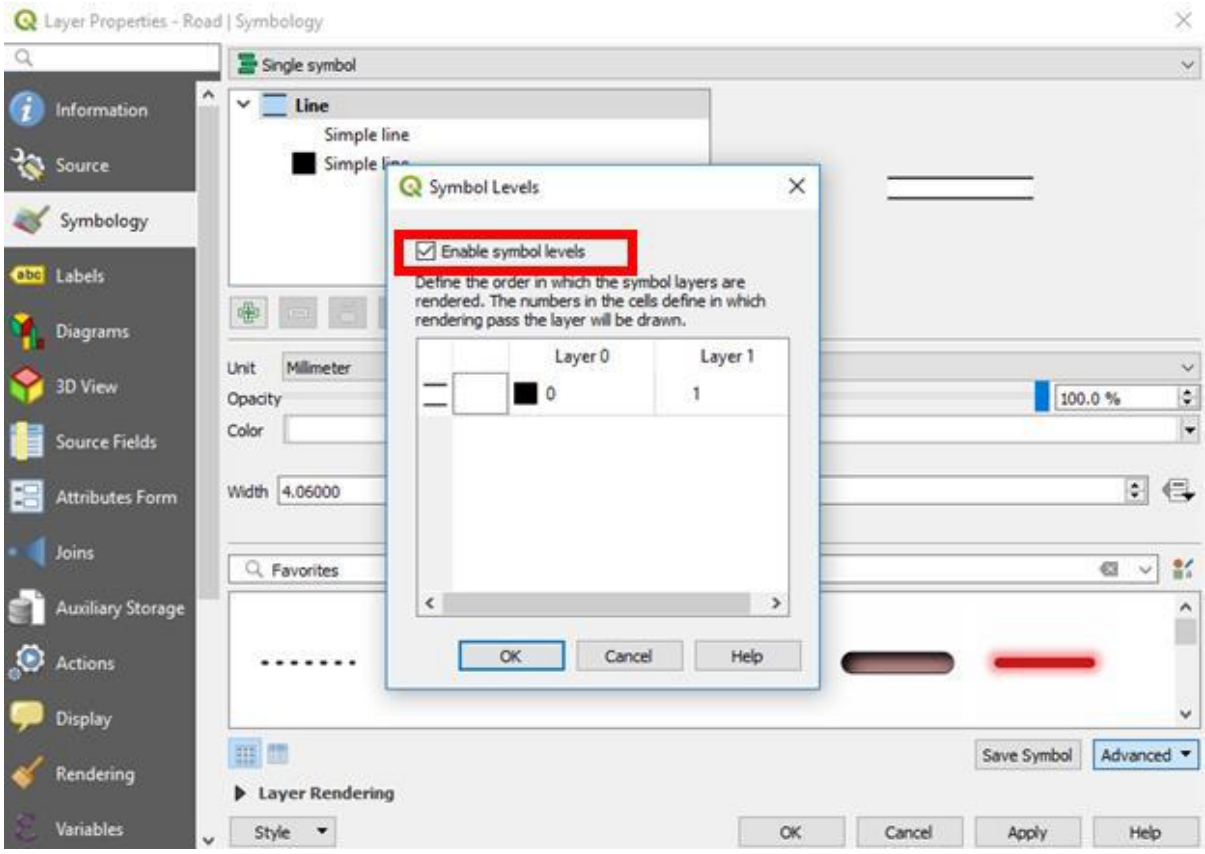
- To label your roads **Right click** on **Road layer** .Go to **properties** window then select label and set single **label property**



- Roads will look like these

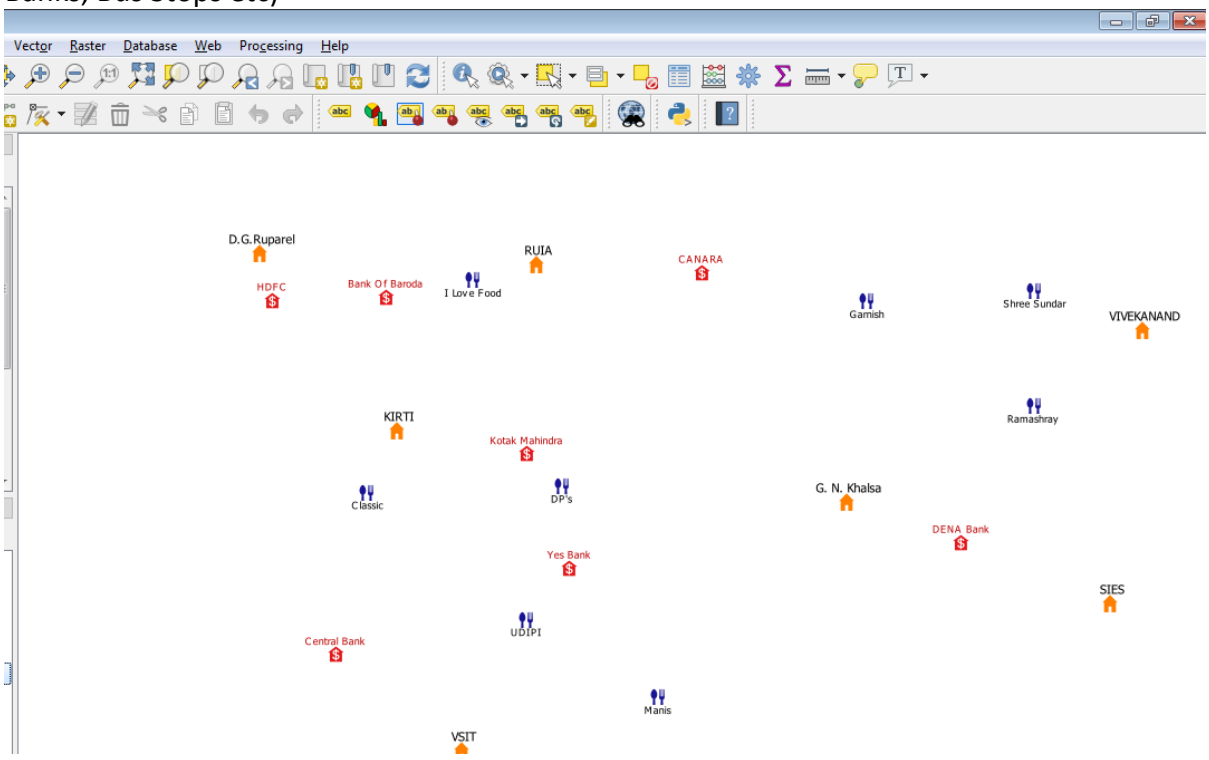


- To merge roads
- Go to **properties** of road then select **symbology**. click on **Advanced button** select Symbol levels.
- Check **Enable symbol levels** option



C. Create Point vector layer

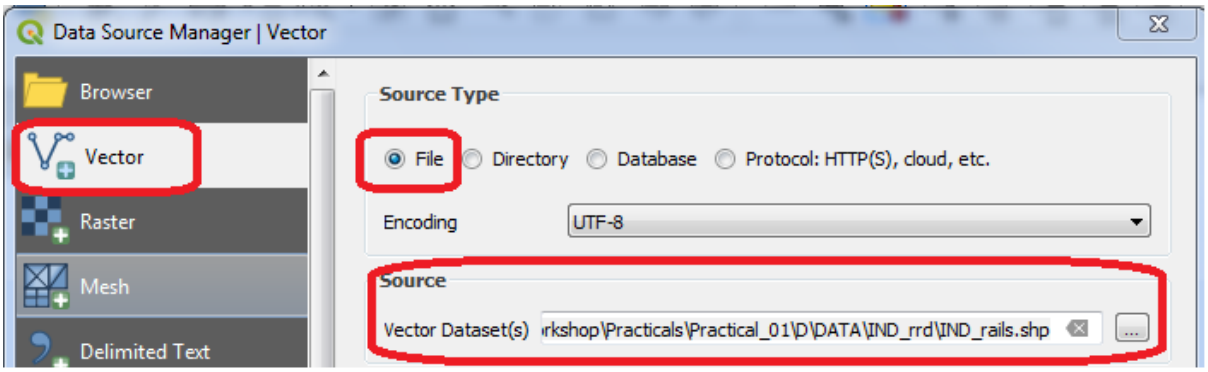
A. Repeat same steps to add point layers as we have done in previous layers.(For ATM, Restaurants, Banks, Bus Stops etc)



Final output:

d) Calculating line lengths and statistics

- Go to Layer > Add Layer > Add Vector Layer
- Add the following file to project



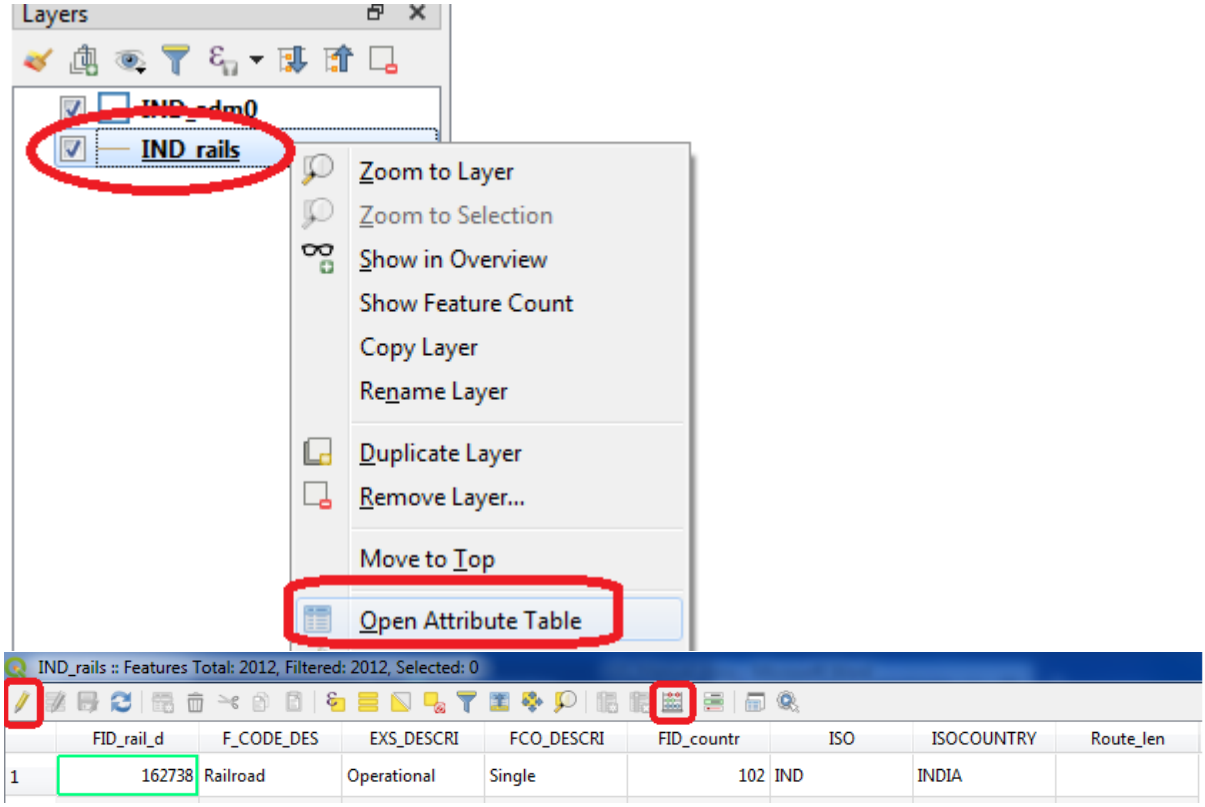
"\GIS_Workshop\Practicals\Practical_01\D\DATA\IND_rrd\IND_rails.shp"
Press “ADD”

- Also add India Administrative Map

“GIS_Workshop\Practicals\Practical_01\D\DATA\IND_adm\IND_adm0.shp”

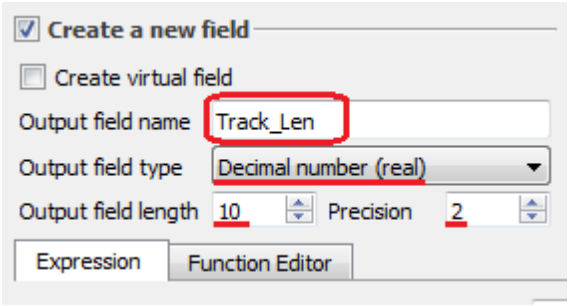
- Double Click on IND_adm0
- Select any outline style from below given options.
- The display window will appear like

- In Layer Pane, Right click on IND_rails > Open Attribute Table



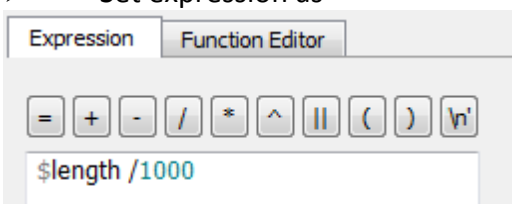
- Press Toggle Editing button using button, on Attribute table window toolbar.
- Press Open Field Calculator using button.

- Set the output field as “Track_Len”, field type to “Decimal Number”.

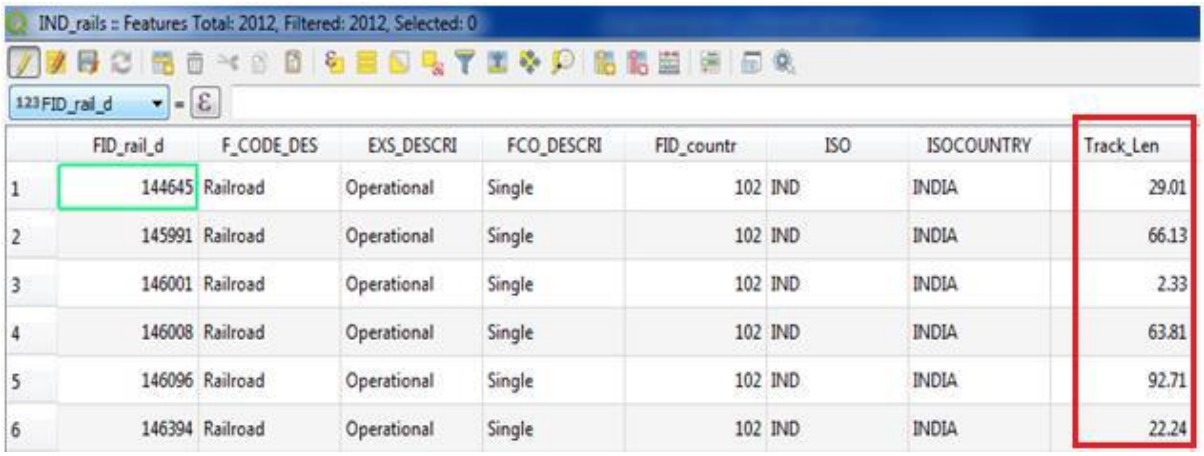


- From Function List search $length or go to Geometry > Select $length

- Set expression as



➢ A new column is added to the attribute table with value representing the length of track in KM.



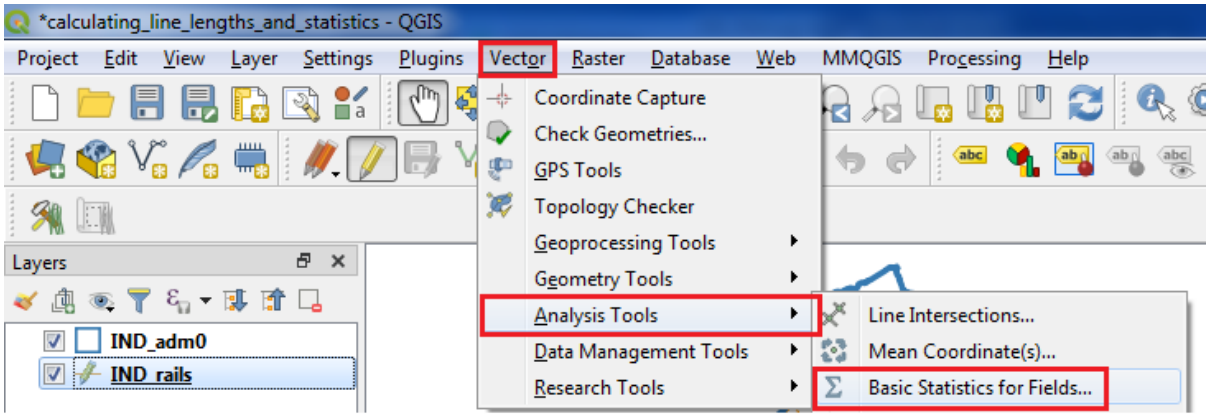
	FID_rail_d	F_CODE_DES	EXS_DESCRI	FCO_DESCRI	FID_countr	ISO	ISOCOUNTRY	Track_Len
1	144645	Railroad	Operational	Single	102	IND	INDIA	29.01
2	145991	Railroad	Operational	Single	102	IND	INDIA	66.13
3	146001	Railroad	Operational	Single	102	IND	INDIA	2.33
4	146008	Railroad	Operational	Single	102	IND	INDIA	63.81
5	146096	Railroad	Operational	Single	102	IND	INDIA	92.71
6	146394	Railroad	Operational	Single	102	IND	INDIA	22.24

➢ Press CTRL+S or click on Save Edits option on tool bar

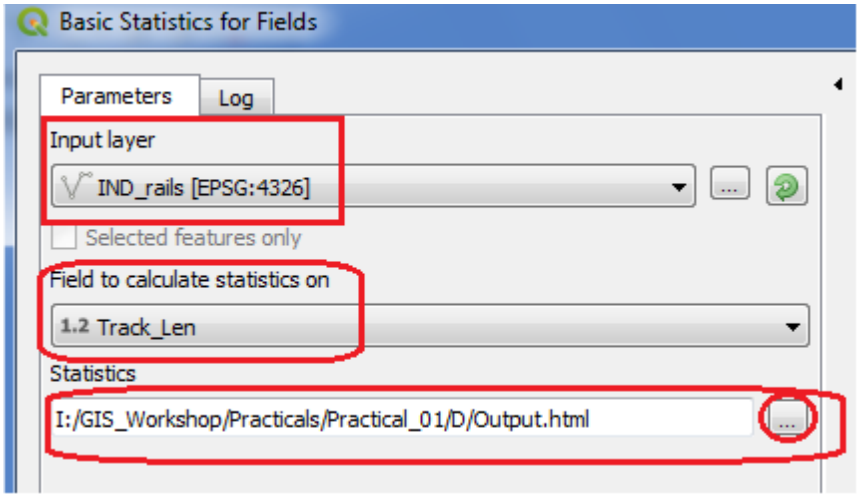
➢ Close the attribute table window.

➢ For calculating the total length of Railway tracks in India.

➢ Select Vector > Analysis Tools > Basic Statics for Fields



➢ Select IND_rails layer from input layer. And select Track_Len in “Field to Calculate statistics on”



- Press RUN

- Open the "**output.html"** file to get the field statistics.

  Analyzed field: Track_Len
  Count: 2012
  Unique values: 1608
  NULL (missing) values: 0
  Minimum value: 0.0
  Maximum value: 400.48
  Range: 400.48
  Sum: 60479.320000000014
  Mean value: 30.059304174950306
  Median value: 14.04
  Standard deviation: 39.483220276624444
  Coefficient of Variation: 1.313510786770889
  Minority (rarest occurring value): 0.03
  Majority (most frequently occurring value): 0.0
  First quartile: 3.35
  Third quartile: 42.855000000000004
  Interquartile Range (IQR): 39.505

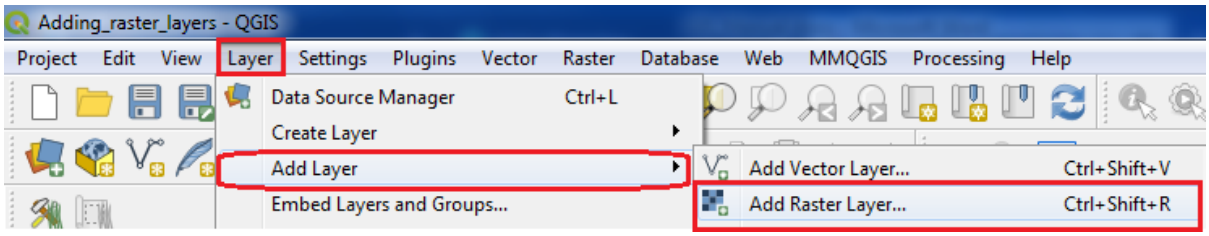
- The above statistics show that the total length of Railway track in India is **60,479.32 KM**.

PRACTICAL NO:- 2

AIM:- Exploring and Managing Raster data
a) Adding raster layers,
b) raster styling and analysis,
c) raster mosaicking and clipping

a) Adding raster layers

- From menu bar select Layer > Add Layer > Add Raster Layer



- Select Gridded Population of the World (GPW) v3 dataset from Columbia University, Population Density Grid for the entire globe in ASCII format and for the year 1990 and 2000.

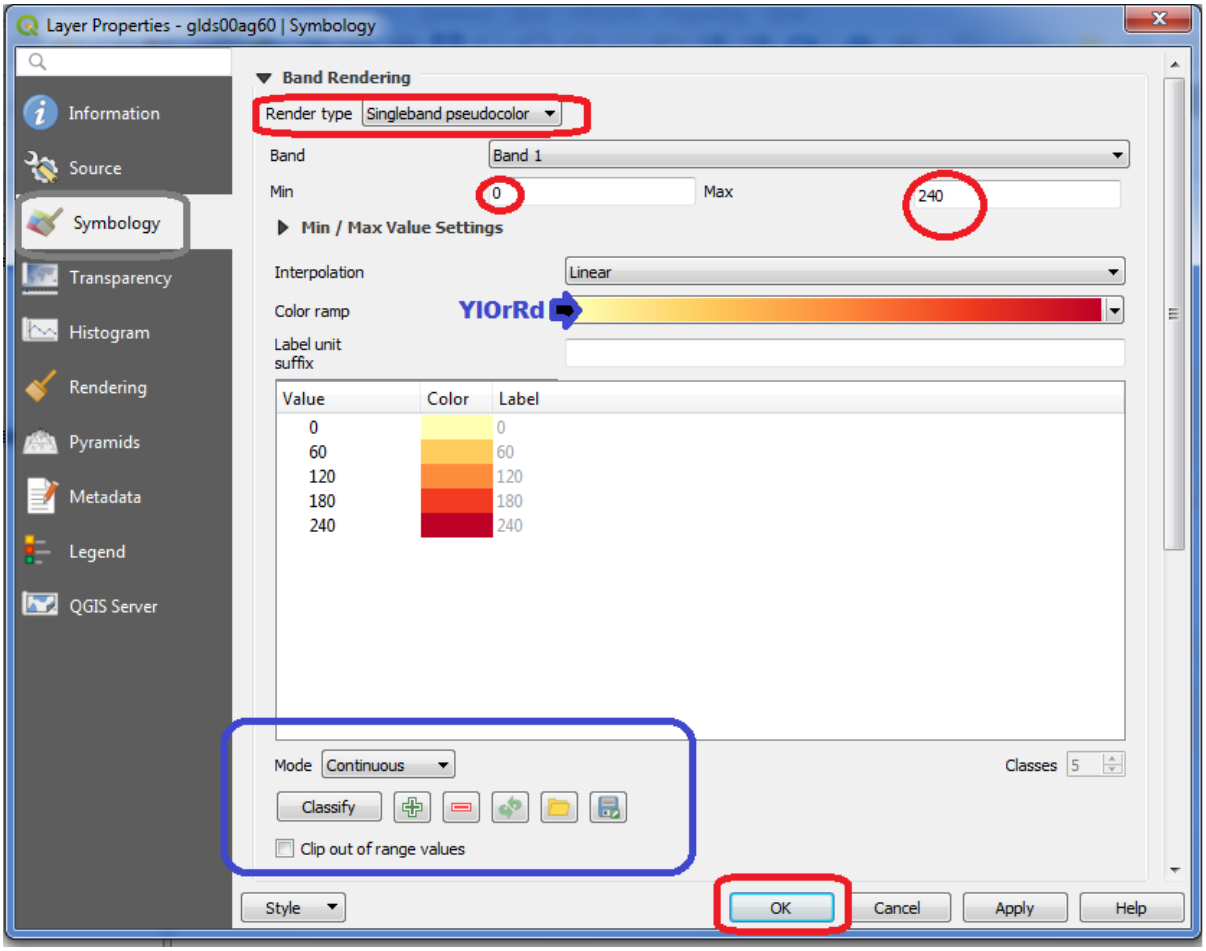
  "\GIS_Workshop\Practicals\Practical_02\A\Data\gl_gpwv3_pdens_90_ascii_one\glds90ag60.asc"

  "\GIS_Workshop\Practicals\Practical_02\A\Data\gl_gpwv3_pdens_90_ascii_one\glds00ag60.asc"

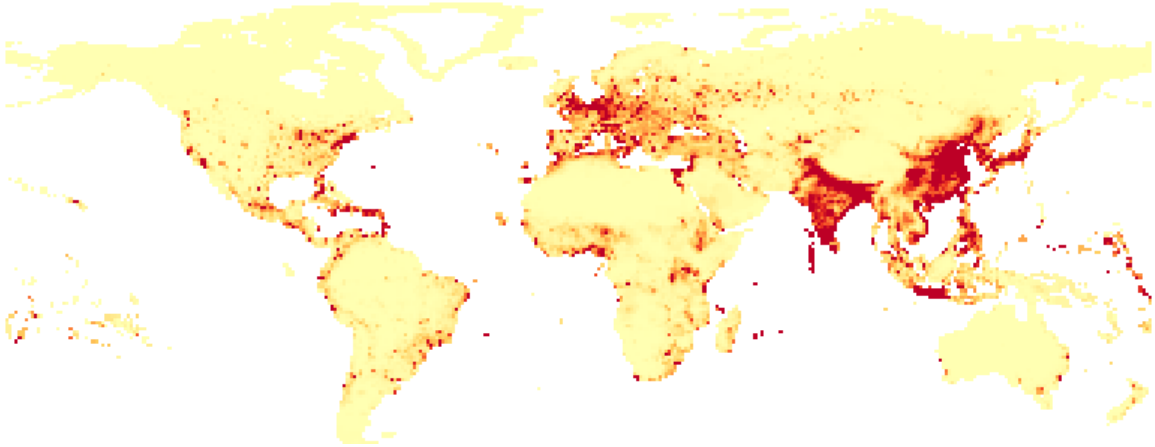
- Go to Project > Properties OR Press the Set CRS option on bottom right corner.
  Select WGS 84 EPSG: 4326 and Press OK

b) **Raster Styling and Analysis**

- To start with analysis of population data, convert the pixel from grayscale to Color.
- Select “glds90ag60.asc” Layer form layer Pane > select property OR double click on it.
- Select symbology



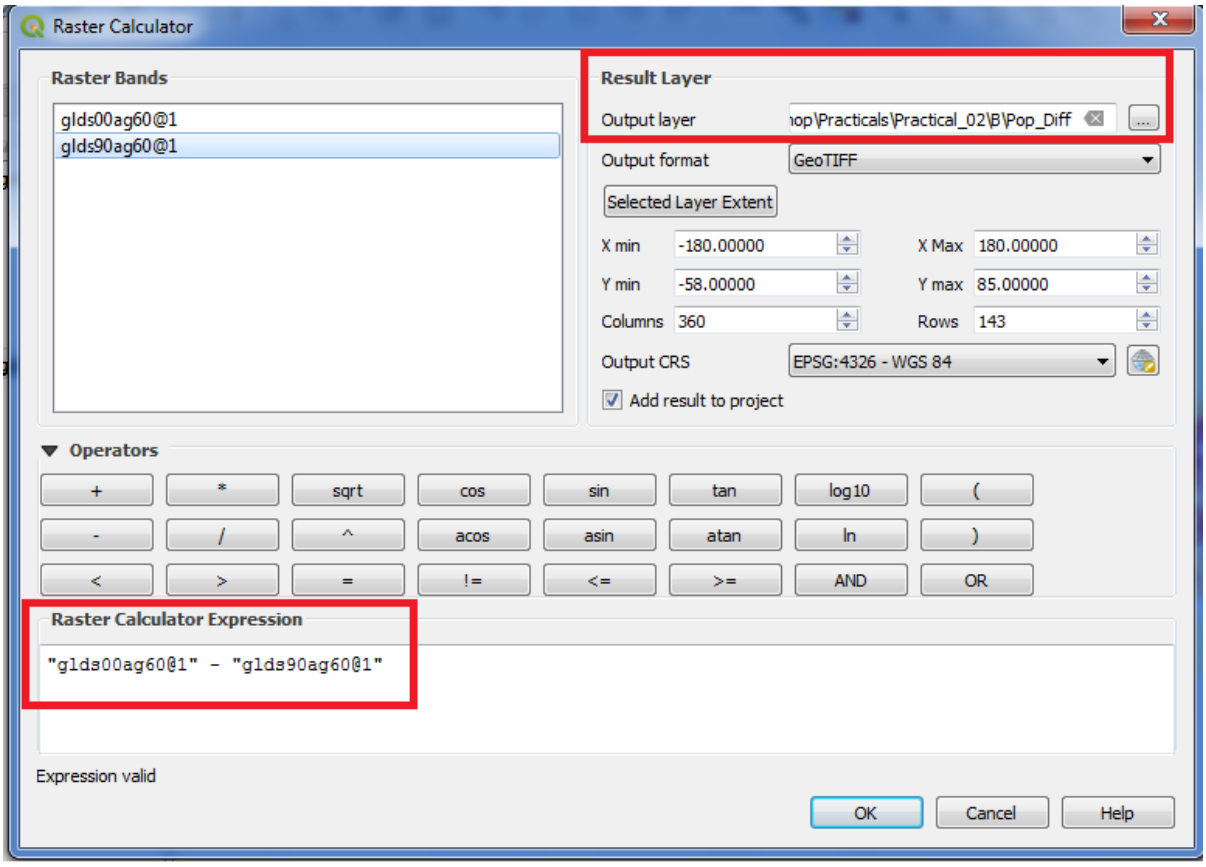
- Press “APPLY”
- Repeat the same for “glds00ag60.asc” Layer



Layer output after applying style.

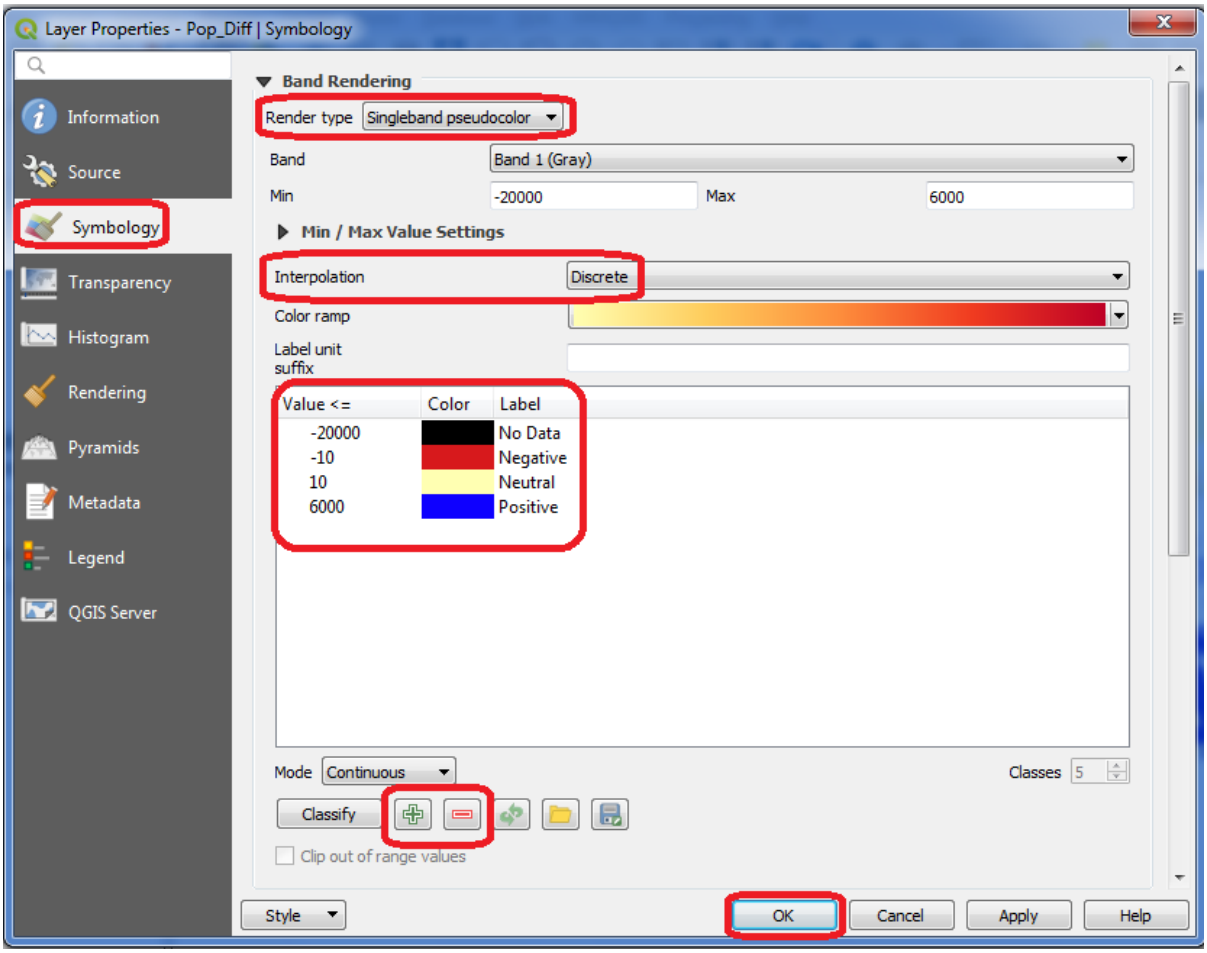
- The objective this experiment is to analyze raster data, as an example we will find areas with largest population change between 1990 and 2000, by calculating the difference between each pixel values.

- Go to Raster > Raster Calculator

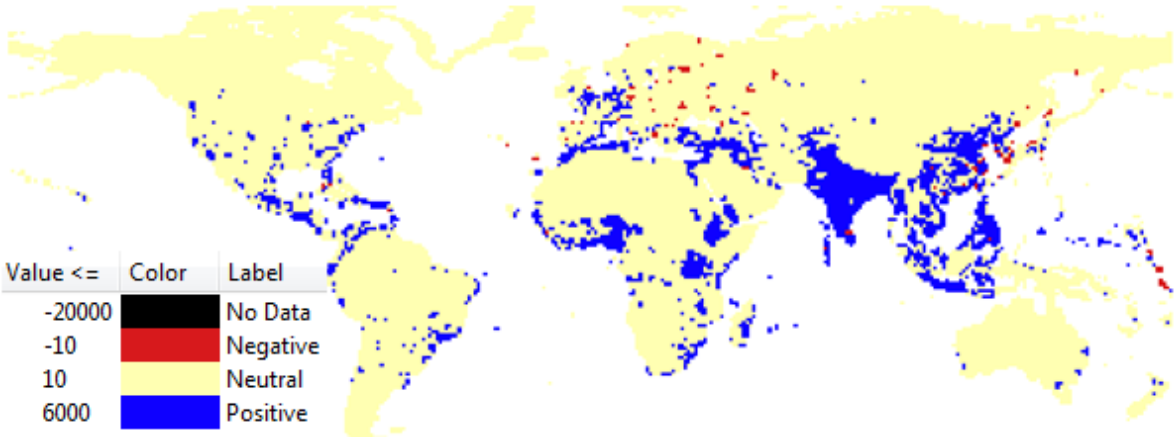


- Put the expression "glds00ag60@1" - "glds90ag60@1"

- Select the output file location & name and Press OK.
- Remove the other two layers i.e. glds00ag60.asc and glds90ag60.asc
- Double click on pop_diff layer.
- Select > symbology



- Set Render Type to “Single band Pseudo color”, Interpolation as Discrete, and remove all
- classification and add as shown in figure above using button. After all settings press “OK”.
- Layer will appear like



- Explore an area of your choice and check the raster band value using to verify the classification rule.

- The red pixel shows negative changes and blue shows positive changes.

c) Raster Mosaicking and Clipping

A **mosaic** is a combination or merge of two or more images.

In GIS, a single raster dataset can be created from multiple raster datasets by mosaicking them together

In many cases, there will be some overlap of the raster dataset edges that are being mosaicked together, as shown below.

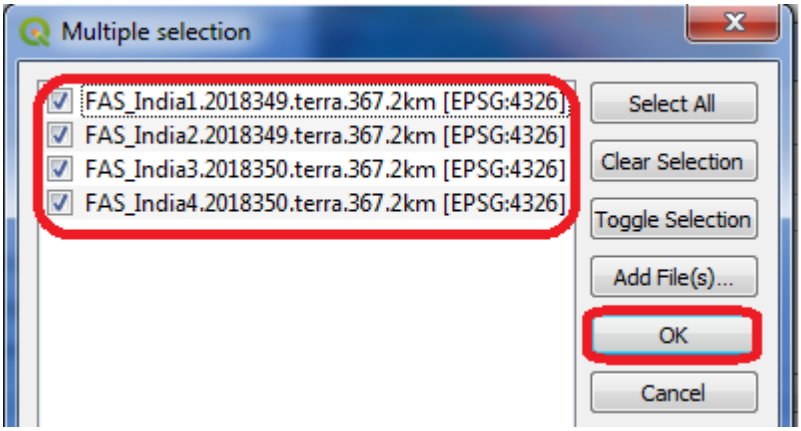
These overlapping areas can be handled in several ways; for example, you can choose to only keep raster data from the first or last dataset, you can blend the overlapping cell values using a weight-based algorithm, you can take the mean of the overlapping cell values, or you can take the minimum or maximum value. When mosaicking discrete data, the First, Minimum, or Maximum options give the most meaningful results. The Blend and Mean options are best suited for continuous data. If any of the input rasters are floating point, the output is floating point. If all the inputs are integer and First, Minimum, or Maximum is used, the output is integer.

- Go to Layer > Add Layer > Add Raster Layer.

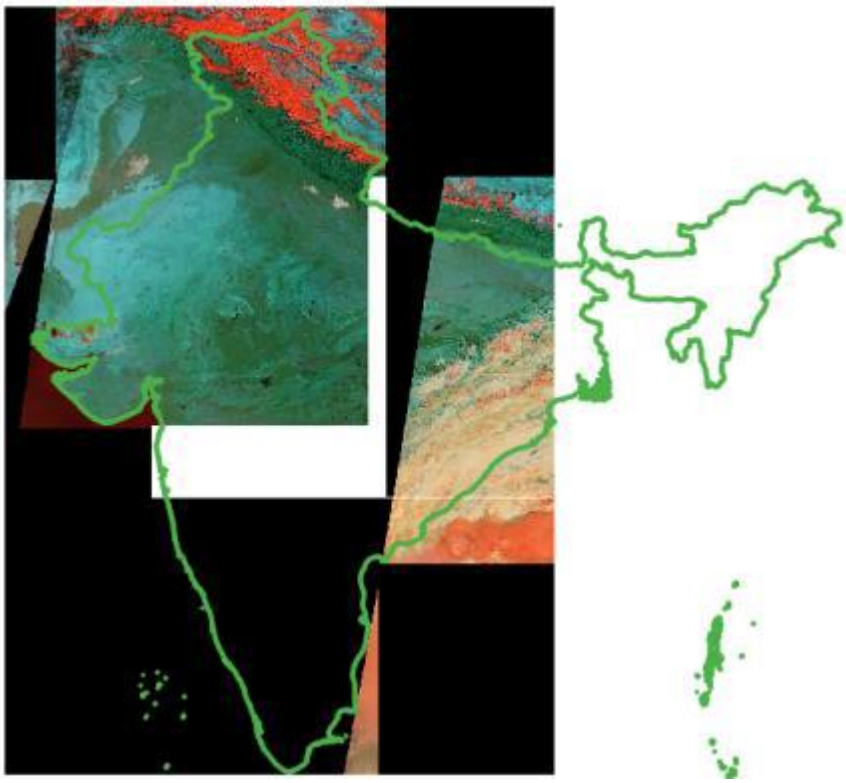
- Select the following "**.tif**" raster images for India from data folder.

FAS_India1.2018349.terra.367.2km.tif
FAS_India2.2018349.terra.367.2km.tif
FAS_India3.2018349.terra.367.2km.tif
FAS_India4.2018349.terra.367.2km.tif

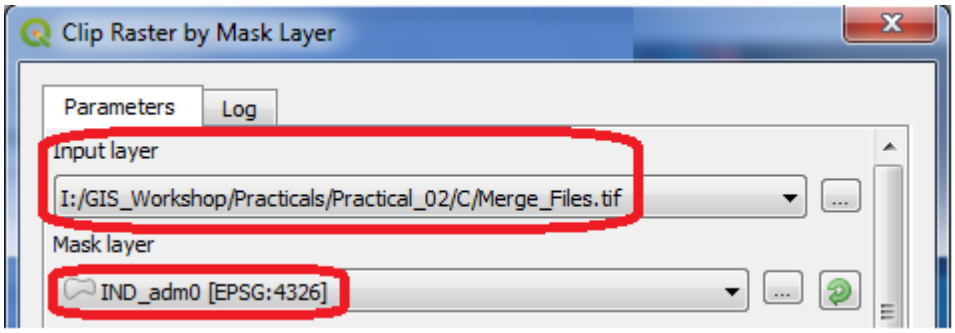
- Press open
- In data source manager | Raster window click Add.
- Go to Raster > Miscellaneous > Merge
- Select all layers and Press OK.



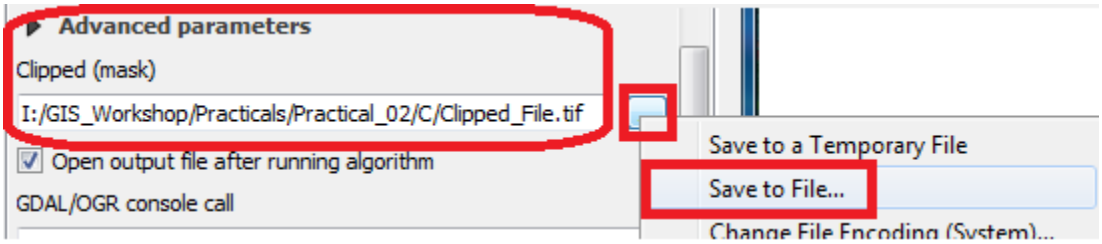
- In Merge dialog window select a file name and location to save merged images.
- Save the file to “GIS_Workshop/Practicals/Practical_02/C/” location with the name as Merge_Files.tif
- Press Run and after completion of operation close the Merge window dialog box.
- You can now deselect individual layers from layer pane and only keep the merged raster file.
- Go to Layer > Add Vector Layer > Select \GIS_Workshop\Practicals\Practical_02\C\IndiaAdminBoundry\IND_adm0.shp file.
- From layer properties > select > select any one of the following
- The result will be



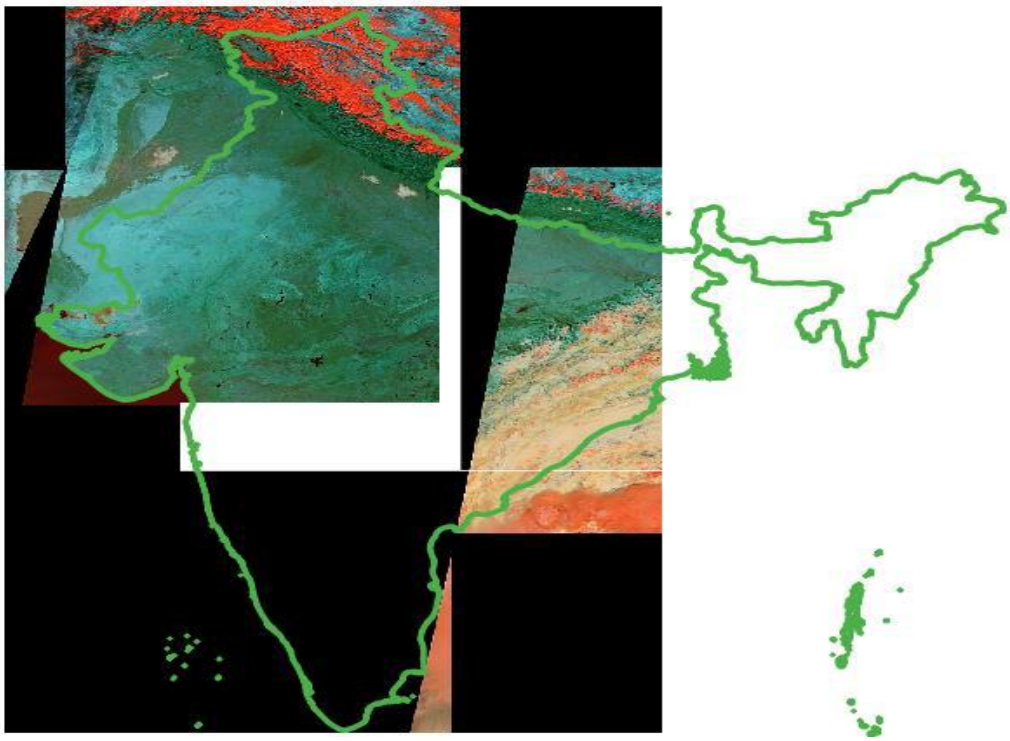
- Go to Raster > Extraction > Clip Raster by Mask Layer
- Select the merge raster image as input and Ind_adm0 as mask layer.



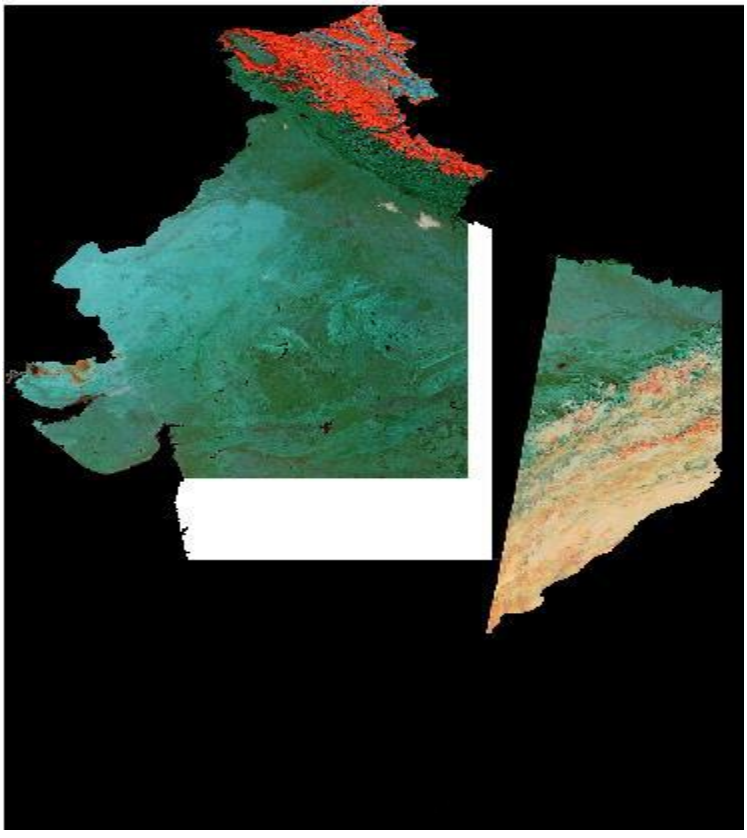
- Select a file name and location for clipped raster as /Practical_02/C/Clipped_File.tif.



- Press **RUN**.



After Clipping

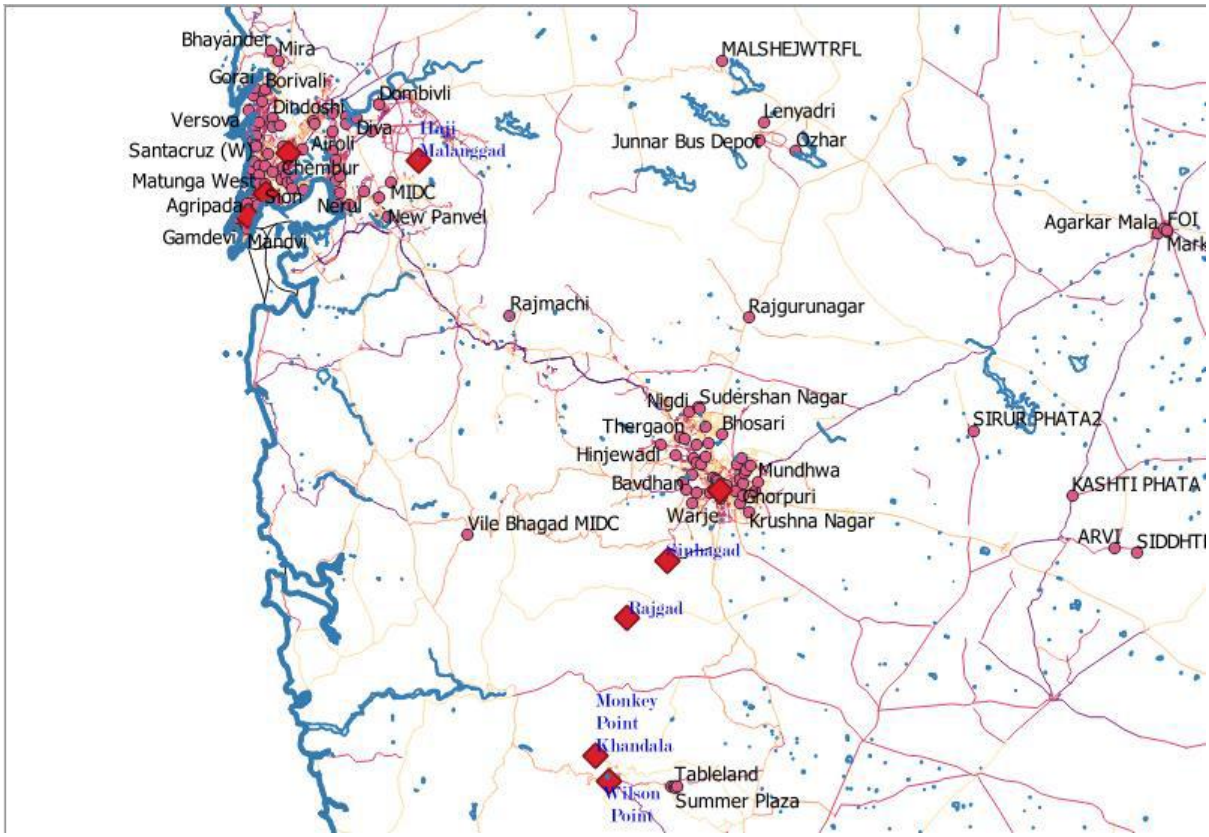


PRACTICAL NO:- 3

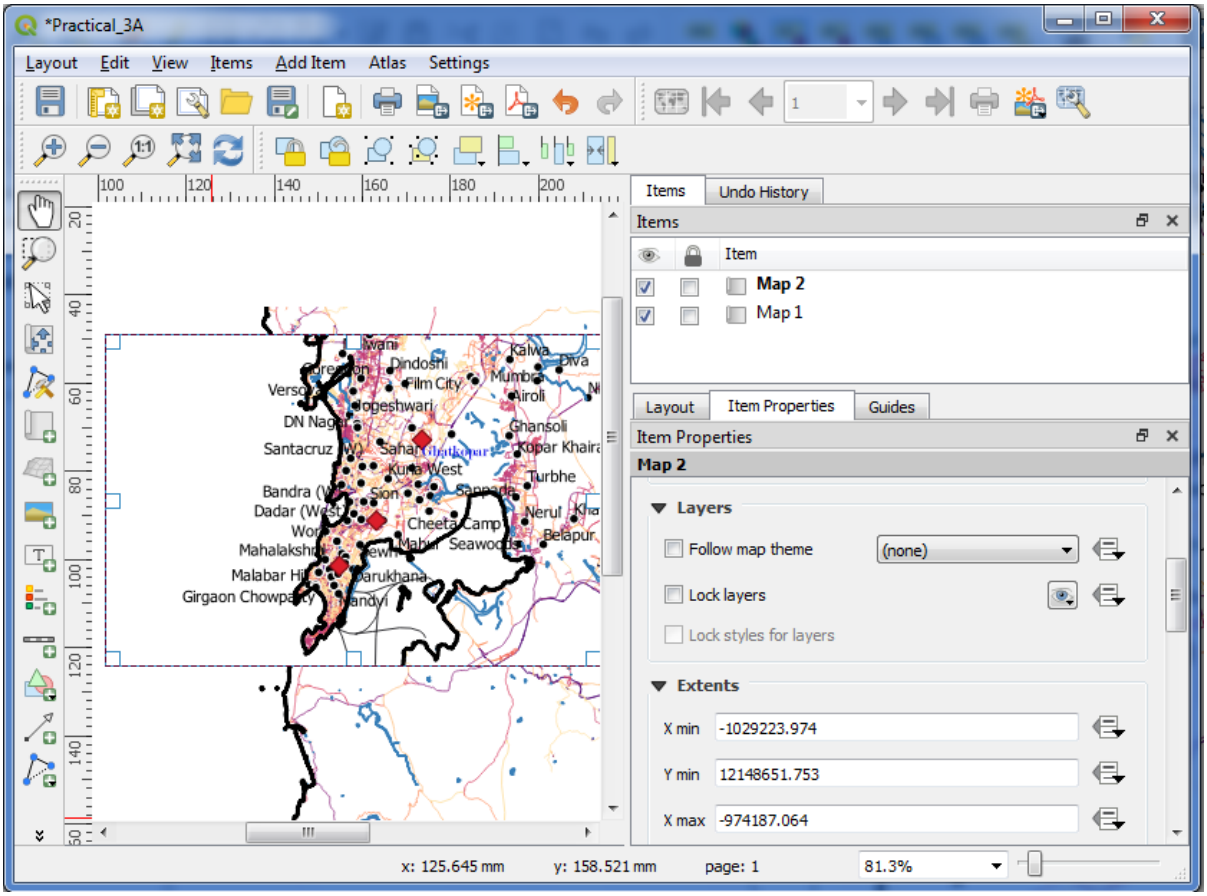
a) Making a Map,
b) Working with Attributes,
c) Importing Spreadsheets or CSV files Using Plugins,
d) Searching and Downloading OpenStreetMap Data

a) Making a Map

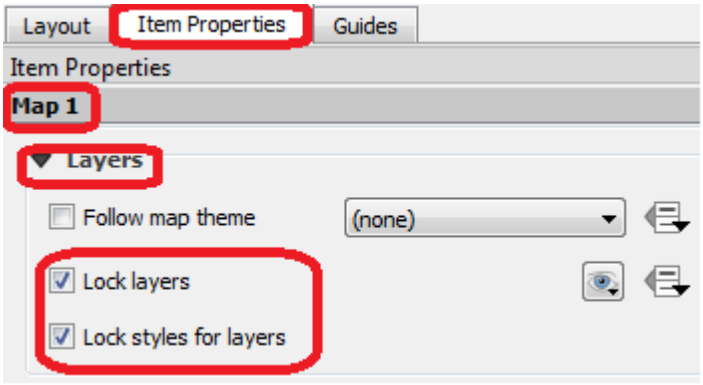
- Create a new Thematic Map or open and existing one
- Consider the following map as an example map



- Go to Project > New PrintLayout
- A new Print Layout window will open
- Select Add Item > Add Map

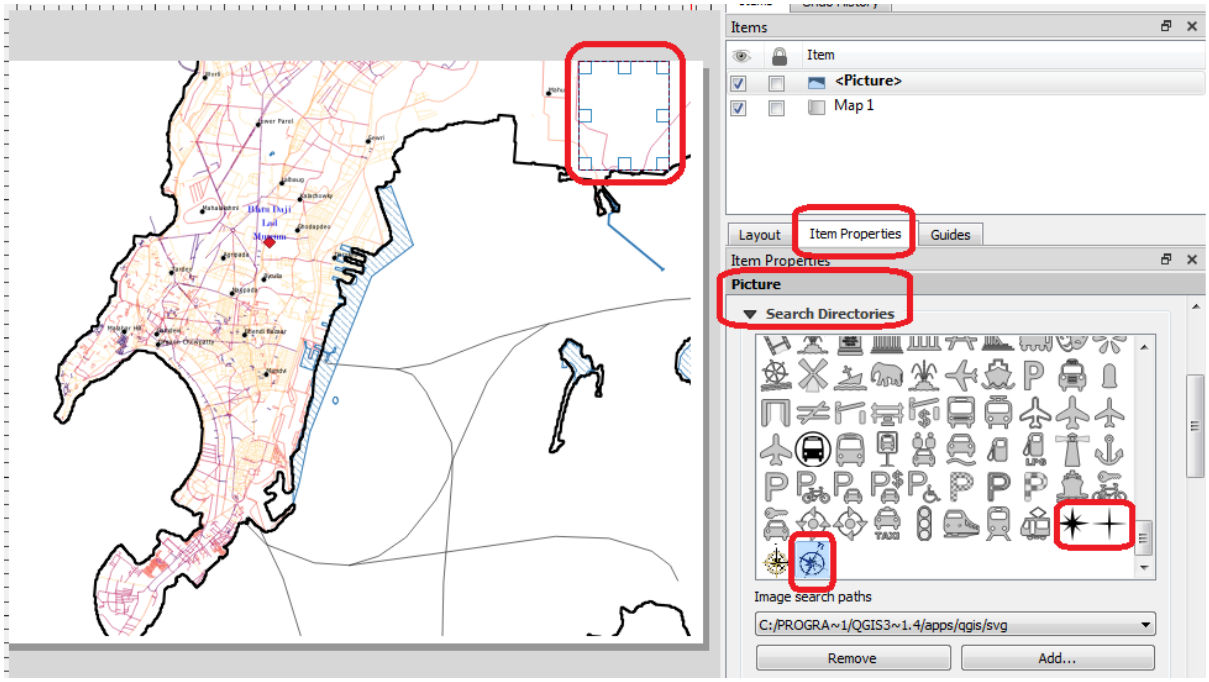


- After adding map go to ItemProperties > Map1 > Layers
  Check on Lock Layers and Lock Styles for Layers



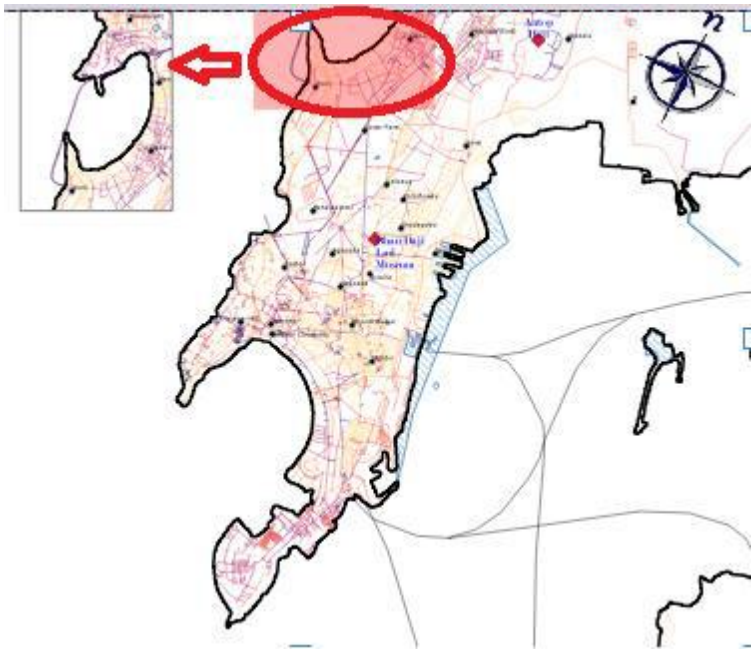
This will ensure that if any change in layers or change their styles, the Print Layout view will not change.

- Go to Add Item > Add Picture > Place a picture box at appropriate location

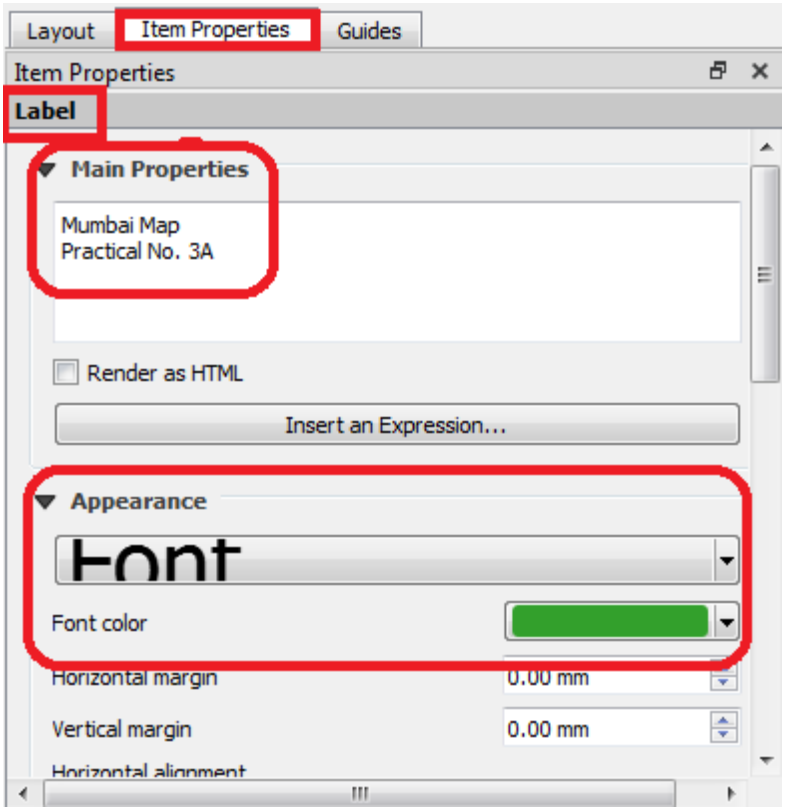


- Also adjust Image Rotation to its appropriate value.
- Item Properties > Image Rotation
- Add an inset Using Add Item > Add Picture > Select an area to be highlighted on main Map.
- Set a frame for Inset by enabling the check box for Frame.
- To highlight the area shown in Inset
- Select the Picture representing main Map from Items pane.
- In Item Properties > Overviews > using icon add an overview.
- Select the checkbox Draw Overview
- Name the Picture object representing inset (Map1 in our case).

- The Print Layout will appear like

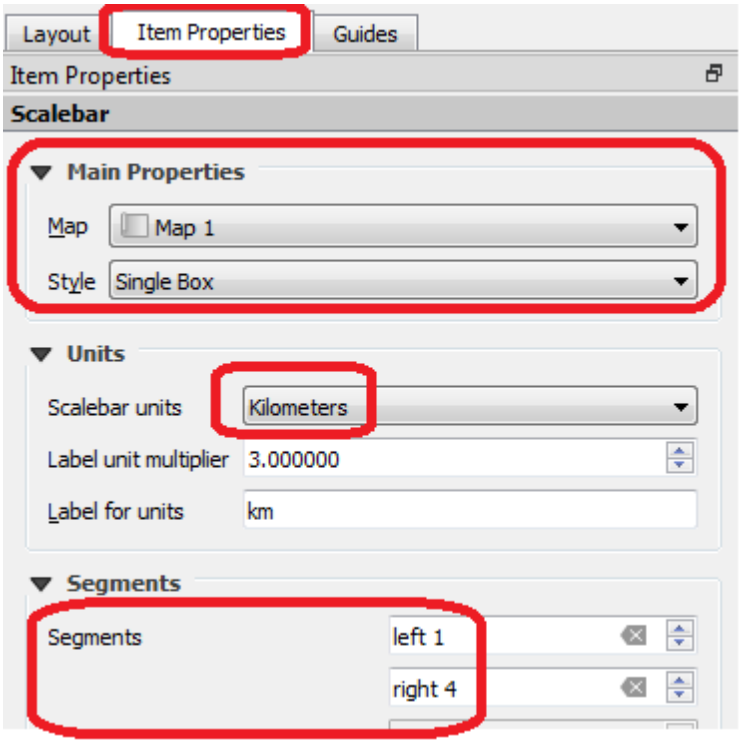


- Add Item > Add Label
- Change the Label text To “Mumbai Map”, Set appropriate font size and color using Item Properties > Main Properties.

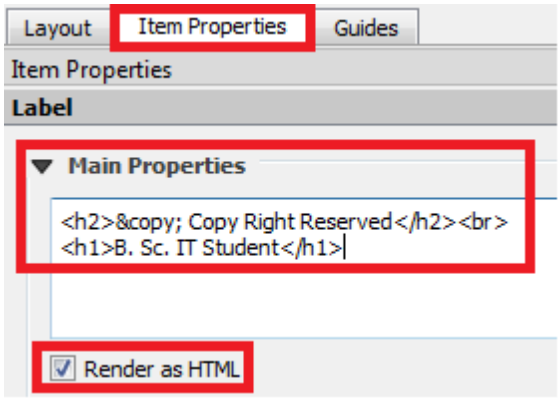


- Add Item > Add Legend > Place the legend indicator at appropriate location.
- Uncheck auto update and use suitable legend indicator label.

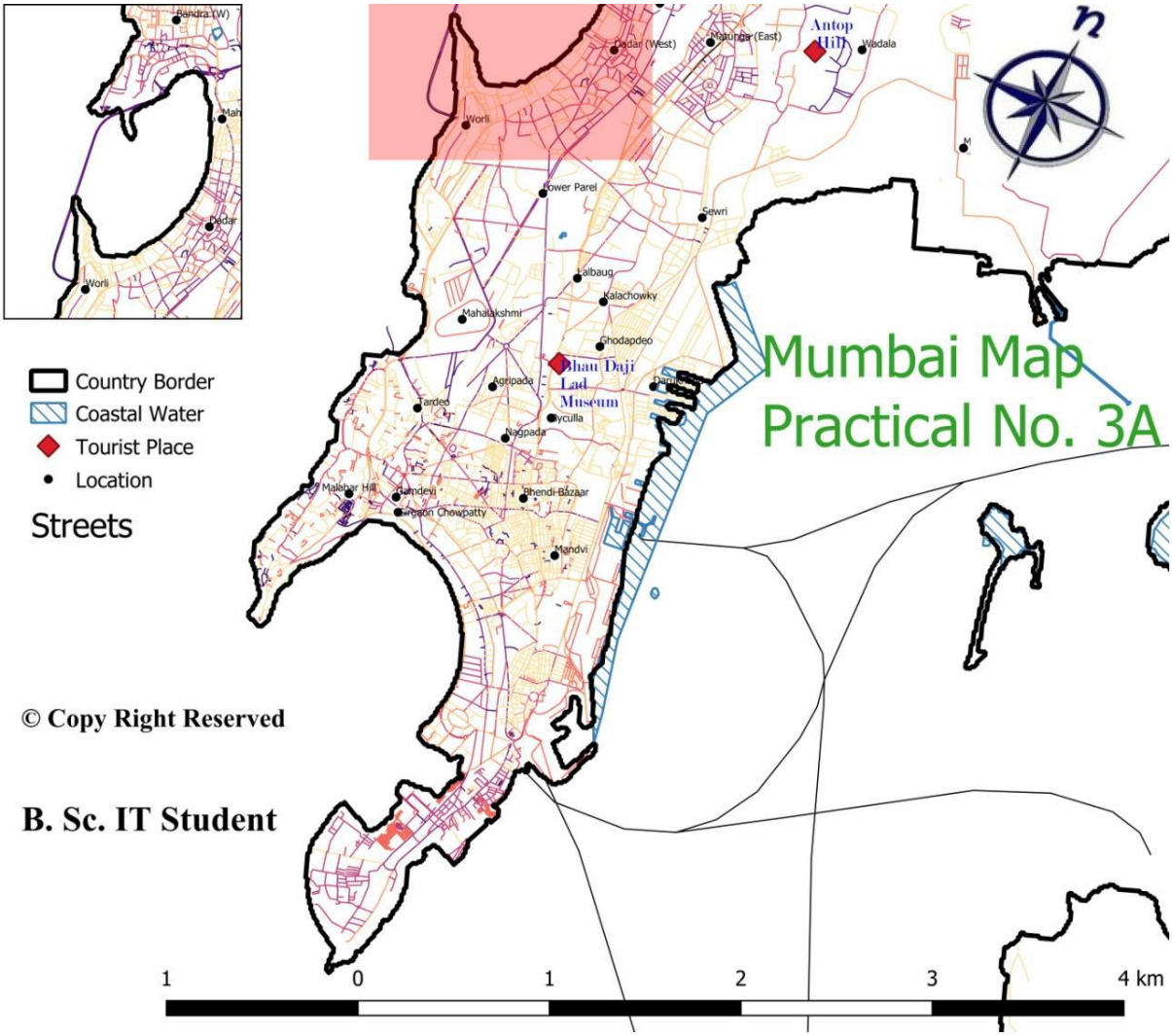
- The Print Layout will appear
- Add Item > Add Scale Bar



- Add Item > Add Label > Add a Label using HTML rendering

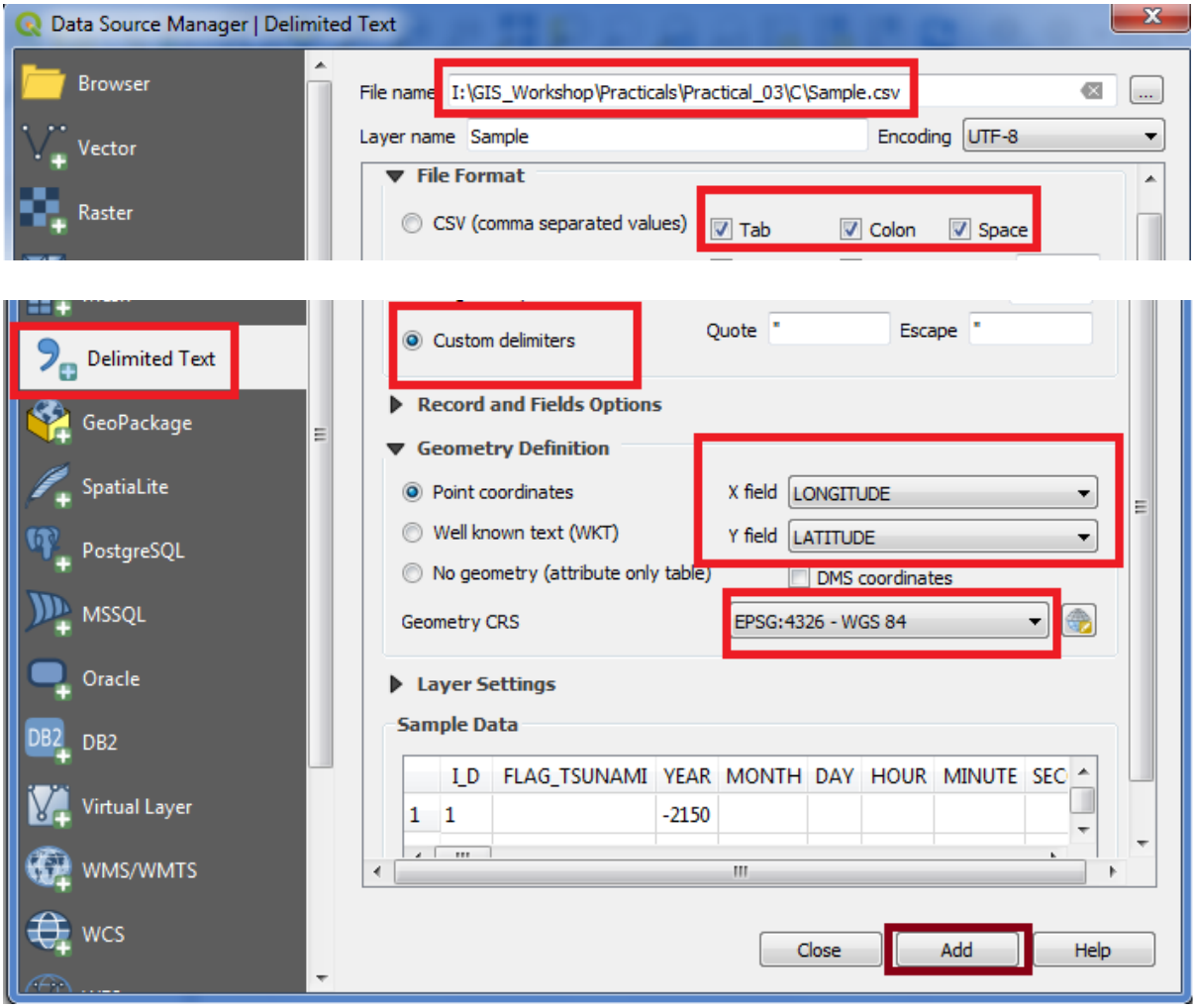


- A Map can be saved in Image or PDF using Layout > Export as Image / Export as PDF
- Save the Map to a location appropriate location as PDF or Image.
- Open the PDF or Image from location.

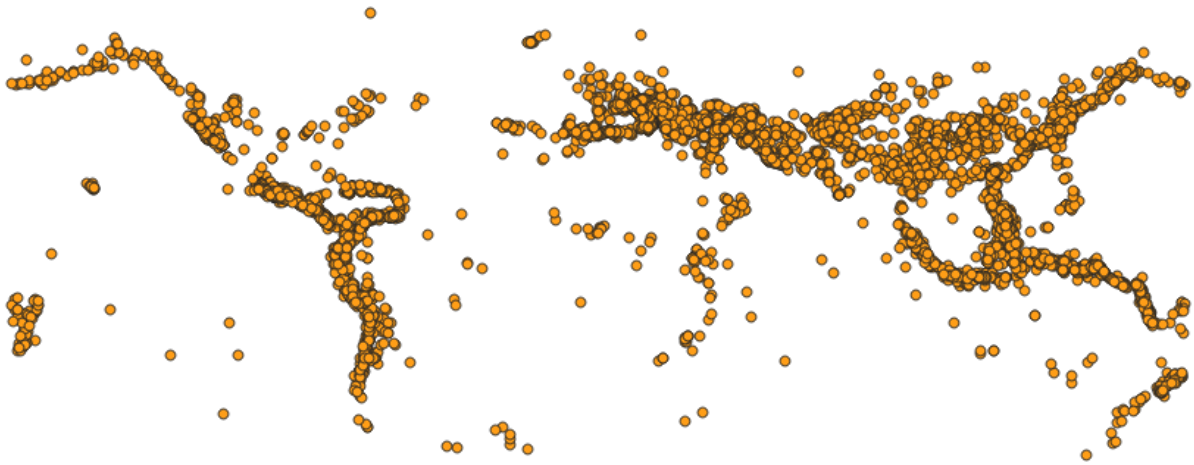


b) Importing Spreadsheets or CSV files

- Many times the GIS data comes in a table or an Excel spreadsheet or a list lat/long coordinates, therefore it has to be imported in a GIS project.
- Sample file for Earthquake data will be used in this practical.
- Go to Layer > Add Layer > Add Delimited text Layer
- Data Source Manager | Delimited Text window will appear
- Select the \GIS_Workshop\Practicals\Practical_03\C\Sample.csv file from data folder.

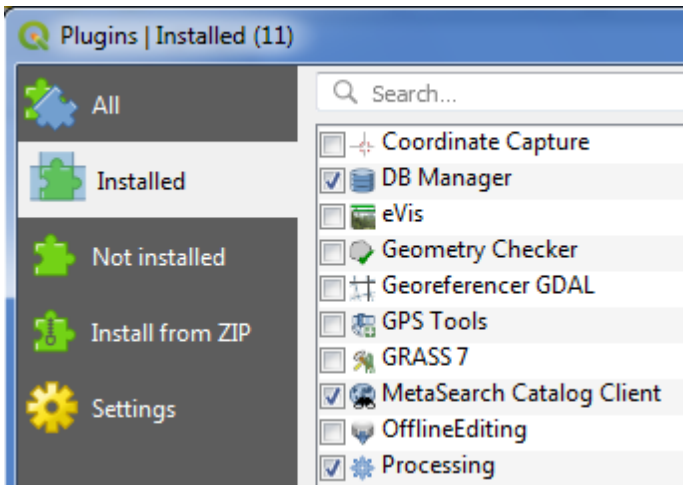


- Press ADD and close the window.
- Output:



c) Using Plugins

- Core plugins are already part of the standard QGIS installation. To use these, just enable them.
- Open QGIS. Click on Plugins > Manage and Install Plugins....



- **To enable a plugin**, check on the checkbox next to Plugin. This will enable the plugin to use it.
- **External plugins** are available in the QGIS Plugins Repository and need to be installed by the users before using them.
- Click on Not Installed or Install from ZIP.
- Once the plugin is downloaded and installed, you will see a confirmation dialog.
- Click on Plugins > <<new Plugin Name>>
- The Plugin if marked **Experimental plugin** can be installed, from Setting > check on
- A tab will be added to Plugin Manager Window.
- Click on a plugin name and Click Install.

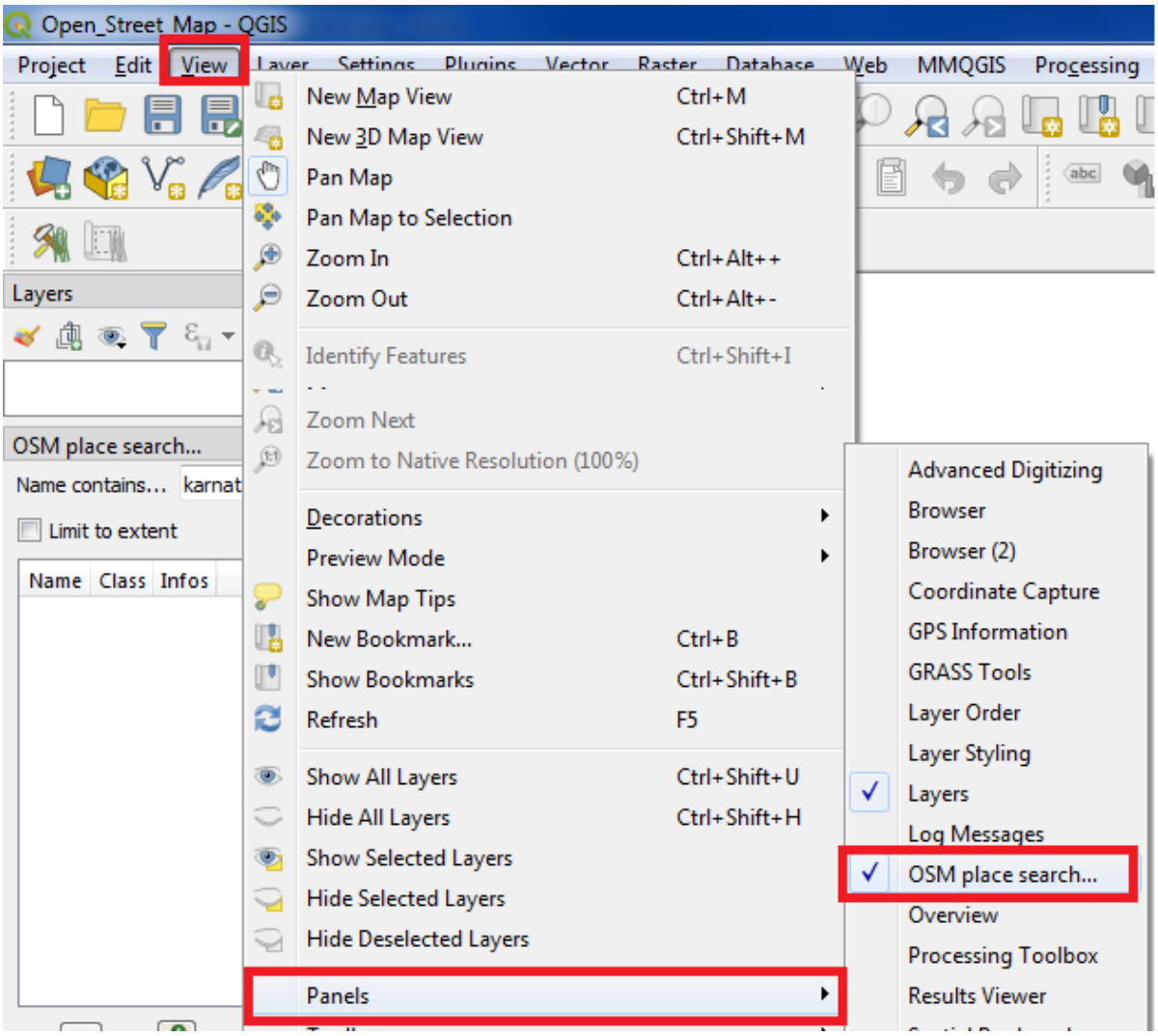
d) Searching and Downloading OpenStreetMap Data

OpenStreetMap (**OSM**) created by Steve Coast in the UK in 2004 is a collaborative project to create a free editable map of the world. Rather than the map itself, the data generated by the project is considered its

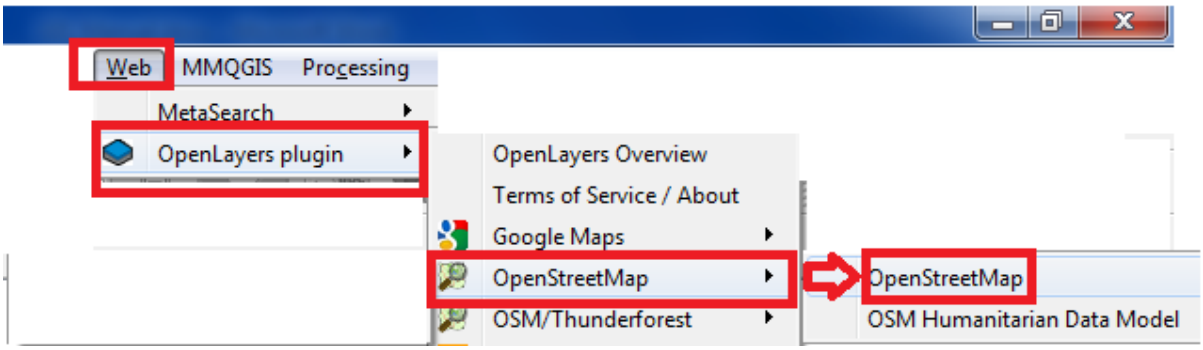
primary output. The creation and growth of OSM has been motivated by restrictions on use or availability of map information across much of the world, and the advent of inexpensive portable satellite navigation devices.

- Add "**Open Layer"** and "**OSM Search"** Plugin from Not Installed option from Plugin Manager Dialog Box.

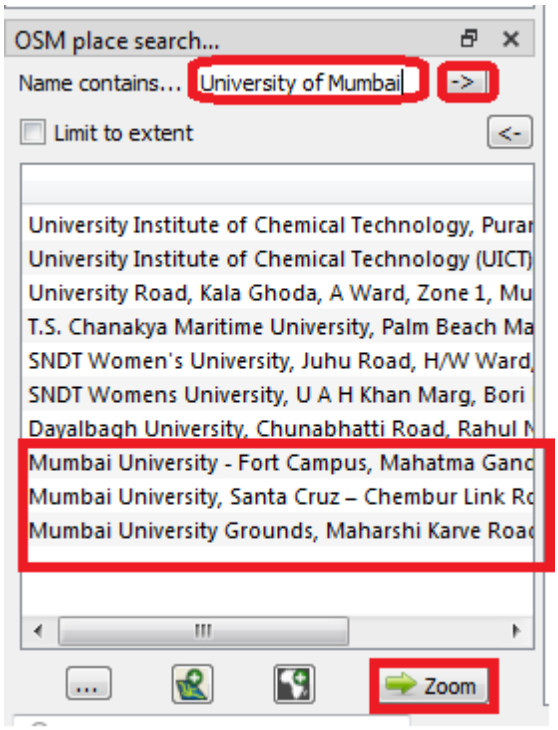
- The **OSM Place Search** plugin will install itself as a *Panel* in QGIS, if not go to View > Panels > select OSM Place Search.



- Go to Web > OpenLayer Plugin and select Open Street Map

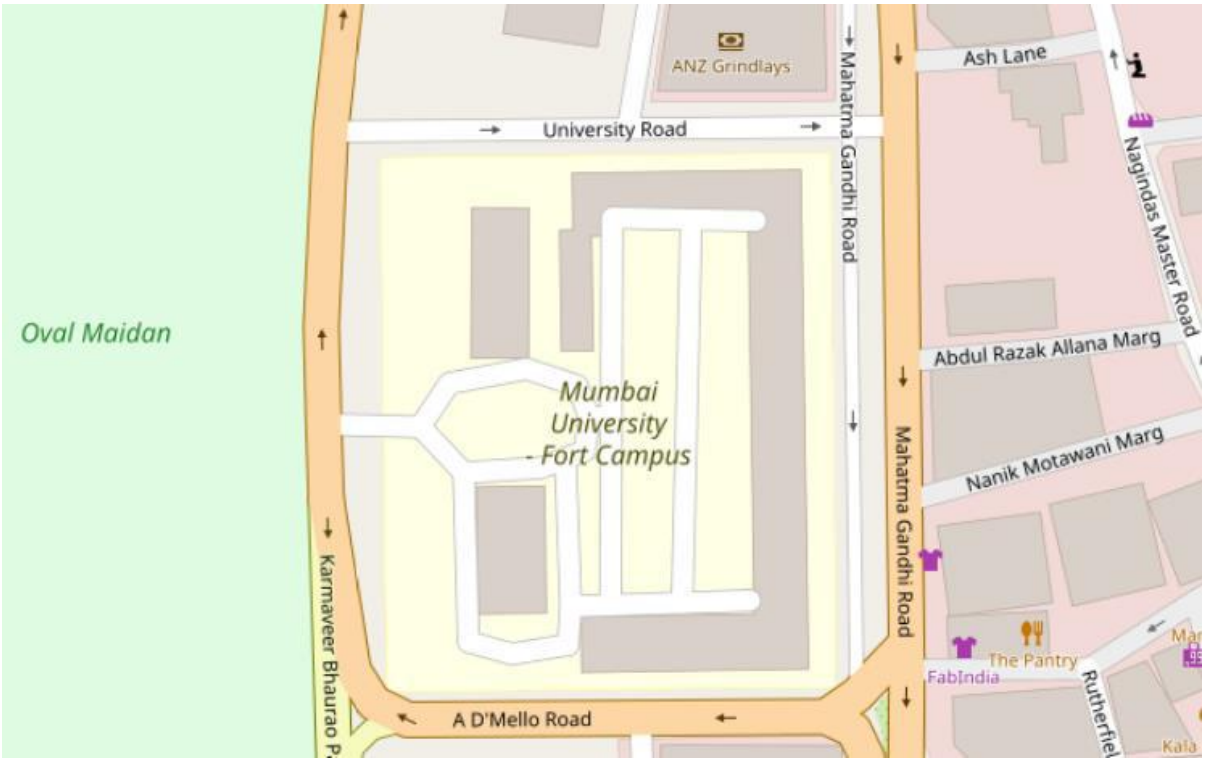


- A World map will appear on screen.
- If an error occurs in loading maps, go to project properties > CRS >



- In OSM Place search Pane > Enter Mumbai or any place name to search
- Double click on the desired place in OSM Place search Panel or Click and press

Output:

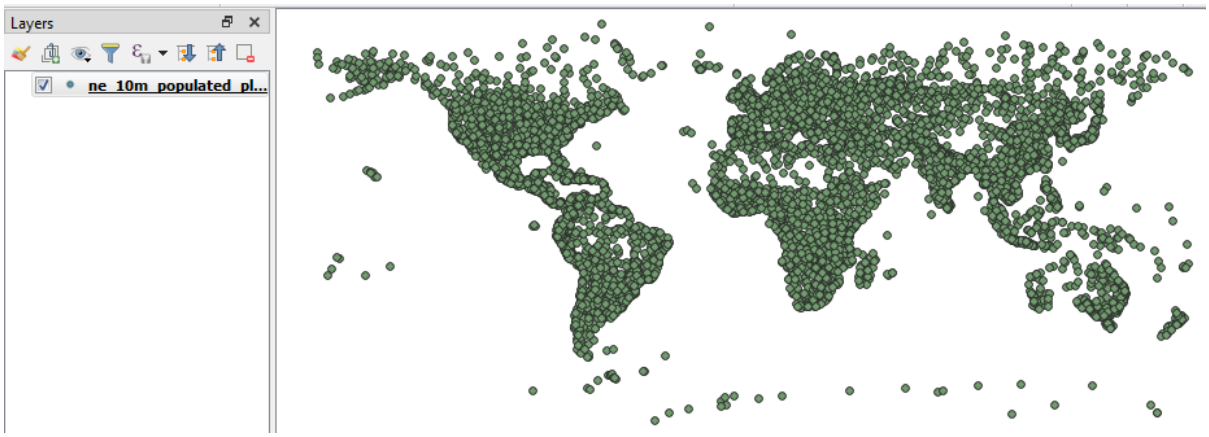

Oval Maidan
ANZ Grindlays
University Road
Mahatma Gandhi Road
Ash Lane
Nagindas Master Road
Abdul Razak Allana Marg
Nanik Motawani Marg
Mumbai
University
- Fort Campus
Karmaveer Bhaurao P
A D'Mello Road
Mahatma Gandhi Road
The Pantry
FabIndia
Rutherfiel
Kala

PRACTICAL NO:- 4

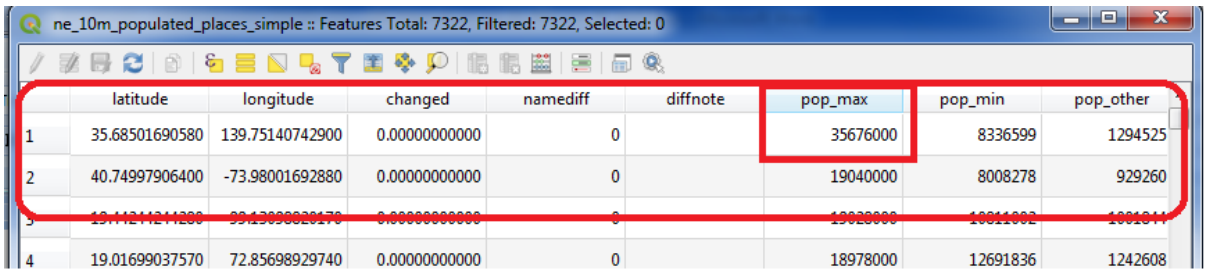
a) Working with attributes,
b) terrain Data

A. Working with attributes

- Start a new project.
- Go to Layer > Add Layer > Add Vector Layer
- Select
  "\GIS_Workshop\Practicals\Practical_04\A\Data\ne_10m_populated_places_simple.zip"

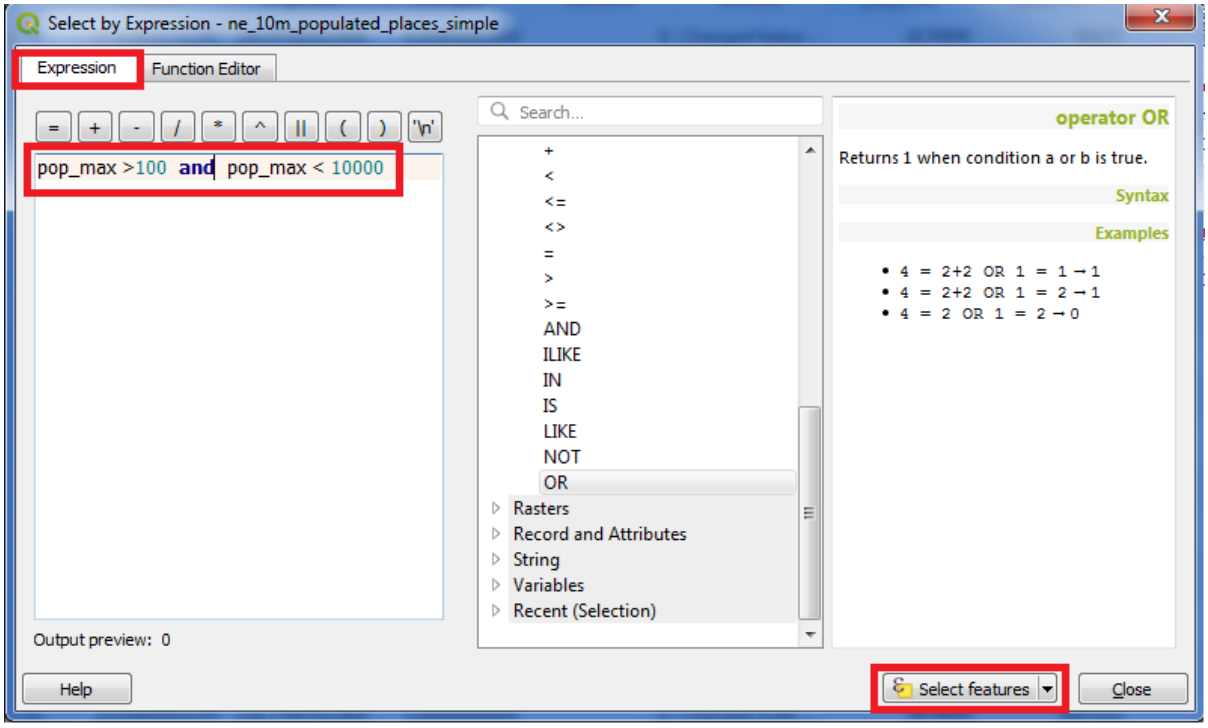


- Right click on Layer in Layer Panel > Open Attribute Table.
- Explore various attributes and their values in the Attribute table.
- To find the Place with maximum population click on "**pop_max"** file

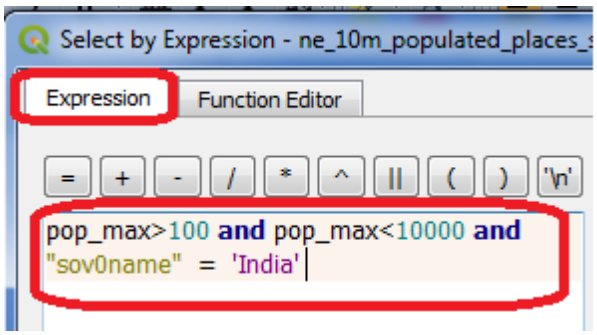


	latitude	longitude	changed	namediff	diffnote	pop_max	pop_min	pop_other
1	35.68501690580	139.75140742900	0.00000000000	0		35676000	8336599	1294525
2	40.74997906400	-73.98001692880	0.00000000000	0		19040000	8008278	929260
3	[illegible]	[illegible]	[illegible]	0		[illegible]	[illegible]	[illegible]
4	19.01699037570	72.85698929740	0.00000000000	0		18978000	12691836	1242608

- On clicking the Select feature using expression button the following window will appear.



- Enter pop_max>100 and pop_max<10000 and click button to get all the places with population between 100 and 10000.
- The places matching the criteria will appear in different color.
- Different queries can be performed using the dataset.
- Try this

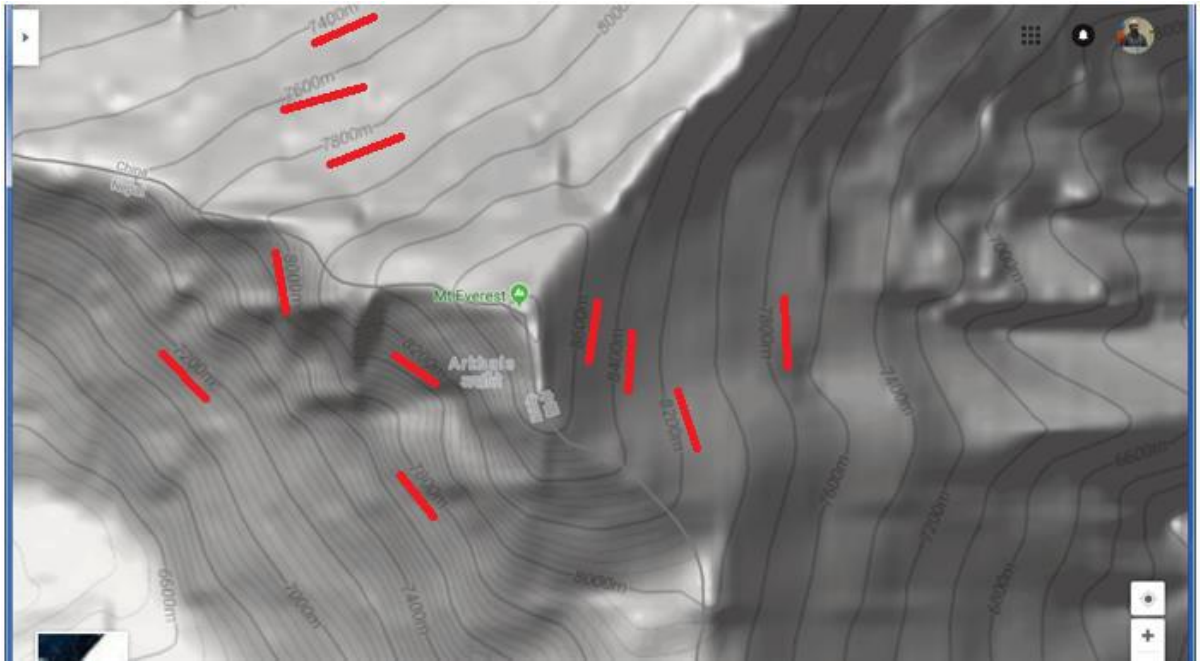


will give

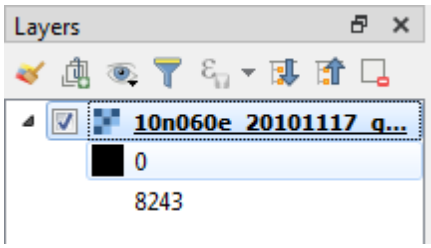
- Use the deselect button to deselect the feature to be rendered in original color.

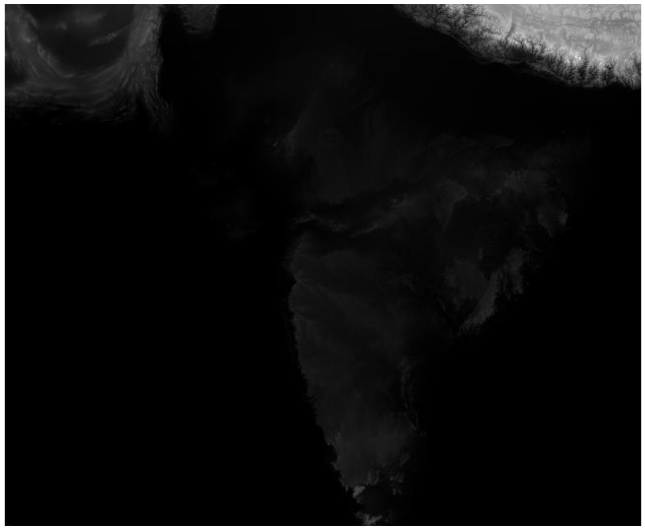
B. Terrain Data

A terrain dataset is a multiresolution, TIN-based surface built from measurements stored as features in a geodatabase. Terrain or elevation data is useful for many GIS Analysis like, to generate various products from elevation data such as contours, hillshade etc.



- Go to Layer > Add Raster Layer > select “10n060e_20101117_gmted_mea300.tif”, from Data folder

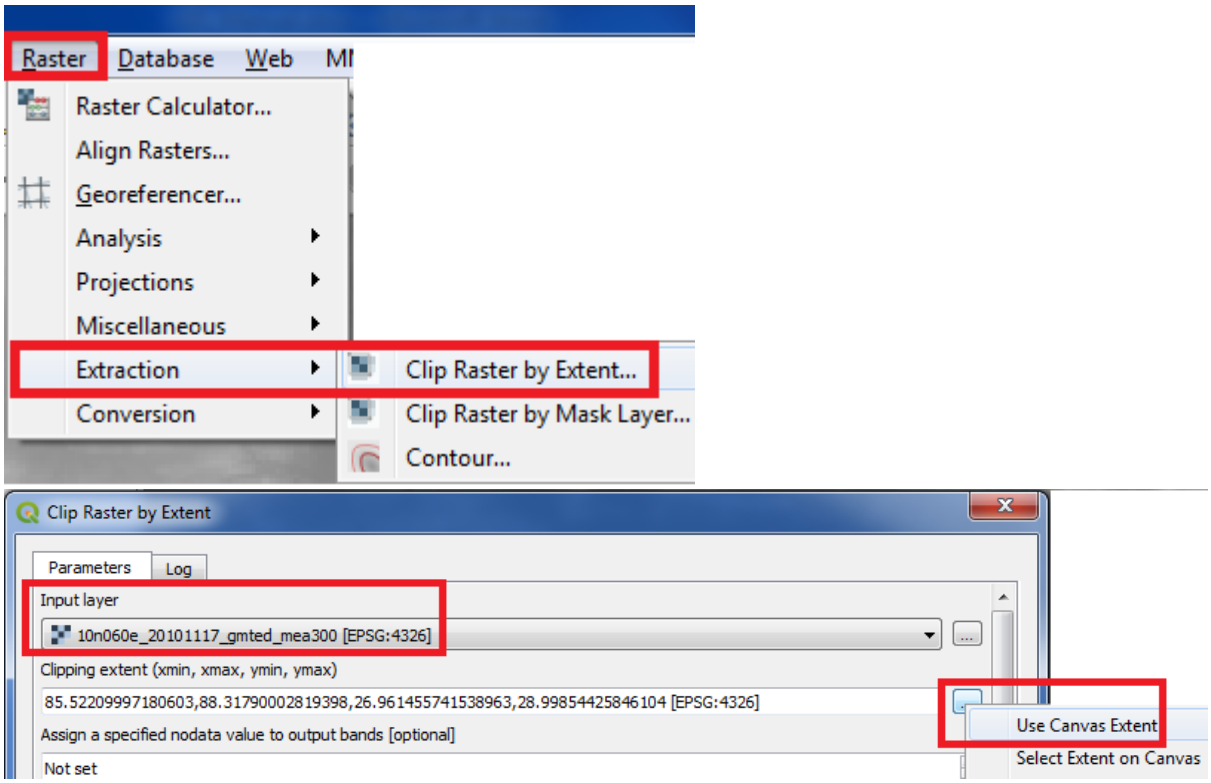




- The Lower altitude regions are shown using dark color and higher using light shade as seen on top region containing Himalaya and Mt Everest.
- Mt. Everest - is located at the coordinates 27.9881° N, 86.9253° E.

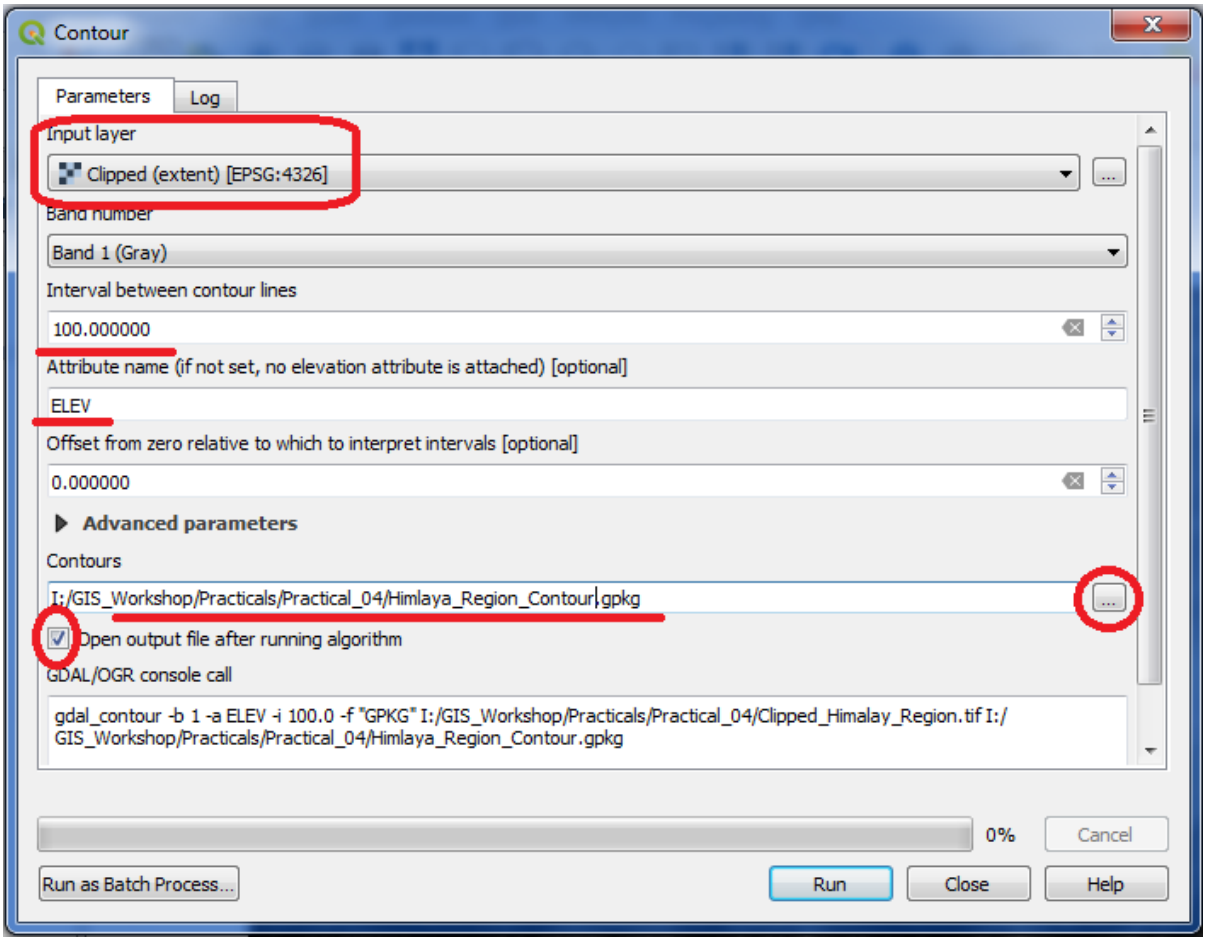
- Enter 86.92, 27.98 in the coordinate field, Scale 900000 and Magnifier 100% at the bottom of QGIS.

- Press enter the view port will be centered on Himalaya Region.
- Crop the raster layer only for the region under study.
- Go to Raster > Extraction > Clip Raster by Extent



- Select the raster layer *(if project contains multiple layers)*.
- Select the clipping area by selecting the option **Use Canvas Extends** if the visible part of map is to be selected or manually select an area on canvas by using **Select Extent on Canvas**.
- Select the location and file name for storing clipped raster layer.
- Press RUN.
- Deselect the original layer and keep the clipped one.
- The Clipped raster layer is representing altitude are from 103 Meters.
- Counter lines are the lines on a map joining points of equal height above or below sea level. A **contour interval** in surveying is the vertical distance or the difference in the elevation between the two **contour** lines in a topographical map.
- To derive counter lines from given raster.
- Go to Raster > Extraction > Contour

- The Contour configuration window will appear

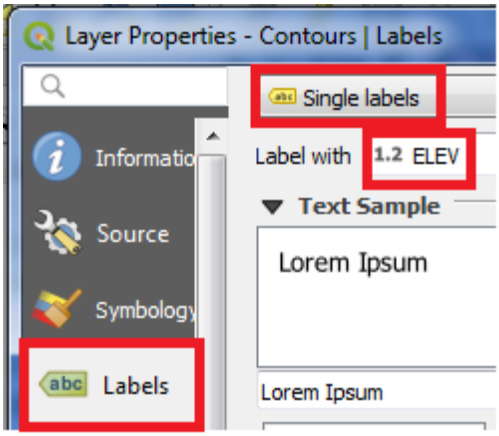


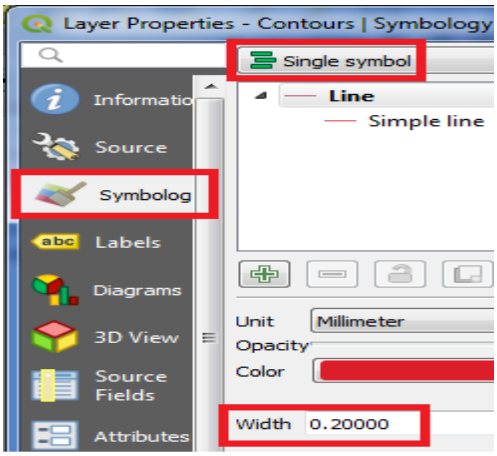
- Select the input raster layer name. Set contour interval 100.00 meters, select the output file name & location and check the option to add output file to project after processing.

- Press “RUN”.

- The contour layer will appear like this

- Label the layer using “ELEV” field and set appropriate symbols for line.

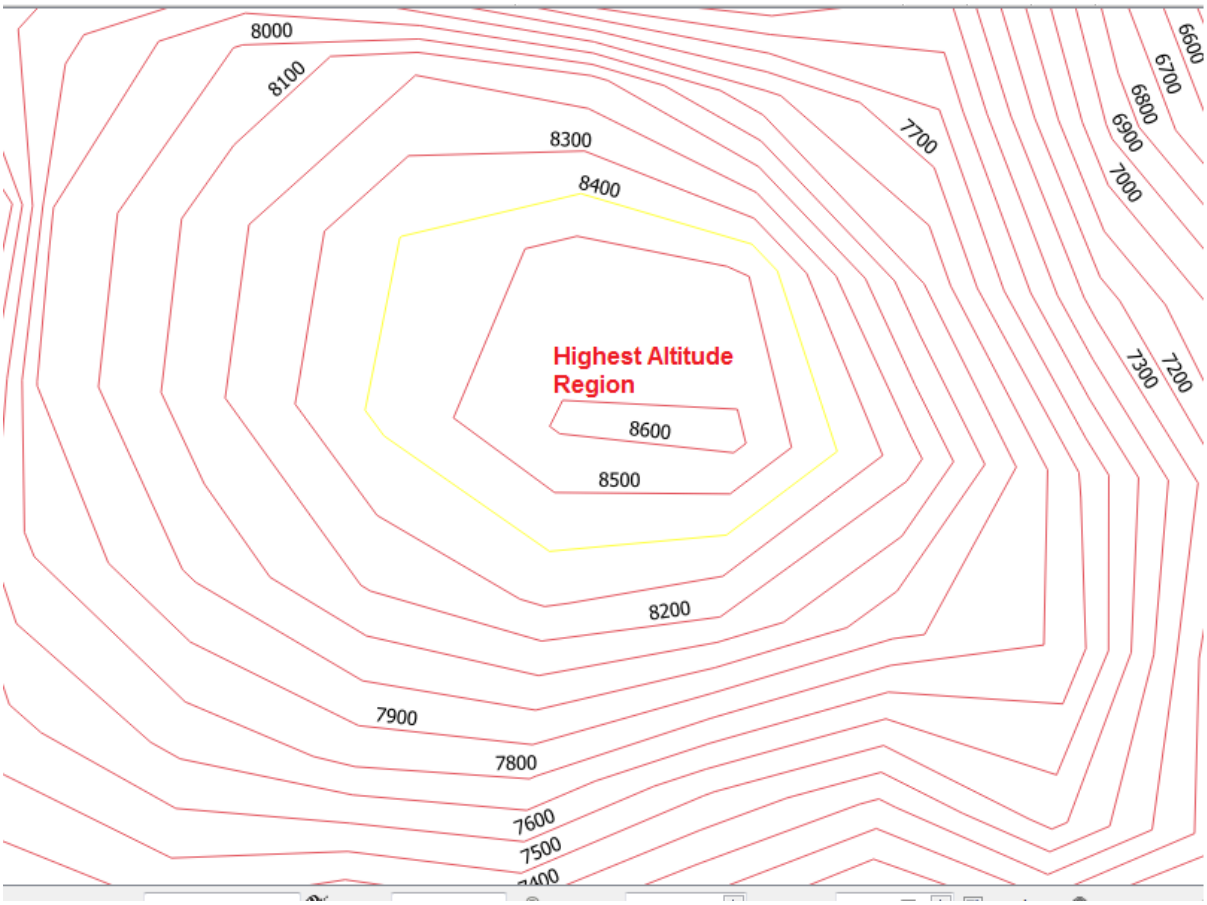




- In the Layer panel right click on Contour Raster Layer and select "**Open Attribute table**",
- Arrange the table in descending order based on the value of "ELEV" column.

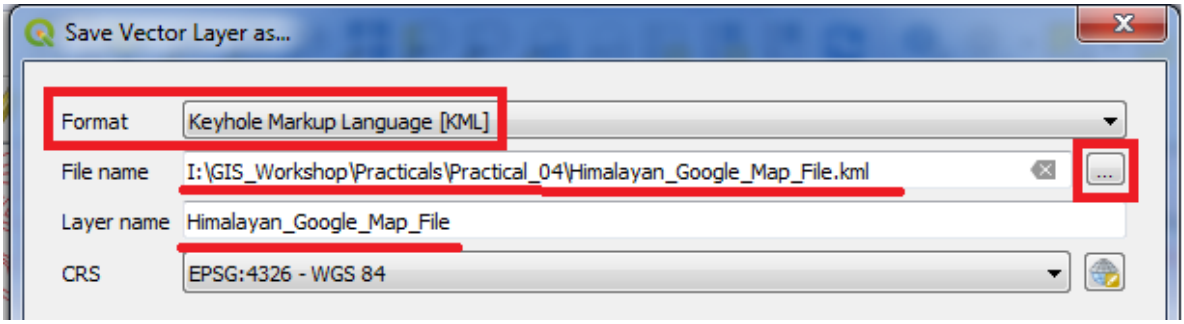
Contours :: Features Total: 4714, Filtered: 4714, Selected: 1

	fid	ID	ELEV
1	1990	1989	8600
2	1989	1988	8500
3	2337	2336	8400
4	2019	2018	8400
5	2336	2335	8300
6	2018	2017	8300
7	2335	2334	8200
8	2017	2016	8200
9	2938	2937	8100
10	2334	2333	8100



- To verify the above contour files using Google Map

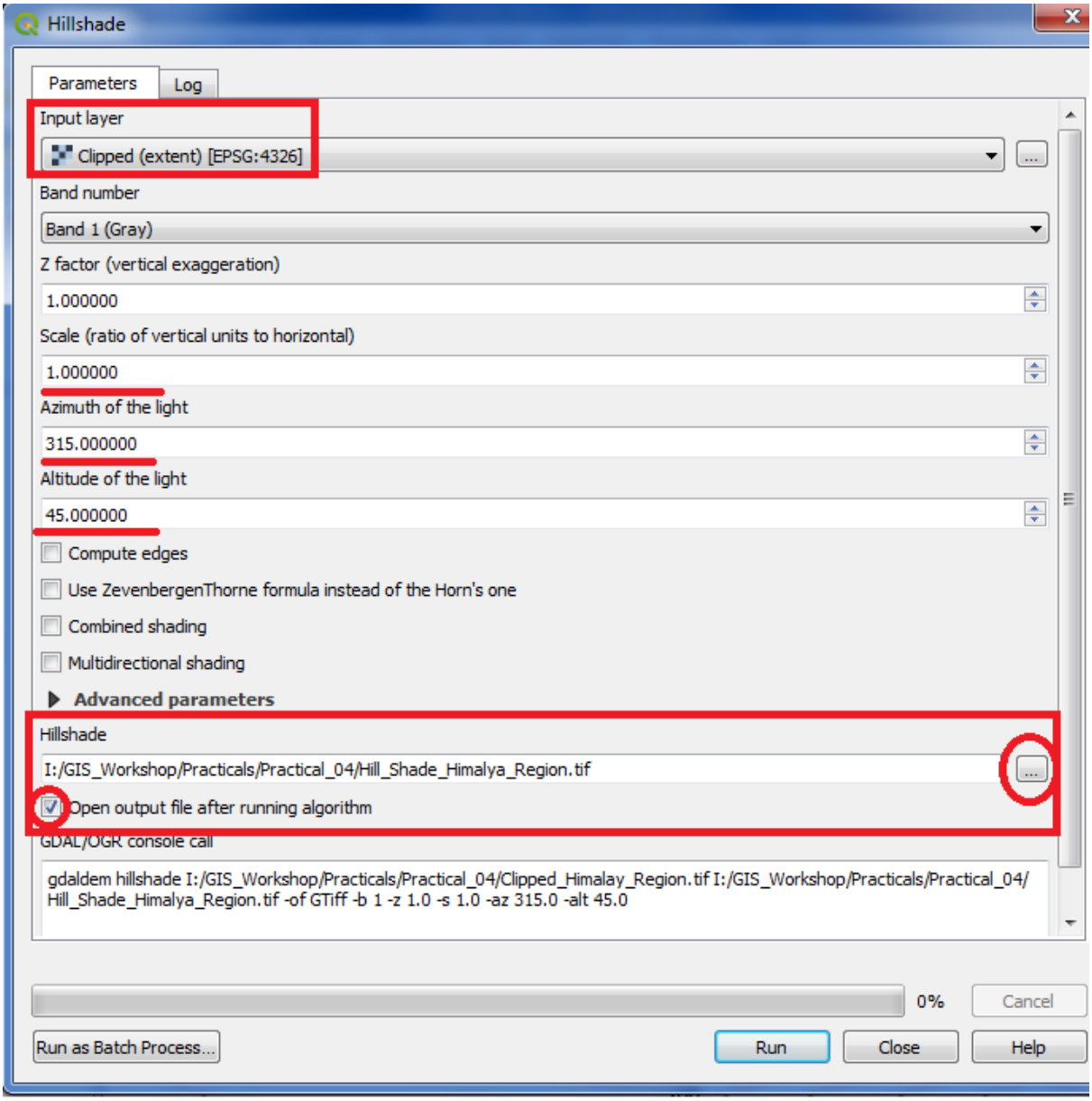
- Make a copy of Contour Layer, Go to Layer > Save As
- Select file format as “Keyhole Markup Language”, set file name, location and Layer Name.
- Also set CRS to WGS 84 EPSG:4326



Go to the stored location on Hard Disk and open the “Himalayan_Google_Map_File.kml” with Google Map.\

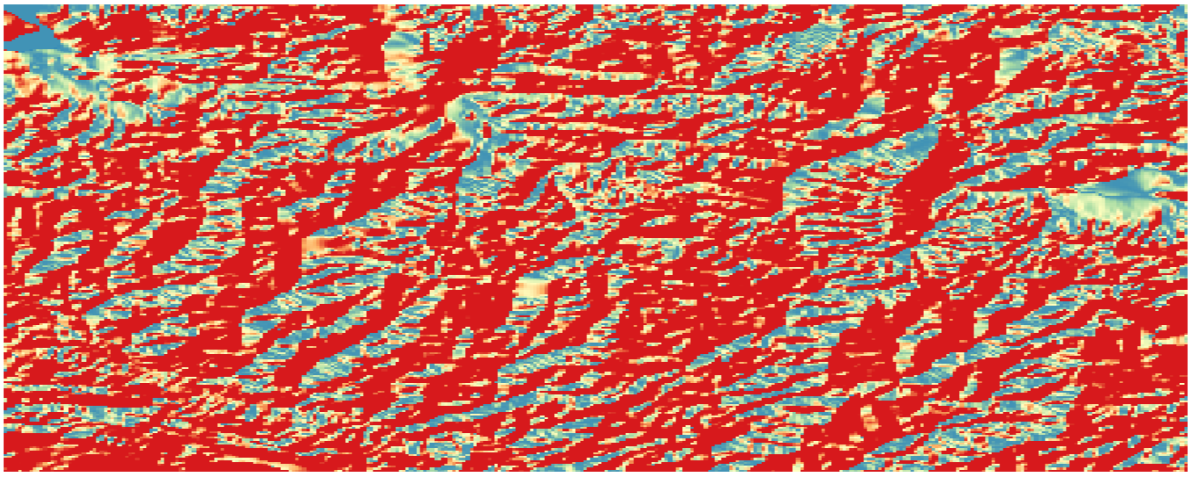
A **Hillshade** is a grayscale 3D representation of the surface, showing the topographical shape of hills and mountains using shading (levels of gray) on a map, just to indicate relative slopes, mountain ridges, not absolute height.

- For Hill Shade surface analysis
- Go to Plugin > Install Georeferencer GADL.
- After successful installation of plugin Go to Raster > Analysis > Hill Shade
- Select the input raster layer, select file name and location for storing Hill Shade output file.



- Press “RUN” and Close the Hill Shape Dialog window.

- After Raster styling the Output will appear like this.



PRACTICAL NO:- 5

A. Working with Projections and WMS Data

A **Web Map Service** (**WMS**) is a standard protocol developed by the Open Geospatial Consortium in 1999 for serving georeferenced map images over the Internet. These images are typically produced by a map server from data provided by a GIS database

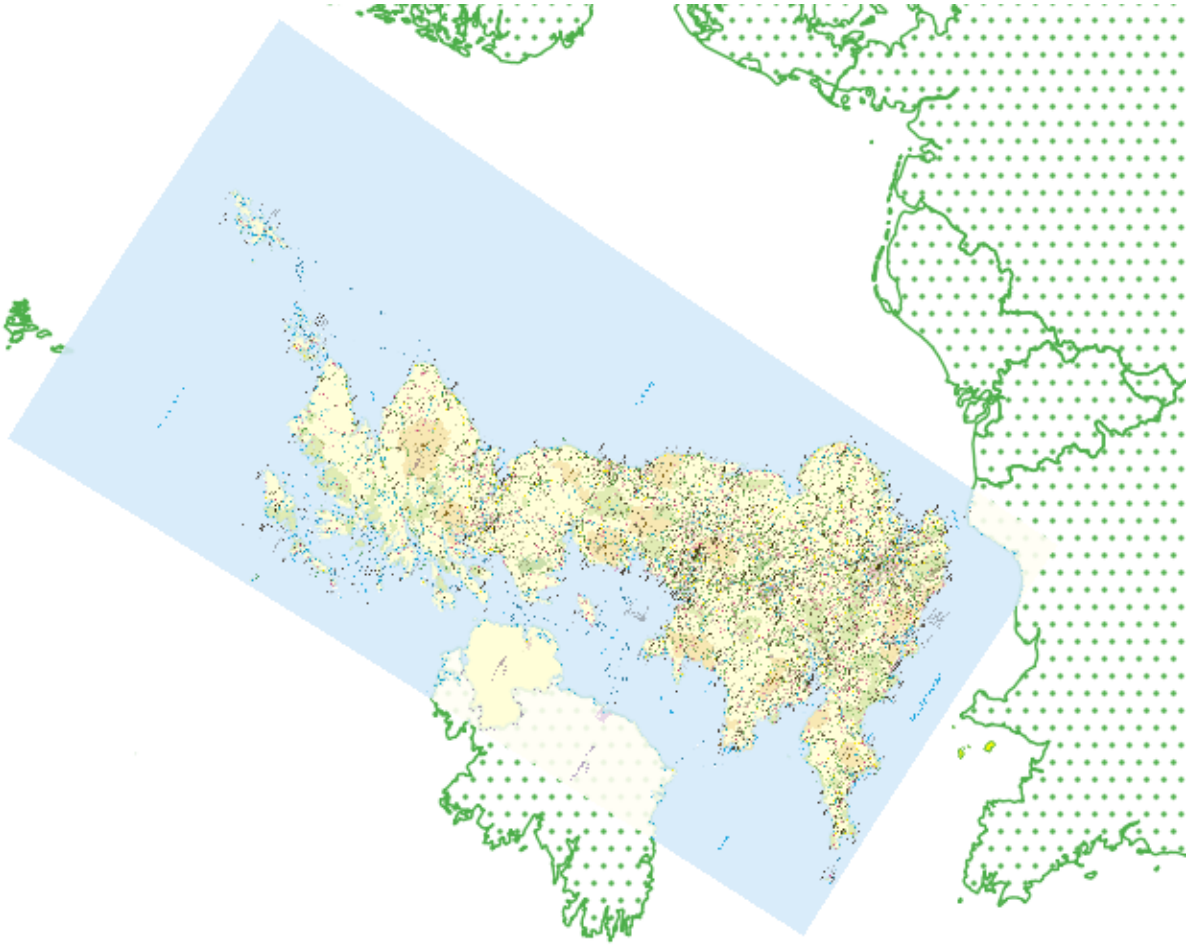
- Start a new Project.
- Layer > Add Layer > Vector Layer
- Select “ne_10m_admin_0_countries.zip” Layer from data folder.
- Go to Layer > Save As
  Select format as ESRI Shape File
  Select folder location and file name
  Set CRS North_America_Albers_Equal_Area_Conic EPSG: 102008
- Press “OK”.
- Deselect the original Image and keep the projected layer visible.

- Select Layer > Add Layer > Add Raster Layer > Select MiniScale_(standard)_R17.tif from Location

“GIS_Workshop\Practicals\Practical_05\DATA\minisc_gb\minisc_gb\data\RGB_TIF_compressed\MiniScale_(standard)_R17.tif”

- The Layer appears on a different location than the location where Great Britain is shown on Map.

- Open Layer Properties > CRS > Search bri > select British National Grid EPSG 27700.
- Processing may take some time.
- Locate United Kingdom on Layer; the vector layer exactly coincides by the raster layer covering United Kingdom.



PRACTICAL NO:- 6

a) Georeferencing Topo Sheets and Scanned Maps
b) Georeferencing Aerial Imagery
c) Digitizing Map Data

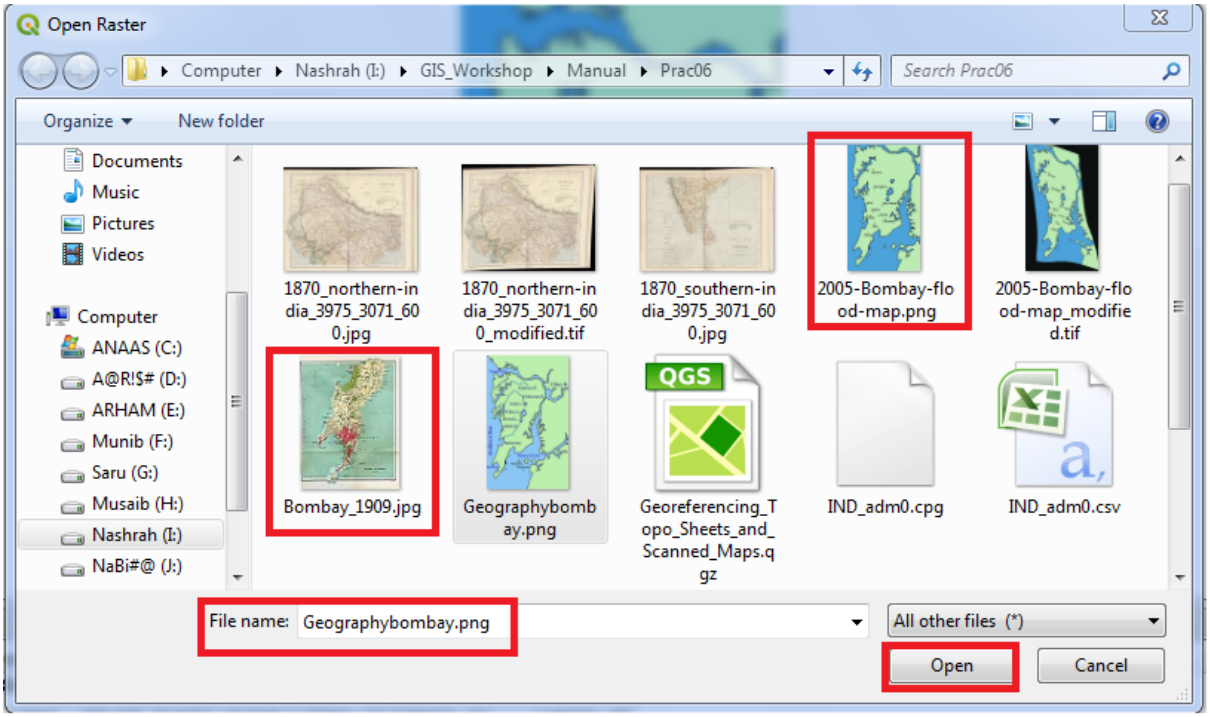
A. Georeferencing

a) Georeferencing Topo Sheets and Scanned Maps

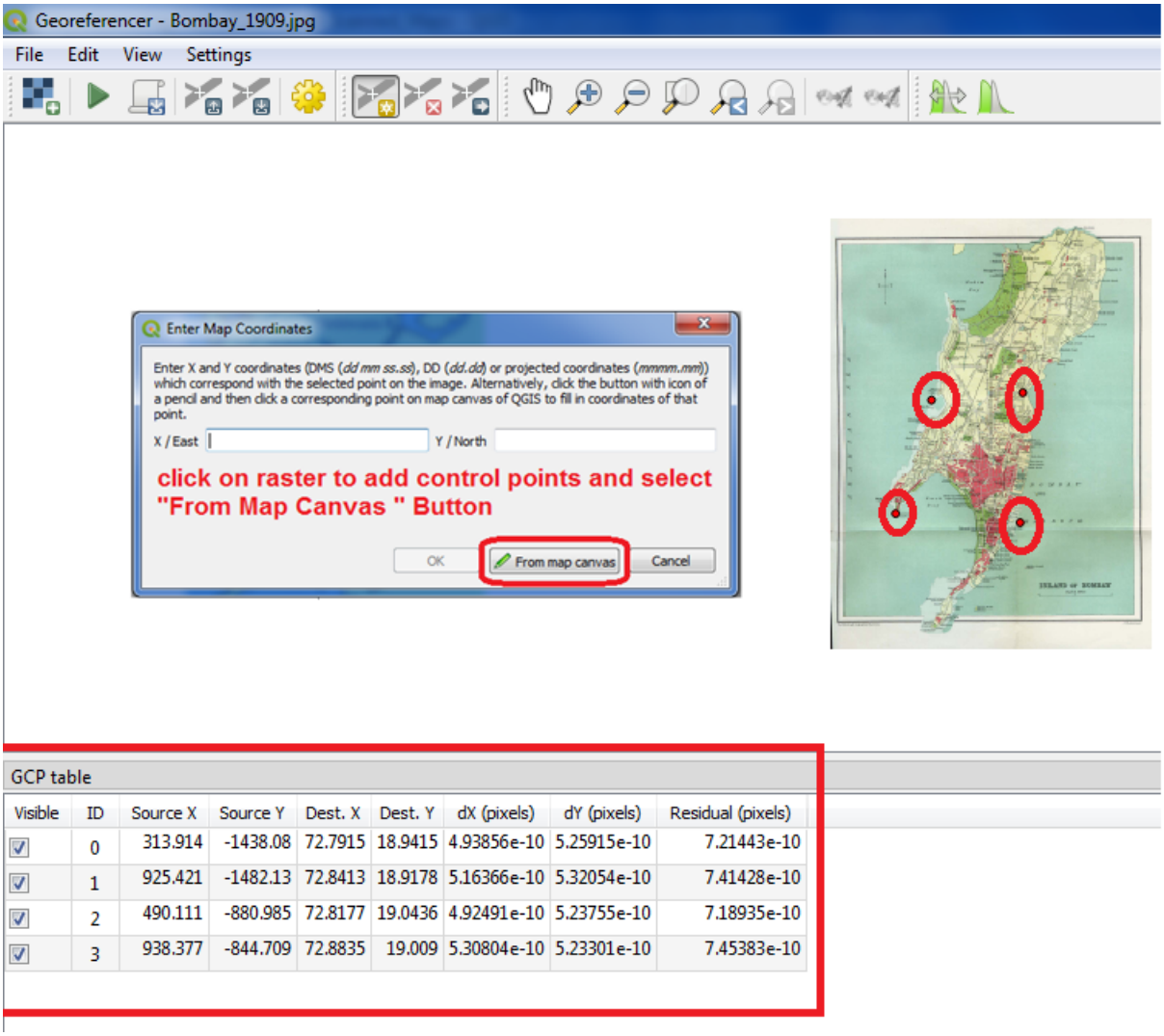
- Start a new project
- Go to Layers > Add Layer > Add vector Layer
- Select GIS_Workshop\Manual\Prac06\IND_adm0.shp
- Zoom in to Mumbai region in the layer.

- Go to Plugins > Manage and Install Plugins
- Ensure that is checked, if not install Georeferencer GDAL plugin.
- Go to Raster > Georefrencer
- A new Georeferencer window will open
- File > Open Raster

- Select file “1870_southern-india_3975_3071_600.jpg” from project data folder



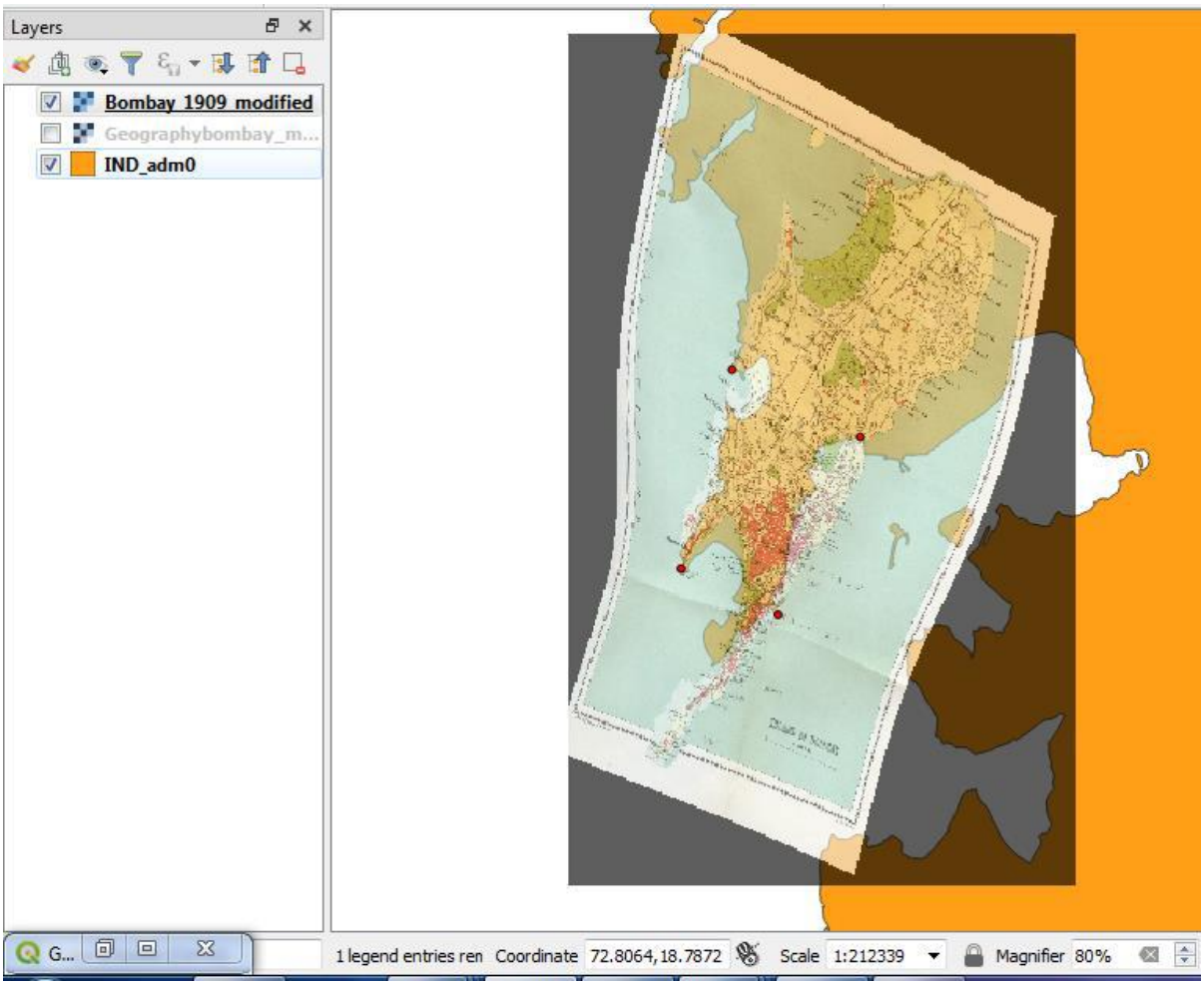
- Go to Settings > Transformation Settings
- In the Transformation Settings window
- Select Transformation type > Thin Plate Spline
- Re-sampling Method > Nearest Neighbour
- Target TRS > Everest 1830 datum: EPSG 4044
- Select Output Raster Name and Location
- Check the Load in QGIS When Done Option
- Press “OK”.
- In Georeferencer window Go to Edit > Add Points



- Select the set of control points.
- Go to, Setting > transformation settings.
- Press “RUN”
- In Georeferencing window go to > File > Start Georeferencing

- The progress indicator will appear
- The canvas area will now have the scanned map of Mumbai referenced with control points.
- Select the newly added layer in Layer Panel Right click and go to property.

- Set Transparency level of raster layer to appropriate level.
- **Output:**

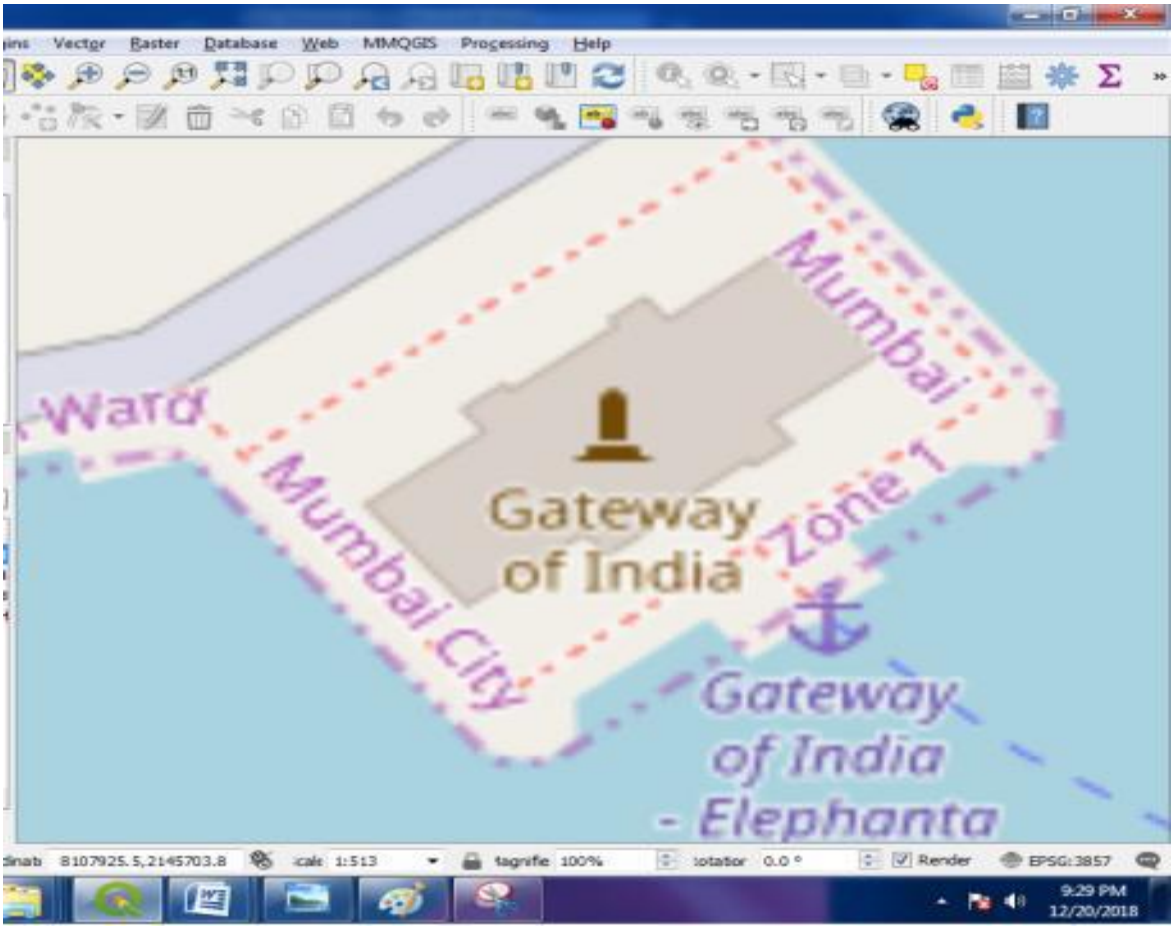


- The Scanned Image map coincides with the existing map.

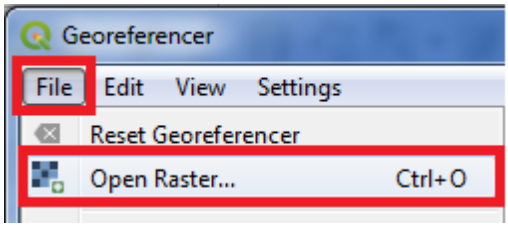
B. Georeferencing Aerial Imagery

- Install plugin OpenStreetMap
- Go to Web Menu > OpenLayerPlugin > OpenStreetMap > OpenStreetMap
- Go to Project > Properties > Set CRS to EPSG 3857
- Go to View > Panels > select OSM Place search
- The Gateway of India, Mumbai is located at 18.92°N 72.83°E
- Search Gateway of India in OSM Search Panel
- Zoom in to appropriate level.

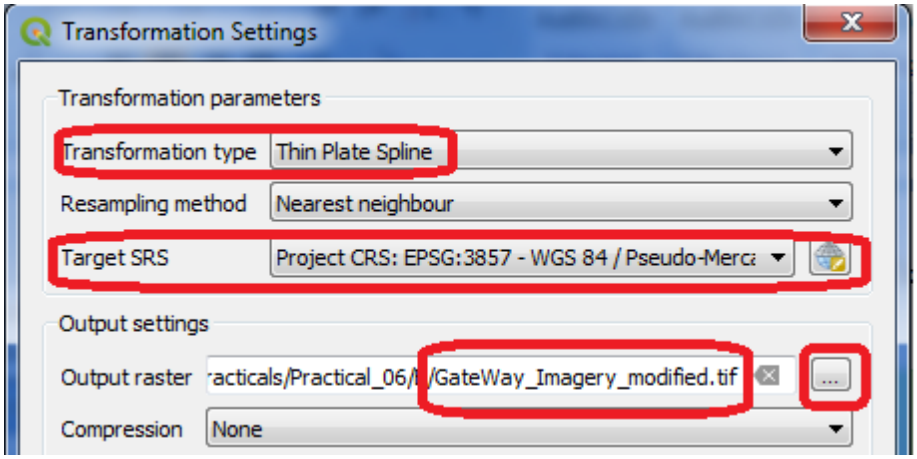
- The map will appear like this



- Go to Raster > Georefrencer
- A new Georeferencer window will open
- File > Open Raster



- Select file “Gateway_Imagery.tif” from project data folder
- Go to Edit > Add Point
- Select control points from map (Indicated in red color).
- Go to Setting > Transformation Setting



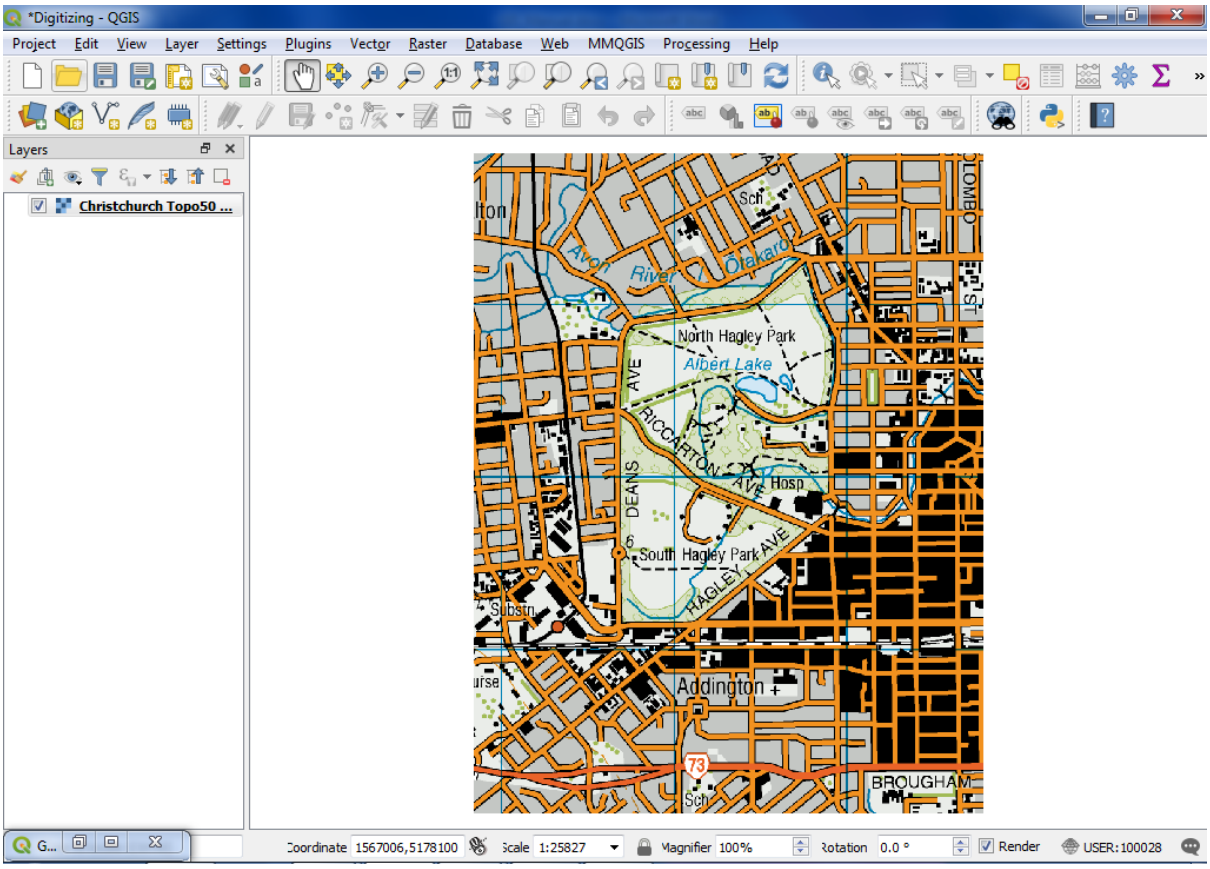
- Go to File > Start Georeferencing or Press the button in Georegerencing Window.
- The progress indicator will appear
- Observe that the aerial image of the Gateway of India is georeferenced on OSM in the map canvas.

C. Digitizing Map Data

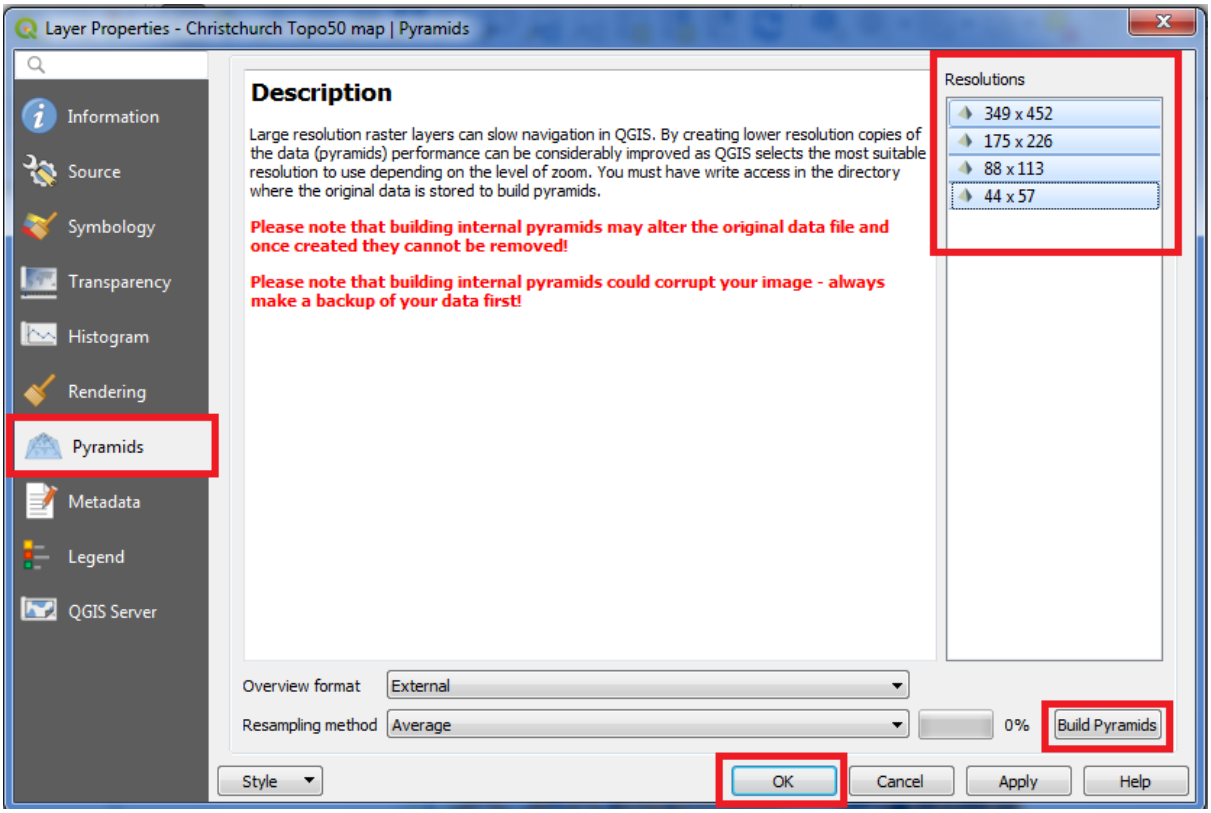
Spatialite is an open database format similar to ESRI's geodatabase format. Spatialite database is contained within a single file on your hard drive and can contain diferent types of spatial (point, line, polygon) as well as non-spatial layers. This makes is much easier to move it around instead of a bunch of shapefiles.

Digitizing Map Data

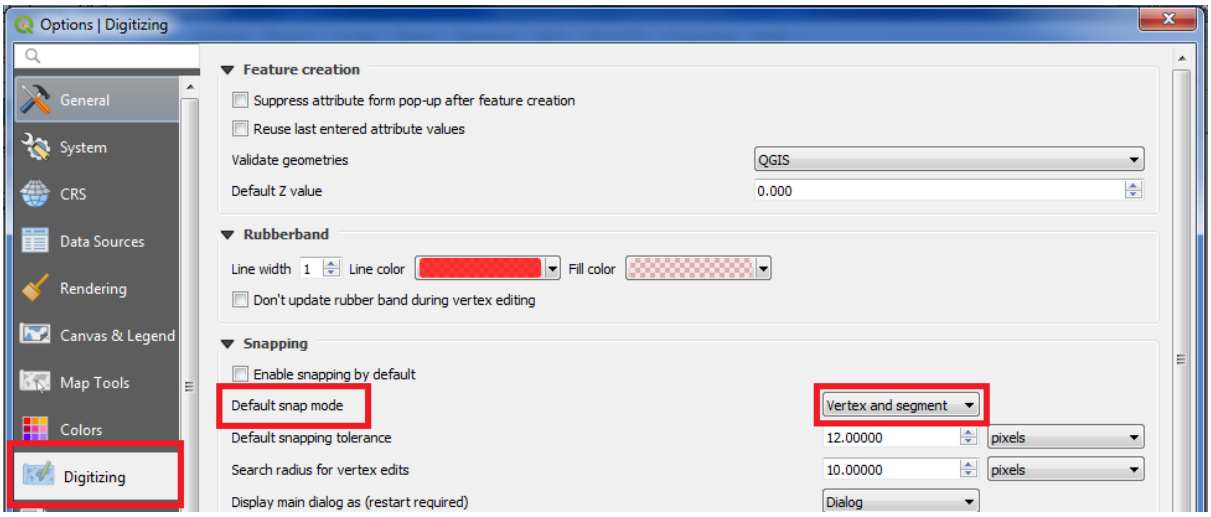
- Go to Layer ‣ Add Raster > Select “Christchurch Topo50 map.tif” from project Folder.



- QGIS offers a simple solution to make raster load much faster by using **Image Pyramids**.
- Right-click the Christchurch Topo50 map.tif layer and select Properties.
- Choose the Pyramids tab. Hold the Ctrl key and select all the resolutions offered in the Resolutions panel.

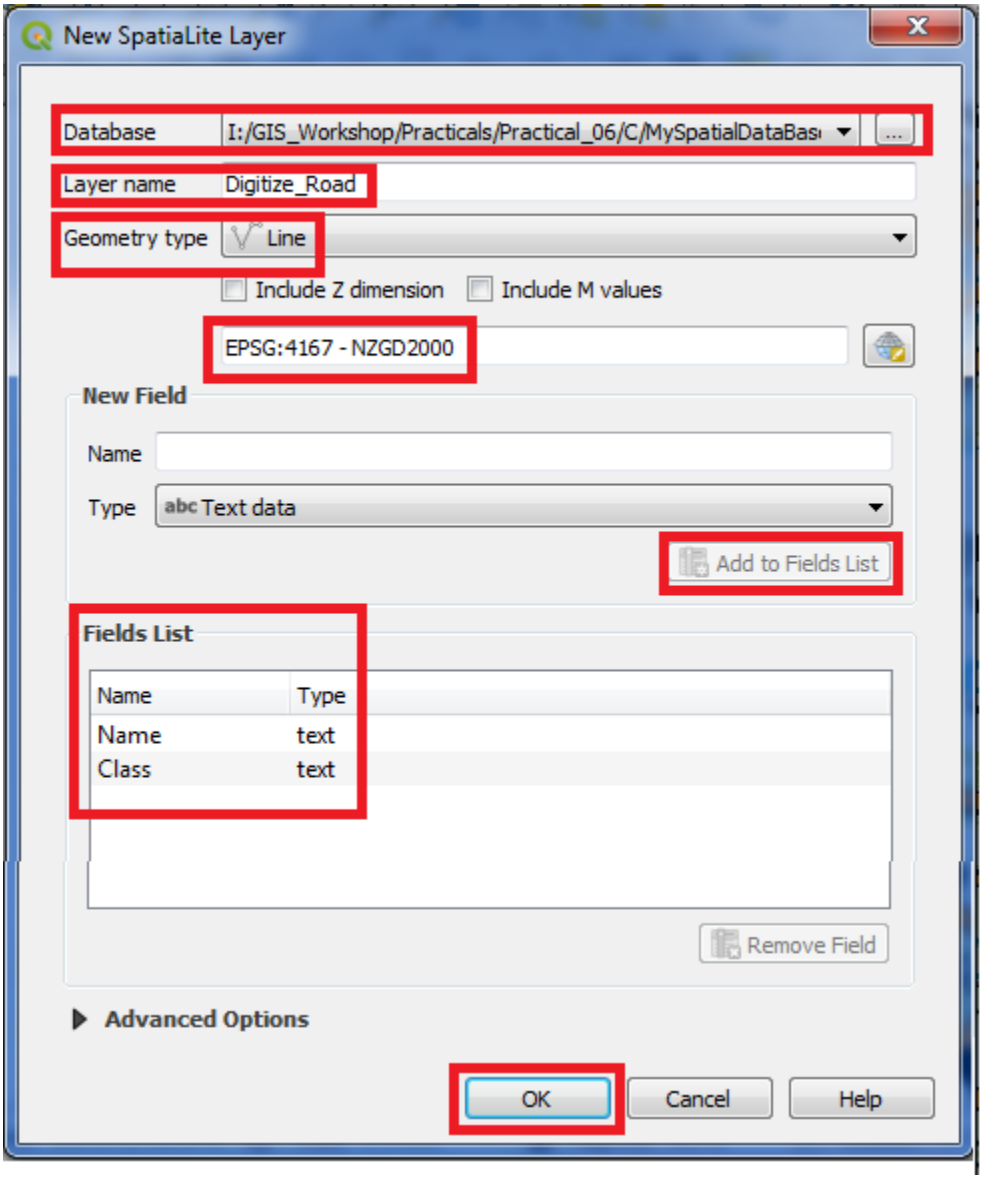


- Click Build pyramids. Then click OK.
- Go to Settings > Options…. Select the Digitizing tab in the Options dialog.
- Set the Default snap mode to vertex and segment.

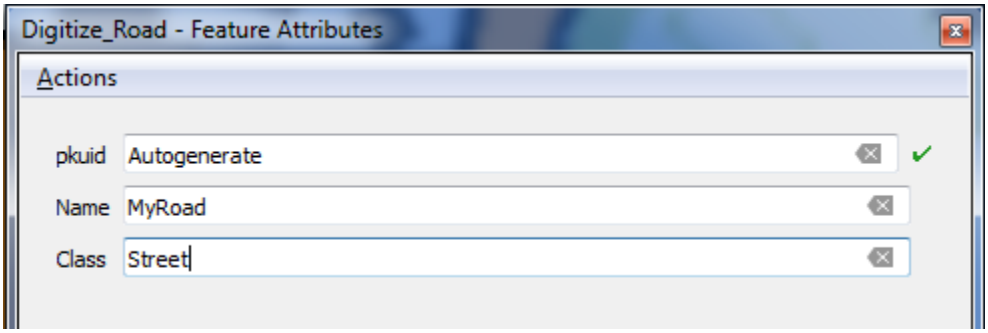


- Press OK.
- Go to Layer > Add Layer > Add Spatialite Layer.
- Select the name and location for Spatial database eg: “GIS_Workshop\Practicals\Practical_06\C\MySpatialDataBase.sqlite”.

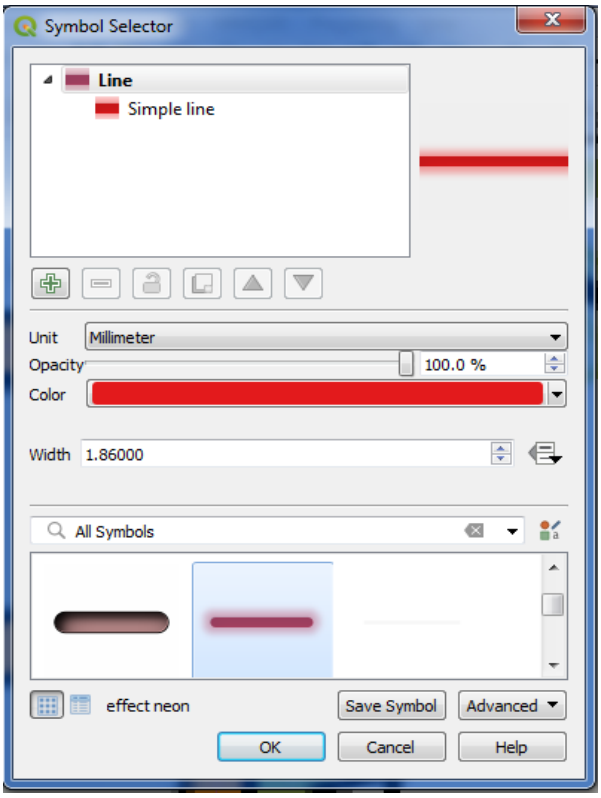
- Name the Layer as “Digitized_Road
- Set Geometry type as “Line”
- Set CRS EPSG:4167 – NZGD2000

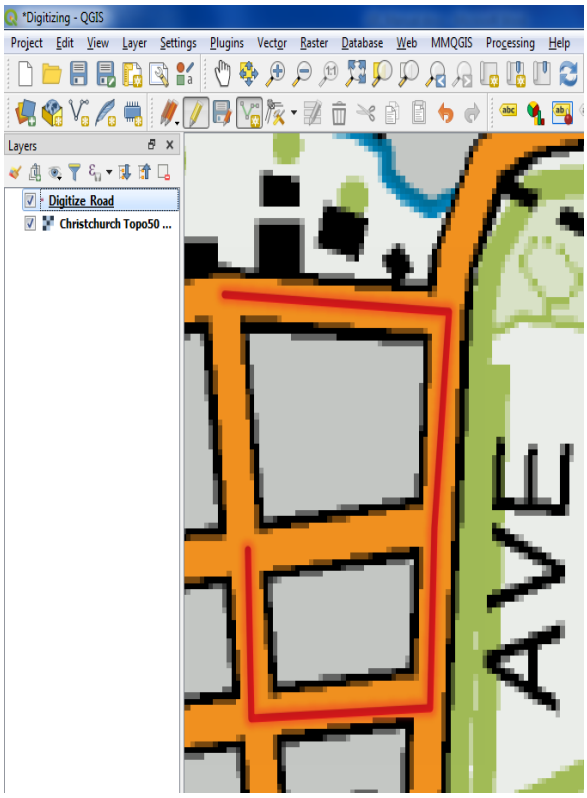


- Add “Name” and “Class” fields using “Add to Fields List”.
- Once the layer is loaded, click the Toggle Editing button to put the layer in editing mode.
- Click the Add feature button. Click on the map canvas to add a new vertex. Add new vertices along the road feature. Once you have digitized a road segment, right-click to end the feature.

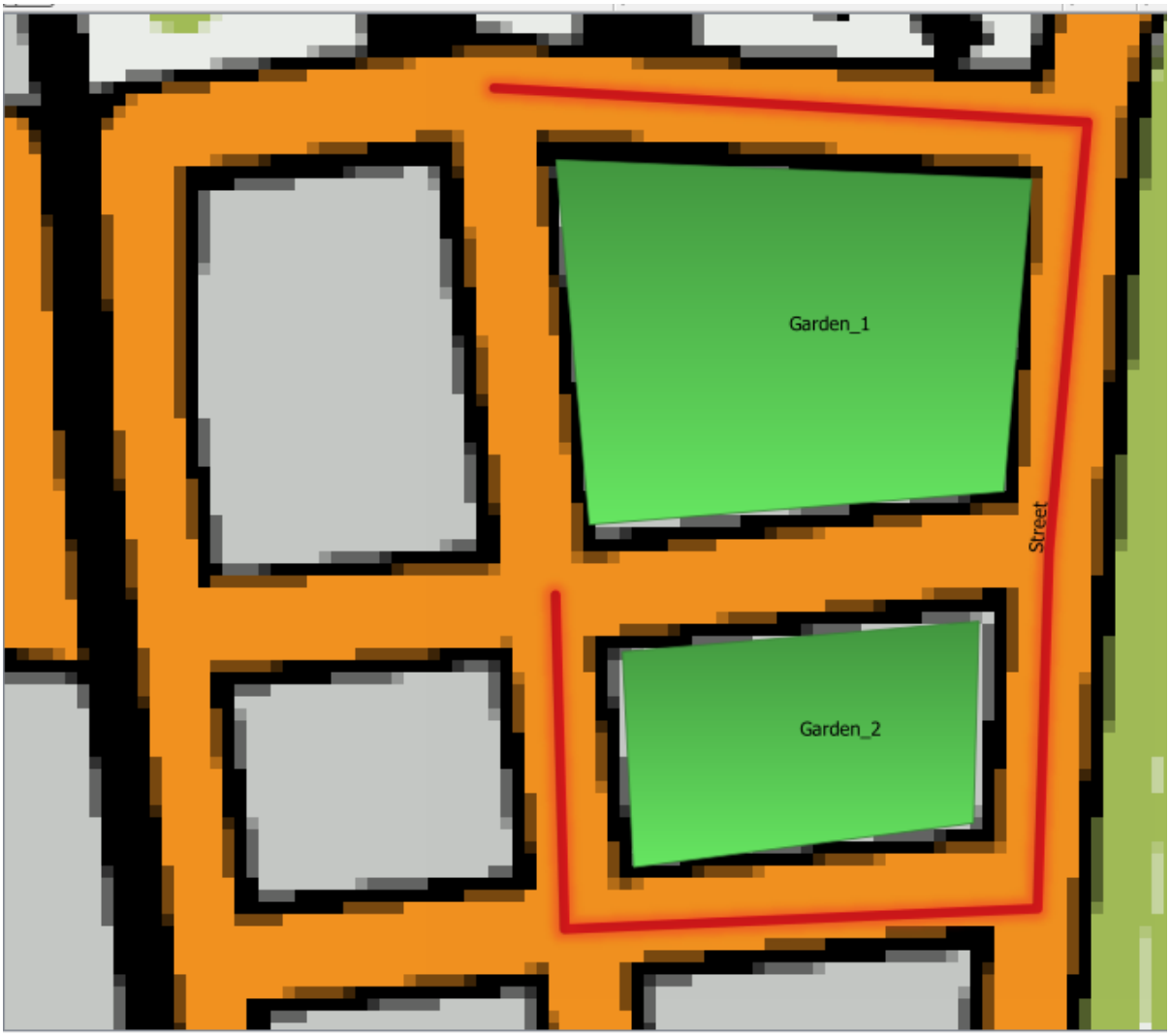


- On Layer Panel Right Click on Digitze_Road, Select the Style tab in the Layer Properties dialog.





- Select appropriate style to see the digitized road feature clearly.
- After creating a new Spatialite layer
- Select Digitized_Garden layer in Layer Panel and click on Toggle Editing button and then Add Polygon Feature button on Tool bar.
- Add two gardens to the region by adding polygon.
- The Layer will appear on map canvas



- Using the above procedure a point feature can also be digitized.

- The digitizing task is now complete. You can play with the styling and labeling options in layer properties to create a nice looking map from the data you created.

PRACTICAL – 7

Managing Data Tables and Saptial data Sets:

a) **Table joins,**

b) **spatial joins,**

c) **points in polygon analysis,**

d) **performing spatial queries**

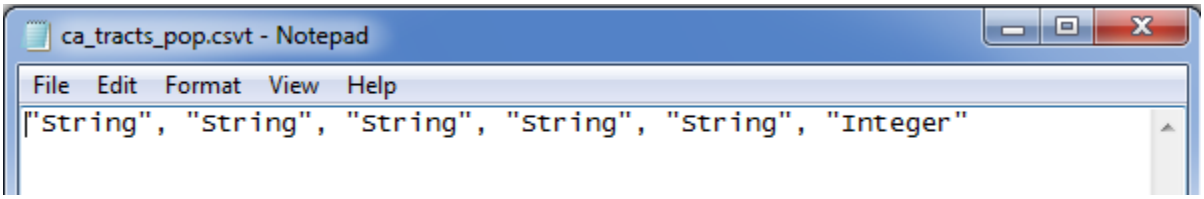
Managing Data Tables and Saptial data Sets:

Table joins

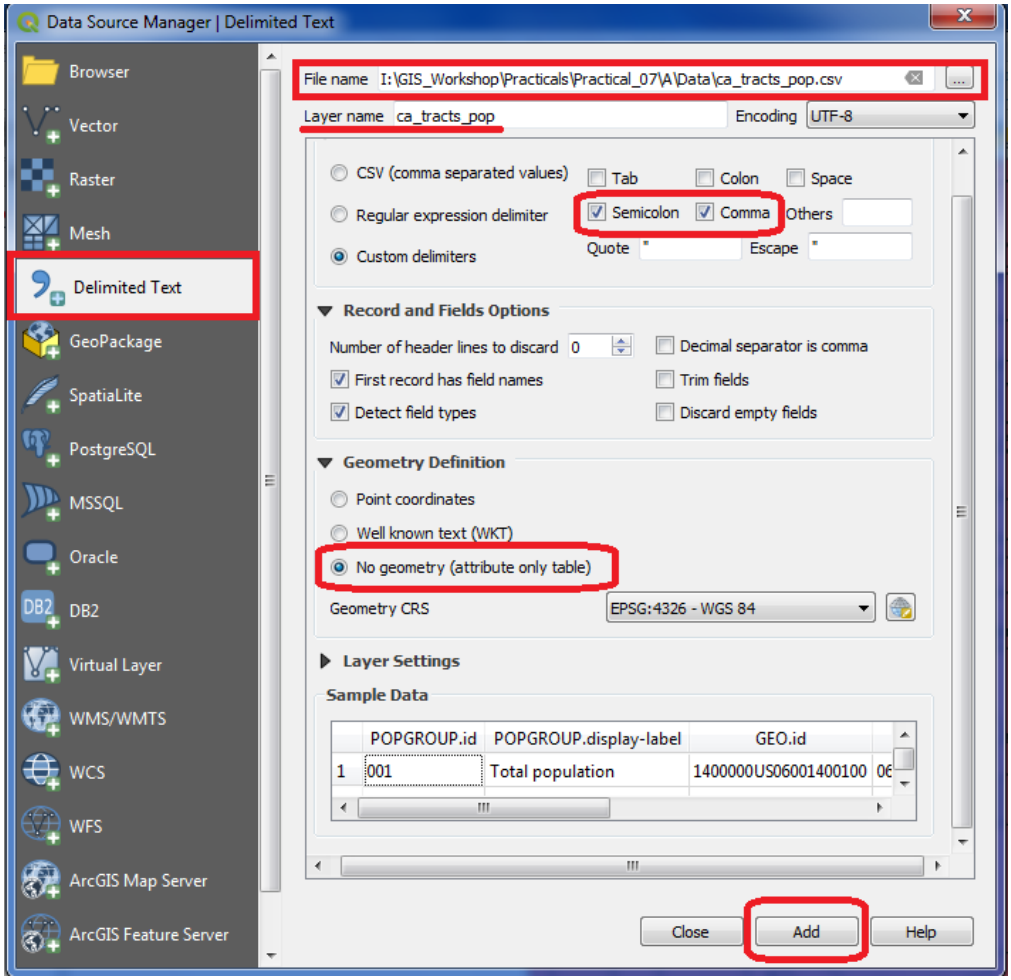
- Start a new project
- Go to Layer → Add Layer → Add new Vector Layer

Add file “tl_2013_06_tract.zip”

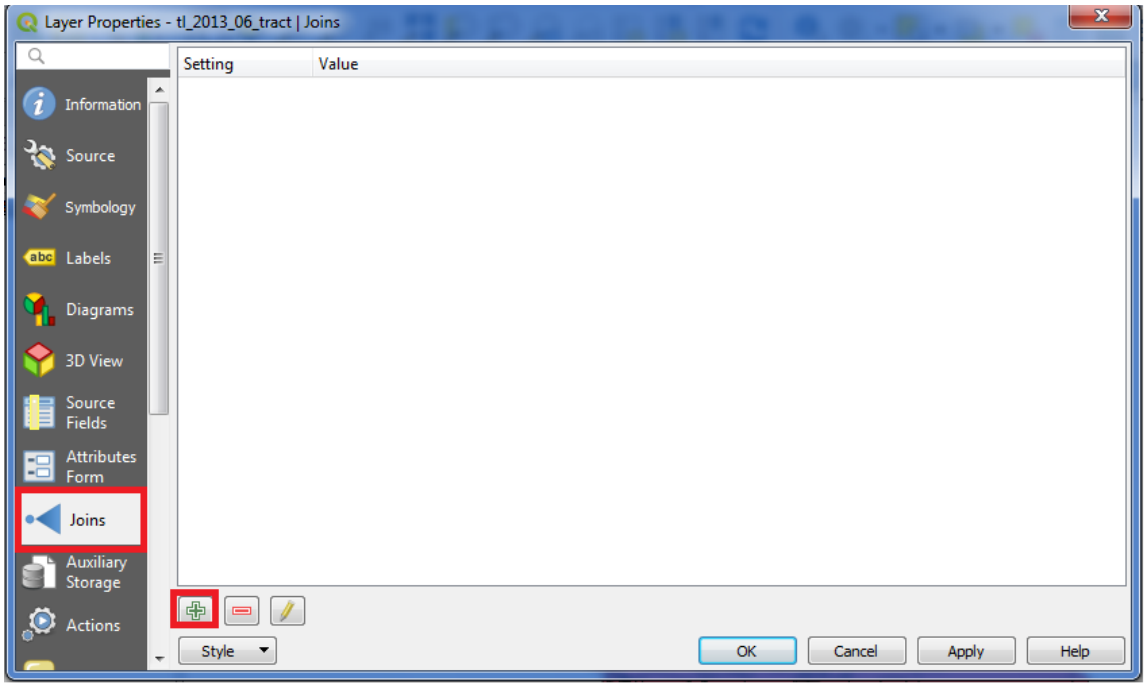
We could import this csv file without any further action and it would be imported. But, the default type of each column would be a *String* (text). That is ok except for the *D001* field which contains numbers for the population. Having those imported as text would not allow us to run any mathematical operations on this column. To tell QGIS to import the field as a number, we need to create a *sidecar* file with a *.csvt* extension.



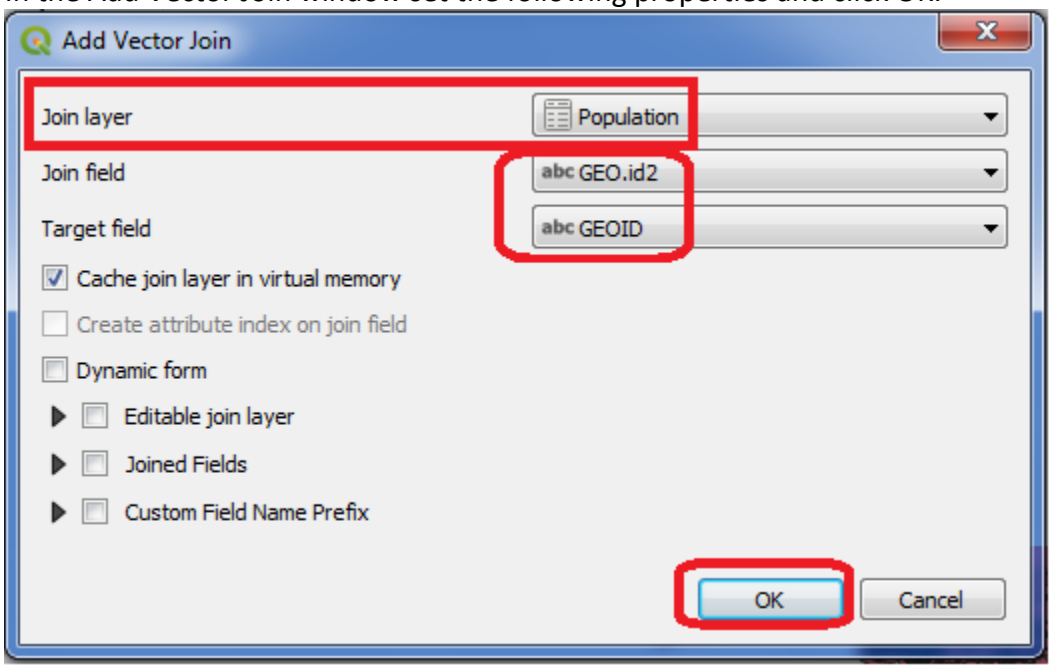
- This file will have only 1 row specifying data types for each column. Save this file as ca_tracts_pop.csvt in the same directory as the original *.csv* file.
- Go to Layer → Add Layer → Add Delimited Text Layer
  And add “ca_tacts_pop.csv”



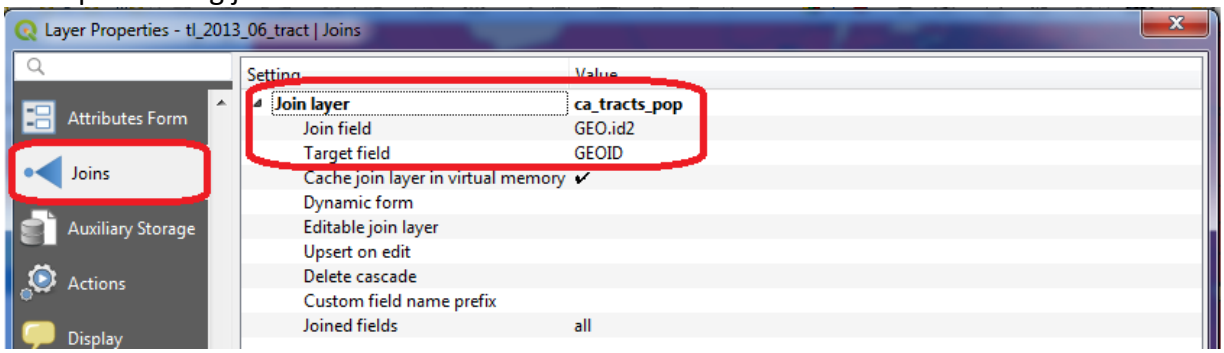
➢ In the layer panel, Right click on “tl_2013_06_tract”, layer and select Properties



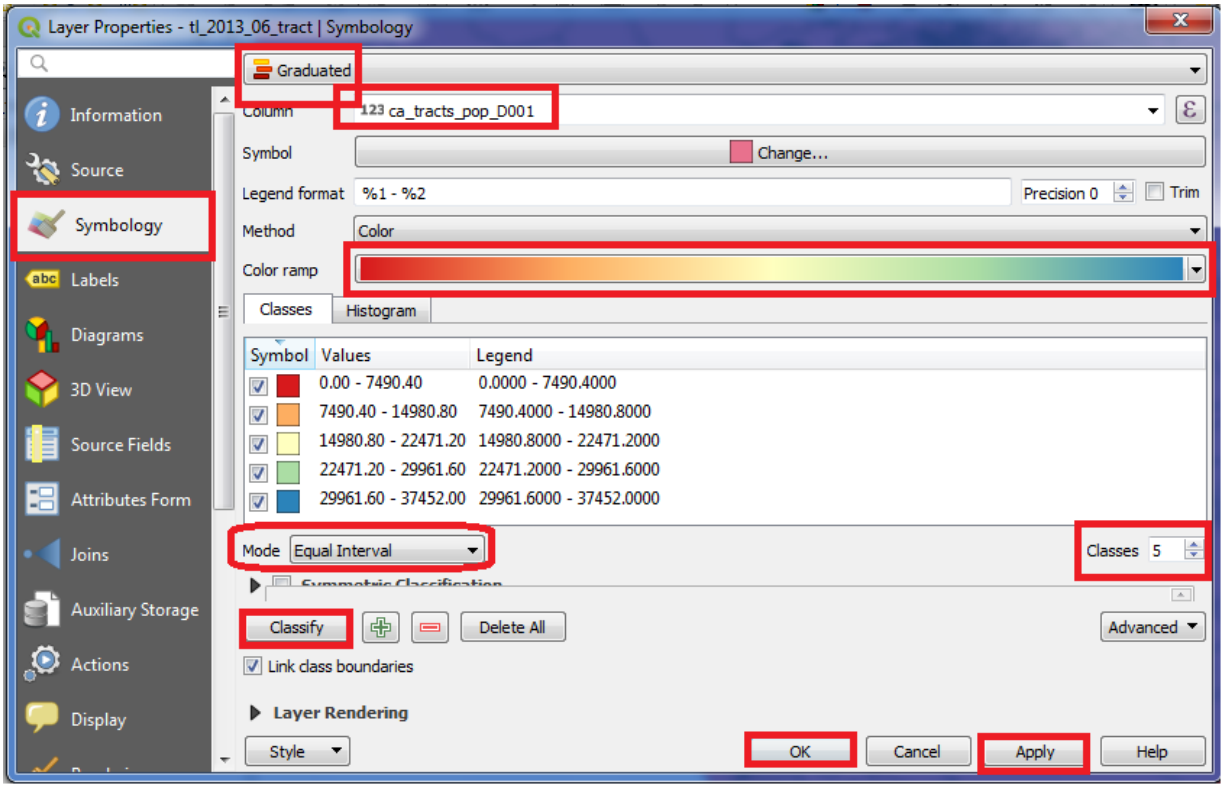
- Select the option in Properties, and click on button to add new table join.
- In the Add Vector Join window set the following properties and click OK.



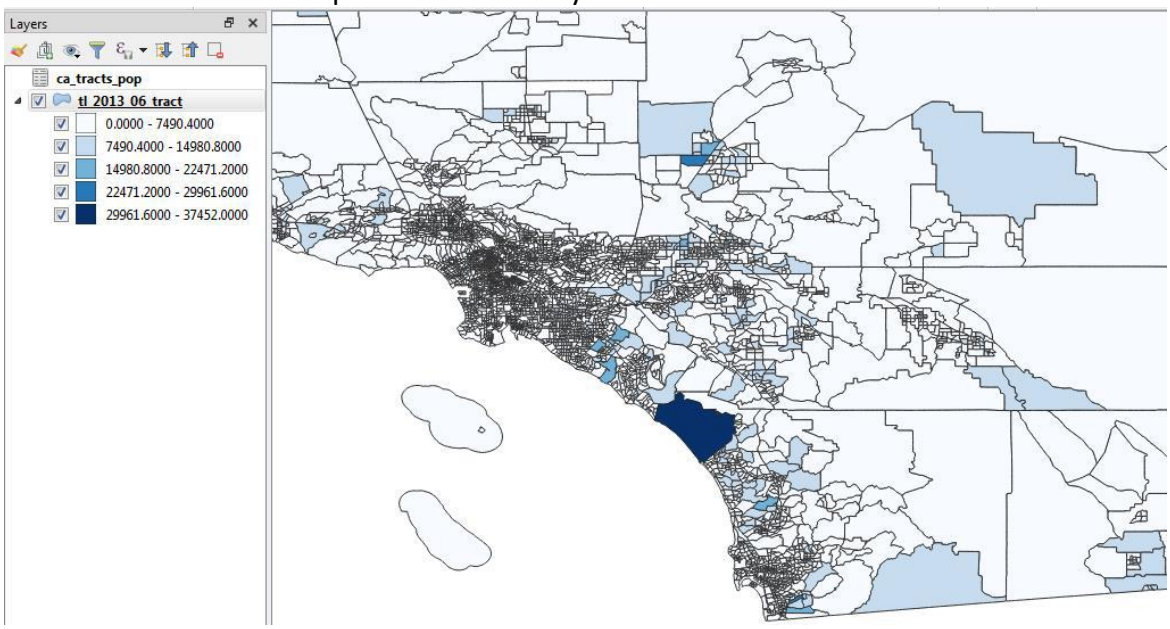
- After performing join



- For more clear output, select “tl_2013_06_tact” from Layer Panel, right click and select properties. Go to Symbology and set the following properties.

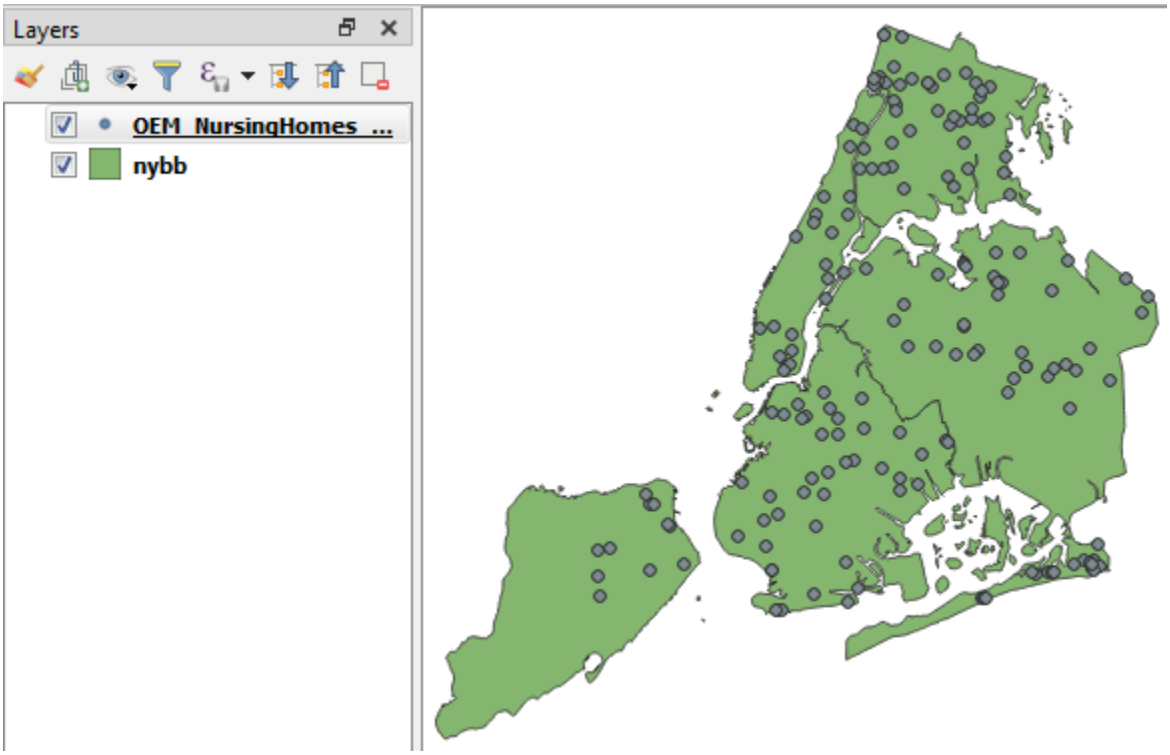


- A detailed and accurate population map of California can be seen as the result. Same technique can be used to create maps based on variety of census data.



b) spatial joins

- Go to Layer→ Add Layer → Add Vector Layer → Select "I:\GIS_Workshop\Practicals\Practical_07\B\Data\nybb_12c\nybb_13c_av\nybb.shp" and "I:\GIS_Workshop\Practicals\Practical_07\B\Data\OEM_NursingHomes_001\OEM_NursingHomes_001.shp", from data folder.



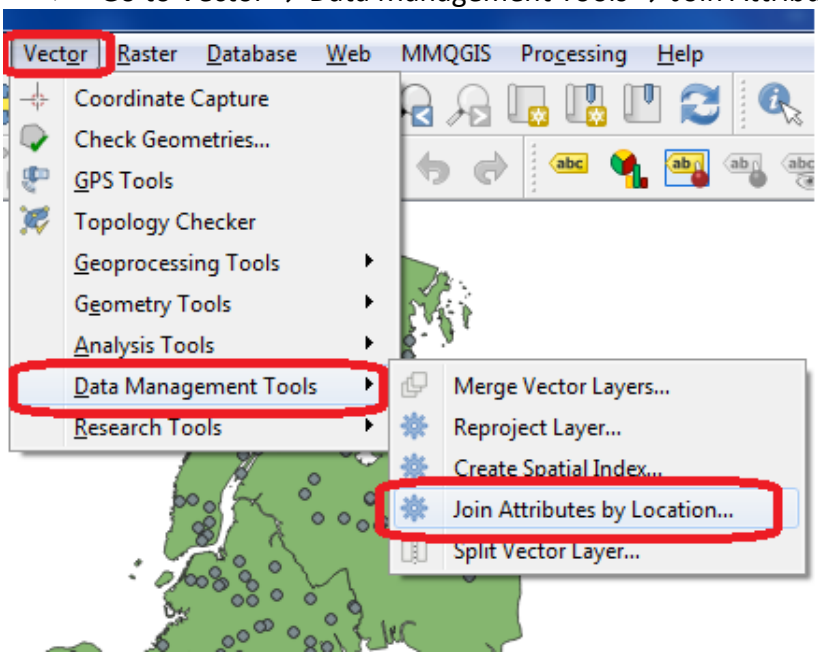
- Go to attribute table and observe the data.

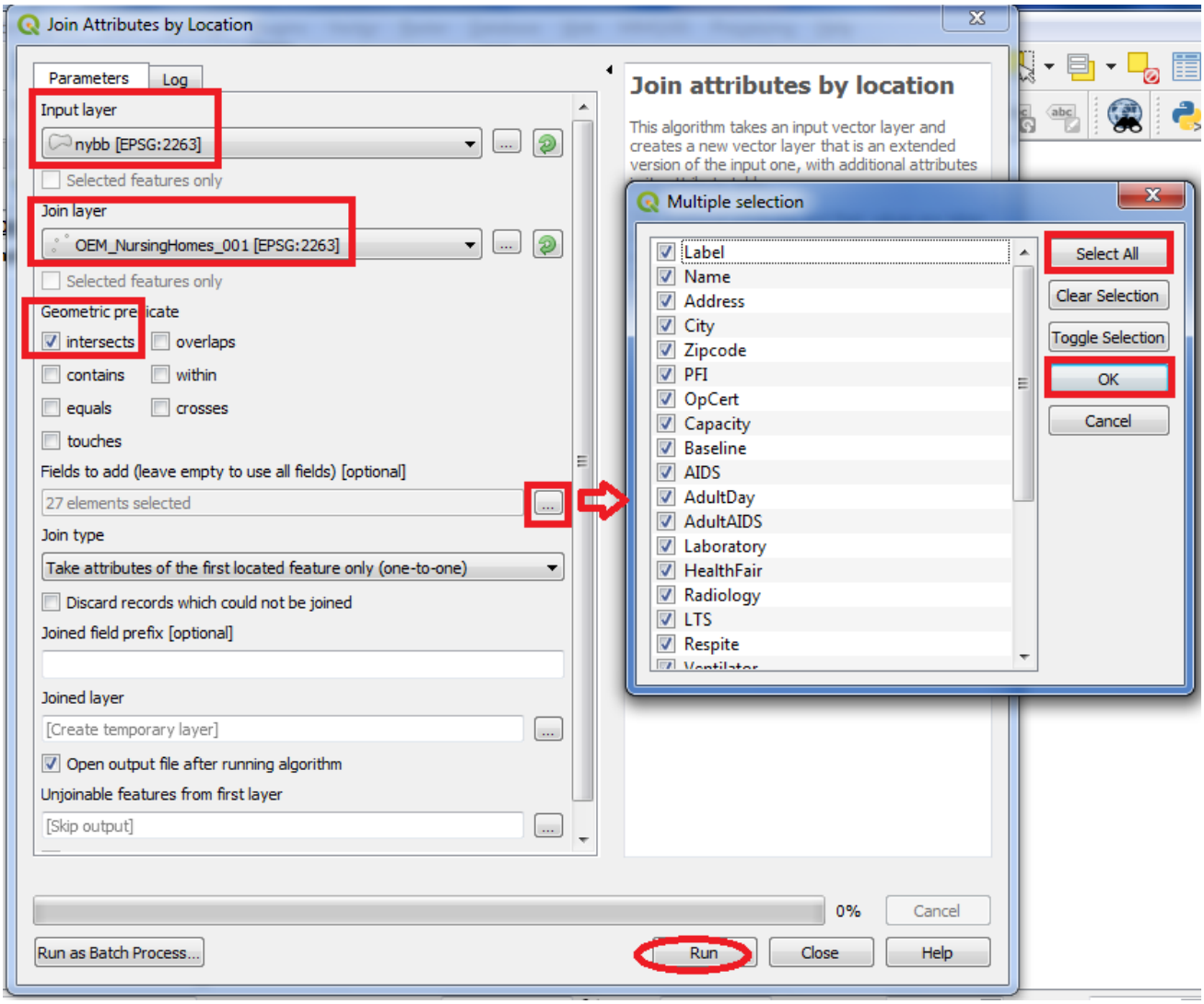
- Table before performing Join

OEM_NursingHomes_001 :: Features Total: 177, Filtered: 177, Selected: 0

	Address	City	Zipcode	PFI	OpCert	Capacity
1	66 VAN CORTL...	BRONX	10463	1217.00000000000	7000307.000000...	264
2	2505 GRAND AVE	BRONX	10468	1244.00000000000	7000337.000000...	46
3	2401 LACONIA ...	BRONX	10469	1245.00000000000	7000338.000000...	200
4	3200 BAYCHES...	BRONX	10475	1242.00000000000	7000356.000000...	236
5	700 WHITE PLA...	BRONX	10473	856.00000000000	7000361.000000...	240
6	3400 CANNON ...	BRONX	10463	1234.00000000000	7000374.000000...	400
7	612 ALLERTON ...	BRONX	10467	1218.00000000000	7000308.000000...	520
8	666 KAPPOCK S...	BRONX	10463	1233.00000000000	7000385.000000...	200
9	3518 BAINBRID...	BRONX	10467	1227.00000000000	7000319.000000...	200
10	801 CO-OP CIT...	BRONX	10475	1260.00000000000	7000389.000000...	480
11	2266 CROPSEY ...	BROOKLYN	11214	1364.00000000000	7001303.000000...	271
12	2865 BRIGHTO...	BROOKLYN	11235	1399.00000000000	7001342.000000...	320

- Go to Vector → Data Management Tools → Join Attributes by Location



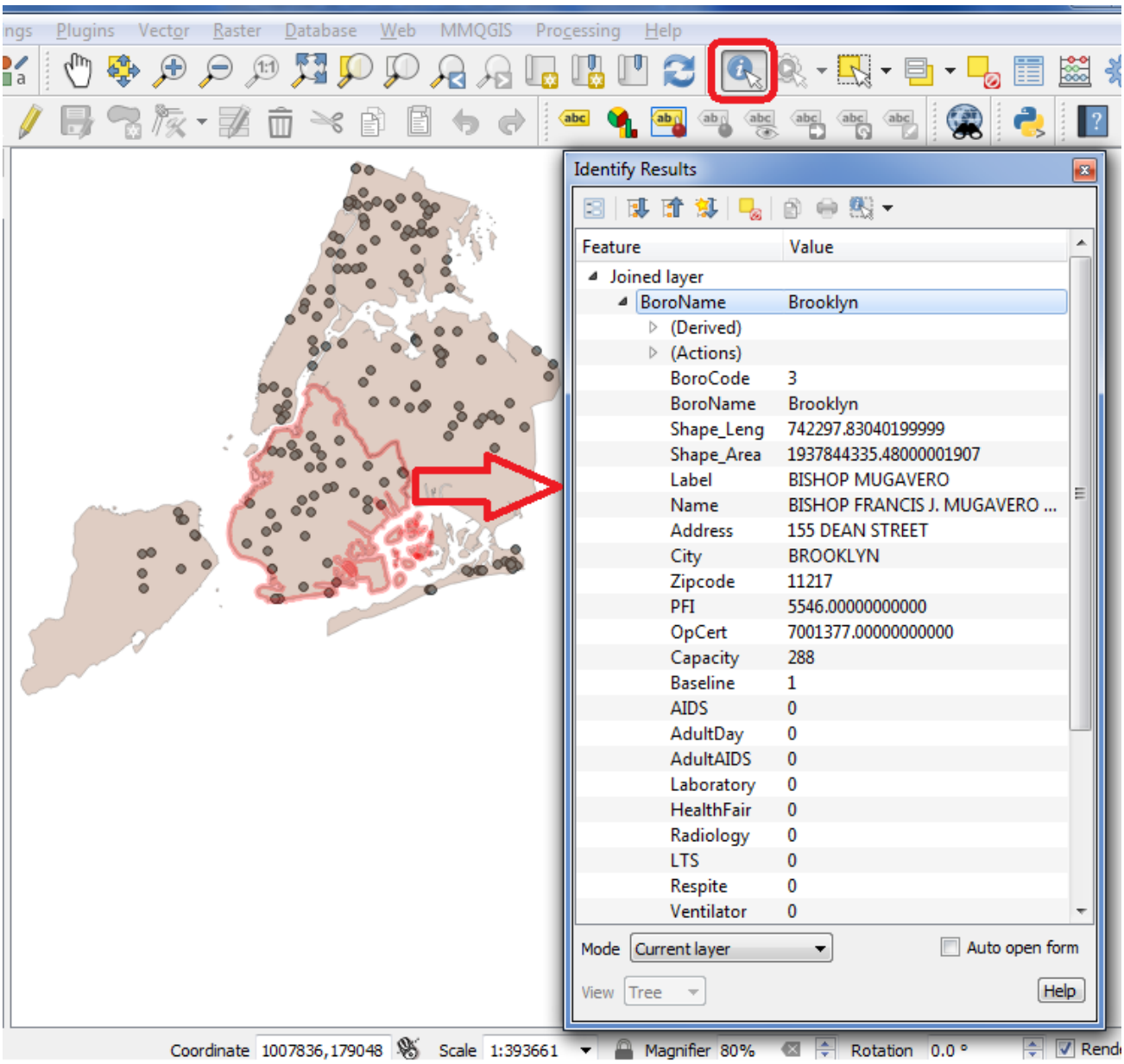


- Attribute table after join

City	Zipcode	PFI	OpCert	Capacity
ASTORIA	11102	6384.00000000000	7003405.000000...	280
BROOKLYN	11217	5546.00000000000	7001377.000000...	288
BRONX	10472	1251.00000000000	7000381.000000...	200
STATEN ISLAND	10304	1755.00000000000	7004310.000000...	300
NEW YORK	10003	4807.00000000000	7002351.000000...	28

- Use the Identify Feature Button  to select a region to view join data on map Layer.

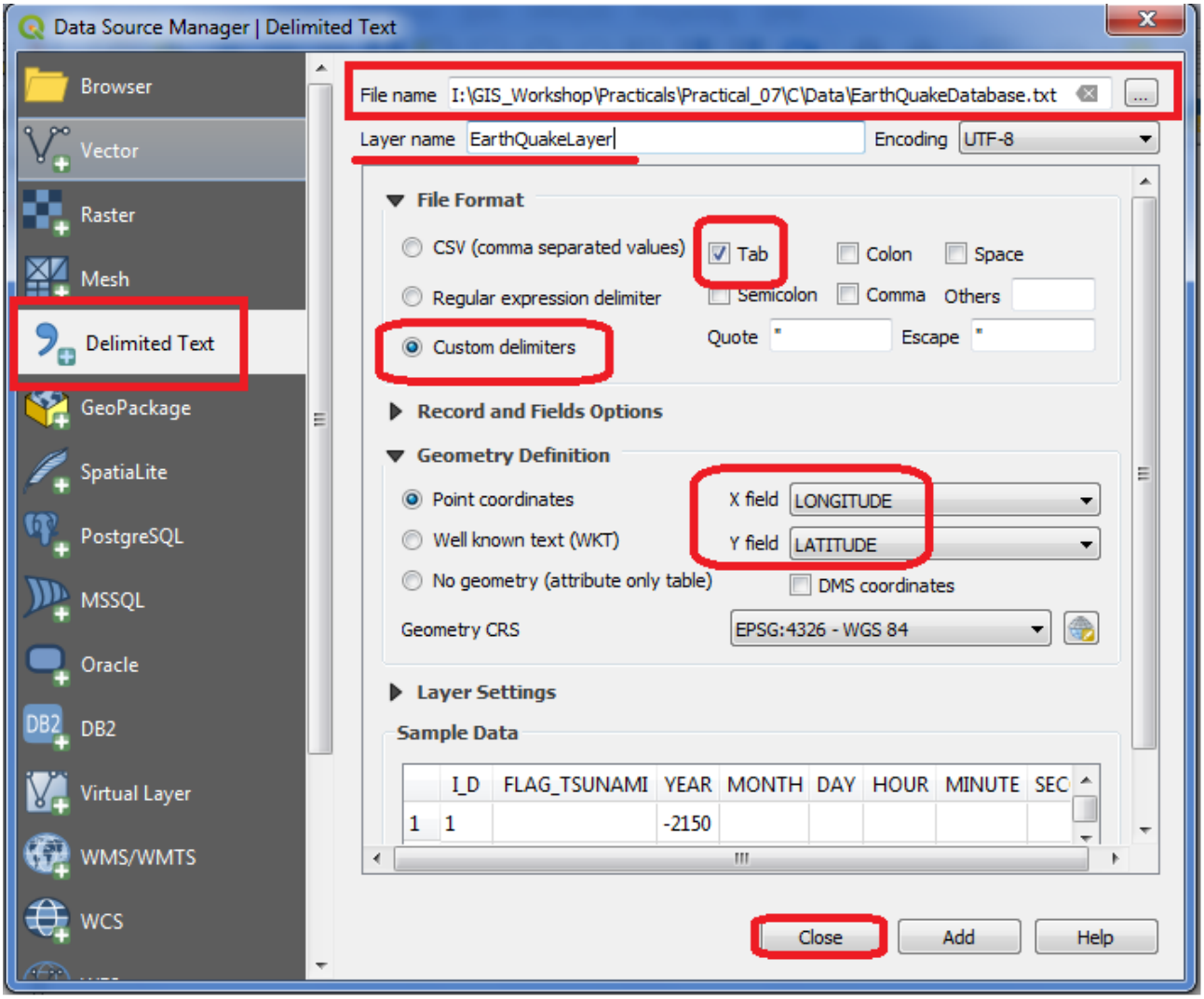
Output



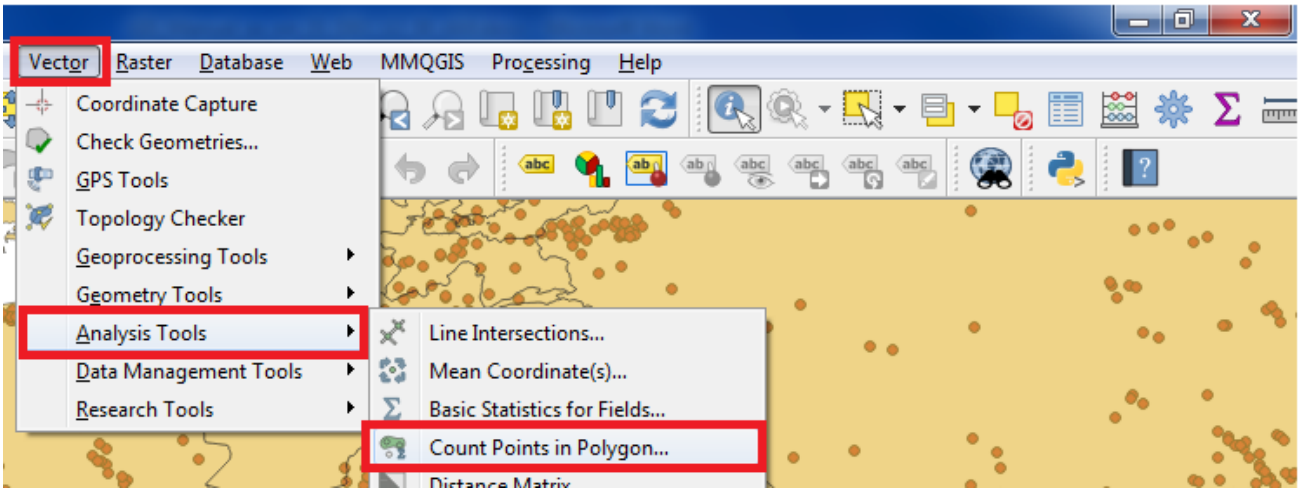
c) Points in polygon analysis

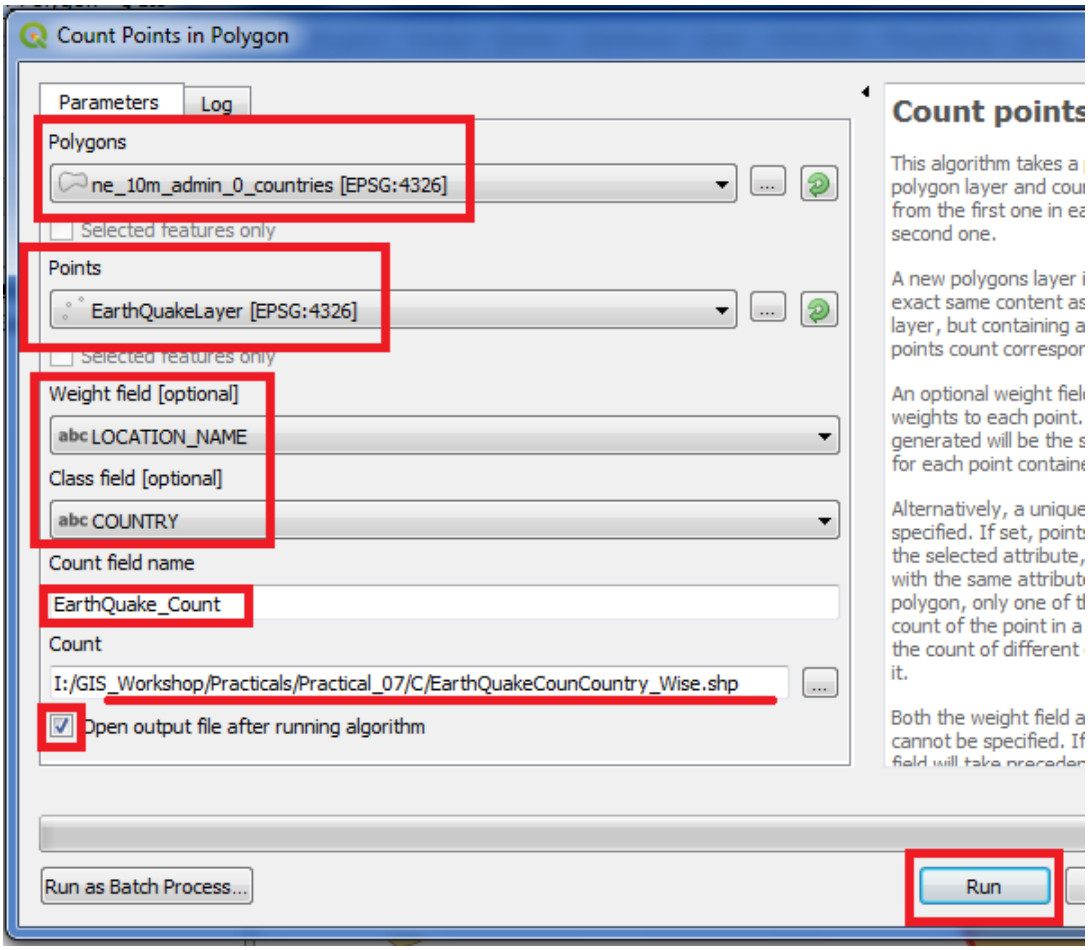
➢ Go to Layer → Add Layer → Add Delimited Text Layer

Select “EarthQuakeDatabase.txt”

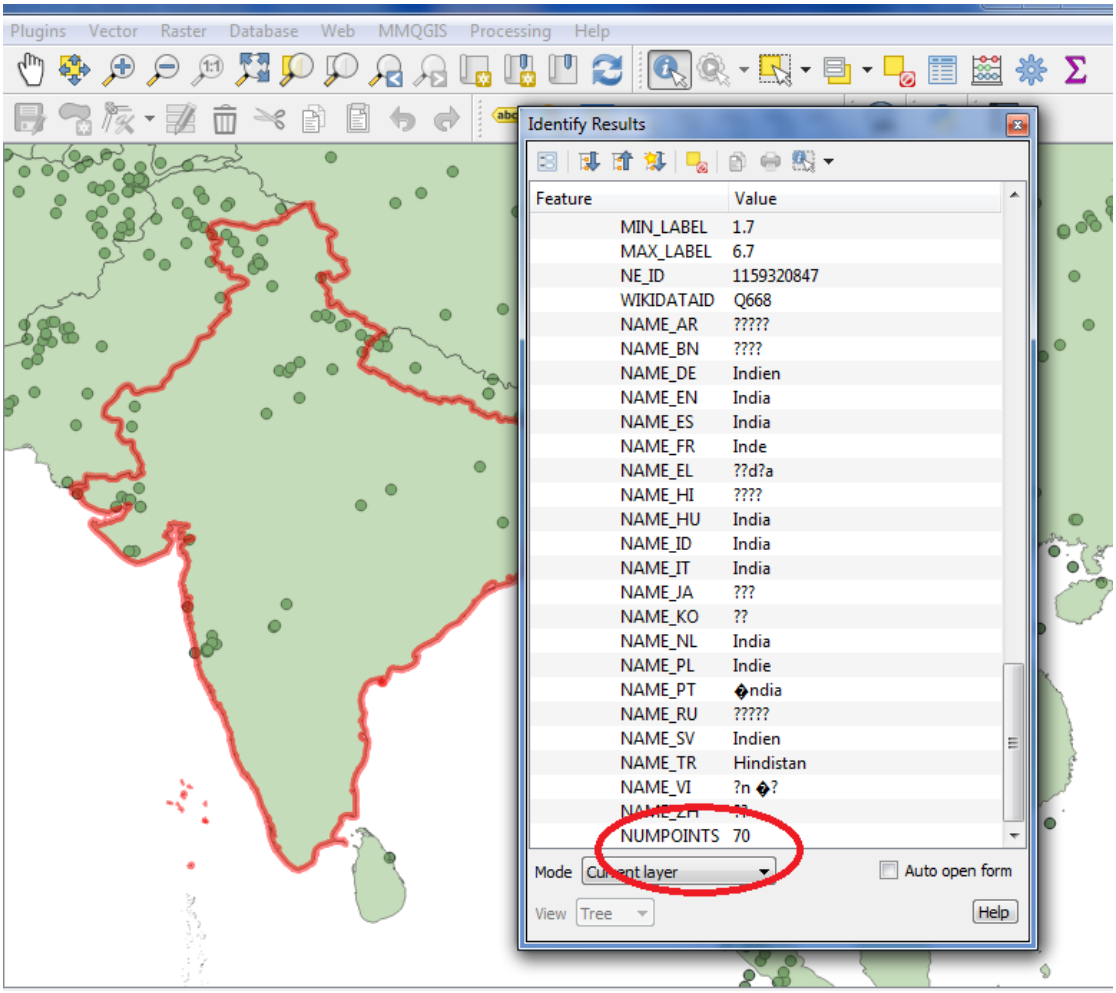


➢ Go to Layer → Add Layer → Add Delimited Text Layer “I:\GIS_Workshop\Practicals\Practical_07\C\Data\ne_10m_admin_0_countries.zip”





- Use the select Feature button  to check country wise counting of Earthquakes



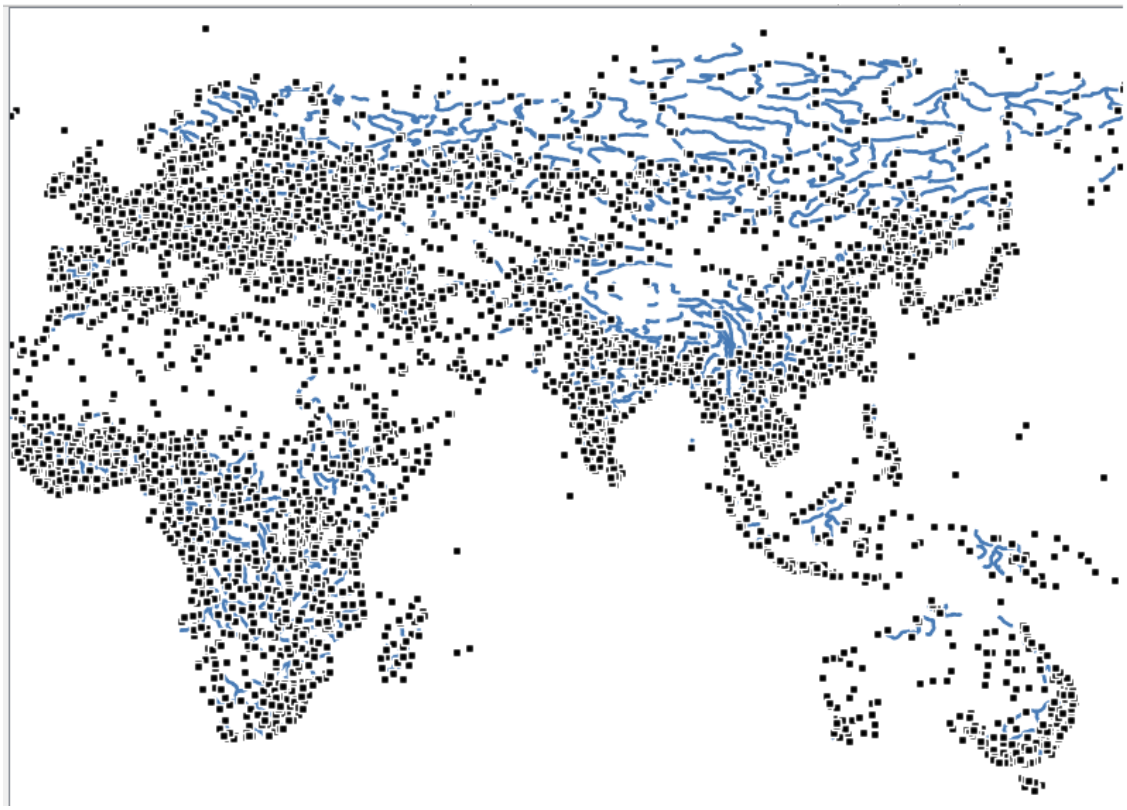
Also a new column is added to attribute table “NumPoints” indicating number of earth quake points in each country.

NUMPOINTS
0
64
53
13
0
9
0
10
5
57
0
12
4
0
2
5
8
152
0

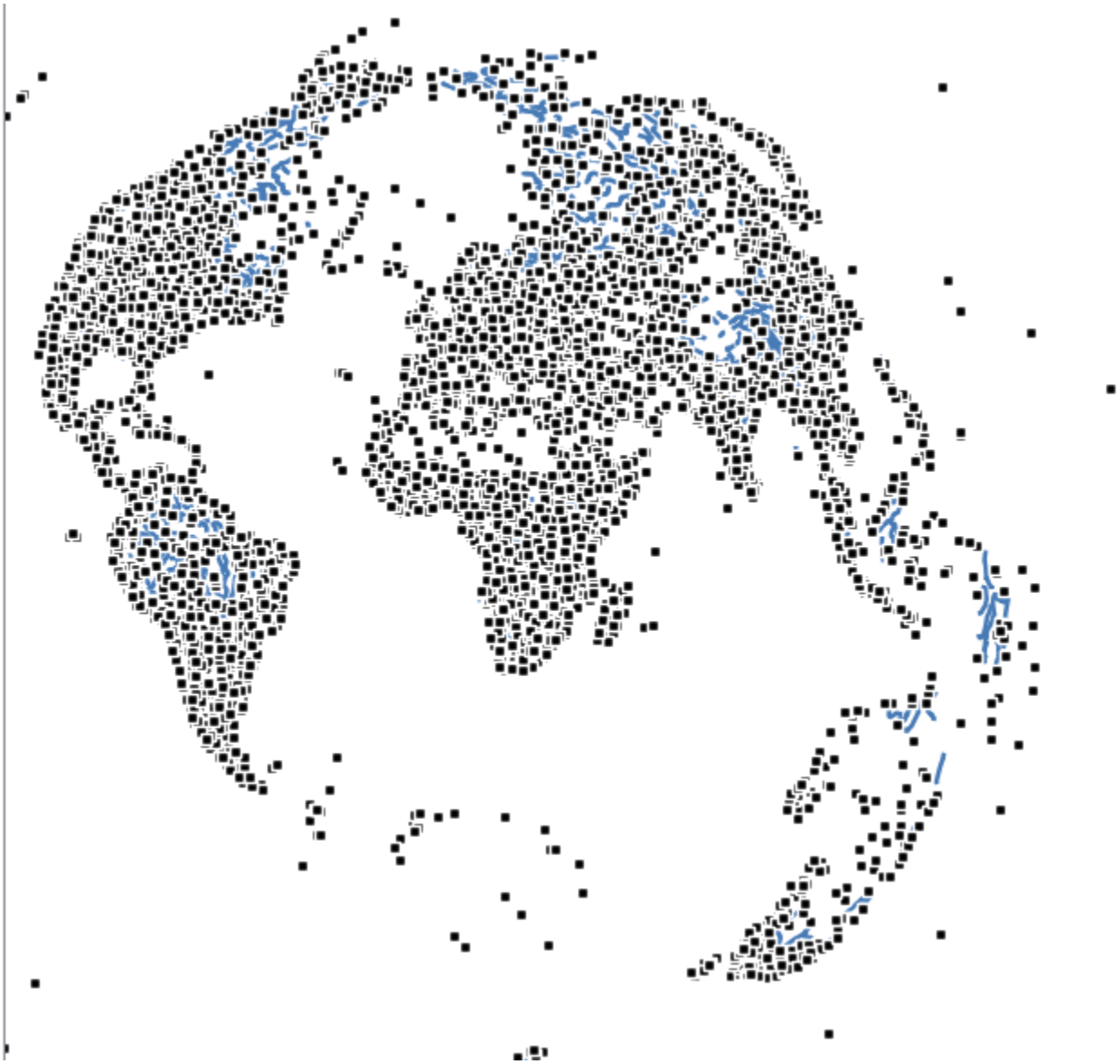
d) Performing spatial queries

➢ Go to Layer → Add Layer → Add Vector Layer and load

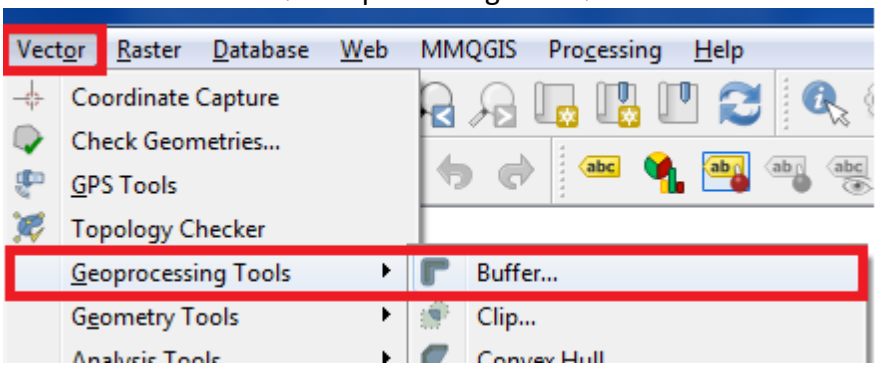
"\GIS_Workshop\Practicals\Practical_07\D\Data\ne_10m_populated_places_simple\ne_10m_populated_places_simple.shp" and
"I:\GIS_Workshop\Practicals\Practical_07\D\Data\ne_10m_rivers_lake_centerlines\ne_10m_rivers_lake_centerlines.shp" from project data folder.



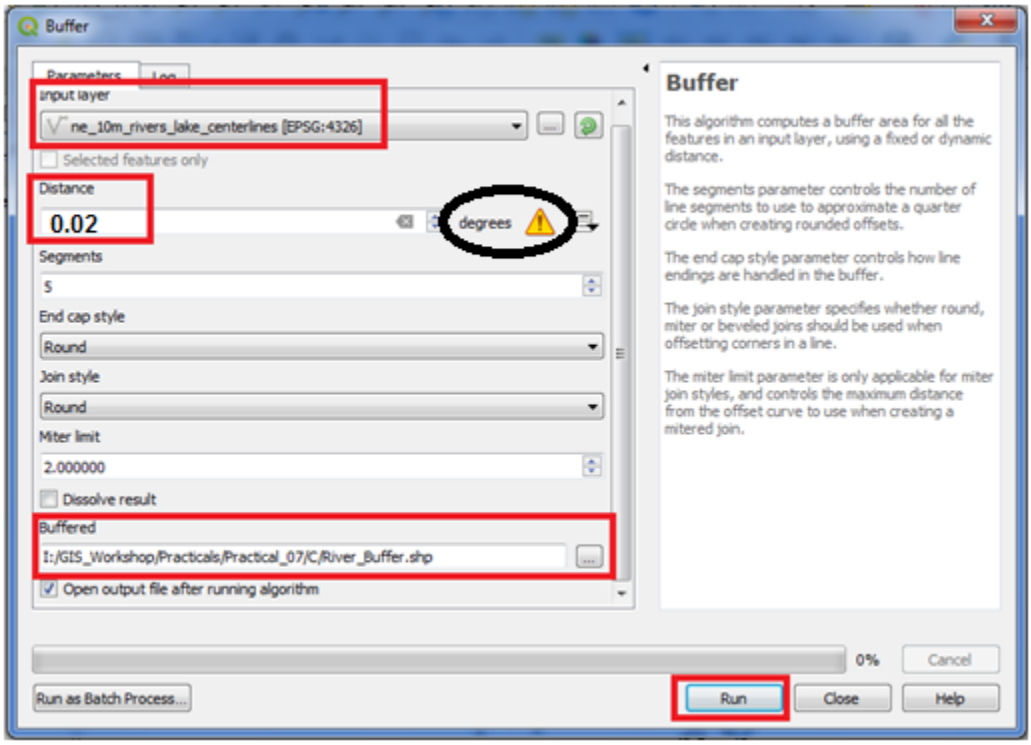
Open project Properties → Set CRS “World_Azimuthal_Equidistant EPSG 54032” . The map will be re-projected as



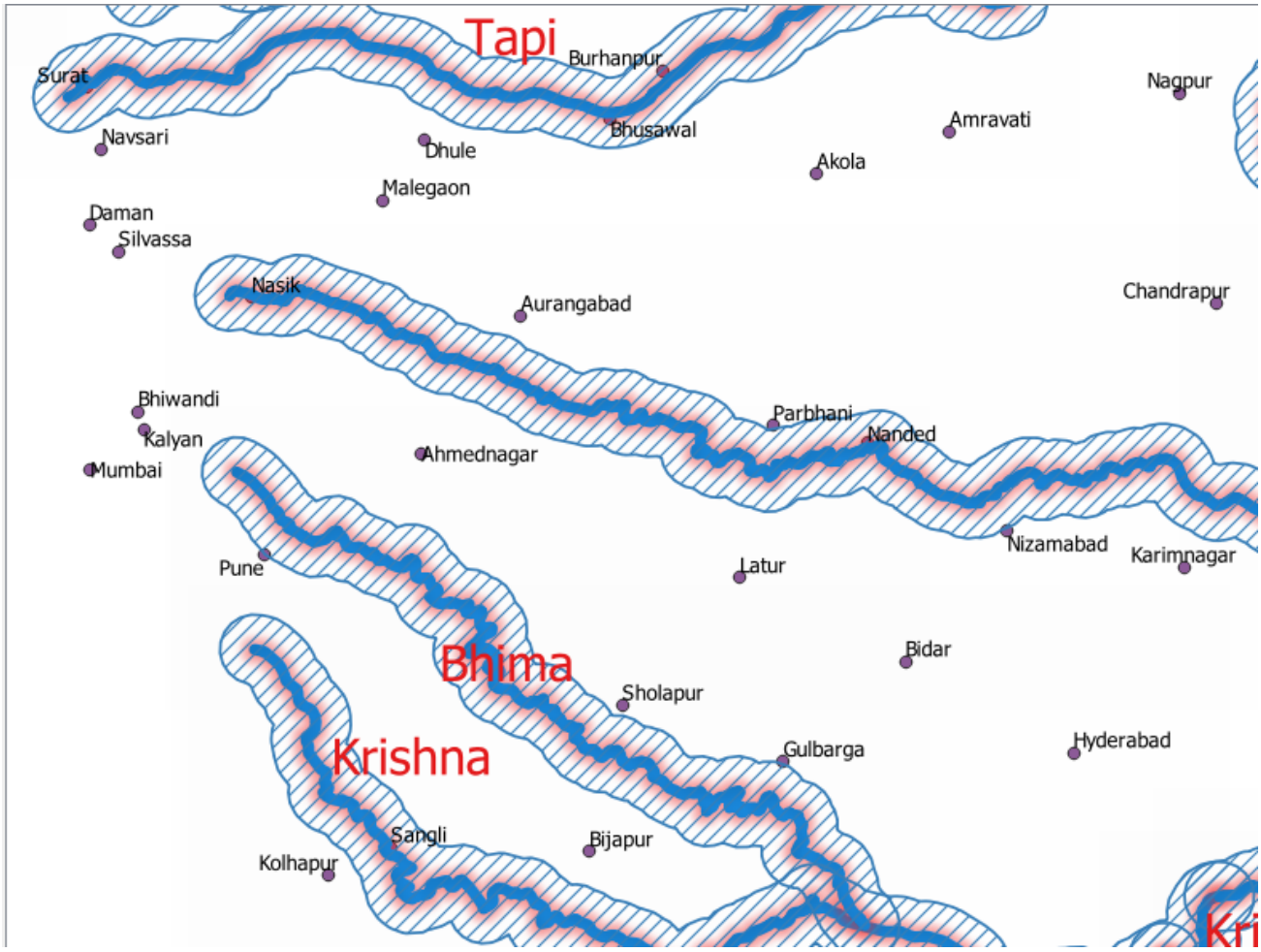
- Go to Vector → Geoprocessing Tool → Buffer



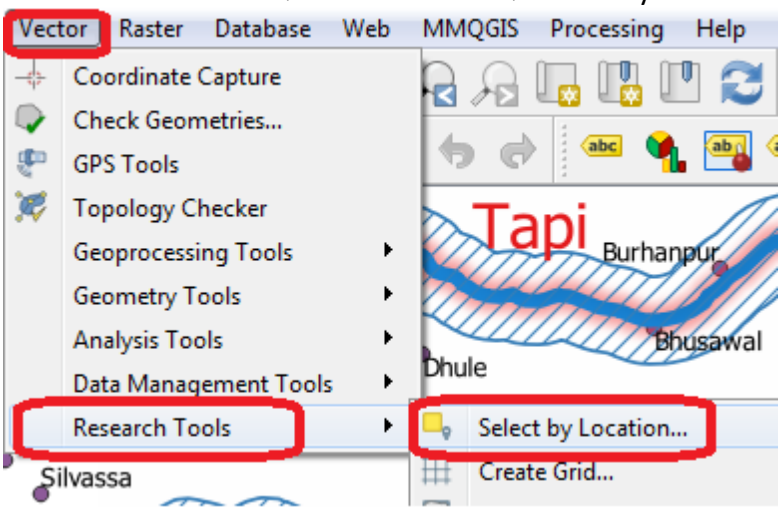
- Repeat the step to create River Buffer

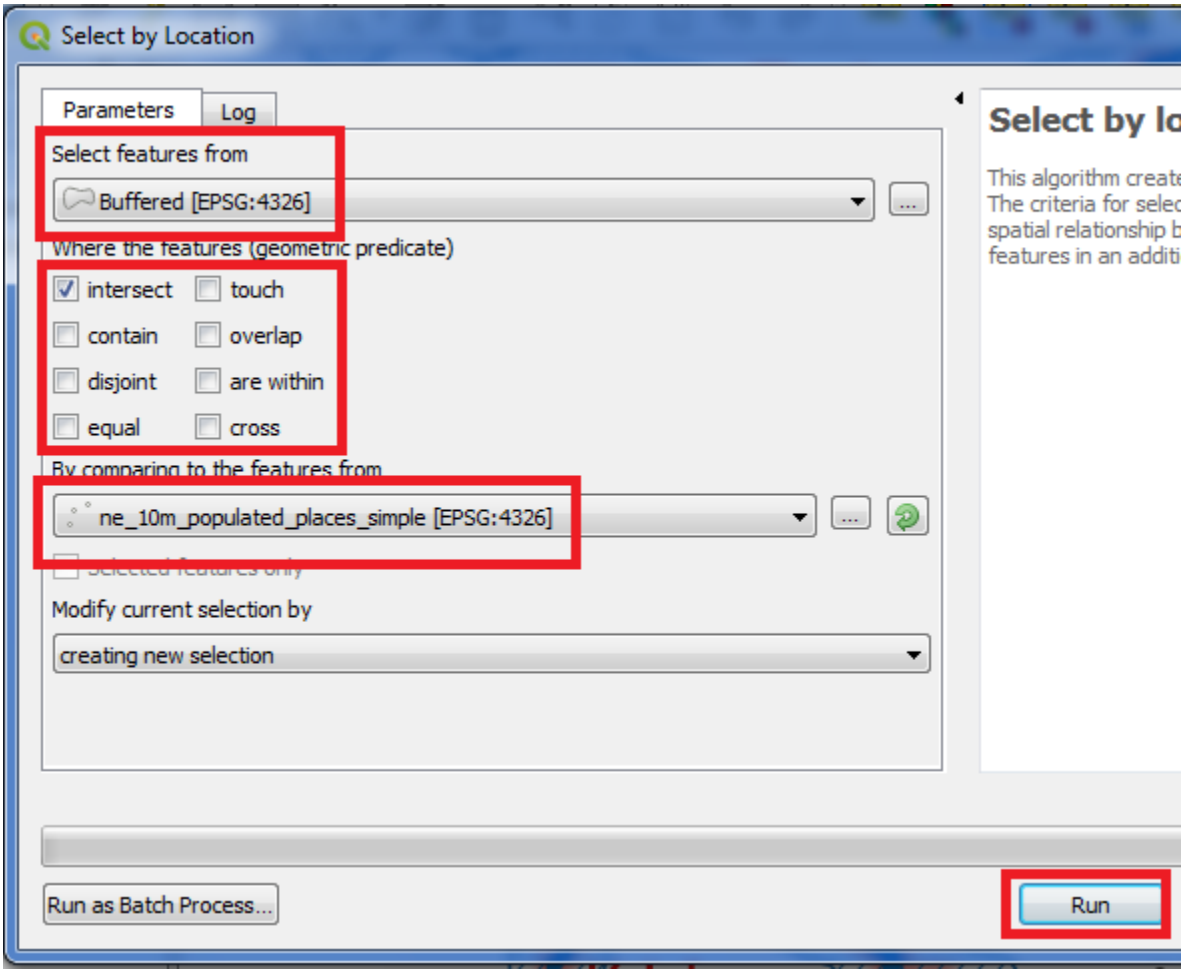


- Create a buffer for River

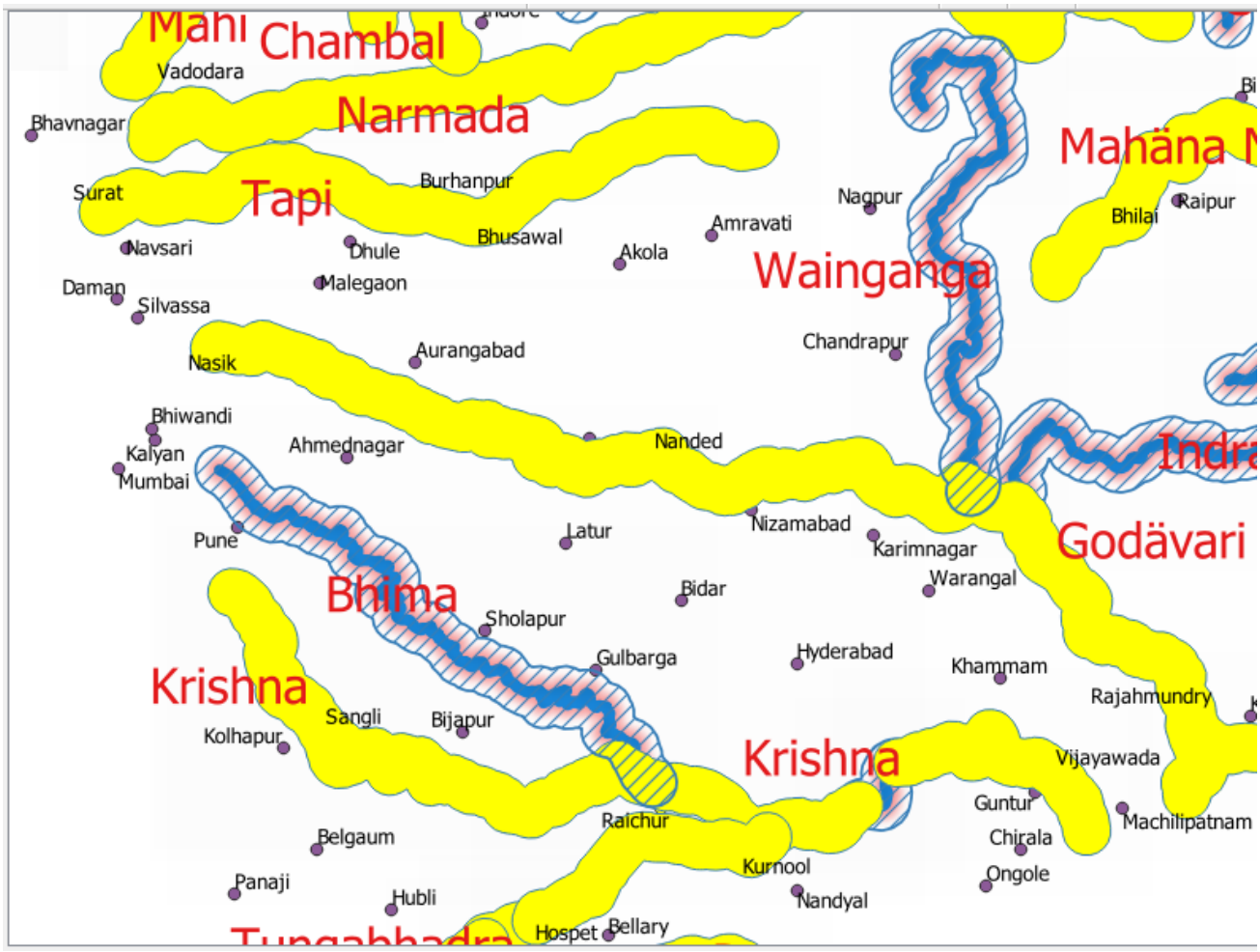


- Go to Vector → Research Tool → Select By Location





- This will highlight only those rivers containing a populated place within 2 KM


Mahi
Chambal
Vadodara
Narmada
Bhavnagar
Mahäna
Surat
Tapi
Burhanpur
Nagpur
Raipur
Bhilai
Amravati
Navsari
Dhule
Bhusawal
Akola
Wainganga
Daman
Malegaon
Silvassa
Chandrapur
Aurangabad
Nasik
Bhiwandi
Nanded
Ahmednagar
Kalyan
Mumbai
Nizamabad
Pune
Latur
Karimnagar
Godävari
Warangal
Bhima
Bidar
Sholapur
Hyderabad
Gulbarga
Khammam
Krishna
Rajahmundry
Sangli
Bijapur
Kolhapur
Krishna
Vijayawada
Guntur
Machilipatnam
Raichur
Belgaum
Chirala
Kurnool
Ongole
Panaji
Hubli
Nandyal
Hospet
Bellary

PRACTICAL NO:- 8

Advanced GIS Operations

a) Nearest Neighbor Analysis
b) Sampling Raster Data using Points or Polygon
c) Interpolating Point Data
A. Nearest Neighbor Analysis

GIS is very useful in analyzing spatial relationship between features. One such analysis is finding out which features are closest to a given feature. QGIS has a tool called **Distance Matrix** which helps with such analysis. In this tutorial, we will use 2 datasets and find out which points from one layer are closest to which point from the second layer.

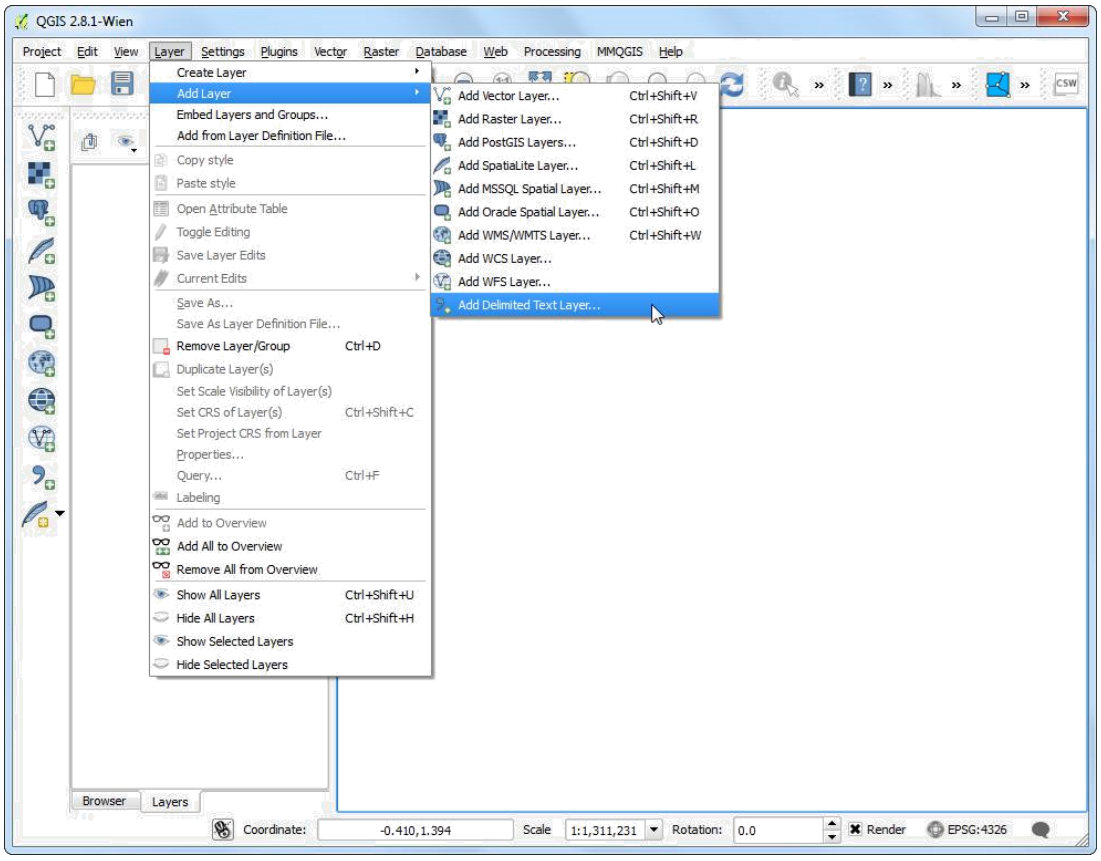
Requierd dataset:

signif.txt

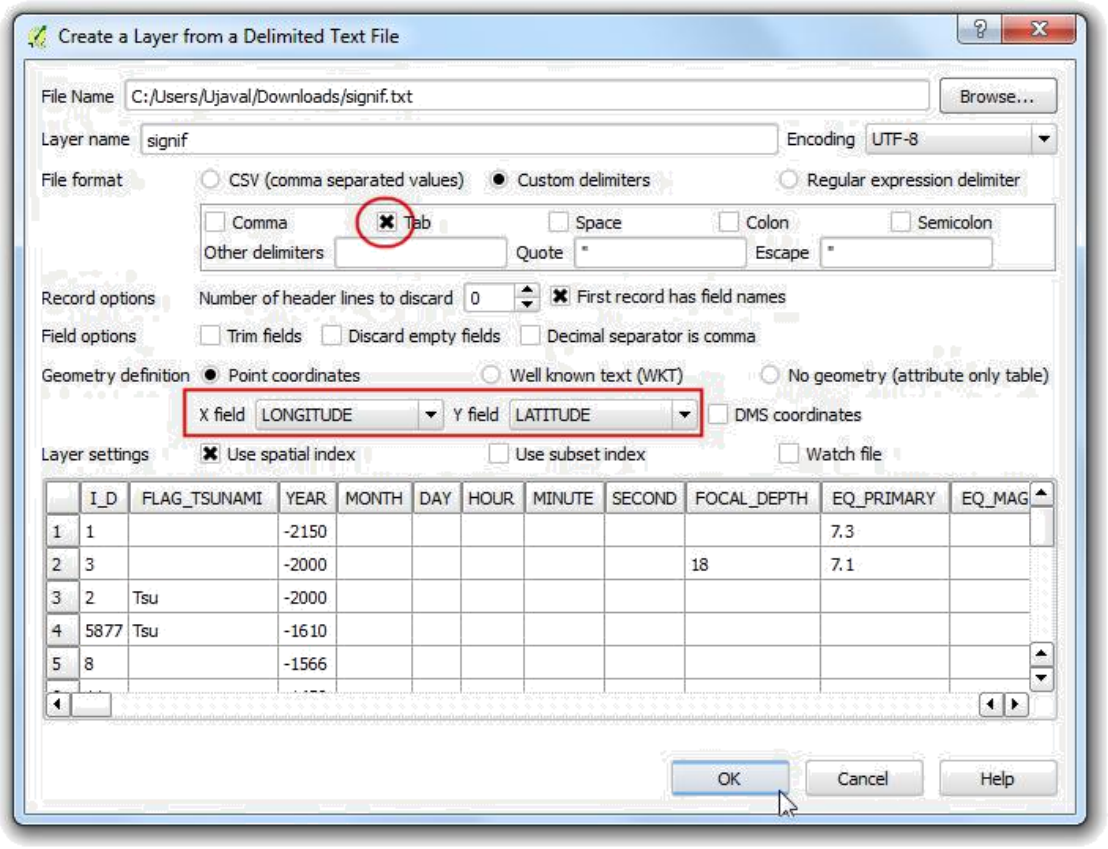
ne_10m_populated_places_simple.zip

Procedure

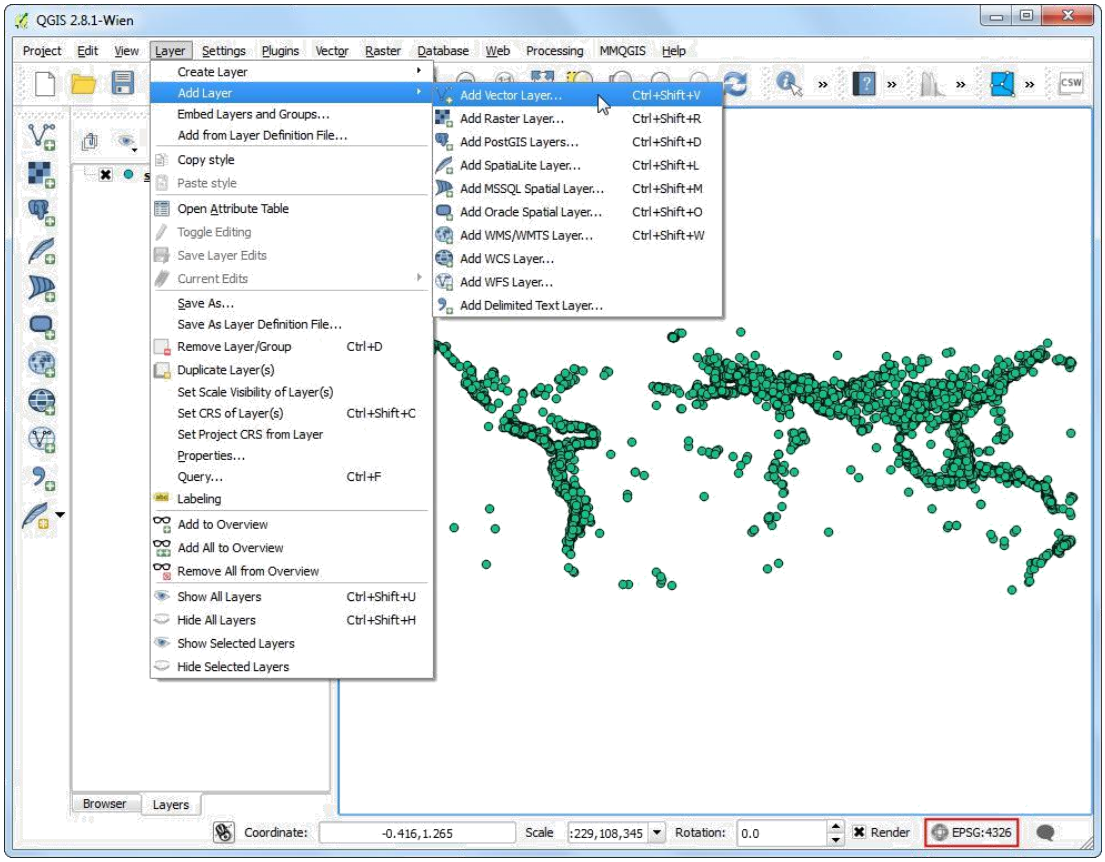
- Open Layer ‣ Add Layer ‣ Add Delimited Text Layer and browse to the downloaded signif.txt file.



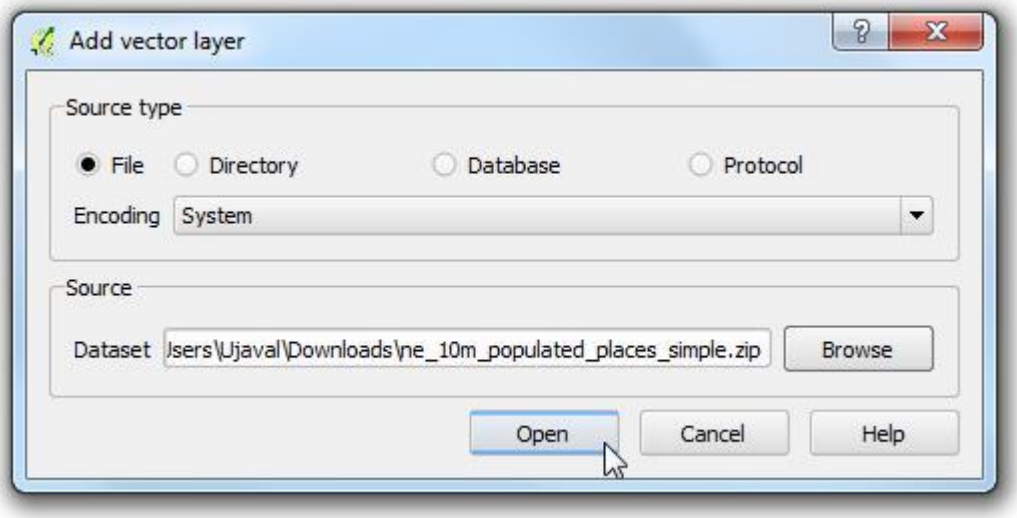
- Since this is a *tab-delimited file*, choose Tab as the File format. The X field and Y field would be auto-populated. Click OK



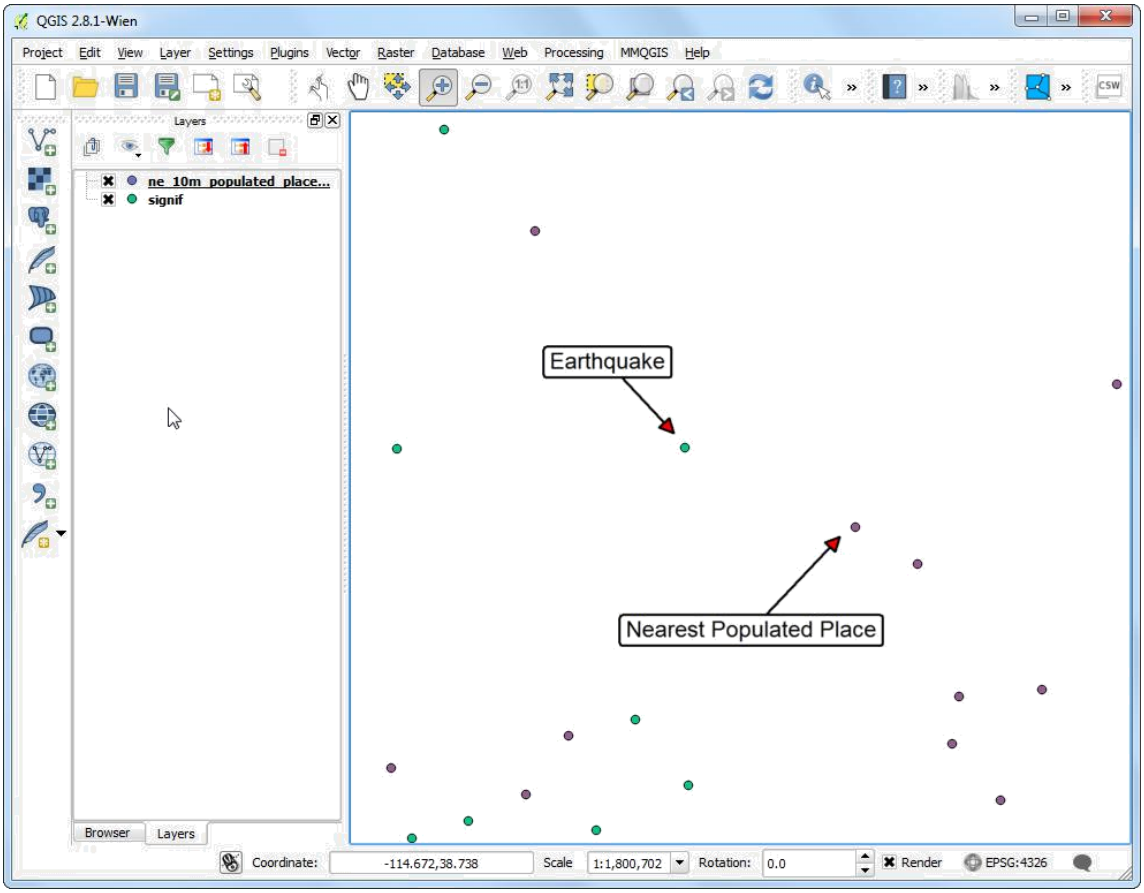
- As the earthquake dataset has Latitude/Longitude coordinates, it will be imported with the default CRS of EPSG: 4326. Verify that is the case in the bottom-right corner. Let's also open the Populated Places layer. Go to Layer ‣ Add Layer ‣ Add Vector Layer.



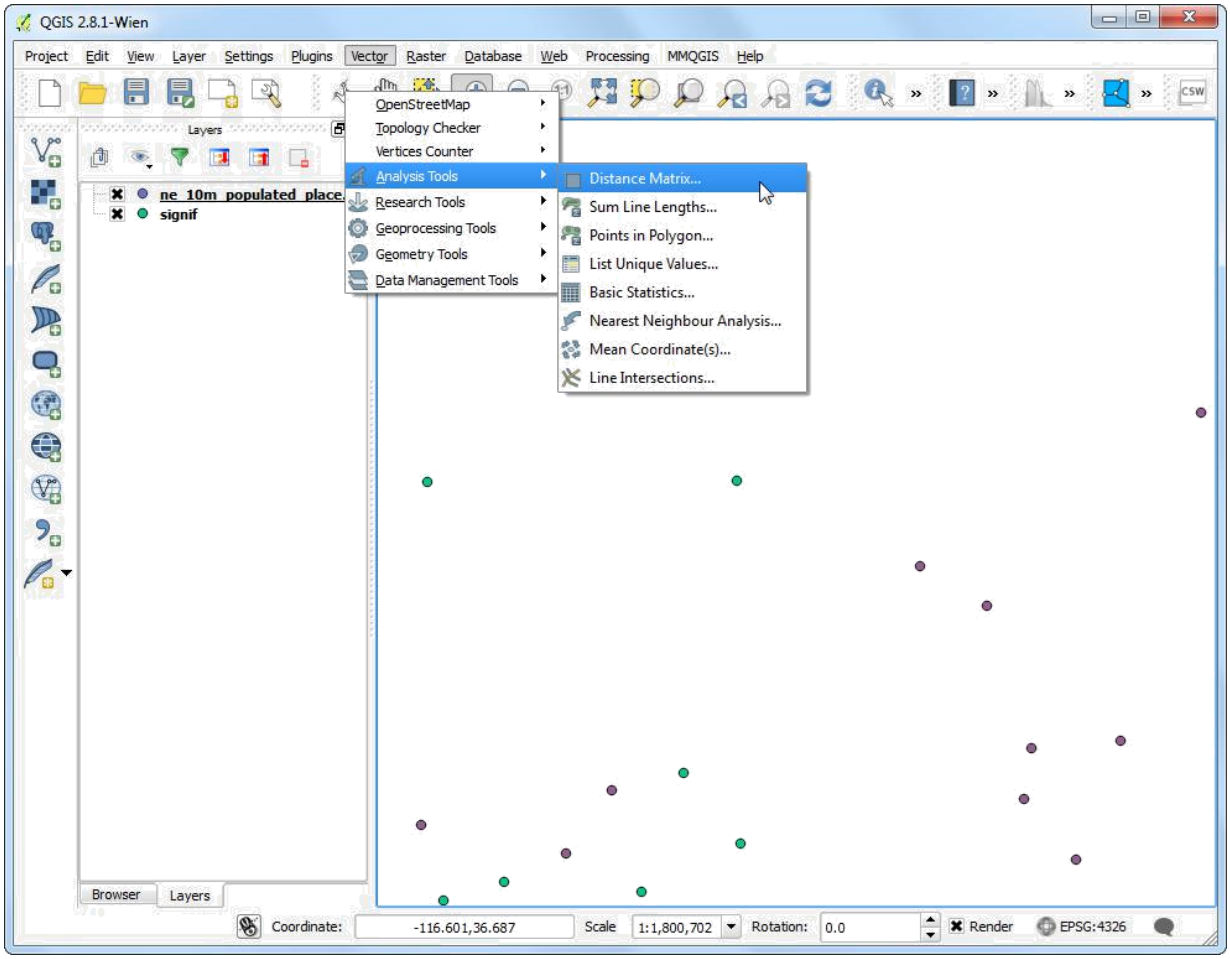
- Browse to the downloaded ne_10m_populated_places_simple.zip file and click Open.



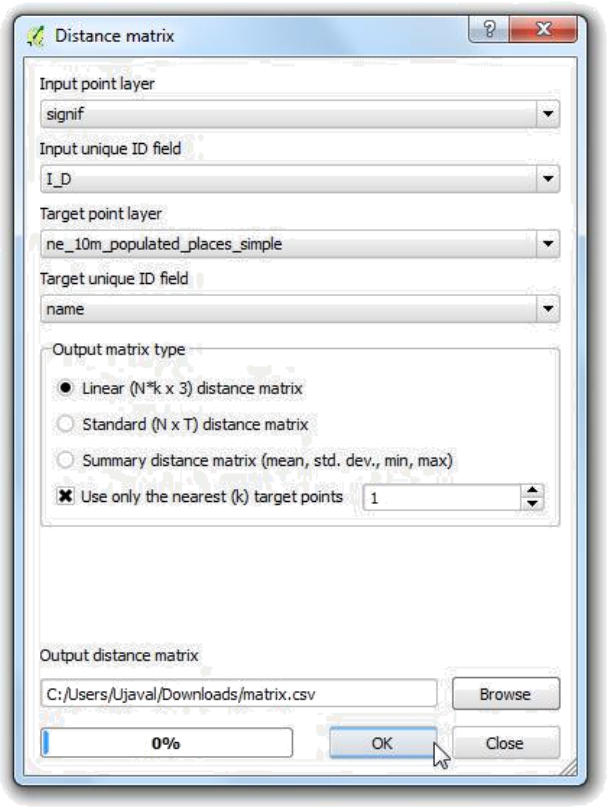
- Zoom around and explore both the datasets. Each purple point represents the location of a significant earthquake and each blue point represents the location of a populated place. We need a way to find out the nearest point from the populated places layer for each of the points in the earthquake layer.



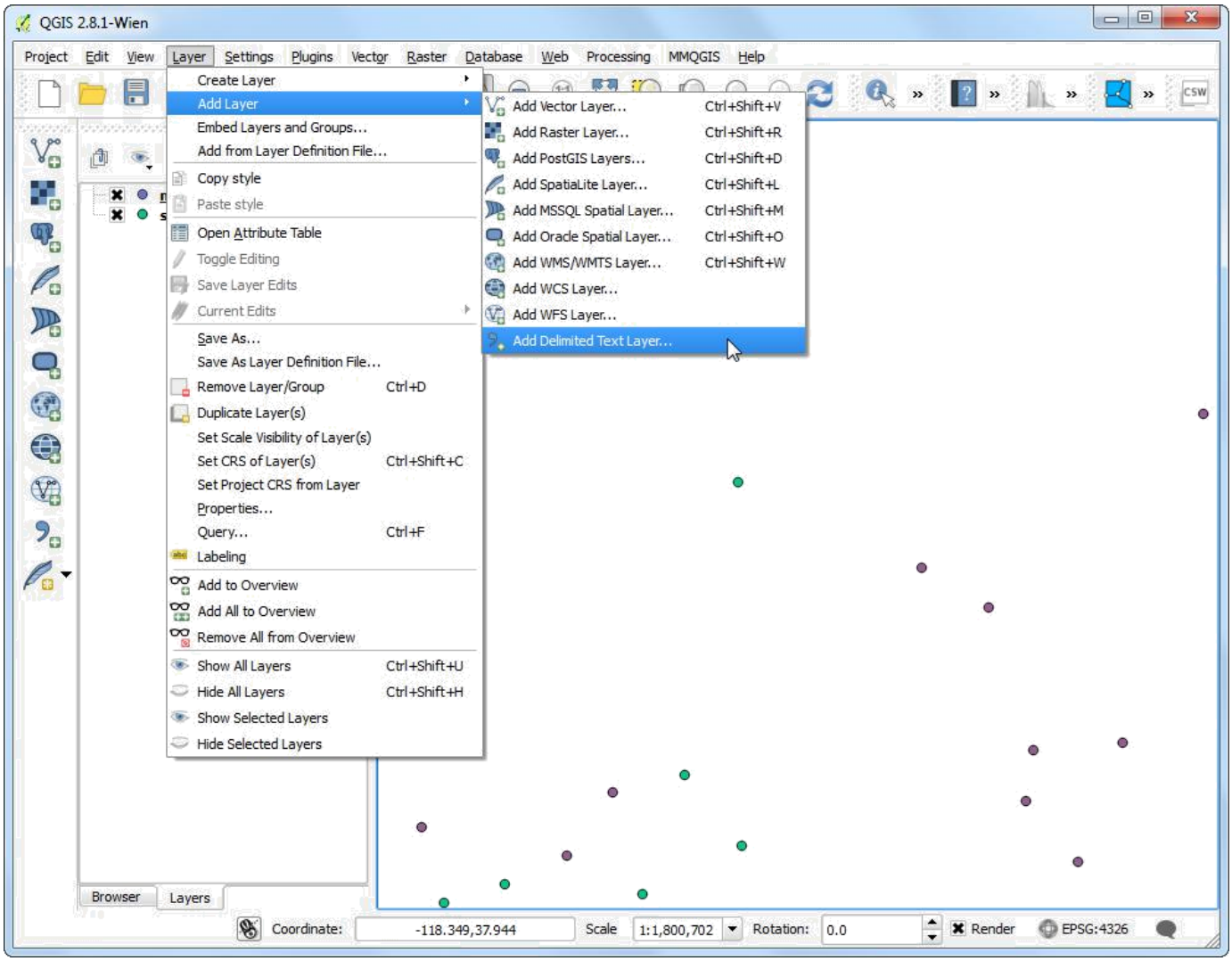
Go to Vector ‣ Analysis Tools ‣ Distance Matrix.



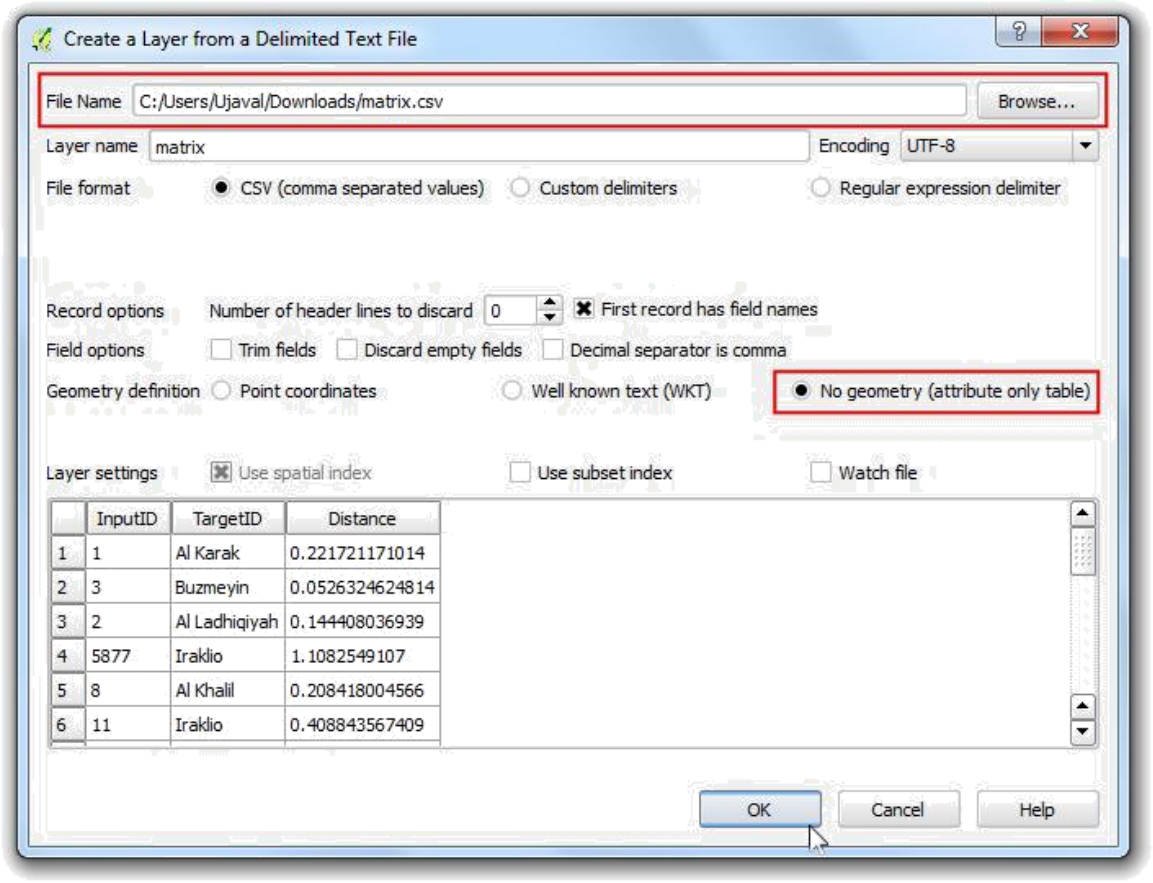
- Here select the earthquake layer signif as the Input point layer and the populated places ne_10m_populated_places_simple as the target layer. You also need to select a unique field from each of these layers which is how your results will be displayed. In this analysis, we are looking to get only 1 nearest point, so check the Use only the nearest(k) target points, and enter 1. Name your output file matrix.csv, and click OK. Once the processing finishes, click Close.



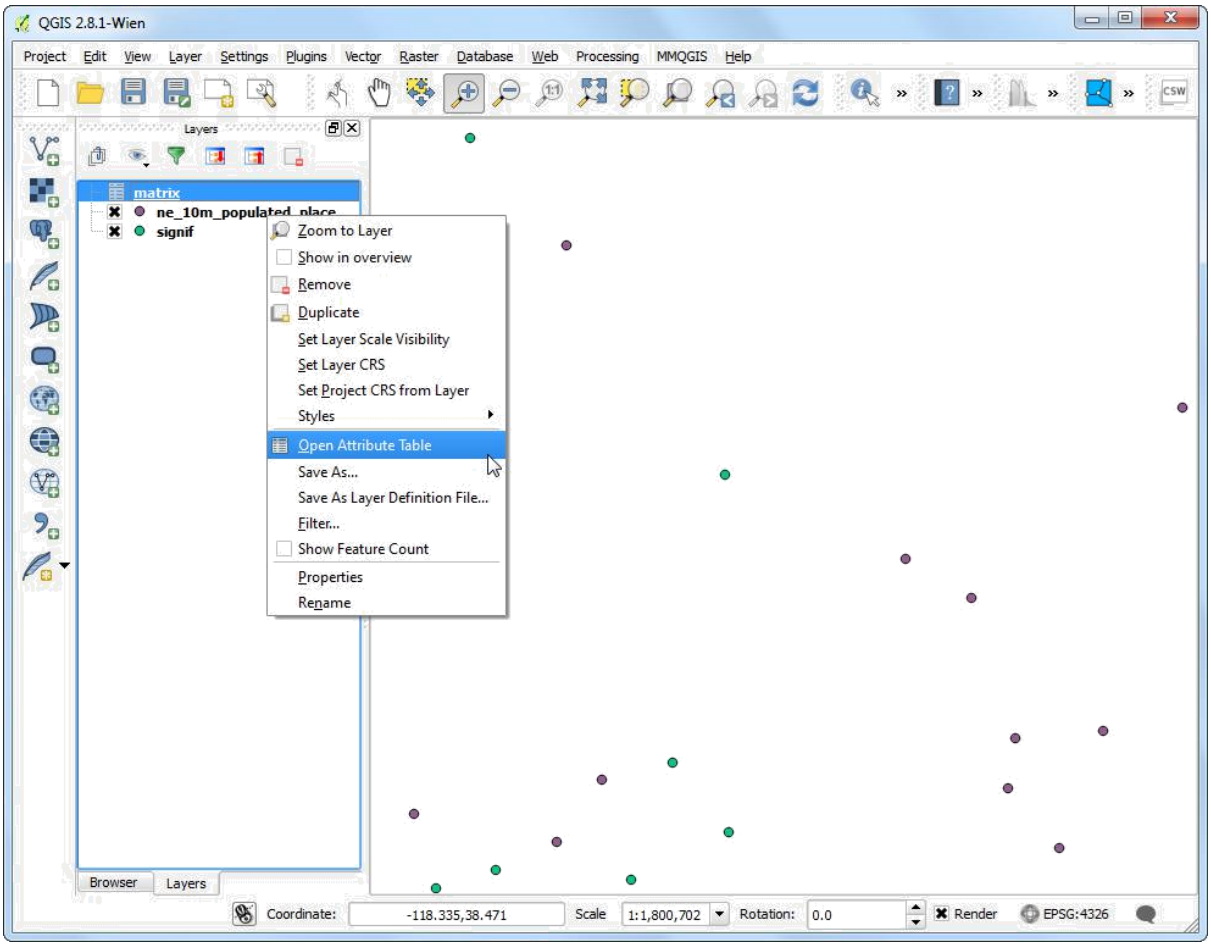
- Once the processing finishes, click the Close button in the Distance Matrix dialog. You can now view the matrix.csv file in Notepad or any text editor. QGIS can import CSV files as well, so we will add it to QGIS and view it there. Go to Layer ‣ Add Layer ‣ Add Delimited Text Layer....



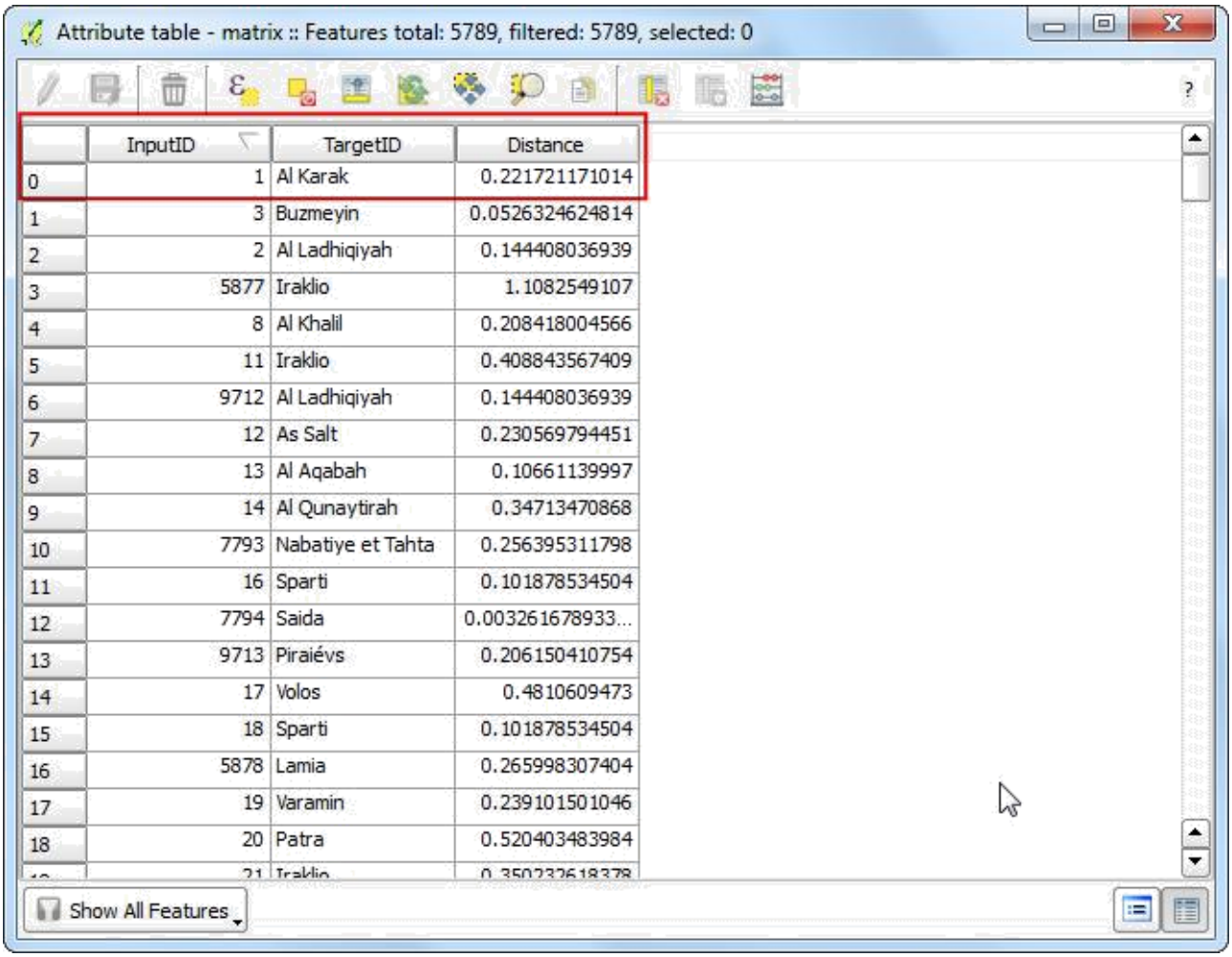
- Browse to the newly created matrix.csv file. Since this file is just text columns, select No geometry (attribute only table) as the Geometry definition. Click OK.



- You will see the CSV file loaded as a table. Right-click on the table layer and select Open Attribute Table.

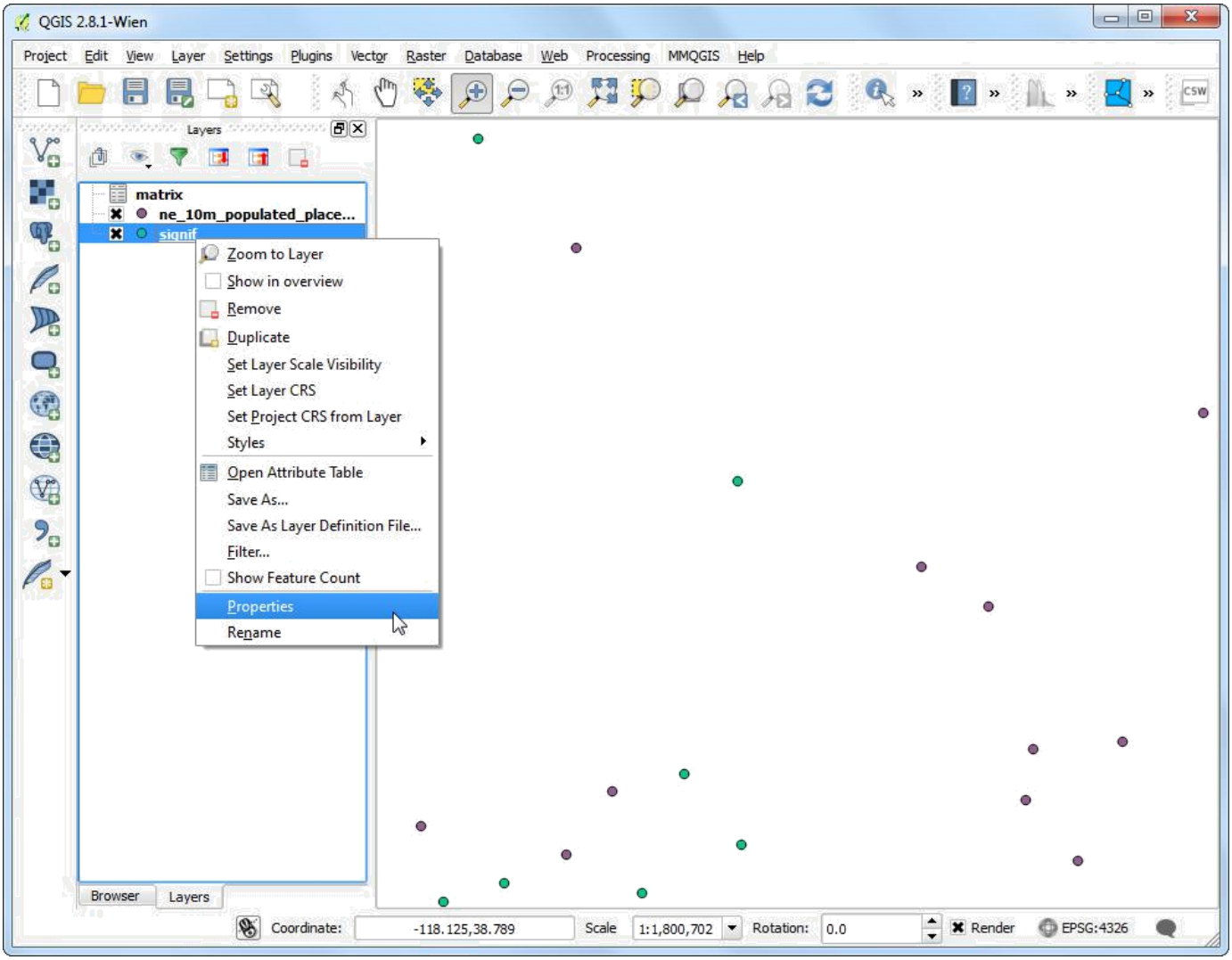


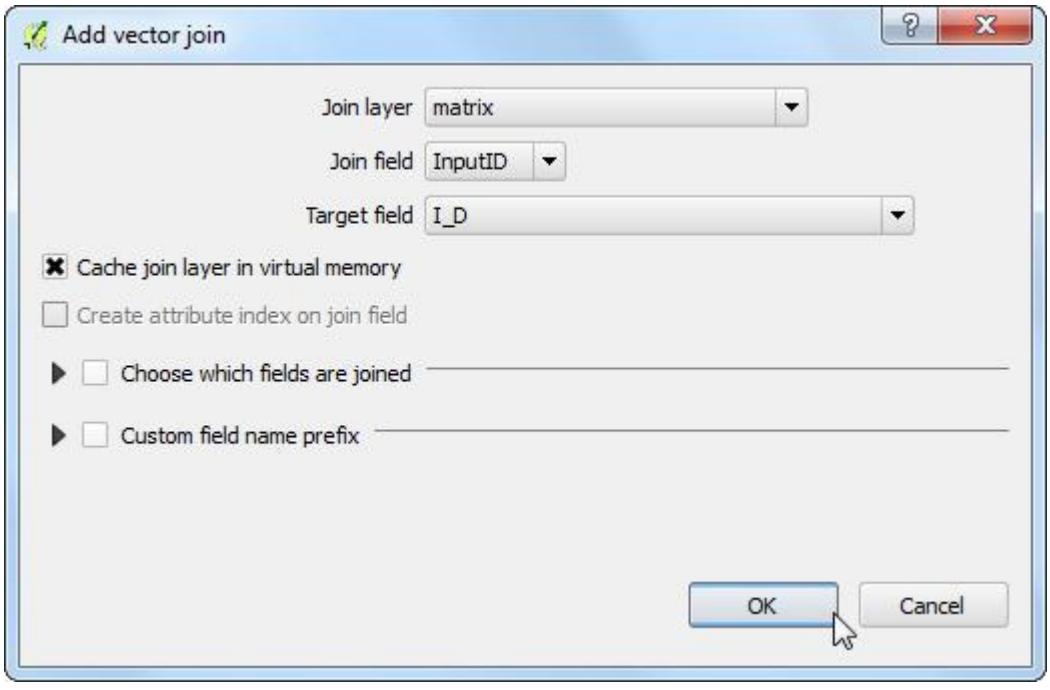
- Now you will be able to see the content of our results. The InputID field contains the field name from the Earthquake layer. The TargetID field contains the name of the feature from the Populated Places layer that was the closest to the earthquake point. The Distance field is the distance between the 2 points.



	InputID	TargetID	Distance
0	1	Al Karak	0.221721171014
1	3	Buzmeyin	0.0526324624814
2	2	Al Ladhiqiyah	0.144408036939
3	5877	Iraklio	1.1082549107
4	8	Al Khalil	0.208418004566
5	11	Iraklio	0.408843567409
6	9712	Al Ladhiqiyah	0.144408036939
7	12	As Salt	0.230569794451
8	13	Al Aqabah	0.10661139997
9	14	Al Qunaytirah	0.34713470868
10	7793	Nabatiye et Tahta	0.256395311798
11	16	Sparti	0.101878534504
12	7794	Saida	0.003261678933...
13	9713	Piraiévs	0.206150410754
14	17	Volos	0.4810609473
15	18	Sparti	0.101878534504
16	5878	Lamia	0.265998307404
17	19	Varamin	0.239101501046
18	20	Patra	0.520403483984
	21	Iraklio	0.350232618378

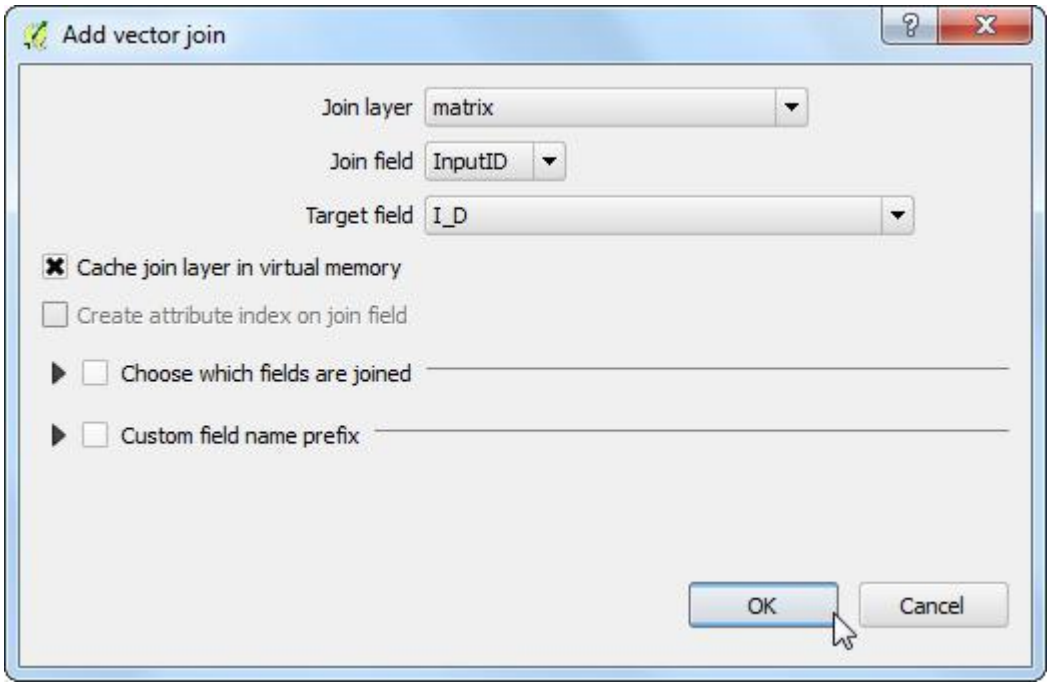
- This is very close to the result we were looking for. For some users, this table would be sufficient. However, we can also integrate this results in our original Earthquake layer using a **Table Join**. Right-click on the Earthquake layer, and select Properties.



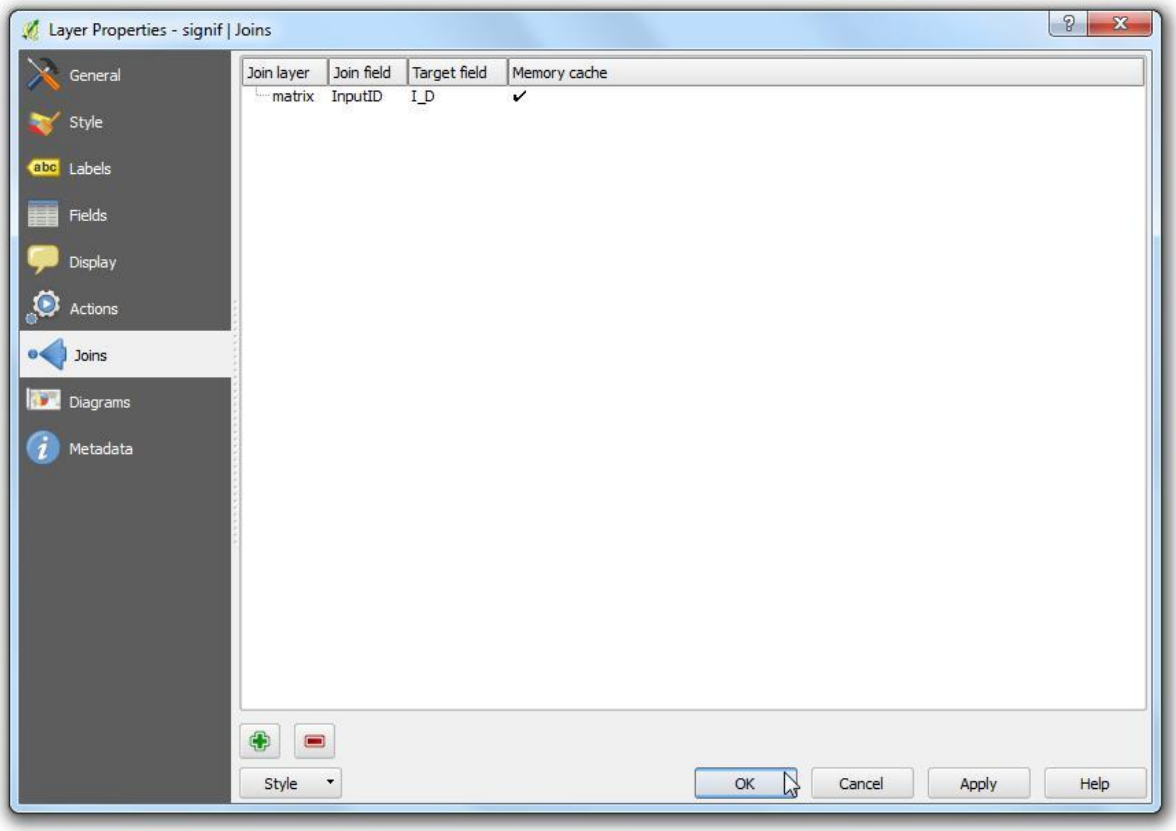


- Go to the Joins tab and click on the + button.

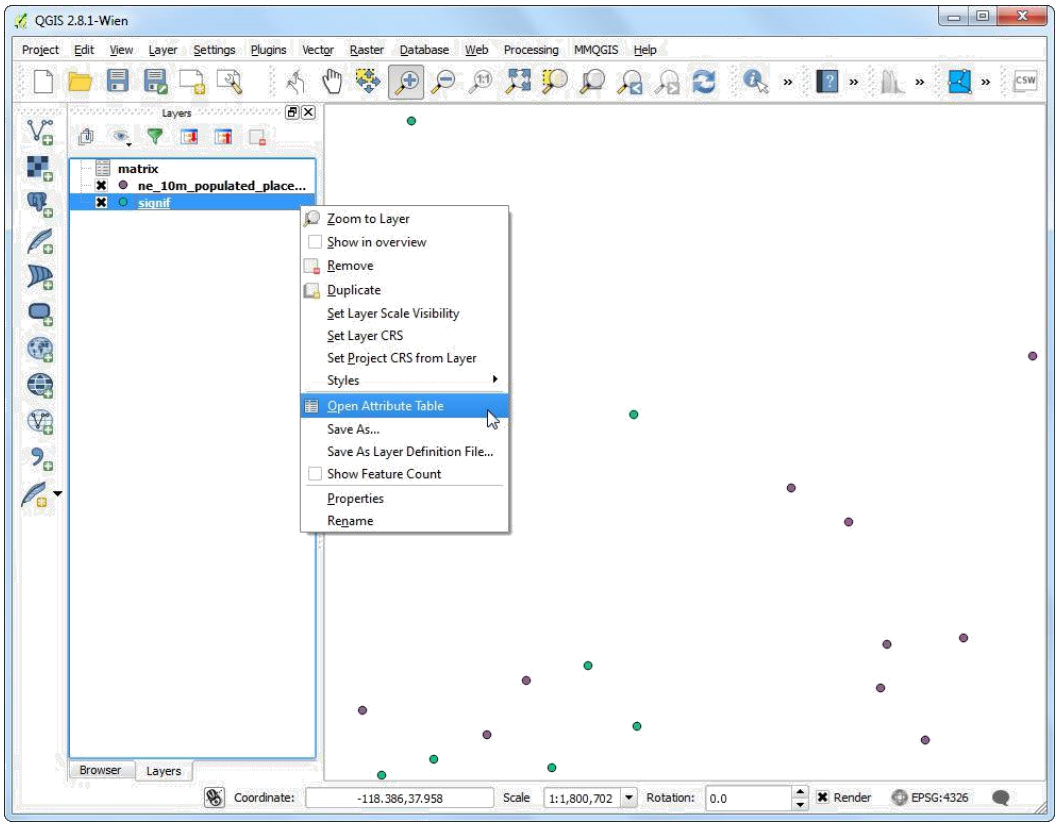
- We want to join the data from our analysis result to this layer. We need to select a field from each of the layers that has the same values. Select matrix as the Join layer` and InputID as the Join field. The Target field would be I_D. Leave other options to their default values and click OK



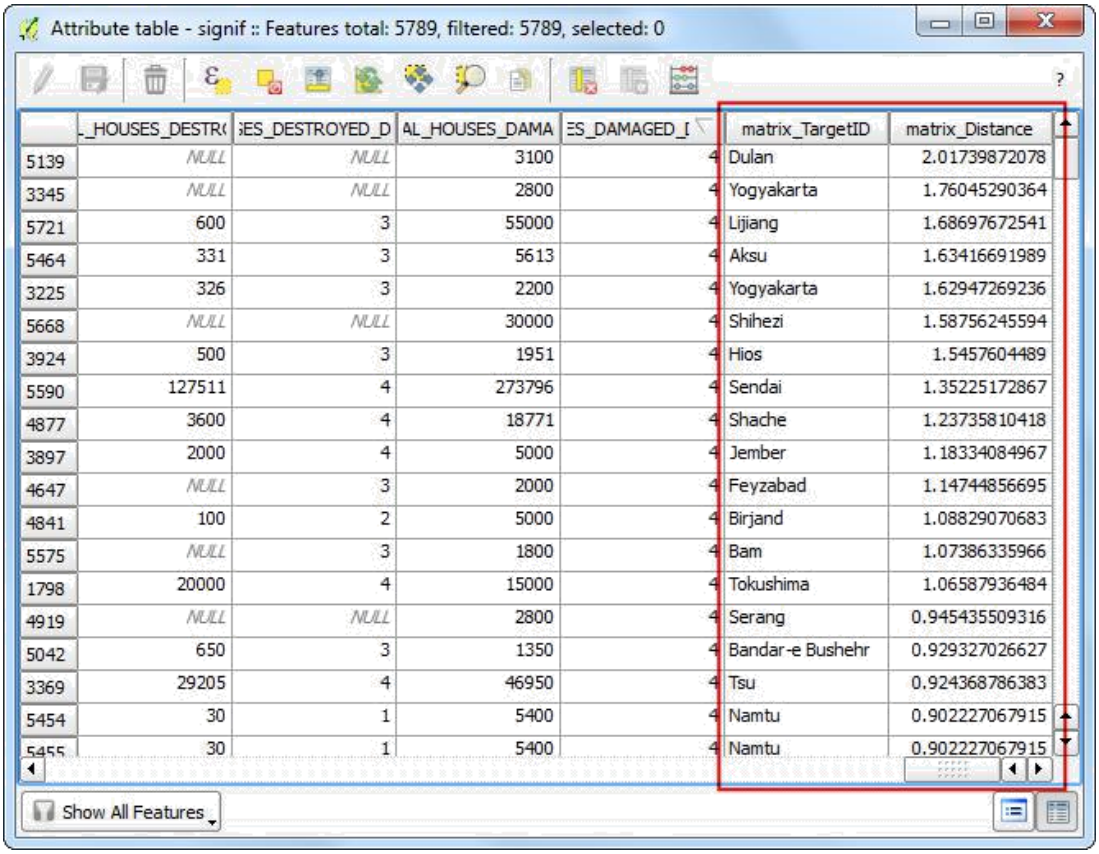
- You will see the join appear in the Joins tab. Click OK.



- Now open the attribute table of the signif layer by right-clicking and selecting Open Attribute Table

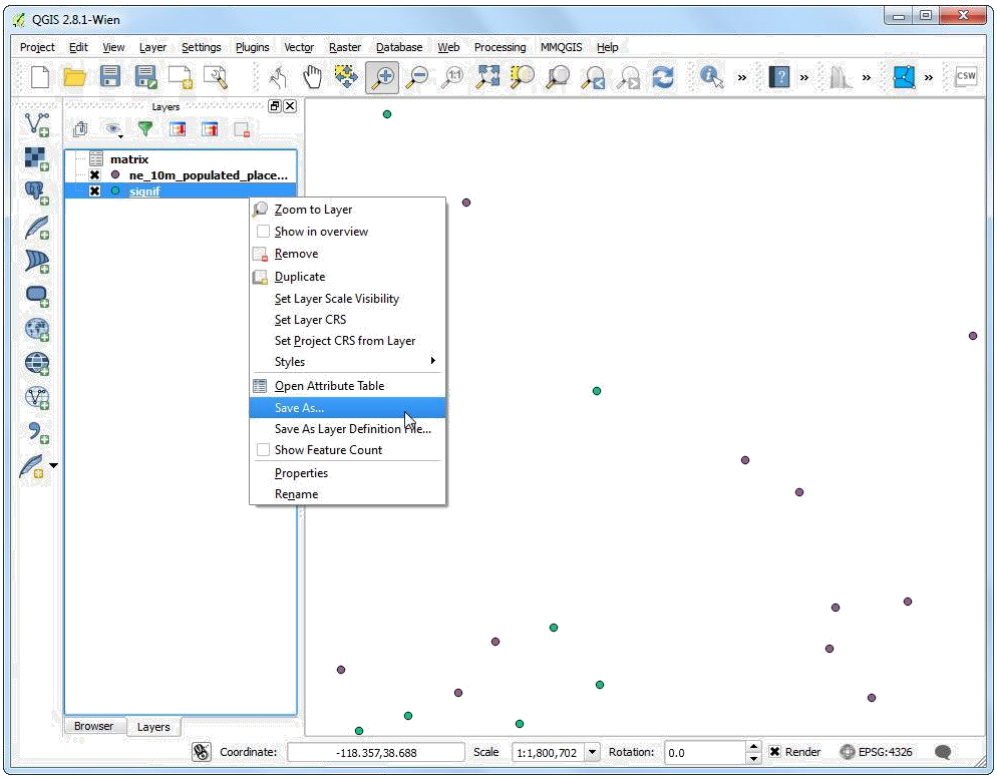


- You will see that for every Earthquake feature, we now have an attribute which is the nearest neighbor (closest populated place) and the distance to the nearest neighbor

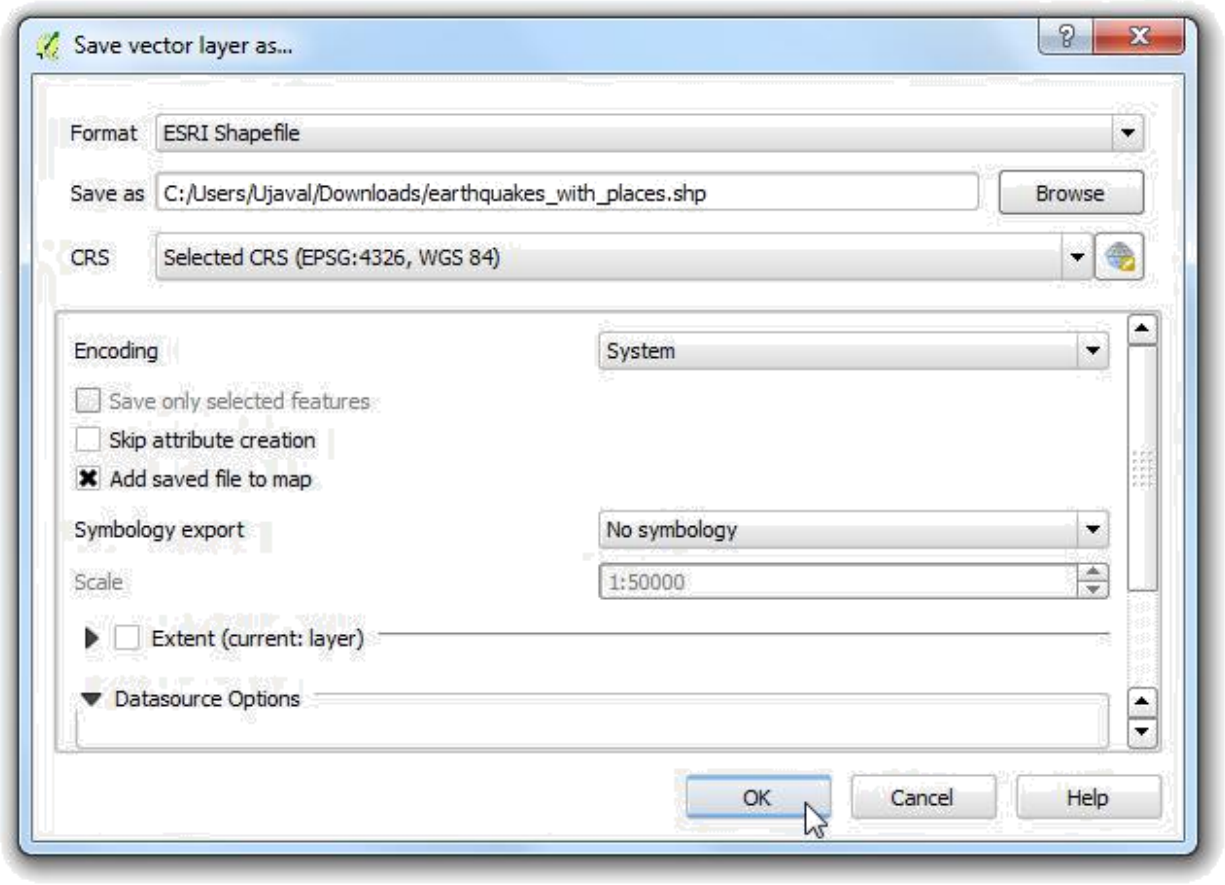


	_HOUSES_DESTR(	ES_DESTROYED_D	AL_HOUSES_DAMA	ES_DAMAGED_I	matrix_TargetID	matrix_Distance
5139	NULL	NULL	3100	4	Dulan	2.01739872078
3345	NULL	NULL	2800	4	Yogyakarta	1.76045290364
5721	600	3	55000	4	Lijiang	1.68697672541
5464	331	3	5613	4	Aksu	1.63416691989
3225	326	3	2200	4	Yogyakarta	1.62947269236
5668	NULL	NULL	30000	4	Shihezi	1.58756245594
3924	500	3	1951	4	Hios	1.5457604489
5590	127511	4	273796	4	Sendai	1.35225172867
4877	3600	4	18771	4	Shache	1.23735810418
3897	2000	4	5000	4	Jember	1.18334084967
4647	NULL	3	2000	4	Feyzabad	1.14744856695
4841	100	2	5000	4	Birjand	1.08829070683
5575	NULL	3	1800	4	Bam	1.07386335966
1798	20000	4	15000	4	Tokushima	1.06587936484
4919	NULL	NULL	2800	4	Serang	0.945435509316
5042	650	3	1350	4	Bandar-e Bushehr	0.929327026627
3369	29205	4	46950	4	Tsu	0.924368786383
5454	30	1	5400	4	Namtu	0.902227067915
5455	30	1	5400	4	Namtu	0.902227067915

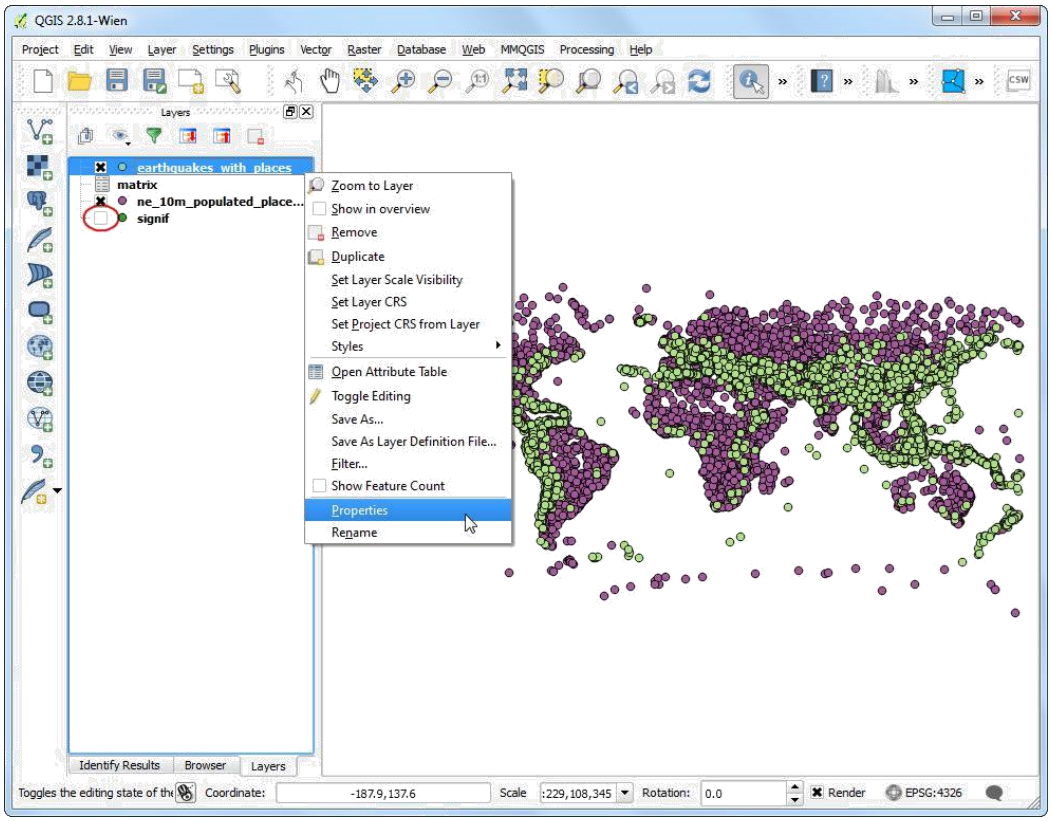
- We will now explore a way to visualize these results. First, we need to make the table join permanent by saving it to a new layer. Right-click the signif layer and select Save As....



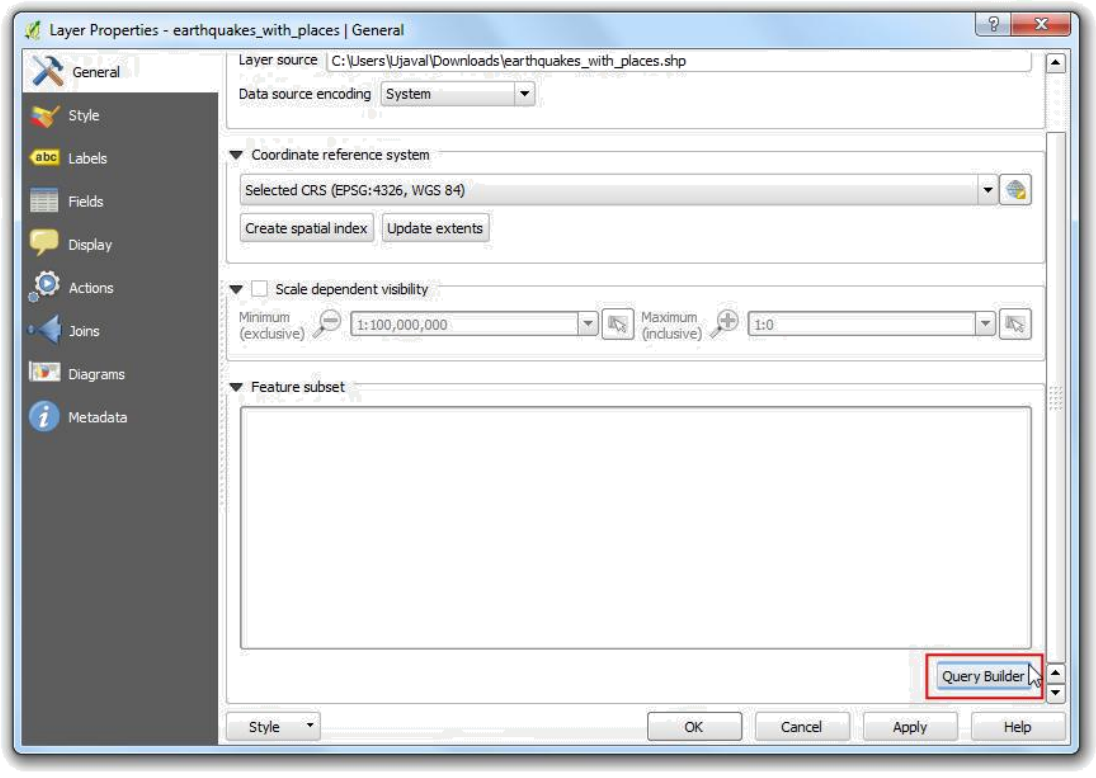
- Click the Browse button next to Save as label and name the output layer as earthquake_with_places.shp. Make sure the Add saved file to map box is checked and click OK.



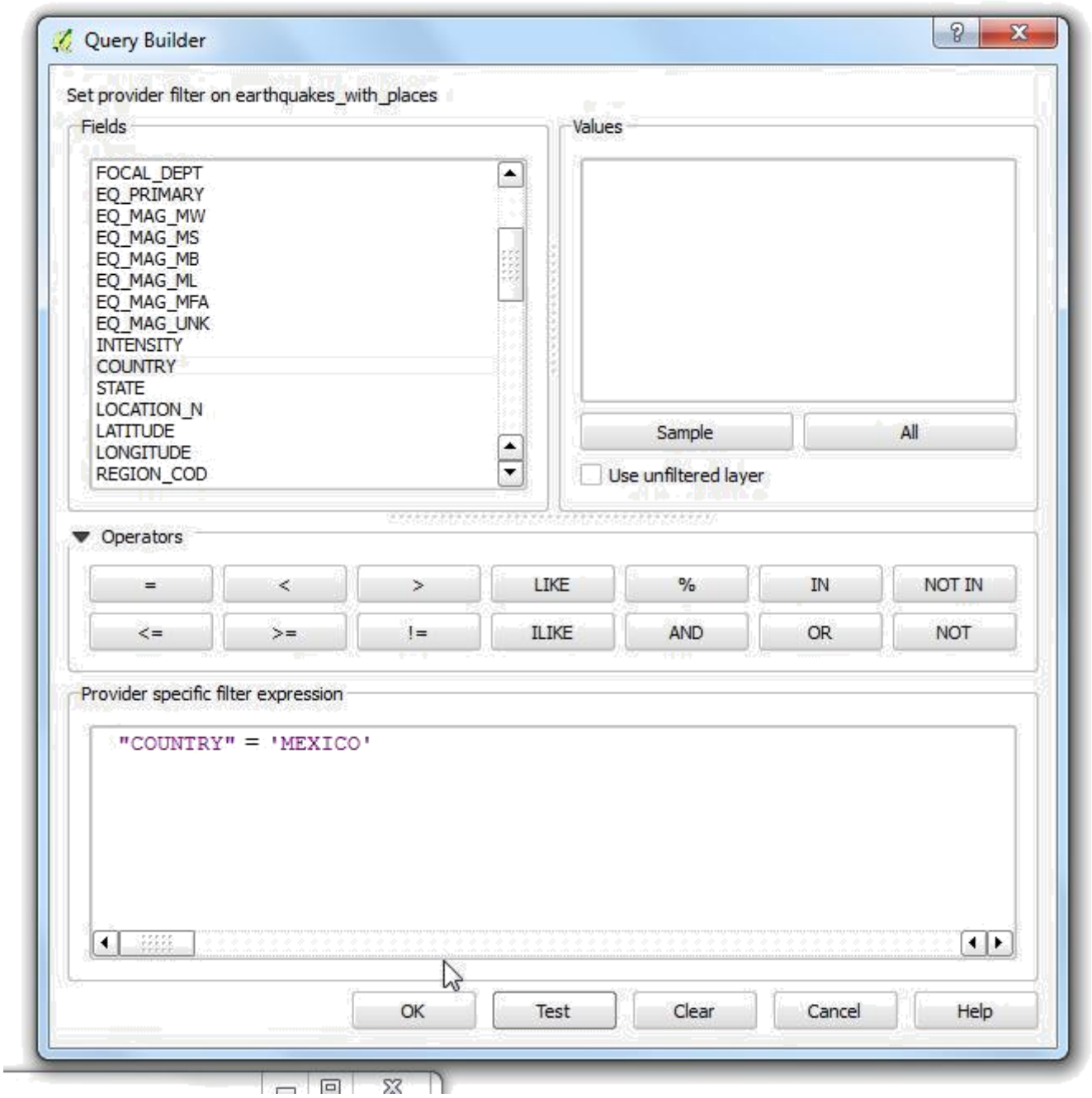
- Once the new layer is loaded, you can turn off the visibility of the signif layer. As our dataset is quite large, we can run our visualization analysis on a subset of the data. QGIS has a neat feature where you can load a subset of features from a layer without having to export it to a new layer. Right-click the earthquake_with_places layer and select Properties.



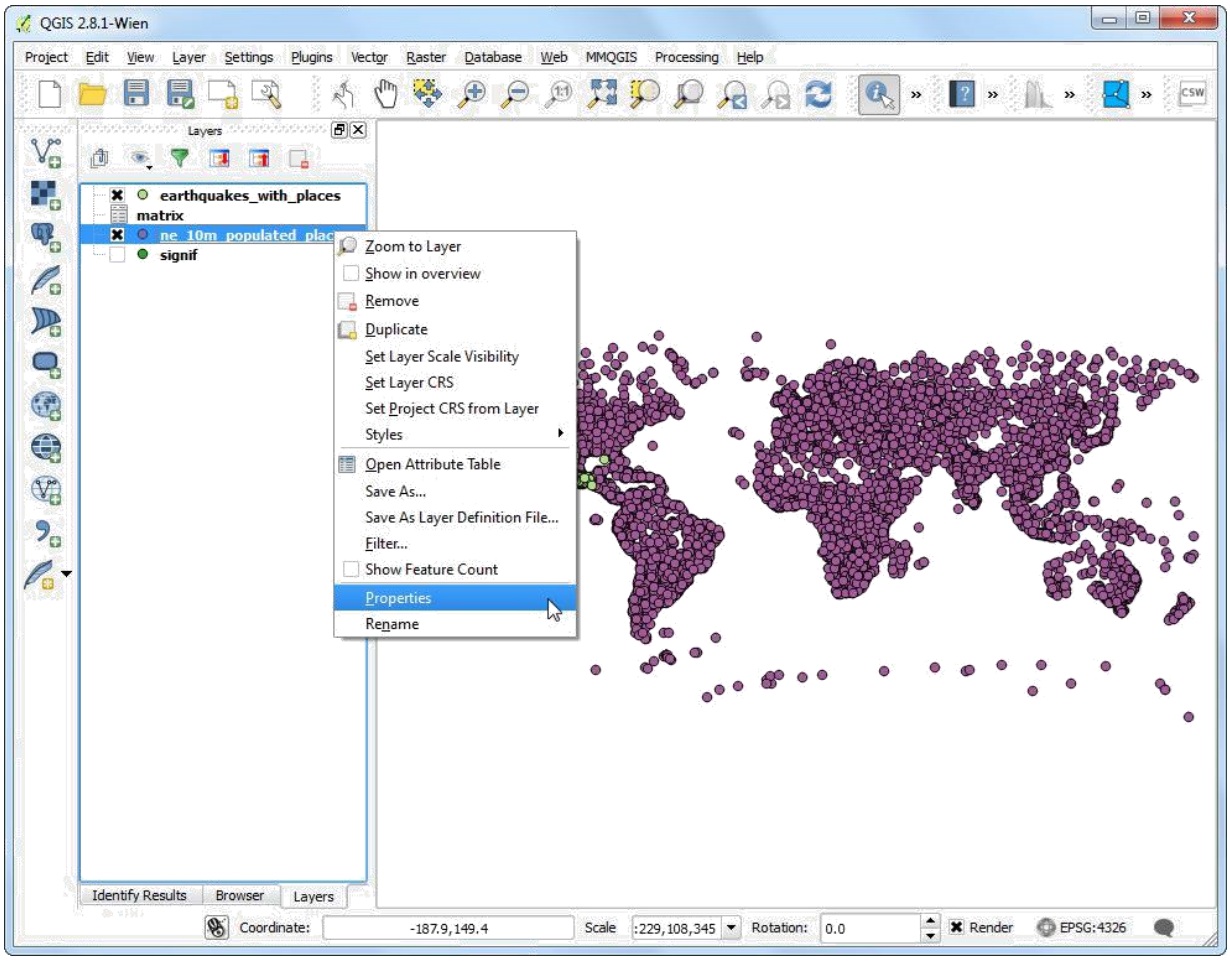
- In the General tab, scroll down to the Feature subset section. Click Query Builder.



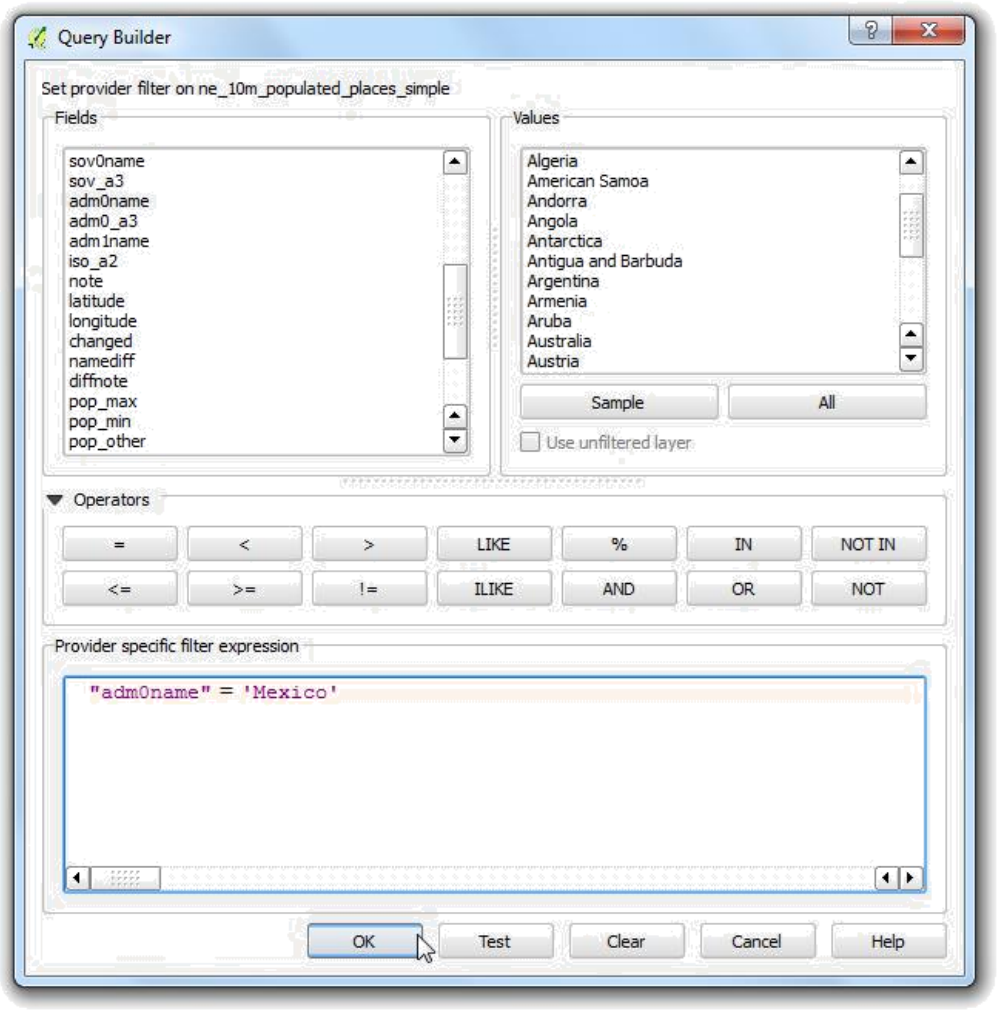
- For this tutorial, we will visualize the earthquakes and their nearest populated places for Mexico. Enter the following expression in the Query Builder dialog.



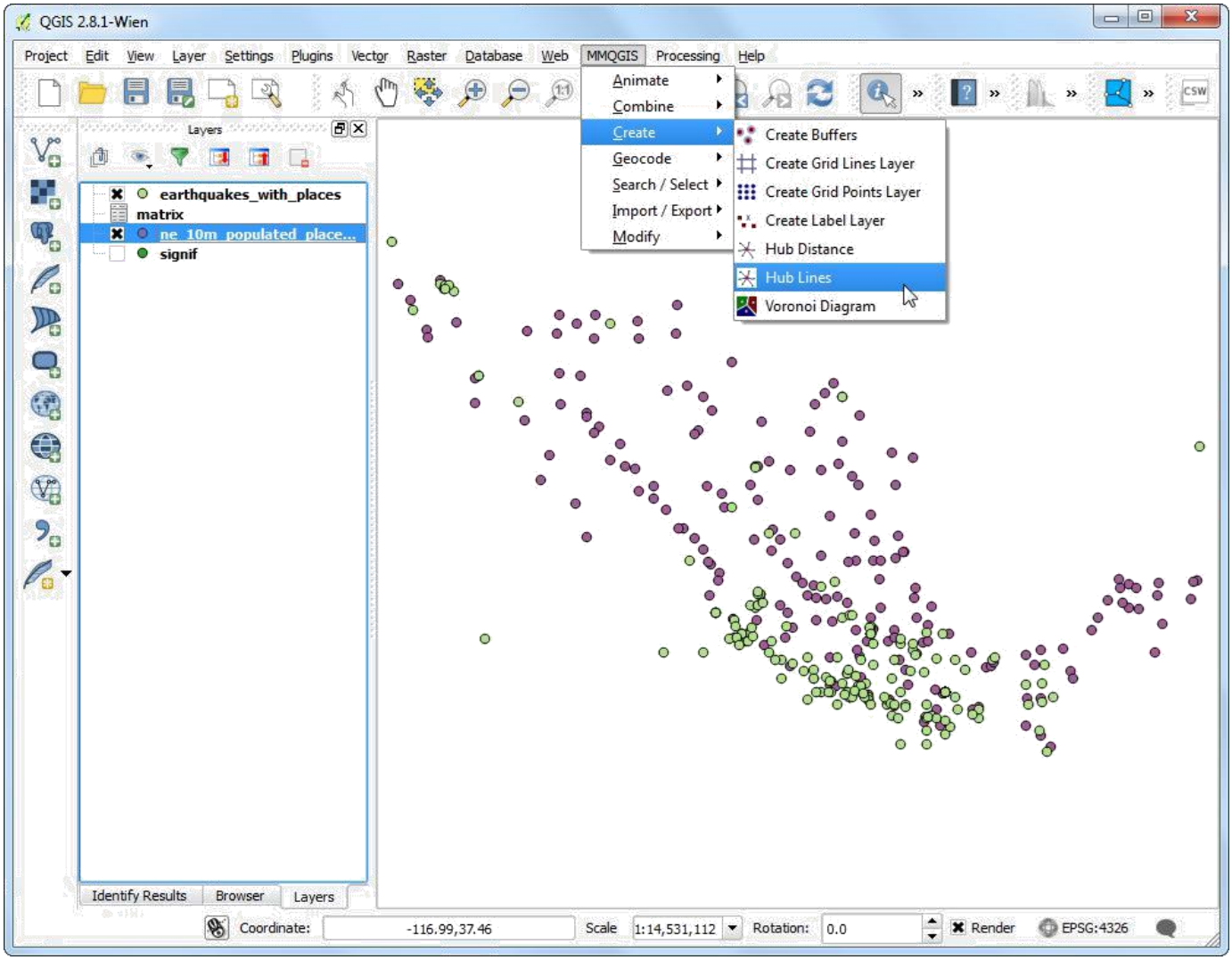
- You will see that only the points falling within Mexico will be visible in the canvas. Let's do the same for the populated places layer. Right-click on the ne_10m_populated_places_simple layer and select Properties.



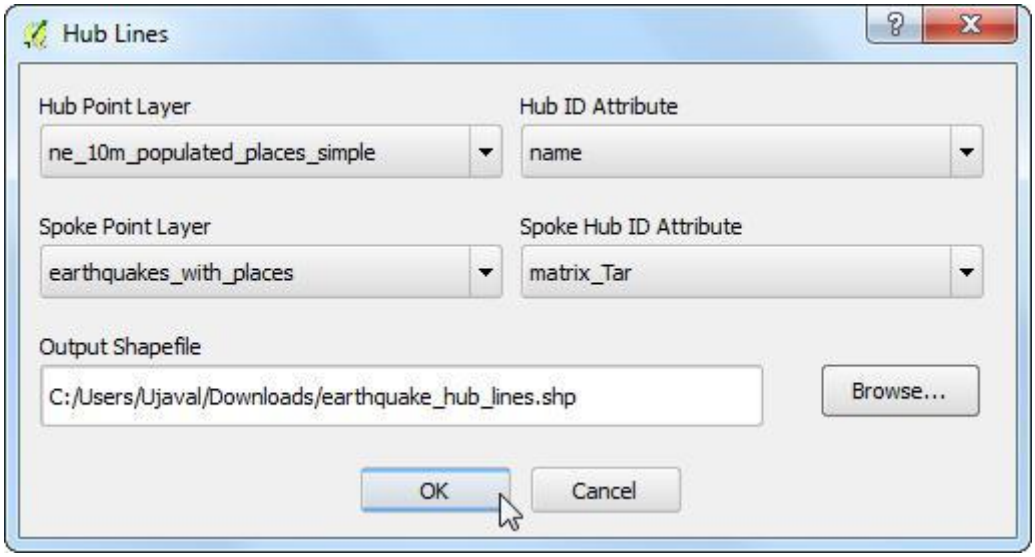
- Open the Query Builder dialog from the General tab. Enter the following expression.



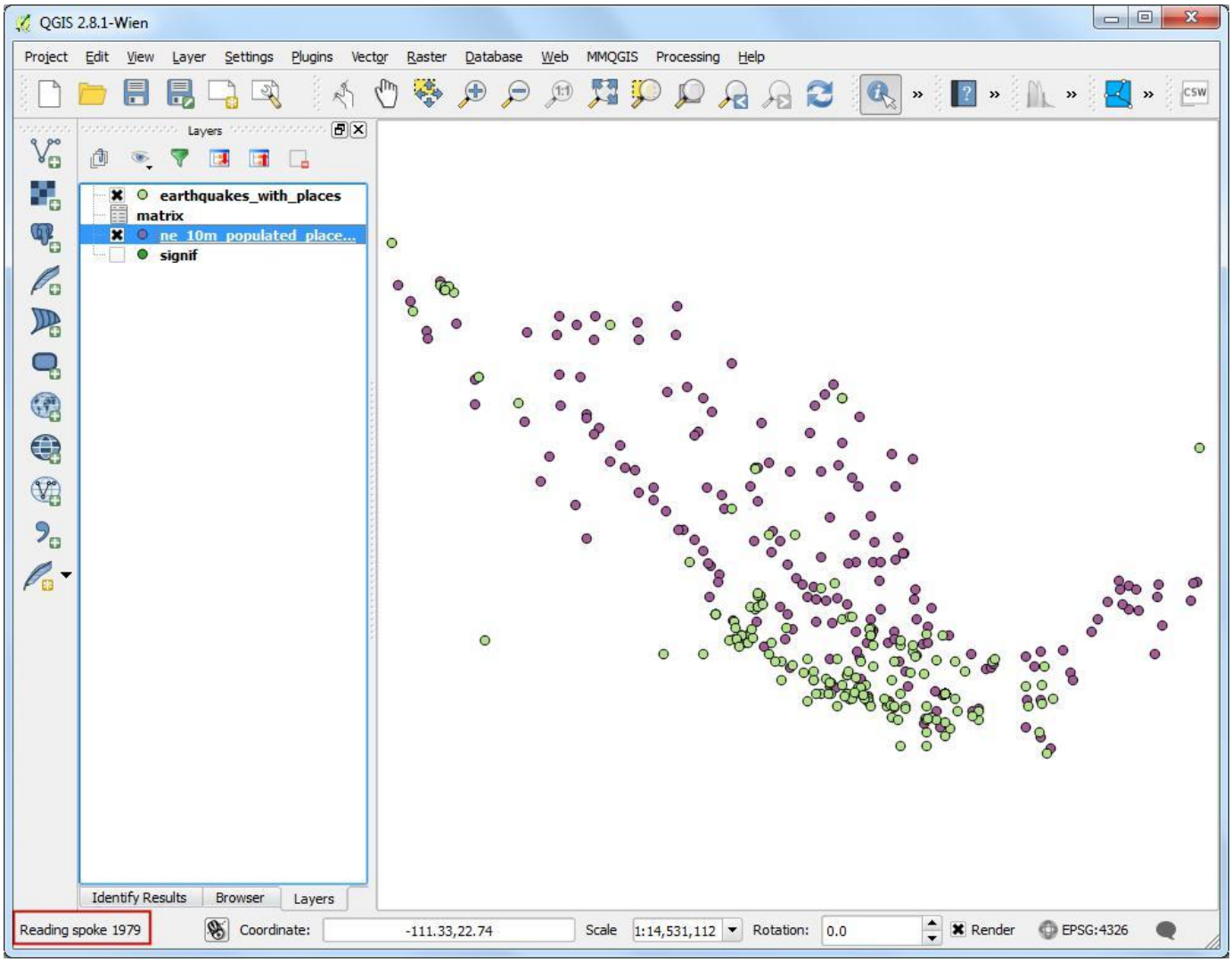
- Now we are ready to create our visualization. We will use a plugin named MMQGIS. Find and install the plugin. See *Using Plugins* for more details on how to work with plugins. Once you have the plugin installed, go to MMQGIS ‣ Create ‣ Hub Lines.



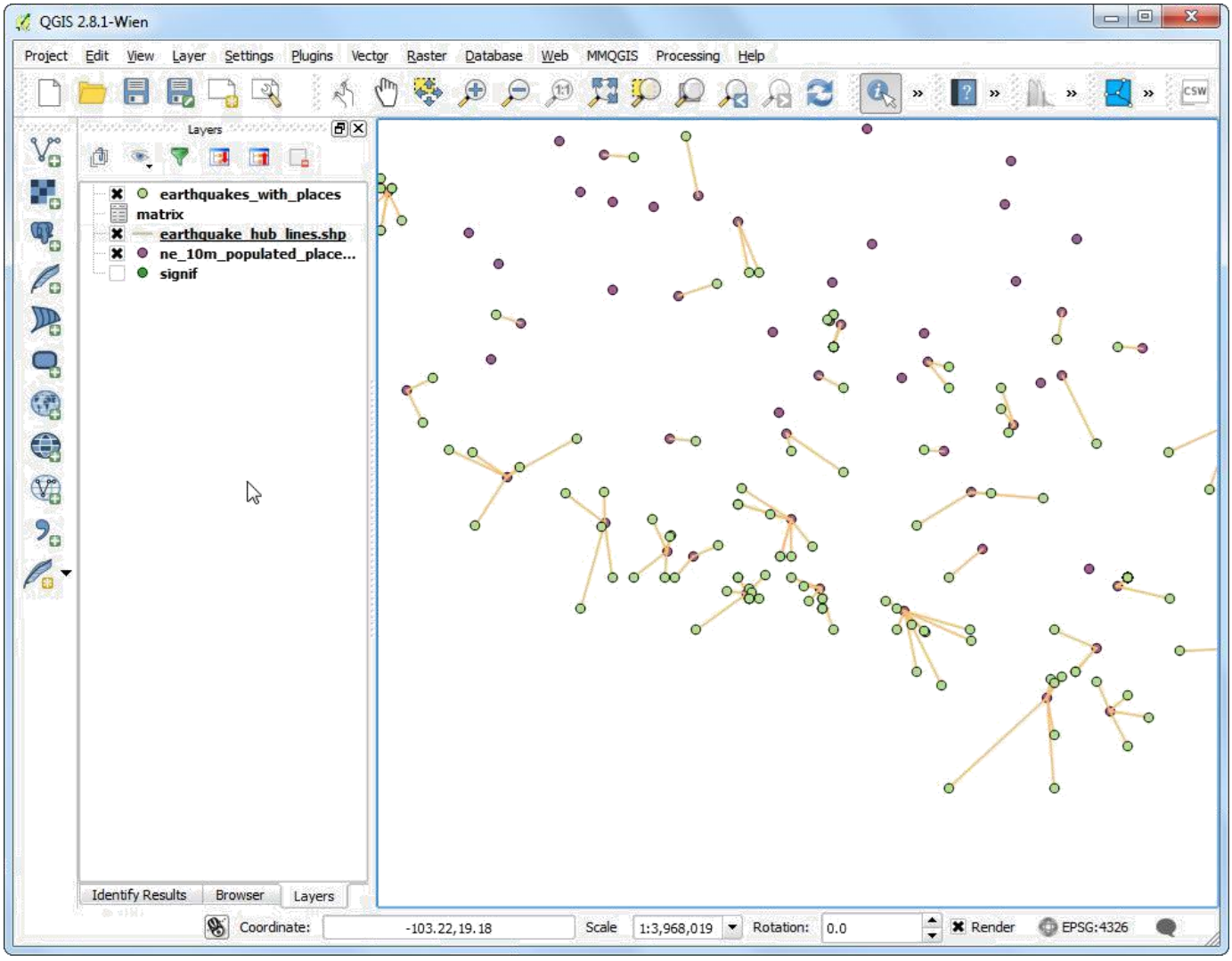
- Select ne_10m_populated_places_simple as the Hub Point Layer and name as the Hub ID Attribute. Similarly, select earthquake_with_places as the Spoke Point Layer and matrix_Tar as the Spoke Hub ID Attribute. The hub lines algorithm will go through each of earthquake points and create a line that will join it to the populated place which matches the attribute we specified. Click Browse and name the Output Shapefile as earthquake_hub_lines.shp. Click OK to start the processing.



- The processing may take a few minutes. You can see the progress on the bottom-left corner of the QGIS window.



- Once the processing is done, you will see the earthquake_hub_lines layer loaded in QGIS. You can see that each earthquake point now has a line that connects it to the nearest populated place.



b) Sampling Raster Data using Points or Polygons

Many scientific and environmental datasets come as gridded rasters. Elevation data (DEM) is also distributed as raster files. In these raster files, the parameter that is being represented is encoded as the pixel values of the raster. Often, one needs to extract the pixel values at certain locations or aggregate them over some area. This functionality is available in QGIS via two plugins - Point Sampling Tool and

Zonal Statistics plugin

datasets:

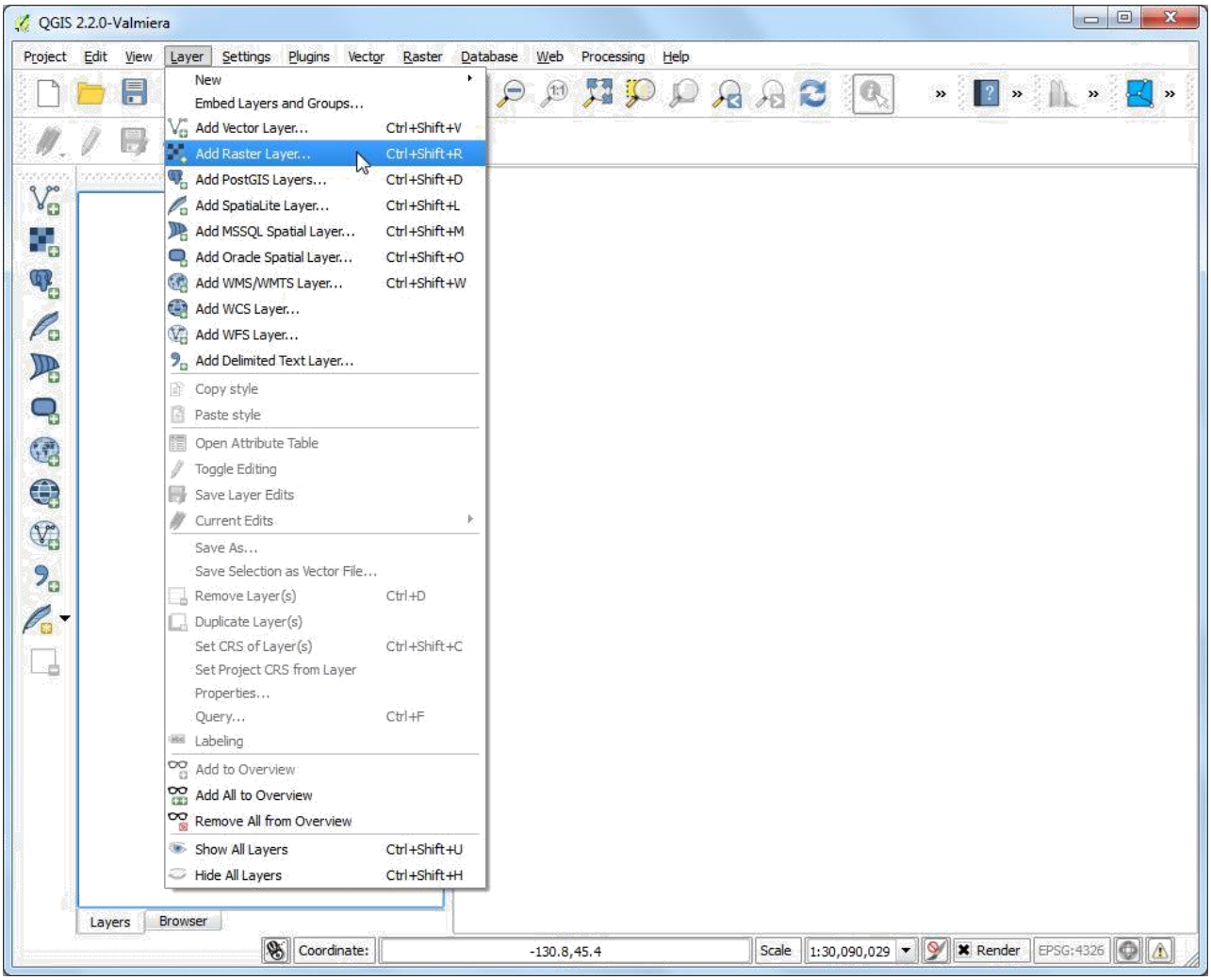
us.tmax_nohads_ll_20140525_float.tif

2013_Gaz_ua_national.zip

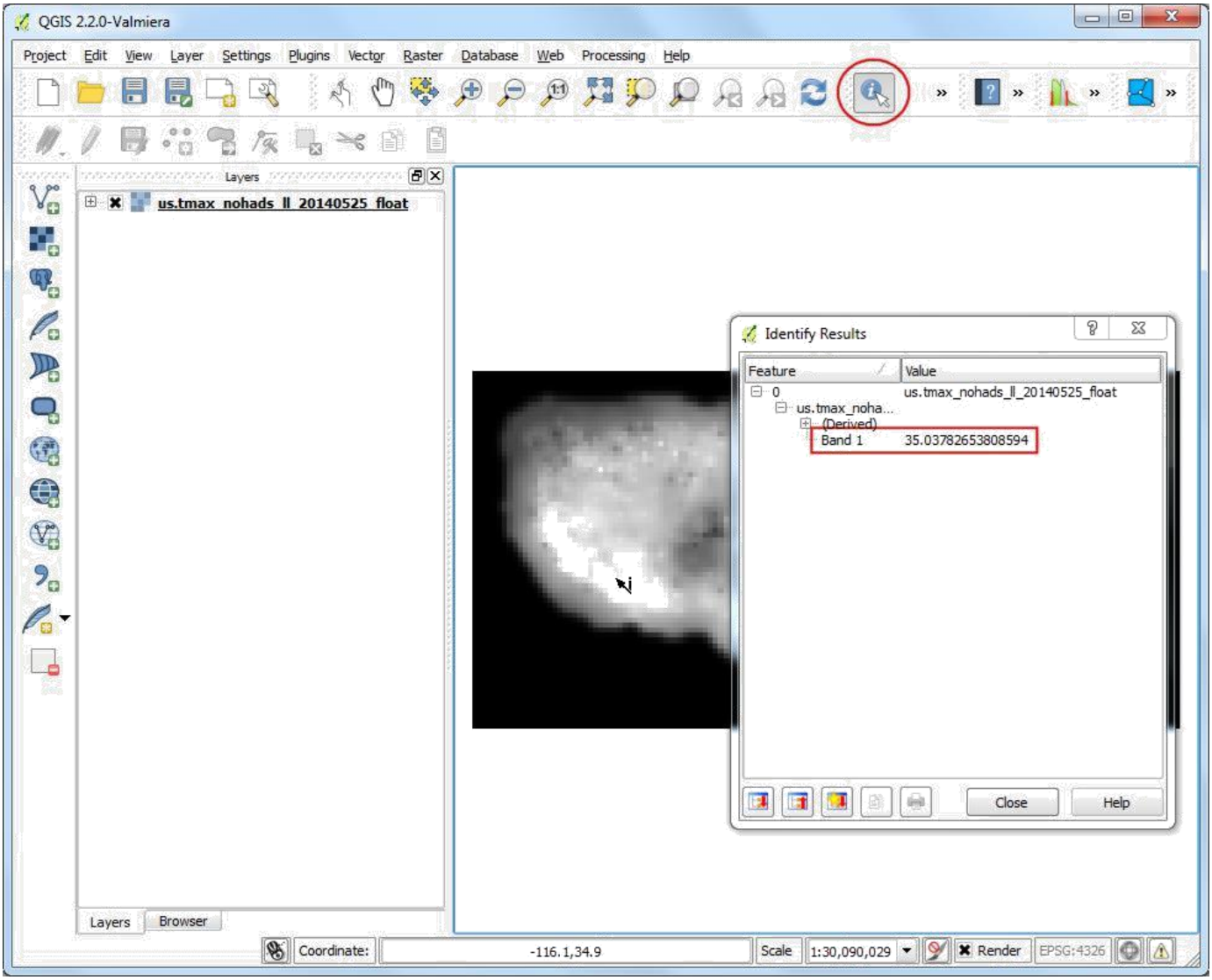
tl_2013_us_county.zip

Procedure

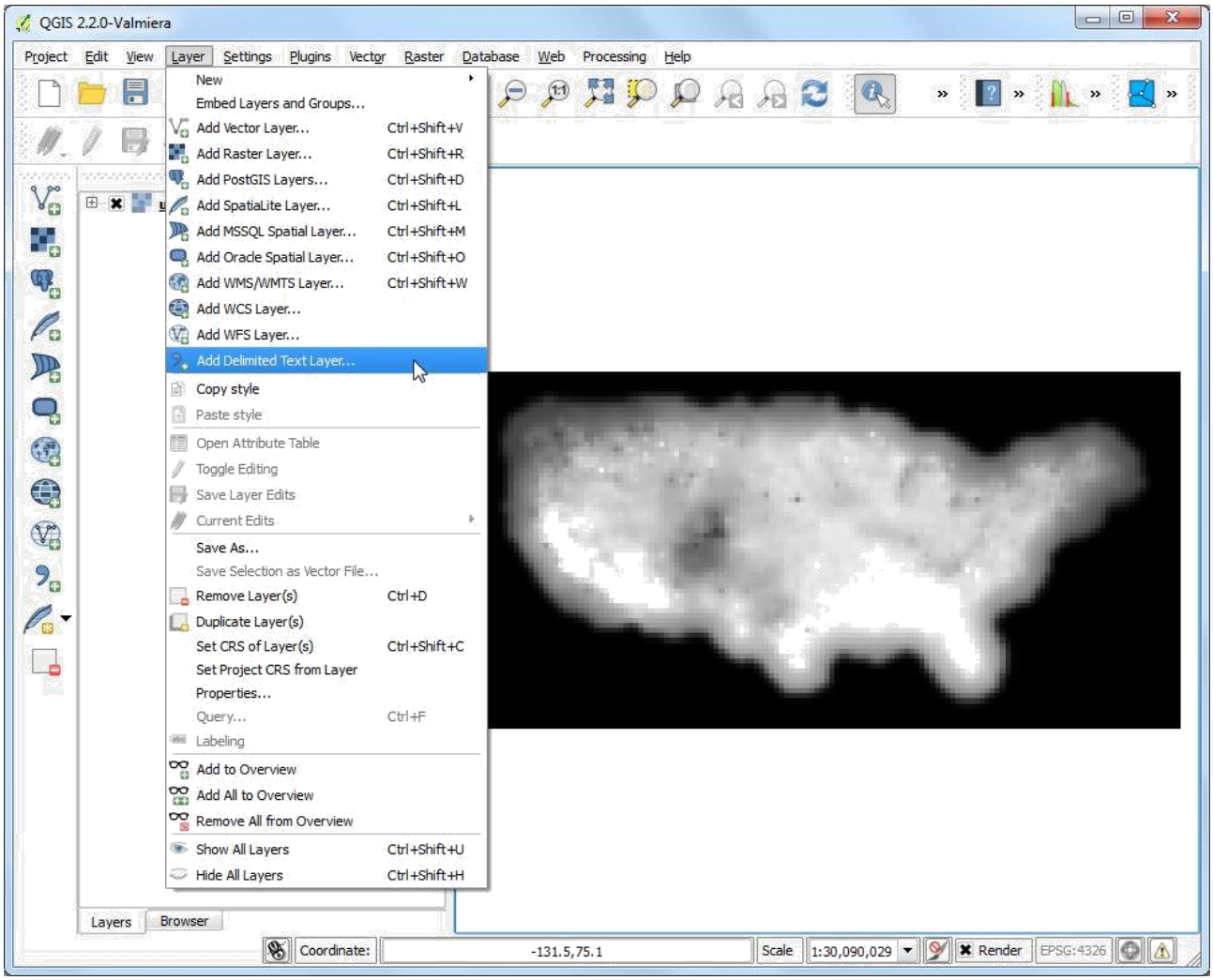
- Go to Layer ‣ Add Raster Layer and browse to the downloaded us.tmax_nohads_ll_{YYYYMMDD}_float.tif file and click Open.

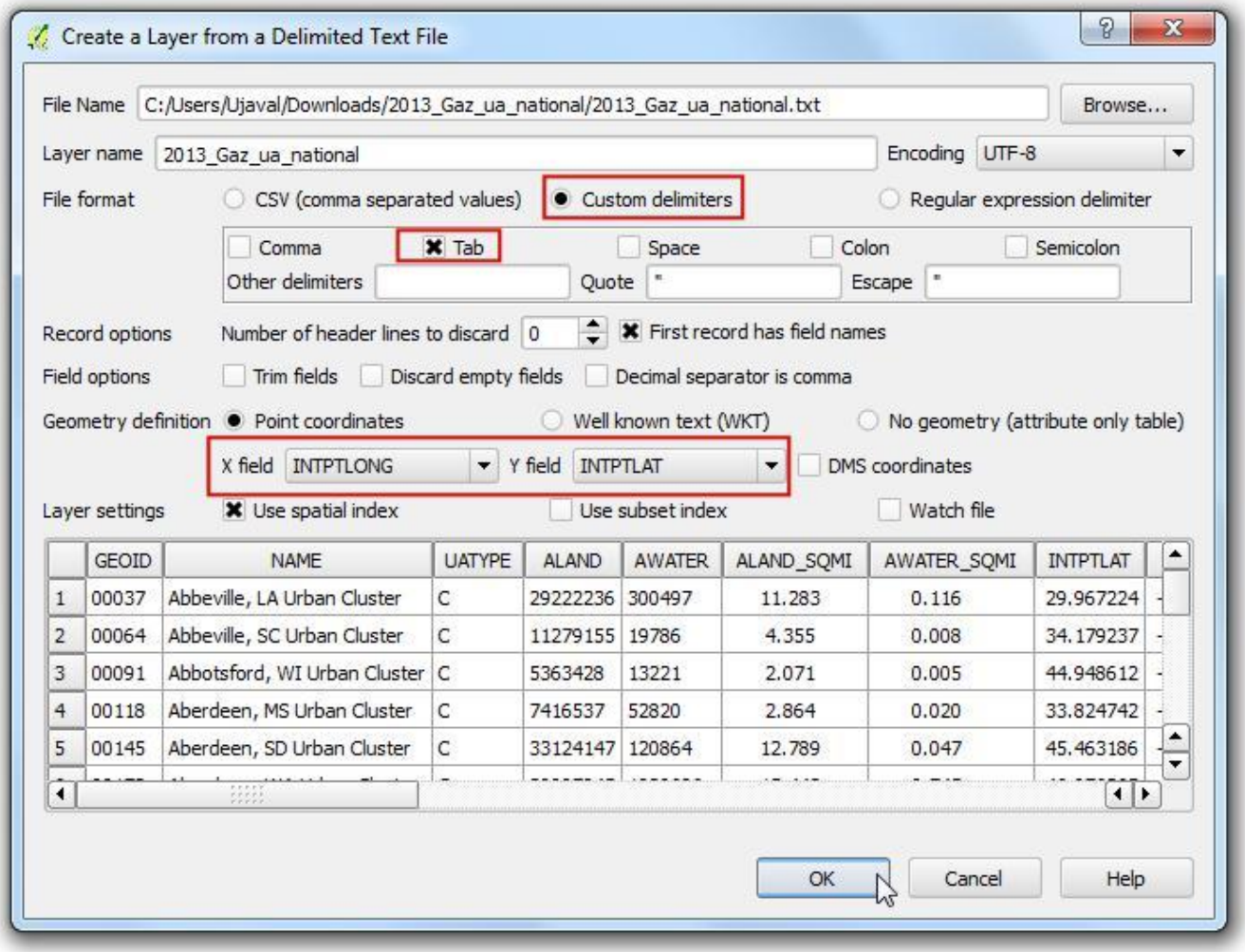


- Once the layer is loaded, select the Identify tool and click anywhere on the layer. You will see the temperature value in celsius as the value or Band 1 at that location.



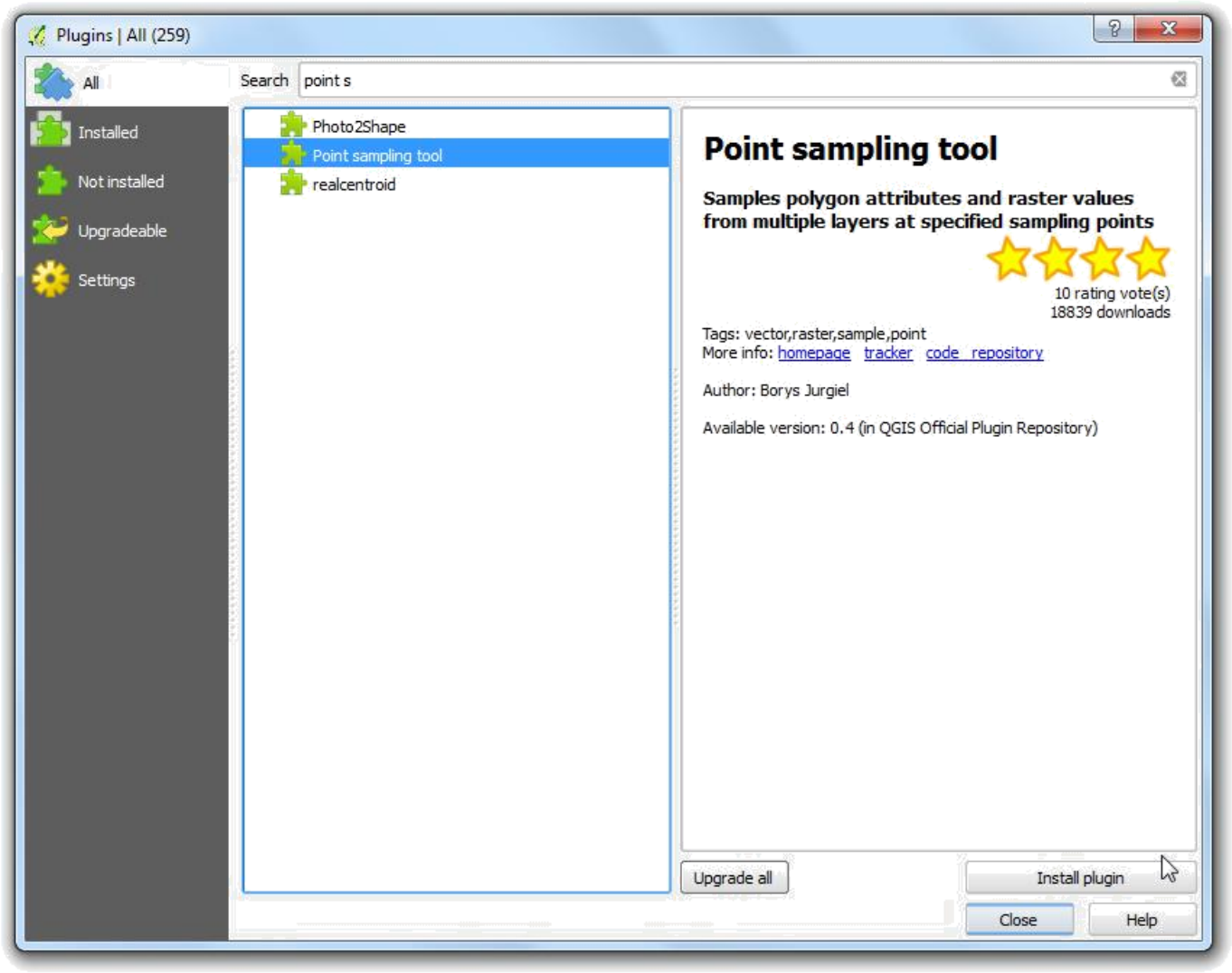
- Now unzip the downloaded 2013_Gaz_ua_national.zip file and extract the 2013_Gaz_ua_national.txt file on your disk. Go to Layer ‣ Add Delimited Text Layer.



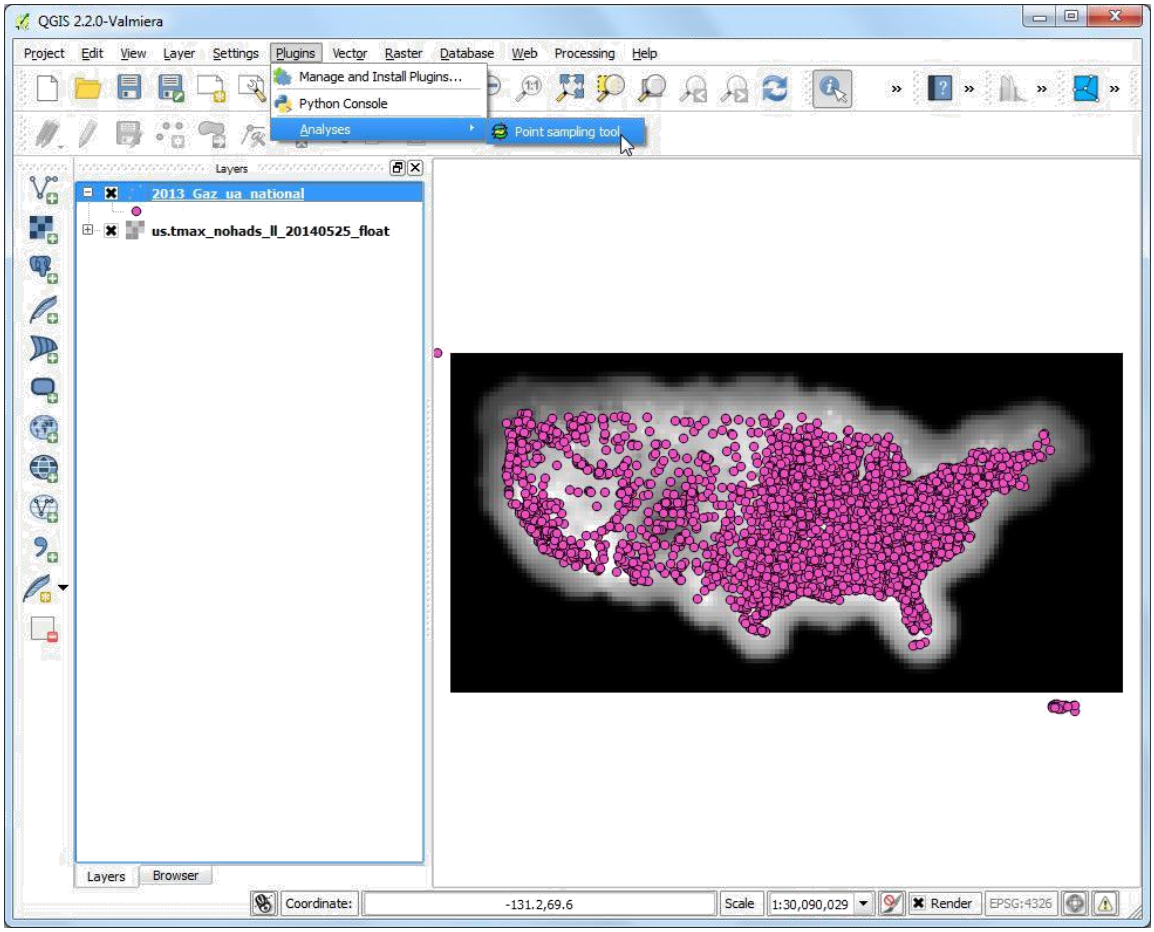


	GEOID	NAME	UATYPE	ALAND	AWATER	ALAND_SQMI	AWATER_SQMI	INTPTLAT
1	00037	Abbeville, LA Urban Cluster	C	29222236	300497	11.283	0.116	29.967224
2	00064	Abbeville, SC Urban Cluster	C	11279155	19786	4.355	0.008	34.179237
3	00091	Abbotsford, WI Urban Cluster	C	5363428	13221	2.071	0.005	44.948612
4	00118	Aberdeen, MS Urban Cluster	C	7416537	52820	2.864	0.020	33.824742
5	00145	Aberdeen, SD Urban Cluster	C	33124147	120864	12.789	0.047	45.463186

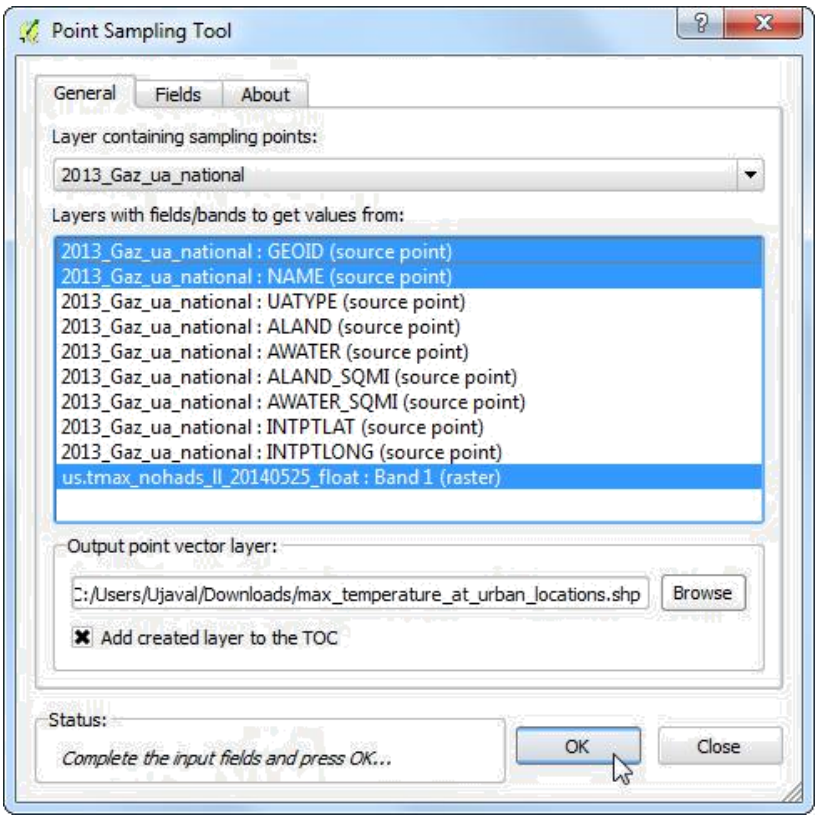
- In the Create a Layer from Delimited Text File dialog, click Browse and open 2013_Gaz_ua_national.txt. Choose Tab under Custom delimiters. The point coordinates are in Latitude and Longitude, so select INTPTLONG as X field and INTPTLAT as Y field. Check the Use spatial index box and click OK.
- Now we are ready to extract the Install the Point Sampling Tool to install plugins.
- temperature values from the raster layer. plugin. See *Using Plugins* for details on how



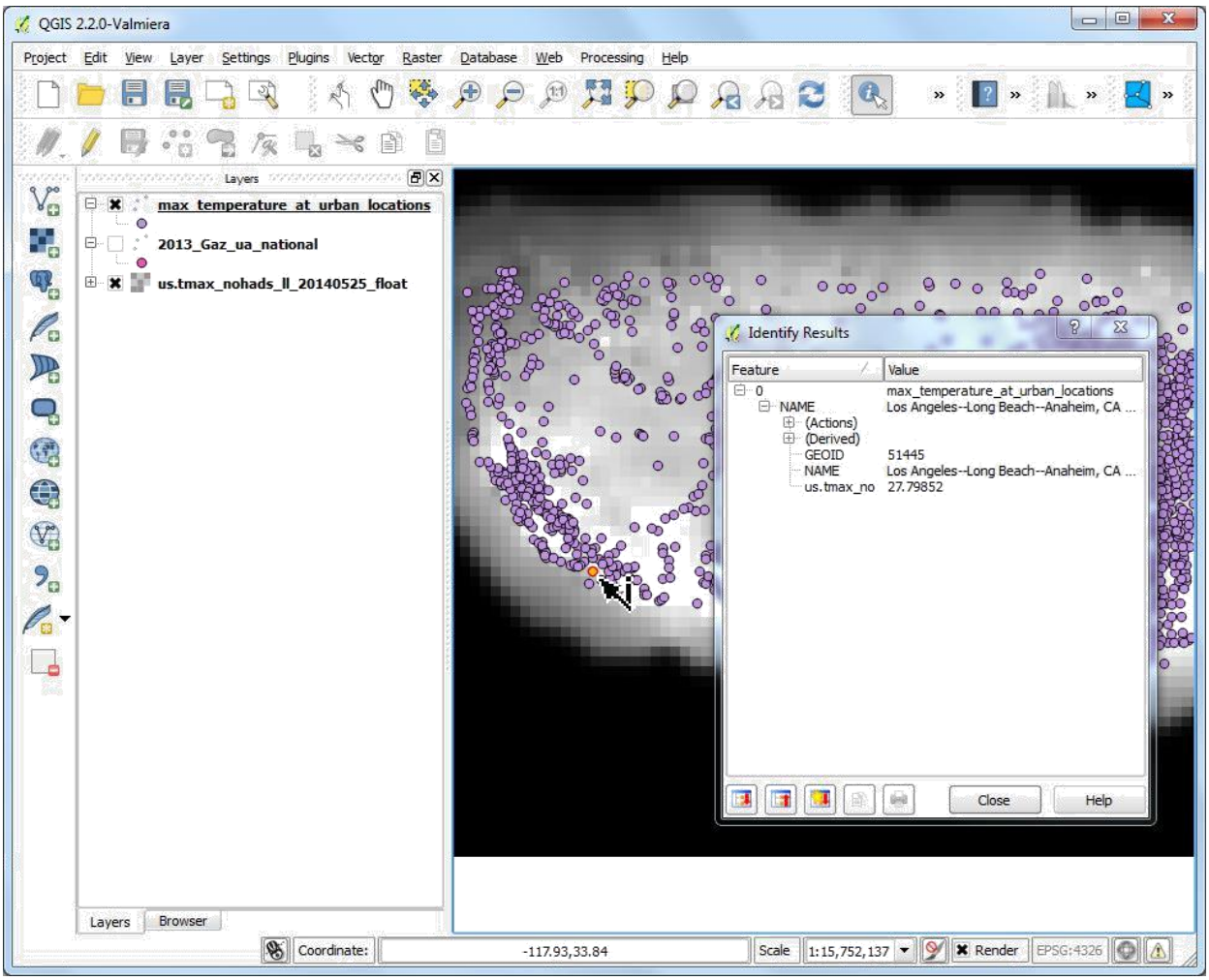
Open the plugin dialog from Plugins ‣ Analyses ‣ Point sampling tool.



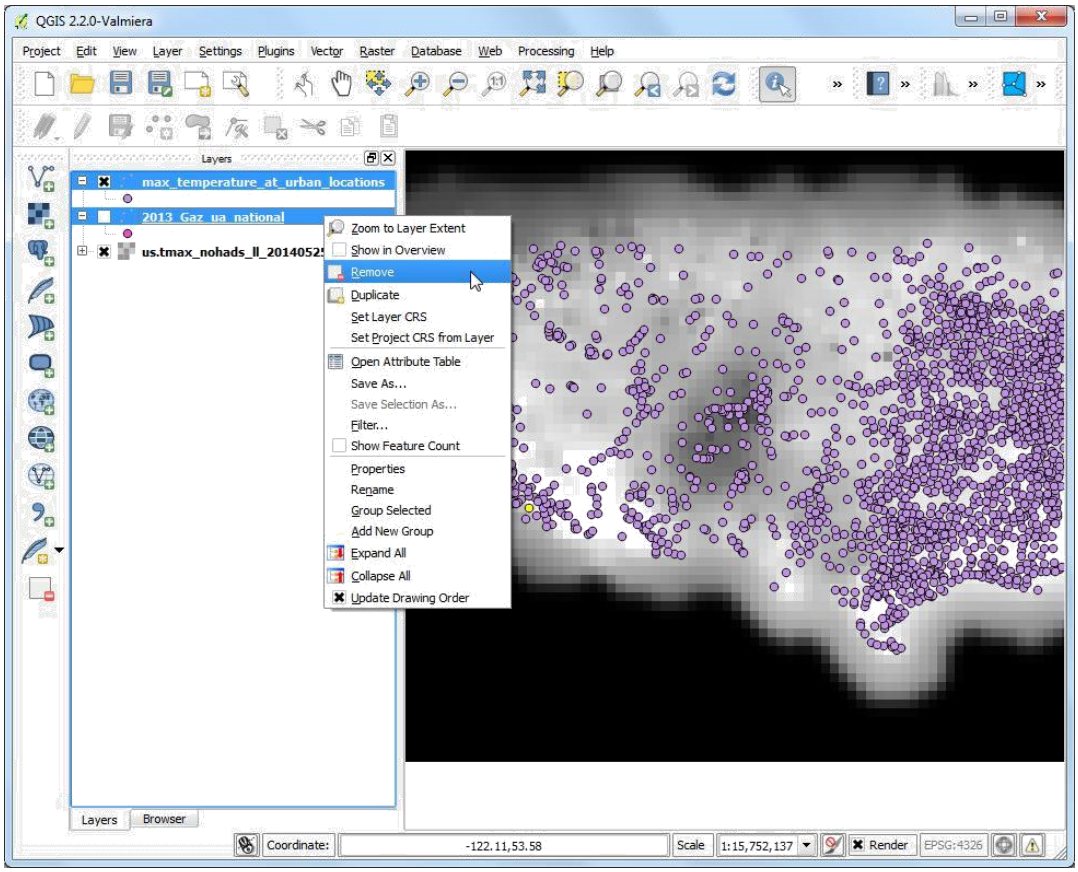
- In the Point Sampling Tool dialog, select 2013_Gaz_ua_national as the Layer containing sampling points. We must explicitely pick the fields from the input layer that we want in the output layer. Choose GEOID and NAME fields from the 2013_Gaz_ua_national layer. We can sample values from multiple raster band at once, but since our raster has only 1 band, choose the us.tmax_nohads_ll_{YYYYMMDD}_float: Band 1. Name the output vector layer as max_temparature_at_urban_locations.shp. Click the OK to start the sampling process. Click Close once the process finishes.



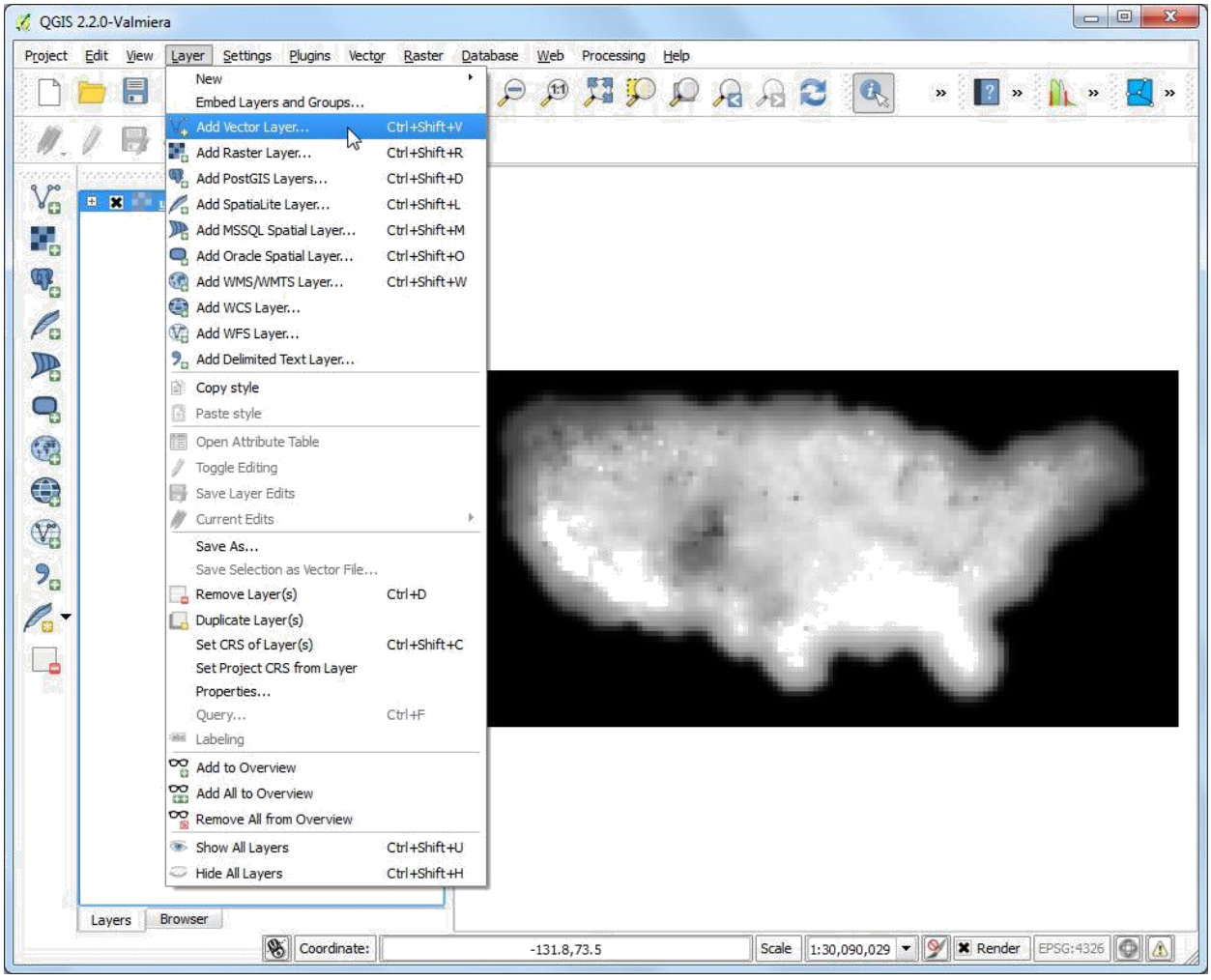
- You will see a new layer max_temparature_at_urban_locations loaded in QGIS. Use the Identify tool to click on any point to see the attributes. You will see the us.tmax_no field - which contains the raster pixel value at the location of the point.



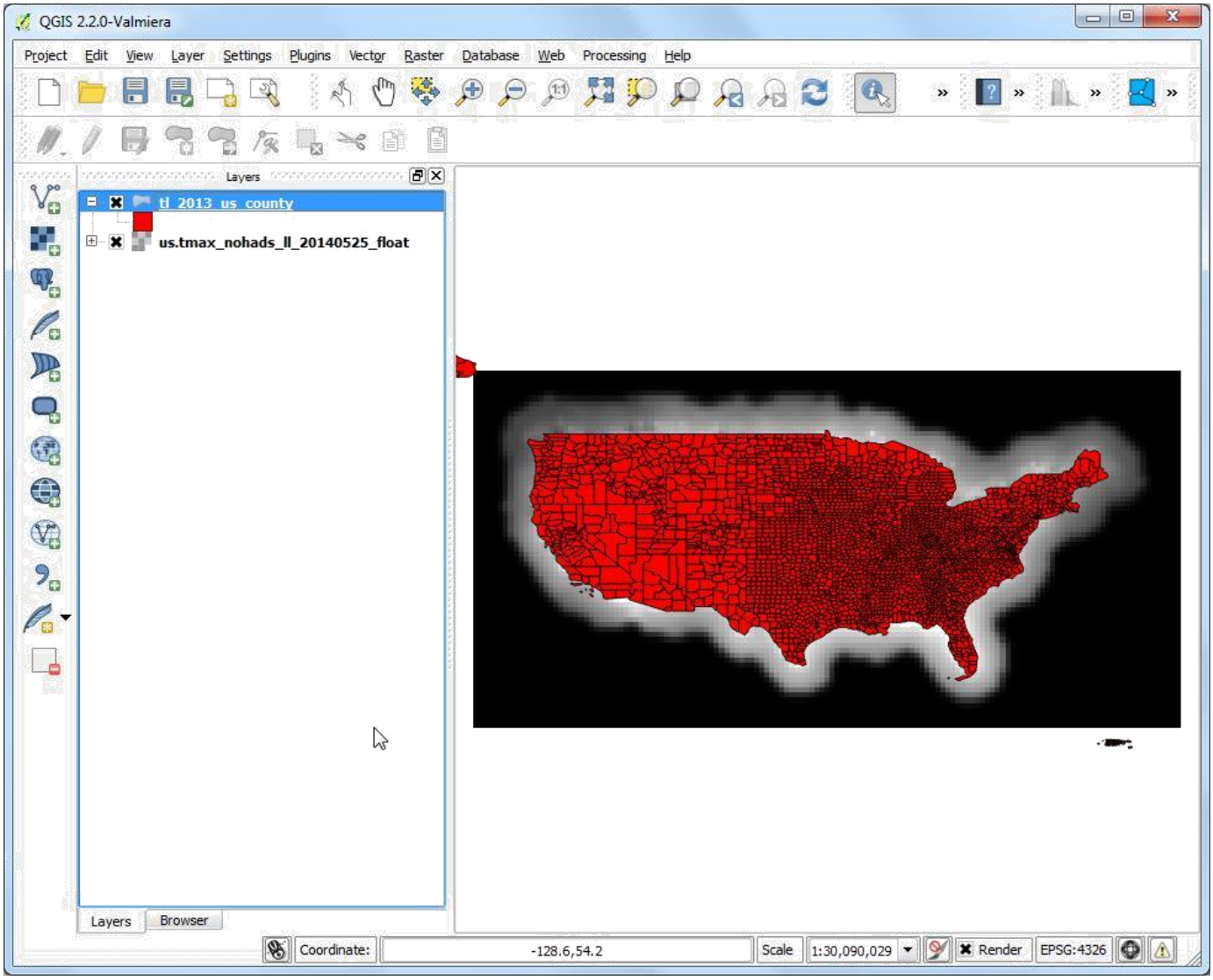
- First part of our analysis is over. Let's remove the unnecessary layers. Hold the Shift key and select max_temparature_at_urban_locations and 2013_Gaz_ua_national layers. Right-click and select Remove to remove them from QGIS TOC.



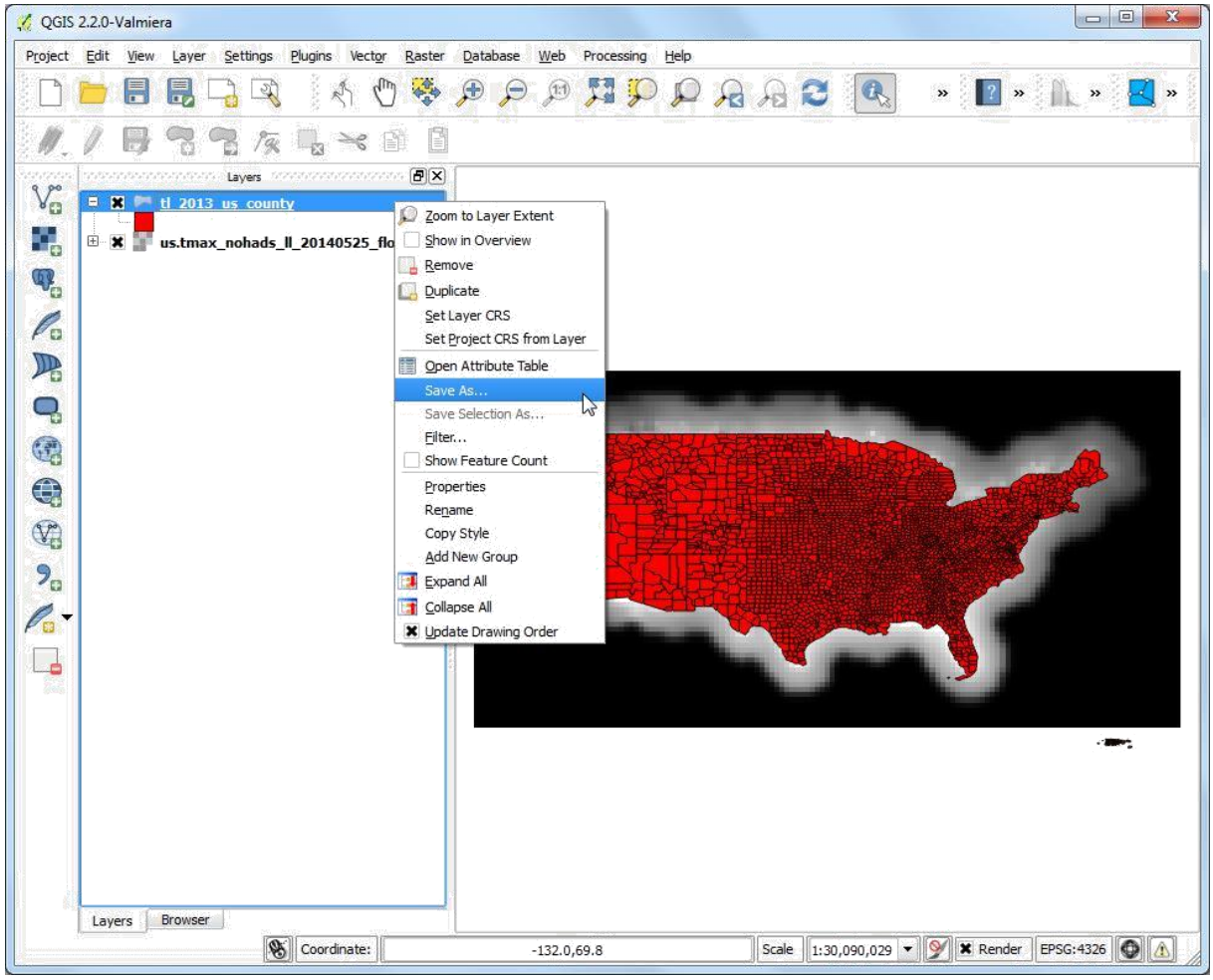
- Go to Layer ‣ Add Vector Layer. Browse to the downloaded tl_2013_us_county.zip file and click Open. Select the tl_2013_us_county.shp as the layer and click OK.



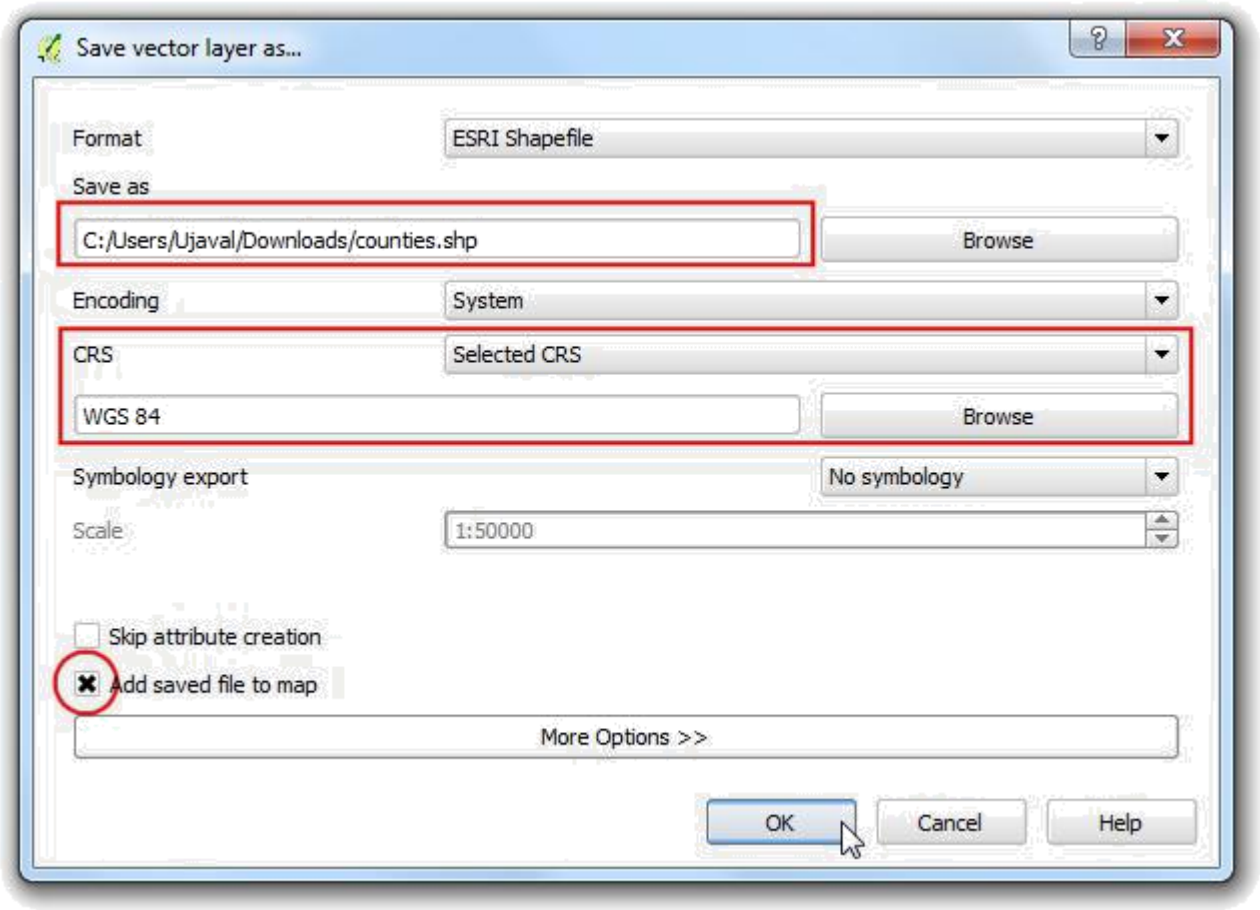
- The tl_2013_us_county will be added to QGIS. This layer is in EPSG:4269 NAD83 projection. This doesn't match the projection of the raster layer. We will re-project this layer to EPSG:4326 WGS84 projection.



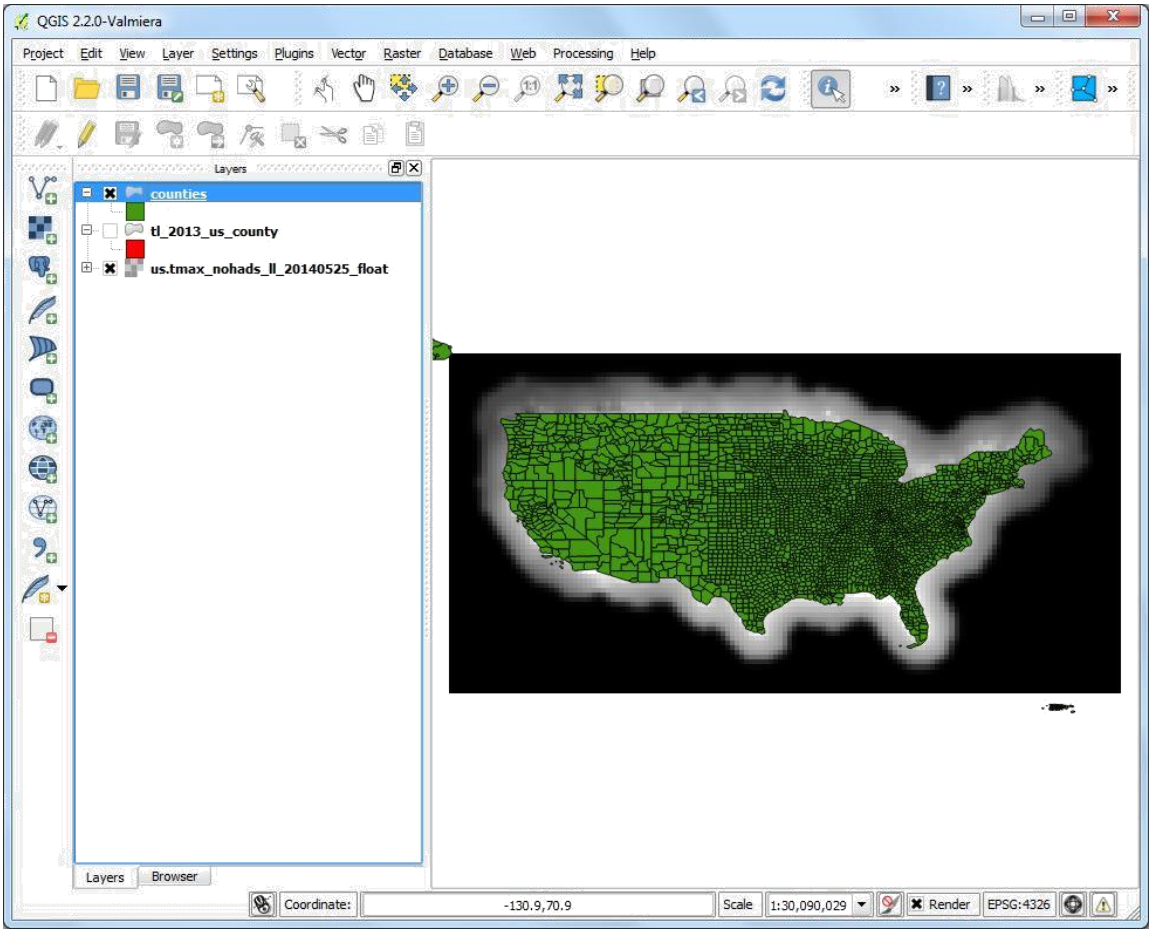
- Right-click the tl_2013_us_county layer and select Save As...



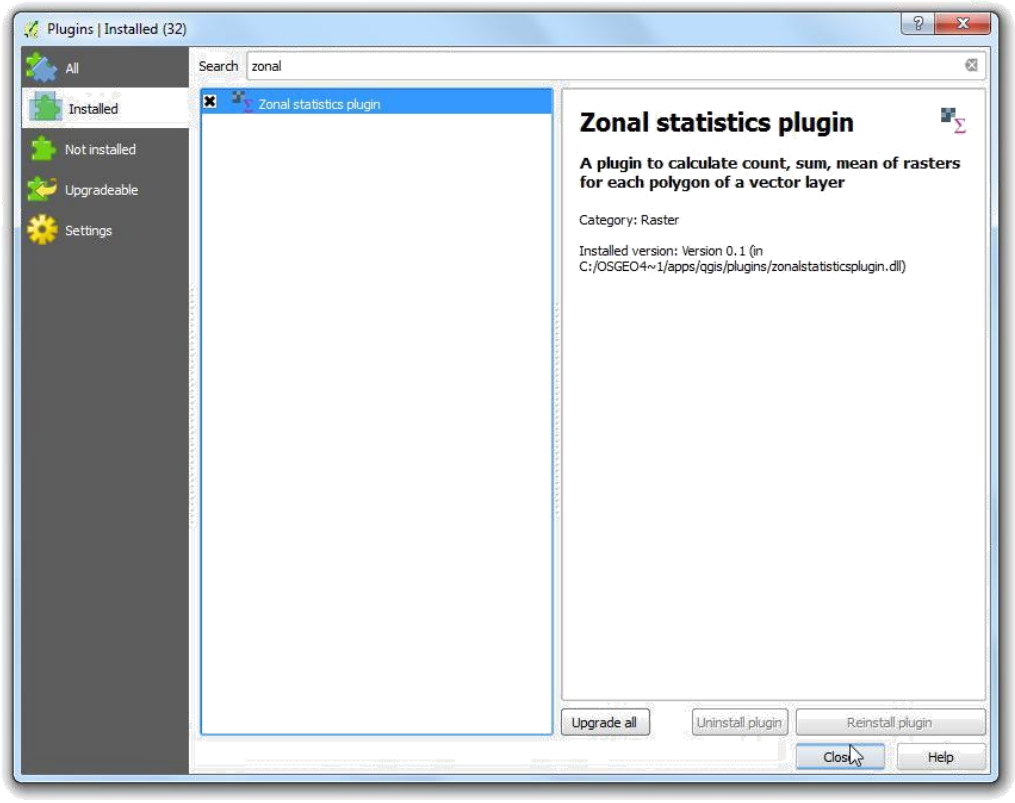
In the Save Vector layer as.. dialog, click Browse and name the output file as counties.shp. Choose Selected CRS from the CRS dropdown menu. Click Browse and select WGS 84 as the CRS. Check the Add saved file to map and click OK.



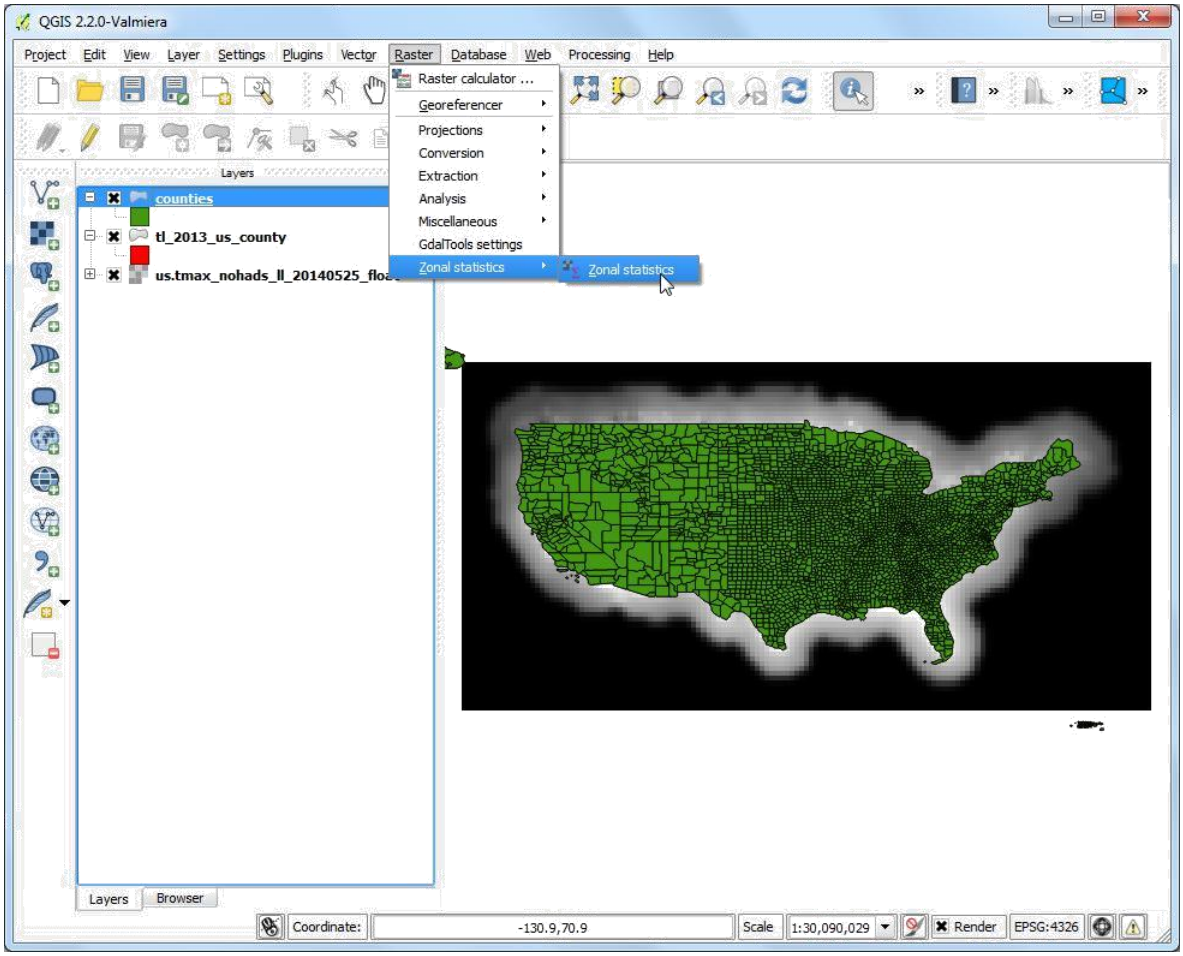
- A new layer named counties will be add to QGIS.



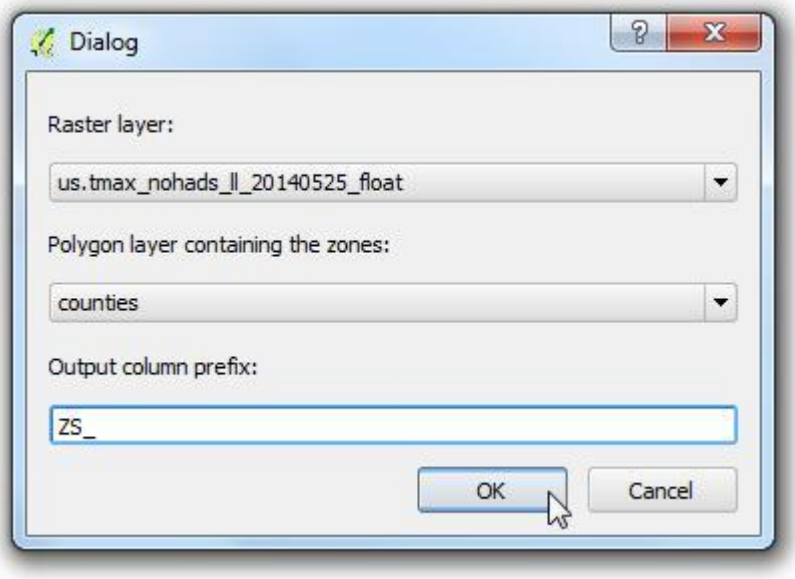
- Enable the Zonal Statistics Plugins. This is a core plugin so it is already installed. See *Using Plugins* to know to how enable core plugins.



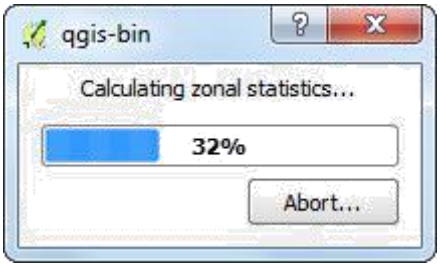
- Go to Raster ‣ Zonal statistics ‣ Zonal statistics.



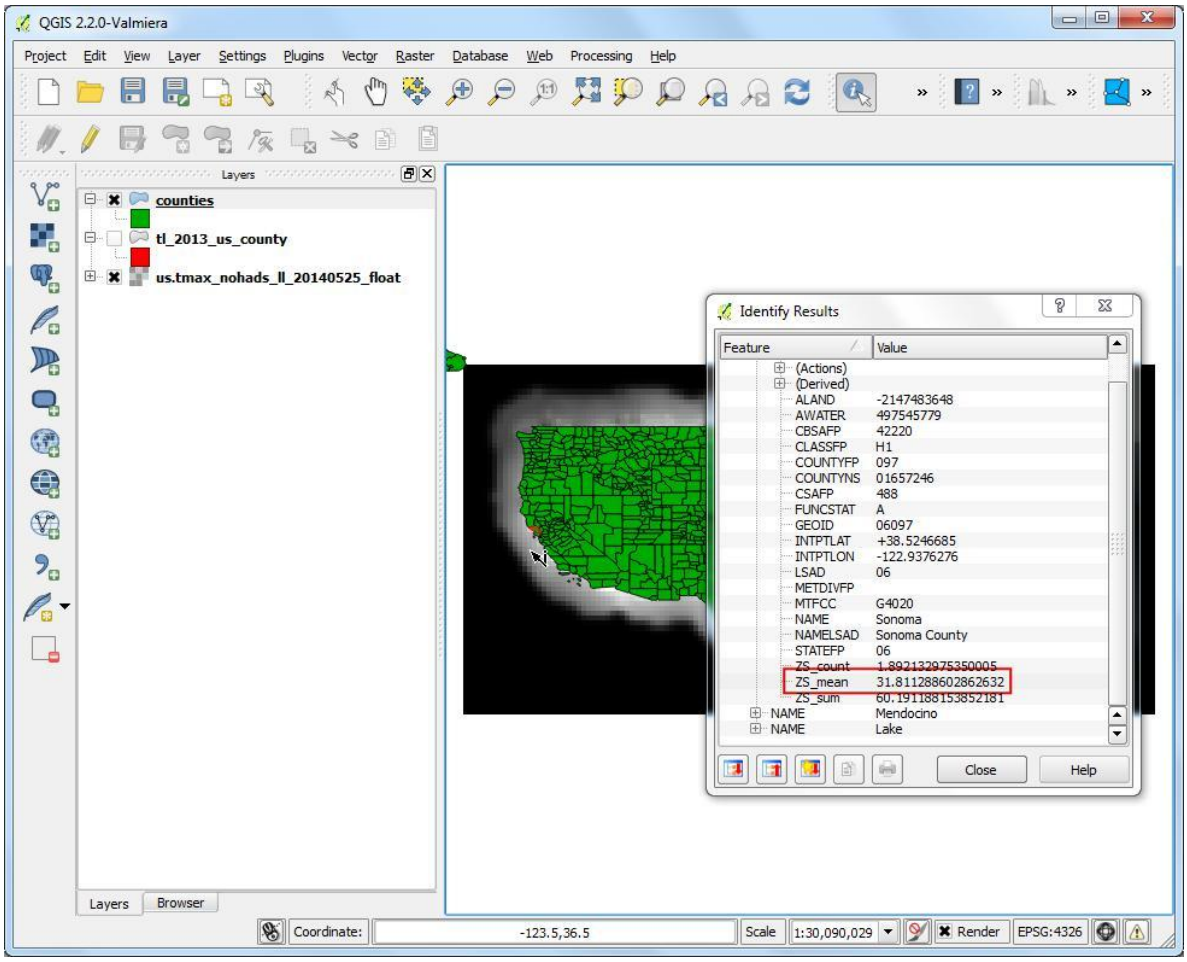
- Select us.tmax_nohads_ll_{YYYYMMDD}_float as the Raster layer and counties as the Polygon layer containing the zones. Enter ZS_ as the Output column prefix. Click OK.



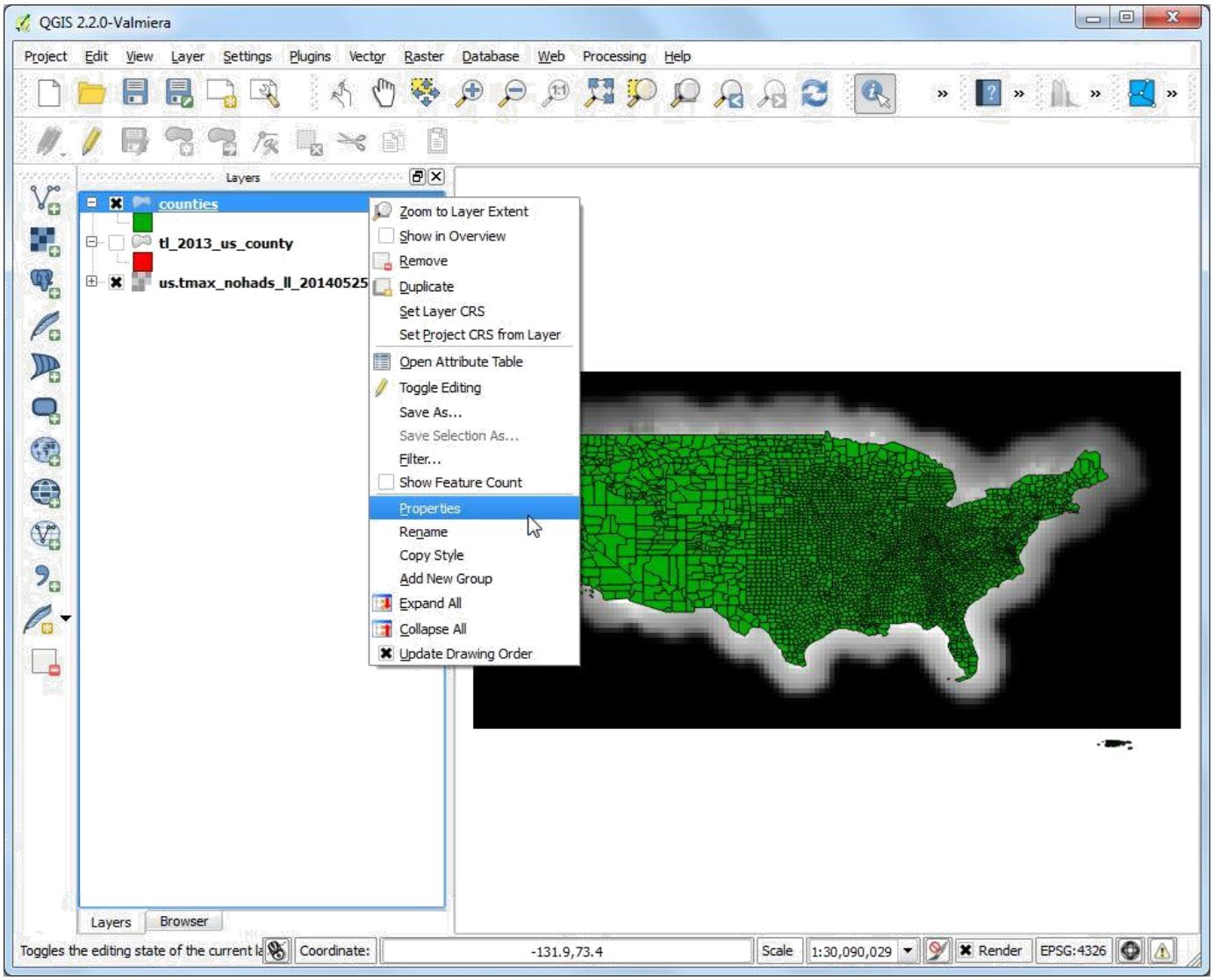
- The analysis may take some time depending on the size of the dataset.



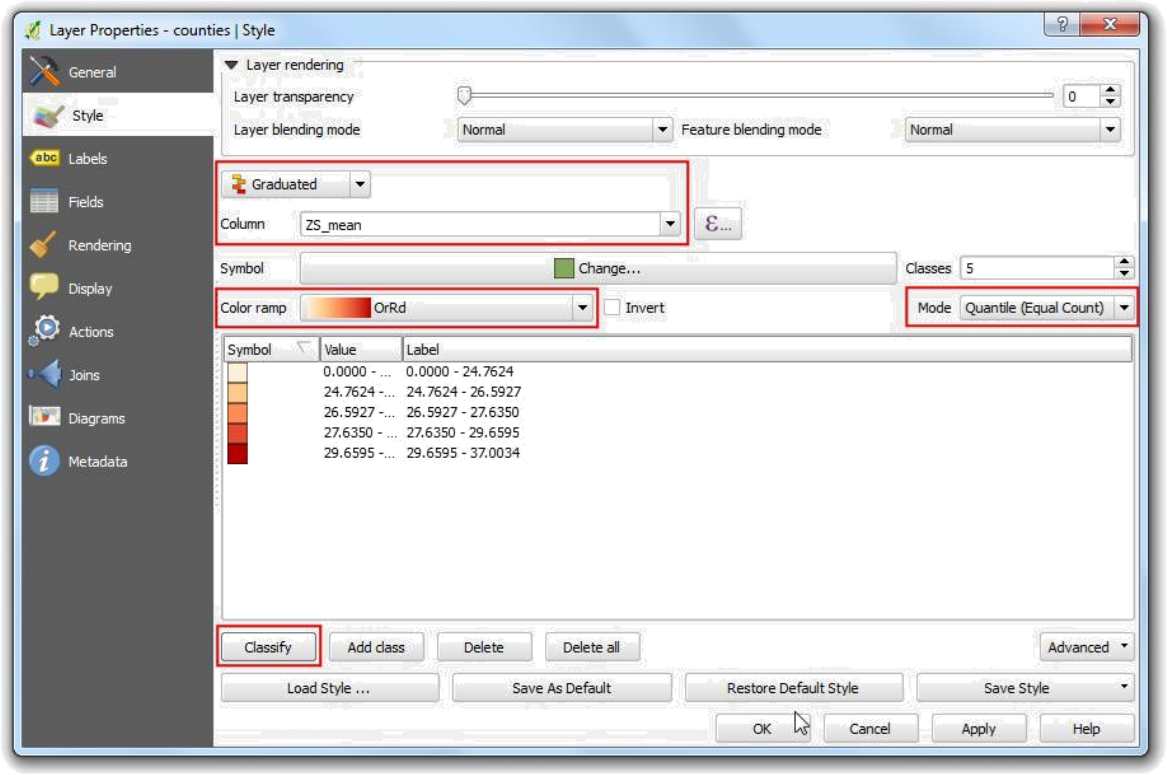
- Once the processing finishes, select the counties layer. Use the Identify tool and click on any county polygon. You will see three new attributes added to the layer: ZS_count, ZS_mean and ZS_sum. These attributes contain the count of raster pixels, mean of raster pixel values and sum of raster pixel values respectively. Since we are interested in average temperature, the ZS_mean field will be the one to use.



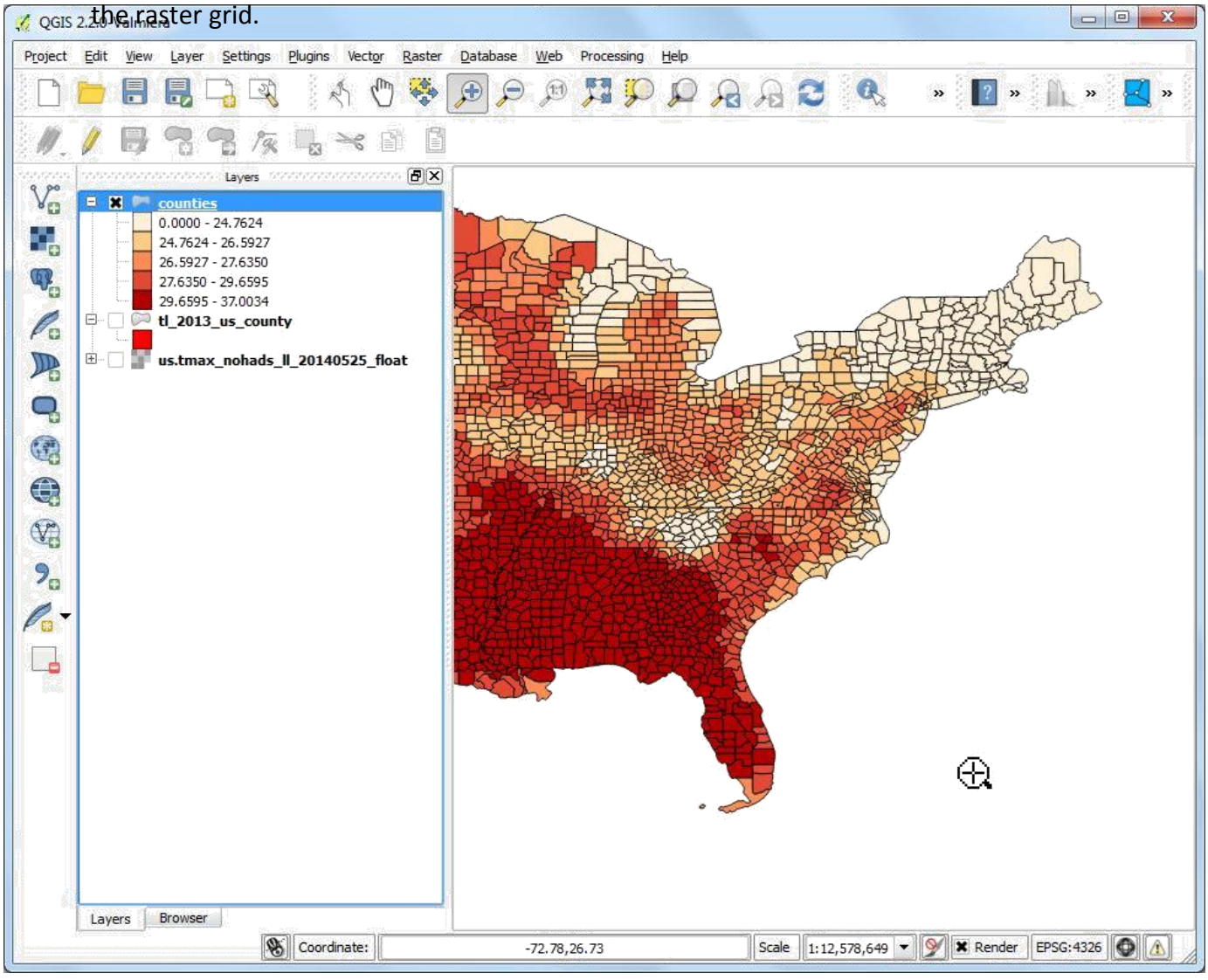
- Let's style this layer to create a temperature map. Right-click the counties layer and select Properties.



- Switch to the Style tab. Choose Graduated style and select ZS_mean as the Column. Choose a Color Ramp and Mode of your chose. Click Classify to create the classes. Click OK. (See *Basic Vector Styling* for more details on styling.)



- You will see the county polygons styled using average maximum temperature extracted from the raster grid.



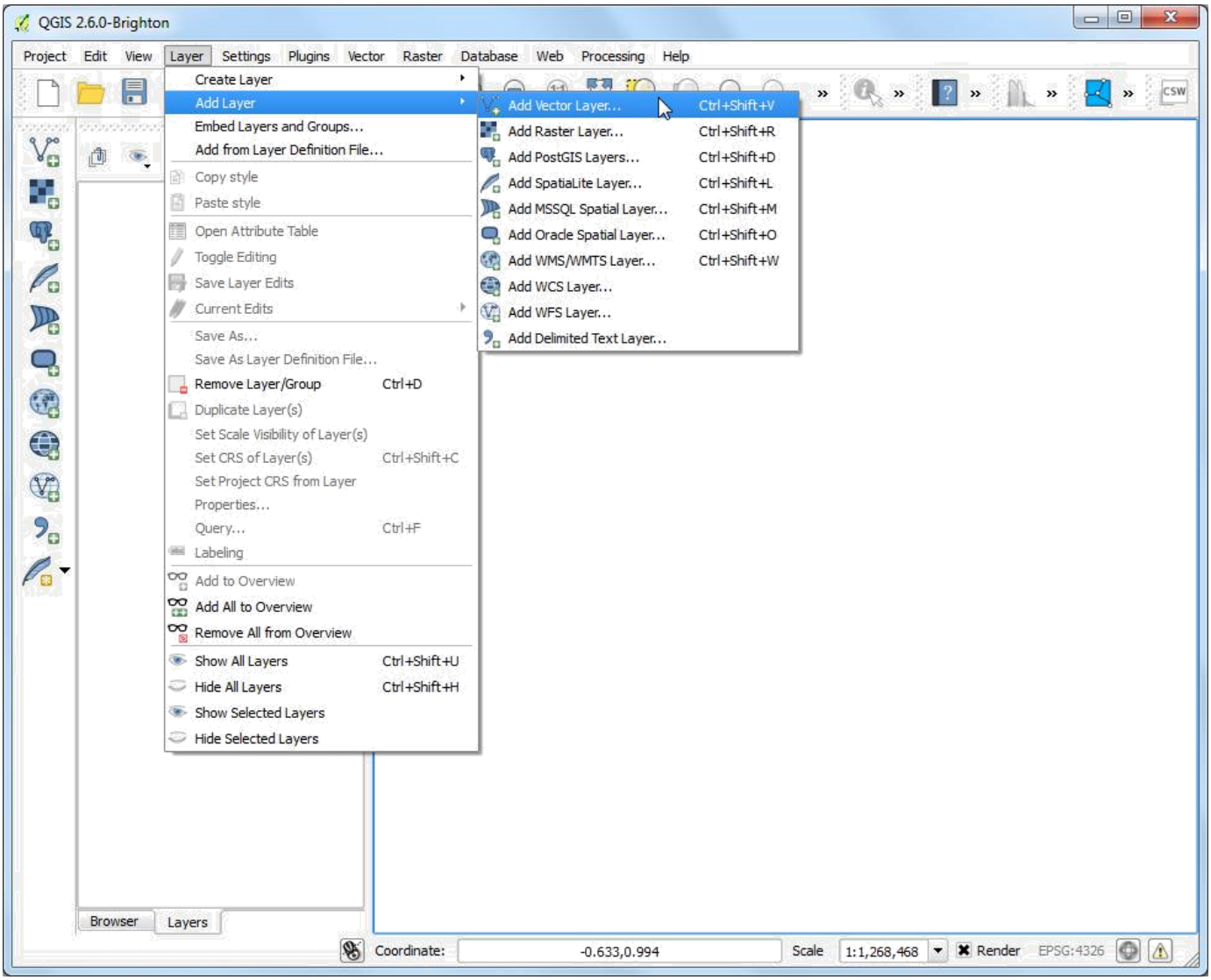
c) Interpolating Point Data

Interpolation is a commonly used GIS technique to create continuous surface from discrete points. A lot of real world phenomena are continuous - elevations, soils, temperatures etc. If we wanted to model these surfaces for analysis, it is impossible to take measurements throughout the surface. Hence, the field measurements are taken at various points along the surface and the intermediate values are inferred by a process called 'interpolation'. In QGIS, interpolation is achieved using the built-in

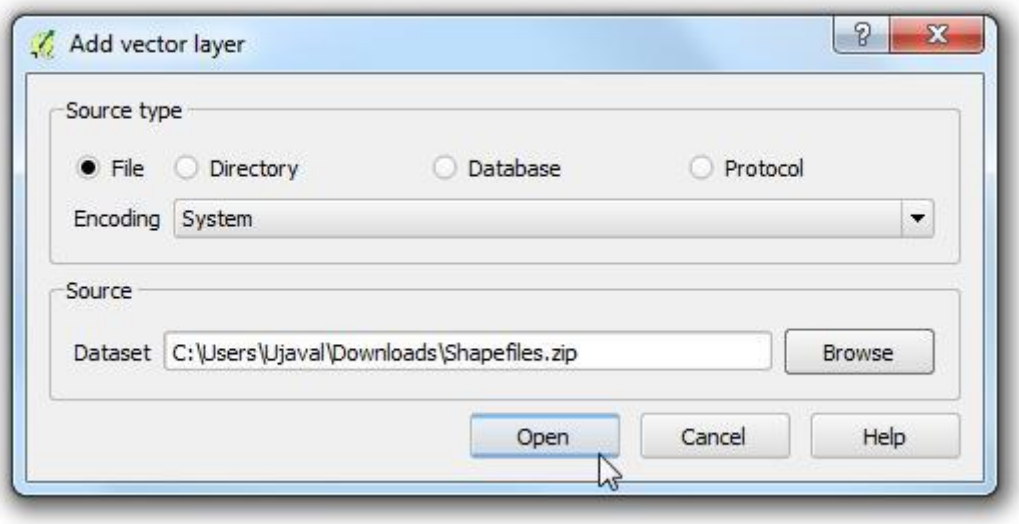
Interpolation plugin.

Procedure

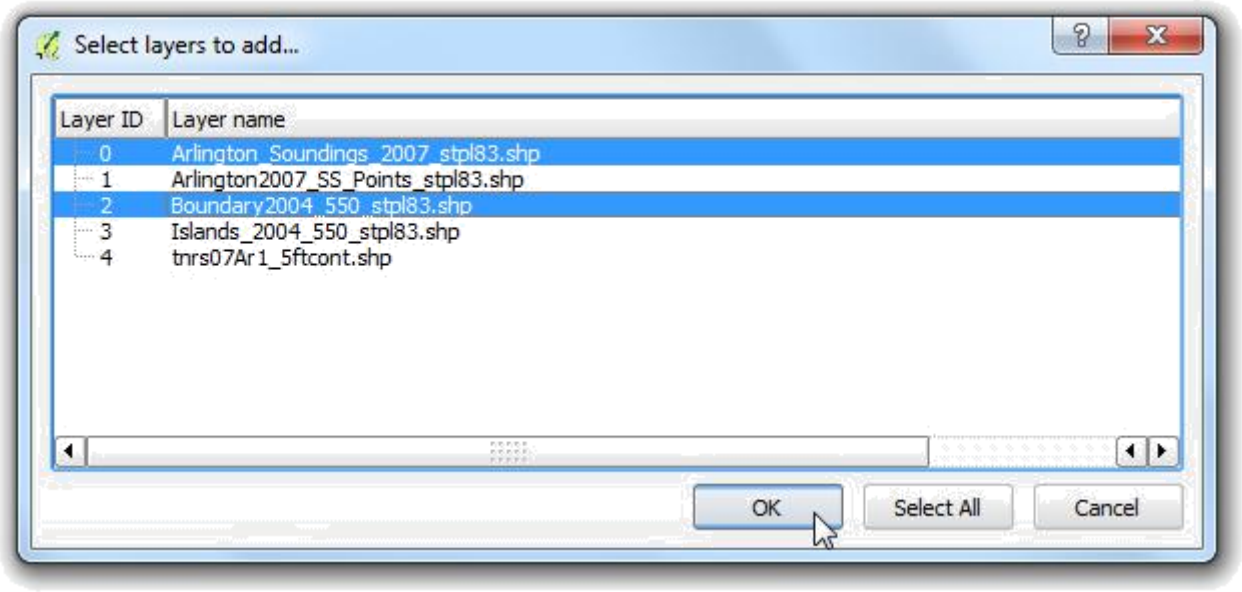
1. Open QGIS. Go to Layer ‣ Add Layer ‣ Add Vector Layer.



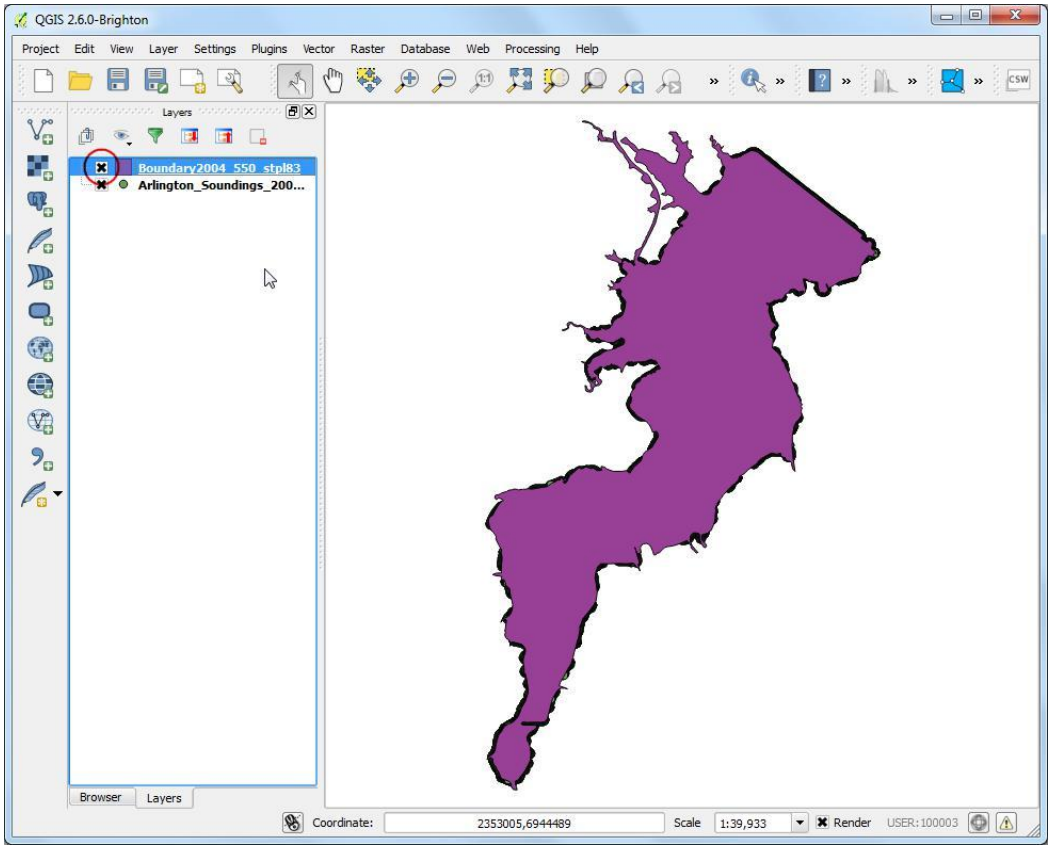
2. Browse to the downloaded Shapefiles.zip file and select it. Click Open.



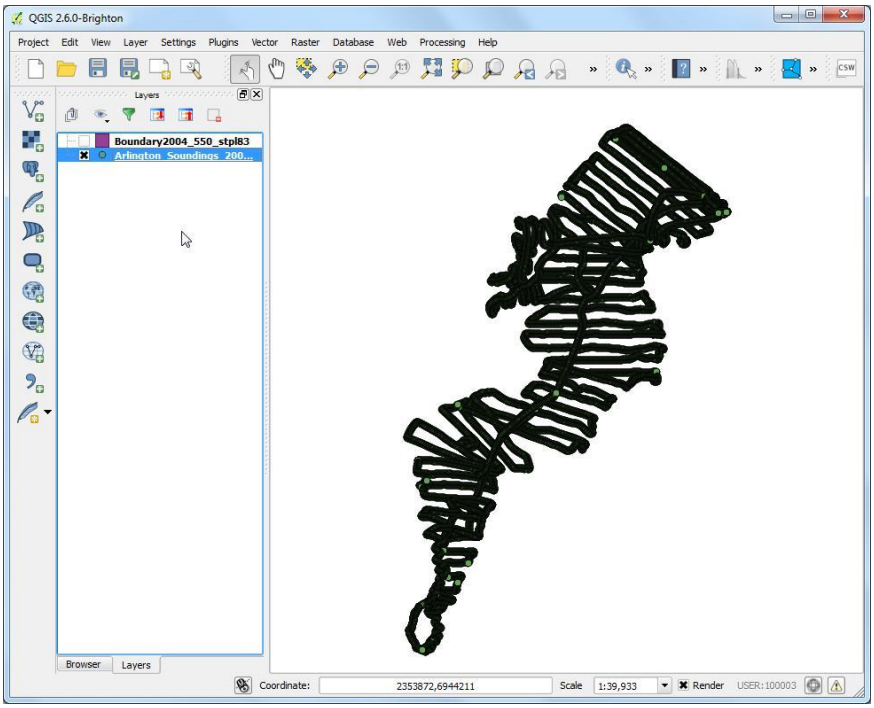
3. In the Select layers to add... dialog, hold the Shift key and select Arlington_Soundings_2007_stpl83.shp and Boundary2004_550_stpl83.shp layers. Click OK



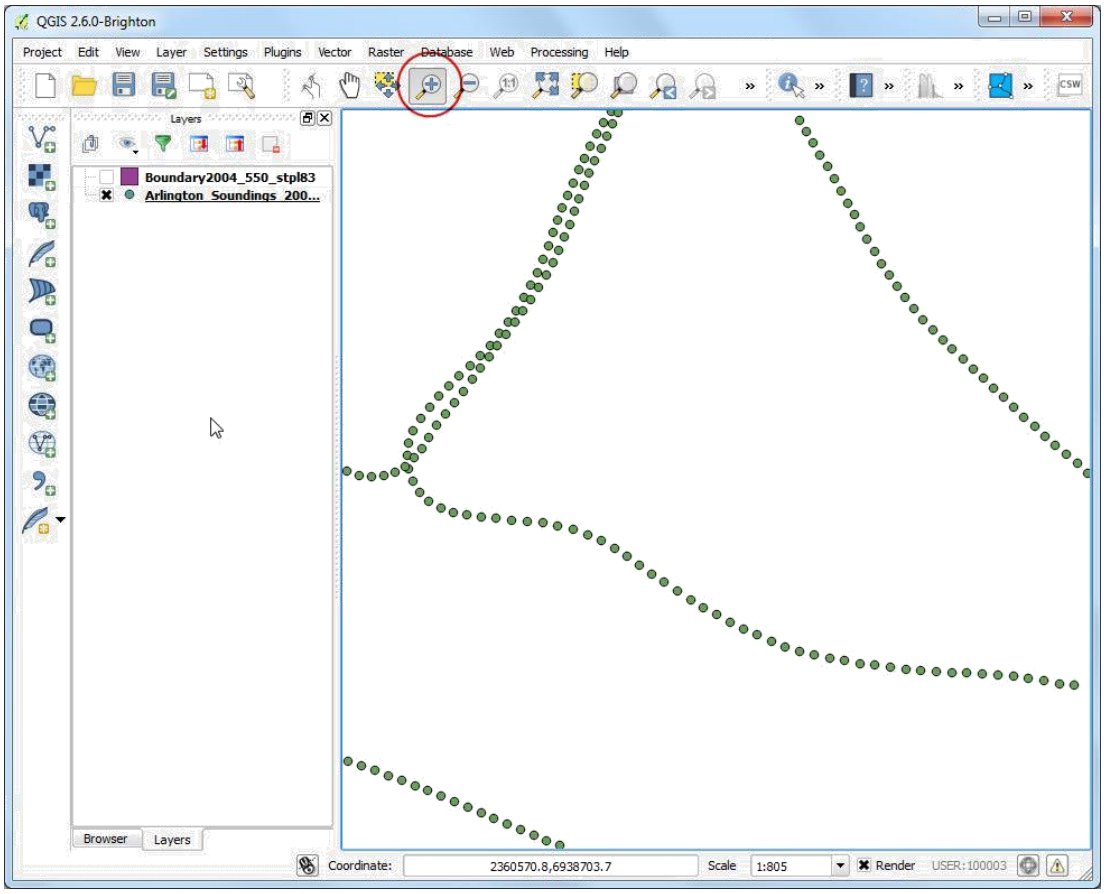
4. You will see the 2 layers loaded in QGIS. The Boundary2004_550_stpl83 layer represents the boundary of the lake. Un-check the box next to it in the Table of Contents.



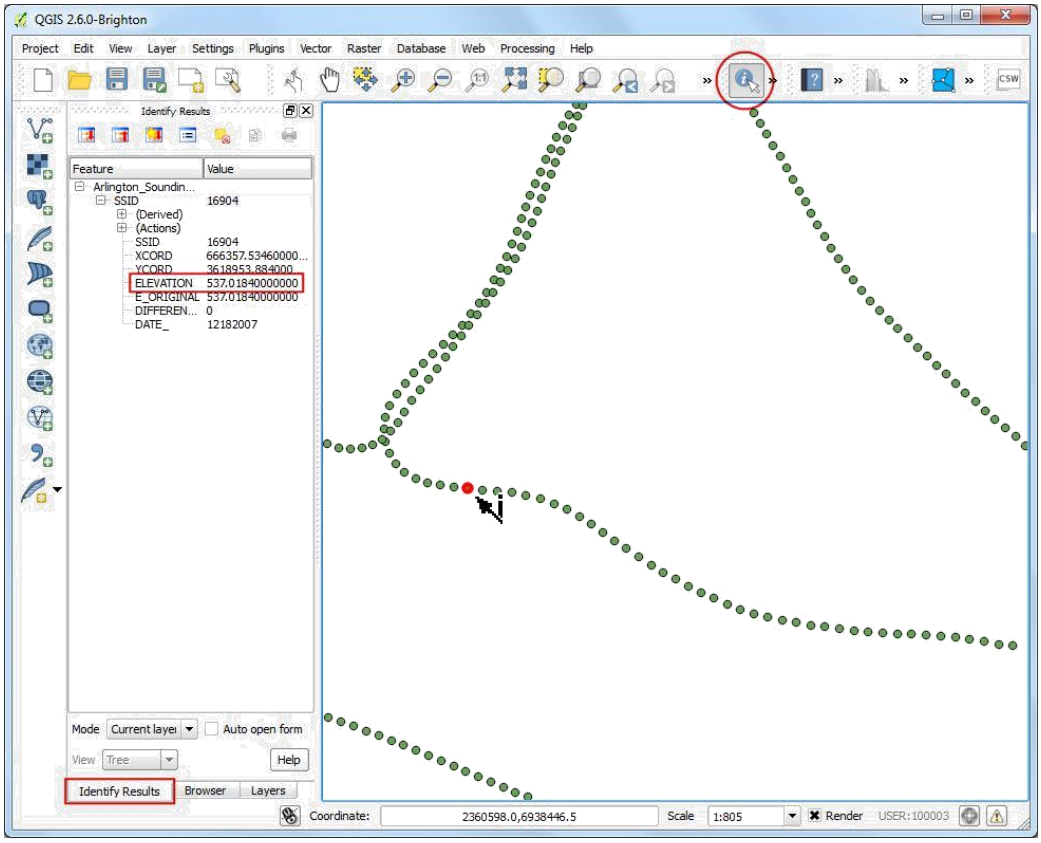
5. This will reveal the data from the second layer Arlington_Soundings_2007_stpl83. Though the data looks like lines, it is a series of points that are very close.



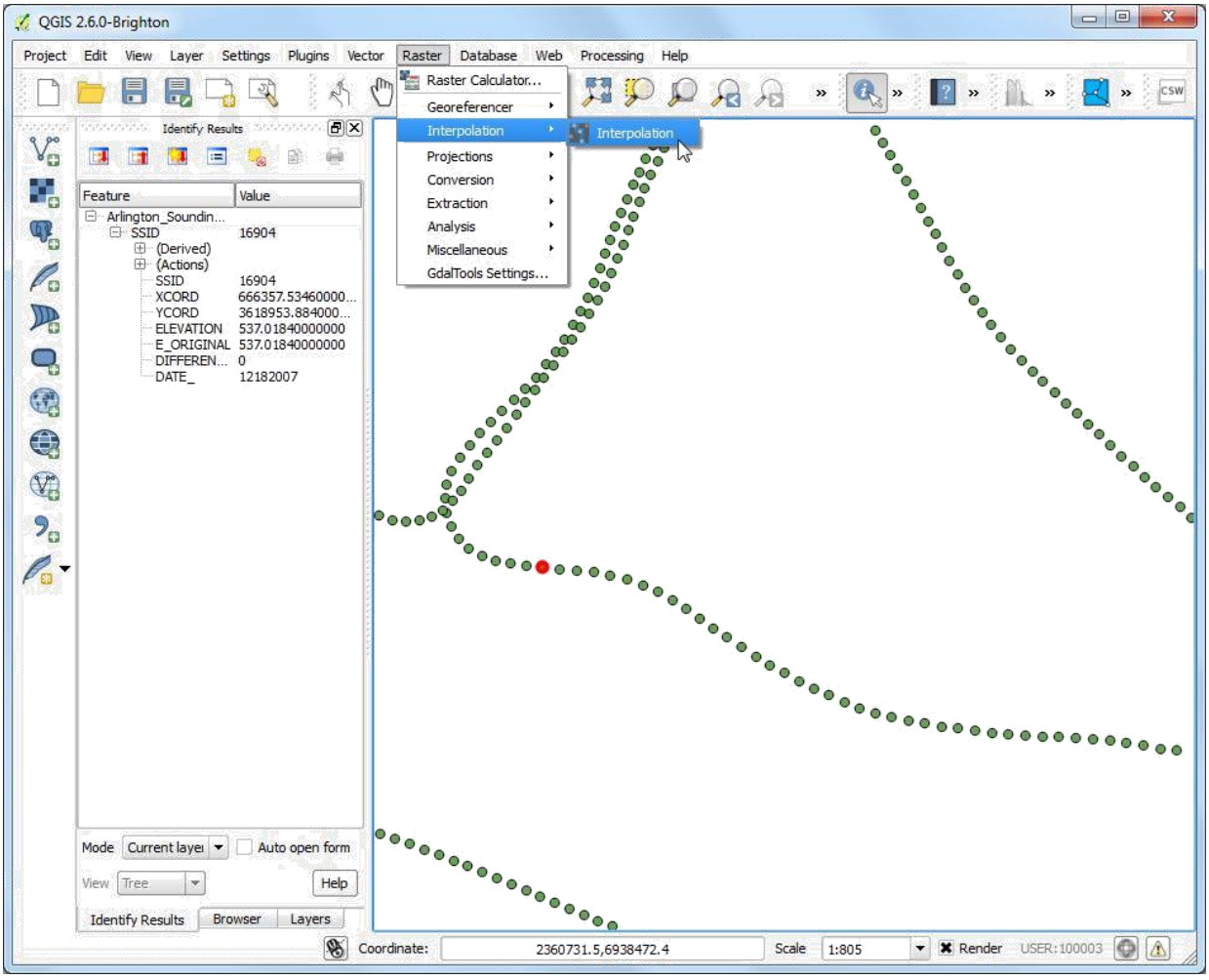
6. Click the Zoom icon and select a small area on the screen. As you zoom closer, you will see the points. Each point represents a reading taken by a *Depth Sounder* at the location recorded by a *DGPS* equipment.



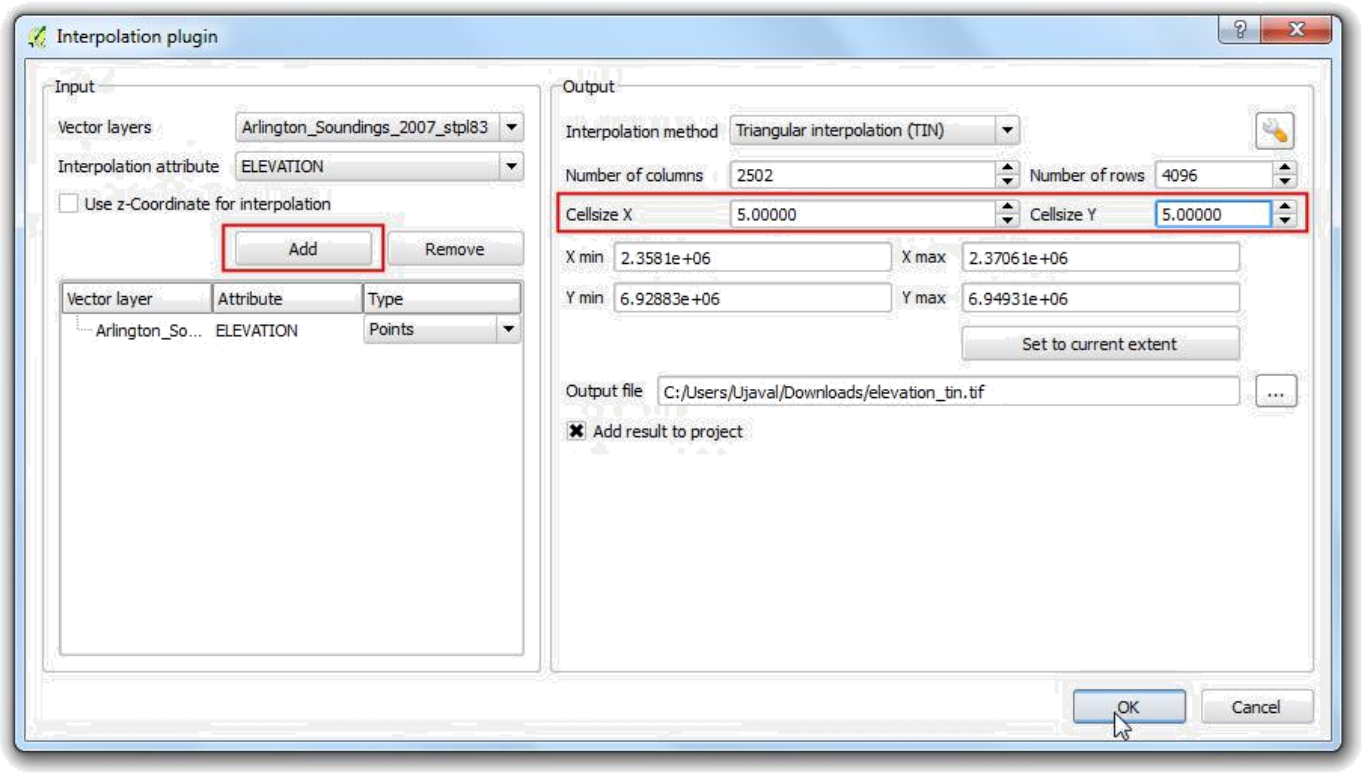
7. Select the Identify tool and click on a point. You will see the Identify Results panel show up on the left with the attribute value of the point. In this case, the ELEVATION attribute contains the depth of the lake at the location. As our task is to create a depth profile and elevation contours, we will use this values as input for the interpolation.



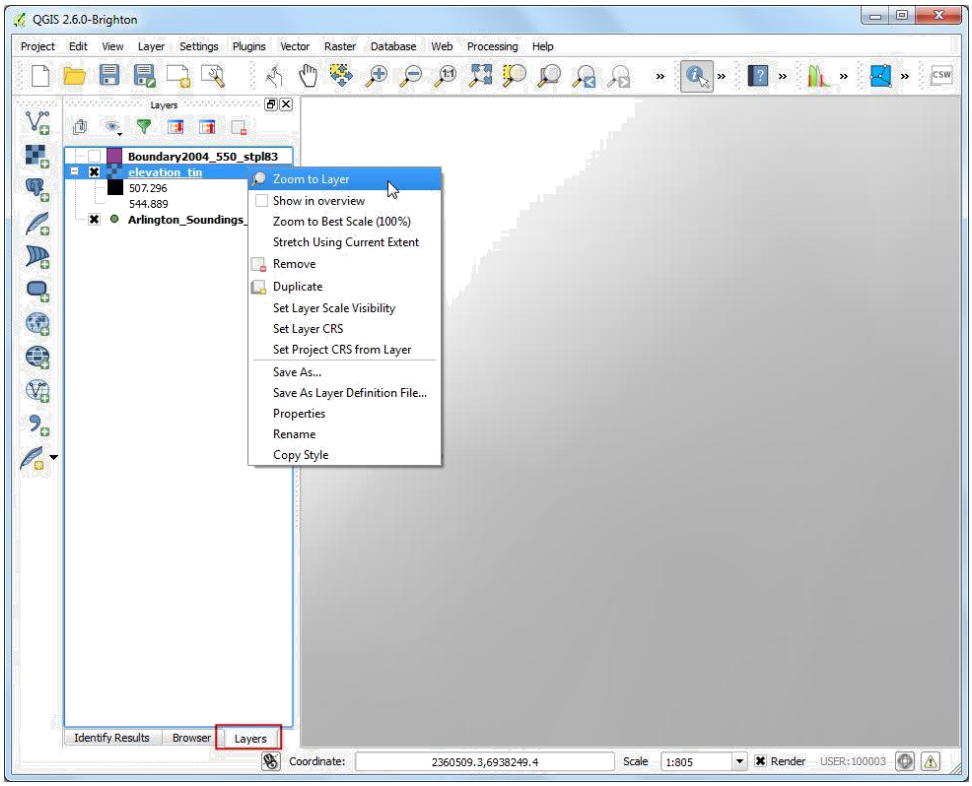
8. Make sure you have the Interpolation plugin enabled. See *Using Plugins* for how to enable plugins. Once enabled, go to Raster ‣ Interpolation ‣ Interpolation.



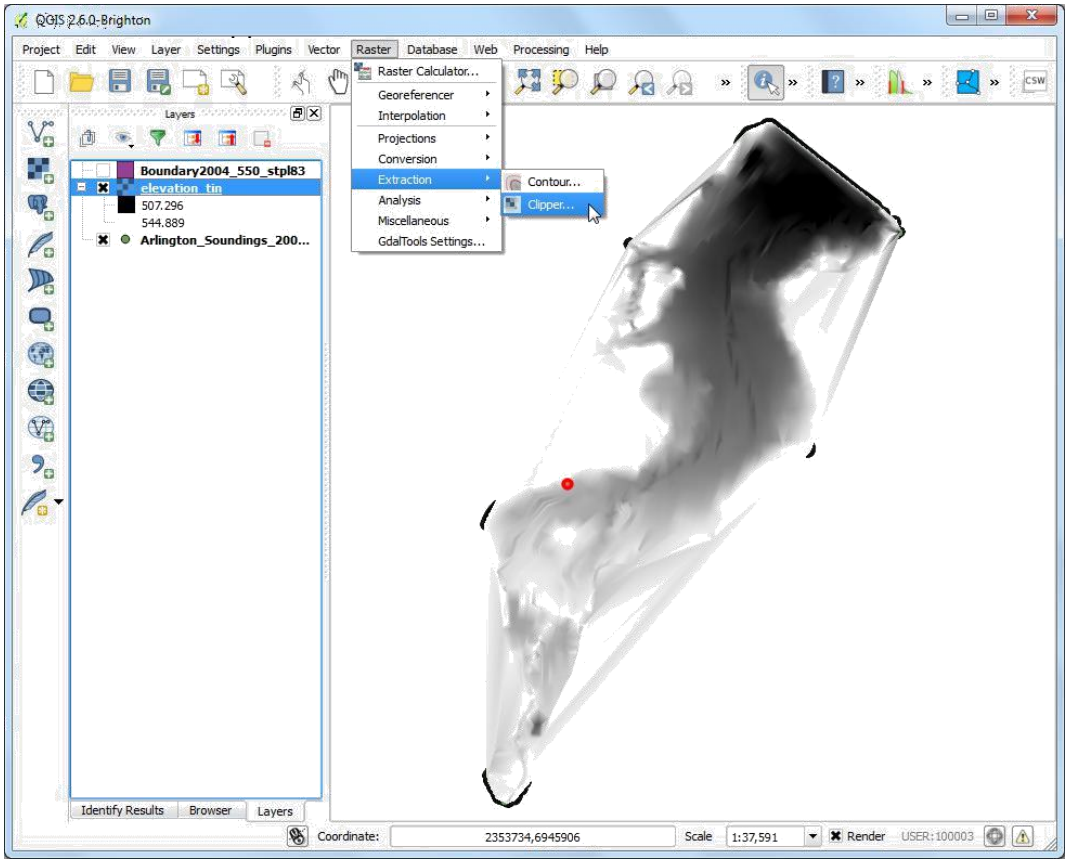
9. In the Interpolation dialog, select Arlington_Soundings_2007_stpl83 as the Vector layers in the Input panel. Select ELEVATION as the Interpolation attribute. Click Add. Change the Cellsize X and Cellsize Y values to 5. This value is the size of each pixel in the output grid. Since our source data is in a projected CRS with **Feet-US** as units, based on our selection, the grid size will be **5 feet**. Click on the ... button next to Output file and name the output file as elevation_tin.tif. CLick OK.



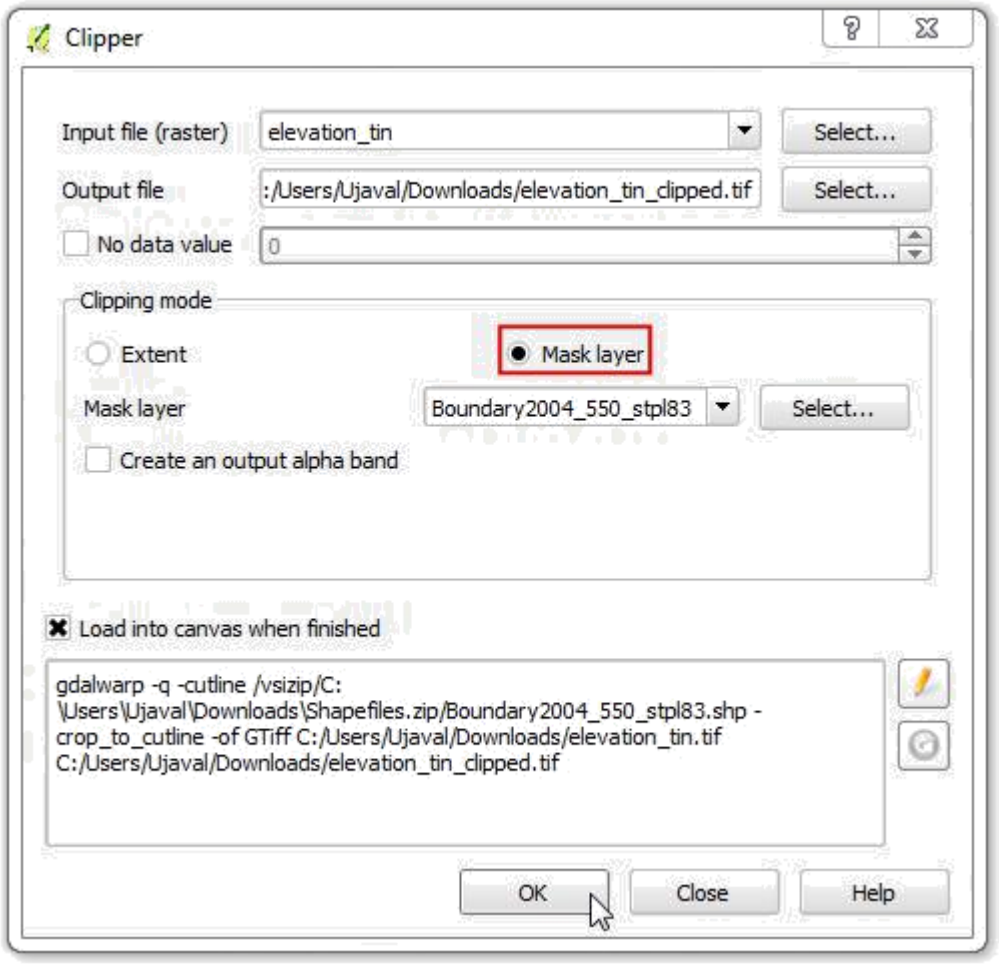
10. You will see the new later elevation_tin loaded in QGIS. Right-click the layer and select Zoom to layer.



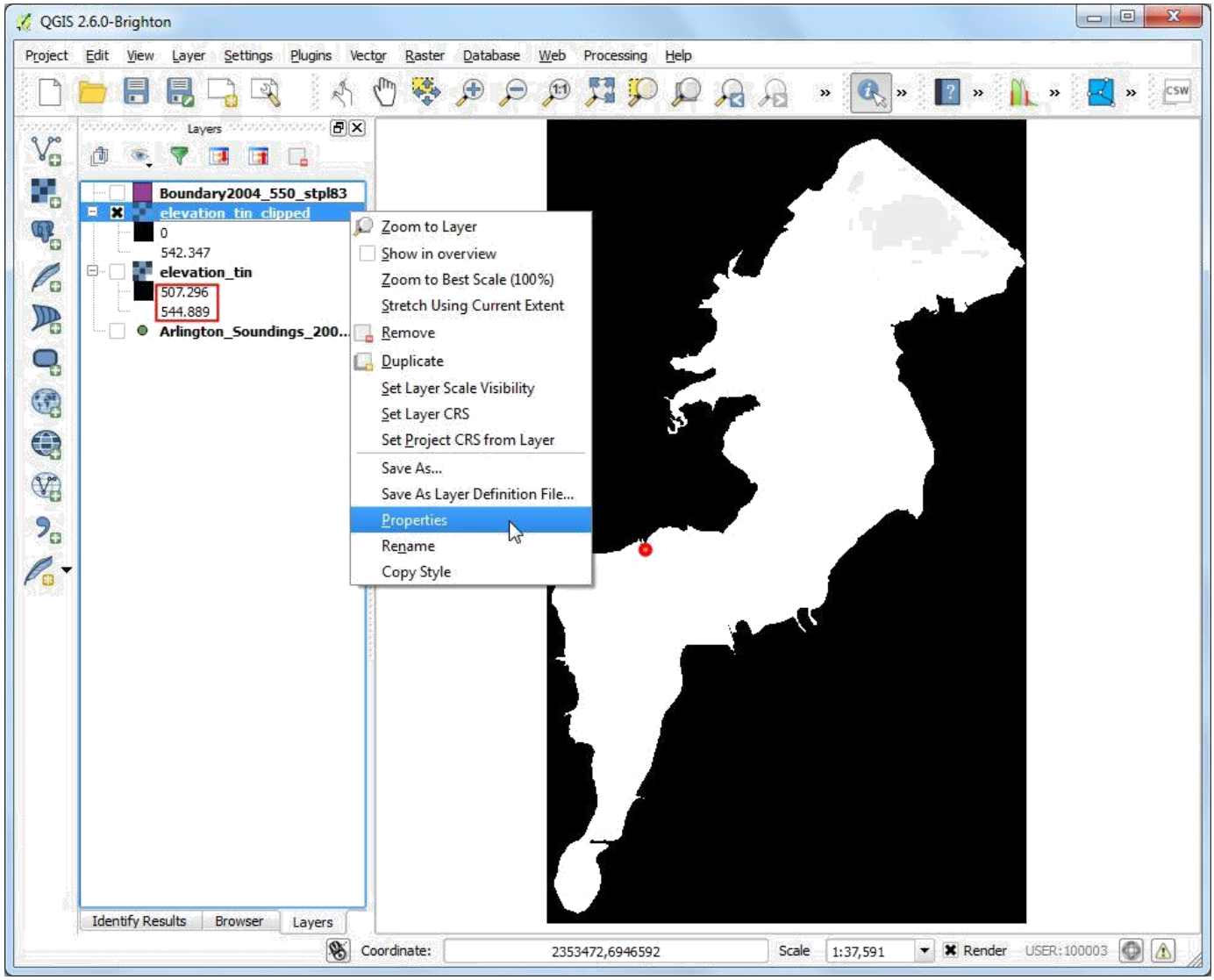
Now you will see the full extent of the created surface. Interpolation does not give accurate results outside the collection area. Let's clip the resulting surface with the lake boundary. Go to Raster ‣



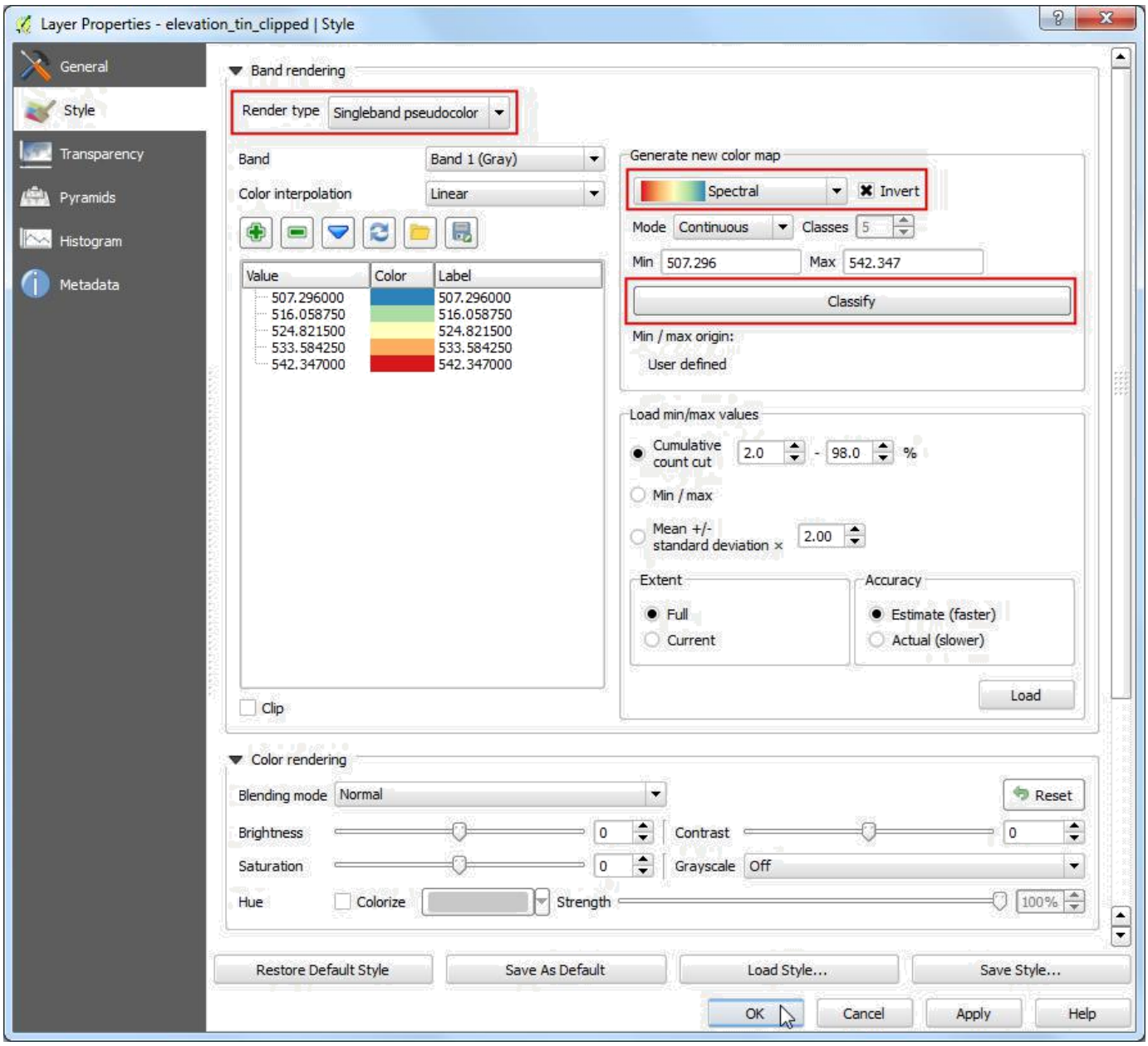
12. Name the Output file as elevation_tin_clipped.tif. Select the Cliiped mode as Mask layer. Select Boundary2004_550_stpl83 as the Mask layer`. Click OK.



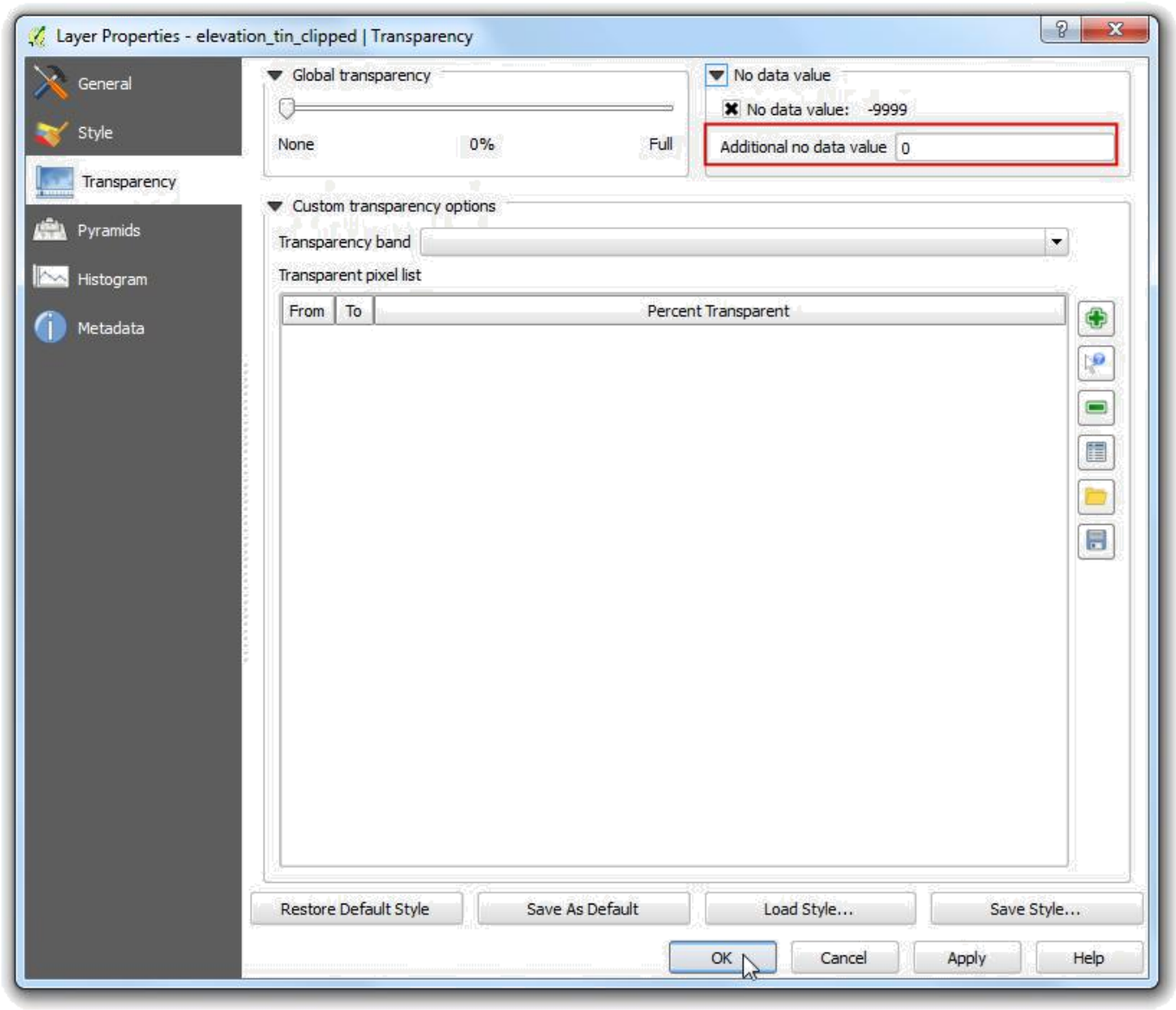
13. A new raster elevation_tin_clipped will be loaded in QGIS. We will now style this layer to show the difference in elevations. Note the min and max elevation values from the elevation_tin layer. Right-click the elevation_tin_clipped layer and select Properties.



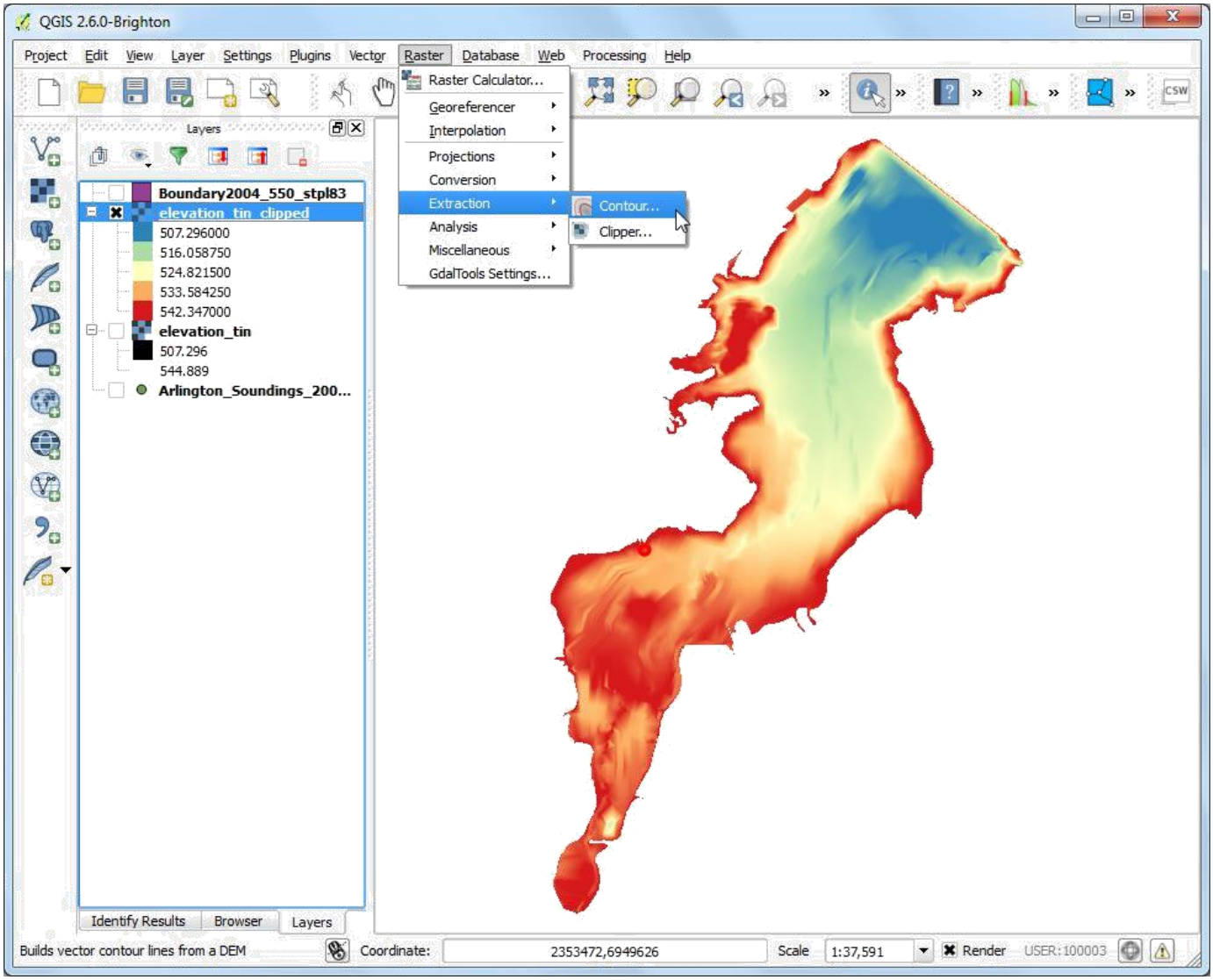
14. Go to the Style tab. Select Render type as Singleband pseudocolor. In the Generate new color map panel, select Spectral color ramp. As we want to create a depth-map as opposed to a height-map, check the Invert box. This will assign blues to deep areas and reds to shallow areas. Click Classify.



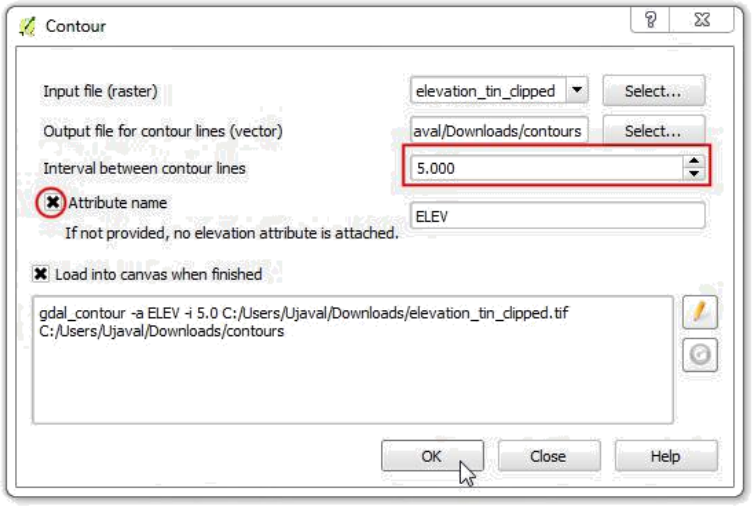
15. Switch to the Tranparency tab. We want to remove the black-pixels from our output. Enter 0 as the Additional no data value. Click OK.



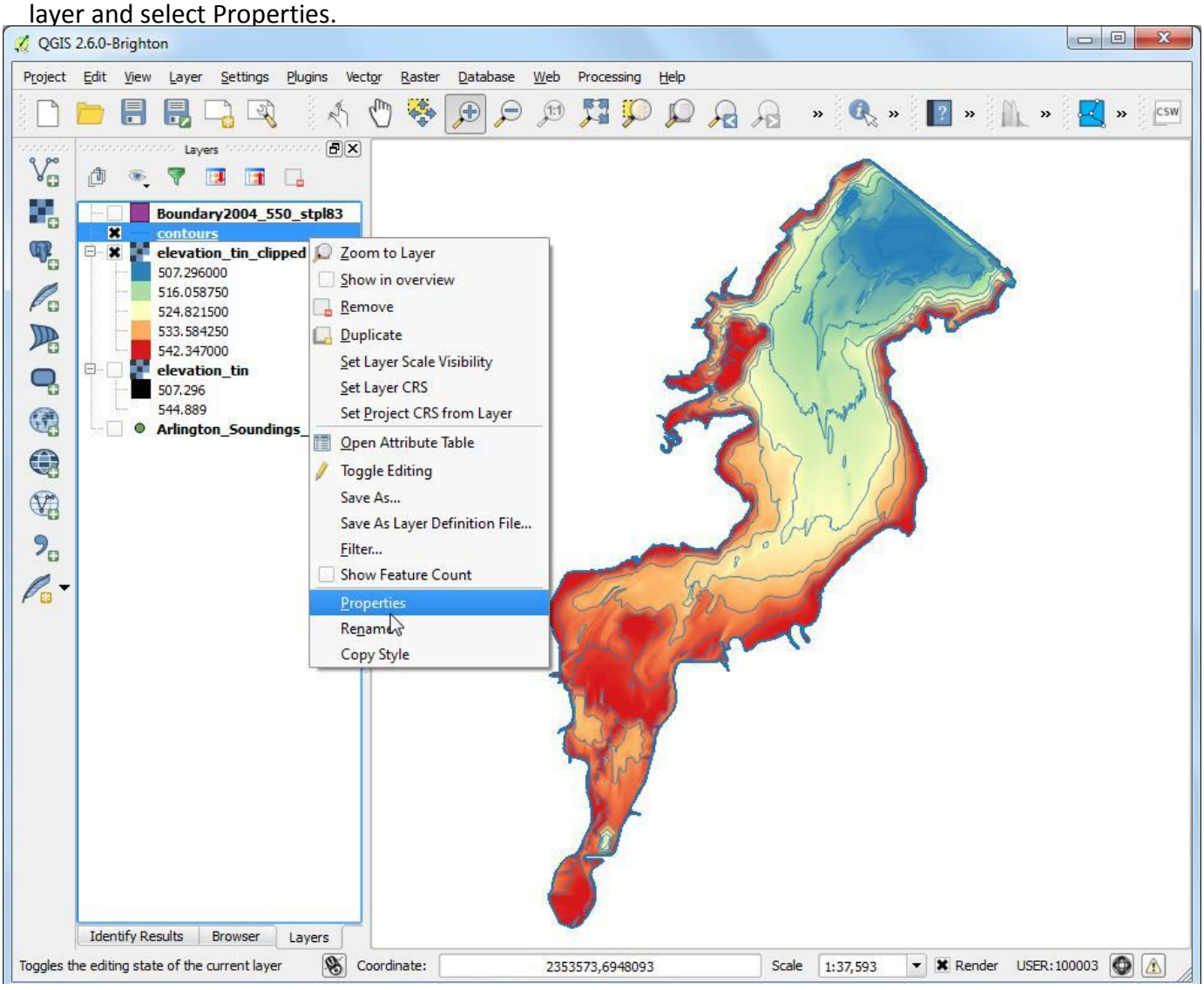
16. Now you have a elevation relief map for the lake generated from the individual depth readings. Let's generate contours now. Go to Raster ‣ Extraction ‣ Contours.



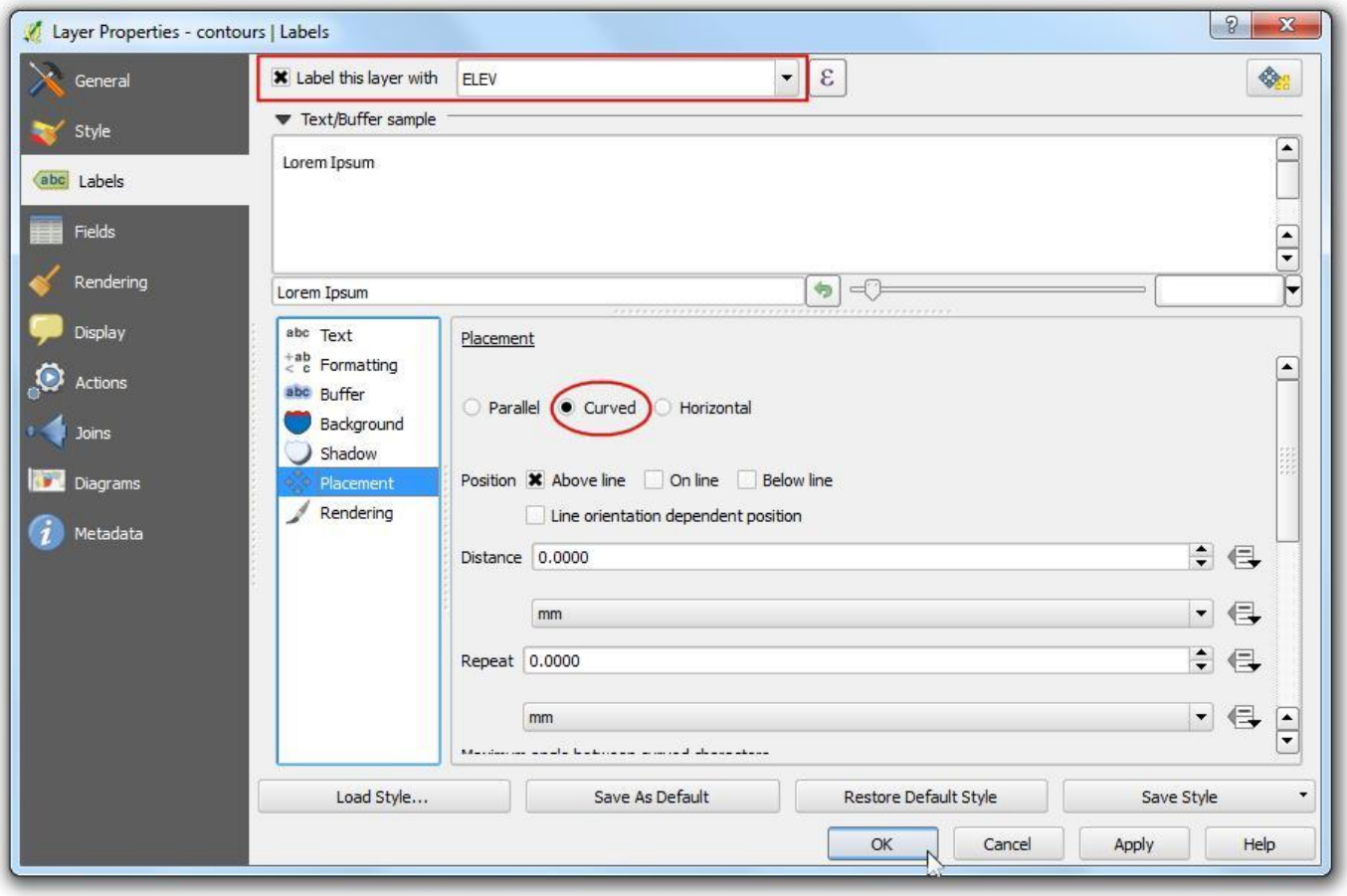
17. In the Contour dialog, enter contours as the Output file for contour lines. We will generate contour lines at 5ft intervals, so enter 5.00 as the Interval between contour lines. Check the Attribute name box. Click OK.



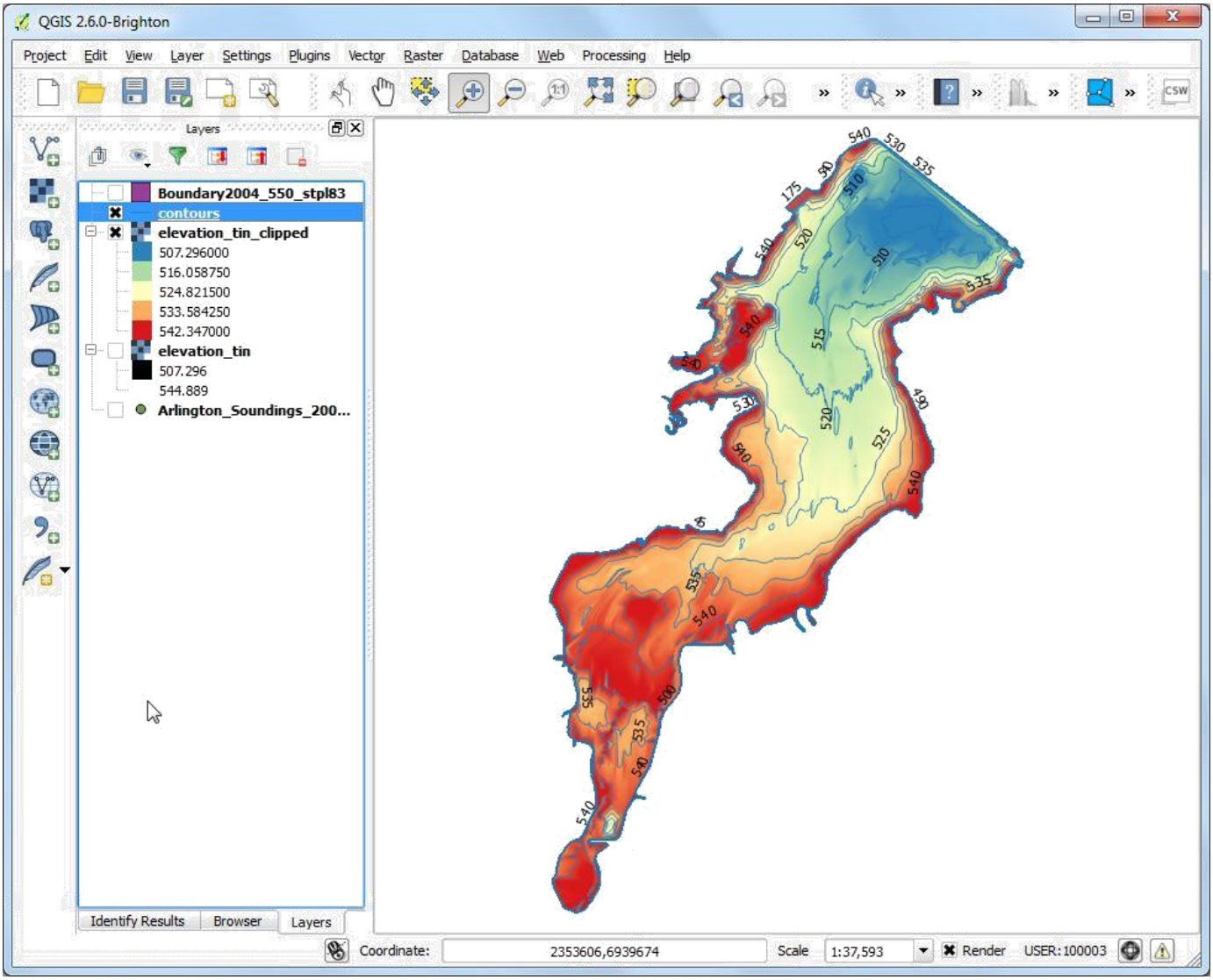
18. The contour lines will be loaded as contours layer once the processing is finished. Right-click the layer and select Properties.



19. Go to the Labels tab. Check the Label this layer with box and select ELEV as the field. Select Curved as the Placement type and click OK.



20. You will see that each contour line will be appropriately labeled with the elevation along the line.


QGIS 2.6.0-Brighton
Project Edit View Layer Settings Plugins Vector Raster Database Web Processing Help
Layers
Boundary2004_550_stpl83
contours
elevation_tin_clipped
507.296000
516.058750
524.821500
533.584250
542.347000
elevation_tin
507.296
544.889
Arlington_Soundings_200...
Identify Results
Browser
Layers
Coordinate:
2353606,6939674
Scale
1:37,593
Render
USER:100003

PRACTICAL NO:- 9

Advance GIS Operations 2:

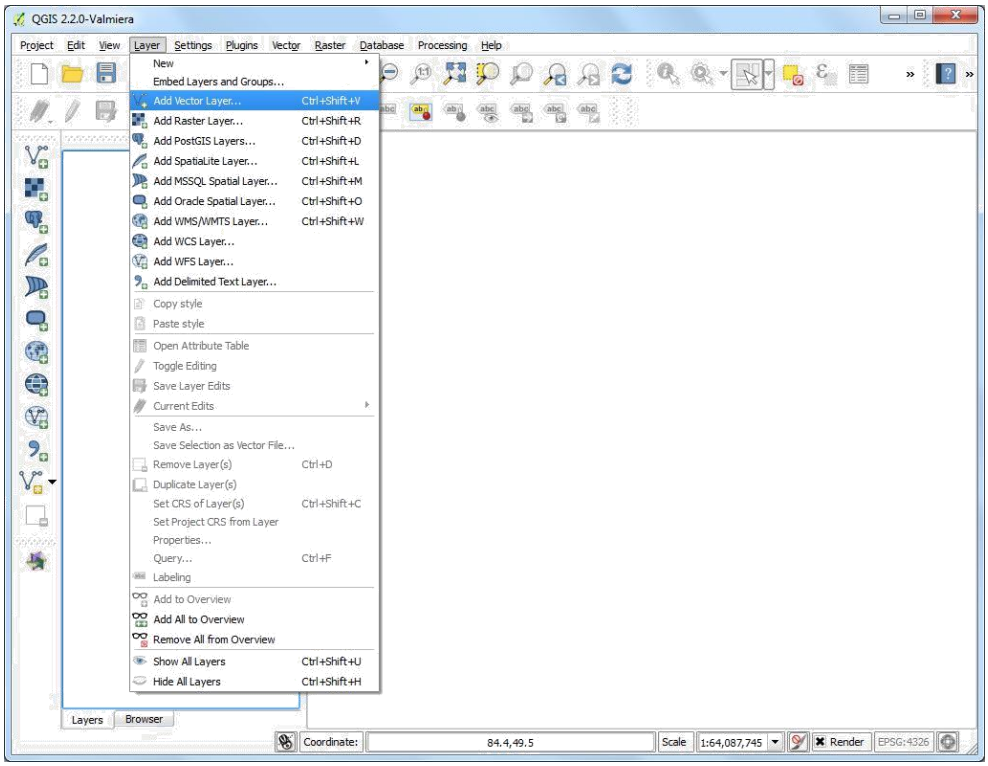
a) Batch Processing using Processing Framework

QGIS 2.0 introduced a new concept called **Processing Framework**. Previously known as **Sextante**, the Processing Framework provides an environment within QGIS to run native and third-party algorithms for processing data. It contains a nice batch processing interface that allows one to execute an algorithm on several layers easily. Batch processing is a useful tool that can save manual effort and help you automate repetitive tasks. Download the following layers

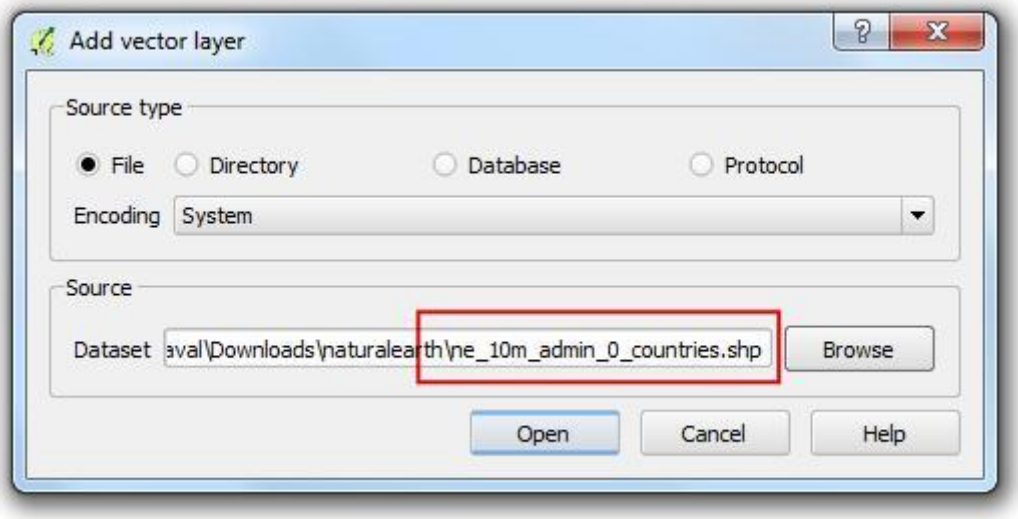
- Admin 0 - Countries
- Railroads
- Ports
- Airports

Procedure

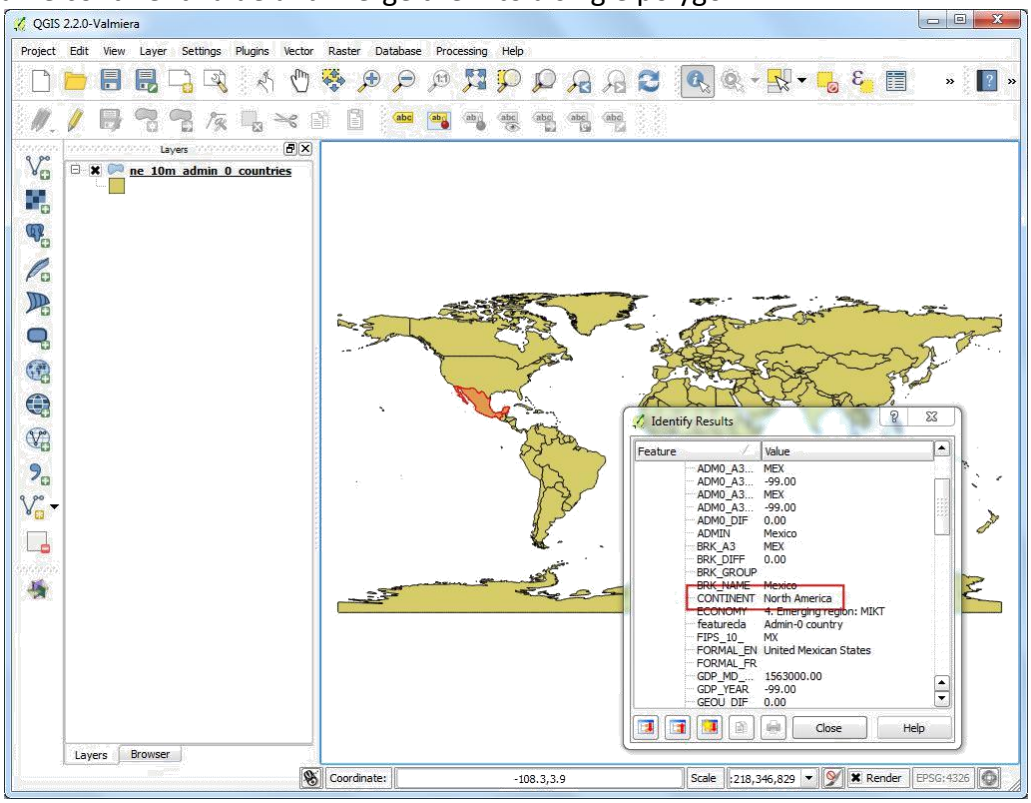
1. Go to Layer ‣ Add Vector Layer.



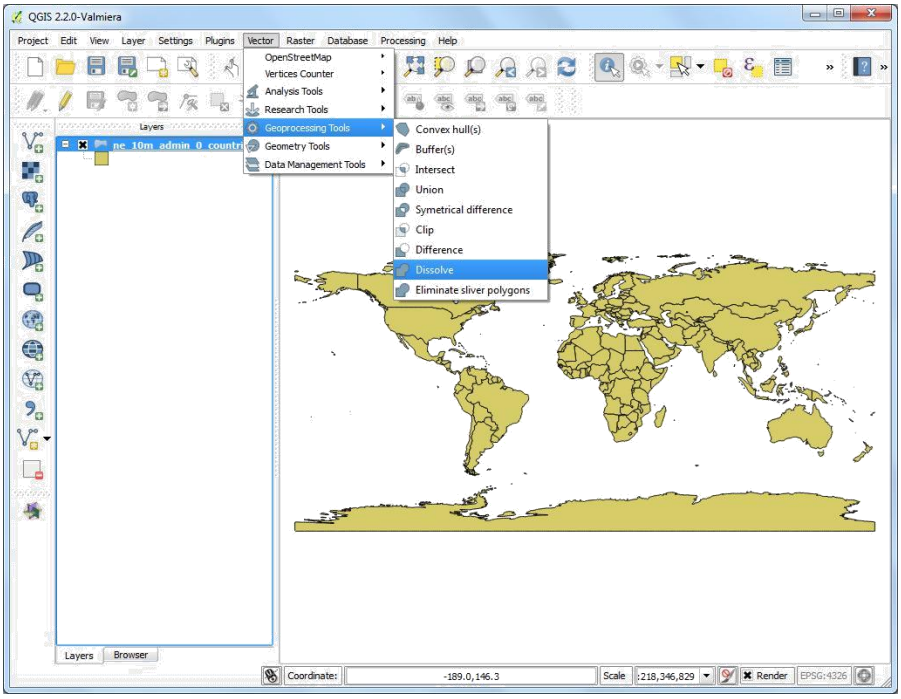
2. Browse to the downloaded Admin 0 Countries shapefile ne_10m_admin_0_countries.shp and click Open.



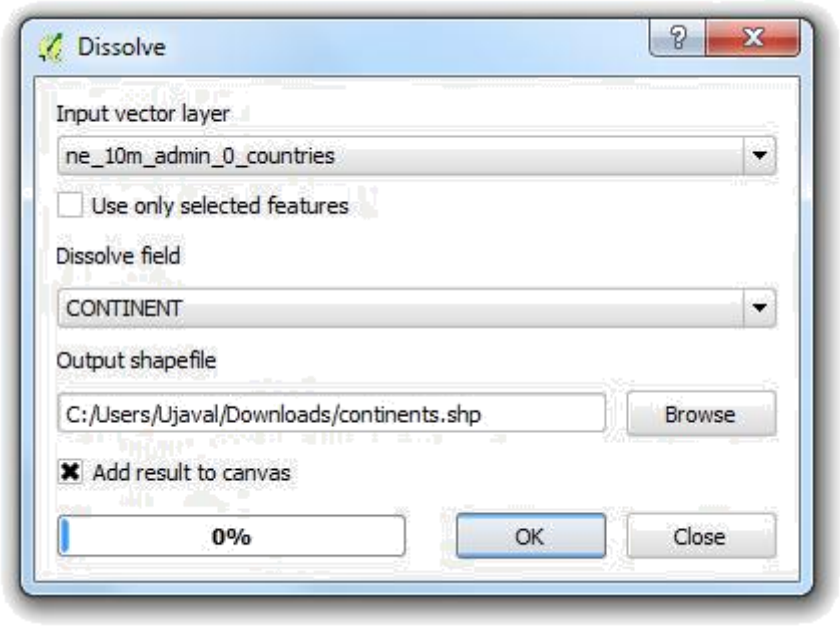
3. As our task is to clip the global layers to the boundary of Africa, we need to first prepare a layer containg a polygon for the entire continent. The countries layer has an attribute called **CONTINENT**. We can use a geoprocessing concept called *Dissolve* to merge all countries that have the same continent value and merge them to a single polygon.



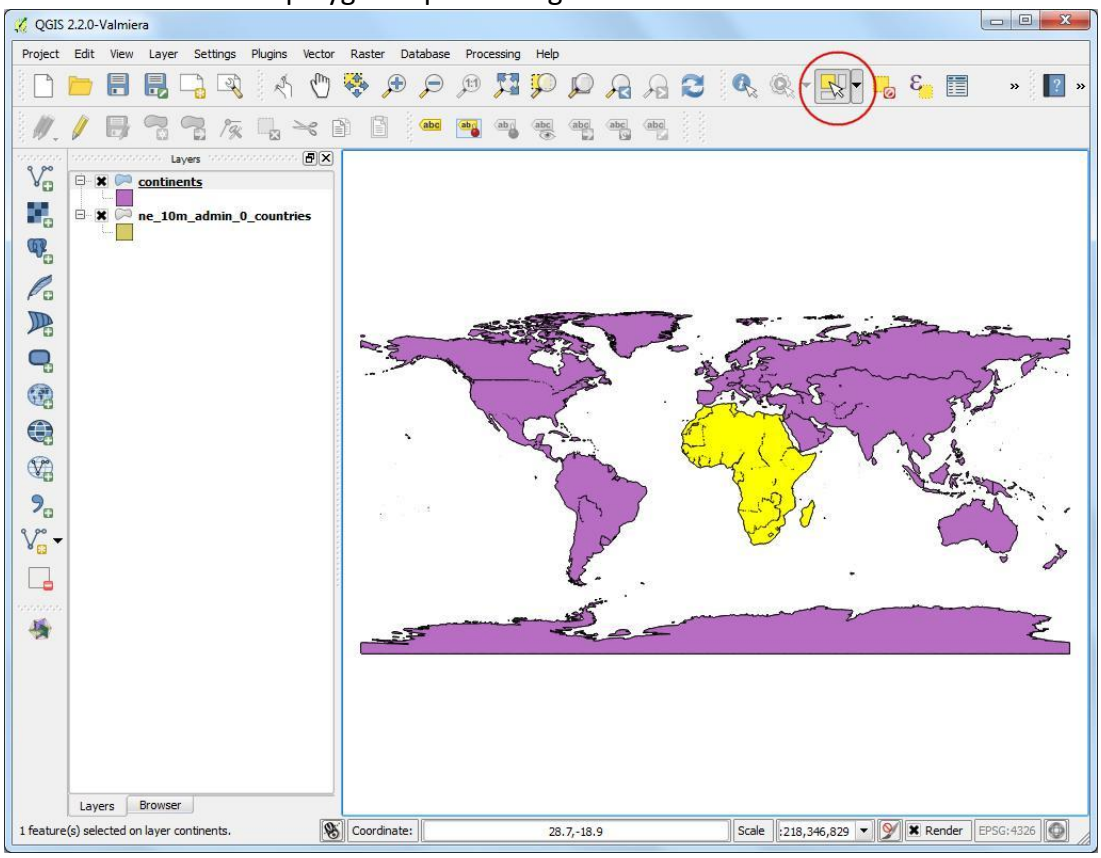
4. Open the Dissolve tool from Vector ‣ Geoprocessing Tools ‣ Dissolve.



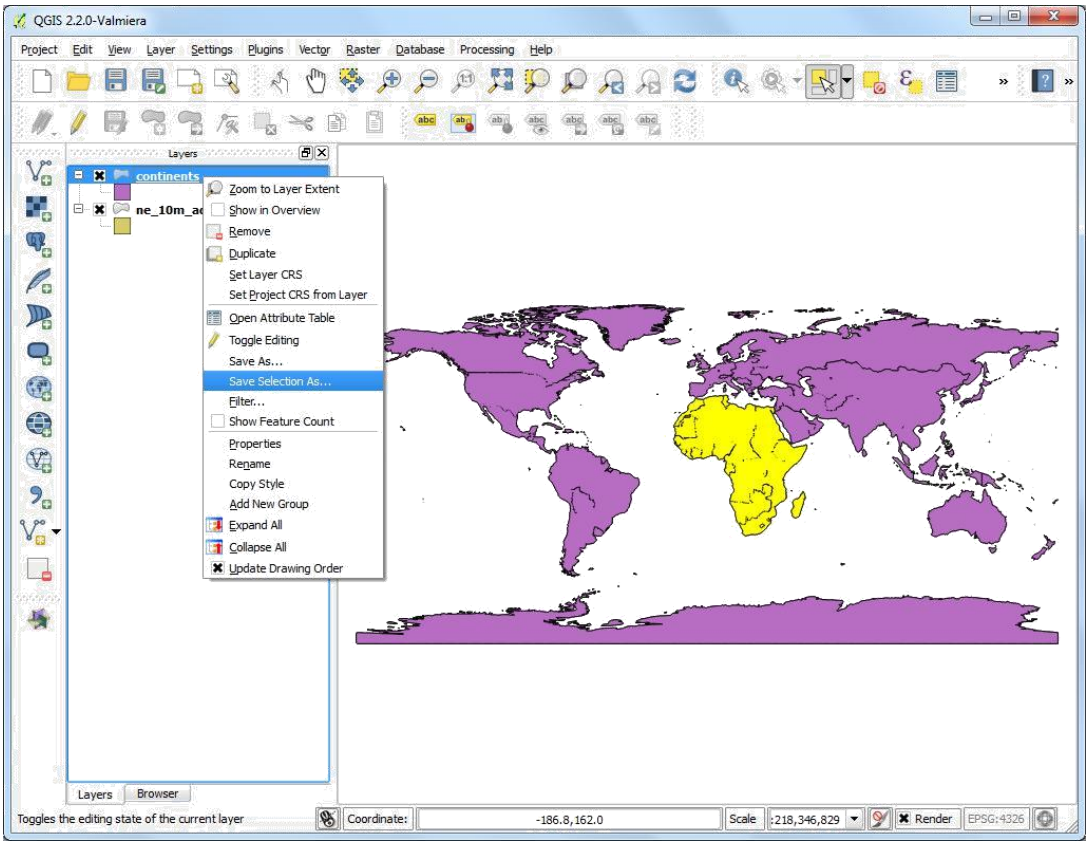
5. Select ne_10m_admin_0_countries as the Input vector layer. The Dissolve field would be CONTINENT. Name the output file as continents.shp and check the box next to Add result to convas.



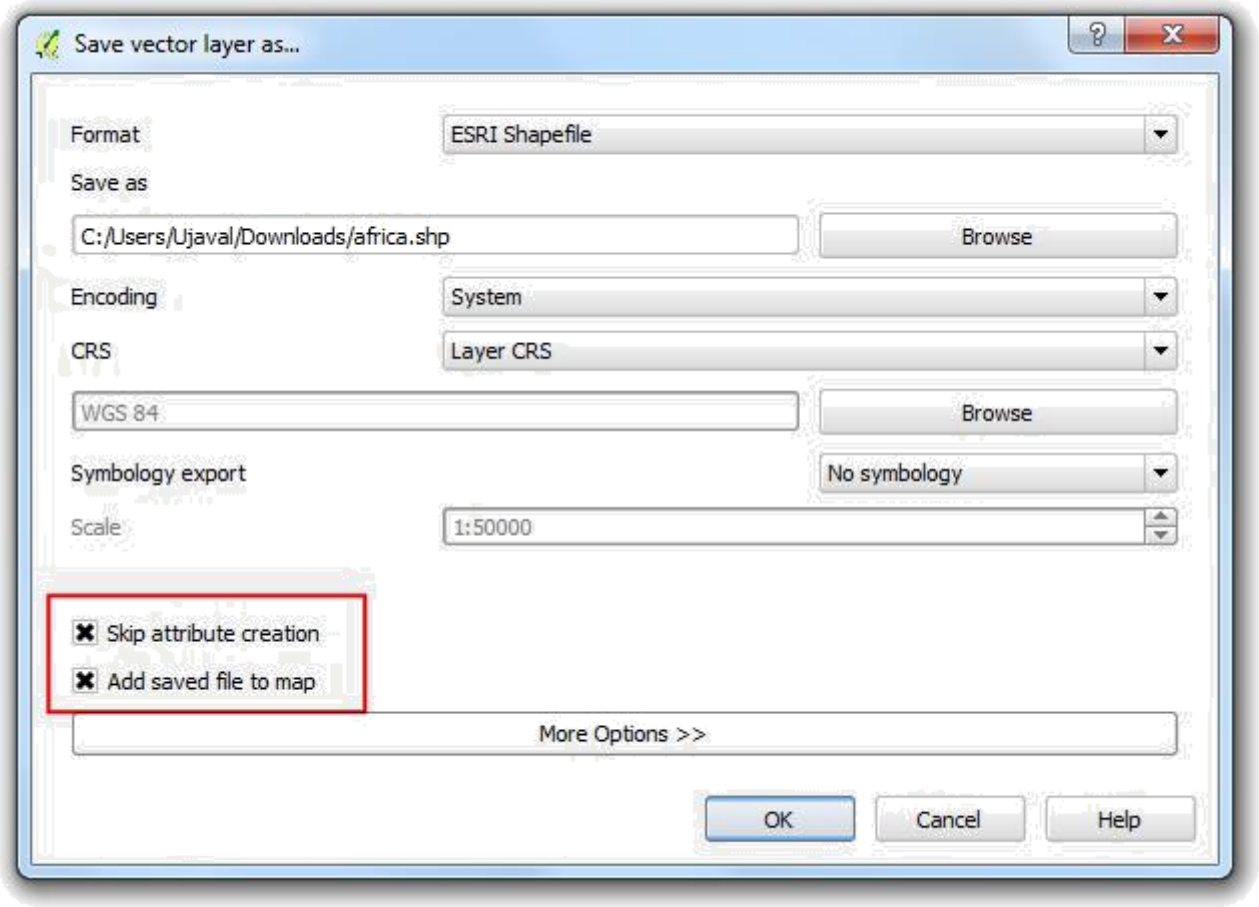
6. The dissolve processing may take a while. Once the process finishes, you will see the new continent layer added to QGIS. Use the Select Single Feature tool from the toolbar and click on Africa to select the polygon representing the continent.



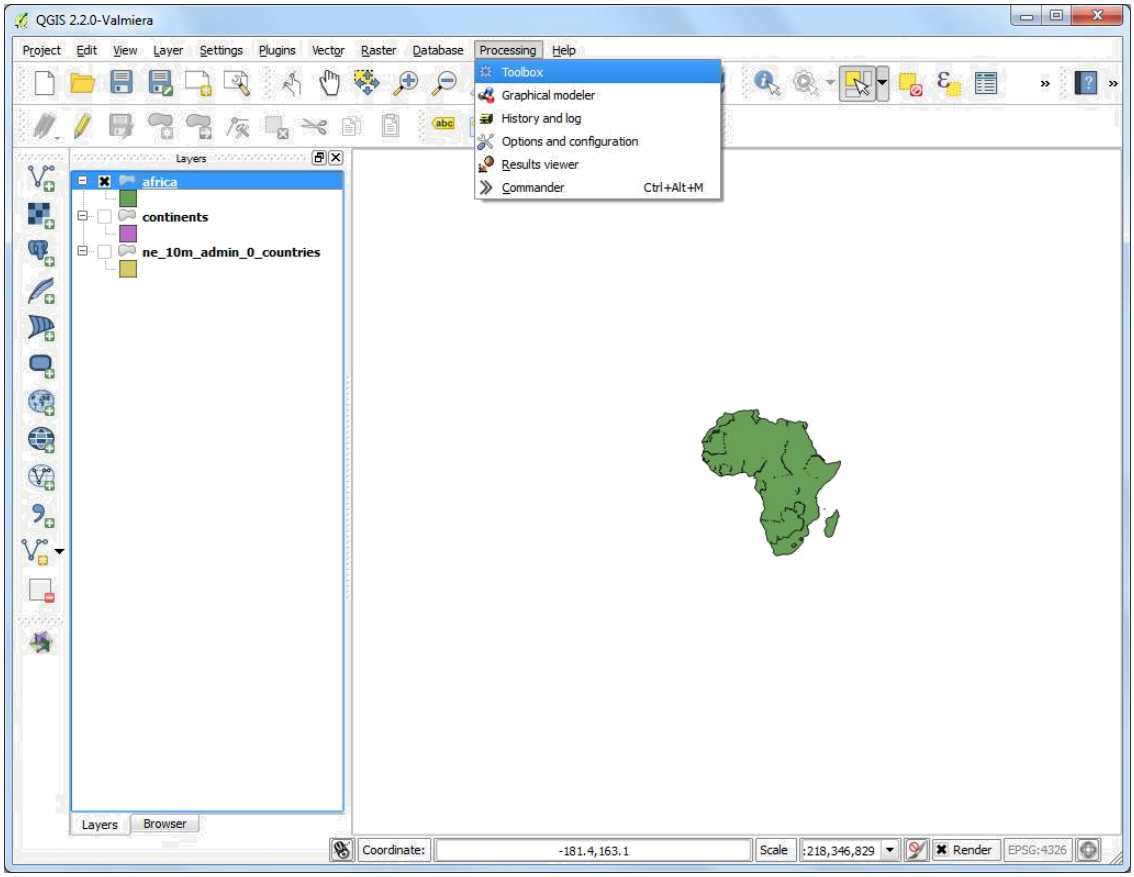
7. Right-click the continents layer and select Save Selection As....



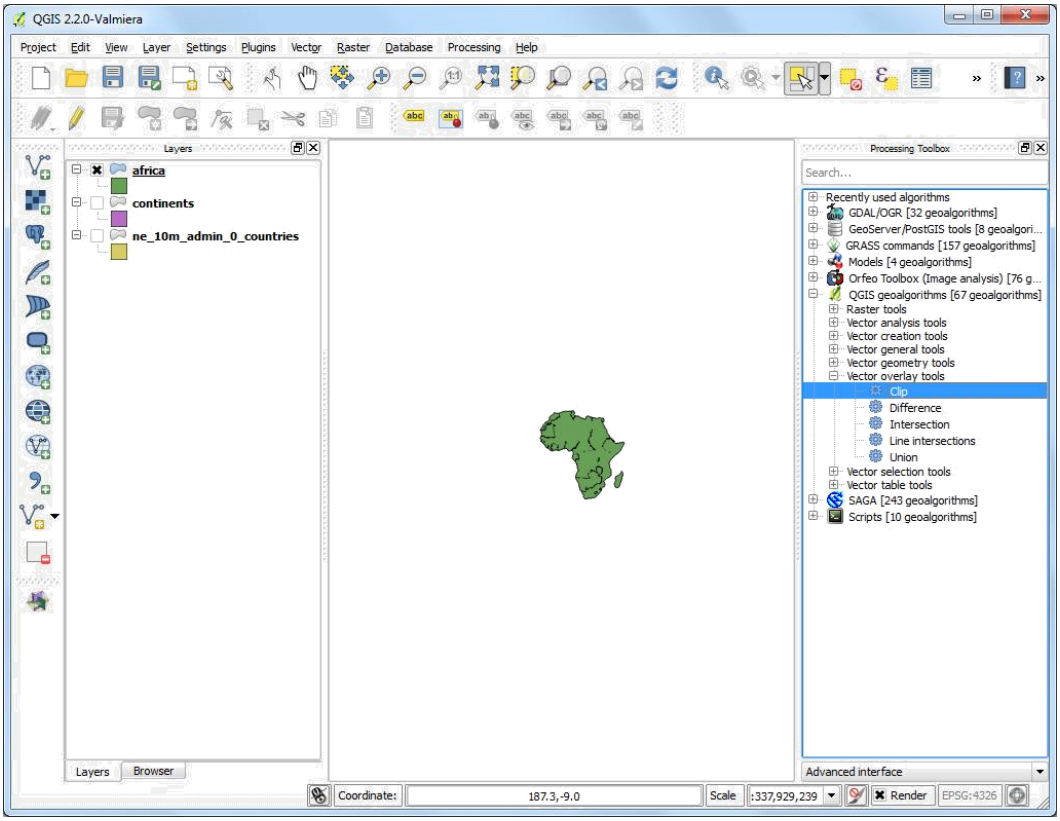
8. Name the output file as africa.shp. Since we are only interested in the shape of the continent and not any attributes, you may check the Skip attribute creation. Make sure the Add saved file to map box is checked and click OK.



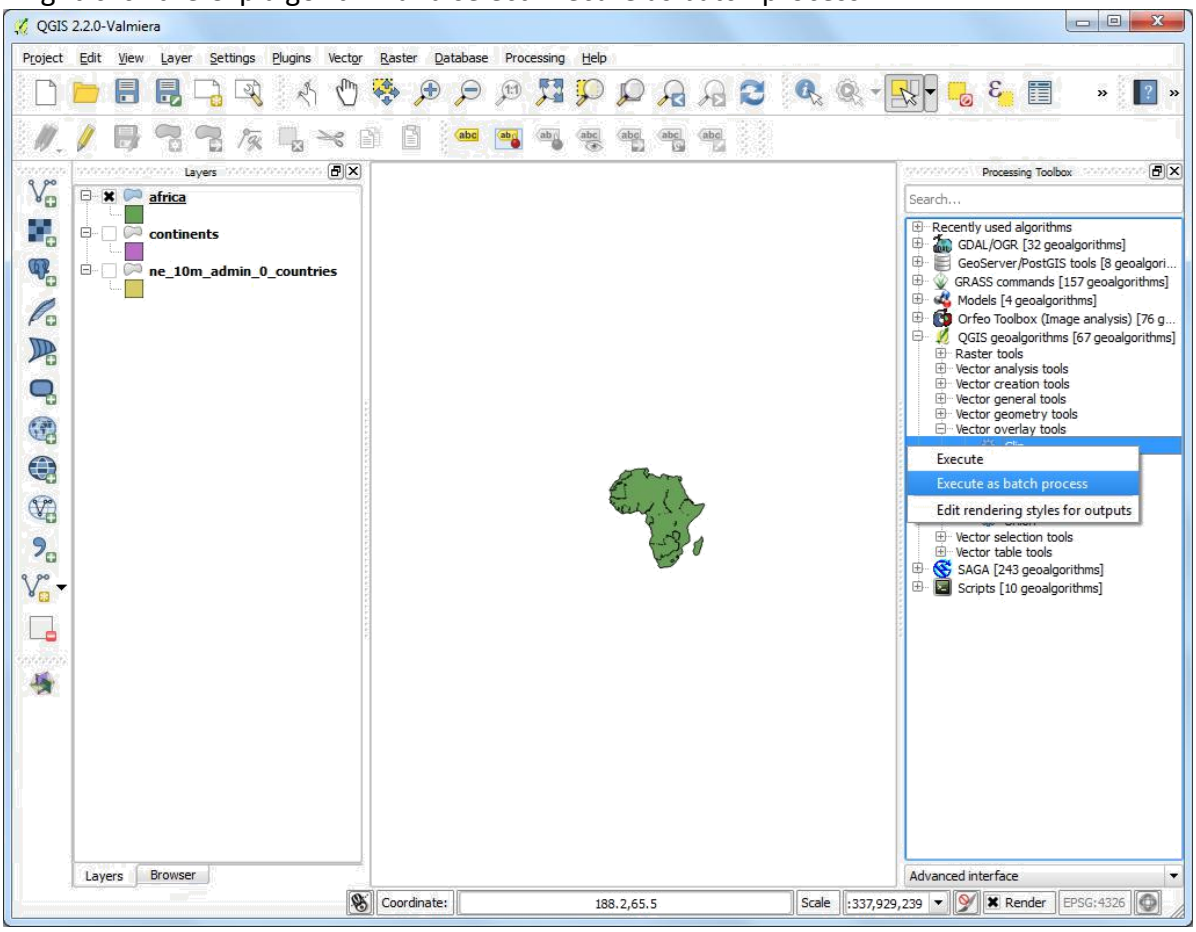
• Now you will have the africa layer loaded in QGIS containing a single polygon for the entire continent. Now, it's time to start our batch clip process. Open Processing ‣ Toolbox.



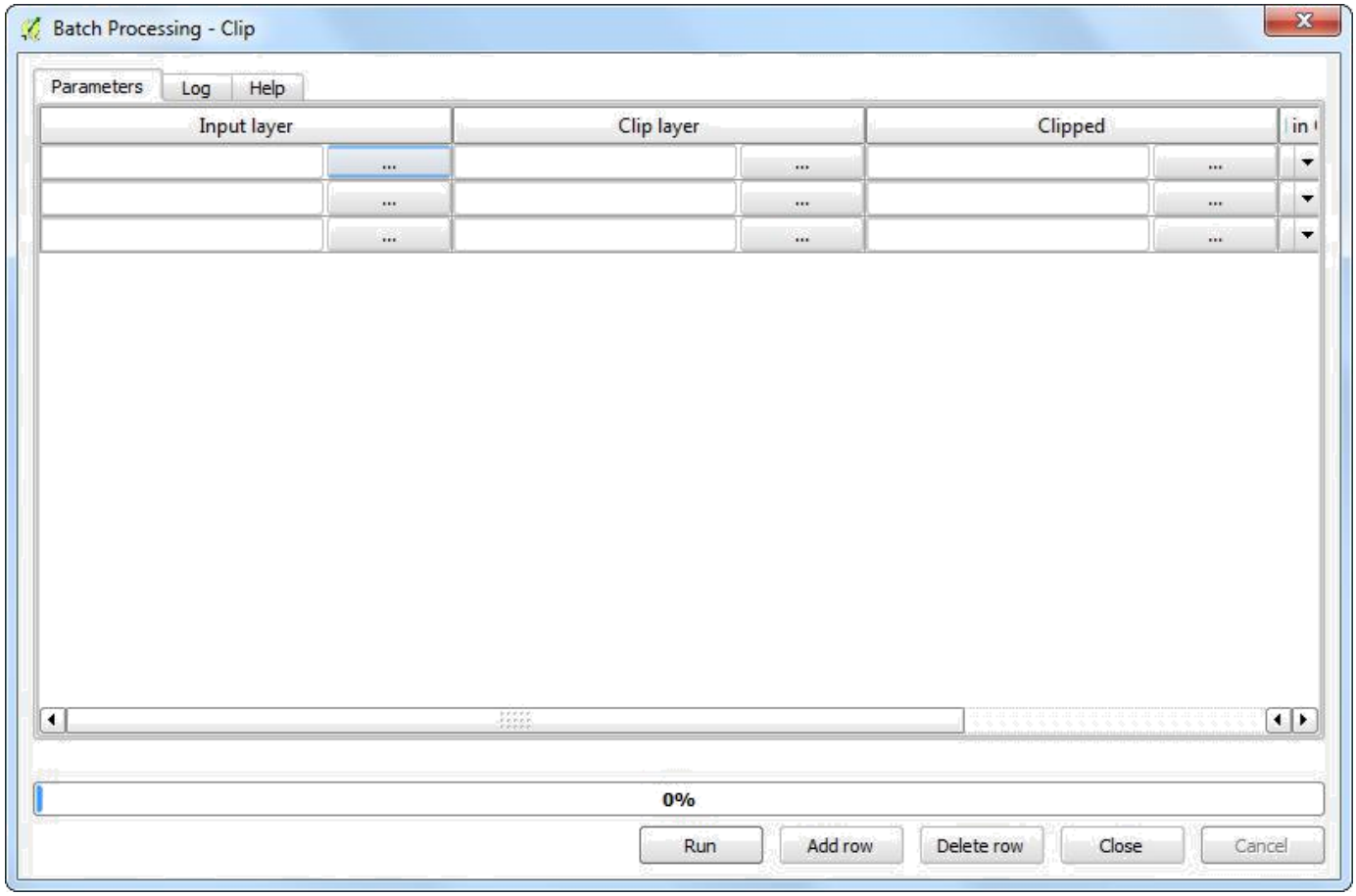
10. Browse all available algorithms and find the Clip tool from QGIS geoalgorithms ‣ Vector overlay tools ‣ Clip. You may also use the Search box to easily find the algorithm as well.



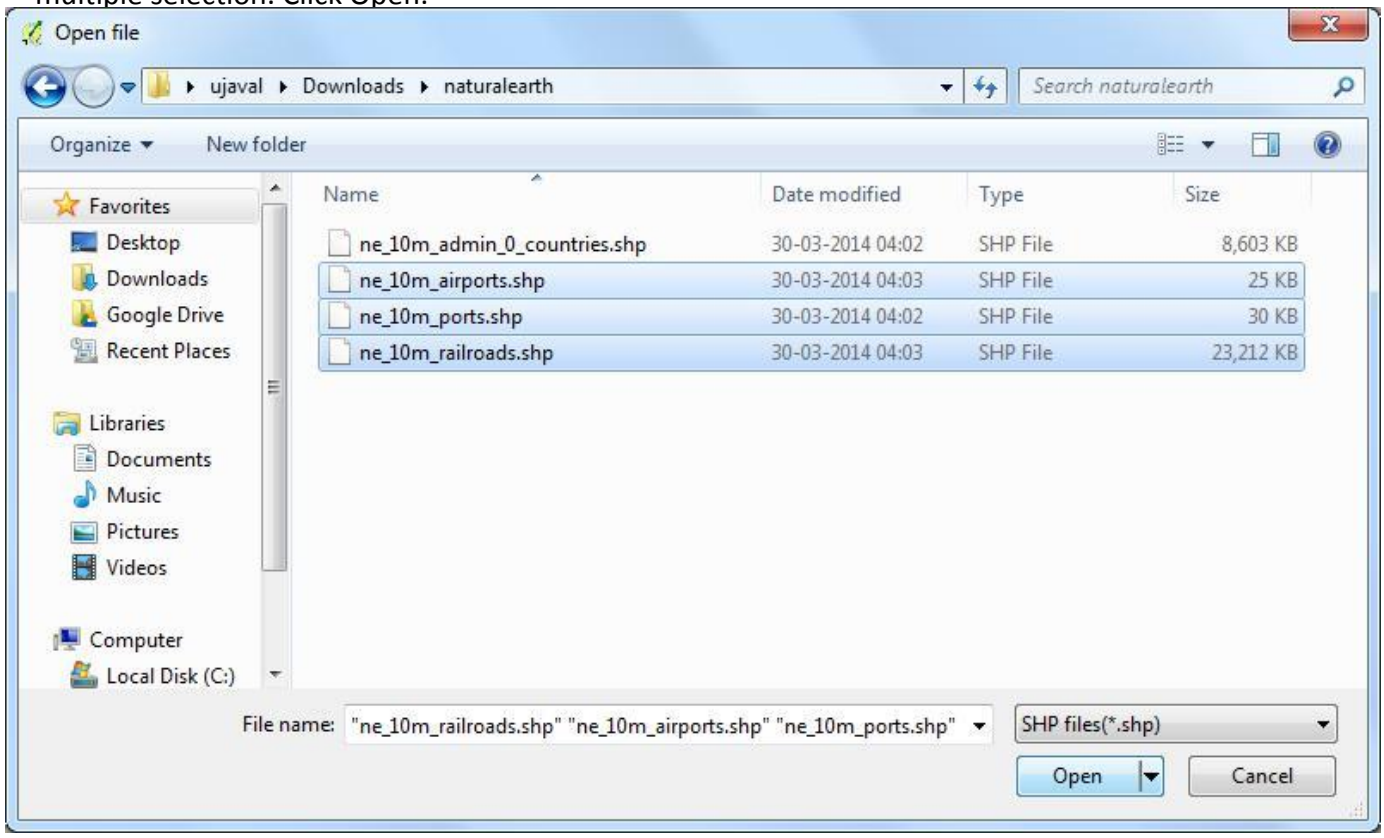
11. Right-click the Clip algorithm and select Execure as batch process.



12. In the Batch Processing dialog, the first tab is Parameters where we define out inputs. Click the ... next to the first row in the Input layer column.

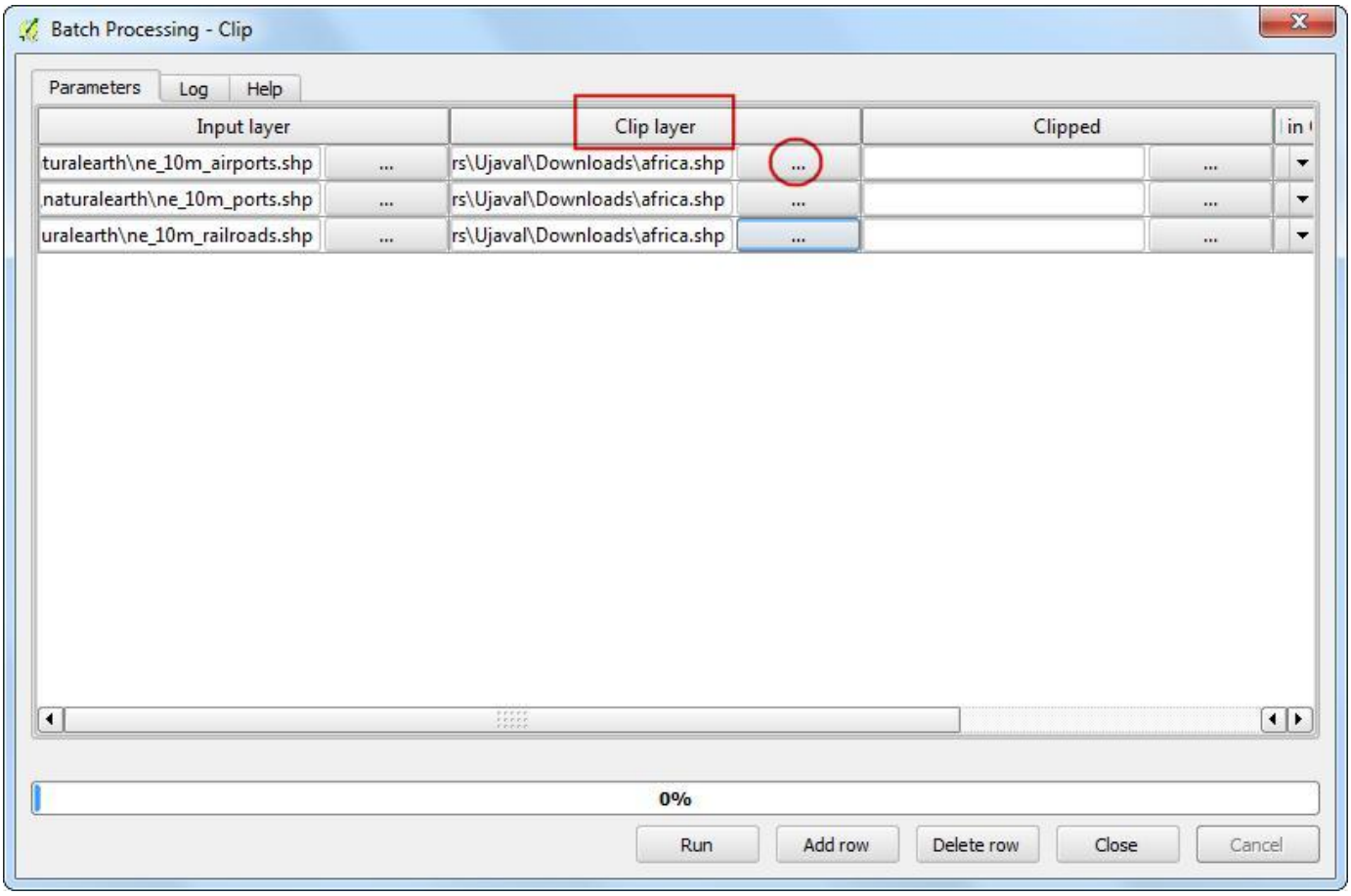


13. Browse to the directory containing the global transportation layers that you had downloaded. Hold the Ctrl key and select all the layers that you want to clip. You may also use Shift or Ctrl-A to make multiple selection. Click Open.

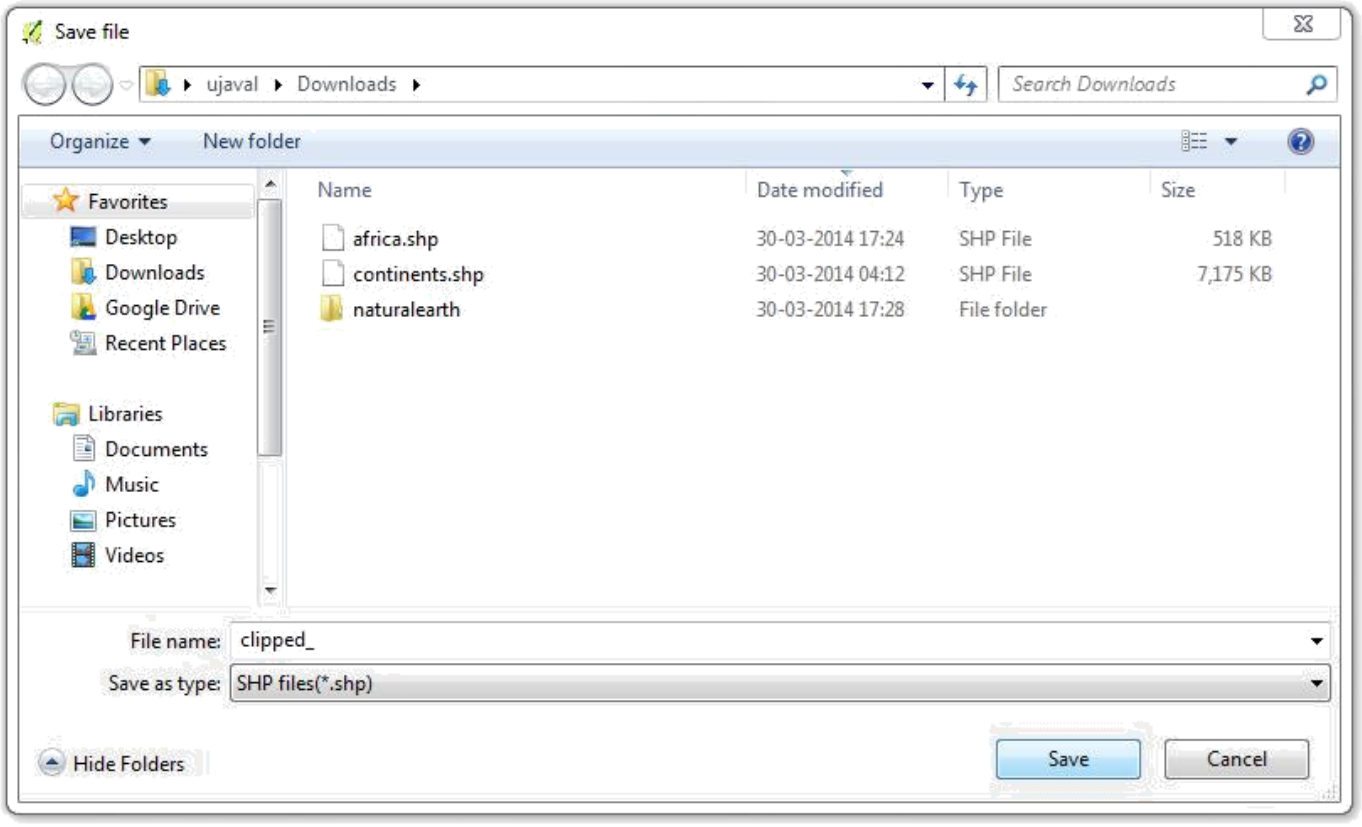


14. You will notice that the Input layer columns will be auto-populated with all layers you had selected. You may use Add row button to add more rows and define more inputs. Next, we need to select the layer containing the boundary to clip our input layers. Click the ... button for the first row and add the africa.shp Clip layer. Since the clip layer is the same for all our inputs, you can double-click the column header Clip layer and the same layer will be auto-filled for all the rows. Next, we need to define our outputs. Click the ...

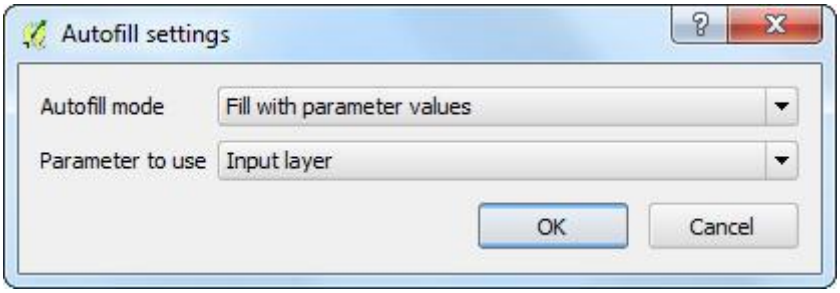
buton next to the first row in the Clipped column.



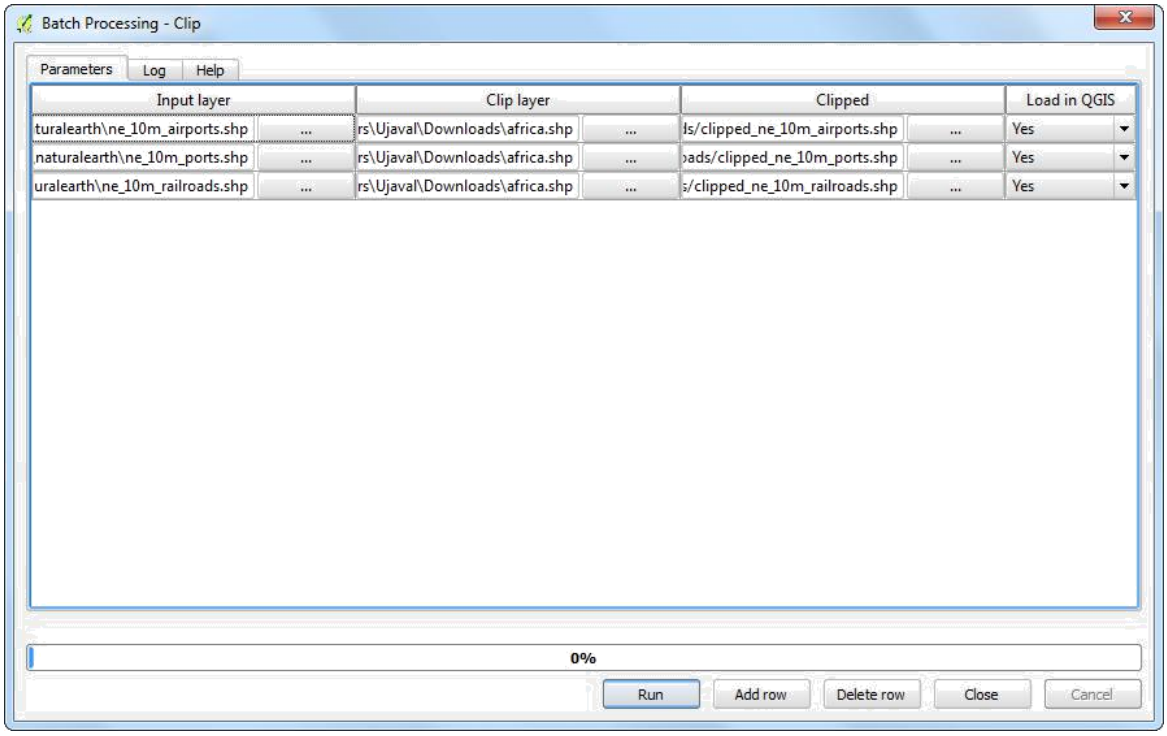
15. Browse the the directory where you want your output layers. Type the filename as clipped_ and click Save.



16. You will see a new Autofill settings dialog pop up. Select Fill with parameter values as the Autofill mode. Select Parameter to use as Input layer. This setting will add the input file name to the output along with the specified output_ filename. This is important to ensure all the output files have unique names and they do not overwrite each other.



17. Now we are ready to start the batch procesing. Click Run.



18. The clip algorithm will run for each of the inputs and create output files are we have specified. Once the batch process finishes, you will see the layers added to QGIS canvas. As you will notice, all the global layers are properly clipped to the continent boundary that we had specified.