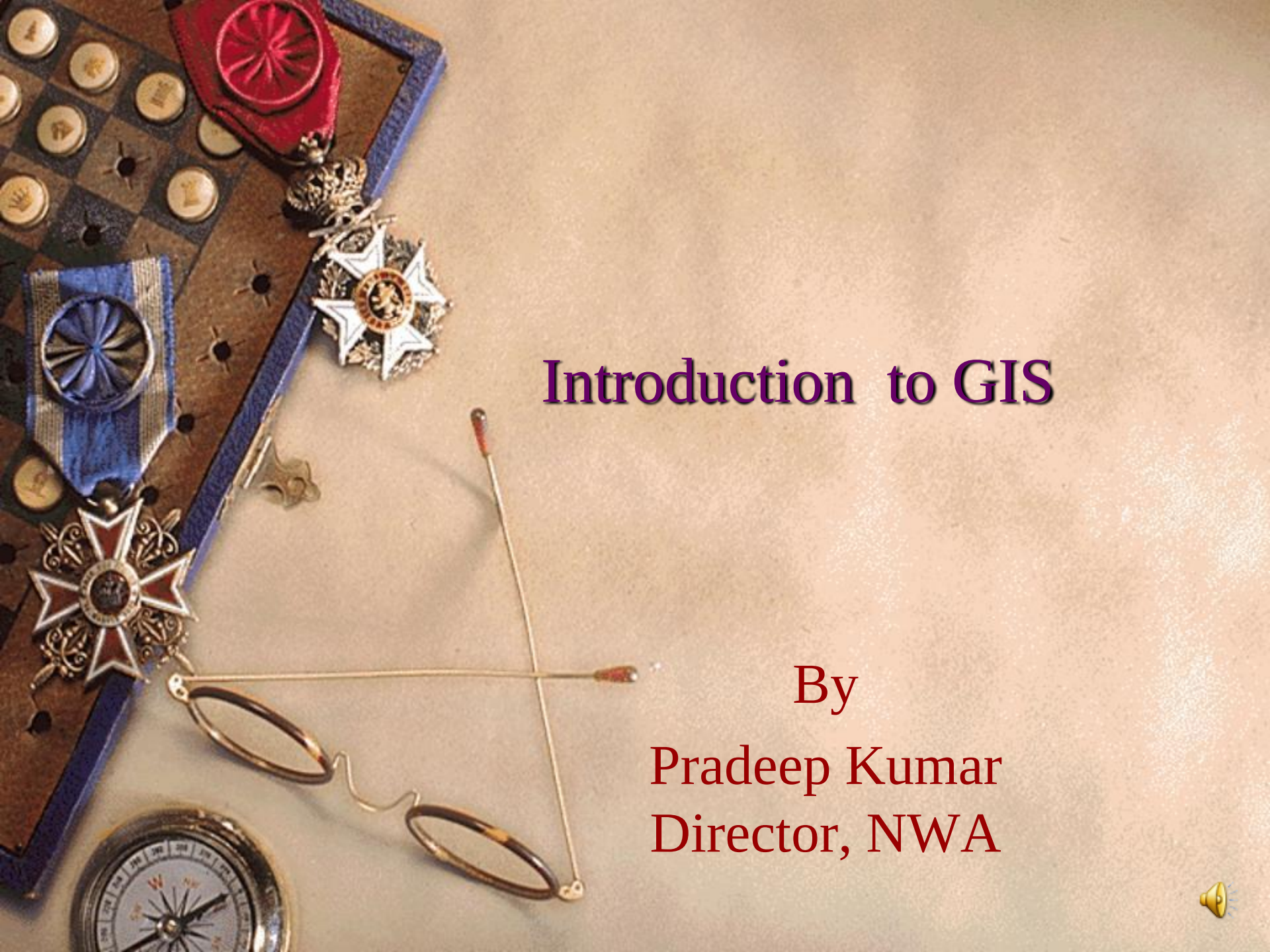


Introduction to GIS

By

Pradeep Kumar
Director, NWA

Geographical Information System

- GIS is defined as set of powerful tools for collecting, storing, retrieving at will, transforming and displaying spatial and non-spatial data from the real world for a particular set of purposes.

- GIS allows to view, understand, question, interpret, and visualize data in many ways that helps to understand the relationships, patterns, and trends in the form of maps, globes, reports, and charts

Geographic Information System (GIS)

- Questions a GIS can answer
  - Location-Where are Particular Features found?
  - Patterns - What geographical pattern exist
  - Trends - What has changed since…?
  - Conditions - where do certain conditions apply?
  - Implications-what are spatial implications if...?

VERY FIRST USE OF GIS

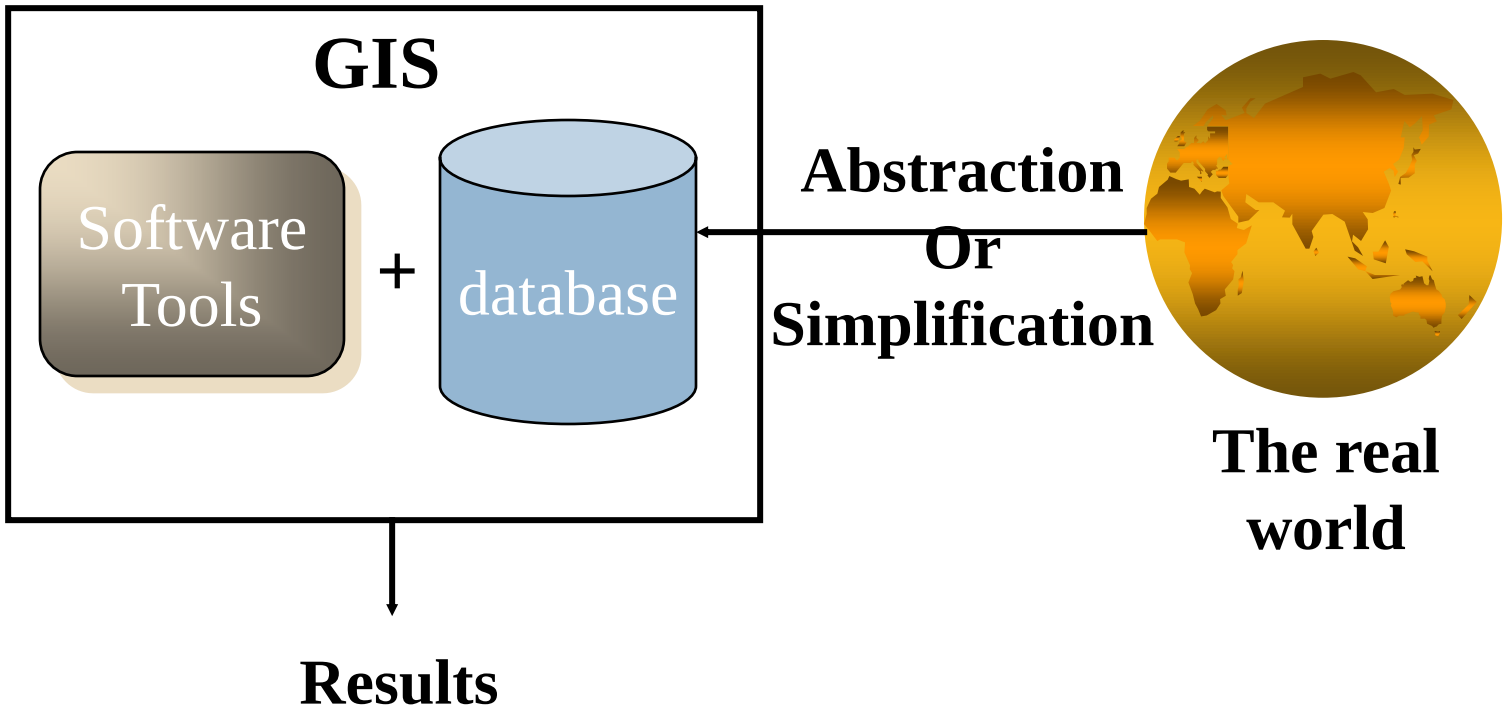
The GIS

- Digital Data
  The geographical information that you will view and analyse using computer hardware and software.

- Computer Hardware
  Computers used for storing data, displaying graphics and processing data.

- Computer Software
  Computer programs that run on the computer hardware and allow you to work with digital data.

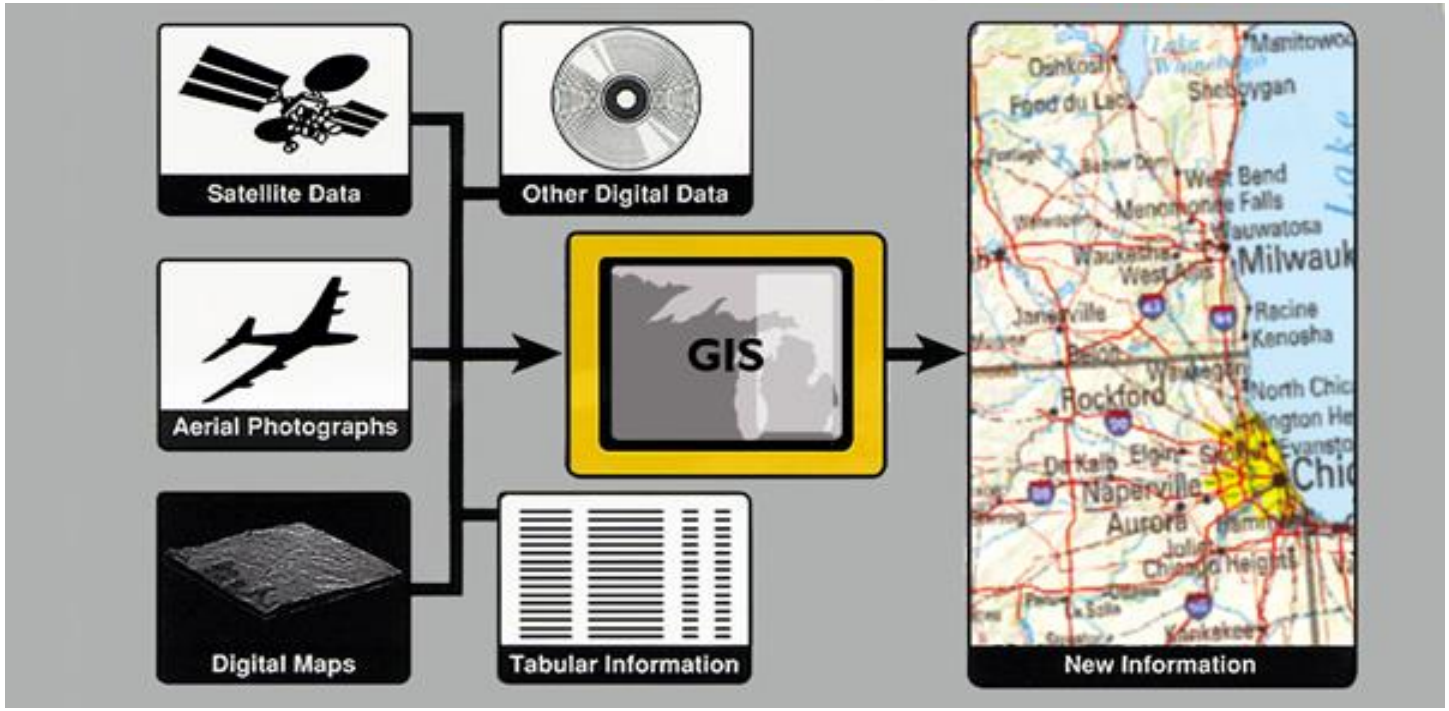
The GIS


GIS
Software Tools
+
database
Abstraction Or Simplification
The real world
Results

GIS Database ?

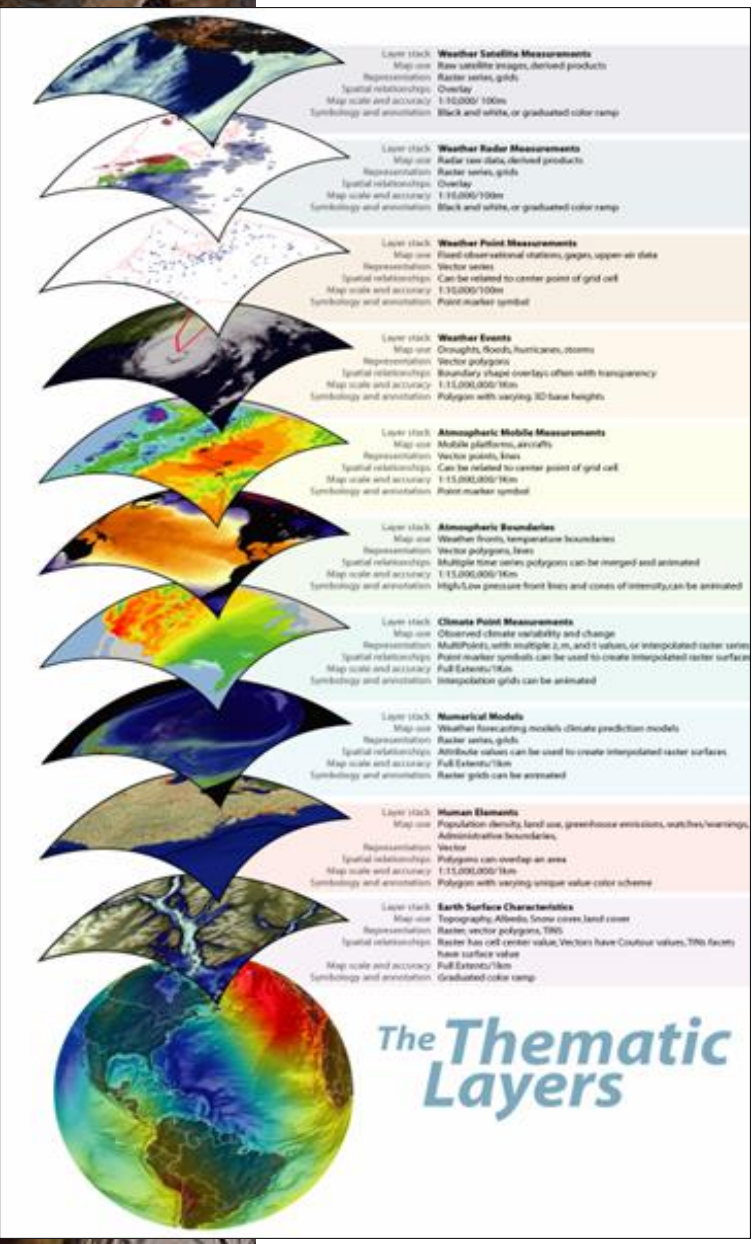
- **A database containing**
  - **Spatial data (Geographical Data)..Where?**
    - **Lat Long information**
    - **Geometry**
    - **Position**
    - **connections**
  - **Attribute data (Properties data)….What?**
    - **Name**
    - **Length**
    - **Area**
    - **Type etc**

Data for GIS Application



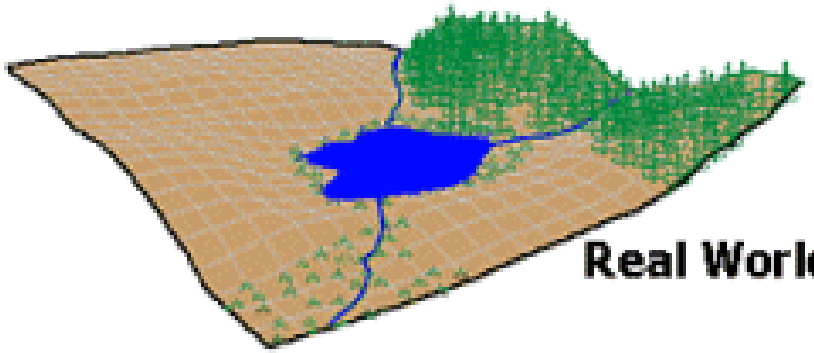
- Digitized and scanned maps
- Databases - table of data
- Field sampling
- Remote sensing and aerial photographs

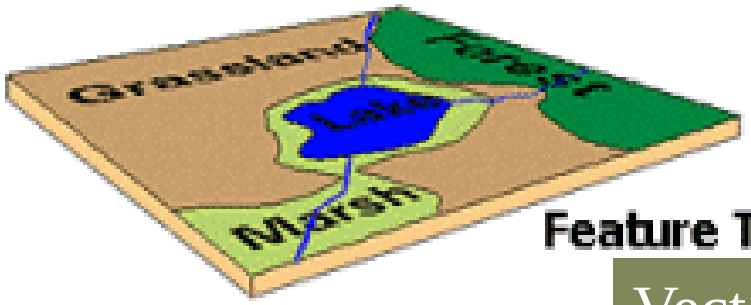
GIS Layers



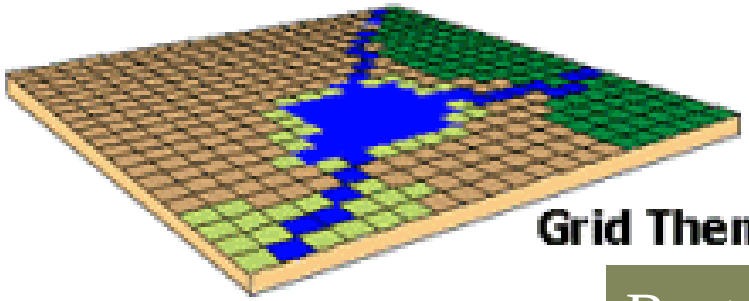
- GIS allows multiple layers of information to be displayed on a single map (eg. Landuse, soil type, Thiessen polygon).
- One of the main features of contemporary GIS
- Layers facilitates representation of real world.

GIS – Data Model





Vector

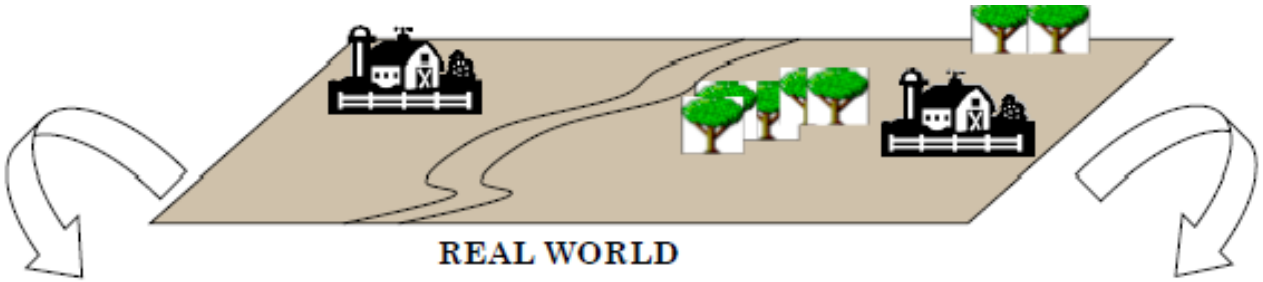


Raster

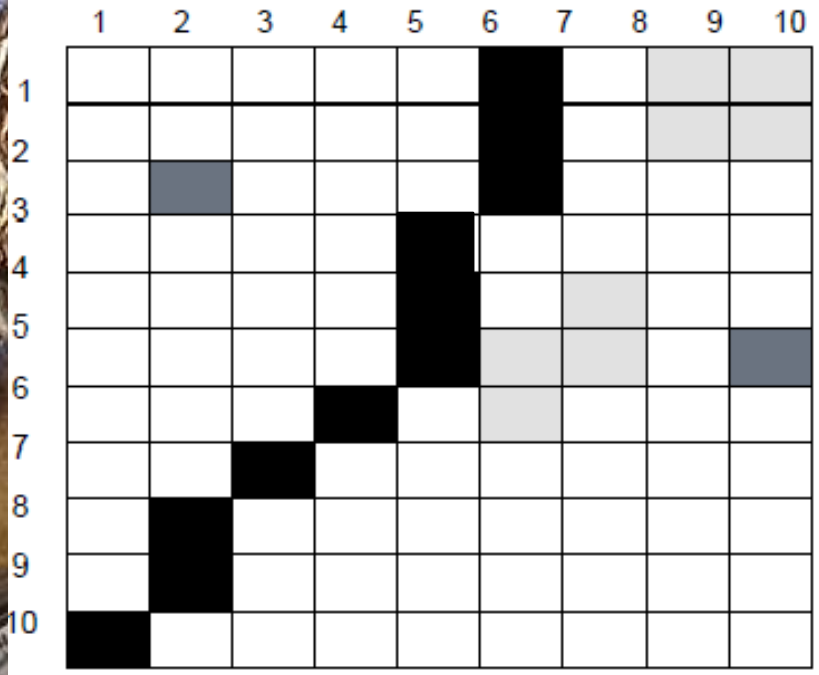
Attributes of Rain25used.txt

Shape*	rainfalls for site	Easting	Northing	Alt	Rain (mm)
Point	999	2411300	5901700	334	2592.200
Point	211302	2372144	5899615	4	2658.491
Point	211802	2416286	5898496	198	1833.954
Point	213810	2410022	5872000	183	2131.642
Point	214202	2361986	5858663	20	2551.988
Point	214301	2370172	5860685	12	3234.292
Point	214710	2405600	5862900	117	2424.000
Point	215102	2359367	5853050	11	2773.110
Point	215302	2375764	5855241	143	3394.845
Point	215401	2379943	5851617	75	3146.148
Point	215702	2406013	5848356	175	3068.048
Point	216401	2382989	5835007	116	5119.652
Point	216503	2392487	5838880	107	3696.638
Point	216510	2384400	5846800	90	2683.821
Point	217411	2379300	5826800	126	4308.232
Point	218910	2416759	5827584	1418	5025.104
Point	220201	2447921	5906255	380	1826.003
Point	223101	2442708	5874733	421	2236.851
Point	224001	2429123	5861627	368	2888.288

Types of GIS Data



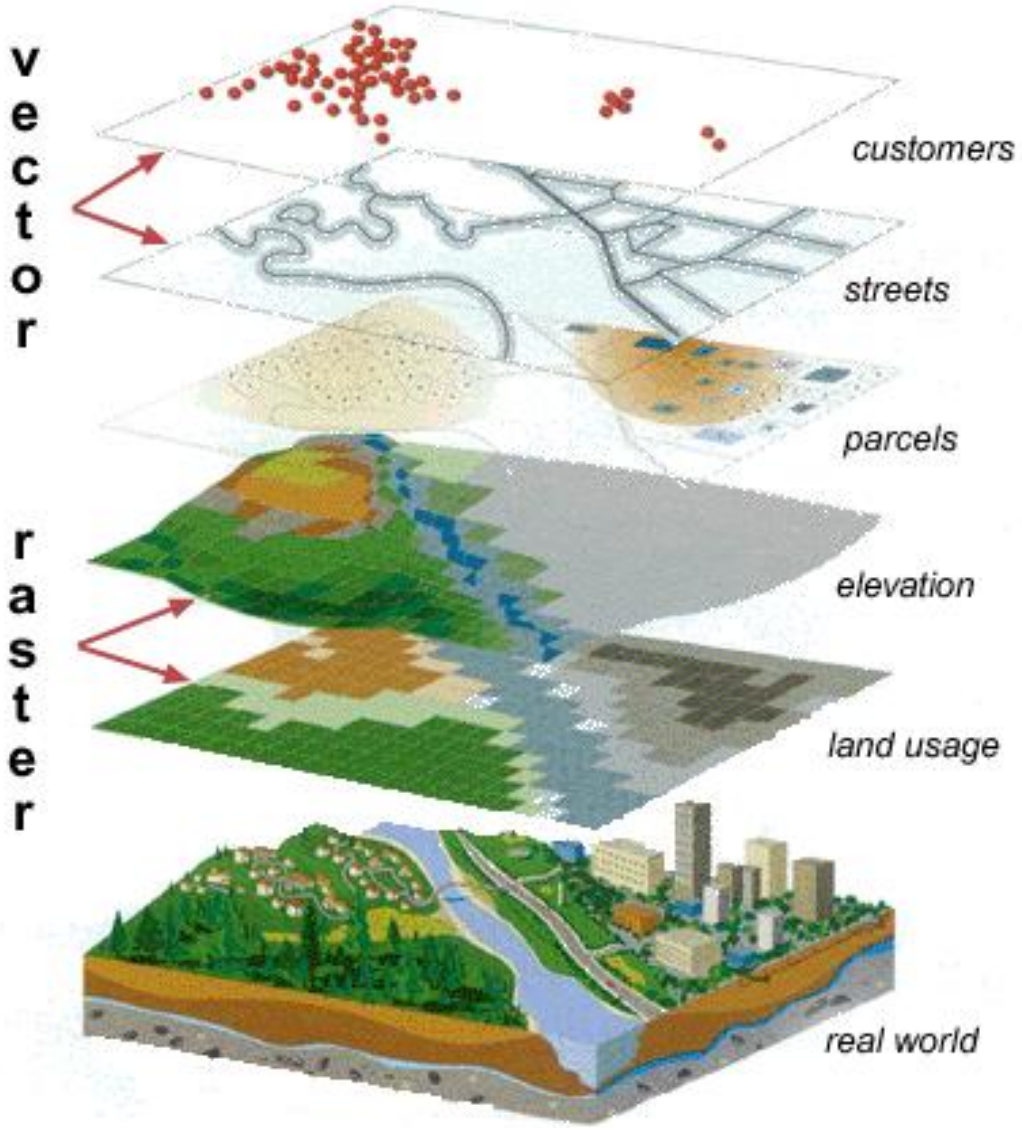
REAL WORLD



GRID RASTER

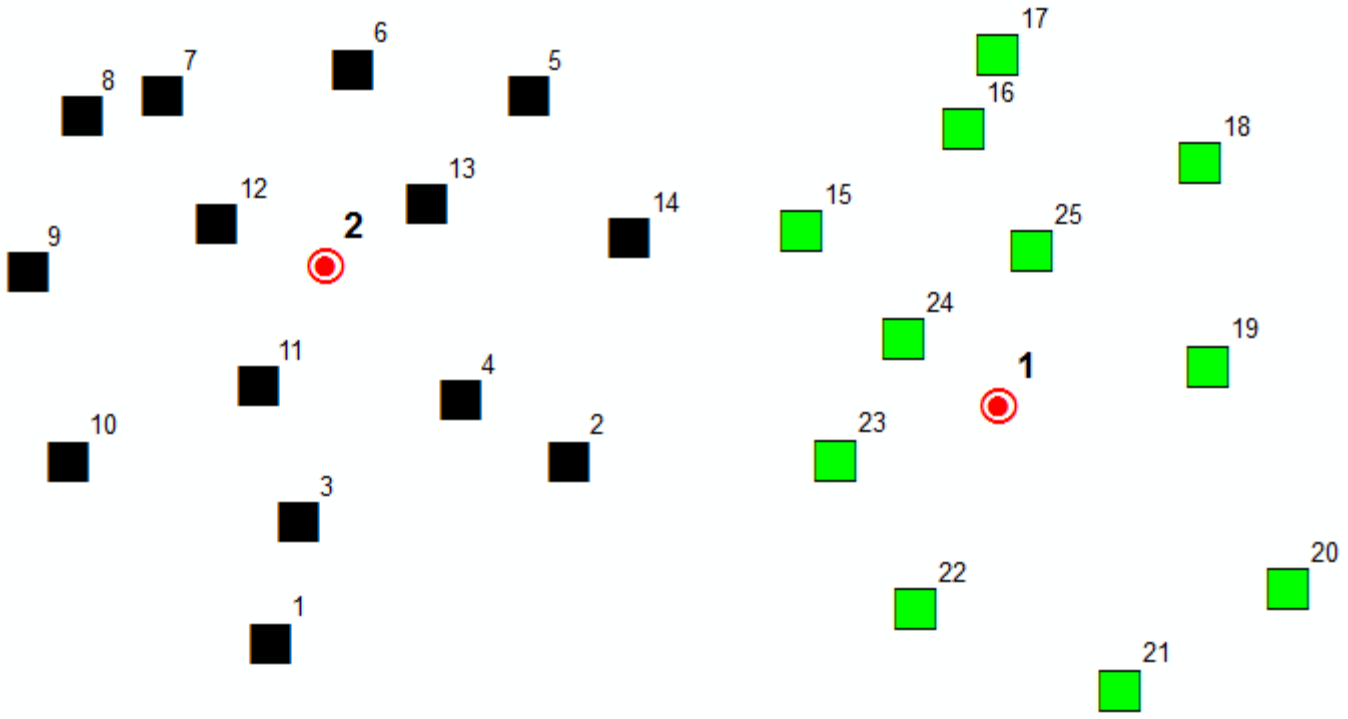
VECTOR

The GIS

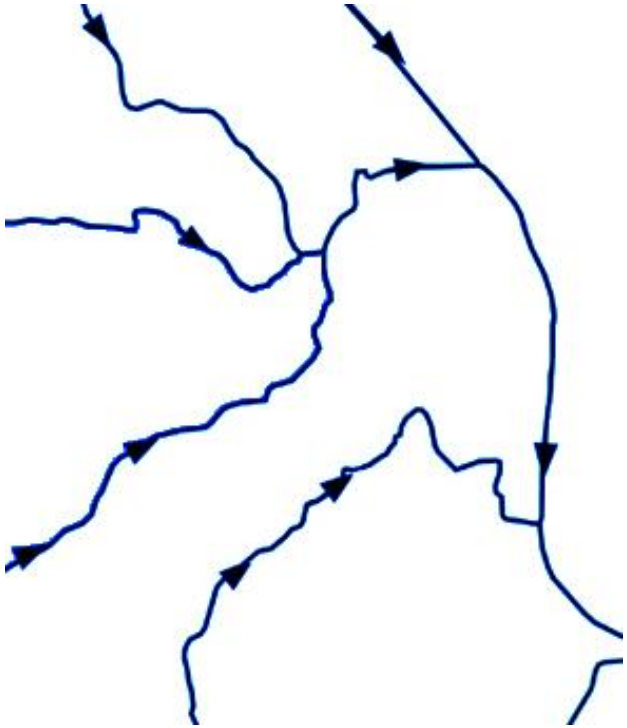

vector
raster
customers
streets
parcels
elevation
land usage
real world

GIS – Map Features

Point Feature: Represents a single point location (eg. location of rain gauge, flow-gauge, manholes)



GIS – Map Features



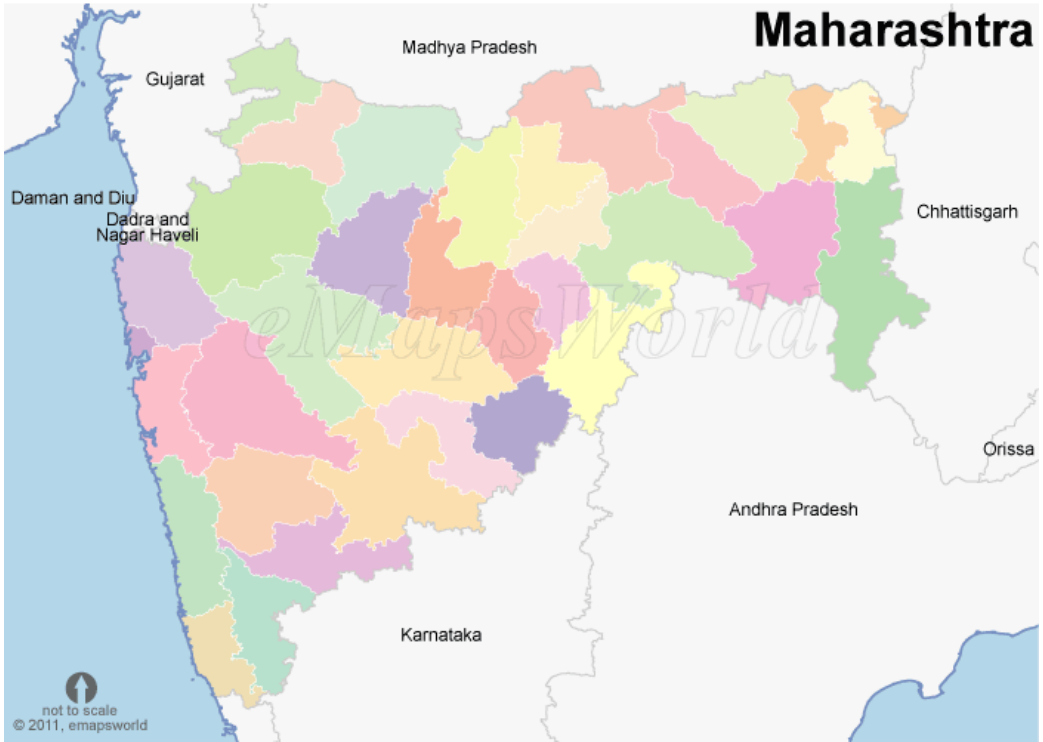
Line Features: Lines are used to represent the shape and location of geographic objects, too narrow to depict as areas.

(eg. Streams, Rivers, Canals)

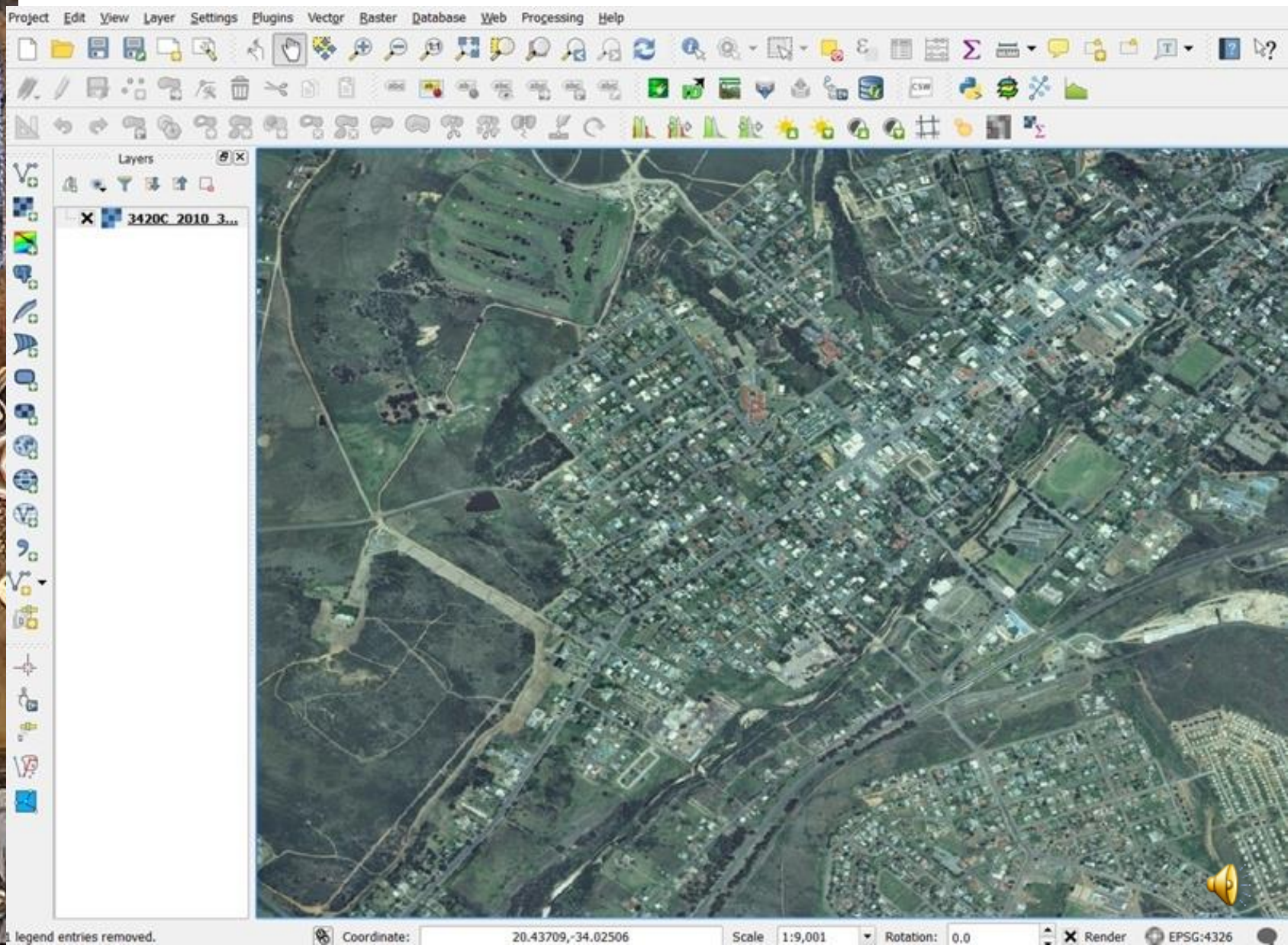
GIS – Map Features

Polygon Features: Polygon is used to represent a shape, set of connected, ordered coordinates forming an area

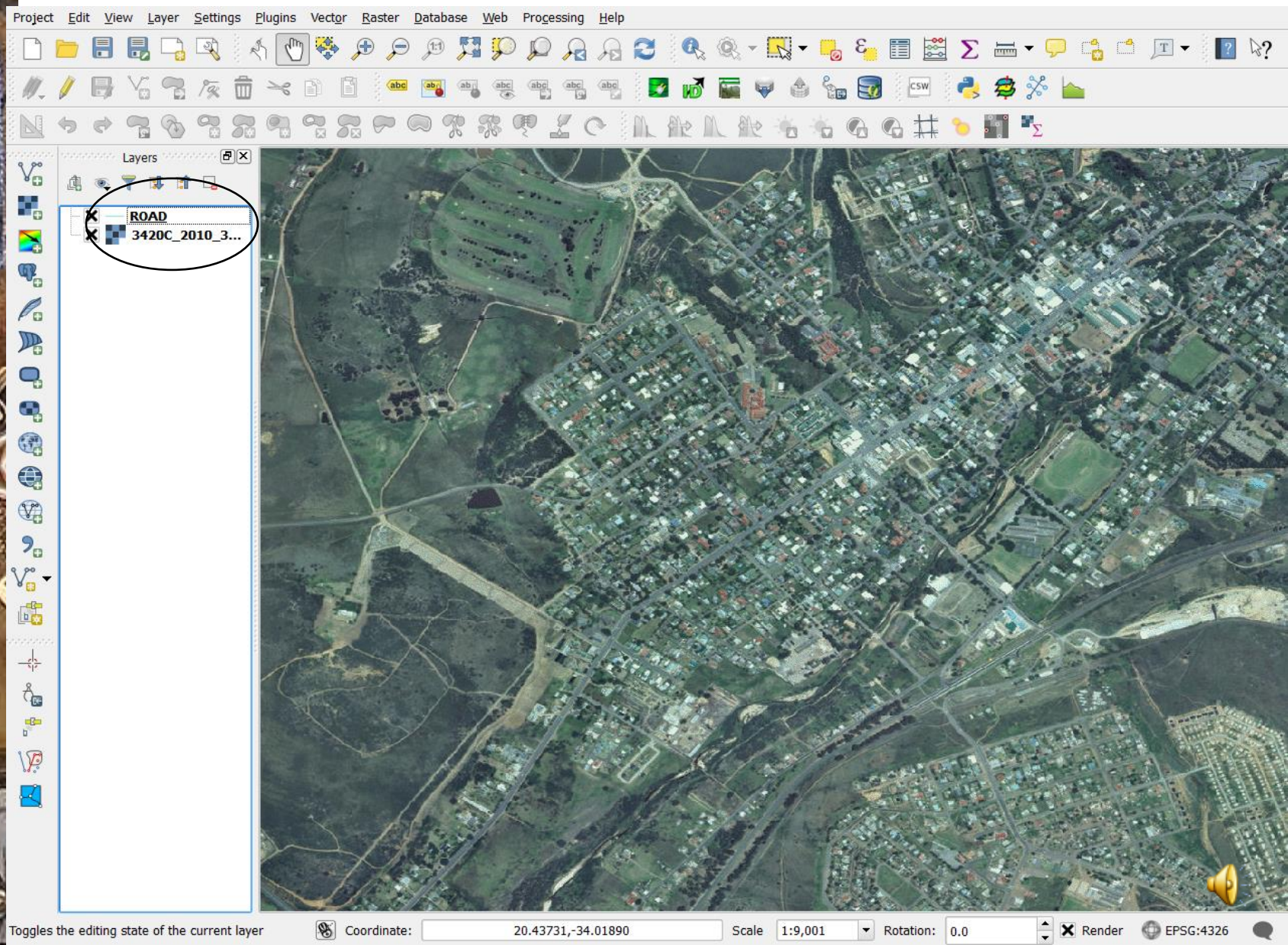
(eg. Watersheds, catchments, water bodies etc.)



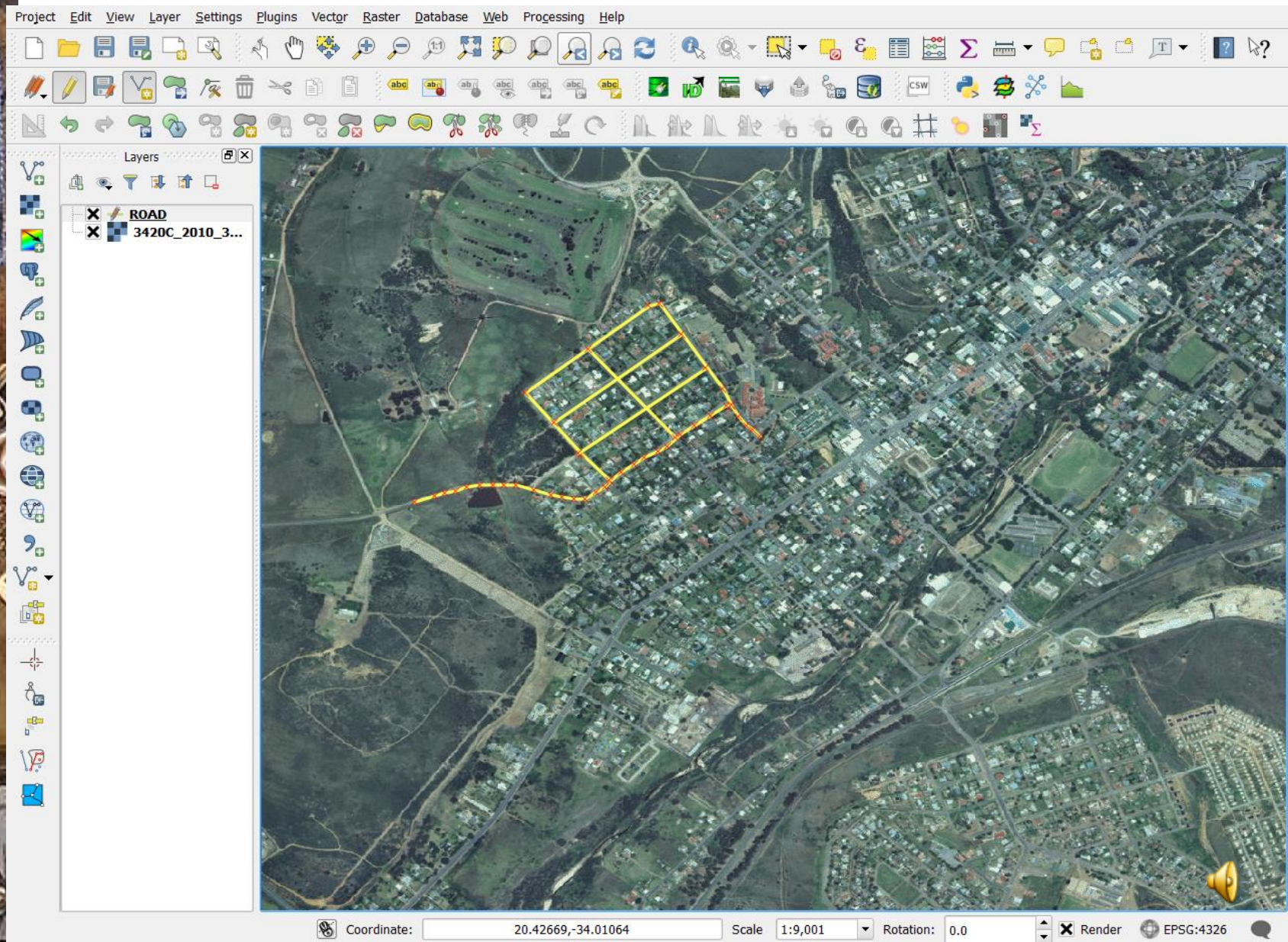
Creation of spatial layers - GIS software



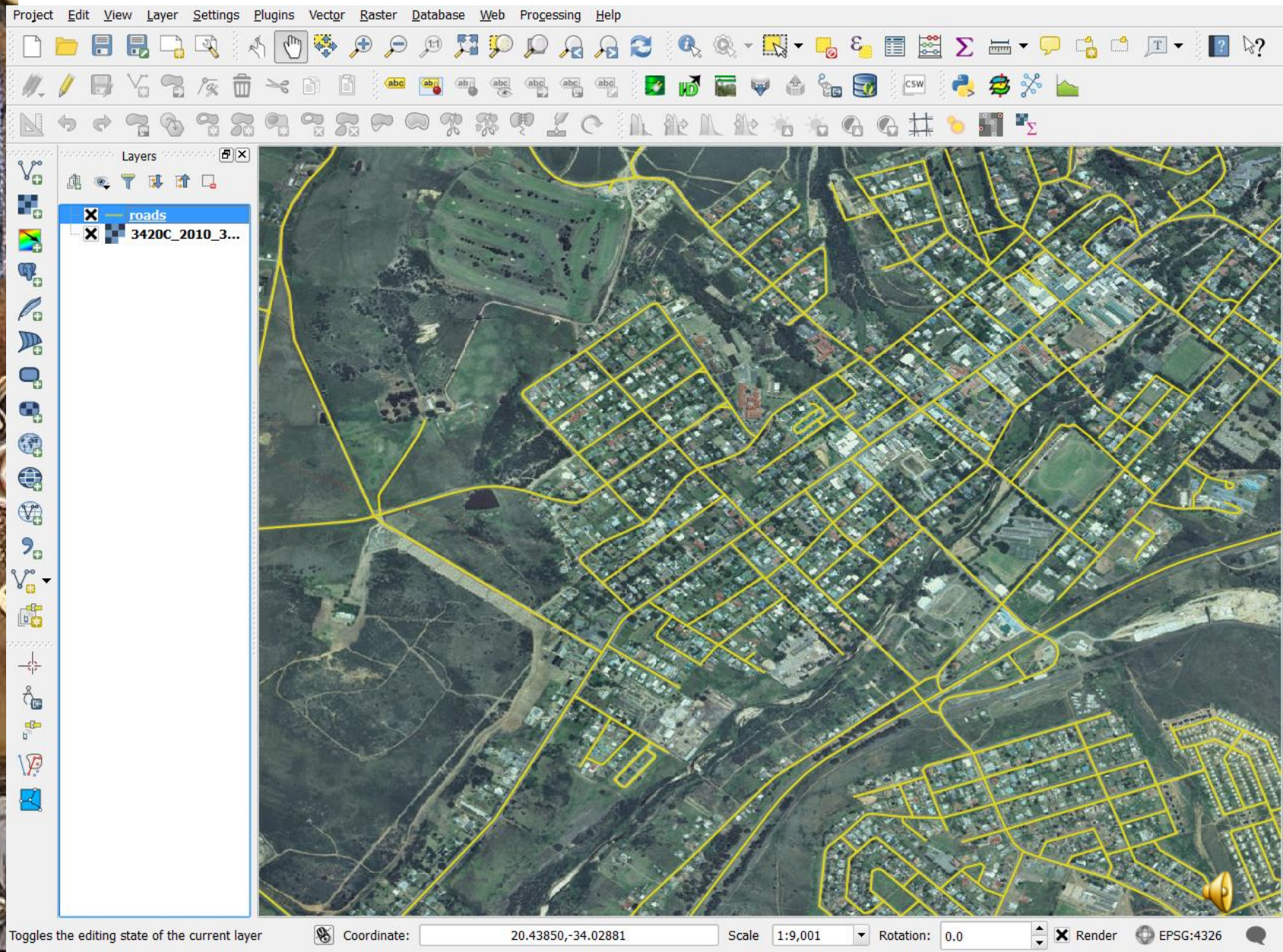
Creation of spatial layers - GIS software



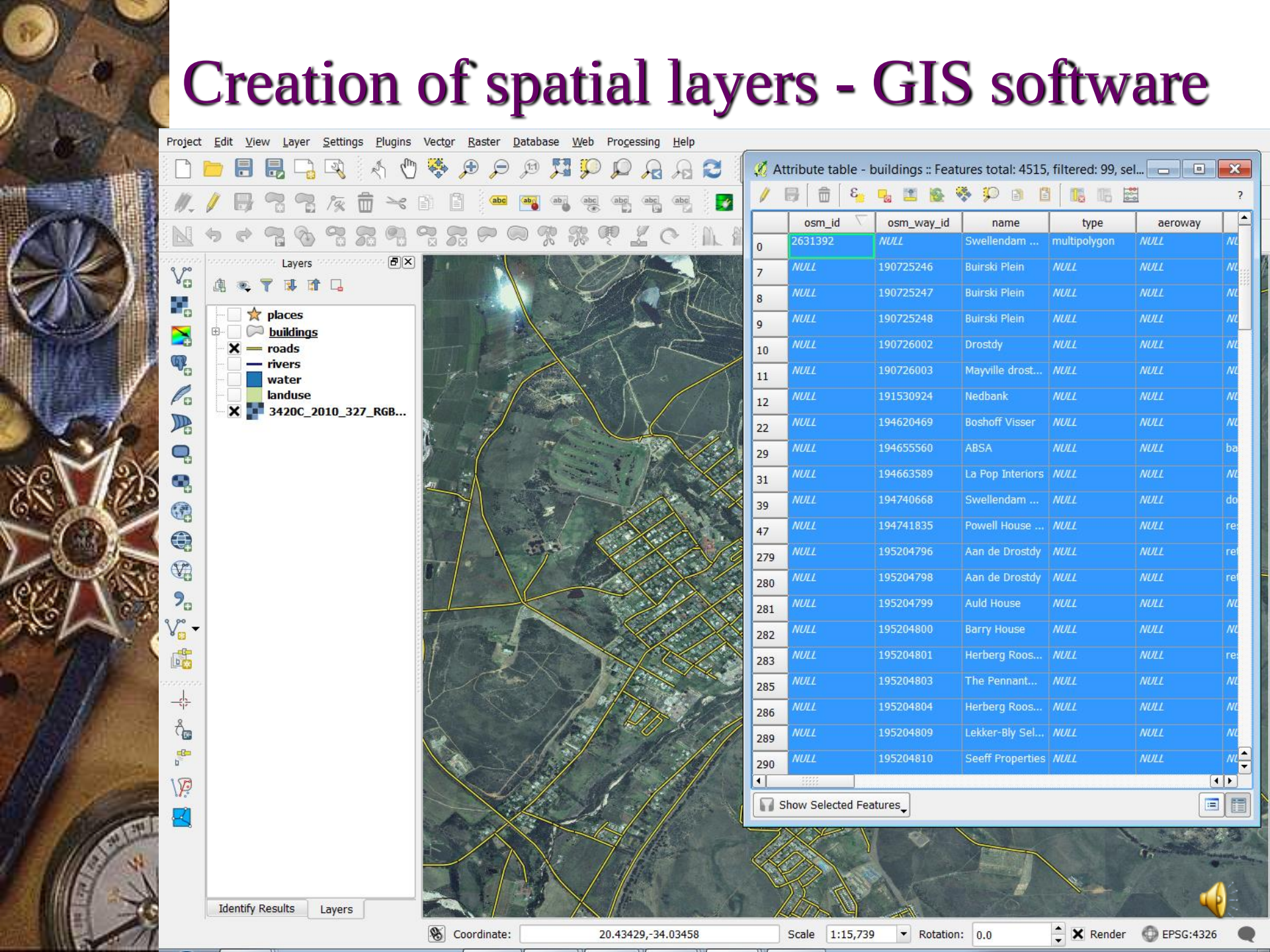
Creation of spatial layers - GIS software



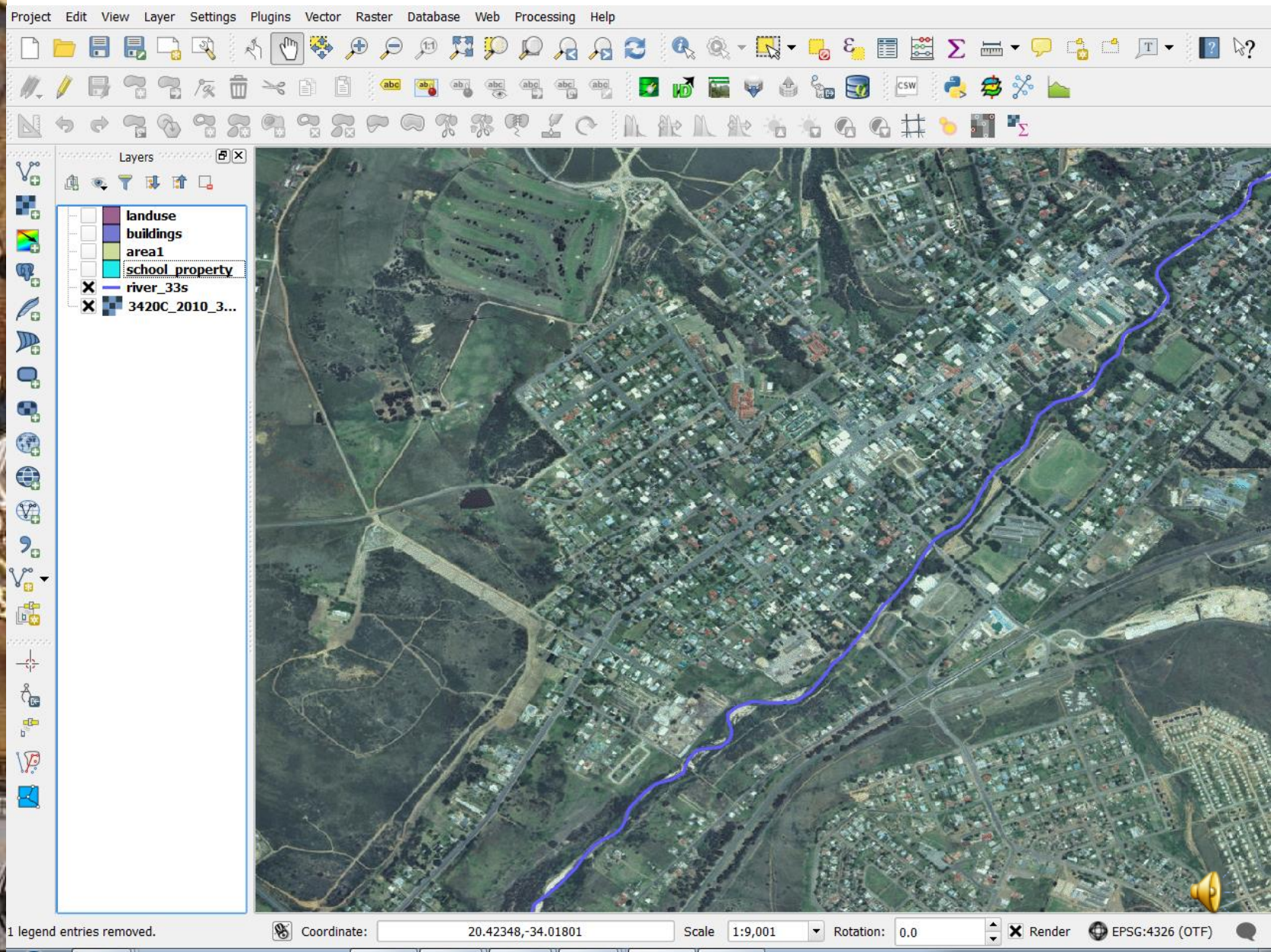
Creation of spatial layers - GIS software



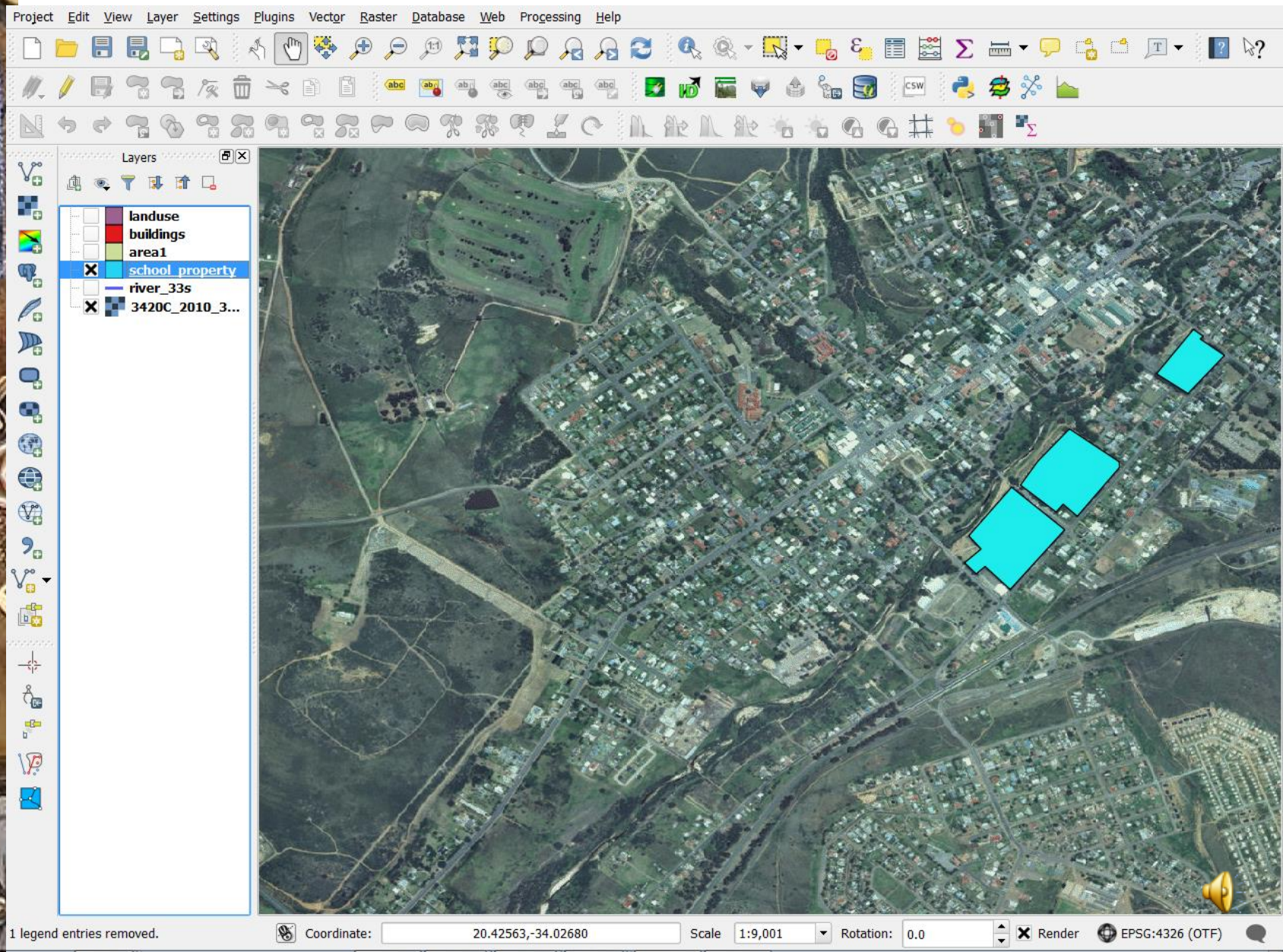
Creation of spatial layers - GIS software



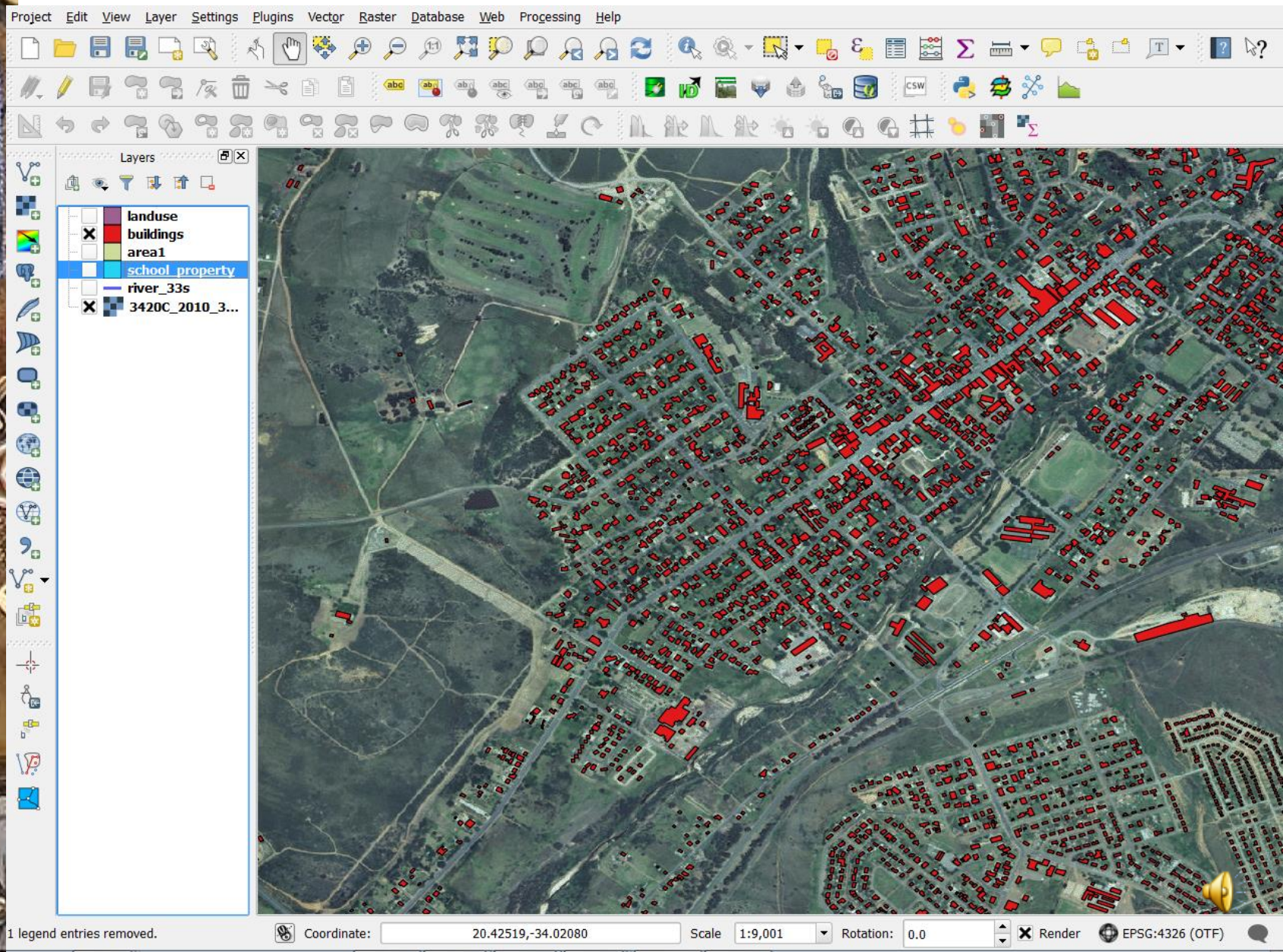
Creation of spatial layers - GIS software



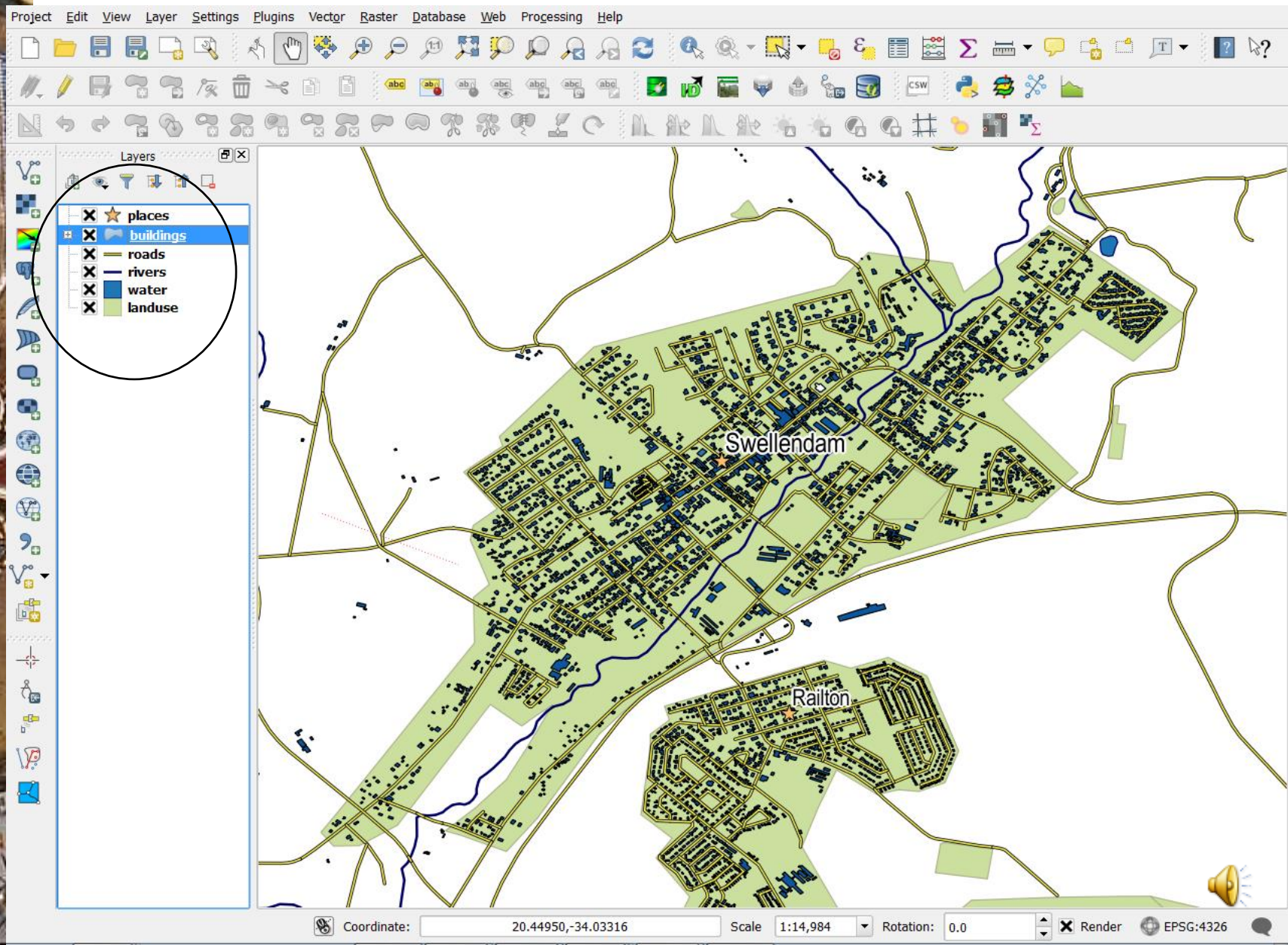
Creation of spatial layers - GIS software



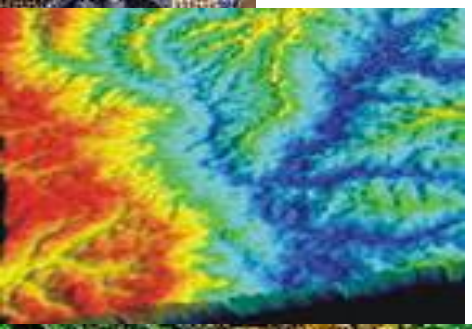
Creation of spatial layers - GIS software

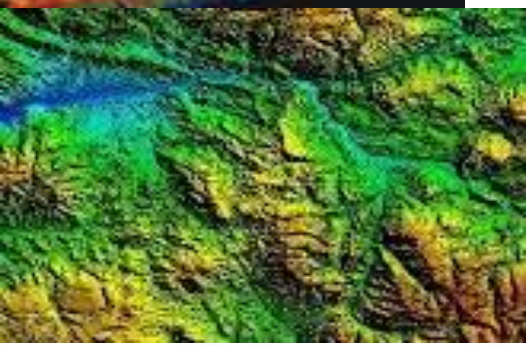


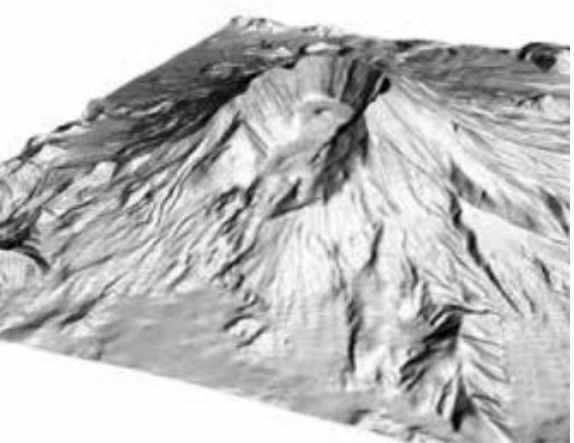
Creation of spatial layers - GIS software



Digital Elevation Model



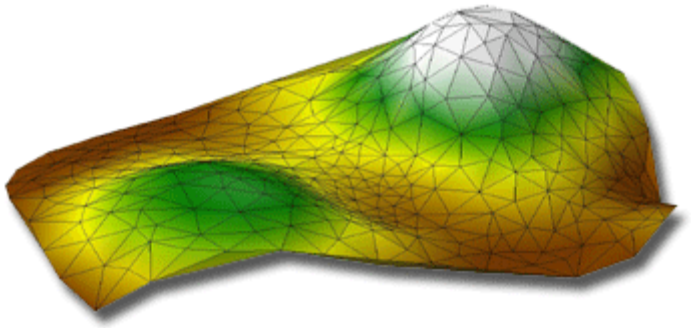


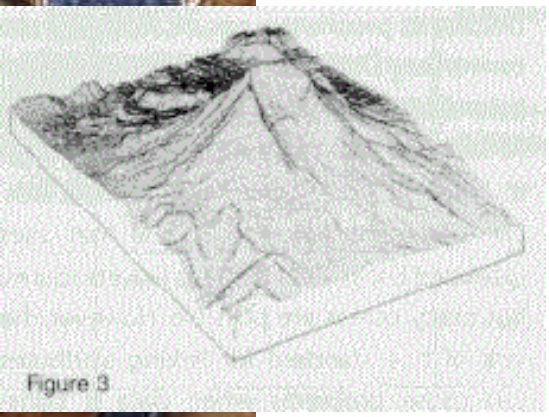


- DEM is a digital model or 3D representation of a terrain's surface
  - Raster (a grid of squares, also known as a heightmap when representing elevation)
  - Vector-based triangular irregular network (TIN).
  - Acquired through techniques such as photogrammetry, lidar, land surveying, etc. i.e. remote sensing techniques

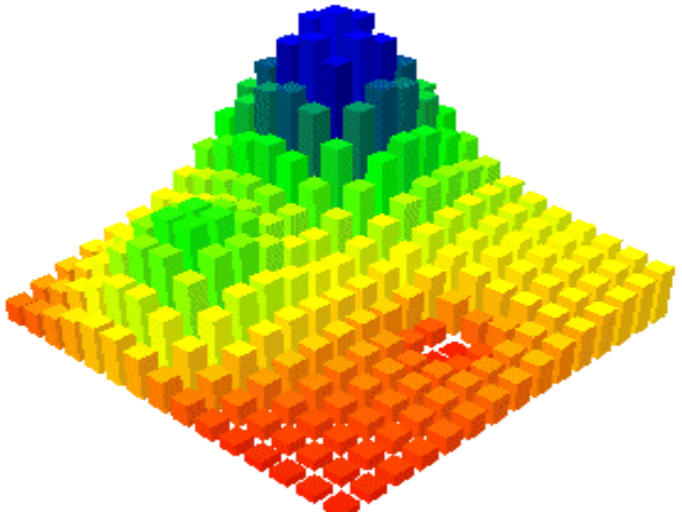
Digital Elevation Model

- TIN





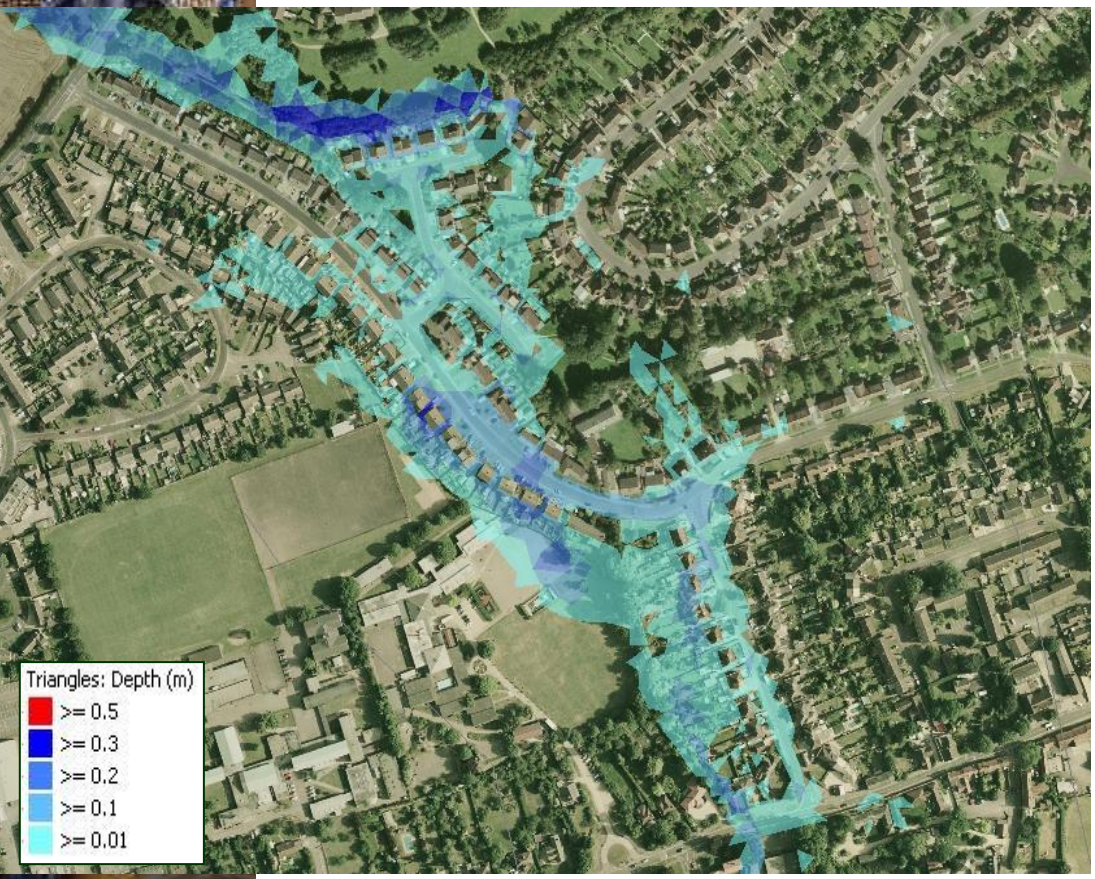
- GRID



GIS - Analysis

- Querying
- Measurement
- Routing and Minimum path
- Buffering
- Overlay
- Distance, Adjacency and Proximity analysis
- Misc. analysis likes neighbourhood analysis, network analysis, 3D Analysis etc.
- Interpolation

Overlay Analysis



Superimposing two or more maps registered to a common coordinate system, to show relationships between features in the same study area.

Uses of GIS

- River Basin Management
- Crop Water Requirement & Scheduling
- Irrigation Water Management
- Ground Water Investigations
- Watershed Management
- Soil Erosion Modelling
- Land Use Change Detection
- Flood Management
- Environmental Modeling
- Sedimentation Studies Etc

THANK YOU