

# Environmental Analysis and Landscape Mapping

Landscape Architecture / Land Landscape Heritage

## TUTORIAL 2

### Working with historical maps in Qgis

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## Aims

In the first part of the tutorial the **Georeferencer tool** is introduced in QGIS. This plugin allows referencing raster to geographic or projected coordinate systems by creating a new Geo Tiff or by adding a world file to the existing image.

In the second part, it is illustrated how to create a new shapefile and how to use the **Toggle editing tool** through which it is possible to draw and trace new features from the georeferenced image.

To conclude, a preferred symbology is assigned to the new features and saved as a style.

### **The goals for this tutorial:**

- To learn how to use the Georeferencer tool
- To be able to create and edit new shapefiles
- To learn how to save a preferred layer symbology style

# Index

## Part 1) Georeferencer tool

- Add Base Map: *Openstreetmap*
- Raster: *Georeferencer*

## Part 2) Create and Edit a New Shapefile

- Create Layer: *New Shapefile Layer*
- Edit Layer: *Toggle Editing*
- Symbology: *Save Style*

## PART 1

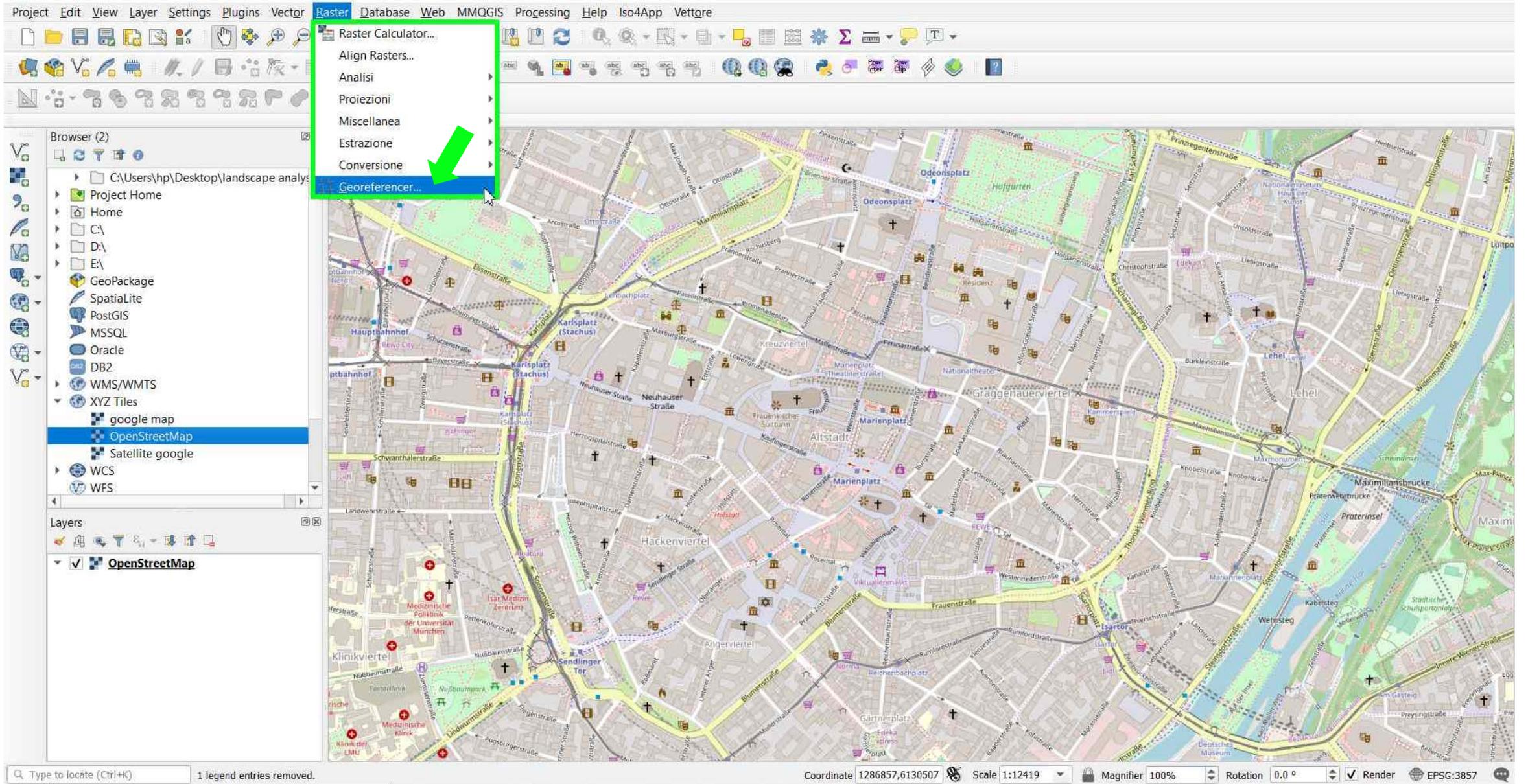
- **Add Base Map → Openstreetmap**
- **Raster → Georeferencer**

# ADD BASE MAP → Browser → XYZ Tiles → Openstreetmap

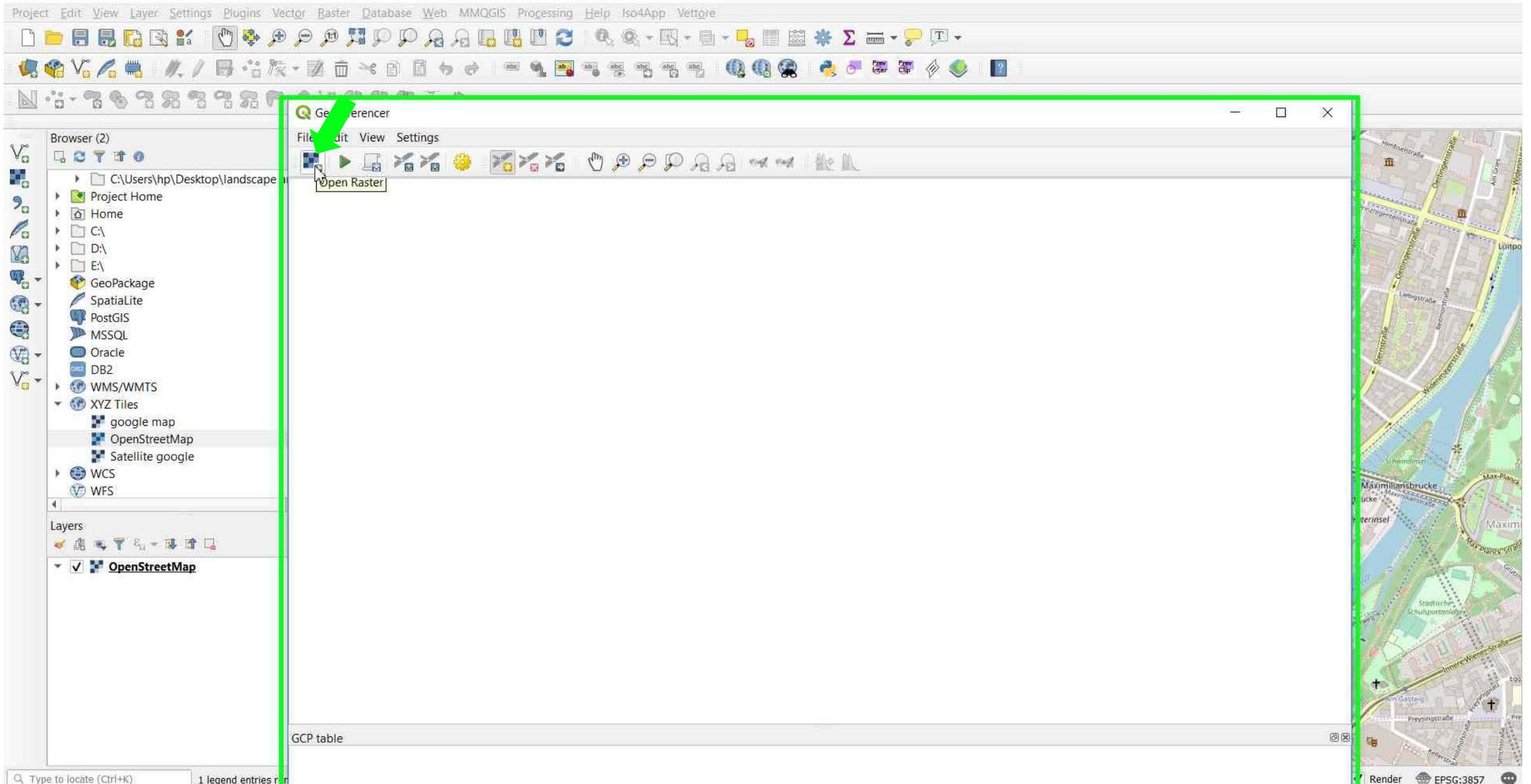
The screenshot displays the QGIS desktop environment. At the top, the menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu is a toolbar with various icons for file operations, navigation, and editing. The main window is divided into several panels:

- Browser (2):** Located on the left, it shows a tree view of the file system and network services. Under the 'XYZ Tiles' category, 'OpenStreetMap' is highlighted with a blue background and a green arrow pointing to it. Other visible items include 'google map', 'Satellite google', 'WCS', and 'WFS'.
- Layers:** Below the Browser panel, it shows a list of loaded layers. 'OpenStreetMap' is checked and listed as the active base map.
- Map View:** The central area displays a detailed street map of a city, likely Munich, showing buildings, roads, and green spaces. Labels for 'Karlplatz (Stachus)', 'Marienplatz', and 'Praterinsel' are visible.
- Status Bar:** At the bottom, it shows the current coordinate (1286857,6130507), scale (1:12419), magnifier (100%), rotation (0.0°), and projection (EPSG:3857).

# GEOREFERENCER → Raster → Georeferencer



## GEOREFERENCER → Open Raster

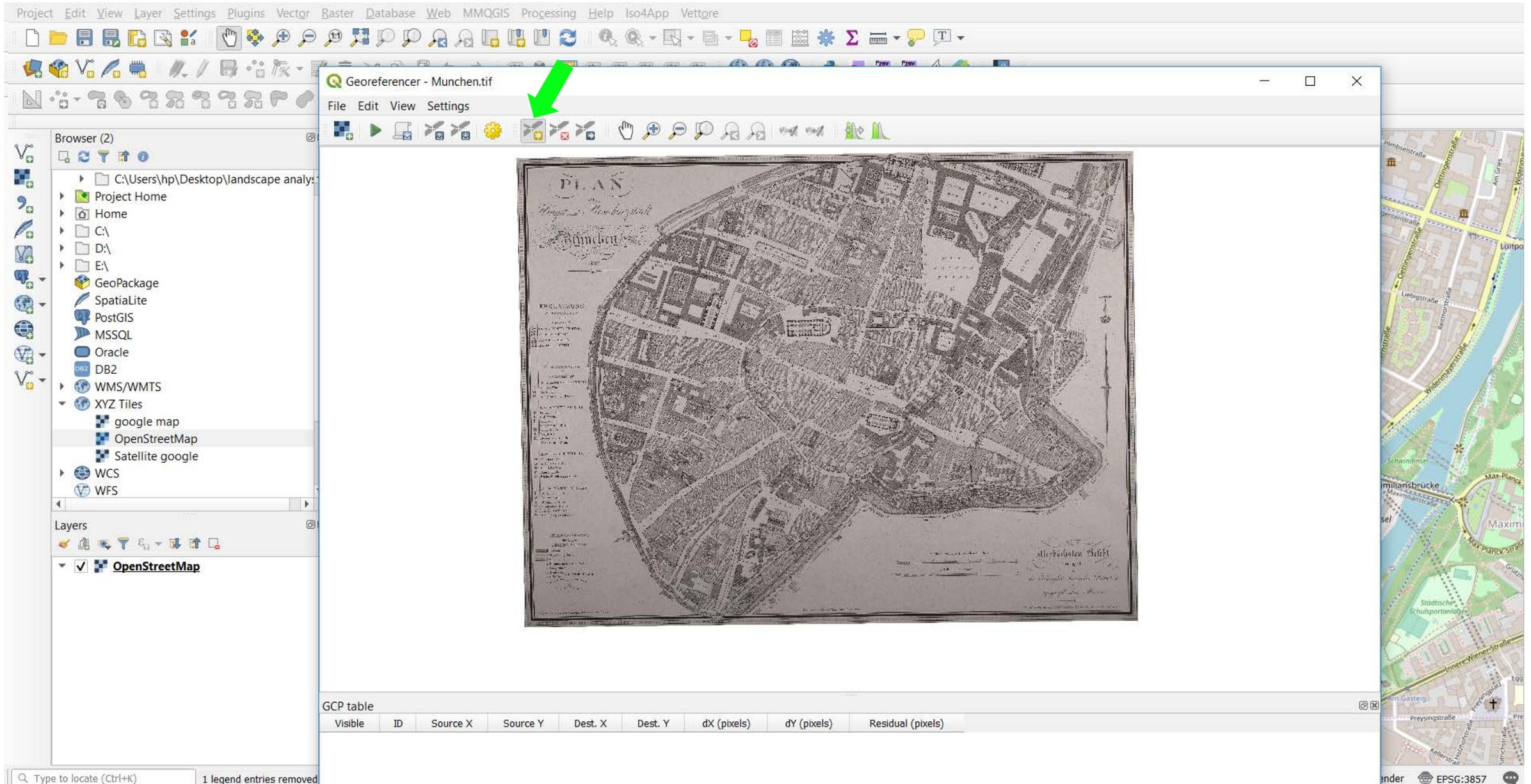


GEOREFENCER → Load the map to be georeferenced → Determine the first point in the map

The screenshot shows the QGIS Georeferencer interface. The main window displays a historical map of Munich, titled "PLAN" and "München". The map is being loaded into the Georeferencer window. The interface includes a menu bar (Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, Vettore), a toolbar, and a Browser panel on the left. The Browser panel shows the file system structure, including "C:\Users\hp\Desktop\landscape analysis", "Project Home", "Home", "C:\", "D:\", "E:\", "GeoPackage", "Spatialite", "PostGIS", "MSSQL", "Oracle", "DB2", "WMS/WMTS", "XYZ Tiles", "google map", "OpenStreetMap", "Satellite google", "WCS", and "WFS". The Layers panel shows "OpenStreetMap" selected. The Georeferencer window has its own menu bar (File, Edit, View, Settings) and toolbar. The GCP table at the bottom is empty.

Visible	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
---------	----	----------	----------	---------	---------	-------------	-------------	-------------------

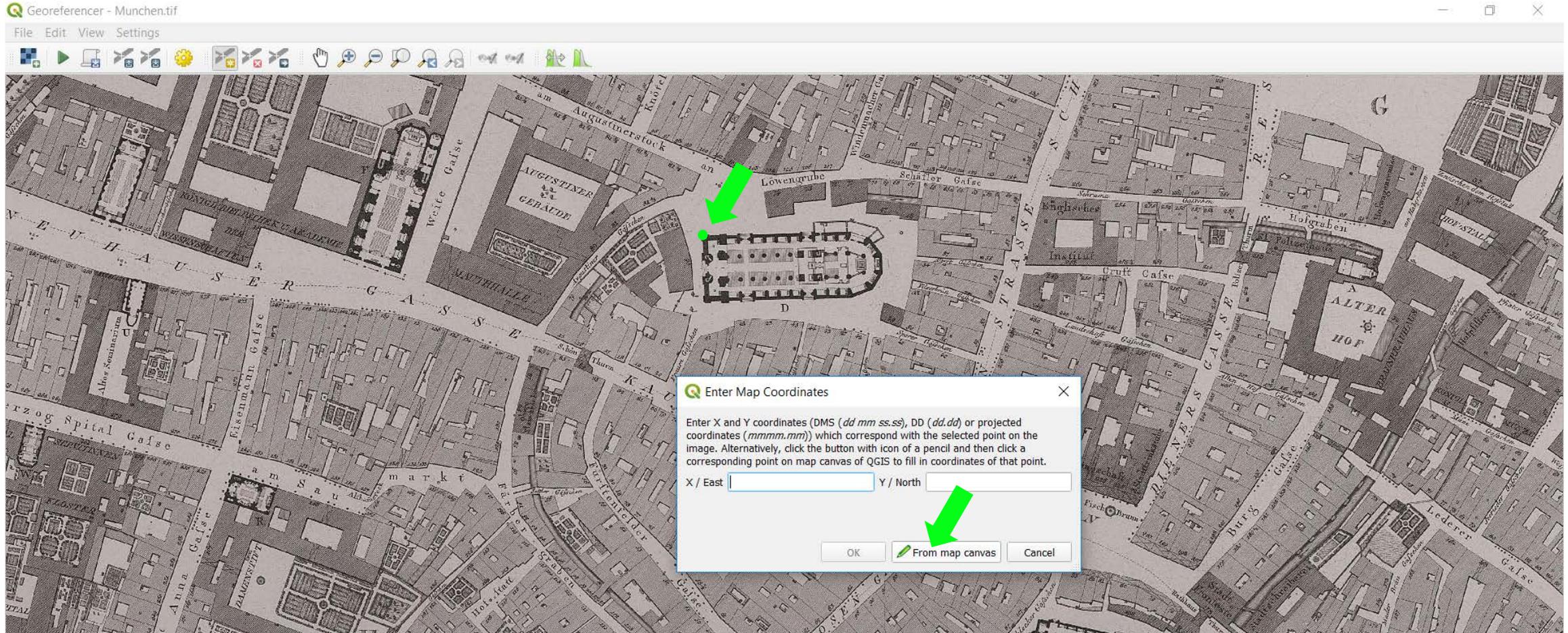
## GEOREFENCER → Add Point to determine first point in the map



The screenshot displays the QGIS Georeferencer interface. The main window, titled 'Georeferencer - Munchen.tif', shows a historical map of Munich on the left and a modern OpenStreetMap on the right. A green arrow points to the 'Add Point' button (represented by a crosshair icon) in the Georeferencer toolbar. The 'Layers' panel on the left shows 'OpenStreetMap' selected. The 'GCP table' at the bottom is empty.

Visible	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
---------	----	----------	----------	---------	---------	-------------	-------------	-------------------

# GEOREFENCER → Click to select a first point → Enter Map Coordinates → From map Canvas



GCP table

Visible	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
<input type="checkbox"/>	0	3103.61	-1943.71	1.28829e+06	6.12997e+06	0	0	0

# GEOREFERENCER → Determine first point in the basemap

The screenshot displays the QGIS desktop environment. At the top, the menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu is a comprehensive toolbar with icons for file operations, navigation, and editing. On the left side, the 'Browser (2)' panel shows a file tree with 'C:\Users\hp\Desktop\landscape analy...' expanded, listing various data sources like Project Home, Home, C:\, D:\, E:\, GeoPackage, Spatialite, PostGIS, MSSQL, Oracle, DB2, WMS/WMTS, XYZ Tiles (with sub-items for google map, OpenStreetMap, and Satellite google), WCS, and WFS. The 'Layers' panel below it shows 'OpenStreetMap' selected. The main map area displays a detailed street map of a city, likely Munich, with numerous buildings, streets, and landmarks. A prominent green arrow points to a specific location on the map, near the intersection of Augustinerstraße and Frauenplatz. The status bar at the bottom provides technical details: Coordinate 1288285.8,6129966.4, Scale 1:3105, Magnifier 100%, Rotation 0.0°, Render checked, and EPSG:3857.

# GEOREFENCER → Repeat the operation for N points

Georeferencer - Munchen.tif

File Edit View Settings

GCP table

Visible	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
✓	0	3106.01	-2124.18	1.28828e+06	6.12991e+06	0	0	0
✓	1	3986.65	-3110.07	1.28858e+06	6.12958e+06	0	0	0
✓	2	5116.5	-668.677	1.28895e+06	6.13039e+06	0	0	0
✓	3	2510.3	-4499.05	1.28809e+06	6.12913e+06	0	0	0
✓	4	1436.55	-3450.11	1.28774e+06	6.12947e+06	0	0	0
✓	5	1865.45	-2027.87	1.28788e+06	6.12994e+06	0	0	0
✓	6	2716.32	-1185.95	1.28816e+06	6.13023e+06	0	0	0

**GEOREFERENCE** → Transformation Settings to set up georeferencing parameters → Type: Helmert → Resampling method: Cubic

Georeferencer - Munchen.tif

File Edit View Settings

Transformation Settings

Transformation parameters

Transformation type: Helmert

Resampling method: Cubic

Target SRS: invalid projection

Output settings

Output raster: wetransfer-eb7761/Munchen\_modified.tif

Compression: None

Horizontal: 0.00000

Vertical: -1.00000

Reports

Generate PDF map

Generate PDF report

Load in QGIS when done

Visible	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual
✓	0	3106.01	-2124.18	1.28828e+06	6.12991e+06	-14.5373	-1.87189	
✓	1	3986.65	-3110.07	1.28858e+06	6.12958e+06	3.16953	9.75264	
✓	2	5116.5	-668.677	1.28895e+06	6.13039e+06	-0.240437	-7.12541	
✓	3	2510.3	-4499.05	1.28809e+06	6.12913e+06	-0.162197	8.96811	
✓	4	1436.55	-3450.11	1.28774e+06	6.12947e+06	4.14055	9.08817	9.98694
✓	5	1865.45	-2027.87	1.28788e+06	6.12994e+06	4.62741	5.88577	7.487
✓	6	2716.32	-1185.95	1.28816e+06	6.13023e+06	6.54046	-26.1412	26.947

Transform: Helmert Translation (1 28727e+06 6 13061e+06) Scale (0 328741 0 328741) Rotation: -0.252151 Mean error: 13.2549 -2697.0 None

# GEOREFERENCER → Press start Georeferencing

Georeferencer Munchen.tif

File Edit View Settings

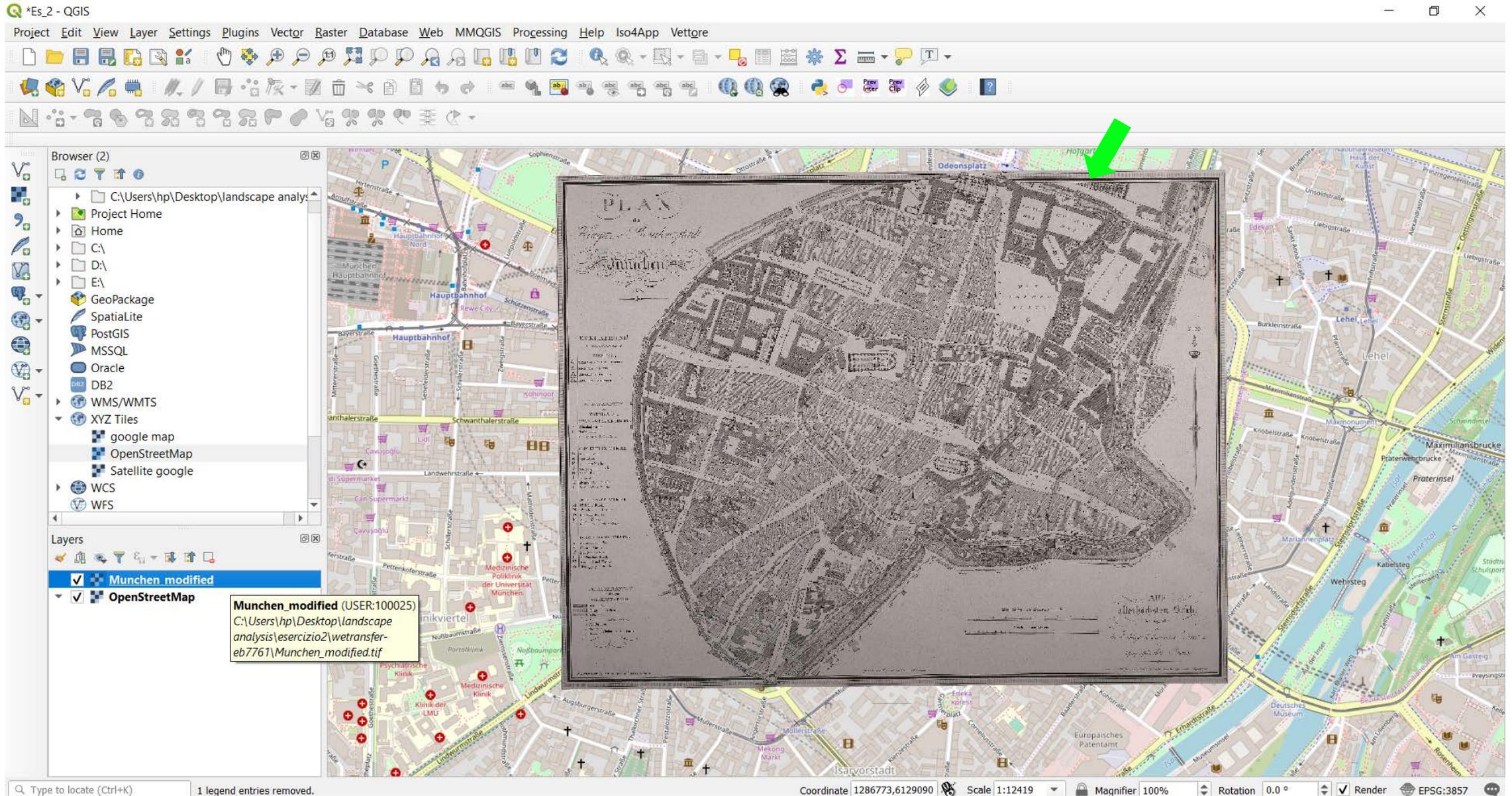
Start Georeferencing

Visible	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
✓	0	3106.01	-2124.18	1.28828e+06	6.12991e+06	-14.5373	-1.87189	14.6573
✓	1	3986.65	-3110.07	1.28858e+06	6.12958e+06	3.16953	9.75264	10.2548
✓	2	5116.5	-668.677	1.28895e+06	6.13039e+06	-0.240437	-7.12541	7.12946
✓	3	2510.3	-4499.05	1.28809e+06	6.12913e+06	-0.162197	8.96811	8.96958
✓	4	1436.55	-3450.11	1.28774e+06	6.12947e+06	4.14055	9.08817	9.98694
✓	5	1865.45	-2027.87	1.28788e+06	6.12994e+06	4.62741	5.88577	7.487
✓	6	2716.32	-1185.95	1.28816e+06	6.13023e+06	6.54046	-26.1412	26.947

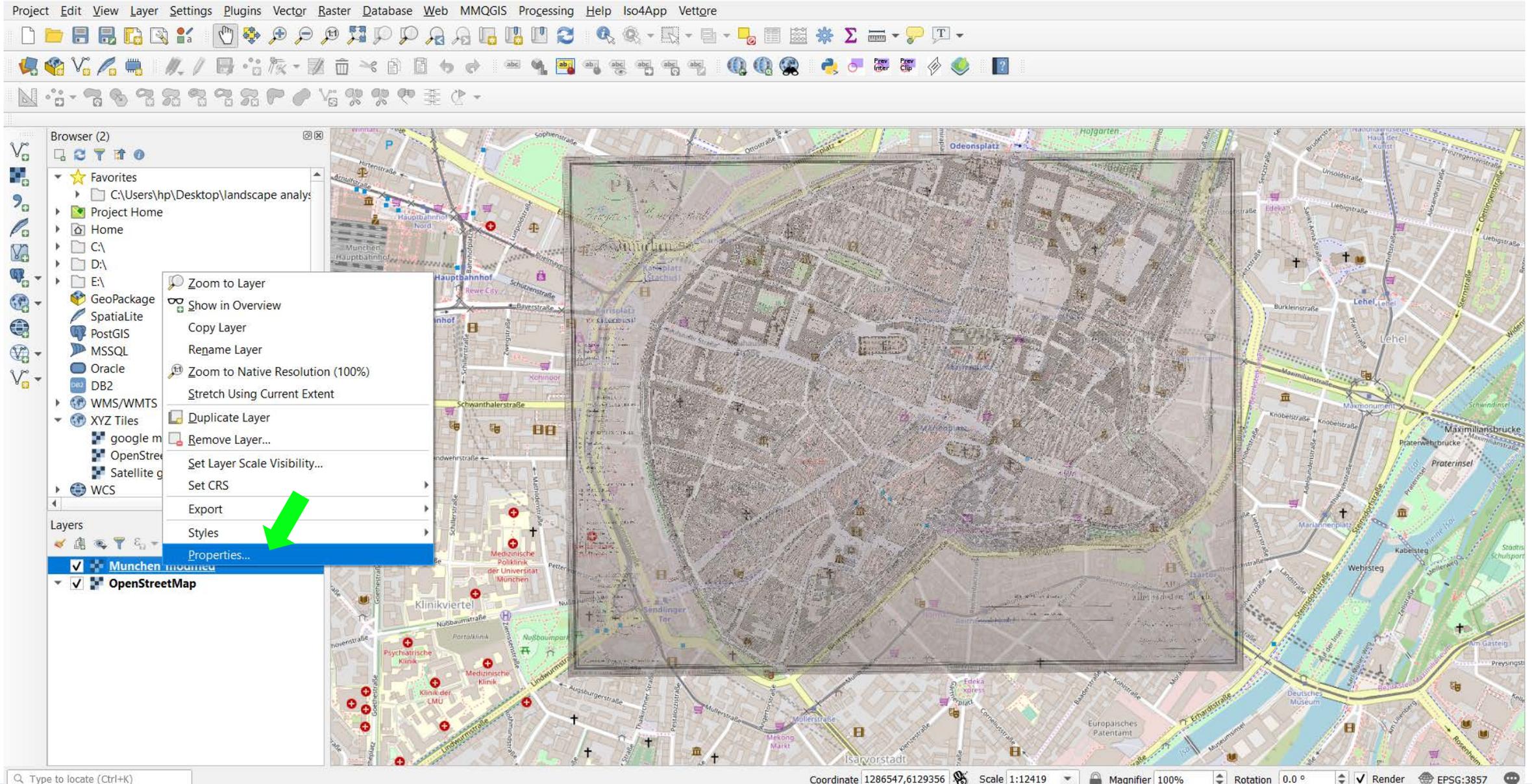
Start georeferencing

Transform: Helmert Translation (1.28727e+06, 6.13061e+06) Scale (0.328741, 0.328741) Rotation: -0.252151 Mean error: 13.2549, -1277, -106, None

# GEOREFERENCER → The map has been georeferenced making possible to use it as a map layer



# PYRAMIDS → Properties...



# PYRAMIDS → Select the resolutions and press OK

The screenshot shows the QGIS interface with the 'Layer Properties - Munchen\_modified | Pyramids' dialog box open. The dialog has a sidebar with tabs: Information, Source, Symbology, Transparency, Histogram, Rendering, Pyramids (selected), Metadata, Legend, and QGIS Server. The 'Pyramids' tab contains a 'Description' section with text explaining that large resolution raster layers can slow navigation and that building internal pyramids may alter the original data file. Below the description are two red warning notes. To the right is a 'Resolutions' list with six options: 3818 x 3075, 1909 x 1537, 955 x 769, 477 x 384, 239 x 192, and 60 x 48. The '3818 x 3075' option is highlighted in blue. At the bottom of the dialog, there are fields for 'Overview format' (set to 'External') and 'Resampling method' (set to 'Average'), along with a '0%' progress indicator and a 'Build Pyramids' button. At the very bottom are 'Style', 'OK', 'Cancel', 'Apply', and 'Help' buttons. A green arrow points to the 'OK' button. Another green arrow points to the '3818 x 3075' resolution option in the list. The background shows a map of Munich with various landmarks and streets.

**Layer Properties - Munchen\_modified | Pyramids**

**Description**

Large resolution raster layers can slow navigation in QGIS. By creating lower resolution copies of the data (pyramids) performance can be considerably improved as QGIS selects the most suitable resolution to use depending on the level of zoom. You must have write access in the directory where the original data is stored to build pyramids.

**Please note that building internal pyramids may alter the original data file and once created they cannot be removed!**

**Please note that building internal pyramids could corrupt your image - always make a backup of your data first!**

**Resolutions**

- 3818 x 3075
- 1909 x 1537
- 955 x 769
- 477 x 384
- 239 x 192
- 119 x 96
- 60 x 48

Overview format: External

Resampling method: Average

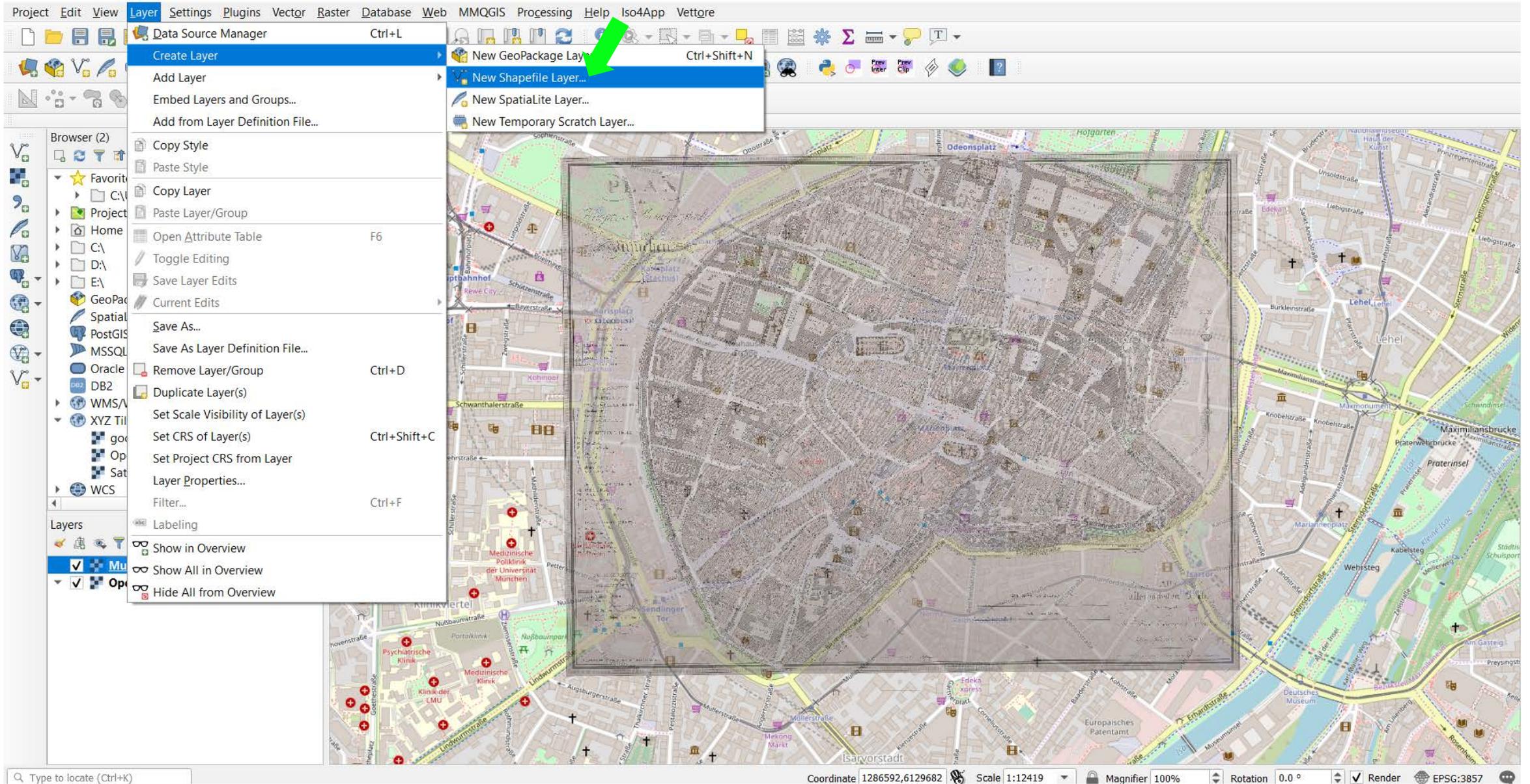
0% Build Pyramids

Style OK Cancel Apply Help

## PART 2

- **Create Layer → New Shapefile Layer**
- **Edit Features → Toggle Editing**
- **Symbology → Save Style**

# CREATE NEW SHAPEFILE → Layer → Create Layer → New Shape Layer...



CREATE NEW SHAPEFILE → Select the File name and the Geometry Type as Polygon → New Field with Text data Type → Add to Field List

The screenshot shows the 'New Shapefile Layer' dialog box in QGIS. The dialog is open over a map of Munich. The 'File name' field is set to 'C:\Users\hp\Desktop\landscape analysis\esercizio2\ELAB\Elab1.shp'. The 'File encoding' is set to 'UTF-8'. The 'Geometry type' is set to 'Polygon'. The 'New Field' section has 'Name' set to 'Name', 'Type' set to 'abc Text data', and 'Length' set to '80'. The 'Add to Fields List' button is highlighted with a green box. The 'Fields List' table is empty. The 'Remove Field' button is visible at the bottom right of the dialog. The background map shows a street grid and a river.

File name: C:\Users\hp\Desktop\landscape analysis\esercizio2\ELAB\Elab1.shp

File encoding: UTF-8

Geometry type: Polygon

Include Z dimension  Include M values

Project CRS: EPSG:3857 - WGS 84 / Pseudo-Mercator

**New Field**

Name: Name

Type: abc Text data

Length: 80 Precision:

**Fields List**

Name	Type	Length	Precision
id	Integer	10	

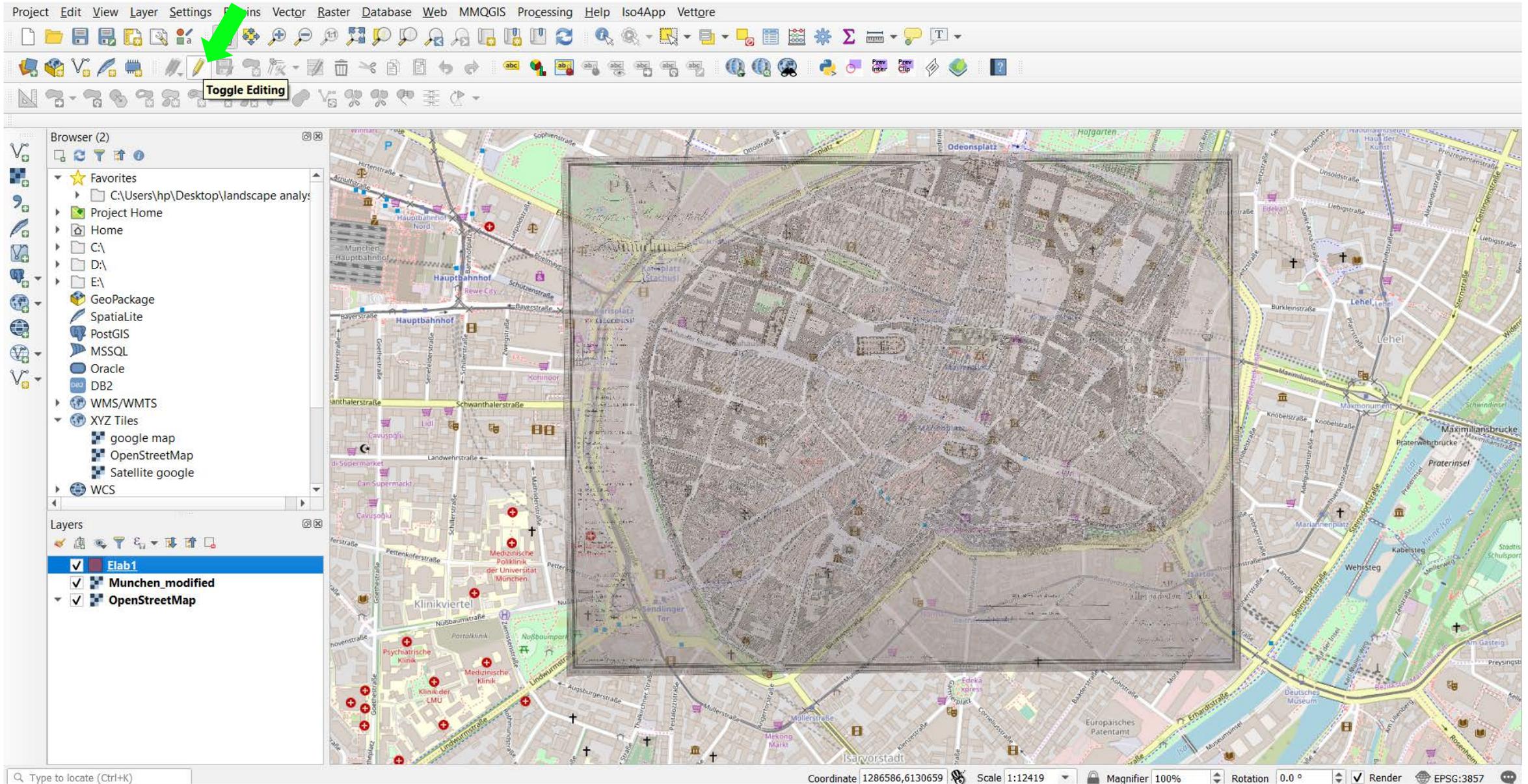
## CREATE NEW SHAPEFILE → New Field is added within the 'Fields list' → OK

The screenshot shows the 'New Shapefile Layer' dialog box in QGIS. The dialog is open over a map of a city area. The 'New Field' section contains a table with the following data:

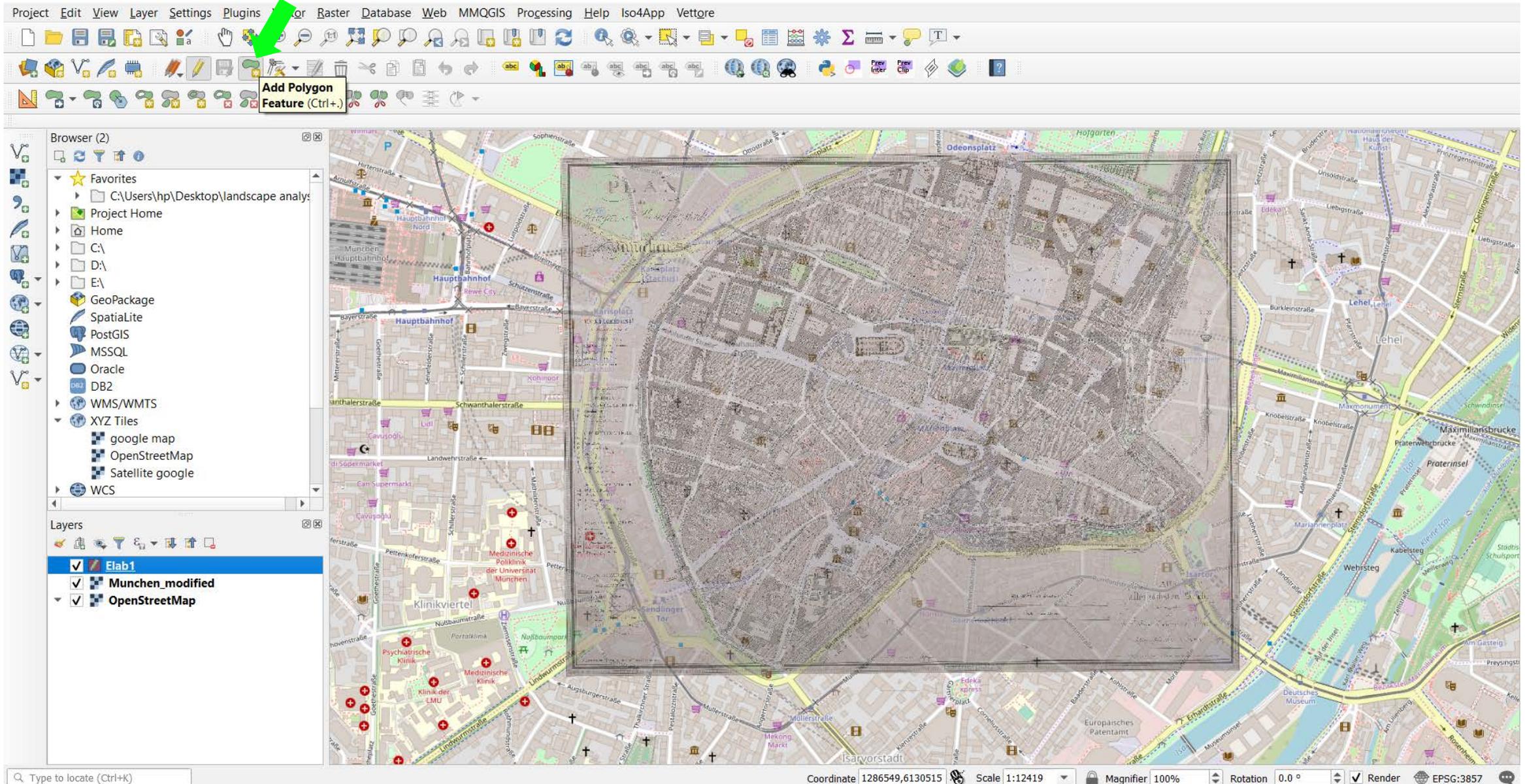
Name	Type	Length	Precision
id	Integer	10	
Name	String	80	

A green arrow points to the 'Length' column of the 'Name' field in the table. Another green arrow points to the 'OK' button at the bottom of the dialog.

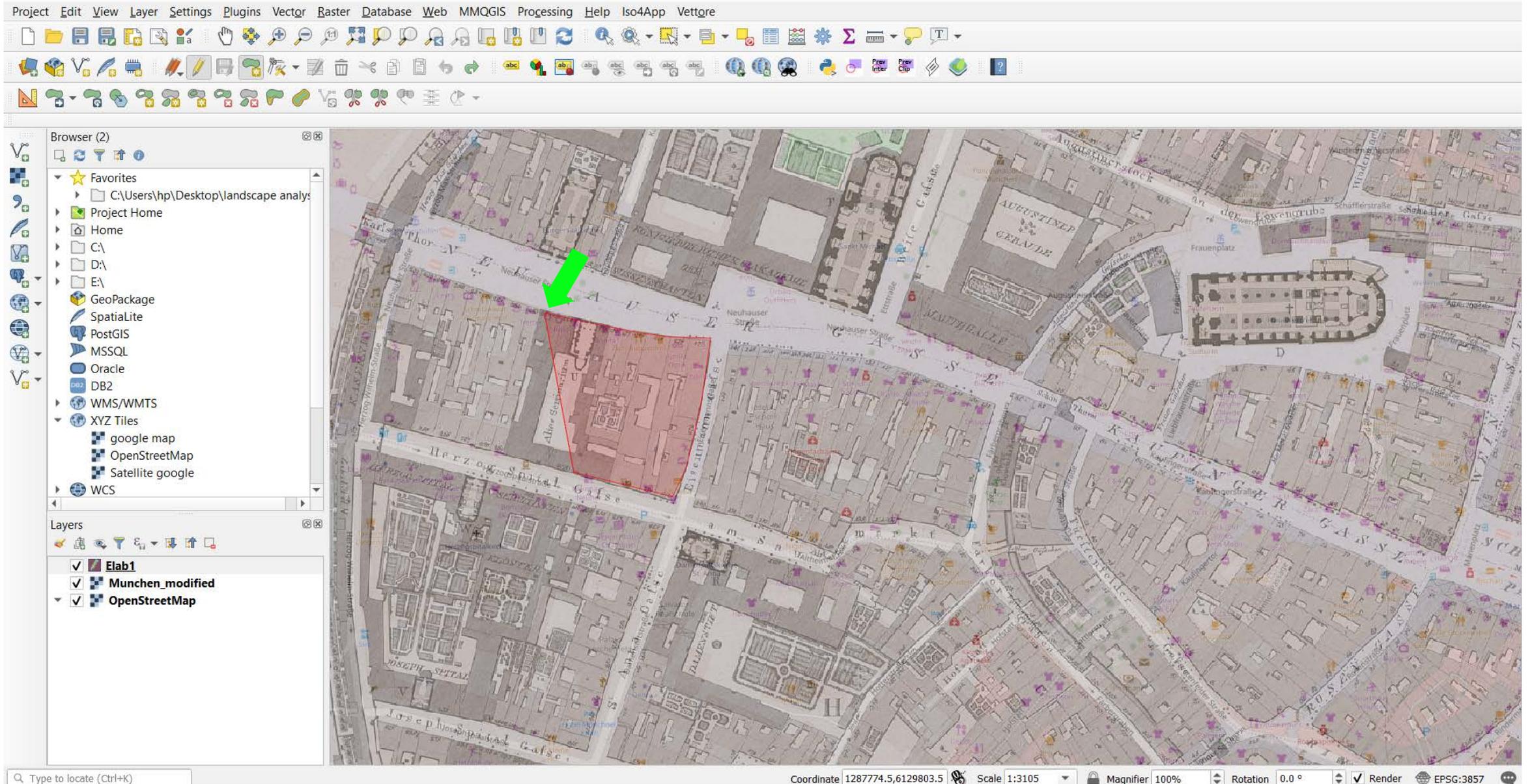
EDIT NEW SHAPEFILE → To add or edit features, select the **Toggle editing** button



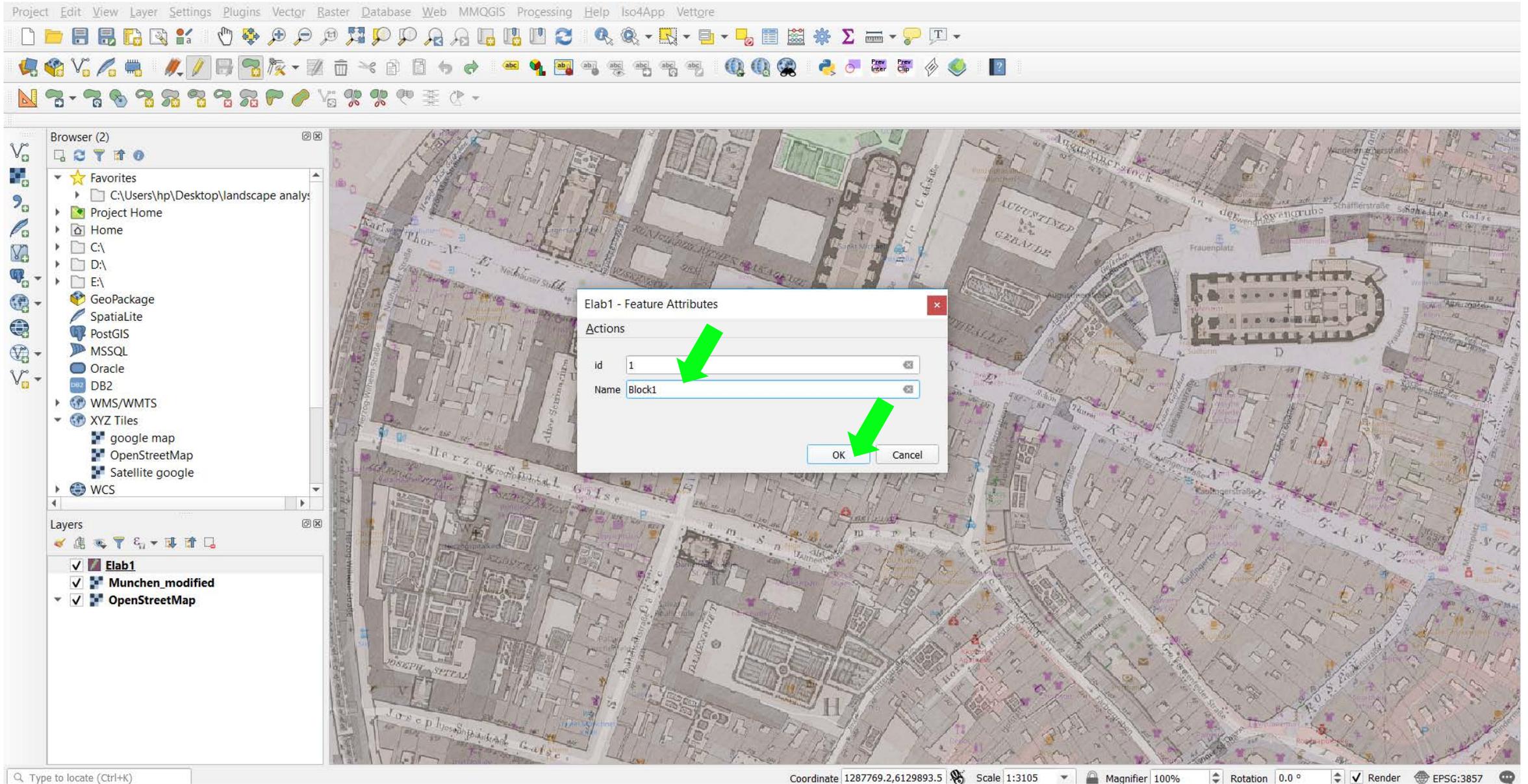
## EDIT NEW SHAPEFILE → Add polygon feature



**EDIT NEW SHAPEFILE** → Click a set of points to draw the polygon feature → Right click when the final point is reached to finish



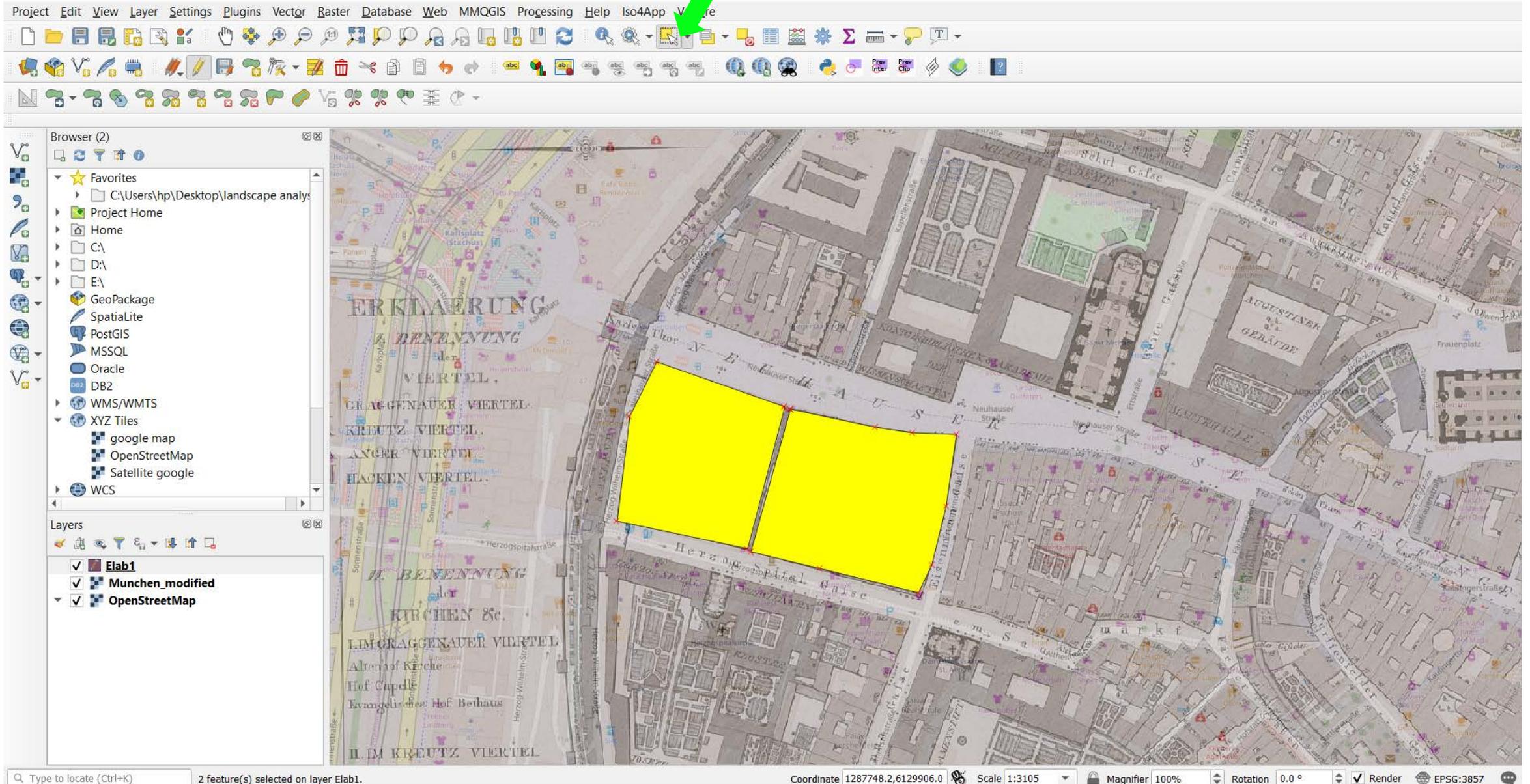
**EDIT NEW SHAPEFILE** → Choose a **name** for the features attribute → Es. *Block1* as we are tracing a block in the map



## EDIT NEW SHAPEFILE → Repeat the operation drawing another polygon feature → Attribute Name es. *Block2*

The screenshot displays the QGIS desktop environment. The main map window shows a street map of a city area with a red polygon highlighting a specific block. A dialog box titled "Elab1 - Feature Attributes" is open, showing the "id" field set to "2" and the "Name" field set to "Block2". Two green arrows point to these fields. The interface includes a menu bar at the top, a toolbar with various tools, a browser panel on the left showing file locations and data sources, and a layers panel at the bottom left showing the loaded layers: "Elab1", "Munchen\_modified", and "OpenStreetMap". The status bar at the bottom shows the coordinate (1287558.9, 6129964.5), scale (1:3105), magnifier (100%), rotation (0.0°), and projection (EPSG:3857).

# EDIT NEW SHAPEFILE → Select features by area or single click → Press to select both features



## EDIT NEW SHAPEFILE → Edit from the toolbar → Merge Selected Features

The screenshot displays the QGIS desktop environment. The top menu bar includes 'Project', 'Edit', 'View', 'Layer', 'Settings', 'Plugins', 'Vector', 'Raster', 'Database', 'Web', 'MMQGIS', 'Processing', 'Help', 'Iso4App', and 'Vettore'. The 'Edit' menu is open, showing various editing tools. A green arrow points to the 'Merge Selected Features' option, which is highlighted in blue. The main map area shows a street map with two yellow polygons selected. The status bar at the bottom indicates the coordinate system (EPSG:3857), scale (1:3105), and other settings.

Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help Iso4App Vettore

Undo Ctrl+Z  
Redo Ctrl+Shift+Z  
Cut Features Ctrl+X  
Copy Features Ctrl+C  
Paste Features Ctrl+V  
Paste Features As  
Select  
Add Polygon Feature Ctrl+.  
Add Circular String  
Add Circular String by Radius  
Add Circle  
Add Rectangle  
Add Regular Polygon  
Add Ellipse  
Move Feature(s)  
Copy and Move Feature(s)  
Delete Selected  
Modify Attributes of Selected Features  
Rotate Feature(s)  
Simplify Feature  
Add Ring  
Add Part  
Fill Ring  
Delete Ring  
Delete Part  
Reshape Features  
Offset Curve  
Split Features  
Split Parts  
Merge Selected Features  
Merge Attributes of Selected Features  
Vertex Tool (All Layers)  
Rotate Point Symbols  
Offset Point Symbol

Coordinate 1287380.2,6130042.7 Scale 1:3105 Magnifier 100% Rotation 0.0° Render EPSG:3857

# EDIT NEW SHAPEFILE → In the Merge Selected Attributes window select **merge** → OK

Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help Iso4App Vettore

Browser (2)

- Favorites
- C:\Users\hp\Desktop\landscape analys
- Project Home
- Home
- C:\
- D:\
- E:\
- GeoPackage
- Spatialite
- PostGIS
- MSSQL
- Oracle
- DB2
- WMS/WMTS
- XYZ Tiles
- google map
- OpenStreetMap
- Satellite google
- WCS

Layers

- Elab1
- Munchen\_modified
- OpenStreetMap

2 feature(s) selected on layer Elab1.

Coordinate 1287387.4,6129845.5 Scale 1:3105 Magnifier 100% Rotation 0.0 ° Render EPSG:3857

id		Name
Id	Feature -5	Feature -5
-5		Block2
-3		Block1
<b>Merge 2</b>		<b>Block2</b>

Take attributes from selected feature  
Skip all fields  
Remove feature from selection

OK Cancel

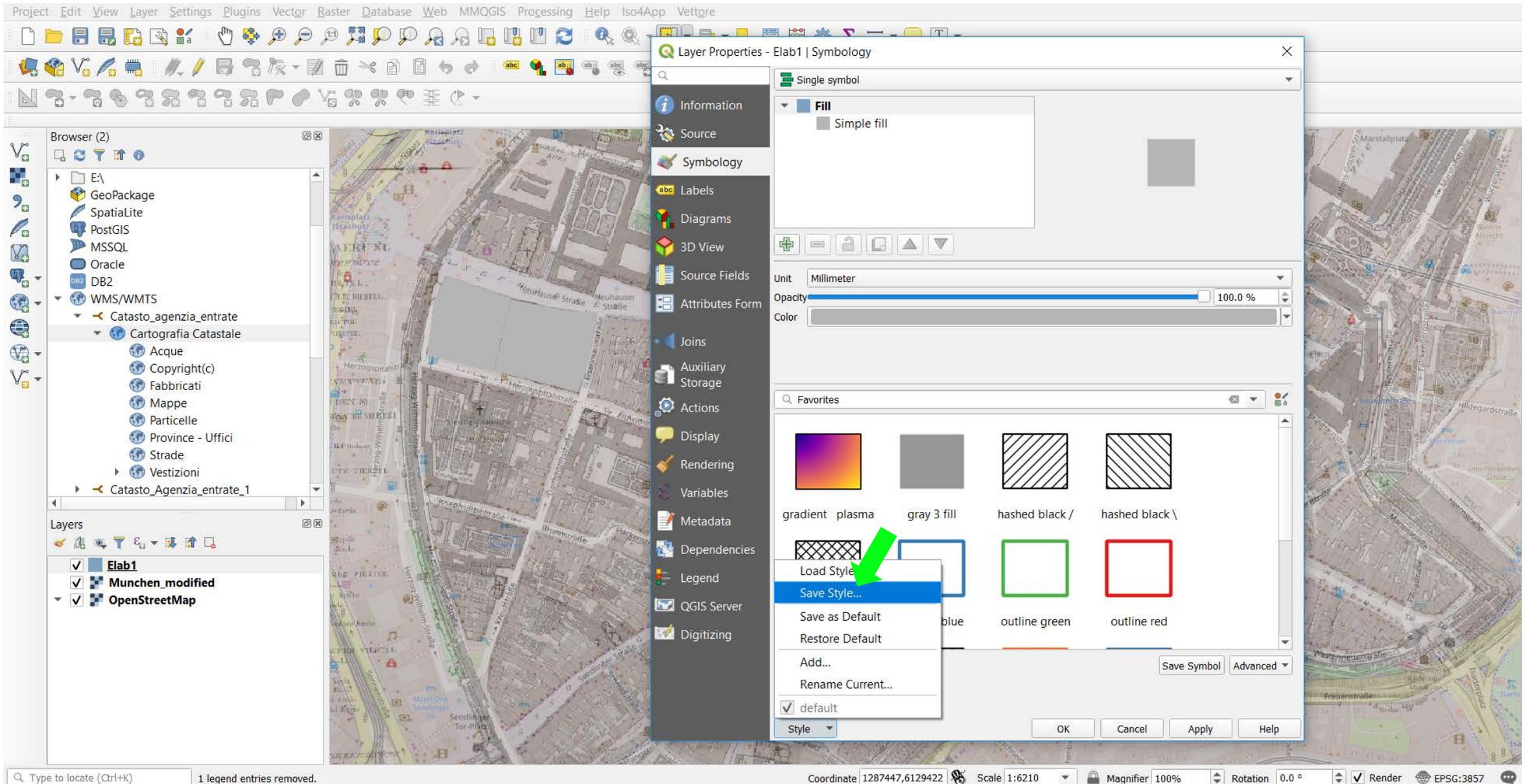
## EDIT NEW SHAPEFILE → Activate the **Vertex** tool to modify the polygon vertices

The screenshot displays the QGIS desktop environment. At the top, the menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Master, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu bar is a toolbar with various icons; a green arrow points to the Vertex tool icon. The main map window shows a grayscale street map of a city area with several red polygons overlaid. A second green arrow points to one of the vertices of these polygons. On the left side, the Browser panel shows a file tree with 'Favorites' and 'Layers' sections. The 'Layers' section is active, showing 'Elab1' (checked), 'Munchen\_modified' (checked), and 'OpenStreetMap' (checked). The status bar at the bottom indicates '2 feature(s) selected on layer Elab1', 'Coordinate 1287415.0,6130166.9', 'Scale 1:3105', 'Magnifier 100%', 'Rotation 0.0 °', 'Render', and 'EPSG:3857'.

## EDIT NEW SHAPEFILE → Select and move the vertices to modify

The screenshot displays the QGIS desktop environment. At the top, the menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu is a comprehensive toolbar with icons for file operations, navigation, editing, and analysis. On the left side, there are two panels: 'Browser (2)' and 'Layers'. The 'Browser' panel shows a file tree with folders like 'Favorites', 'Project Home', 'Home', and 'GeoPackage', along with various data sources like 'google map', 'OpenStreetMap', and 'Satellite google'. The 'Layers' panel shows three layers: 'Elab1', 'Munchen\_modified', and 'OpenStreetMap', all of which are checked. The main map area shows a grayscale street map of a city. A red polygon is overlaid on the map, representing a selected area. Two green arrows point to the top and bottom vertices of this polygon, indicating the process of selecting and moving them for modification. The map includes street names such as 'Thor-Neuhäuser Straße', 'Herzogspital Gasse', 'Eisenmann Gasse', and 'Herzogspital'. The status bar at the bottom provides technical details: 'Coordinate 1287753.1,6129947.1', 'Scale 1:1552', 'Magnifier 100%', 'Rotation 0.0 °', 'Render', and 'EPSG:3857'. A message in the bottom left corner states 'Validation finished (2 error(s) found)'.

**SAVE LAYER SYMBOLOGY** → Choose a preferred symbology for the new vector layer → **Save style...**



## SAVE LAYER SYMBOLOGY → Press the 'Save Style' window and select **As SLD style file**

The screenshot displays the QGIS software interface. The main window is titled 'Layer Properties - Elab1 | Symbology'. A 'Save Layer Style' dialog box is open in the foreground, with a green arrow pointing to the 'As SLD style file' option in the 'File' section. The 'Save style' dropdown is set to 'As QGIS QML style'. The 'File' section has 'As SLD style file' selected. The 'Categories' section lists various symbology options, all of which are checked. The background shows a map with a red polygon and a layer list on the left.

**Save Layer Style**

Save style: As QGIS QML style

File: As SLD style file

Categories:

- Layer Configuration
- Symbology
- 3D Symbology
- Labels
- Fields
- Forms
- Actions
- Map Tips
- Diagrams
- Attribute Table Settings
- Rendering
- Custom Properties
- Geometry Options

OK Cancel Help

SAVE EDITS → Remember to save by clicking again on the Toggle editing button

