EXERCISE 21 DATA QUERY - II

Structure

21.1 INTRODUCTION

You practised performing simple attribute queries and complex attribute queries in the last data query exercise. Let us now learn how to do spatial queries in this exercise. The method of extracting a data subset from a map layer by working directly with the map features is known as spatial query. Data are kept in attribute tables and feature/spatial tables in a spatial database.

This exercise introduces you to the claim or logical argument that chooses geographic features according to their position or spatial relationship. For instance, you may be interested in looking for the points that are contained within a polygon or collection of polygons, features that are close to one another, or features that are within a certain distance of another feature.

Expected Learning Skills

After working through this exercise, you should be able to:

- execute spatial query.

21.2 REQUIREMENTS

To carry out this exercise, you need to have the following:

- a computer with QGIS installed in it, and
- internet connection for downloading data to be used for this exercise.

21.3 IMPORTANCE OF QUERY

The importance of spatial queries lies in their ability to extract relevant information from spatial databases, analyse spatial relationships, and support decision-making processes.By querying spatial data, we can identify patterns, trends, and correlations related to specific locations. This information is valuable in fields such as urban planning, environmental management, transportation, logistics, and retail site selection.Spatial queries provide valuable insights that support decision-making processes. We can obtain information on the distribution of resources, identify areas of high or low demand, evaluate the impact of a proposed project on the surrounding environment, and assess risks associated with specific locations.

Spatial queries enable the evaluation of spatial relationships between different geographic features. These relationships include distance, containment (e.g., whether a point lies within a polygon), adjacency (e.g., whether two polygons share a common boundary), and intersection

(e.g., identifying areas where two or more polygons overlap). Understanding these relationships is vital for tasks like land use planning, utility network analysis, and market analysis.

21.4 STEPS FOR SPATIAL QUERY

Spatial query is performed to select features in a target layer with reference to another layer. In QGIS, ***Spatial Query*** is a plugin. The functionality is based on the GEOS library and depends on the selected source feature layer. Possible operators are: *Contains*, *Equals*, *Overlap*, *Crosses*, *Intersects*, *Is disjoint*, *Touches* and *Within*.

21.4.2 DOWNLOADING DATA FROM BHUKOSH AND VISUALISING IT IN QGIS

Survey of India, under the Department of Science and technology, Government of India has been engaged in production and maintenance of various types of Topographical, Geographical and many other public series maps on various scales covering India. The Survey of India (SOI), Dehradun supplies topographic products (on both hardcopy and digital form) to its users at 1:25,000; 1:50,000 and 1:250,000 scales. One needs to register into the data portal to access the map. Fill up the required details correctly as applicable to you for verification. Read the terms and Conditions thoroughly to agree upon.

1. Download India Administrative boundary from the following link **https://onlinemaps.surveyofindia.gov.in/Digital_Product_Show.aspx/**. Select the Administrative Boundary Database Product Code: OVSF/1M/6 shown in fig.21.1 and click on Add to Cart. Go to View Cart and Place the order. Continue to proceed for download then request to download which will take you to generate download link and finally download. The map will be downloaded in zip archive, extract the shapefiles and save it on the hard disk.

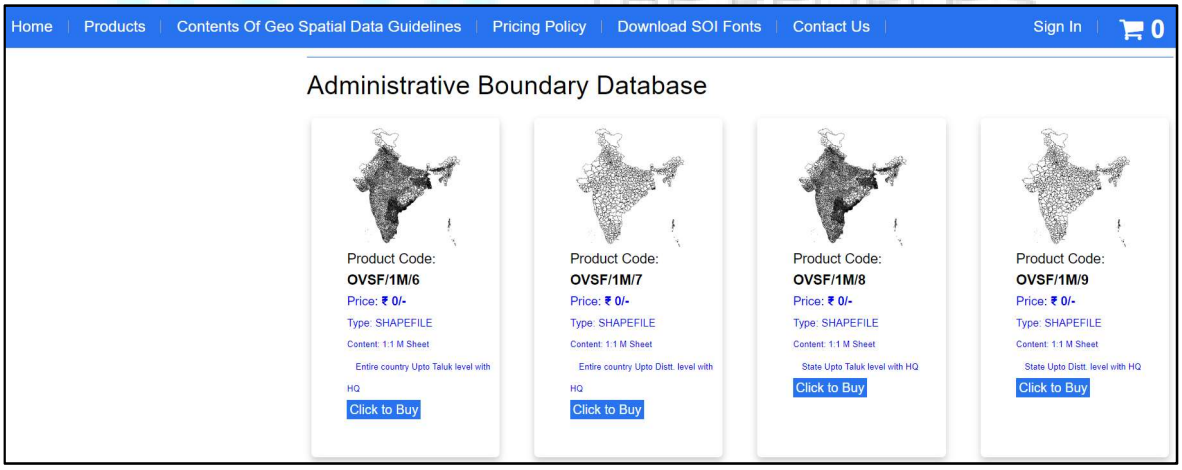

Fig. 21.1: Administrative Boundary Database maps from Survey of India.

Geological Survey of India (GSI) is one of the oldest survey organisations in the world and a premier organisation of Earth science studies. It is custodian of geoscientific database developed over 150 years. The main products of GSI constitute different memoirs, records, journals, bulletins, different thematic maps and atlases, and geological mapping on 1:50,000 scale for entire India. Reconnaitary survey covers 97% of Exclusive Economic Zone (2.02 million sq.km) (www.gsi.gov.in/page2.htm). Airborne geophysical survey covers 2.07 million sq.km in geologically critical areas at 1: 25,000 scale mapping. Bhukosh is a gateway to all geoscientific data of Geological Survey of India. There are variety of vector data at different

scale is available at **http://bhukosh.gsi.gov.in/Bhukosh/Public/**. Users have to register with their details as per the requirements to get access to the maps.

2. Download Railway from Bhukosh by signing in to their portal. Go to Unified Browser icon on the right side of the screen.
3. Select the Maps (WMS) from Services folder which will show list of data available.
4. Select the India_Basemap from the list (Fig. 21.2). A new dialog box will appear showing the unified results of the India_Basemap.

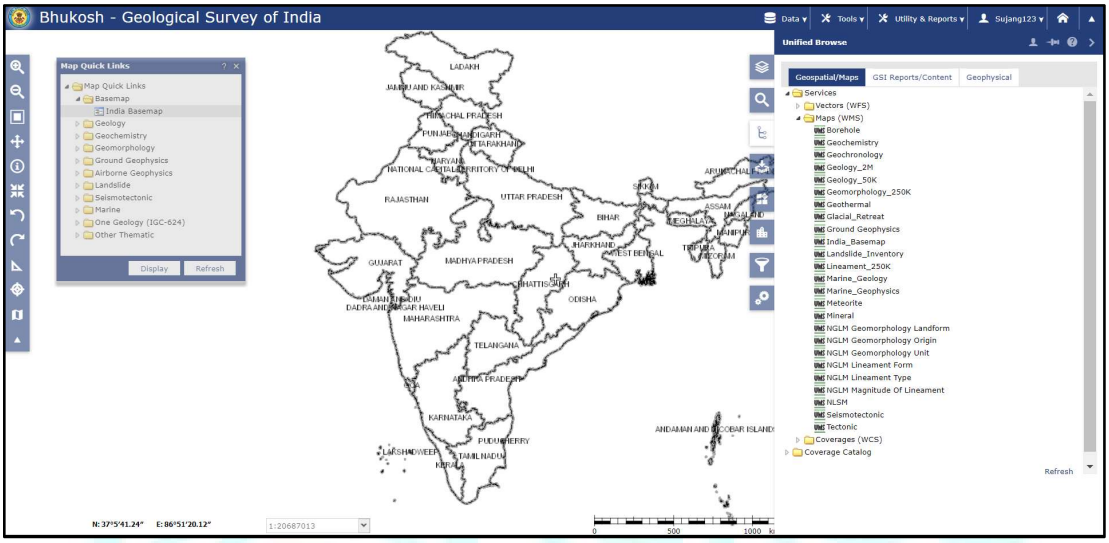

Fig. 21.2: List of Maps available in GSI Bhukosh portal.

5. Click on Add to Download icon of the road and railway. These two maps will be added in the Geospatial/Maps Data Download Cart.
6. In the Output Area Boundary Box of Output Setting under GSI Reports/Content Data Download Cart. Select the State as Rajasthan. Click on Validate and select Item inside Output Area Boundary Box (Fig. 21.3).

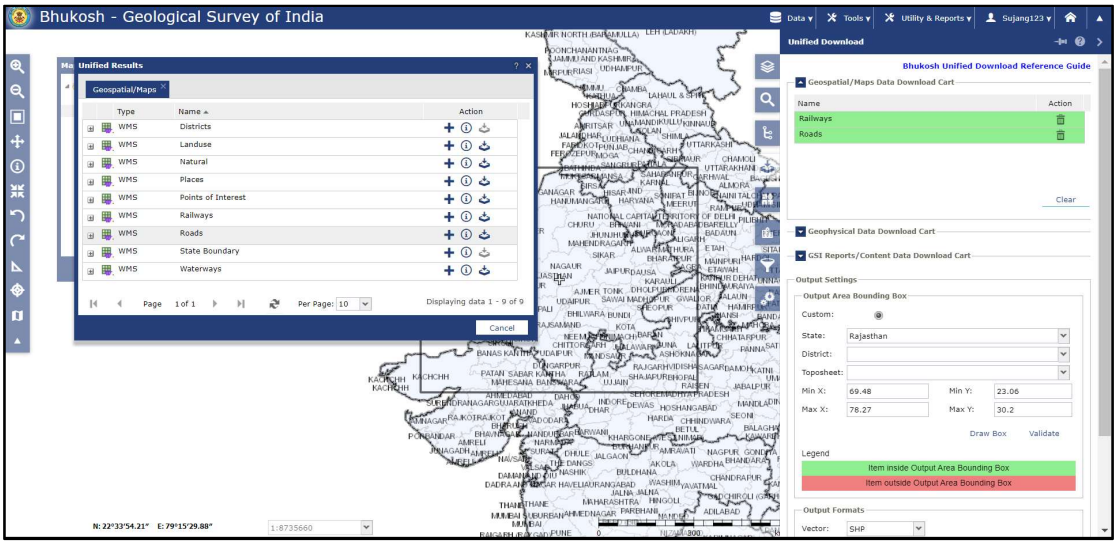

Fig. 21.3: Bhukosh Unified Download Reference Guide.

7. Click on Click to see the Terms and Conditions and carefully read all the terms and conditions to agree. Upon selecting to download, a unified download notification will

appear stating that the download link will be sent to the registered email id which will be valid for the next 7 days. The maps will be downloaded in zip archive, extract the shapefiles and save it on the hard disk.

8. Open ***State Boundary*** shape file from Administrative Boundary Database and ***Railway*** shape files in QGIS which appear as in Fig. 21.4.

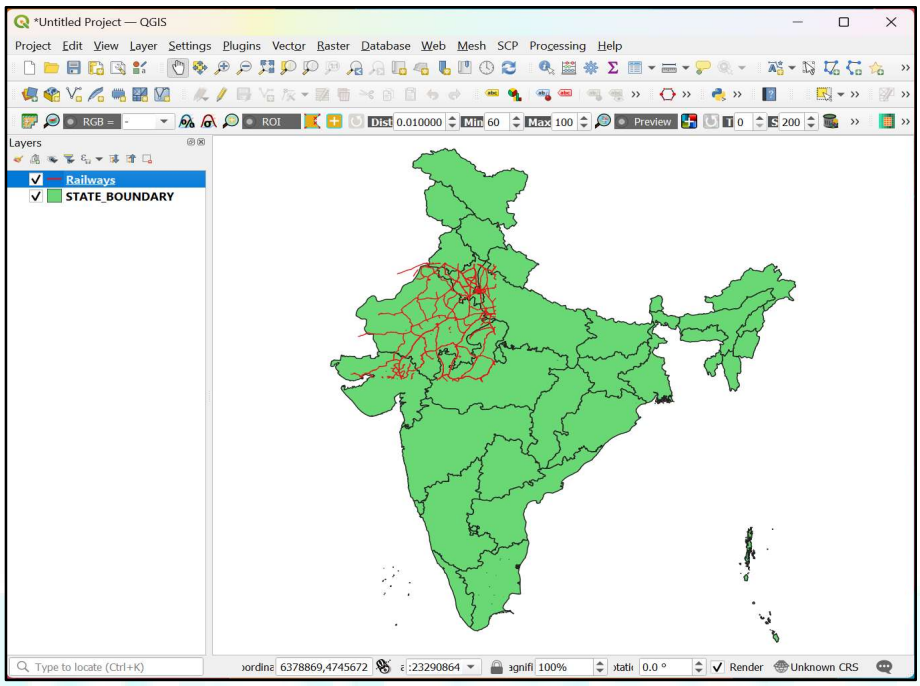

Fig. 21.4: State boundaries and railway as displayed in QGIS.

9. Select ***Rajasthan*** from State Boundary shape file, as explained in simple attribute query in the previous query exercise.
10. Click on *Select by Location* menu item from *Research Tools* submenu in ***Vector*** menu. The *Select by Location* dialogue box opens as in the Fig. 21.5.

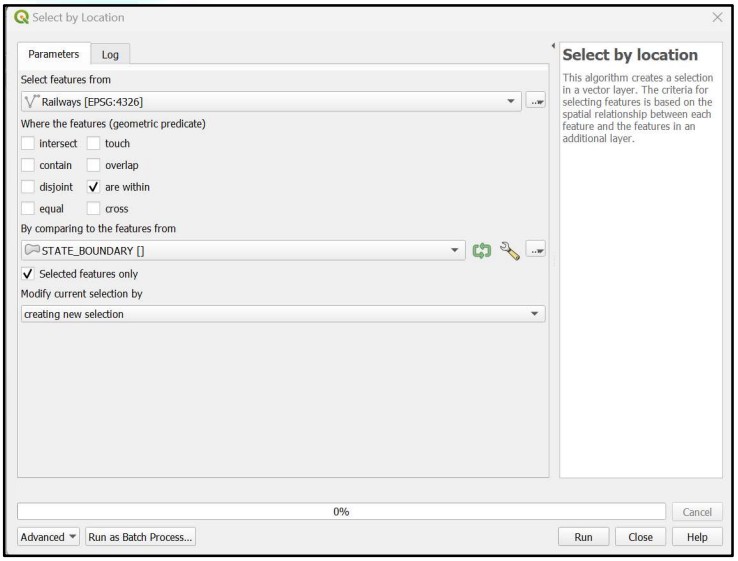

Fig. 21.5: Select by Location dialog box.

11. Select features from to be the *Railways* layer, where the features *are Within*, by comparing to the features from *State Boundary*. Check the selected features only and create a new selection result. Click on *Run* button which appears as shown in Fig. 21.5.

12. The results are displayed as shown in Fig. 21.6.

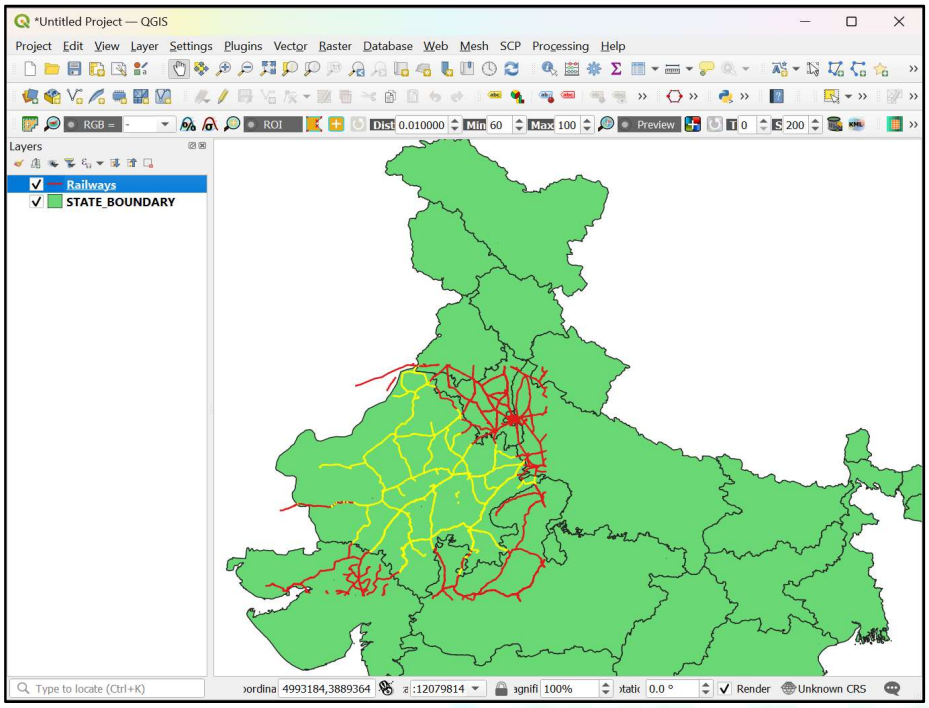

Fig. 21.6: Map showing results of spatial query

13. To change the railway symbol, right click on the Railways layer and select *properties*. Click on *Symbology* tab and under Filter Symbols choose All Symbols and search for ***toporailway***. Change, then click on Apply and Ok.

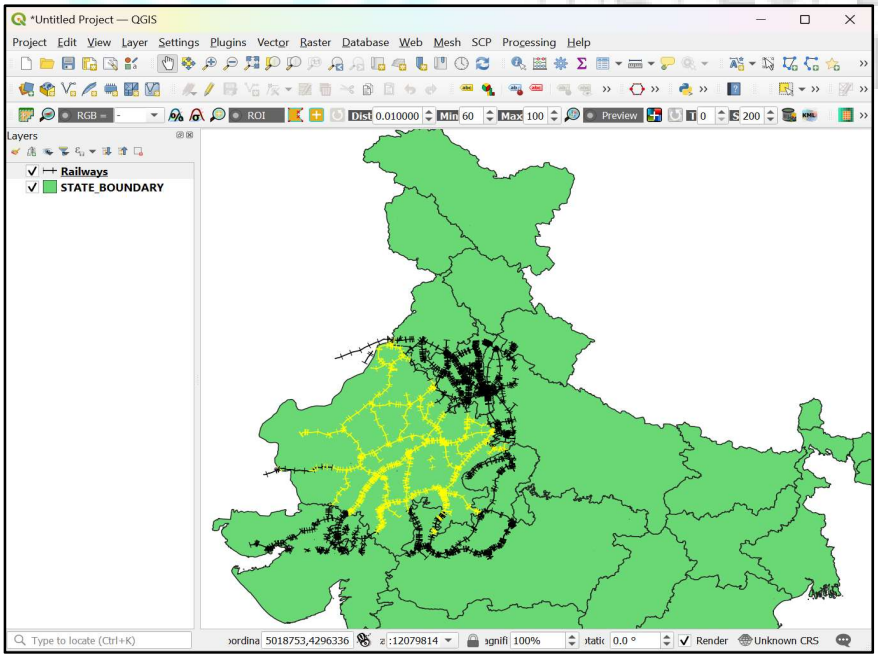

Fig. 21.7: Map showing results of spatial query with change in symbol

14. Close all the windows after completing this exercise.

21.4.2 CREATING BUFFERS

1. Download shape file showing roads of the Rajasthan from GSI Bhukosh as done in previous steps. Extract the shape file from the zip archive and save it on the hard disk.
2. Open ***Road layer*** from Bhukosh and ***Major Towns layer*** and ***State Boundary layer***from Administrative Boundary Database on QGIS.
3. Clip road and major town layers to features within Delhi. Select ***Delhi*** from State Boundary shape file, as explained in the simple attribute query.
4. Select ***Cip*** from ***Geoprocessing Tools*** sub menu item of ***Vector*** menu.Select road and major town as input layer one after the other and overlay it by State Boundary later. Check the *Selected features only* and click on **Run**.
5. Right click on Roads layer and select properties. Under *Symbology* tab, select *categories* and in value list select **TYPE**. Click on *Classify*, uncheck the symbol except for Primary, Secondary and Tertiary Road. Click on Apply and OK (Fig. 21.8). Select ***Secondary*** road type from Roads shape file, as explained in the simple attribute query.

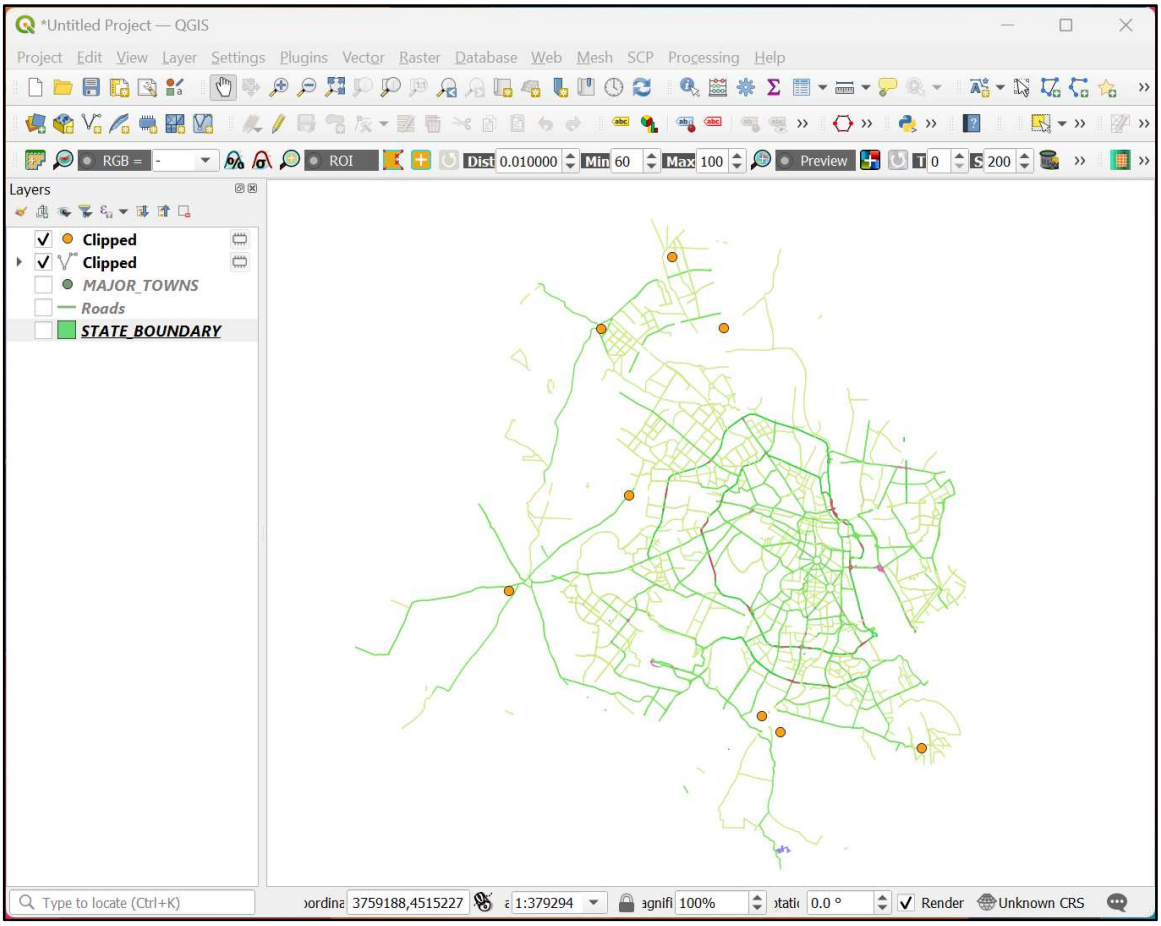

Fig. 21.8: Cipped Road (Primary, Secondary and Tertiary road) and Major Twons of Delhi.

6. Select ***Buffer*** from ***Geoprocessing Tools*** sub menu item of ***Vector*** menu. This opens buffer dialog box which appears as in Fig. 21.9.

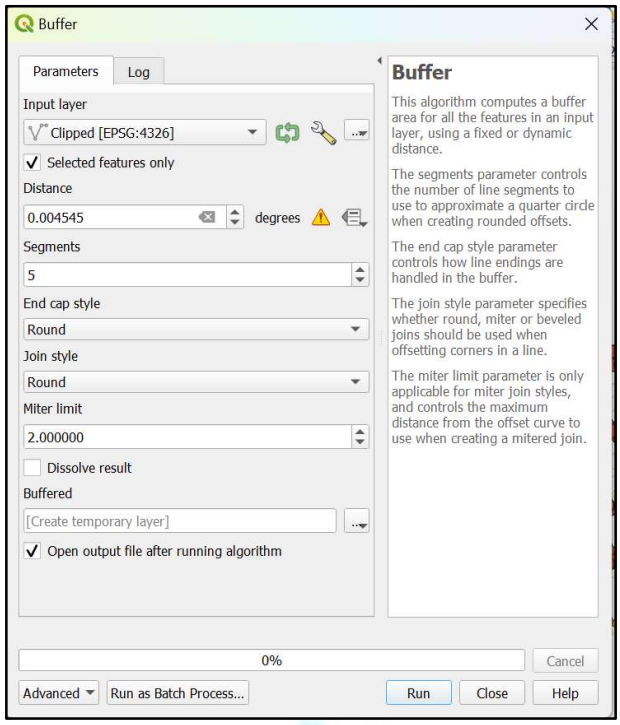

Fig. 21.9: Buffer dialog box.

7. Select *Clipped* roadsas input layer, buffer distance to be 500 m (for converting to 500 m, while using lat/long projection system, divide approximately by 110, i.e., 0.5/110=0.004545).
8. Define an output shape file and click *OK* which appears as in Fig. 21.10.

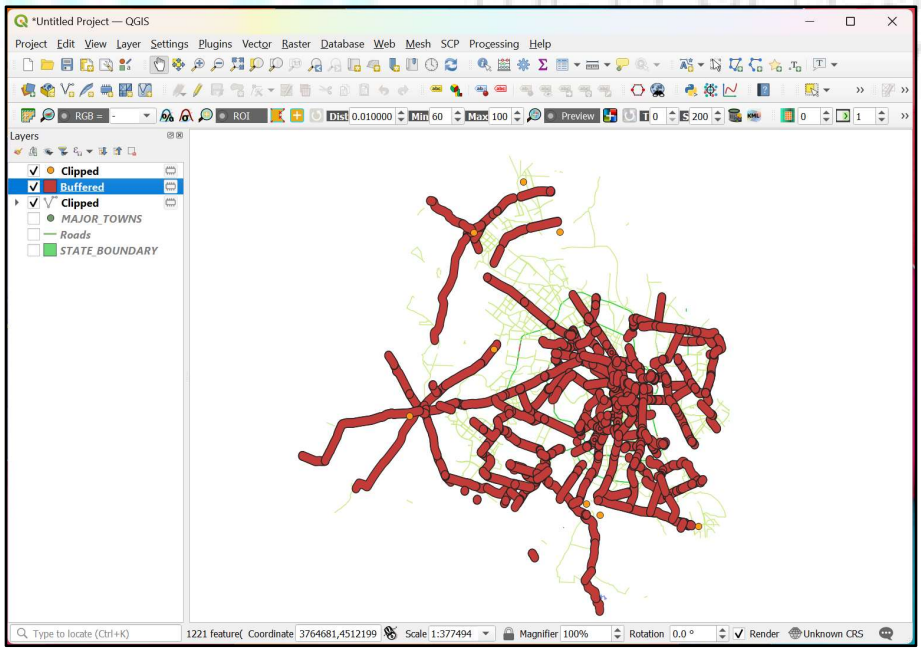

Fig. 21.10: Buffered secondary roads

9. Select ***Select by location*** from ***Research Tool*** sub menu from ***Vector*** menu which appears as in Fig. 21.11.

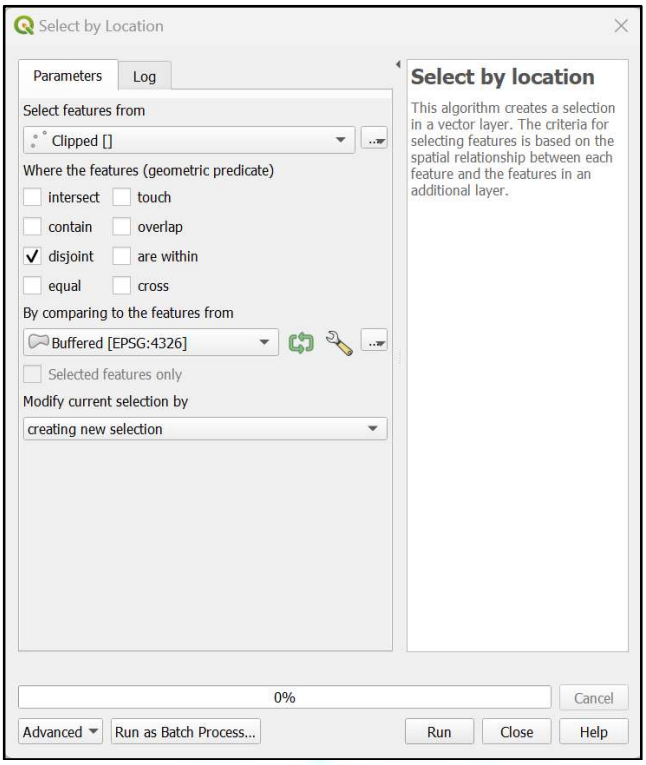

Fig. 21.11: Spatial query dialog box

10. Select Clipped major towns to be source feature, select the *Disjoint* operator and select the reference layer as the buffer road layer. Click *Apply* button to get the results.
11. The results of the proximity analysis for the disjoint features are shown in Fig. 21.12.

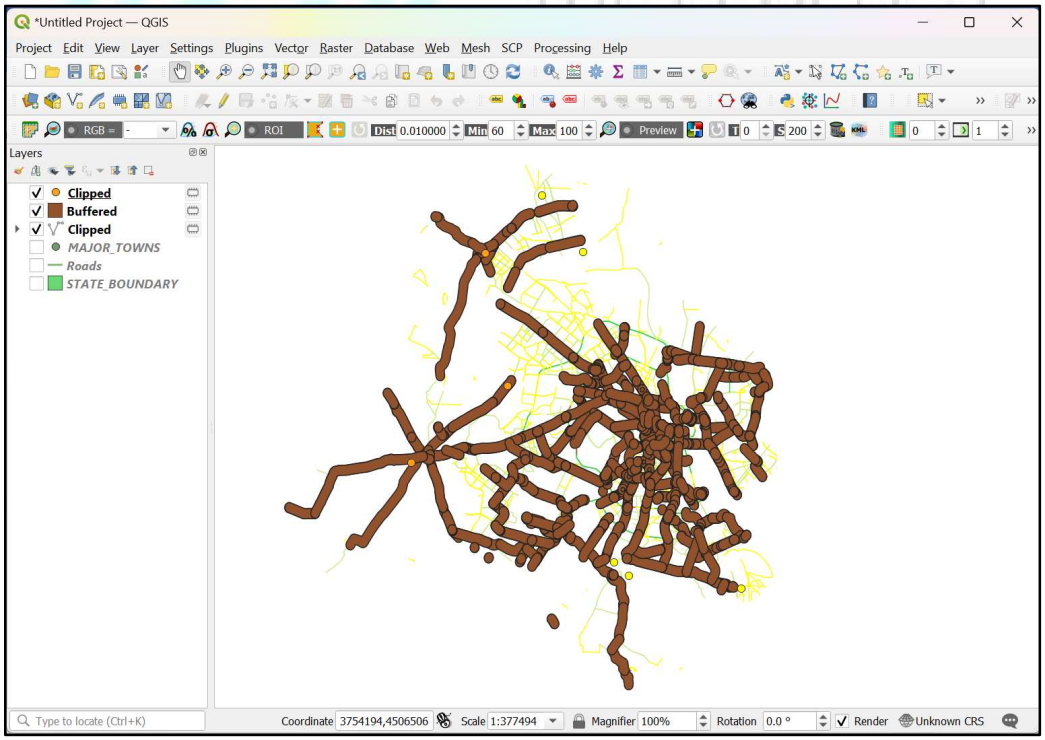

Fig. 21.12: Disjoint major towns against buffered 500m of primary road.

21.5 LABORATORY EXERCISES

After completing the exercise submit the following to your instructor for evaluation:

1. Snapshot of output of the spatial query featuring are within.
2. Snapshot of output of the spatial query featuring disjoint.

21.6 EXERCISES: EXPLORE YOURSELF

1. The spatial query that you have practised in this exercise used the *Within* and *Disjoint* operators. Use other operators like *Intersects, touch, contain*, *overlap*, *equal* and *cross* for two spatial layers.
2. Compare the outputs and note the differences.

21.7 FURTHER/SUGGESTED READING

- QGIS User Guide, https://docs.qgis.org/3.28/pdf/en/QGIS-3.28-DesktopUserGuide-en.pdf