Digitization of a Toposheet

Using Quantum GIS

Digitization of a Toposheet

Objective: To digitize (Vectorization) a toposheet using Quantum GIS.

Software: Quantum GIS 2.0.1-Dufour

Level: Beginner

Time required: 6-8 Hour

Prerequisites and Geospatial Skills:

1. Quantum GIS should be installed on the computer
2. Basic knowledge about the QGIS interface
3. Should have completed Exercise ID: *IGET_GIS_001* and *IGET_GIS_003*

Reading
1. Sutton, T., Dassau, O., & Sutton, M. (2009). A gentle introduction to GIS. *Chief Directorate: Spatial Planning & Information, Eastern Cape*.

Tutorial Data: Tutorial data can be downloaded from the link IGET_GIS_005.

Introduction

Digitization is the process of converting analog data into digital data sets. In GIS context digitization refers to creating vector datasets viz., point, line or polygon from raster datasets. It is a way of tracing/recording geographic features in vector format from georeferenced images or maps. With the help of digitization we can create different set of layers Viz. Rivers, roads, schools, ward boundaries and building blocks from a single map; this process is known as *Vectorization*. Vector data is easy to edit, update and is more accurate as compared to raster data. Vector data is more efficient for GIS analysis. Due to these reasons *Vectorization* is the first step in many GIS projects. However it is a time consuming process and needs a lot of attention to prevent introduction of errors in the datasets. Vector data is mainly of three types

- **Point:** It consists of single points having (X, Y) coordinates, for example lamp posts, bus stops and postbox positions etc.
- **Line:** It consists a series of (X, Y) coordinates in a sequence (from start node to end node with a number of vertices joining these two nodes). For example roads, power lines, ward boundaries and contours etc.
- **Polygon:** It is a series of (X, Y) coordinates in a sequence closing a figure where first and last points are the same. For example lakes, building blocks, village blocks, ward areas and forests etc.

In this exercise we will use the output of '*IGET_GIS_003: Georeferencing a Toposheet tutorial*' as our input.

 Open the raster layer of georeferenced toposheet of IGET_GIS_003 tutorial in the map canvas of Quantum GIS via, '*Main menu bar → Layer → Add Raster Layer*' or else directly click on icon from the toolbar → browse and select the georeferenced raster layer in tutorial data → Click on '*Open*' in the popup window.

Point Layer Creation

1. To create new point layer, go to main menu bar in QGIS interface and select '*Layer*' → '*New*' → '*New Shapefile Layer*'.
2. Now the '*New vector Layer*' window will popup. Select '*Type*' as '*Point*' as we are interested in creating a point layer.
3. Specify CRS same as original layer, i.e., as '*EPSG:4326 - WGS 84*'. To do this click on '*Specify CRS*' → Select the 'WGS 84' under Coordinate reference system of the world → Click on '*OK*'

4. We can add new required attribute fields to the vector layer that we have created. For example if we are creating point vector layer of all hospitals we can add '*Name*' of the hospital as new field and '*intake capacity*', '*Address*' etc. as other fields.
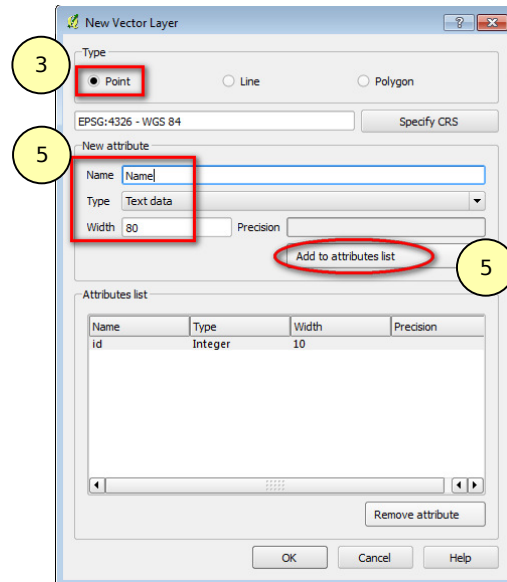

5. For Each New attribute added, an appropriate name, type of the variable (like text, whole number, decimal number and date) and width must be selected. Click on '**Add to attribute List**' and the attribute will be added to the list. Now add the attributes details shown in the below figure.
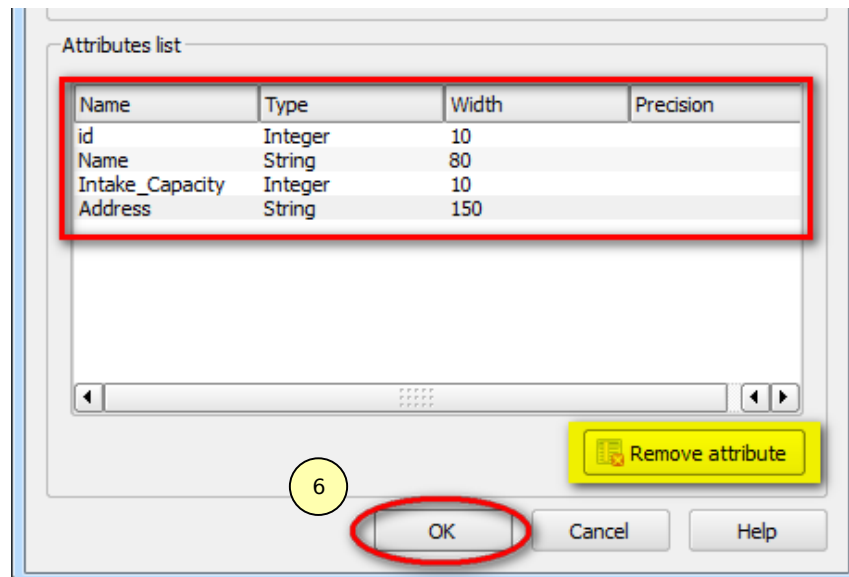
Note: If you want to remove the added attribute from the list, select the attribute you want to delete and click on '**Remove attribute'** in 'N*ew Vector Layer*' window.

6. Once the required attributes are added, click on '***OK***'.

7. Now you will be presented with '***Save As'*** window, save the file in appropriate drive with appropriate name for example: *Hospitals_Pune.shp.* Once the layer is saved it opens up as point data layer under map legend.

8. To start digitization, we have to enable the editing mode of the corresponding vector layer. Right click on '*Hospital_Pune.shp*' point layer and click on *'**Toggle Editing**'* or select the layer and click on ✏️ icon from 'Digitizing[1]' toolbar.
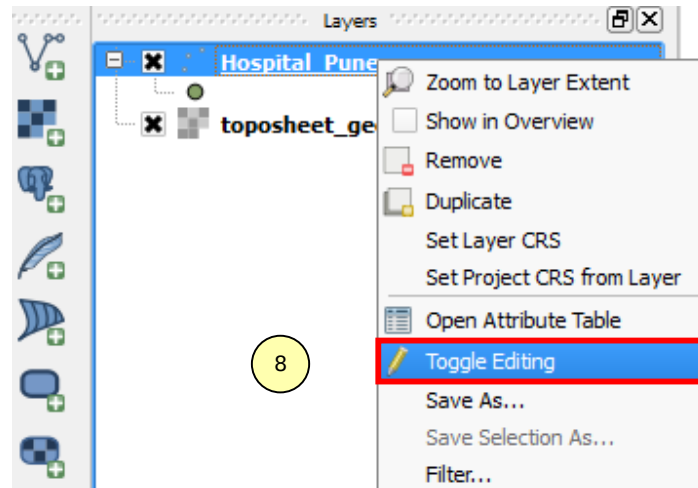
9. You will notice a pencil symbol on left side of the layer name. This tells you that the layer is ready for editing.


10. Zoom into the toposheet where hospitals are present, the symbol of hospital in the given toposheet is ✚. Click on Add feature icon ⊞ from digitizing toolbar.

11. Place the pointer at the center of the feature of interest and click.

12. You will be presented with an '*Attributes*' window. Fill the required attribute information like '*id'*, '*Name'* and '*Intake_Cap'* (Intake Capacity), '*Address'*. Click '***OK***'.

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[1] If Digitizing tool bar not present in your QGIS window, Right click on main menu bar area and check the 'Digitizing'
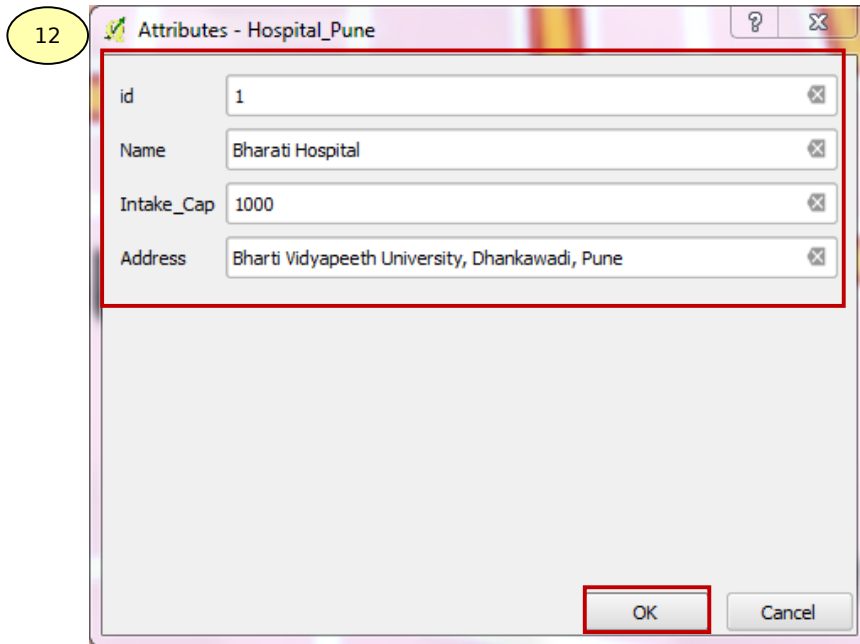
13. The point will be created with the specified attributes at the specified location. Now open the attribute table of 'Hospital_Pune.shp' by right clicking on the hospital layer and selecting '**Open Attribute Table'**. If you want to change any details, then simply select the attribute by double click and edit it. For example change the intake capacity of Bharati Hospital from 1000 to 1200.
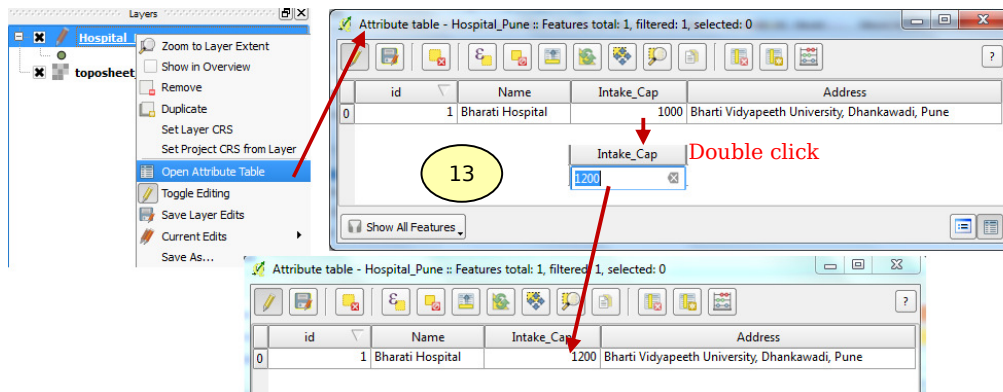
14. Similarly digitize the other hospitals in the toposheet. Click on '**Save Layer Edits**' icon in '*Digitizing*' tool bar, to save the edits. After saving click once again on the toggle button to stop editing. This will save the point layer along with its attributes.
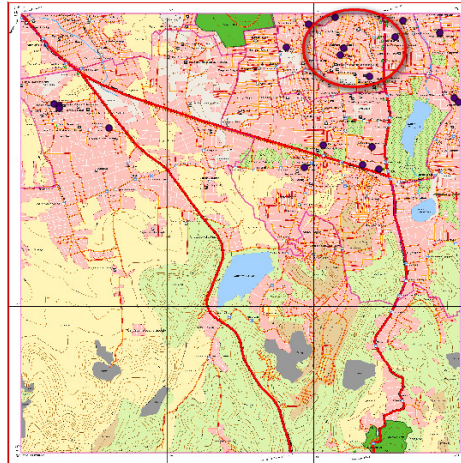
15. Go to attribute table of '*Hospital_pune.shp*' to check if the attributes are added properly or not. If not properly added, edit them as described in step 13.

Line Layer creation:

Line is basically used to represent any linear network such as road, railways and drainage etc.

16. To create line layer, go to '*Layer*' → '*New*' → '*New Shapefile Layer*'. The '*New vector Layer*' window will open up. Select '***Type*' as '*Line*'** as we are interested in creating Line layer of roads and Specify CRS as '*EPSG: 4326 – WGS 84*'.
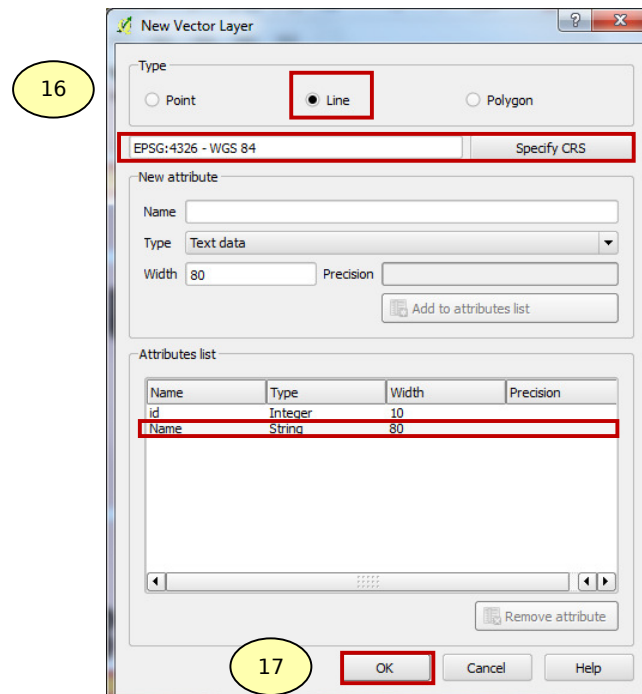
17. Add required attributes, for example '***Name***' as shown in above figure and click '***OK***'. '*Save As*' window will open up. Browse to an appropriate location and give an appropriate name for example '*Roads_Pune*' → click on '***Save***'.

18. The layer is created and will be listed in Map legend. Right click on layer, click on '***Toggle Editing***' or click on ![pencil icon] icon from '*Digitizing*' toolbar.

19. Zoom into the toposheet where roads are seen. Click on '*Add feature*' icon ![add feature icon] from '*Digitizing*' toolbar.

20. Now trace cursor along the middle of the road by using left mouse button to insert vertices when you think the road changes its profile, this means you have to insert more vertices while digitizing bends to get smooth curve. When you reach a junction or at the end of the road click on the right mouse button to stop. Now '*Attributes*' window will open, fill in the appropriate attributes for example Name is '*Pune-Satara Road*' and click '***OK***'.
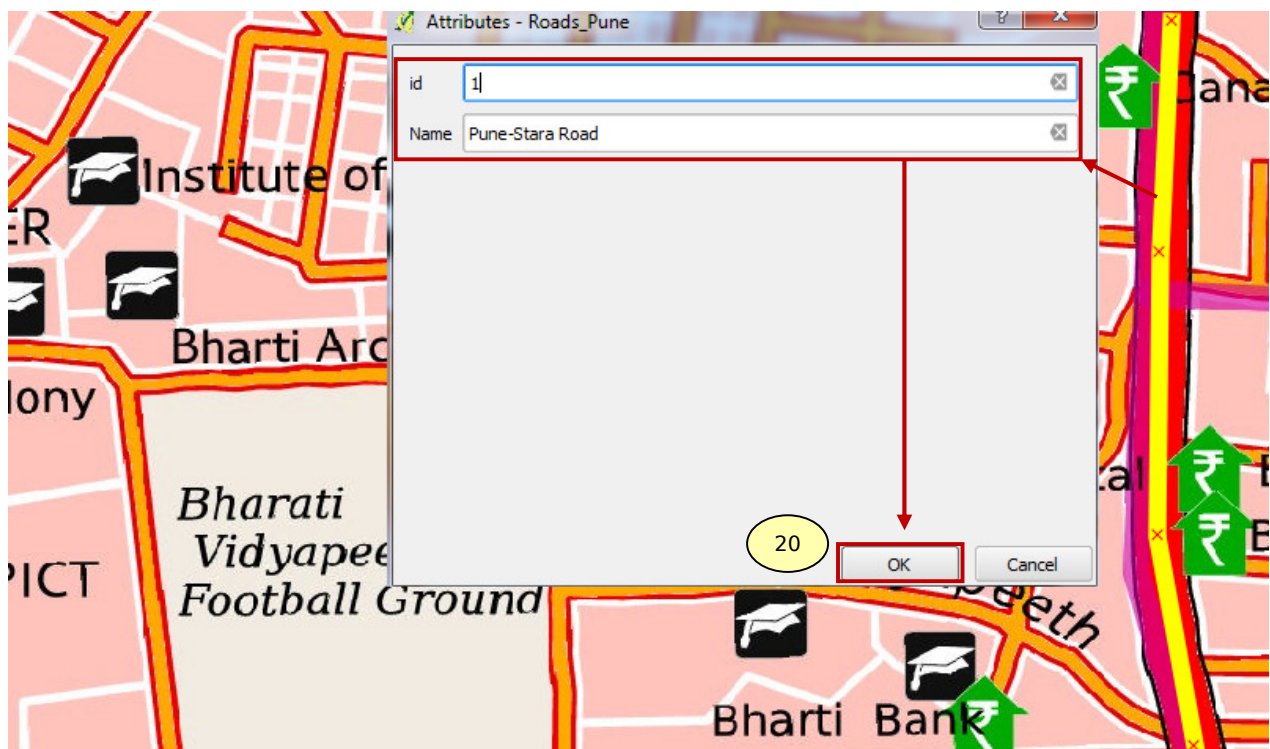

Note: Once you are done with digitizing one road, try and digitize the road network by using the snapping the tool which is very effective and reduces errors like Overshoot and Undershoot. It helps to find out location of one feature in relation to other feature

21. Snapping tolerance can be set manually. Go to '***Settings***' → '***snapping Options***'
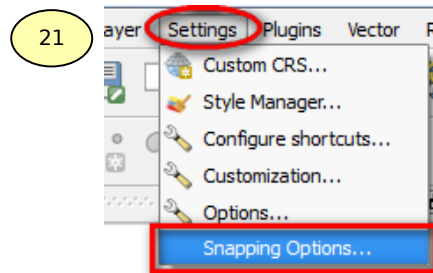
22. Check the box to the left side of road network layer and set '***Mode***' to '***vertex and segment***'. Specify tolerance as '***5***' pixels. Check on '***Enable topological editing***'. And click '***OK***'
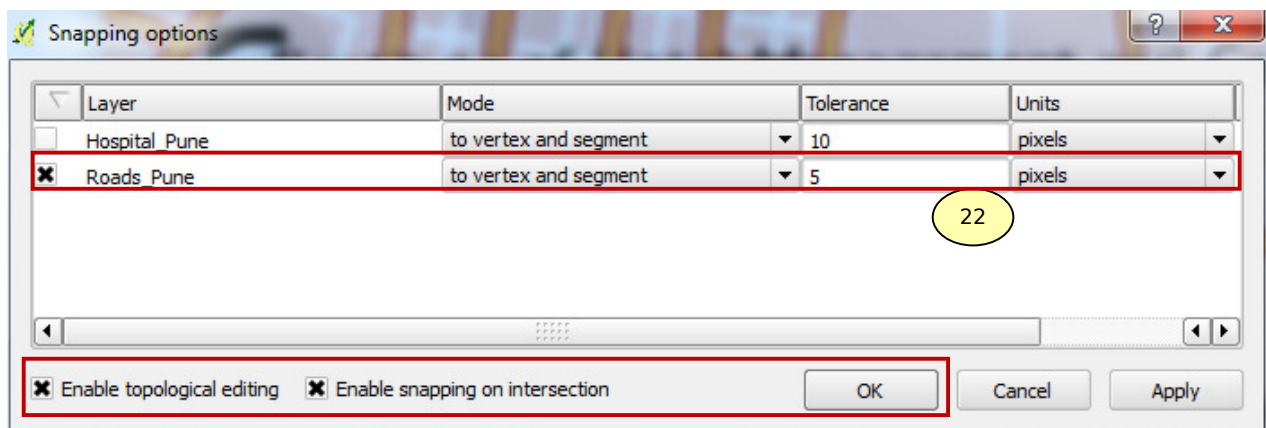
Note: Figure below shows the use of snapping feature. When a pointer is brought near to the neighboring feature within the tolerance limit the pointer tries to snap to the neighboring feature.

The green cross in the figure shows the snapping tool functionality.
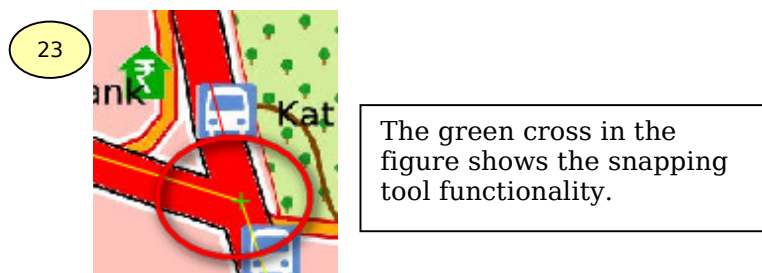
23. So by use of the snapping tool it is possible to get an accurate intersection of roads. Once you finish digitizing all roads in the toposheet save the edits and stop editing by clicking on '***Toggle editing***' button. Now the road network along with its attributes will be saved.

Polygon Layer creation:

Polygon is basically used to demarcate areas such as administrative parcels, forests, buildup areas and water bodies etc.

24. To create Polygon layer, go to '*Layer*' → '*New*' → '*New Shapefile Layer*'. The '*New vector Layer*' window will open up. Select '***Type*'** as '***Polygon*'** and Specify CRS as '*EPSG: 4326 – WGS 84*'.
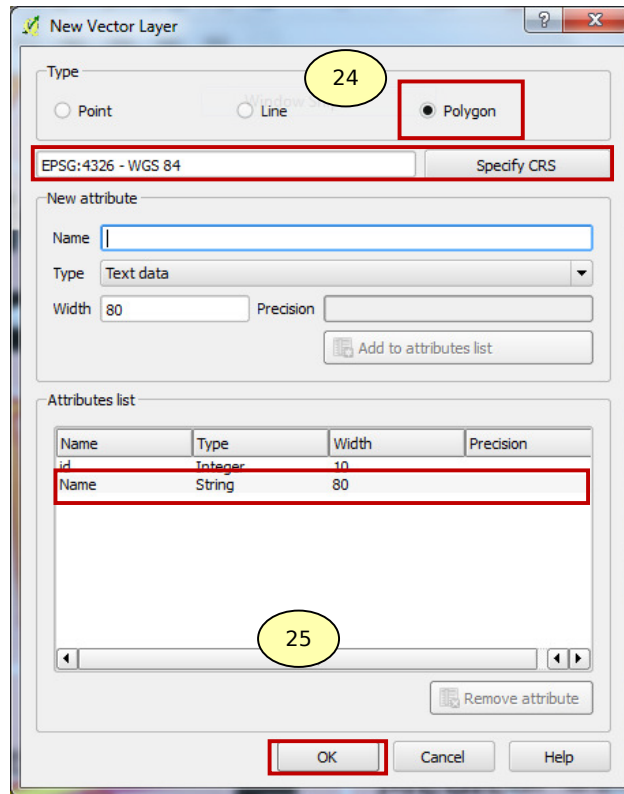
25. Add required attributes for example '*Name*' and click '***OK***'. '*Save As*' window will open up, save the file at appropriate location, for example 'ReservedForest.shp'.

26. The layer will be created and listed under *Map Legend*. Right click on layer → click on '***Toggle Editing***'.

27. Zoom into the toposheet where Reserve forests (RF) are located. Click on '*Add feature*' icon from digitizing toolbar.

28. Make sure that the snapping option for RF layer and also other required layers consisting of the features that are following RF boundary is also enabled.

29. Start digitizing the reserve forest polygons by using left mouse button to insert vertices and right mouse button to finish. Once you finish digitizing all reserve forest areas, save edits and de-select the '***Toggle editing***' button.
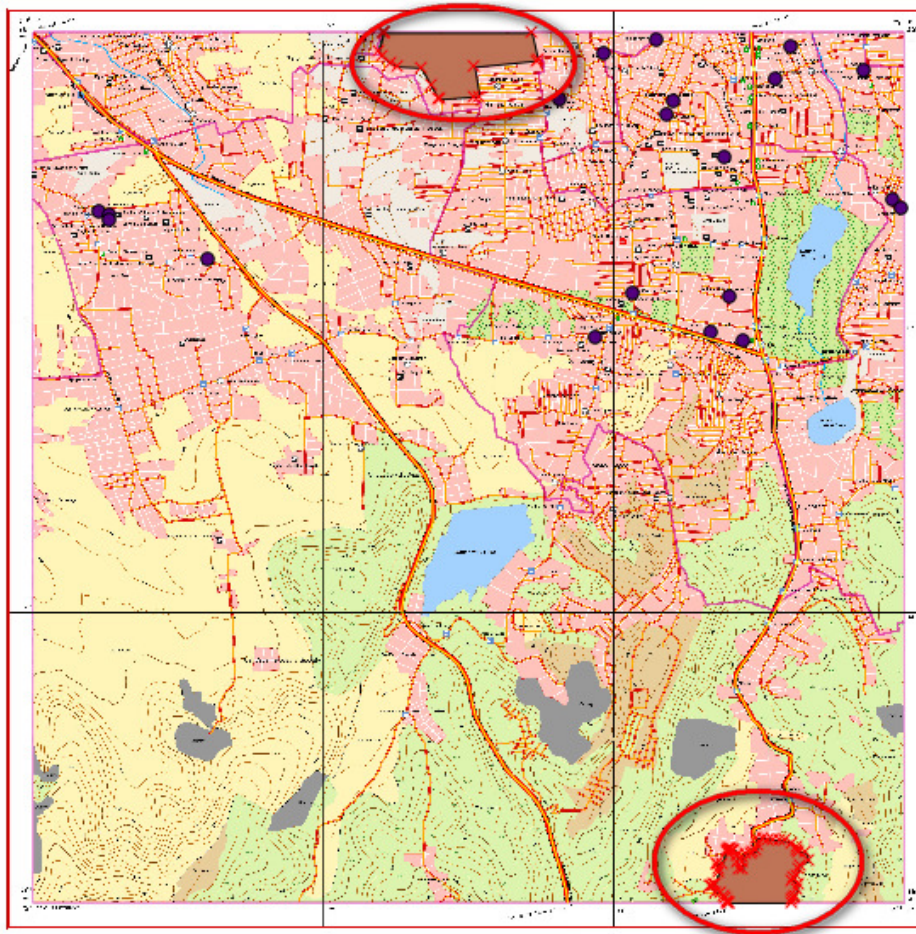
30. Now digitize the other features to prepare a Map. The Toposheet given to you in the supplied data set was prepared by using QGIS. You have to digitize all the vector feature layers in this tutorial to create a map in *cartography* tutorial.