

Welcome to Edit Vector Data with *QGIS*

In 3 sentences or less, answer out loud or in the chat:

- What is your name?
- What program/department are you from?
- What brought you to the workshop today?
- What do you hope to get out the workshop?

Edit Vector Data with *QGIS*



As per the instructions when you signed up:
QGIS downloaded on your computer?



If not, please come back to the workshop another time!

Territorial Acknowledgment

We acknowledge and respect the ləkʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt, and WSÁNEĆ peoples whose historical relationships with the land continue to this day.



Learning Objectives

- **Identify and navigate** key *QGIS* interface elements
(Layers panel, Menu bar, Map view)
- **Define** three types of vector data: **shapefile**, **GeoJSON**, **Geopackage**
- **Edit** attribute tables and vector data using QGIS tools



Outcomes

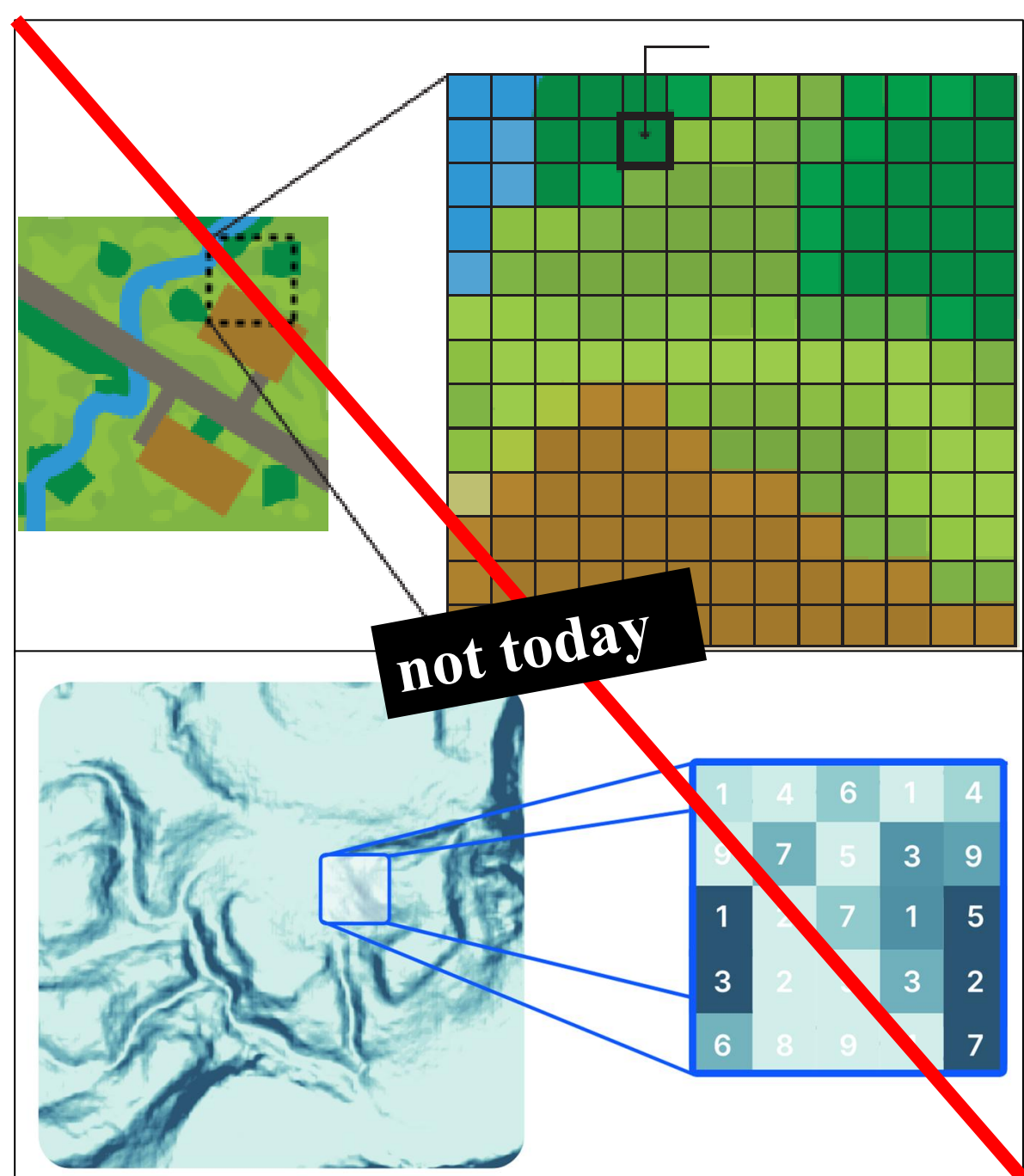
- Using *QGIS*, participants will:
- Load and edit vector files
 - Shapefile, GeoJSON, geopackage
- Change **Symbology** of vector layers
- Edit vector layers using **digitizing**
- Edit vector layer **attribute tables**
- Package vector layers into a Geopackage (.gpkg)



Geospatial Data: Two Types

Raster

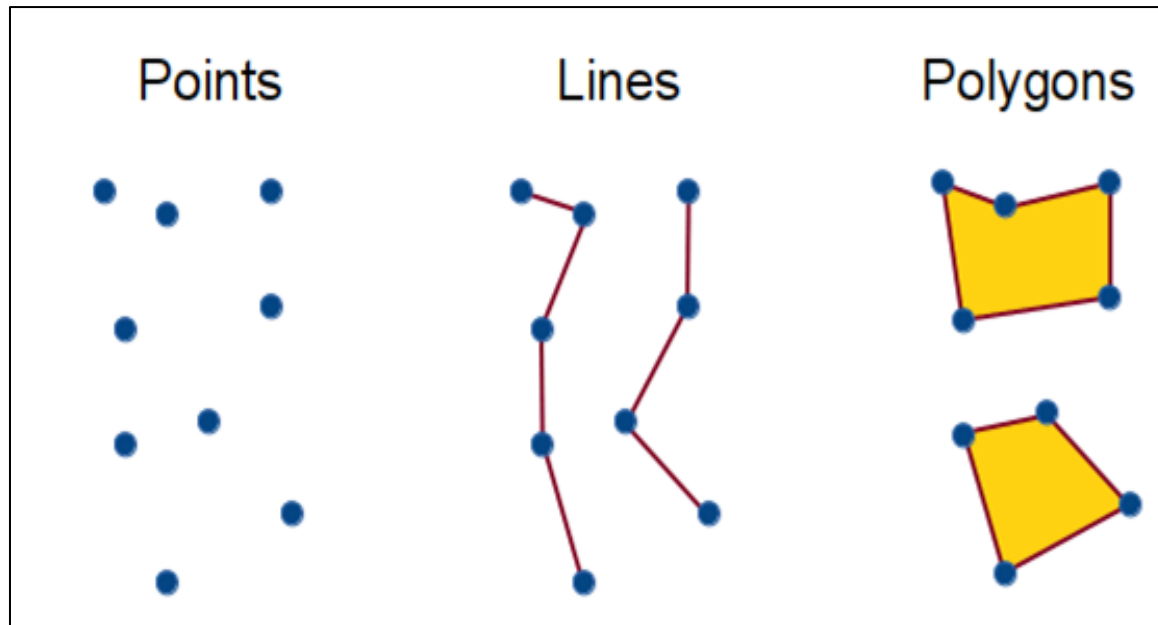
- Represents Earth's surface as a grid of pixels or cells
- Each cell has numeric value(s)



Geospatial Data: Two Types

Vector

- Represents geographic features as discrete geometric features (points, lines, polygons)
- Sometimes no accompanying data values



[Visualizing Terrain in ArcGIS Pro](#)



[Spatial Data Models - Geographic Information Systems \(GIS\) - LibGuides at University of Connecticut](#)

Vector Features

Polygons  **Victoria**

- Area, perimeter

Lines  **Roads**

- Length, sometimes width

Points  **Points**

- No dimensions



A single layer in *QGIS* can only contain one kind of feature (point, line, or polygon)



Questions?

Vector files:

Most common

ESRI Shapefiles (*.shp *.SHP)

GMT ASCII Vectors (.gmt) (*.gmt *.GMT)

GPS eXchange Format [GPX] (*.gpx *.GPX)

GPSTrackMaker (*.gtm *.gtz *.GTM *.GTZ)

GeoJSON (*.geojson *.GEOJSON)

GeoJSON Newline Delimited JSON (*.geojsonl *.geojsons *.nlgeojson *.json *.GEOJSONL *.GEOJSONS *.NLGEOJSON *.JSON)

GeoPackage (*.gpkg *.GPKG)

GeorSS (*.xml *.XML)

Geoconcept (*.gxt *.txt *.GXT *.TXT)

Geography Markup Language [GML] (*.gml *.GML)

Geomedia .mdb (*.mdb *.MDB)

Geospatial PDF (*.pdf *.PDF)

Hydrographic Transfer Format (*.htf *.HTF)

INTERLIS 1 (*.itf *.xml *.ili *.ITF *.XML *.ILI)

INTERLIS 2 (*.xtf *.xml *.ili *.XTF *.XML *.ILI)

Idrisi Vector (.vct) (*.vct *.VCT)

Keyhole Markup Language [KML] (*.kml *.kmz *.KML *.KMZ)

MBTiles (*.mbtiles *.MBTILES)

MS Excel format (*.xls *.XLS)

MS Office Open XML spreadsheet (*.xlsx *.XLSX)

Mapbox Vector Tiles (*.mvt *.mvt.gz *.pbf *.MVT *.MVT.GZ *.PBF)

Mapinfo File (*.mif *.tab *.MIF *.TAB)

Microstation DGN (*.dgn *.DGN)

NAS - ALKIS (*.xml *.XML)

Network Common Data Format (*.nc *.NC)

Open Document Spreadsheet (*.ods *.ODS)

OpenAir Special Use Airspace Format (*.txt *.TXT)

OpenJUMP JML (*.jml *.JML)

OpenStreetMap (*.osm *.pbf *.OSM *.PBF)

PCI Geomatics Database File (*.pix *.PIX)

50+ vector file types!

Shapefiles (.shp)

Shapefile

ESRI Shapefiles (*.shp *.SHP)
GMT ASCII Vectors (.gmt) (*.gmt *.GMT)

ESRI shapefiles must have:

- .shx** shape index position, used for searching
- .shp** gives features their geometry
- .dbf** database file storing attribute data and object IDs
- .prj** for coordinate and projection system

Sometimes additional files

- .cpg** encoding applied to create the shapefile
- .sbn** optimizes spatial queries
- .sbx** speeds up loading times
- .xml** metadata associated with the shapefile



Database Files (.dbf)

- Vector features can have **attribute information**
- The attribute information is contained in the .dbf
- Information is organized into tables

Fields: Each column is called a *field*
each field describes a different attribute

	fid	OBJECTID	PERIMETER	MUNICIPALI	LA_NAME_RE
1	102	133	8777.24307	Esquimalt	Panhandle
2	101	111	9877.67695	Colwood	South Colwood
3	100	110	10232.60456	Oak Bay	South Oak Bay
4	99	109	8353.20166	Victoria	Fairfield

Show All Features

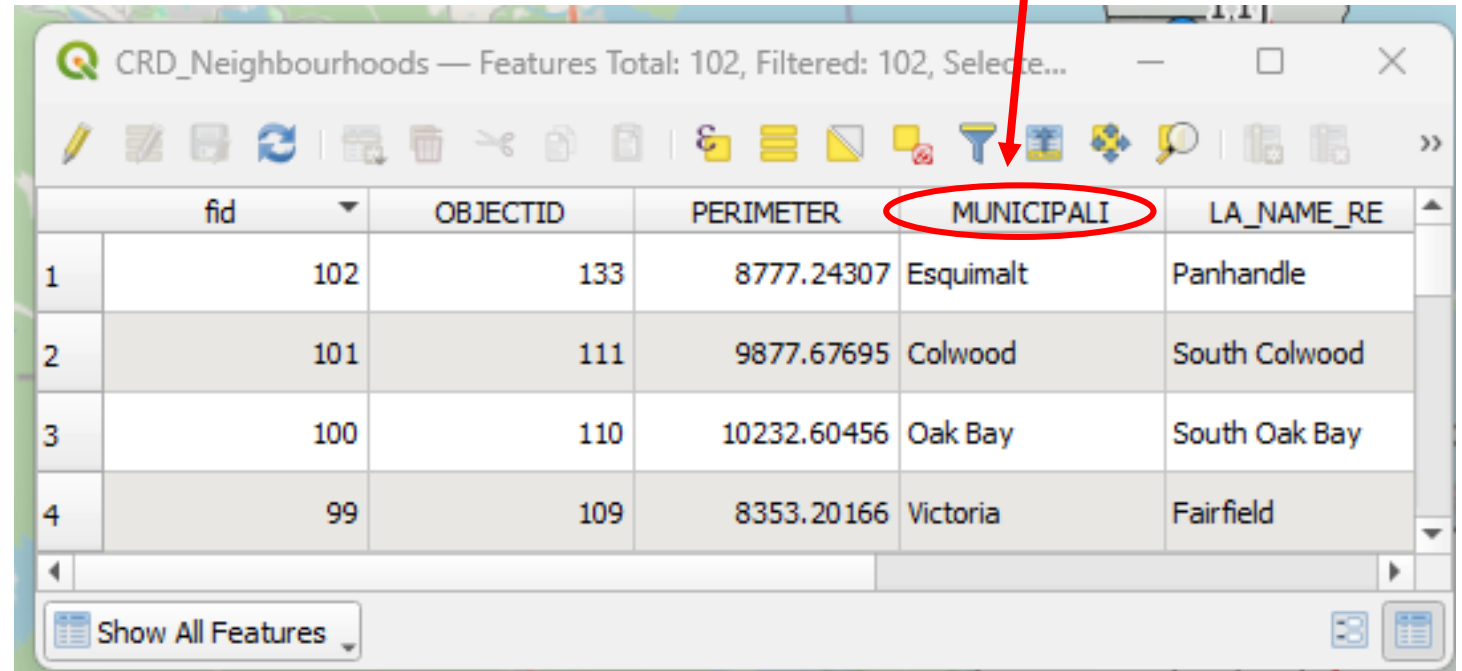
Features: Each row refers to a different feature on screen

Database Files (.dbf) Limitations

Column/Field names must follow these standards

- Maximum 10 characters
- Must begin with a 'letter'
- No dashes - or slashes /
- Underscores _ ok

NOTE: “Municipality” field cuts off to 10 characters MUNICIPALI



CRD_Neighbourhoods — Features Total: 102, Filtered: 102, Selecte...

	fid	OBJECTID	PERIMETER	MUNICIPALI	LA_NAME_RE
1	102	133	8777.24307	Esquimalt	Panhandle
2	101	111	9877.67695	Colwood	South Colwood
3	100	110	10232.60456	Oak Bay	South Oak Bay
4	99	109	8353.20166	Victoria	Fairfield

Show All Features

.dbf can exist without geometric data (**.shp**) but are difficult to interpret without visual representation

GeoJSON (.geojson)

GeoJSON

- Text-based format for geographic data
- Supports points, lines, and polygons
- Human-readable and editable in a text editor (e.g. *Notepad++* as below)
 - Can also edit directly in a GIS software (*QGIS*)



Point
Coordinates

```
1 {
2   "type": "FeatureCollection",
3   "name": "Locations",
4   "crs": { "type": "name", "properties": { "name": "urn:ogc:def:crs:EPSG::3157" } },
5   "features": [
6     { "type": "Feature", "properties": { "Name": "Your Location", "Latitude": null, "Longitude": null }, "geometry": null },
7     { "type": "Feature", "properties": { "Name": "YYJ", "Latitude": 48.65255013, "Longitude": -123.4297931 }, "geometry": { "type": "Point",
8       "coordinates": [ 468346.925805713166483, 5388921.096811008639634 ] } },
9     { "type": "Feature", "properties": { "Name": "Swartz Bay", "Latitude": 48.68812438, "Longitude": -123.4146051 }, "geometry": { "type": "Point",
10      "coordinates": [ 469487.00482679286506, 5392869.288799469359219 ] } },
11     { "type": "Feature", "properties": { "Name": "PKOLS", "Latitude": 48.49348443, "Longitude": -123.3422378 }, "geometry": { "type": "Point",
12      "coordinates": [ 474716.159818745218217, 5371207.259277308359742 ] } },
13     { "type": "Feature", "properties": { "Name": "Royal BC Museum", "Latitude": 48.42113463, "Longitude": -123.3673963 }, "geometry": { "type": "Point",
14      "coordinates": [ 472818.82447299733758, 5363173.876949505880475 ] } },
15     { "type": "Feature", "properties": { "Name": "Royal Jubilee Hospital", "Latitude": 48.43386085, "Longitude": -123.3275827 }, "geometry": { "type":
16      "Point", "coordinates": [ 475770.532241339213215, 5364575.082538747228682 ] } },
17     { "type": "Feature", "properties": { "Name": "UVIC Exchange", "Latitude": 48.4661241, "Longitude": -123.3088589 }, "geometry": { "type": "Point",
18      "coordinates": [ 477169.957331199198961, 5368155.529331269674003 ] } },
19     { "type": "Feature", "properties": { "Name": "Beacon Hill Park", "Latitude": 48.408105, "Longitude": -123.358701 }, "geometry": { "type": "Point",
20      "coordinates": [ 473455.374709020135924, 5361722.536787395365536 ] } },
21     { "type": "Feature", "properties": { "Name": "Hillside Centre", "Latitude": 48.44752084, "Longitude": -123.334211 }, "geometry": { "type": "Point",
22      "coordinates": [ 475286.879061449086294, 5366095.566013755276799 ] } },
23     { "type": "Feature", "properties": { "Name": "Victoria General", "Latitude": 48.46851697, "Longitude": -123.433163 }, "geometry": { "type": "Point",
24      "coordinates": [ 467982.795599248667713, 5368466.047575992532074 ] } },
25     { "type": "Feature", "properties": { "Name": "Costco", "Latitude": 48.45945001, "Longitude": -123.5020806 }, "geometry": { "type": "Point",
26      "coordinates": [ 462881.982760510407388, 5367489.339950951747596 ] } },
27     { "type": "Feature", "properties": { "Name": "Swan Lake", "Latitude": 48.46571279, "Longitude": -123.3738345 }, "geometry": { "type": "Point",
28      "coordinates": [ 472366.679330895422027, 5368131.230441669002175 ] } },
29     { "type": "Feature", "properties": { "Name": "Equimalt Park", "Latitude": 48.44578699, "Longitude": -123.4038815 }, "geometry": { "type": "Point",
30      "coordinates": [ 470133.876311512547545, 5365927.674945689737797 ] } },
31     { "type": "Feature", "properties": { "Name": "Elk/Beaver Lake", "Latitude": 48.52467723, "Longitude": -123.3920731 }, "geometry": { "type": "Point",
32      "coordinates": [ 471052.044112307543401, 5374692.177011045627296 ] } },
33     { "type": "Feature", "properties": { "Name": "Willows Beach", "Latitude": 48.43352245, "Longitude": -123.3040446 }, "geometry": { "type": "Point",
34      "coordinates": [ 477511.443523785448633, 5364530.287813624367118 ] } }
35   ]
36 }
```

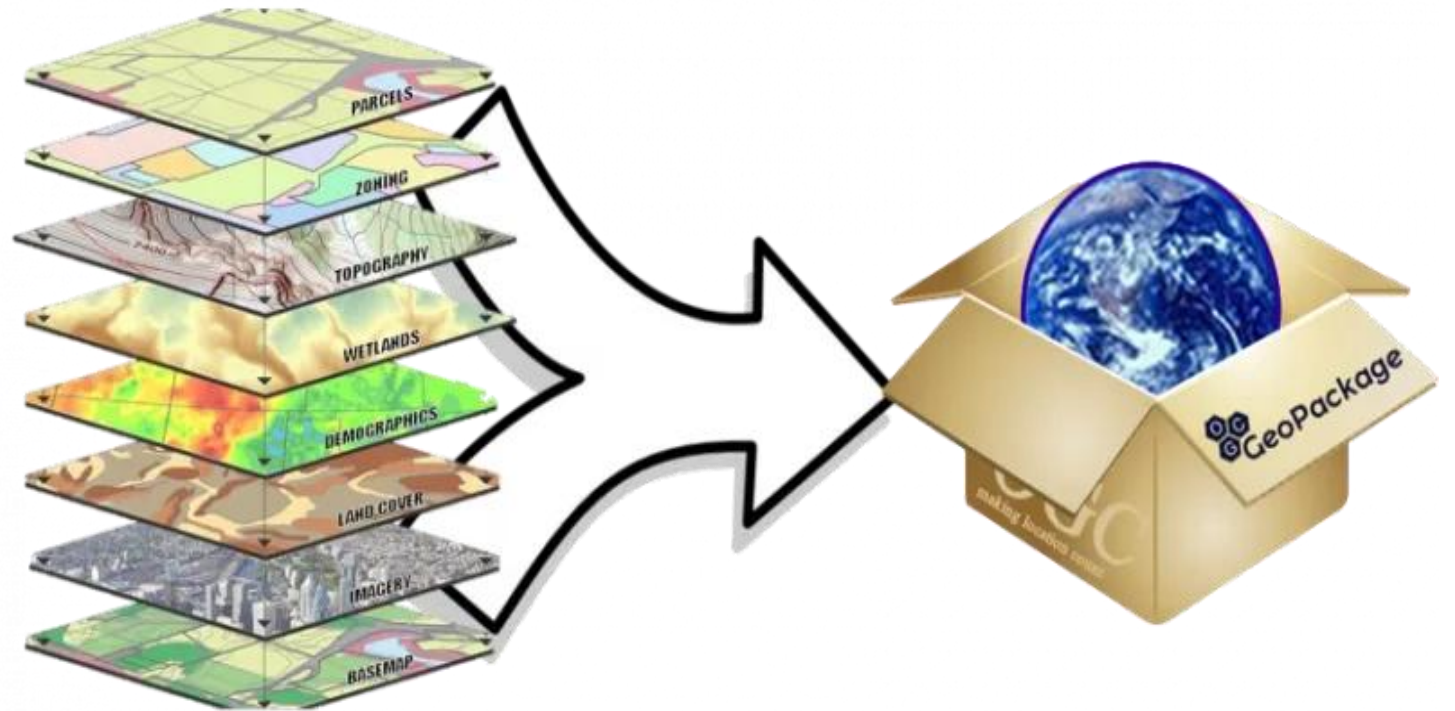
- ## **Remember column/field name limitations...**
- Maximum 10 characters
 - Can't begin with a number
 - No dashes - or slashes /

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Geopackage (.gpkg)

Geopackage

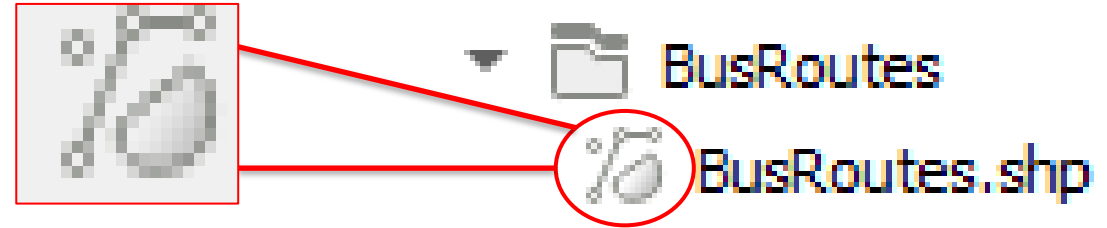
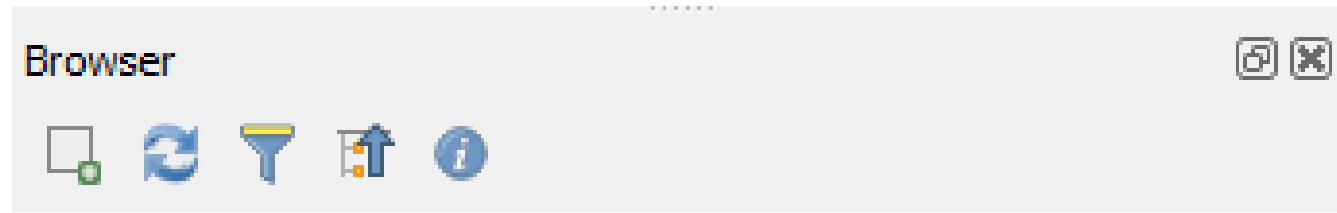
- File format that can hold multiple vector features (points, lines, polygons), tables, and rasters
 - All layers in one file (unlike shapefile; .shp, .dbf., .shx, etc.)
- Useful for large, complex datasets



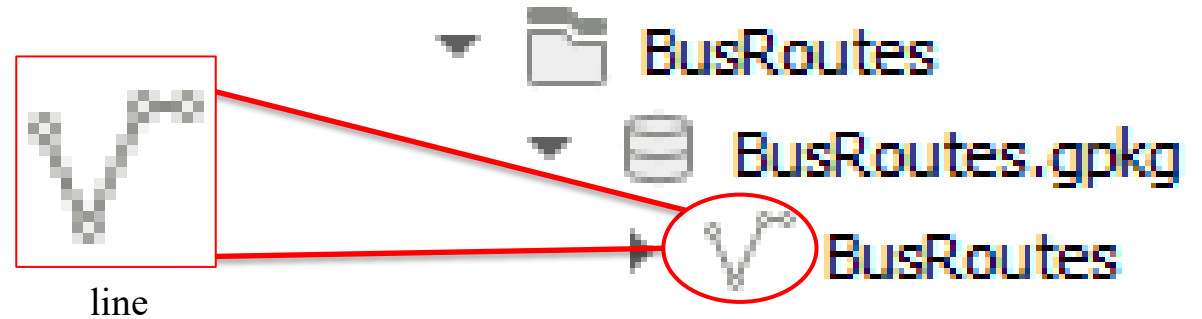
<https://ocad.com/blog/2023/01/geopackage-import-in-ocad/>

Note on geopackages and shapefiles...

When viewing shapefiles (.shp) in **QGIS Browser**, symbol is generic shapefile symbol →



When viewing geopackages (.gpkg) in **QGIS Browser**, symbol is specific to type of geometry (polygon, line, point, etc.) →

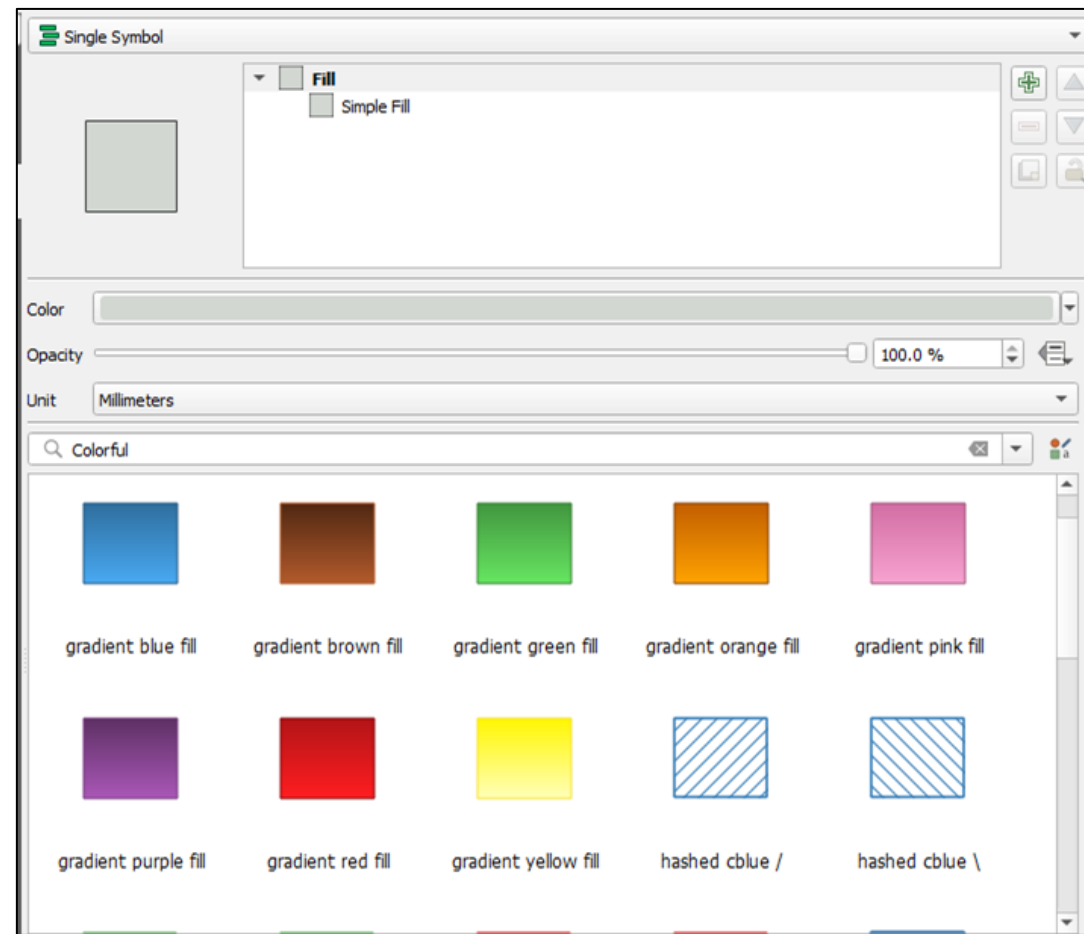
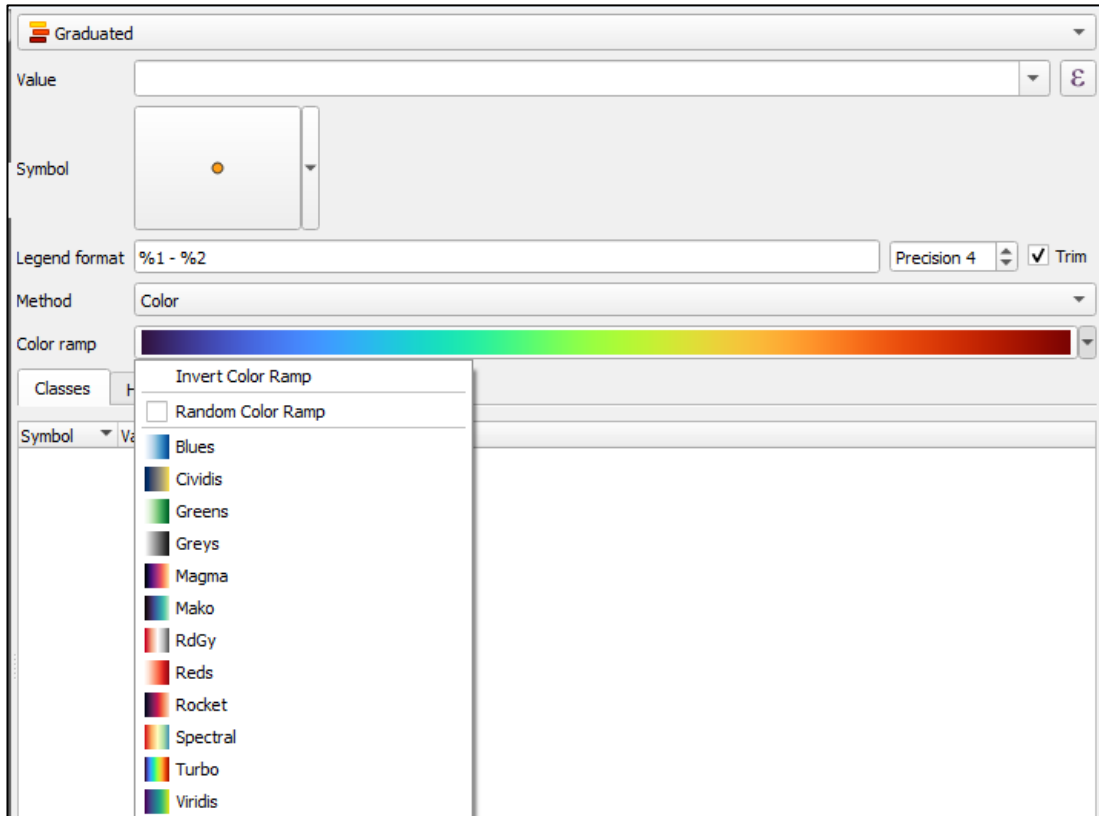


Important to consider when deciding whether to use shapefile or geopackage (e.g. project with many layers, similar file names, etc.)

If you have a choice to download data as a geopackage, do so, but not always an option...

Change vector symbology

- Almost endless options...
 - Colour, transparency, shape, size
 - symbol, labels, schemes



edit Vector data

- Can add and edit fields and features using the *Attribute Table* and *Field Calculator*

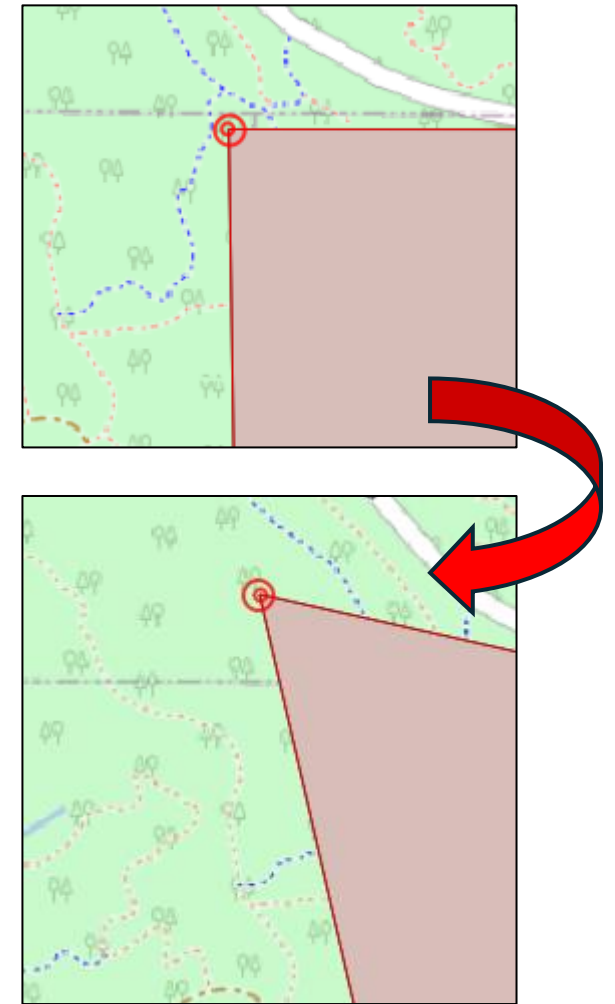
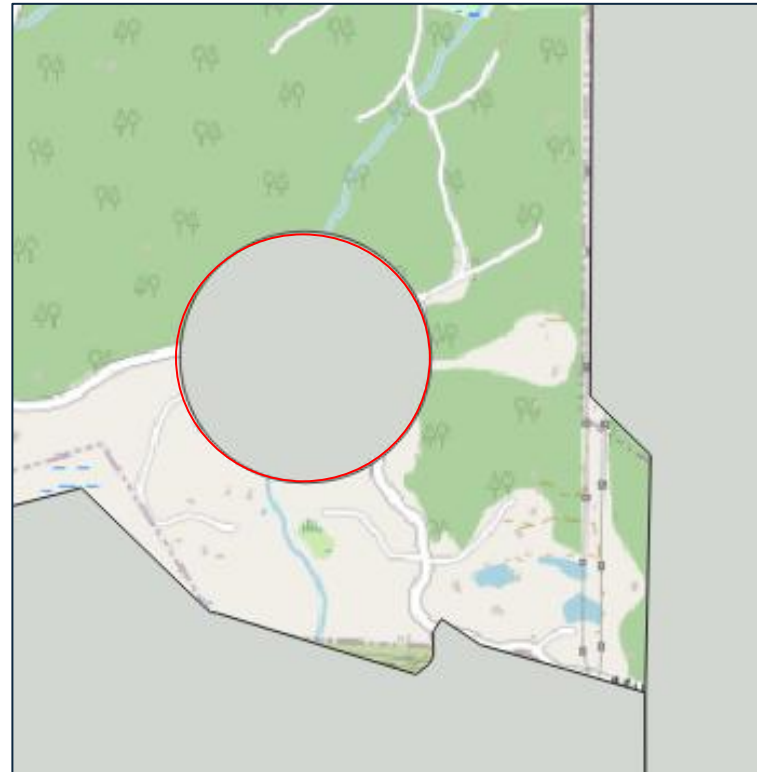
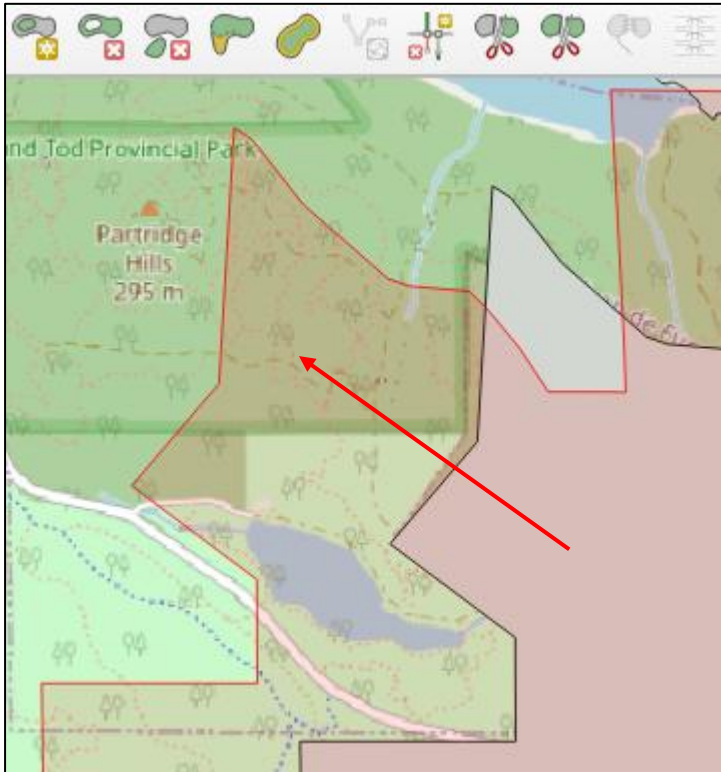
Fields

	OBJECTID	PERIMETER	MUNICIPALI	AREA_HA
1	1	11463.16770	North Saanich	697.812
2	2	14437.25741	North Saanich	530.520
3	3	10838.44985	North Saanich	130.229
4	4	649.69038	North Saanich	1.881
5	5	7885.21741	North Saanich	81.932

Features

edit Vector data

- Can edit vector geometry directly – **digitizing**
 - Move feature, move vertices, add parts, delete parts, split features, etc.
 - Create new lines, points, polygons



Could do all types of edits (add and calculate fields, move/add/delete points, lines, polygons) for any vector file type (.shp, .geojson, .gpkg)...

But for this exercise will only do one type of edit on each vector file type



Questions?

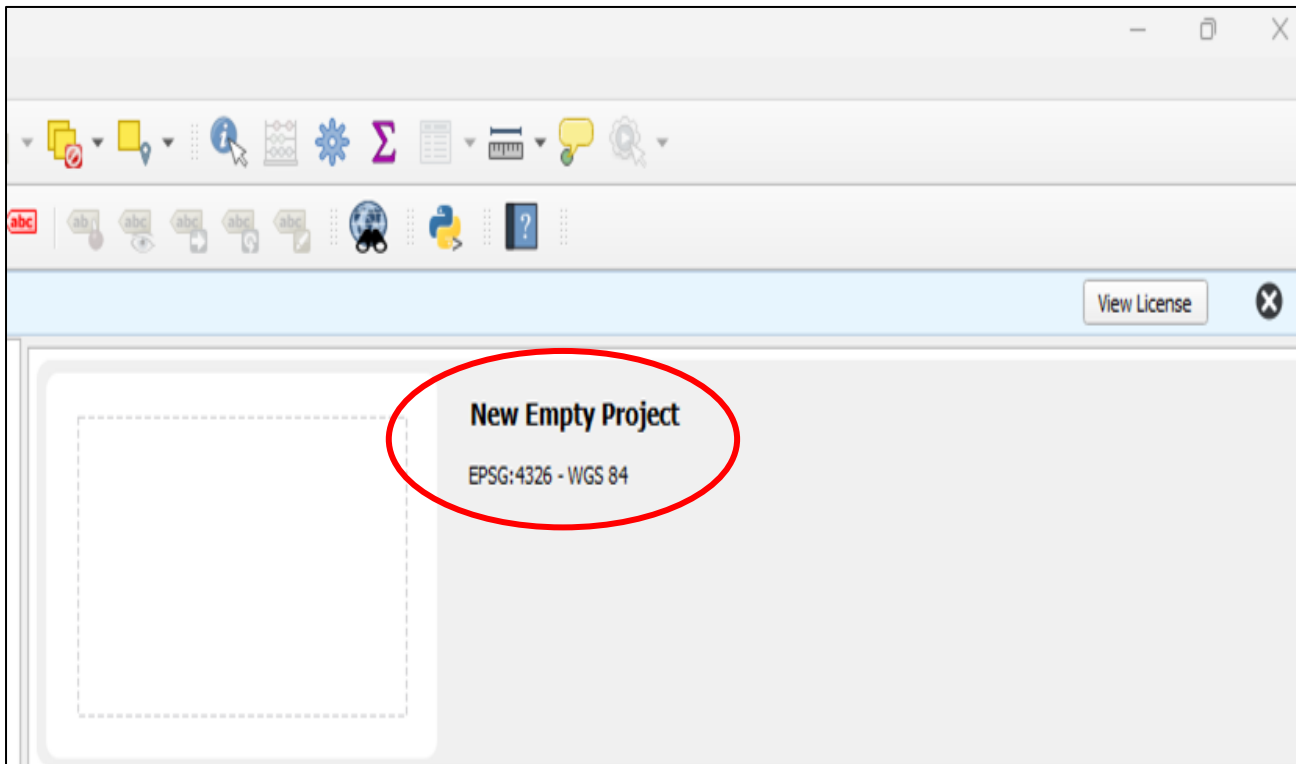
Start *QGIS*

Download workshop data

- Extract /unzip the .zip file
- Save it where you can find it...

Open **QGIS** (your version may be different)

- Double click on *New Empty Project*



Note: New *QGIS* projects open with Geographic Coordinate System (GCS) **EPSG:4326**

Understand *QGIS* interface



*your interface may look different

Menu Bar

Toolbar

Layers Panel

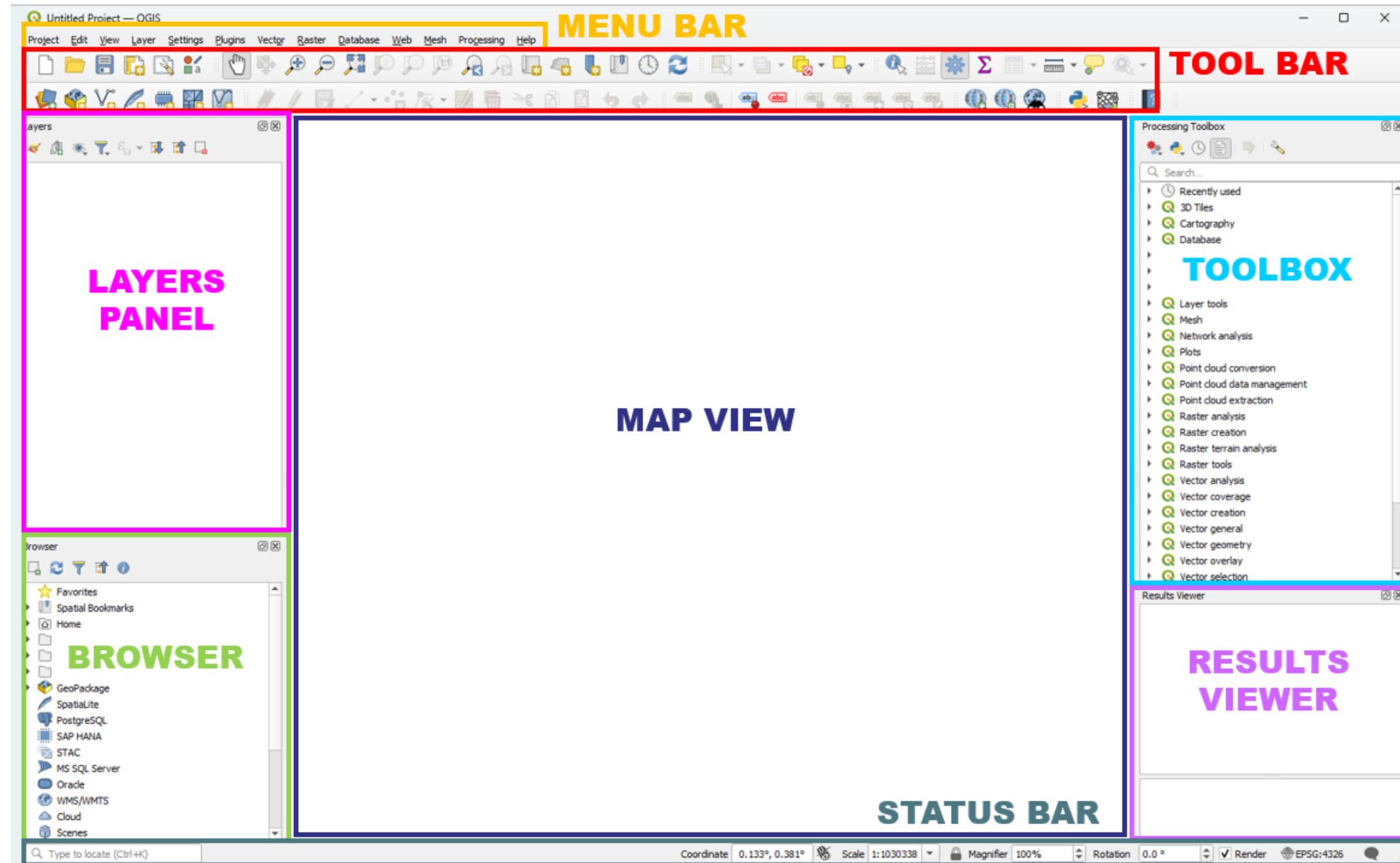
Map view

Browser

Toolbox

Status Bar

Results Viewer



Understand *QGIS* interface

Menu Bar:

Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh HCMGIS Processing Help

Horizontal bar at the top providing access to various functions and tools

(Project management, Edit, Plugins, Vector & Raster tools, etc.)

Toolbar:



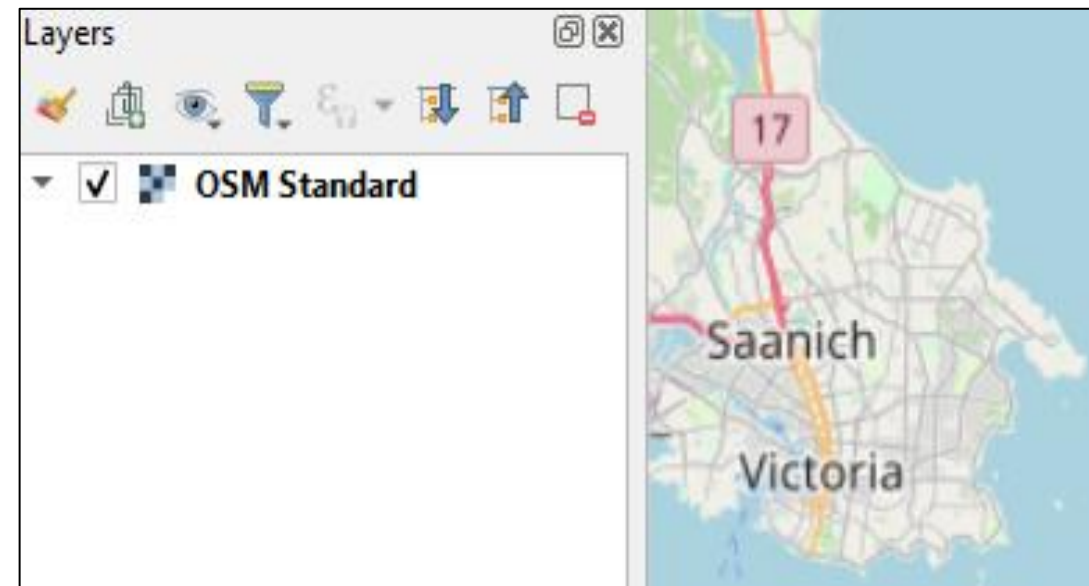
Contains icons for frequently used tools, such as Add Data, Pan, Zoom, Identify, etc.

Quick access to essential operations.

Layers Panel:

Displays all active **Layers** in the project.

Allows users to organize, manage visibility and access properties of layers



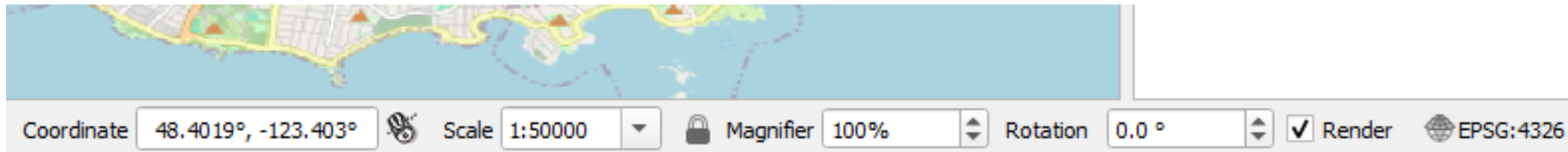
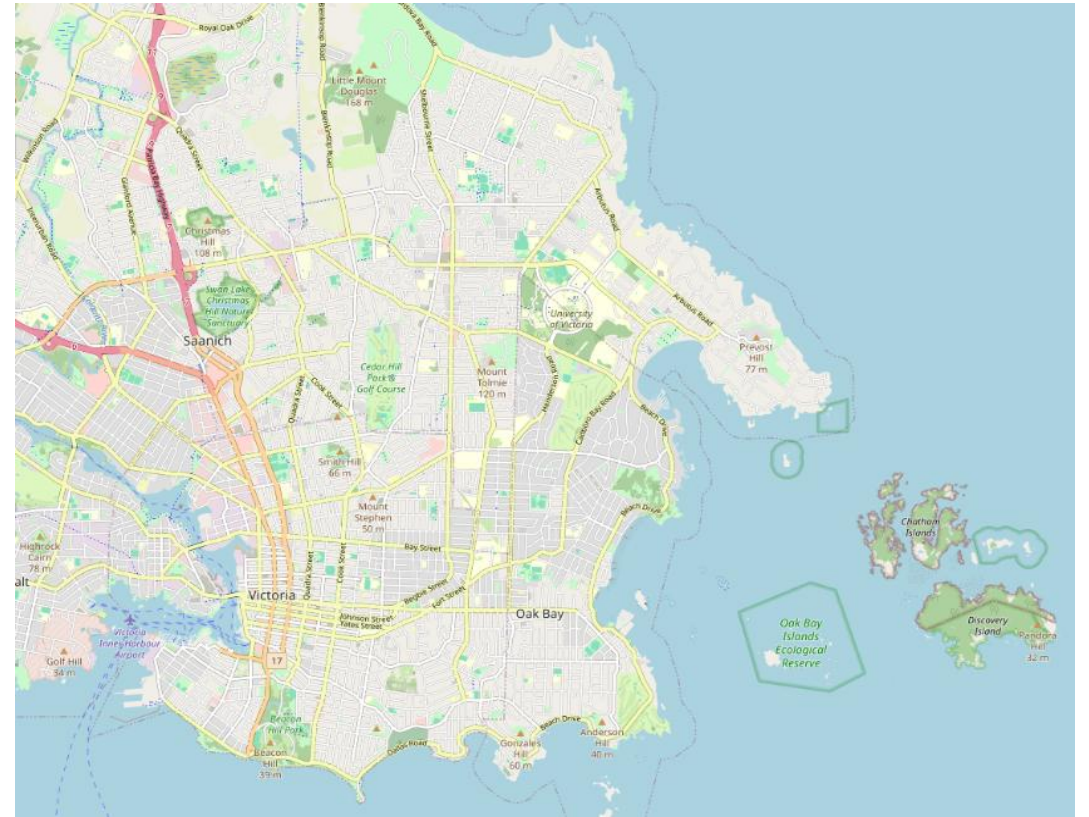
Understand *QGIS* interface

Map View:

The central area where spatial data is displayed.
Interact with the map, visualize layers
and analyze spatial relationships.

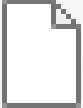
Status Bar:

Located at the bottom, it provides information about
current project: coordinate display, scale and CRS
settings.



Toolbar essentials

New project, open, and save



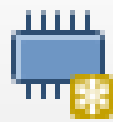
Pan



zoom

“zoom full”

Add data



Turn editing on/off



Add feature

Advanced Digitizing Toolbar

- Some vector feature editing requires the **Advanced Digitizing Toolbar** – we will open this toolbar in the exercise



Move feature

Delete part



Questions?



Proceed to **Workshop Exercise**

There are **Check-In** slides to **ask** for help
(or **ask** sooner!)

Resources going forward:



QGIS – additional resources:

- QGIS Training Manual: https://docs.qgis.org/3.40/en/docs/training_manual/index.html
- QGIS User Guide: https://docs.qgis.org/3.40/en/docs/user_manual/index.html
- QGIS Tutorials & Tips: <https://www.qgistutorials.com/>

Find data:

- GeoSpatial Data Guide: <http://libguides.uvic.ca/geospatialdata>

Questions or problems:

- UVic Geospatial Librarian (danielbm@uvic.ca) or YCW Geospatial Intern (gabriellewade@uvic.ca)

UVic full semester GIS courses in the Department of Geography:

- GEOG222 – Intro to Maps and GIS
- GEOG328 – GIS Analysis



GIS Skills and Mapping Micro-certificate

<https://continuingstudies.uvic.ca/science-and-the-environment/programs/gis-skills-and-mapping>