



# SPACE SYNTAX TOOLKIT FOR QGIS

## INTRODUCTION AND RECENT DEVELOPMENTS

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Stephen Law  
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Space Syntax Limited - Open Digital Works

11<sup>th</sup> International Space Syntax Symposium  
Fundação Calouste Gulbenkian, Lisbon  
3<sup>rd</sup> July 2017

# Introduction

## Who we are

### **Jorge Gil** MSc, PhD

Researcher UCL, Chalmers, TU Delft

Open Source GIS consultant and developer

*Author ‘Space Syntax Toolkit’ for QGIS (2013 - )*

*Author ‘Confeego’ for MapInfo (2004 - 09)*

### **Stephen Law** MSc, PhD

Researcher Turing Institute, UCL

Associate, Space Syntax Limited

### **Ioanna Kolovou** MRes

Consultant, Space Syntax Limited

### **Abhimanyu Acharya** MSc

Associate, Space Syntax Limited

# Introduction

Screenshot of the GitHub organization page for Space Syntax Limited.

**SpaceGroupUCL / qgisSpaceSyntaxToolkit**

Unwatch 11 Star 24 Fork 11

Code Issues 51 Pull requests 0 Projects 0 Wiki Insights

Space Syntax Toolkit for QGIS

162 commits 6 branches 13 releases 2 contributors GPL-3.0

Branches This organization Search Pull requests Issues Marketplace Gist

**Space Syntax Limited**

Original technology that forecasts the impacts of planning, transport, economic and design decisions on people and property for all scales of development

London http://www.spacesyntax.... london@spacesyntax.com

Repositories People 1

Pinned repositories

- Rcl-simplification-**  
QGIS plug-in to simplify a road centre line for angular segment analysis  
Python
- UrbanDataInputTool**  
Urban Data Input Tool for QGIS  
Python
- GateTransformer**  
Gate Transformer QGIS plugin  
Python
- SSS11-workshop**  
Material for the 11th Space Syntax Symposium workshop
- MetricCatchmentAnalyser**  
Network based metric catchment analysis  
Python
- Rcl-topology-cleaner**  
Python



Ioanna  
Anafi



booboo  
booboo18



\W/A\double-u-a



Jorge Gil  
jorgegil



Laurens Versluis  
laurensversluis



Abhimanyu Acharya  
Morri1234

## Introduction

**Who are you?**

Name and affiliation

## Introduction

### Who are you?

	Yes / Some	No
space syntax	5	1
depthmapX	4	2
QGIS	1	5
GIS	3	2

Note: based on 6 participant's responses.

# Introduction

## Objectives

Learn how to use the 'Space Syntax Toolkit' (SST) for QGIS

Learn about its latest features and tools

Explore various space syntax analysis workflows in QGIS

## Main objective is not to...

Learn about space syntax theory and methods

Learn about the depthmapX software

Learn about specific space syntax applications in research

## Introduction

### Requirements

Participants must bring their own laptops in order to carry out the practical exercises, with the necessary software pre-installed:

QGIS 2.14 LTR (or higher):

<http://qgis.org/en/site/forusers/download.html>

depthmapXnet 0.35:

<http://archtech.gr/varoudis/depthmapX/?dir=depthmapXnet>

Space Syntax Toolkit:

<https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit/wiki/Installation>

# Introduction

## Programme

09:30	Introduction to the workshop
09:45	Overview of space syntax and the SST project
10:00	Task 1: Preparing and analysing axial models
<b>11:00</b>	<b>Break</b>
11:45	Task 2: Preparing and analysing road centre line models
12:30	Visualisation and discussion of the results
<b>13:00</b>	<b>Lunch Break</b>
14:00	Task 3: Preparing other urban data layers
15:00	Task 4: Connecting and analysing the various results
16:00	Discussion on QGIS methods for space syntax research
<b>16:30</b>	<b>Close</b>

## Overview

### **Space syntax theory and the SST project**

- Overview of relevant space syntax concepts
- Overview of the SST project
- SST installation in QGIS and downloading the sample data set

# Space syntax theory

## Relevant space syntax concepts

- Representing space: axial maps and unlinks
- Topology of space: graphs and centrality analysis
- Segment maps and angular centrality analysis
- Radius and distances

# Space syntax theory

## Representing space: axial maps and unlinks

The axial map is a linear representation of space, with the fewest longest set of straight lines that covers all spaces.



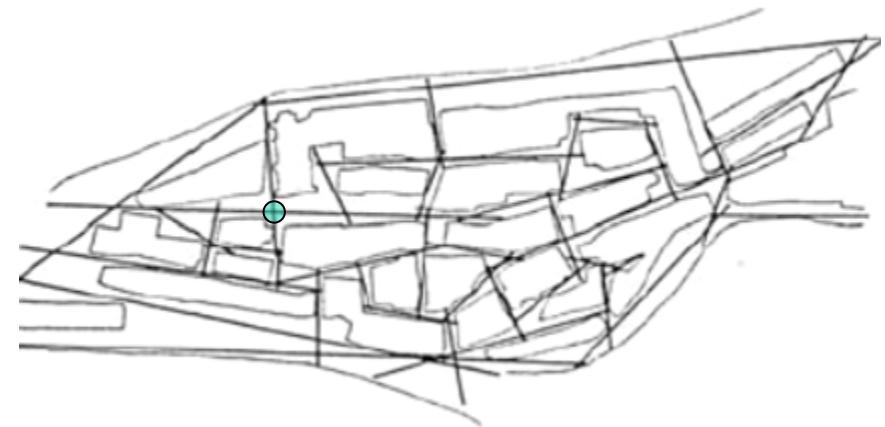
Source: Hillier, B., Hanson, J., 1984. *The Social Logic of Space*. Cambridge University Press, Cambridge, UK

# Space syntax theory

## Representing space: axial maps and unlinks



The axial map is a linear representation of space, with the fewest longest set of straight lines that covers all spaces.



Unlinks are features that mark a location where the intersection between two axial lines does not allow a change of direction.

Source: Hillier, B., Hanson, J., 1984. *The Social Logic of Space*. Cambridge University Press, Cambridge, UK

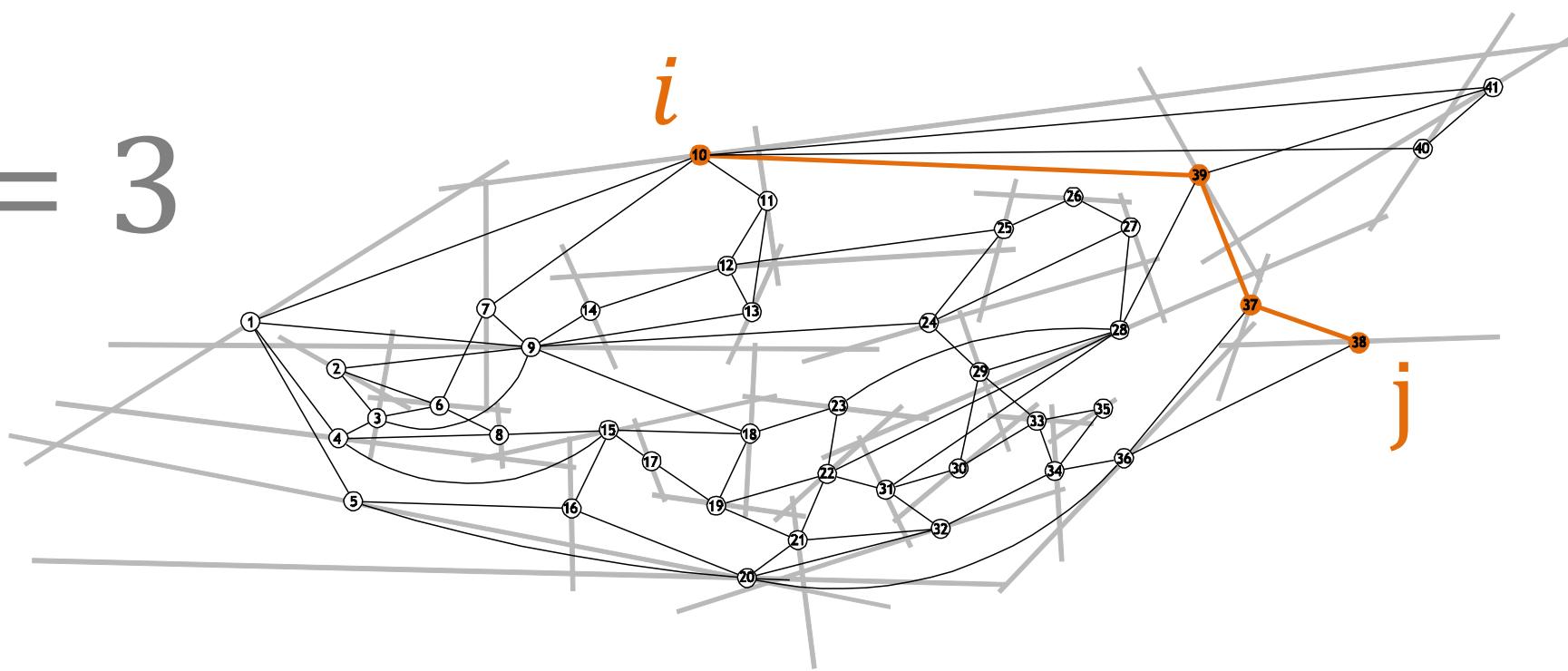
# Space syntax theory

$$d_{ij} = 3$$

## Topology of space: graphs and centrality analysis

Axial maps are translated into mathematical graphs where every line represents a node, and every intersection between lines represents an edge, or link.

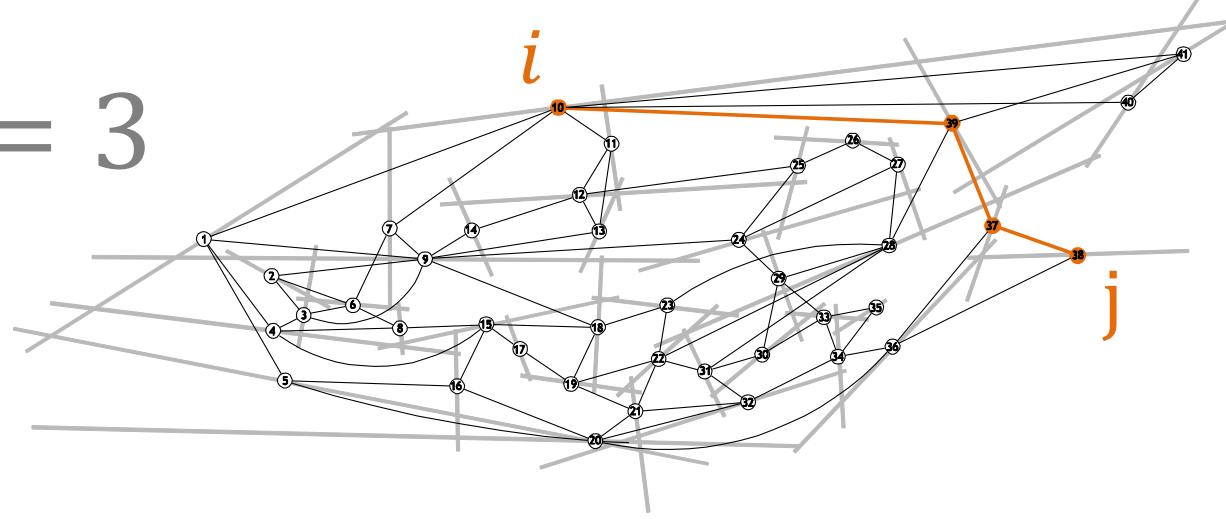
Where there is an unlink, no edge is created, because there is no intersection.



# Space syntax theory

## Topology of space: graphs and centrality analysis

$$d_{ij} = 3$$



Connectivity  
(Degree centrality)

Number of connected nodes

Mean Depth → Integration  
(Closeness centrality)

Average distance to all other nodes

Choice  
(Betweenness centrality)

Number of times on the shortest path  
Between pairs of nodes

$$CON_i = \sum_{i \sim j} d_{ij}$$

$$MD_i = \frac{1}{N-1} \sum d_{ij}$$

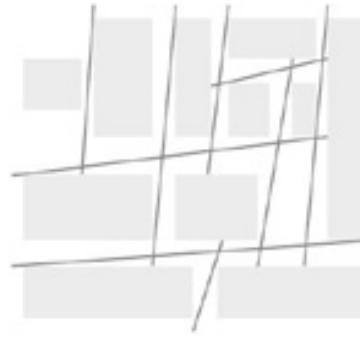
$$C_i = \frac{n_{jk}(i)}{n_{jk}}$$

# Space syntax theory

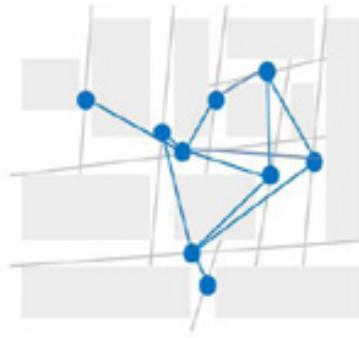
## Topology of space: graphs and centrality analysis



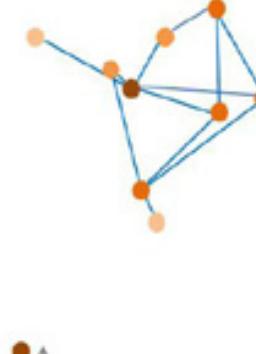
a.



b.

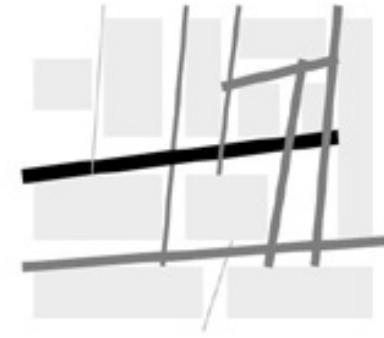


c.



Higher connectivity

d.



e.

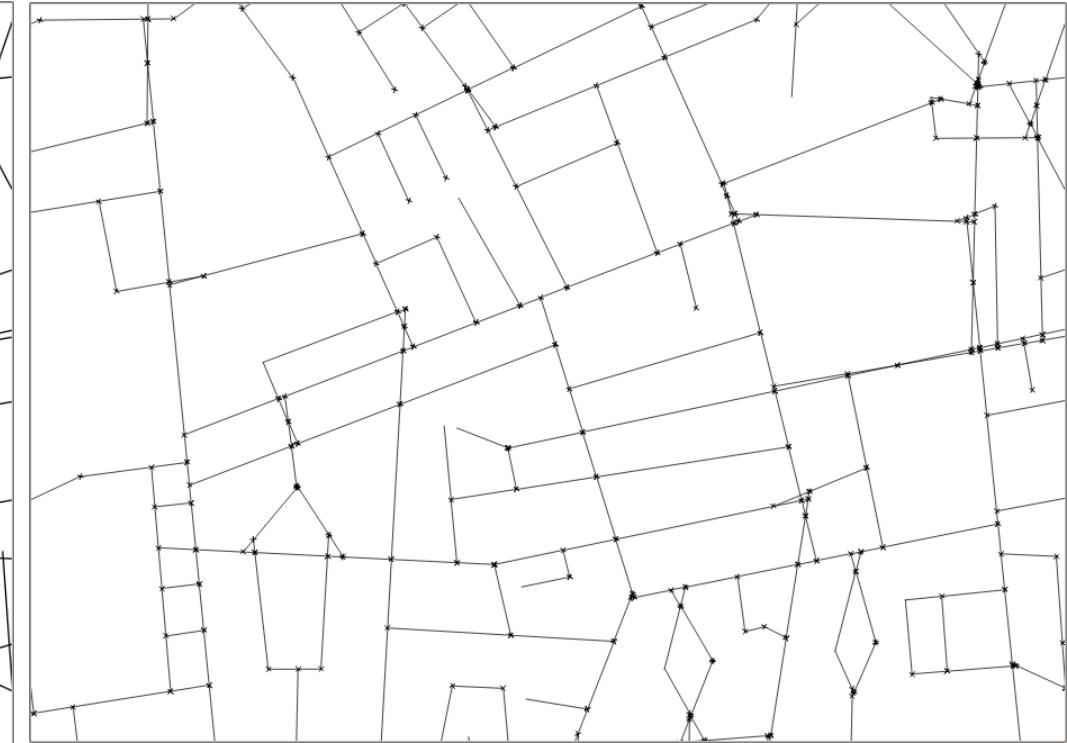
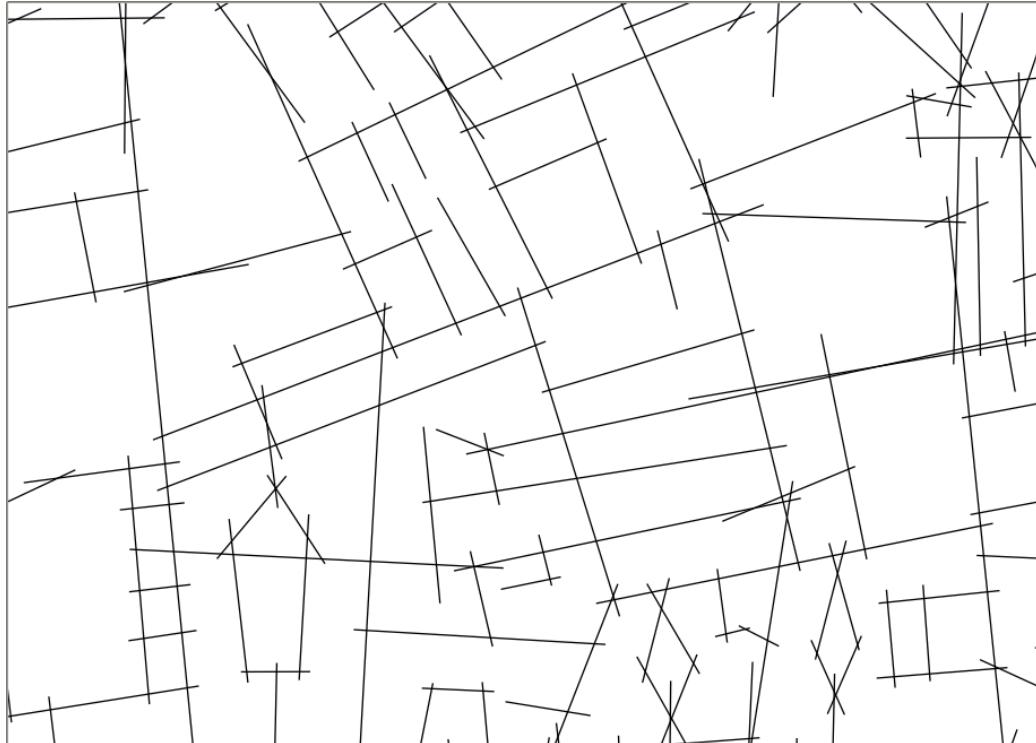
Figure 2.2 The axial representation of Space Syntax. An urban space represented by the fewest and longest axial lines (b), axial lines are represented by a graph (c), the graph Connectivity is highlighted in (d & e).

Source: Al-Sayed, K., Turner, A., Hillier, B., Iida, S., Penn, A., 2015. Space Syntax methodology. Bartlett School of Architecture, UCL, London.

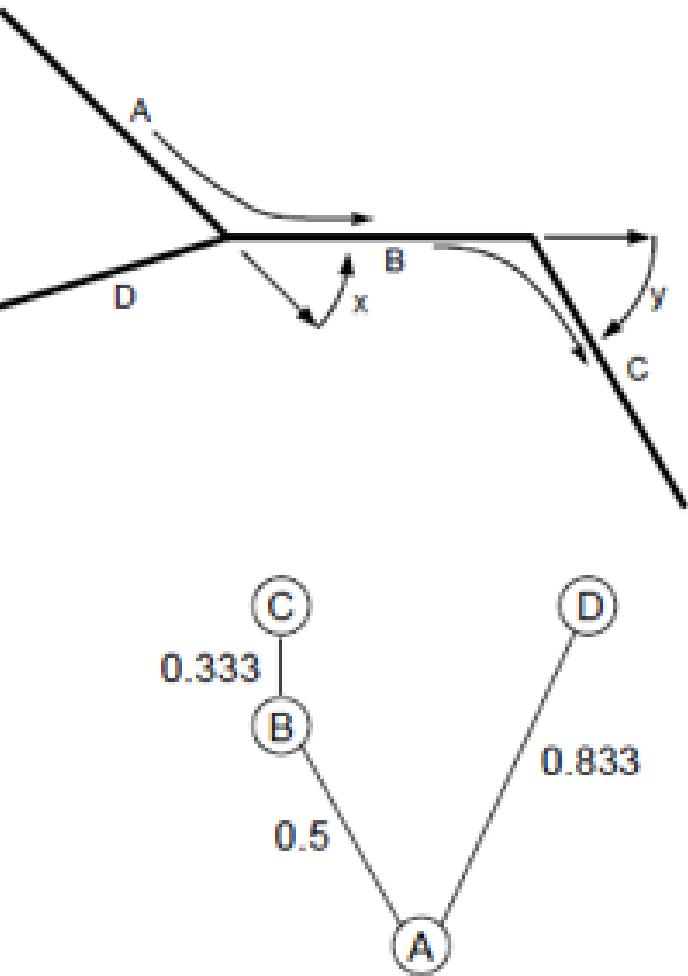
## Segment maps and angular analysis

The segment map is the result of a transformation of the axial map, where the lines are broken at every intersection:

- to obtain a more fin-grained result along axial lines;



# Space syntax theory



## Segment maps and angular analysis

The segment map is the result of a transformation of the axial map, where the lines are broken at every intersection:

- to obtain a more fine-grained result along axial lines;
- to allow the measurement of the different angles of intersection along a route.

<sup>18</sup> Diagram  
source: Turner, A.  
(2005) Could A  
Road-centre Line  
Be An Axial Line  
In Disguise?

# Space syntax theory

## Radius and distances

The graph analysis can be carried out for distances to all nodes in the graph, or just to nodes within a certain distance. This cut-off point is called the **RADIUS** of analysis.

To all nodes the radius is called 'Radius N'

The distance used to calculate the shortest paths or determine the radius can vary, depending on the model being analysed:

*Axial analysis:* distance is always *Topological*, for paths and radius.  
e.g. Axial Integration R3, or Axial Choice RN

*Segment analysis:* distance can be topological, metric or angular. BUT  
the standard in space syntax research is, *Angular path distance*, with  
*Metric radius distance*.  
e.g. Segment Angular Choice R800m

# The SST Project

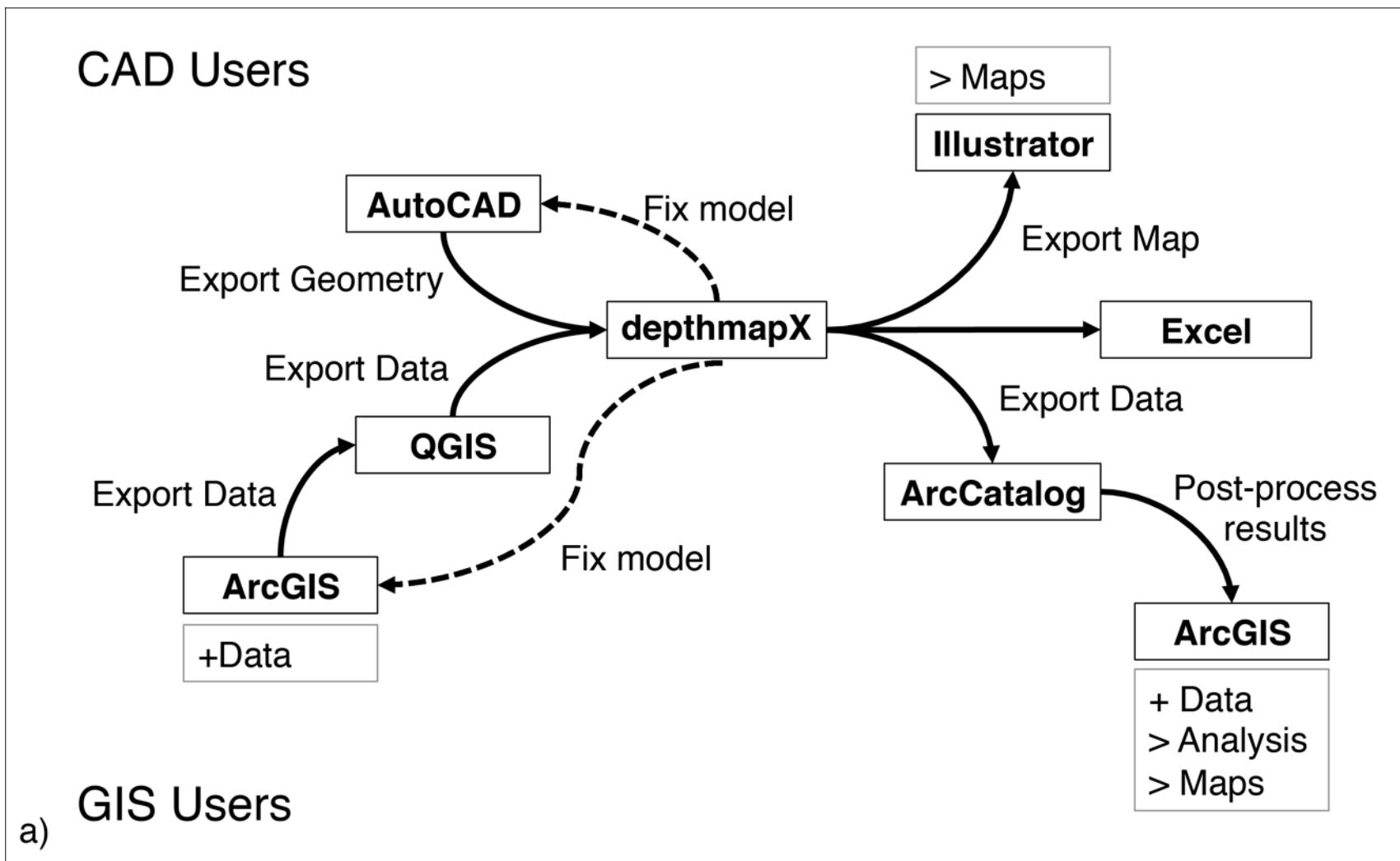
## Overview of the project

- An open source project for space syntax education, research and practice
- Initiated by the Space Syntax Laboratory, UCL
- For the space syntax community
- *WITH* contributions from the space syntax community

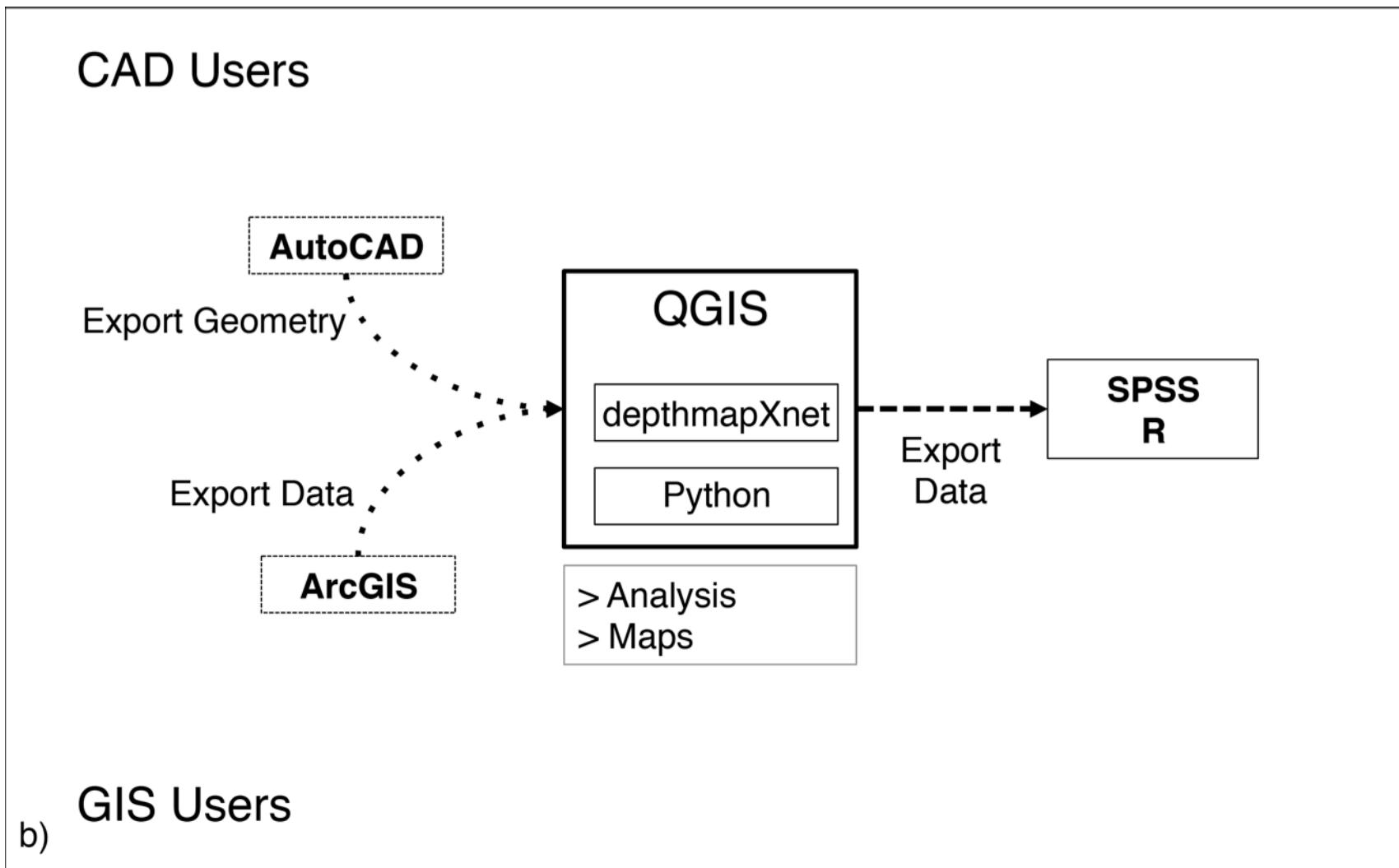
## Aims of the project

- *Integrate* space syntax spatial analysis (`depthmapX`) with QGIS
- *User friendly* for students: clear and linear workflows
- *Flexible* for researchers: analytic options and exploratory depth
- *Operational* for practice: robust, fast and optimised workflows

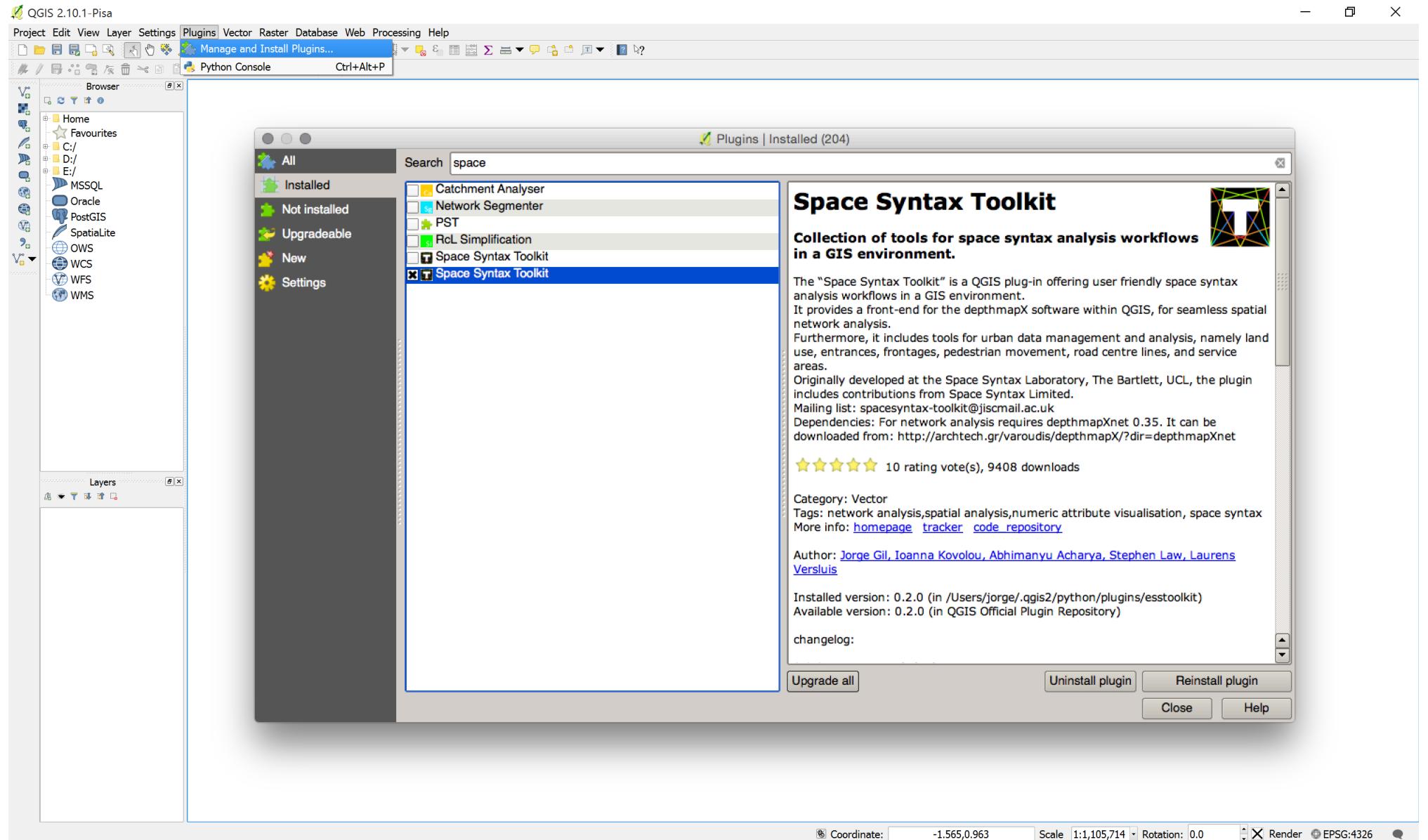
# The SST Project



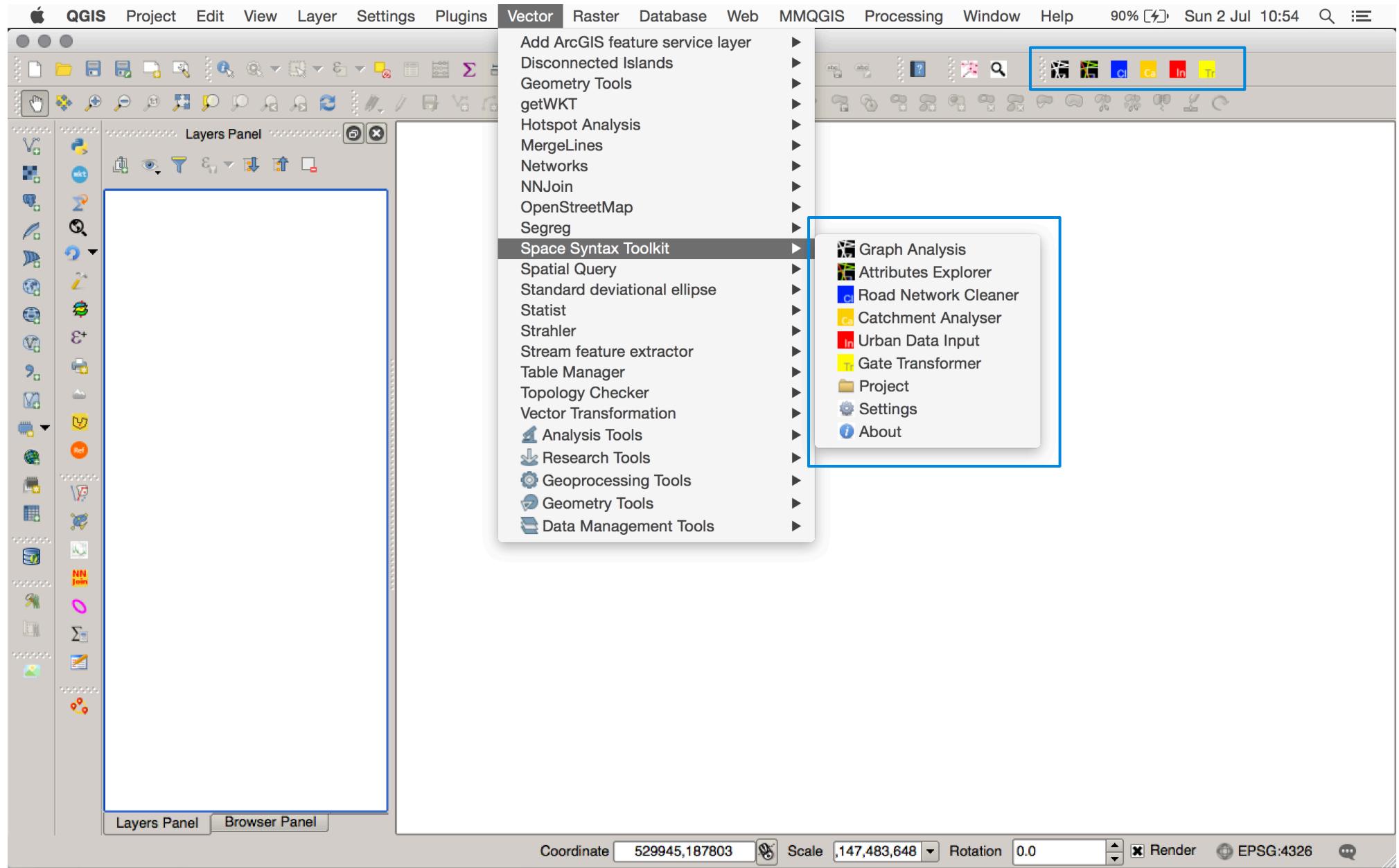
# The SST Project



# SST Installation



# SST Installation



## SST sample data

<https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit/releases>

SpaceGroupUCL / [qgisSpaceSyntaxToolkit](#)

Code Issues 53 Pull requests 0 Projects 0 Wiki Insights

Releases Tags Draft a new release

Latest release v0.2.0 · c5de995

**First expanded release**

jorgegil released this 3 days ago · 5 commits to master since this release

This is the first release incorporating modules contributed by other members of the space syntax community.

It includes four new modules:

- Road centre line cleaner
- Catchment analyser
- Urban data input
- Gate transformer

The new modules have been developed by Space Syntax Limited's Ioanna Kovolou, Abhimanyu Acharya, Stephen Law and Laurens Versluis.

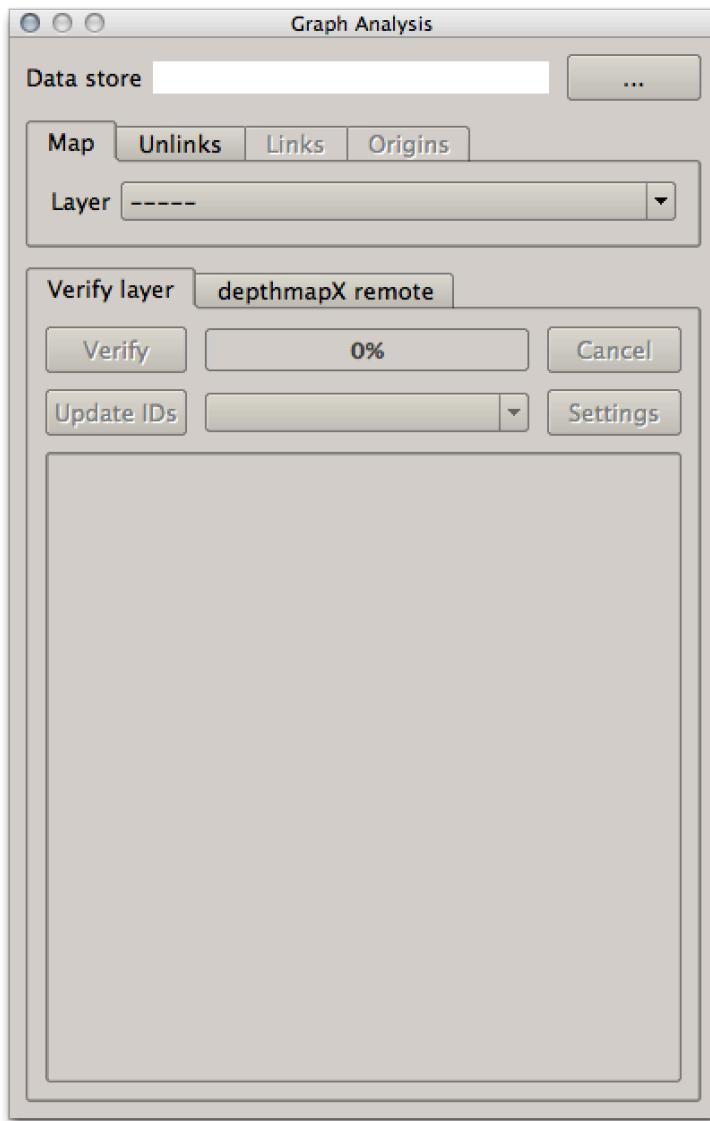
The new version will be demonstrated and used in a workshop at the 11th Space Syntax Symposium, 3rd of July 2017, in Lisbon.

## Downloads

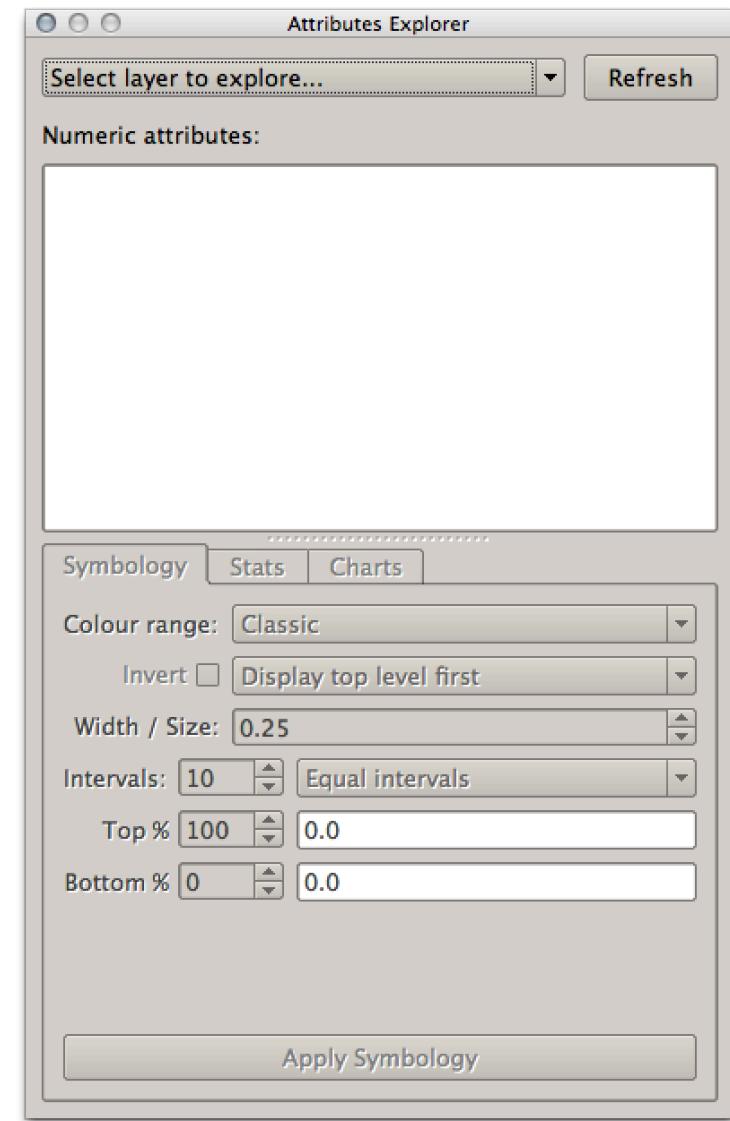
[esstoolkit\\_v0.2.0.zip](#) 2.1 MB

[sample\\_data\\_v0.2.0.zip](#) 26.2 MB

## Original tools: SST version 0.1.x

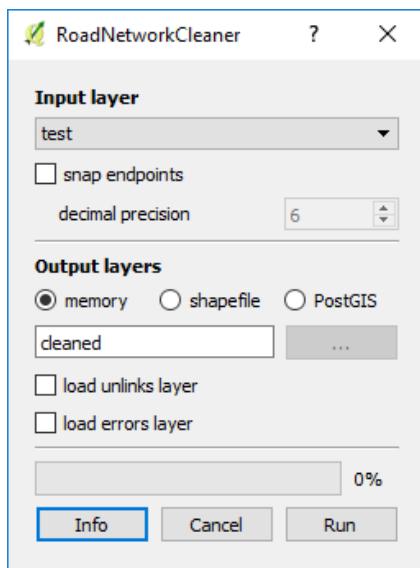


Graph Analysis

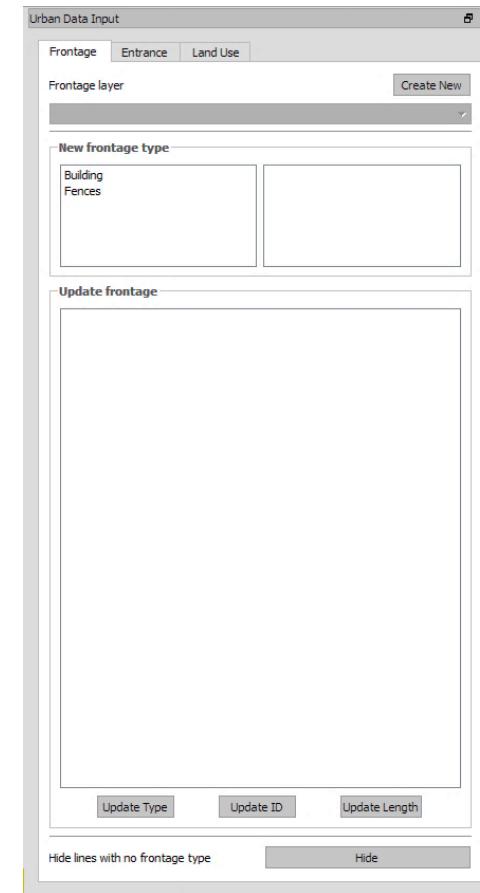


Attribute Explorer

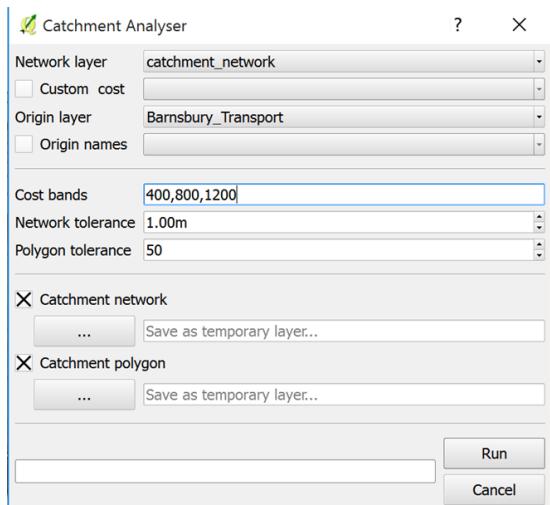
# New Set of tools: SST version 0.2.0



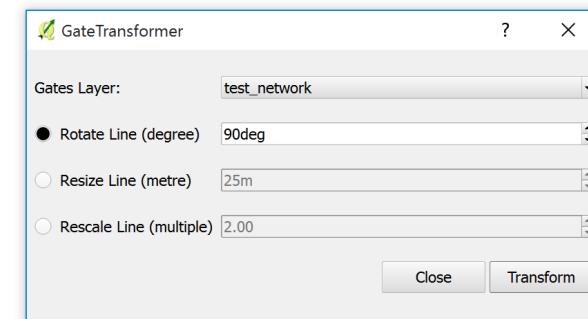
Road network cleaner



Urban Data Input Tool

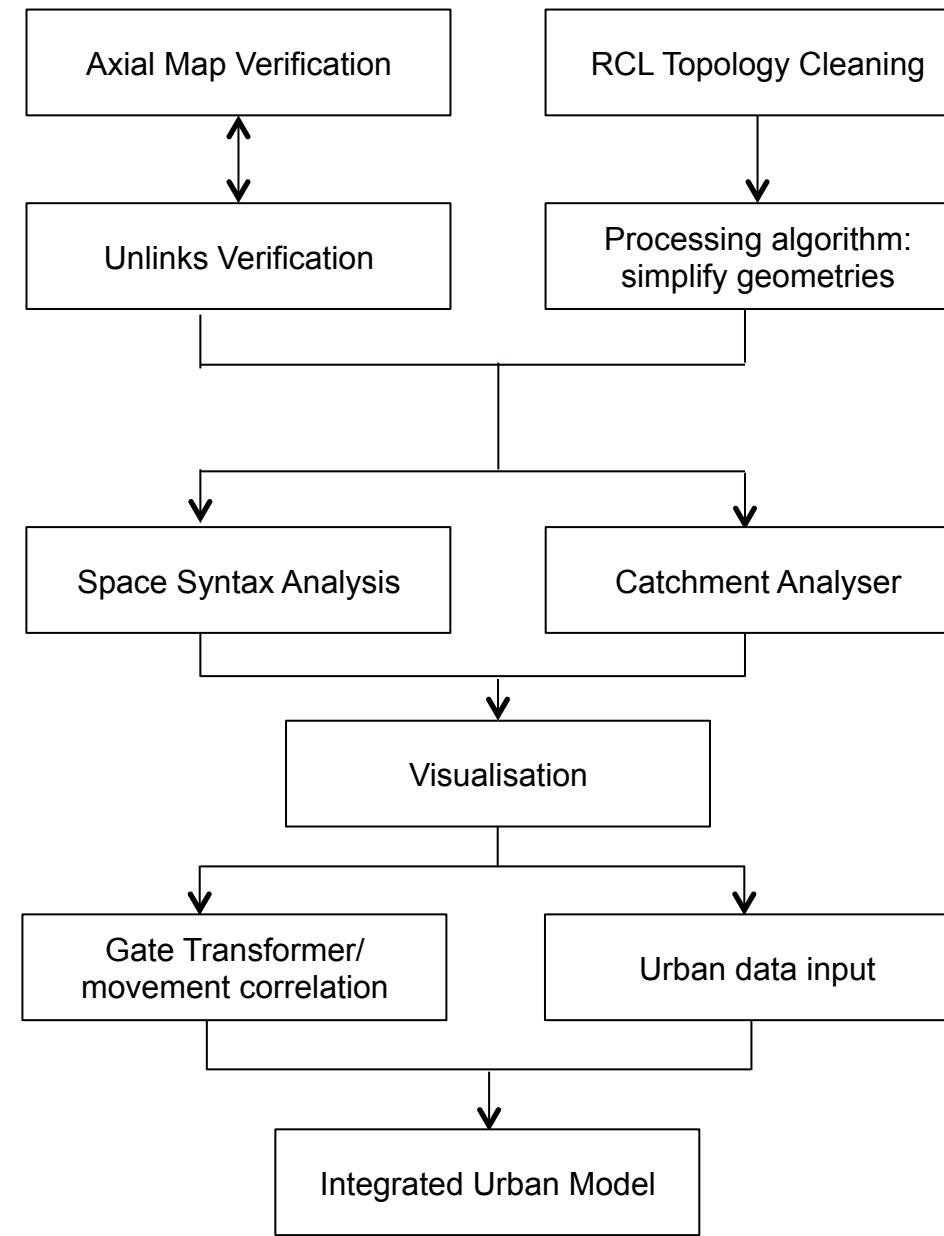


Catchment Analyser



Gate Transformer

## Demo Workflow



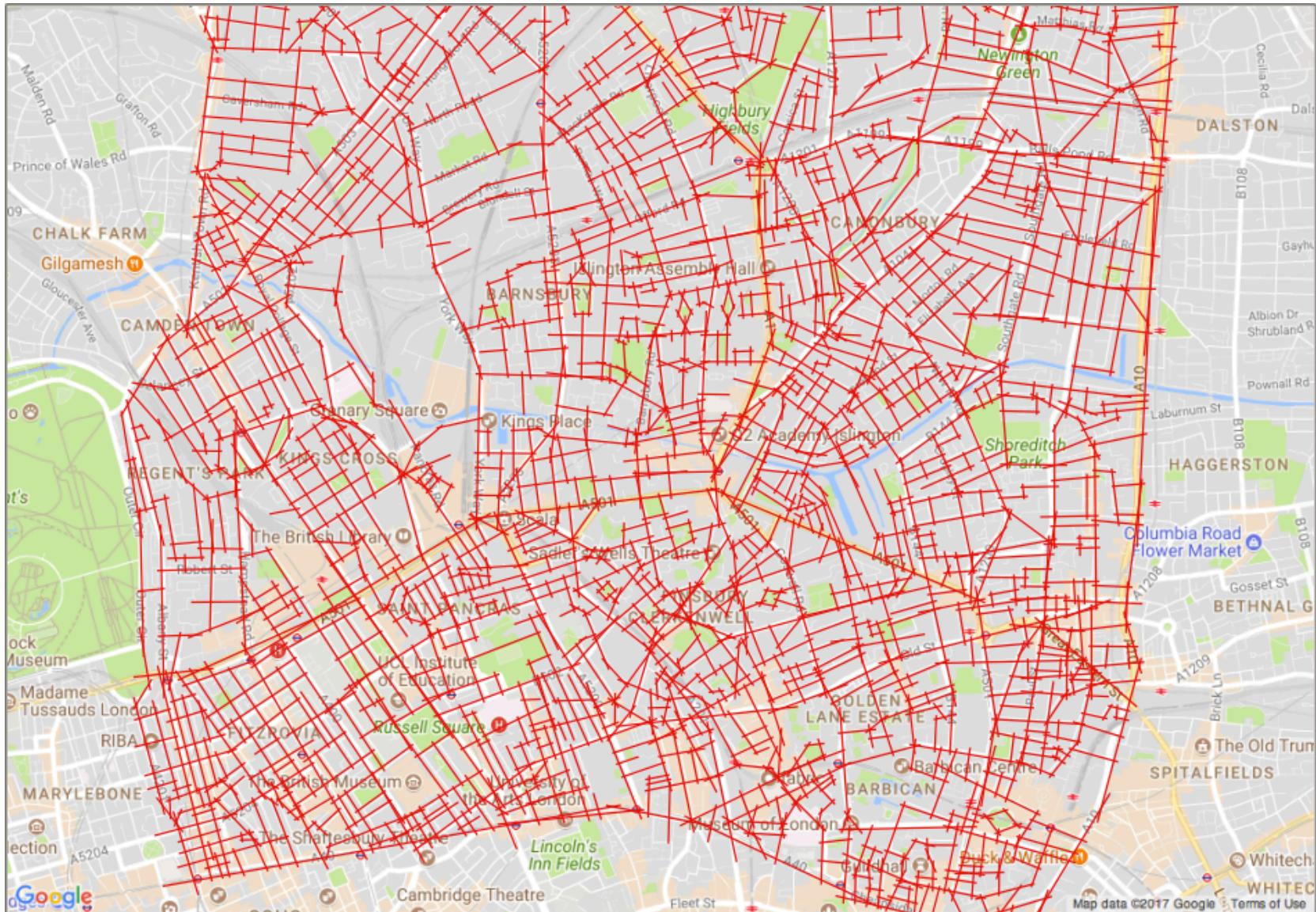
## Task I

### **Preparing and analysing axial models**

- Model preparation: making axial and unlinks maps
- Model verification: verifying the axial and unlinks maps
- Model analysis: Axial and segment analysis of the axial model
- Visualising the results

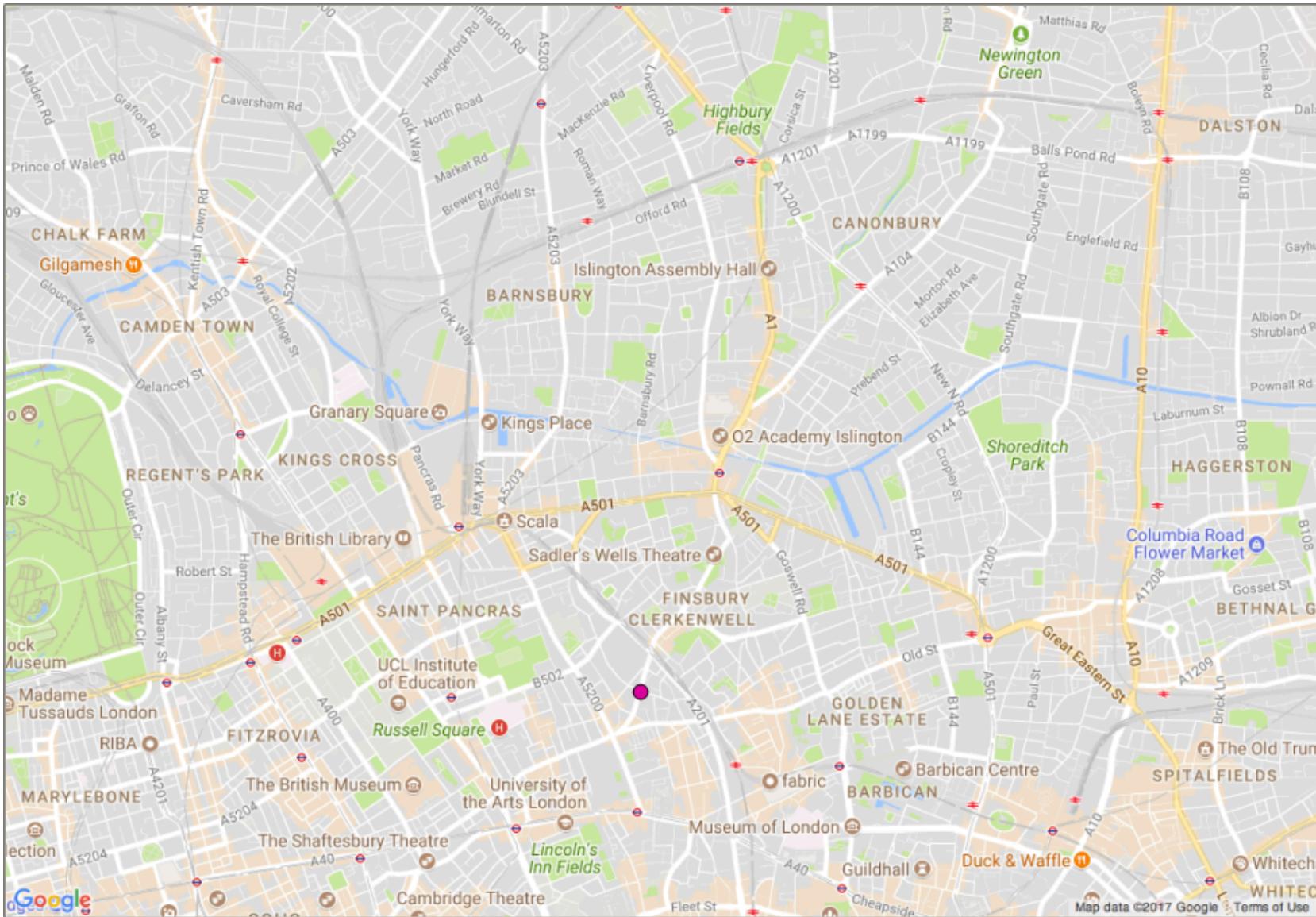
## Model preparation: making axial and unlinks maps

Drawing an axial map (use a projected CRS!)



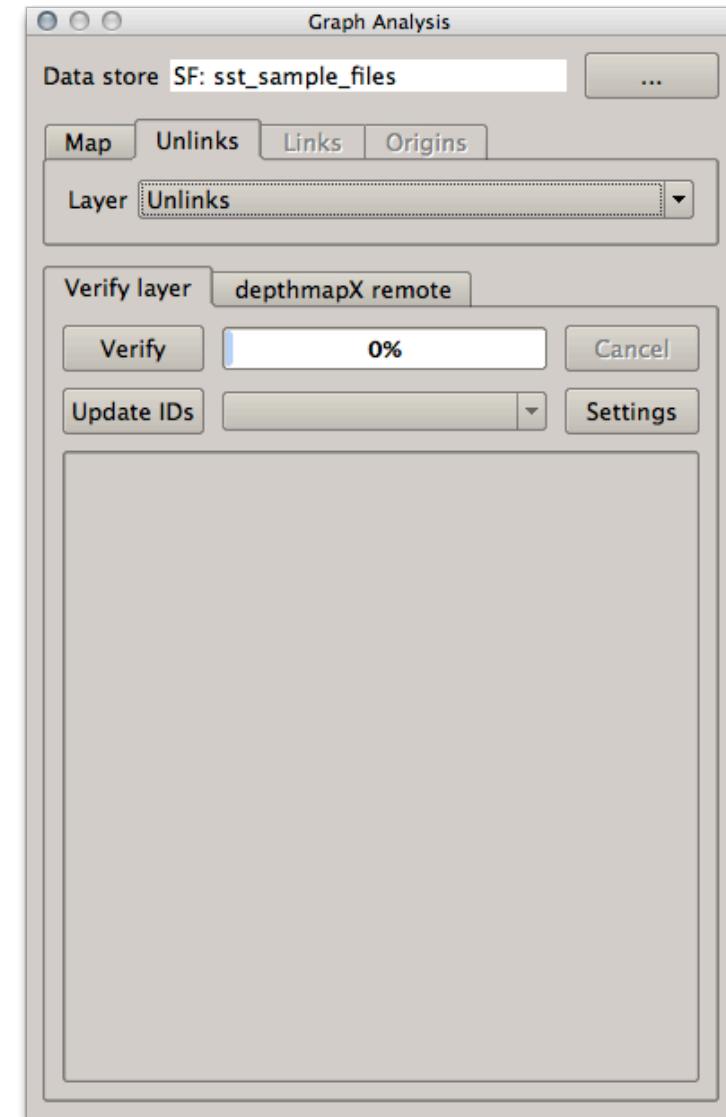
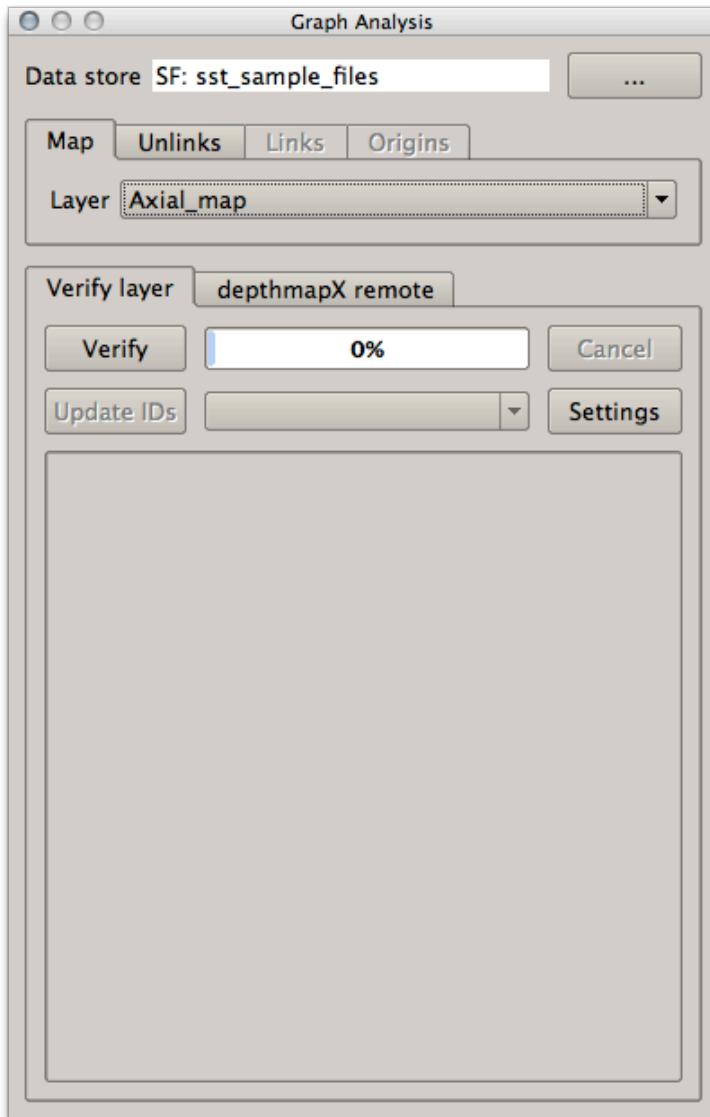
# Model preparation: making axial and unlinks maps

## Drawing an unlinks map



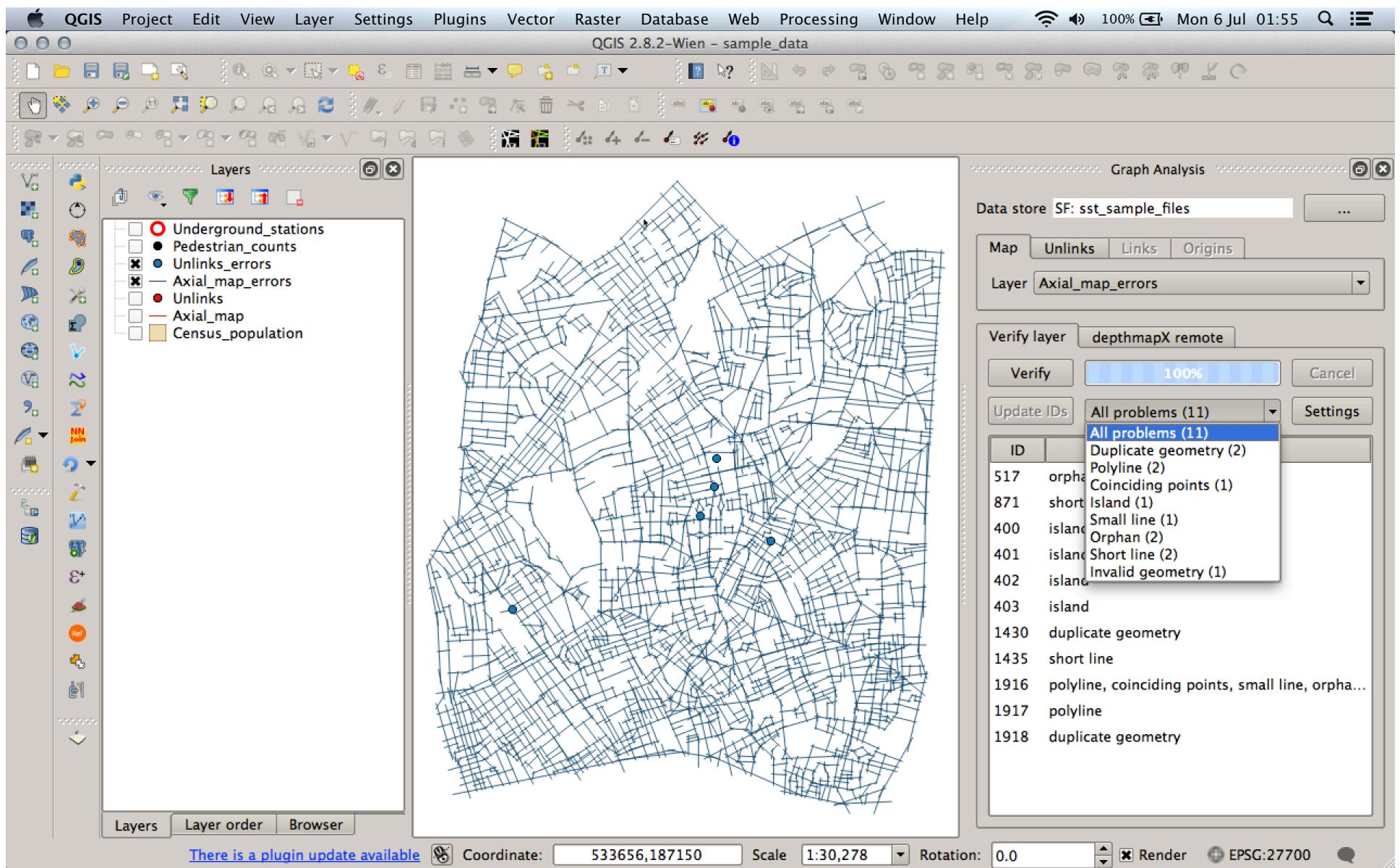
## Model verification: verifying the axial and unlinks maps

### Load map layers in Graph Analysis Tool



# Model verification: verifying the axial and unlinks maps

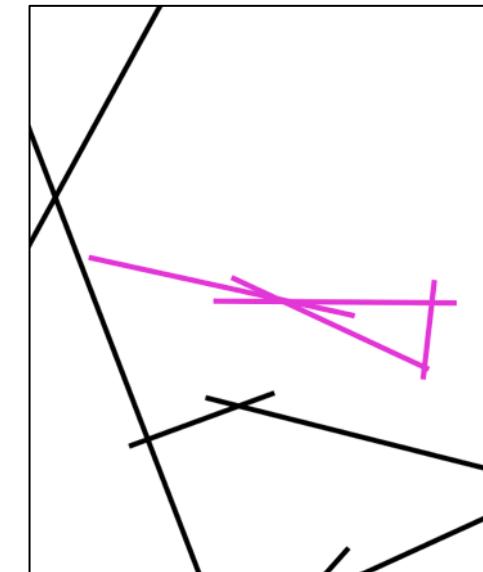
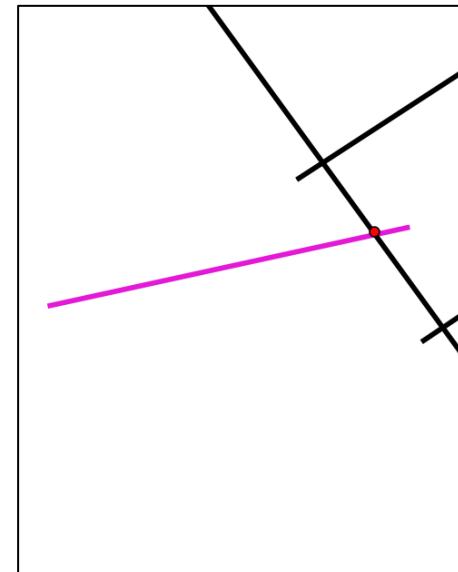
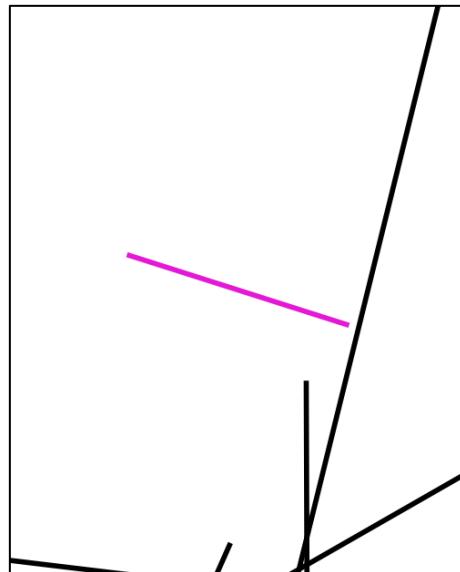
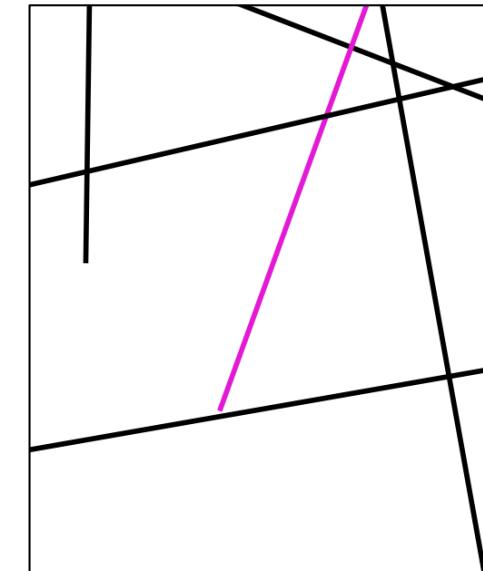
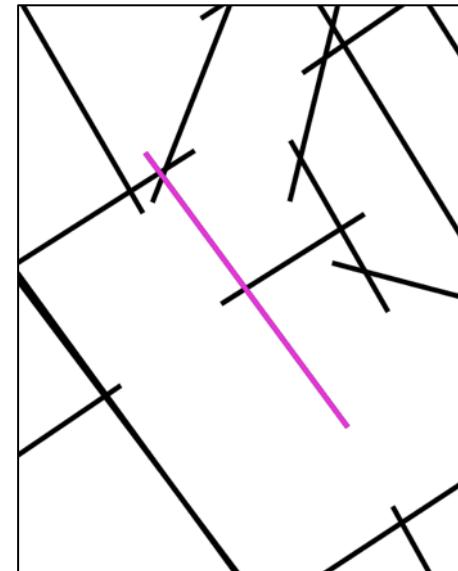
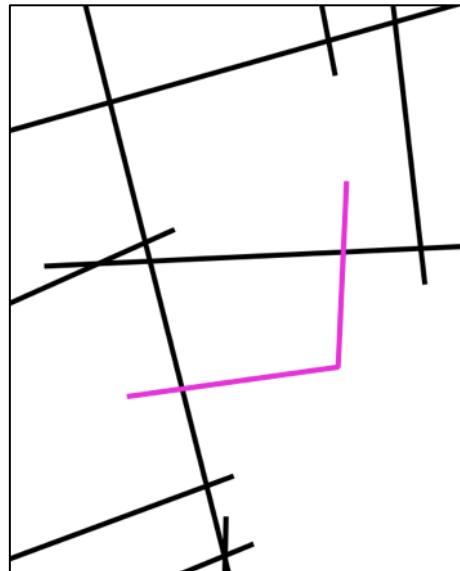
**Verification is done on the two layers combined**



## Model verification: verifying the axial and unlinks maps

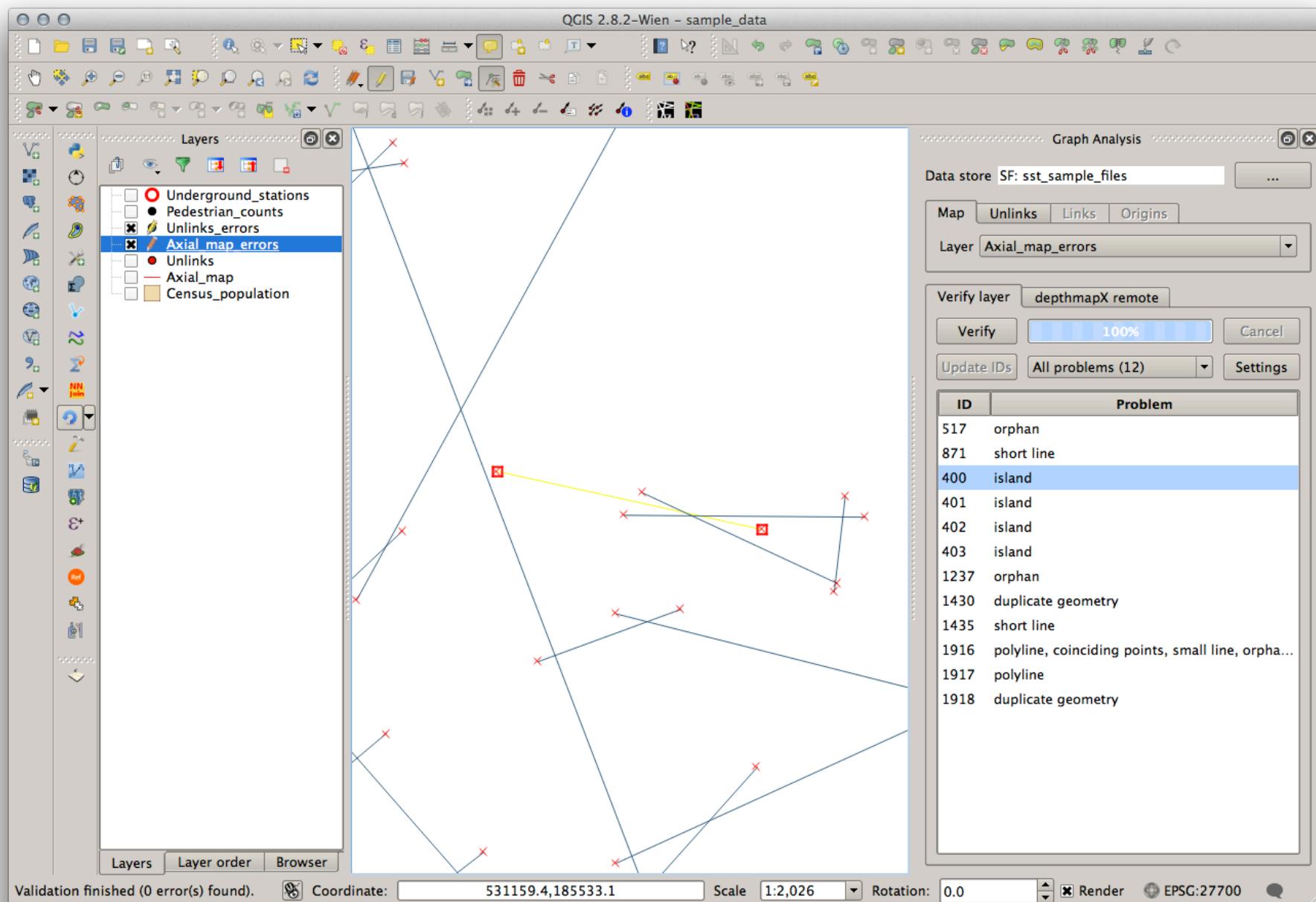
- Polyline
- Duplicate
- Short
- Orphan
- Unlinked orphan
- Island
- Small
- Coinciding points

Axial map errors



## Model verification: verifying the axial and unlinks maps

### Correcting the axial map

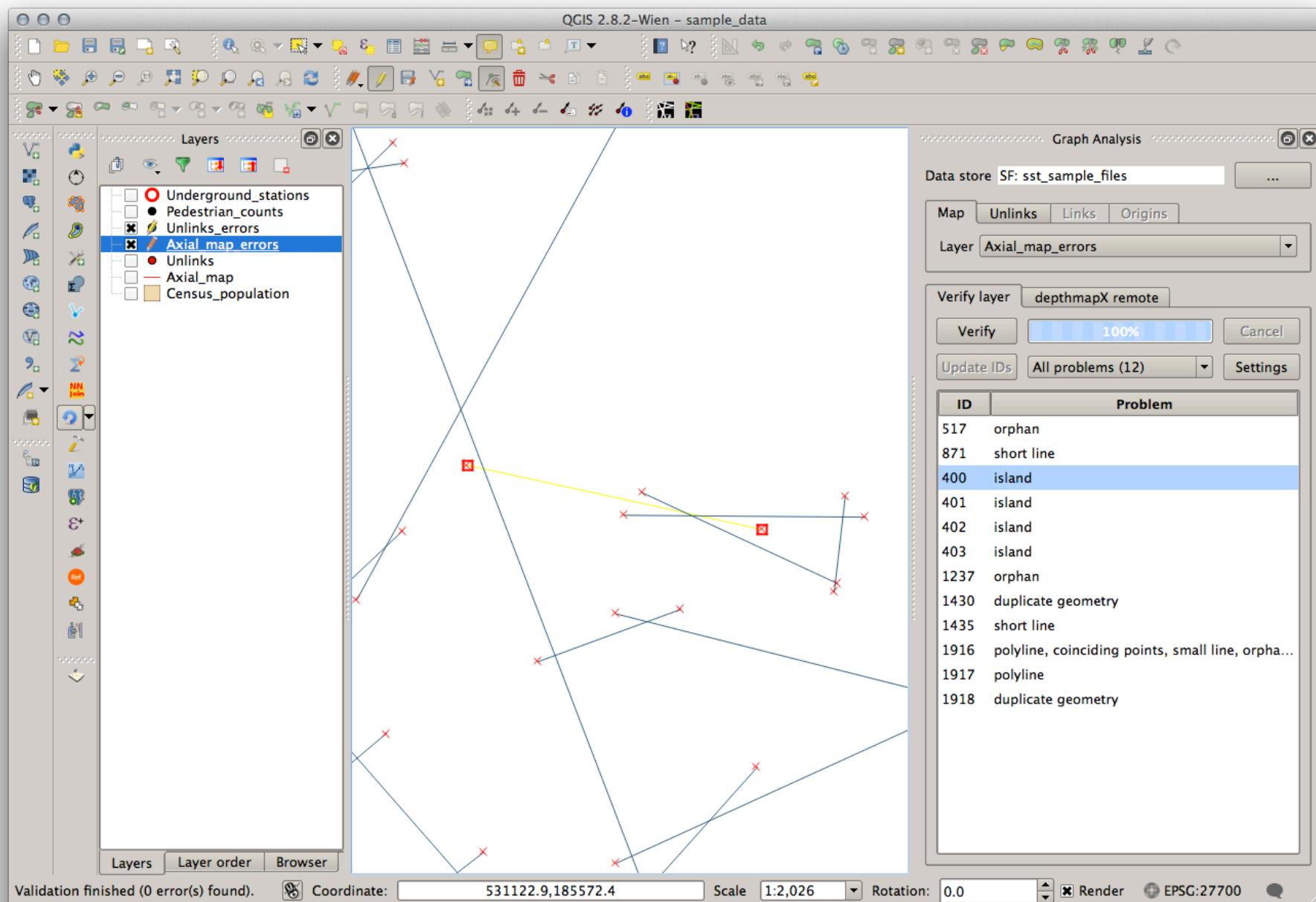


Workshop

Space Syntax Toolkit for QGIS

## Model verification: verifying the axial and unlinks maps

### Correcting the axial map

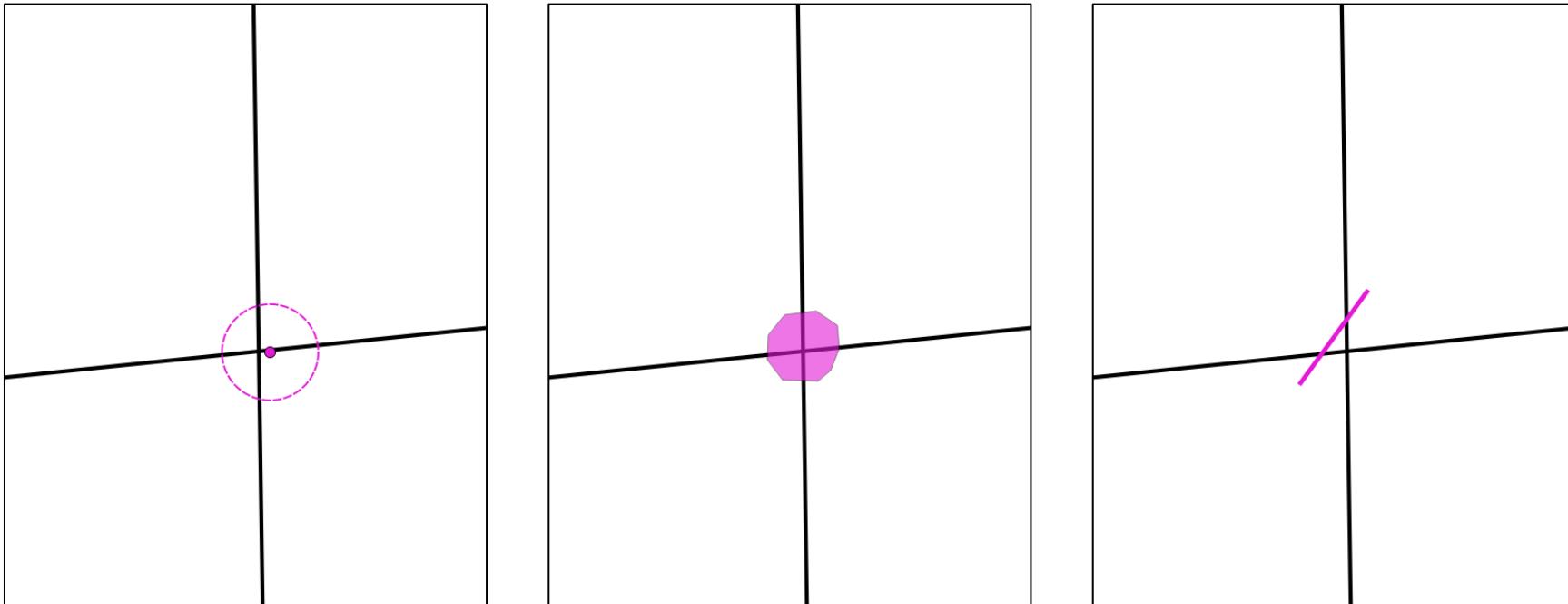


Workshop

Space Syntax Toolkit for QGIS

## Model verification: verifying the axial and unlinks maps

### Representing unlinks



## Model verification: verifying the axial and unlinks maps

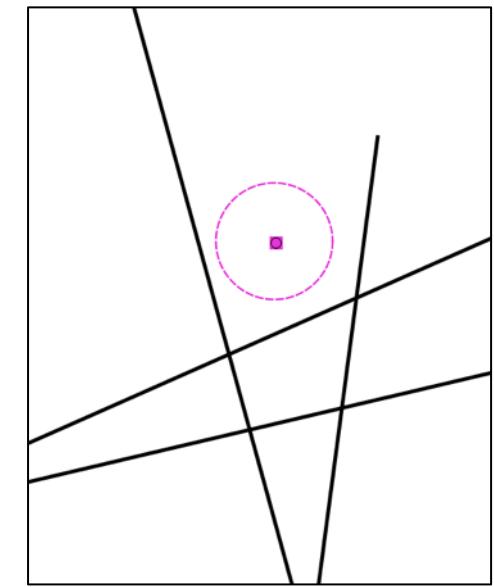
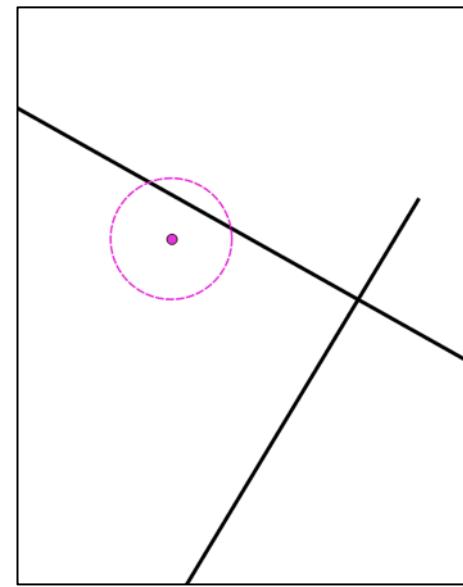
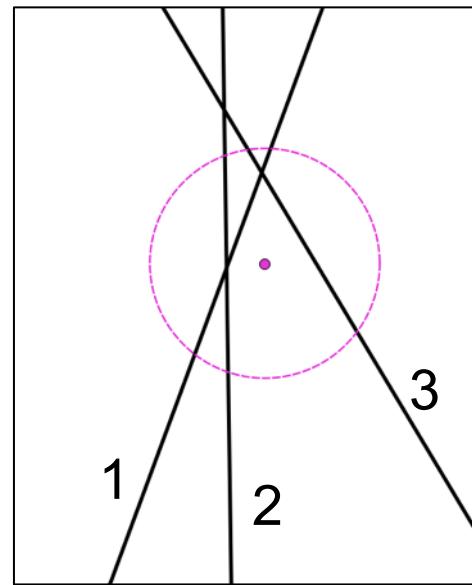
### Feature errors:

- More than 2 lines
- Single line
- No lines

### Attribute error:

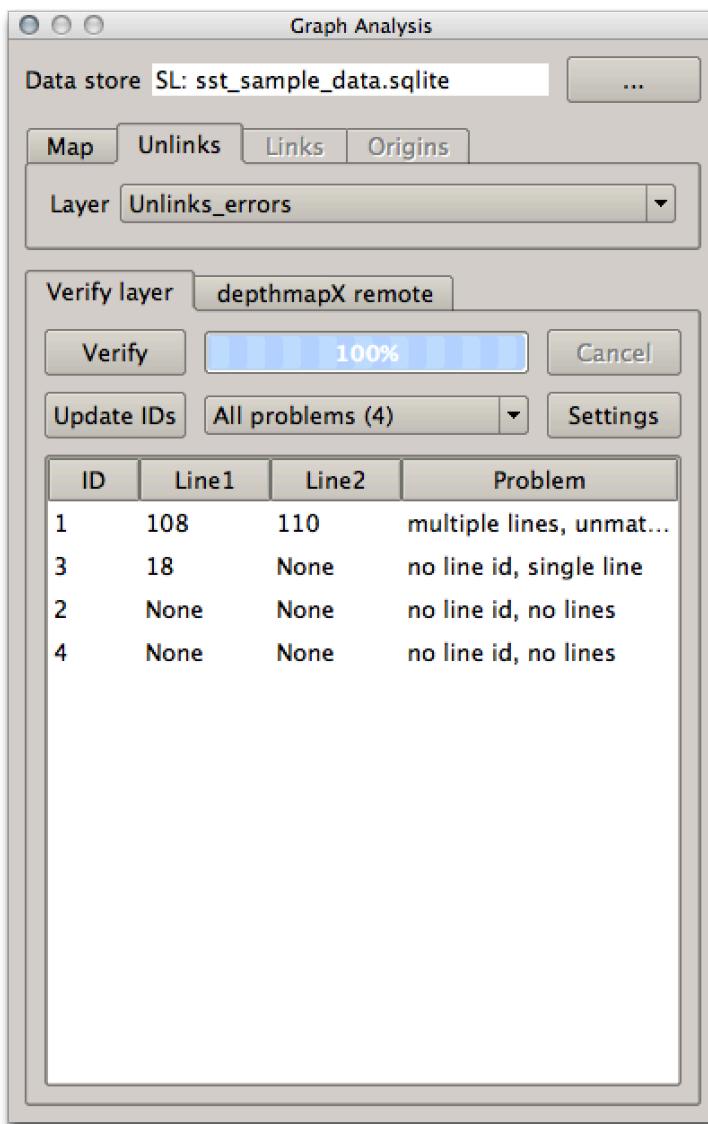
- No line id
- Same line id
- Unmatched line id

### Unlink errors

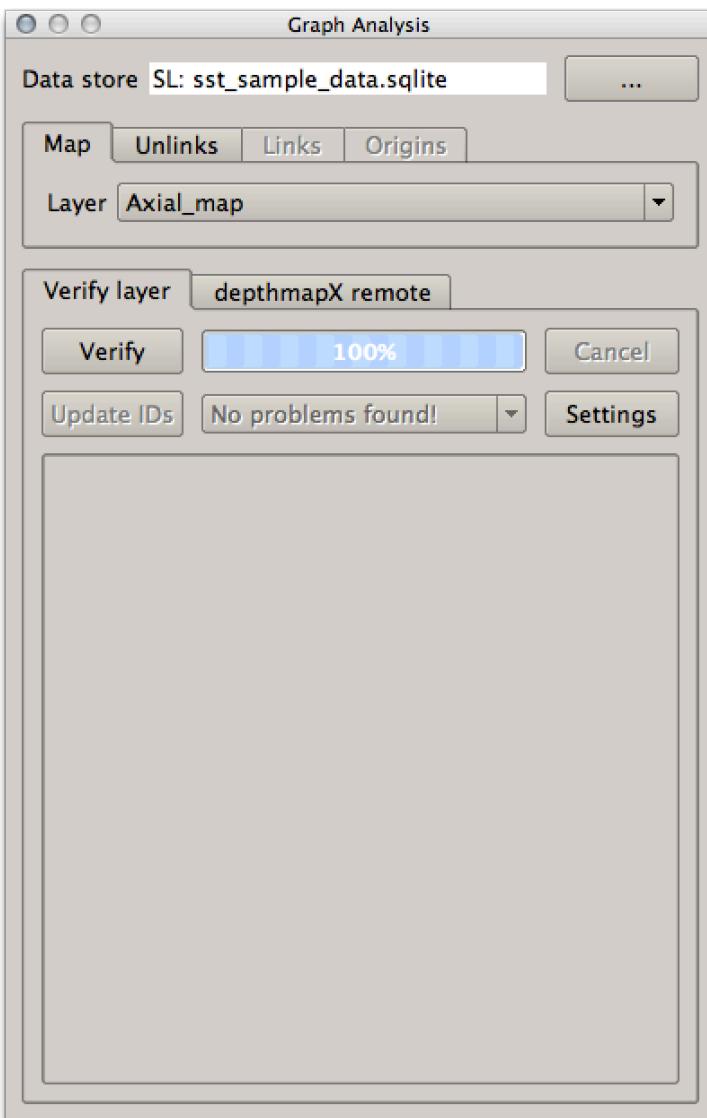


## Model verification: verifying the axial and unlinks maps

### Correcting the unlinks map



## Model verification: verifying the axial and unlinks maps



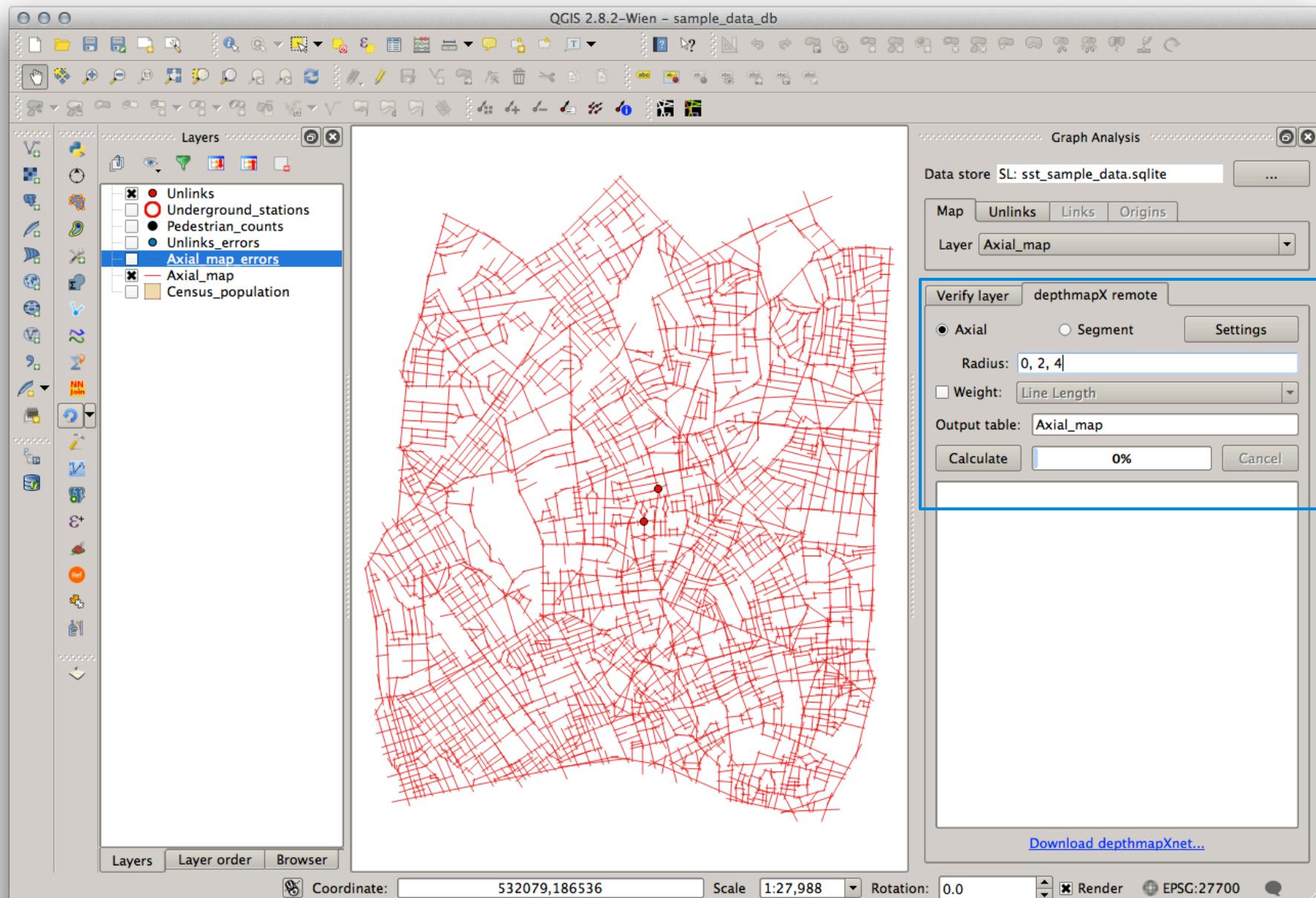
### Axial model verification workflow

It's an *iterative* process that stops when the verification of axial map and unlinks returns no errors.

1. Verify and fix axial lines
2. Update unlinks ids
3. Verify and fix unlinks
4. Verify and fix axial lines
5. Verify and fix unlinks
6. Update unlink ids
7. Verify and fix axial lines
8. ...

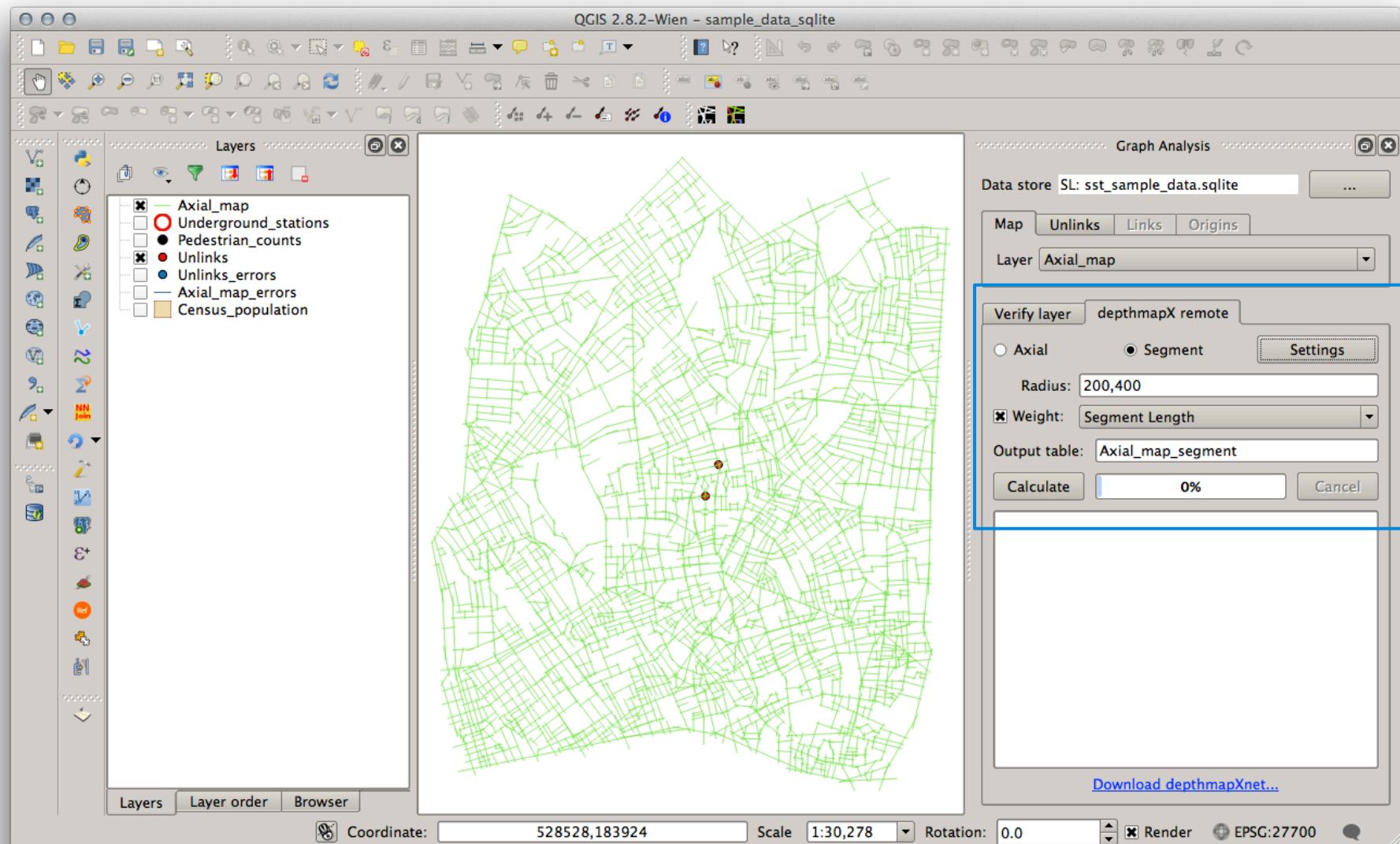
## Model analysis: Axial analysis of the axial model

### DepthmapX remote axial analysis settings

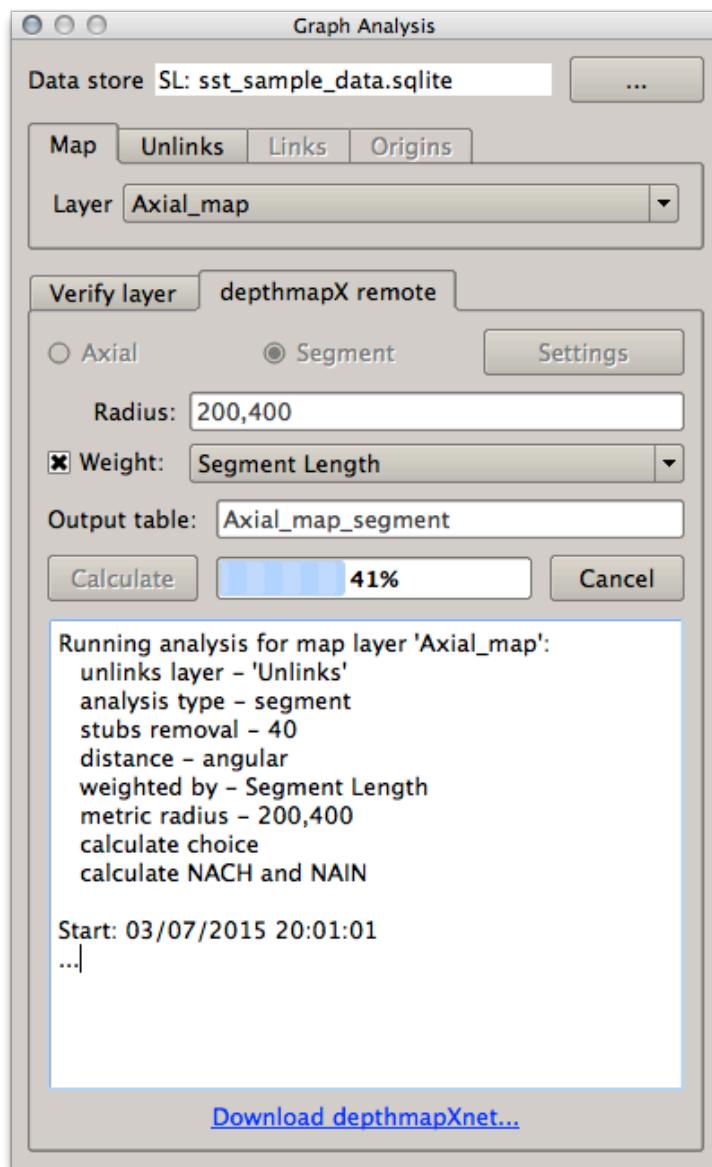


# Model analysis: Segment analysis of the axial model

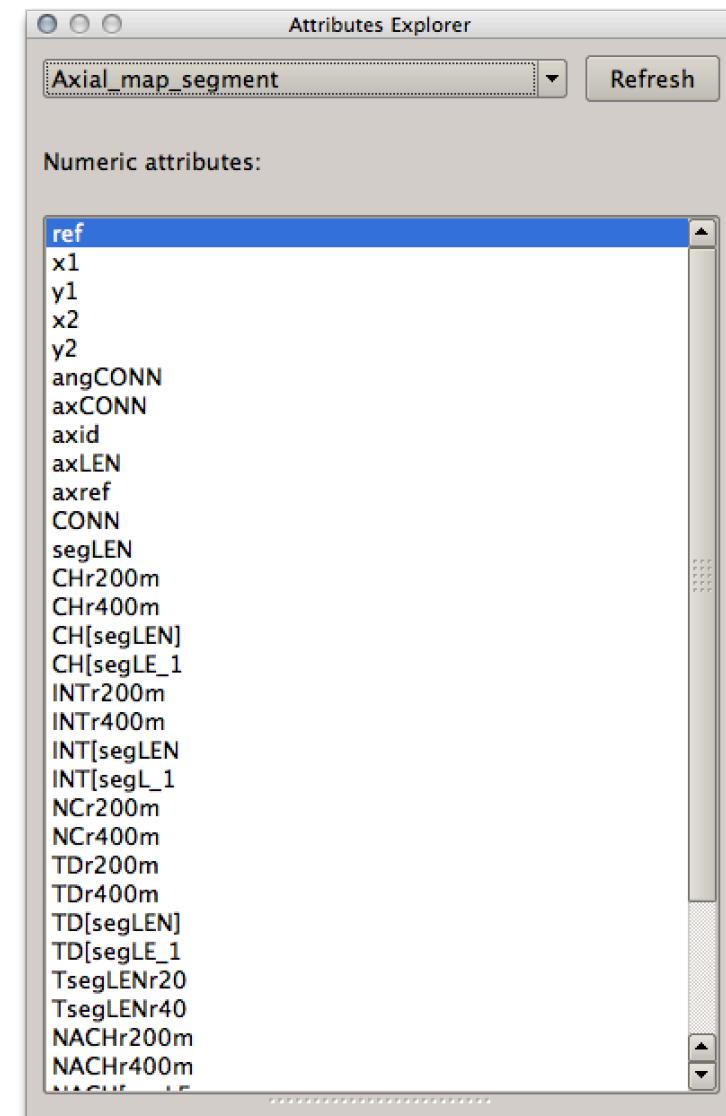
## DepthmapX remote segment analysis settings



# Model analysis

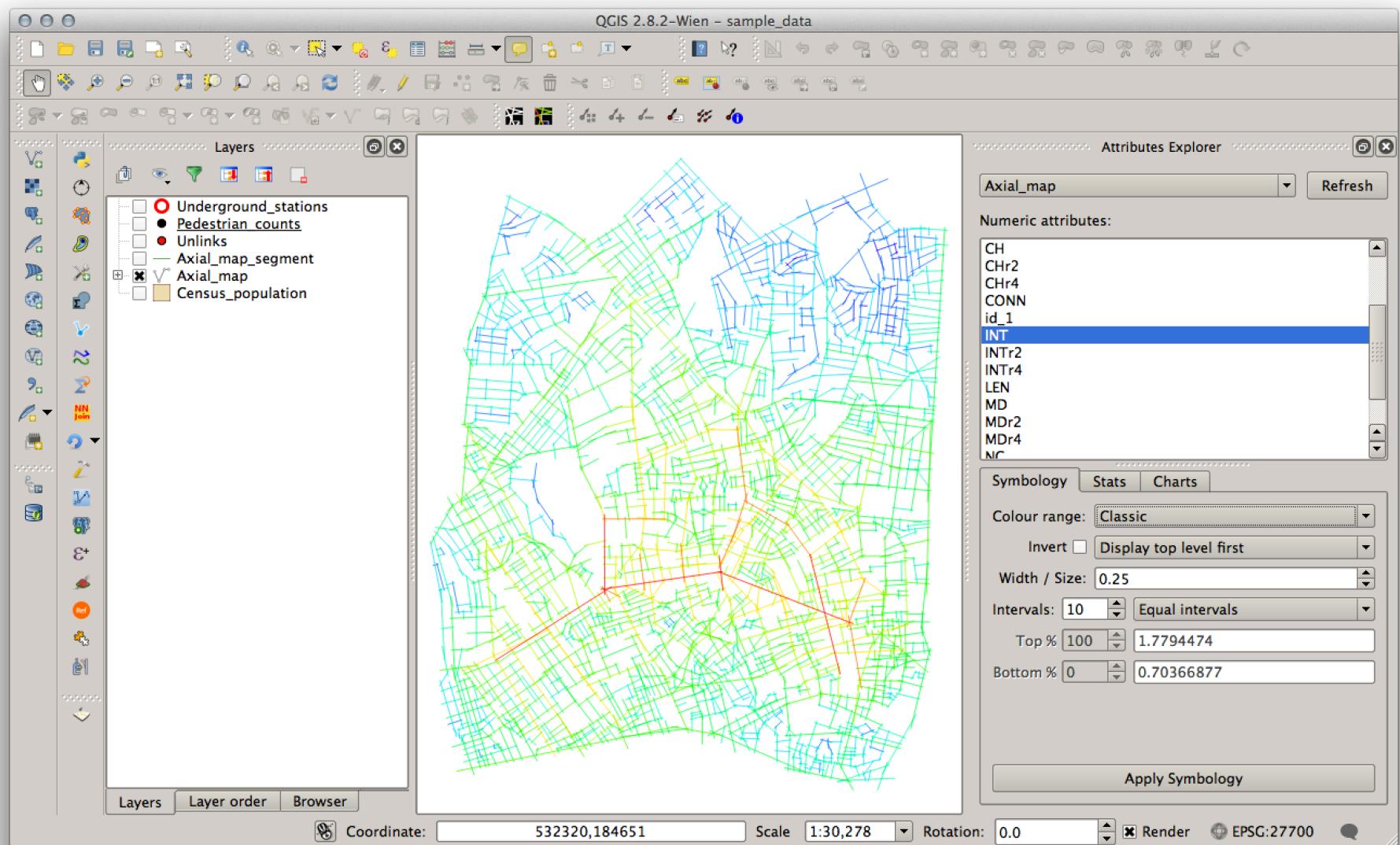


## Results report and postprocessing the results



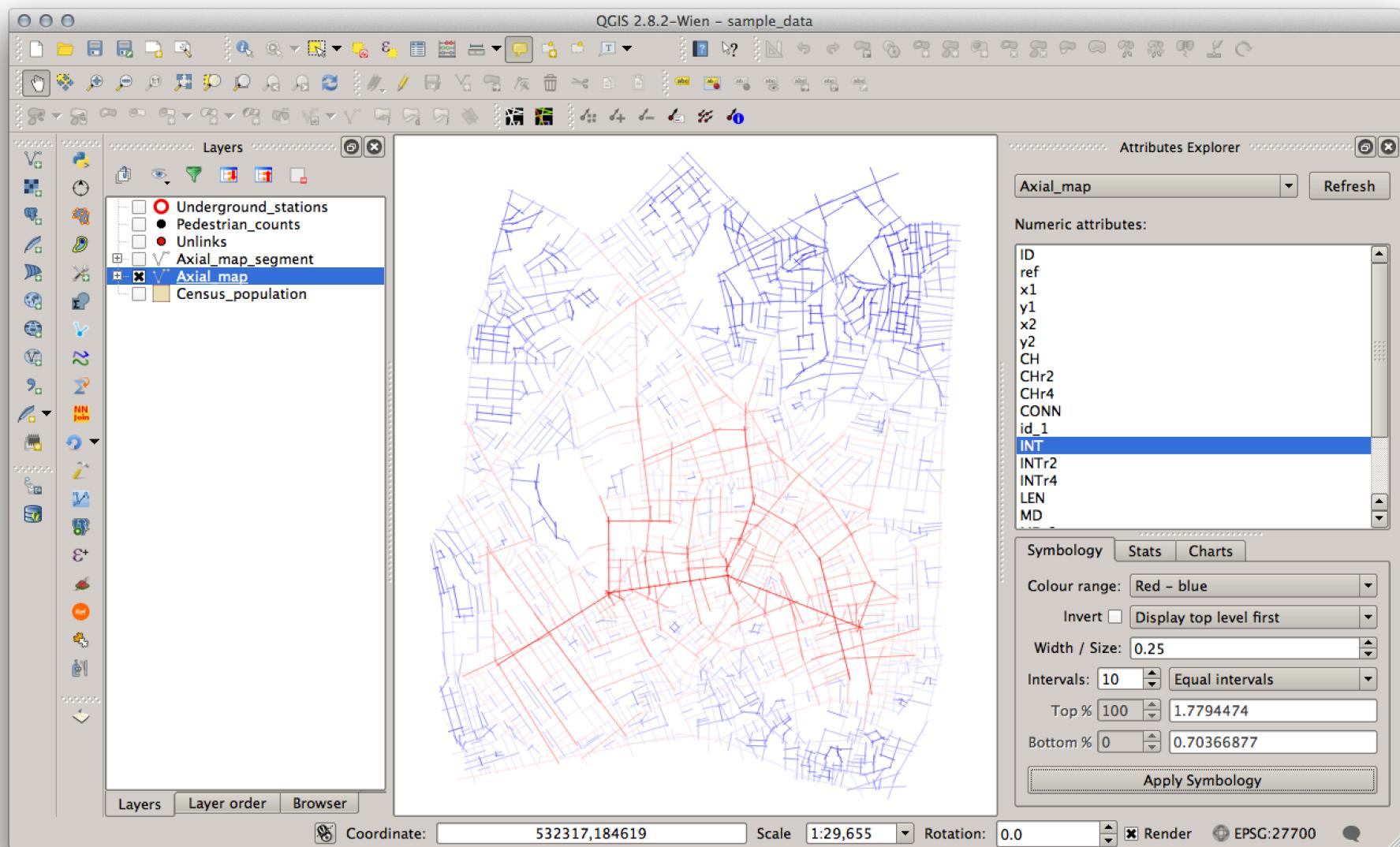
## Visualising the results

### Loading analysis results in Attributes Explorer Tool



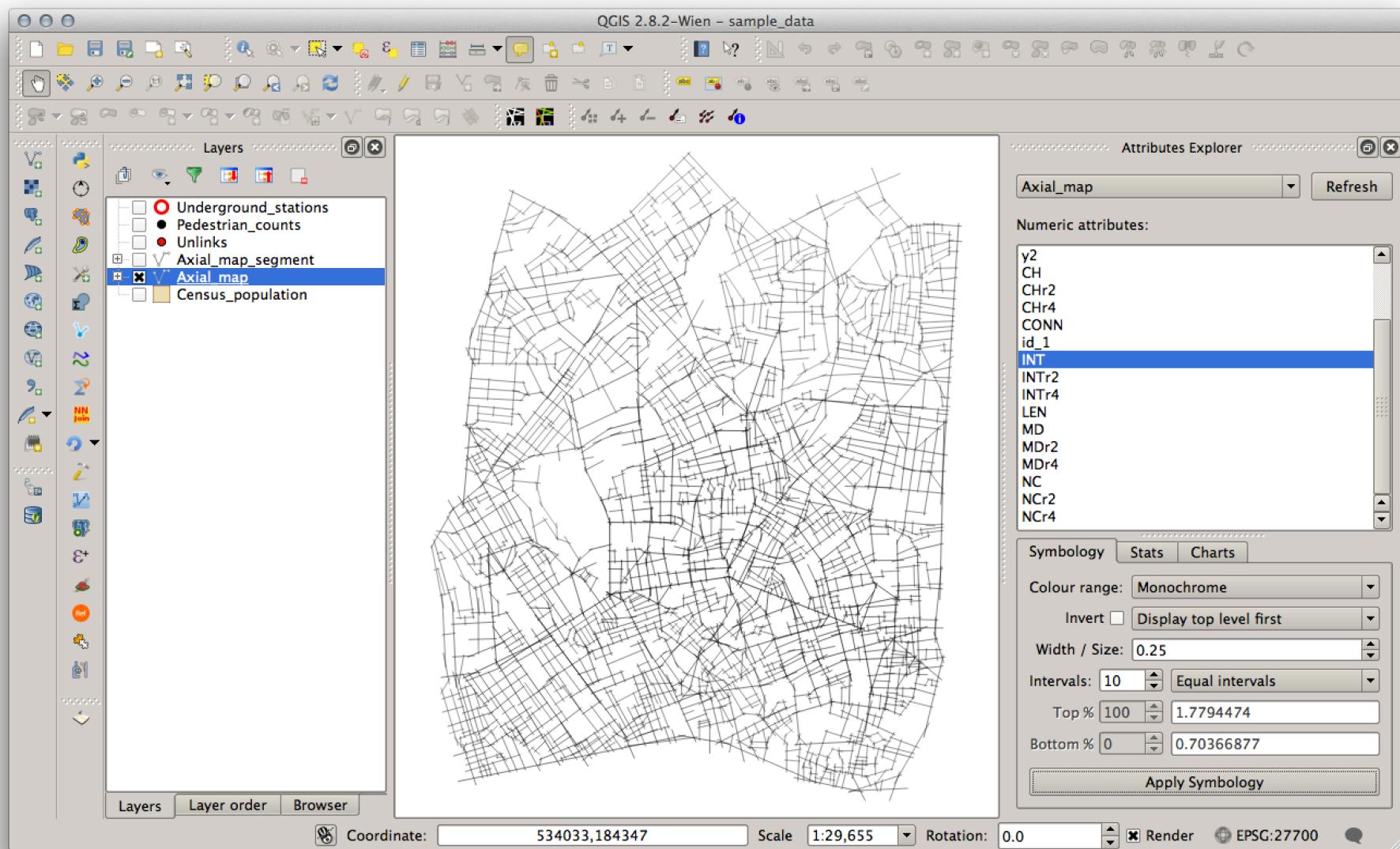
# Visualising the results

## Changing symbology: colour range



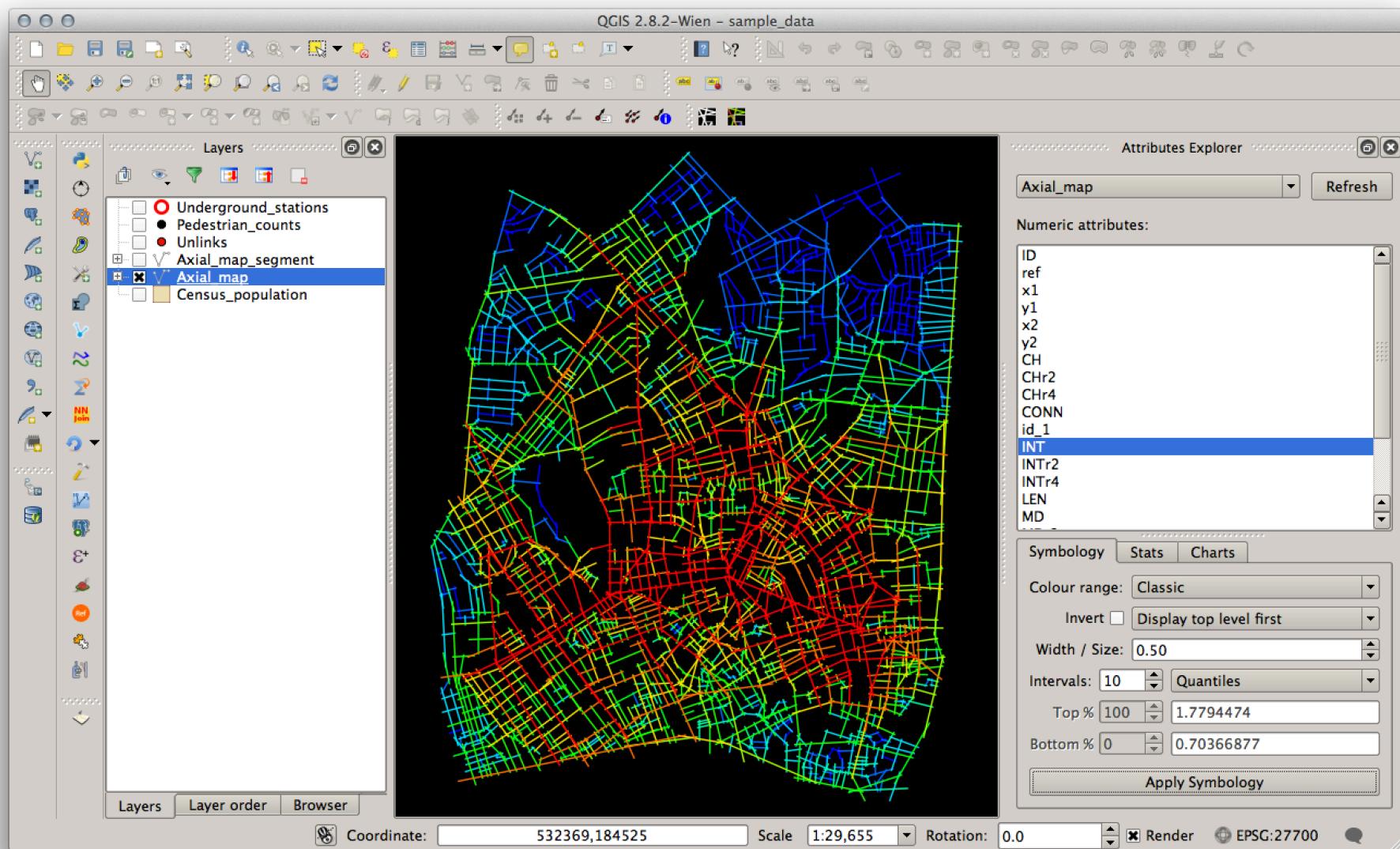
# Visualising the results

## Changing symbology: colour range



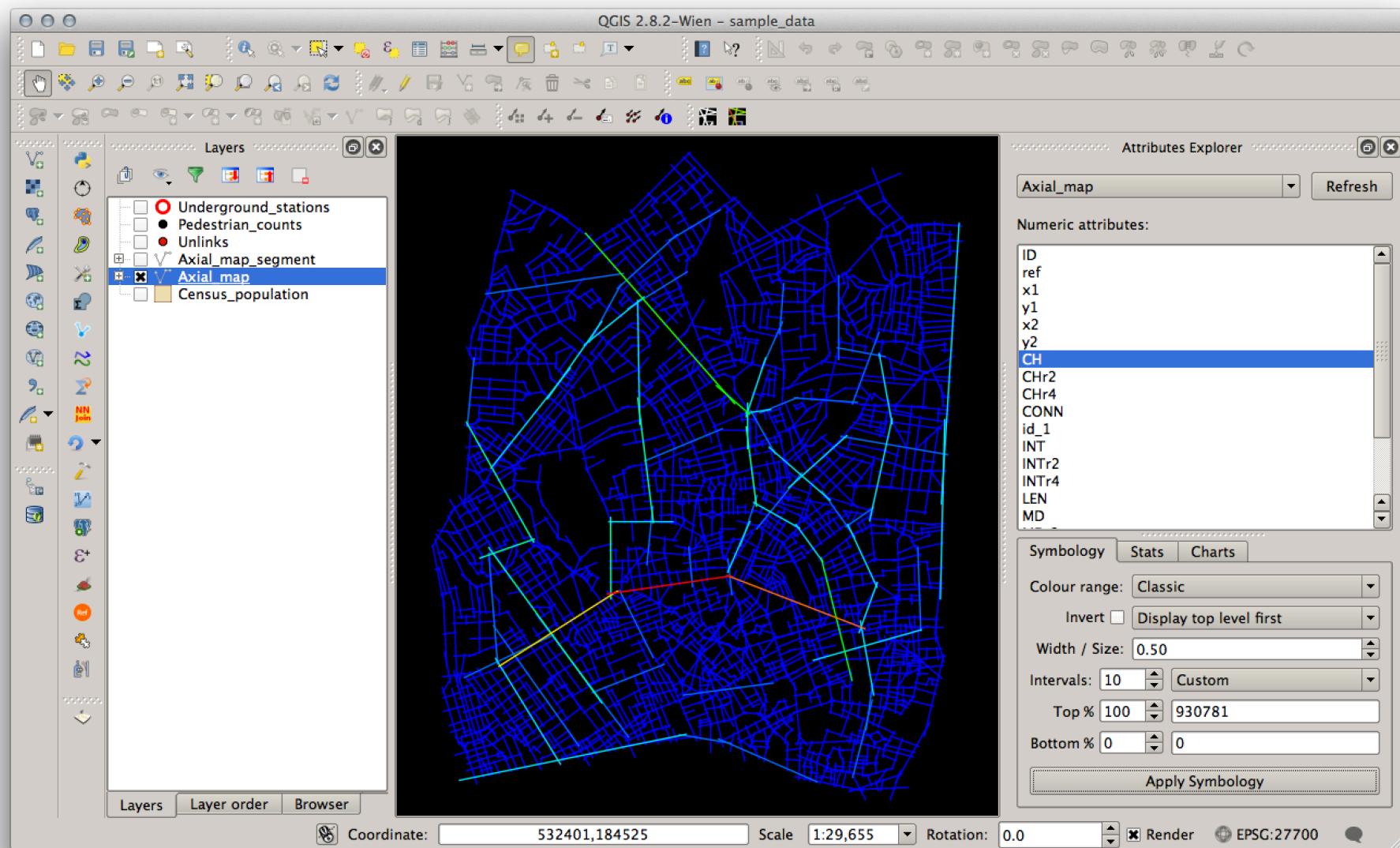
# Visualising the results

## Changing symbology: intervals quantiles



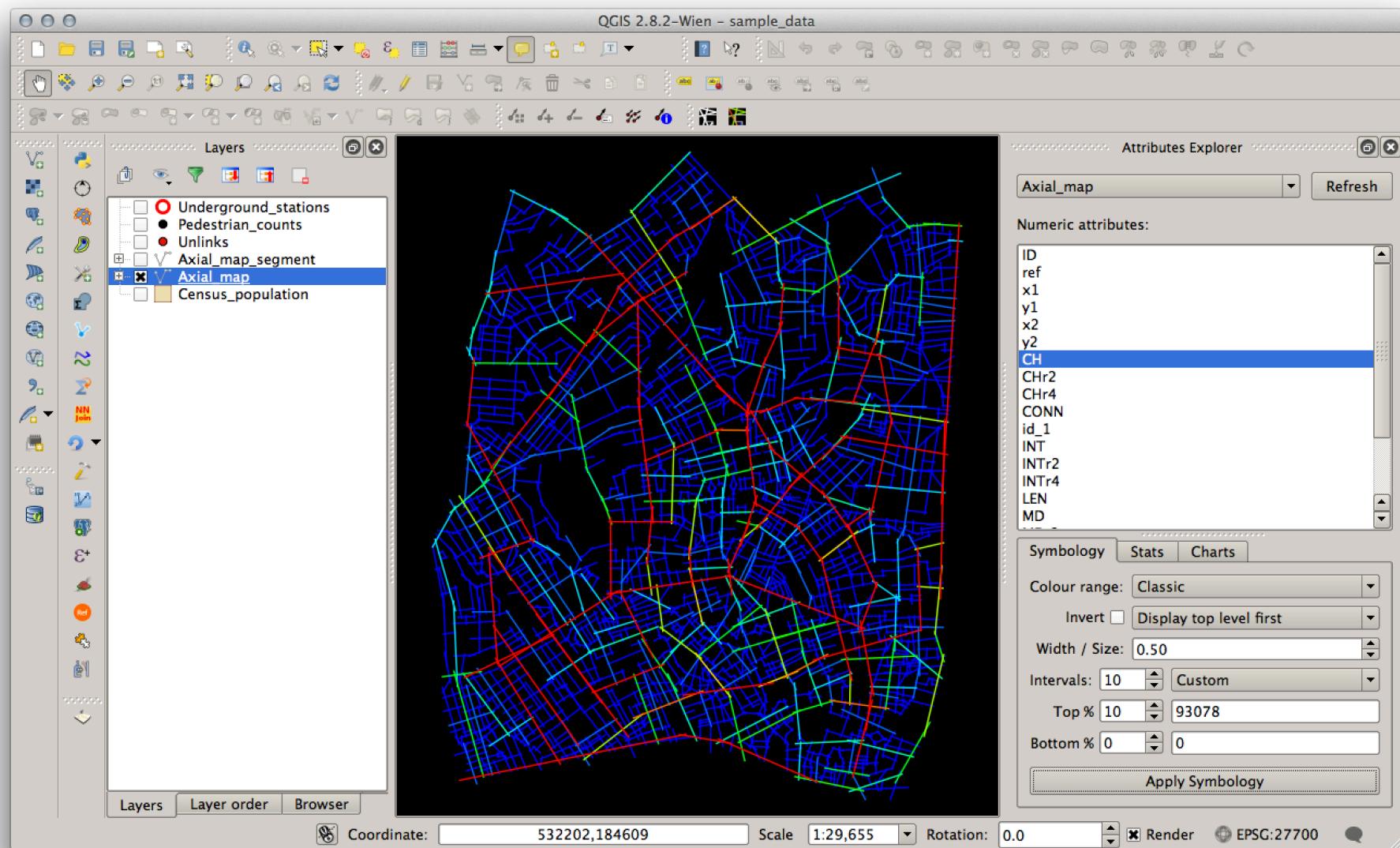
# Visualising the results

## Changing symbology: equal intervals with Choice



# Visualising the results

## Changing symbology: custom intervals with Choice





## Task 2

### **Preparing and analysing road centre line (RCL) models**

- Comparing RCL maps
- Cleaning RCL maps
- Simplifying RCL maps
- Verifying RCL maps
- Analysing RCL maps

# Comparing Road Centre Line maps

OpenStreetMap



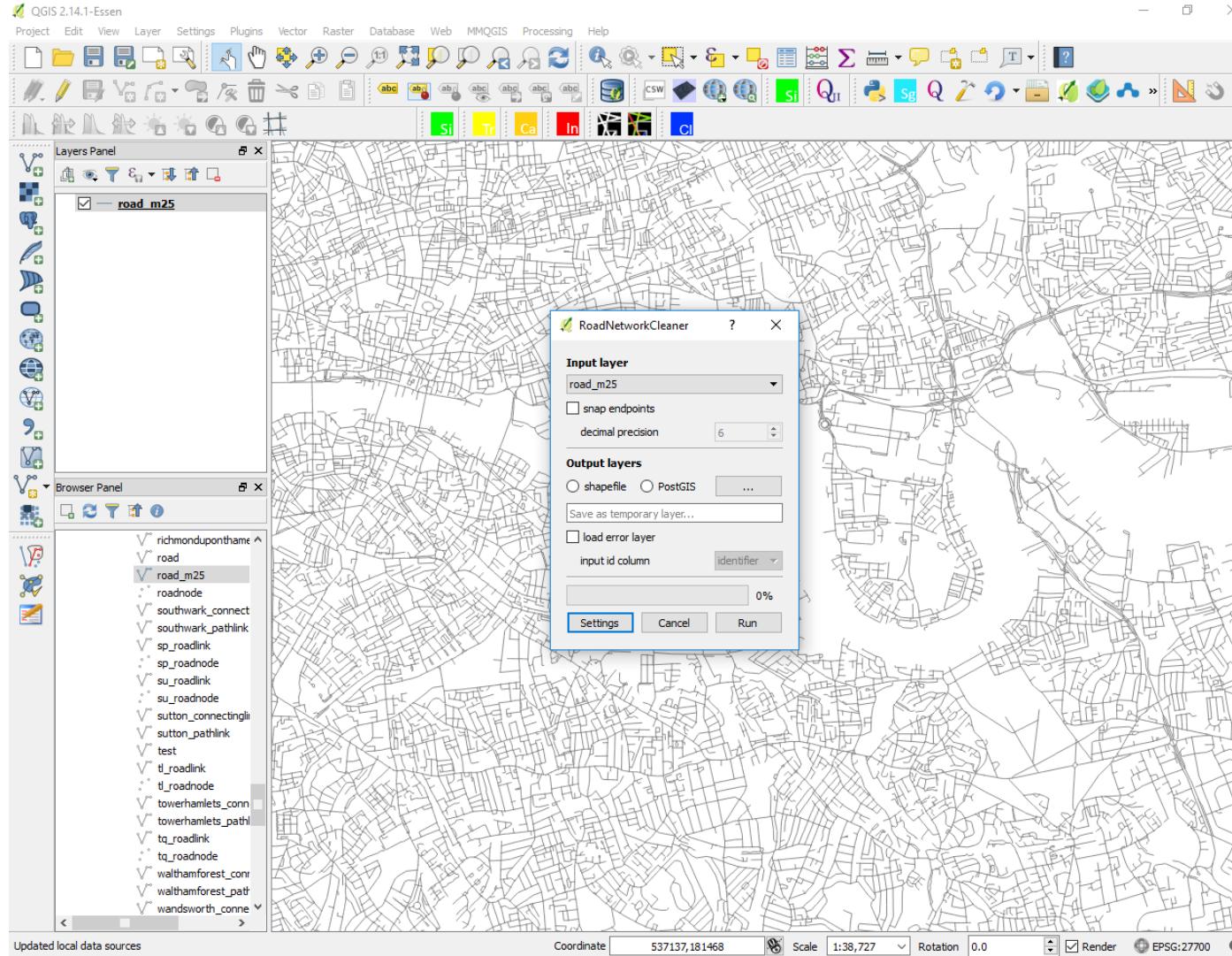
OS Open Roads



OS Meridian 2



# Cleaning RCL maps: Road network cleaner tool

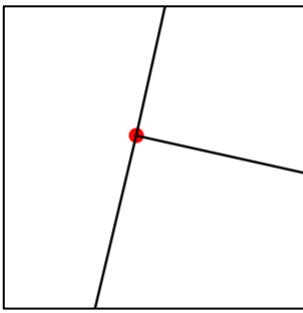


This plugin corrects topological errors of Road-centre-line (RCL) maps. This is a necessary step before performing space syntax analysis to any network.

# Road network cleaner

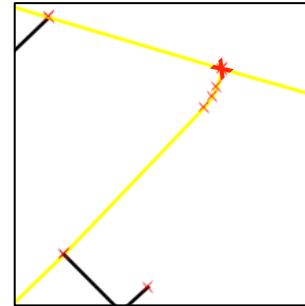
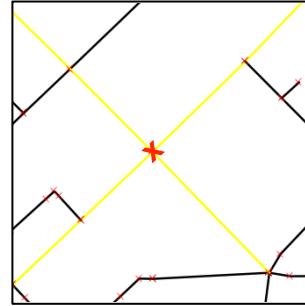
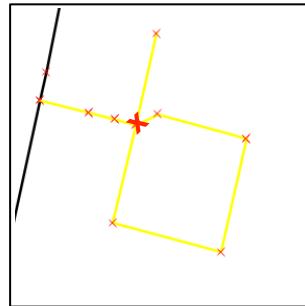
## Geometry

- Removes invalid geometries
- Breaks multi-part geometries
- Removes point geometries

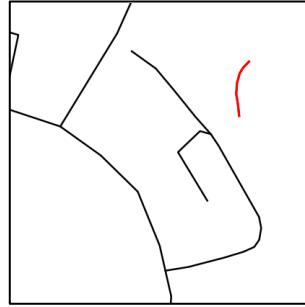
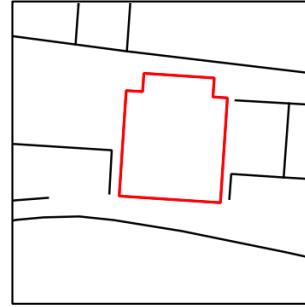
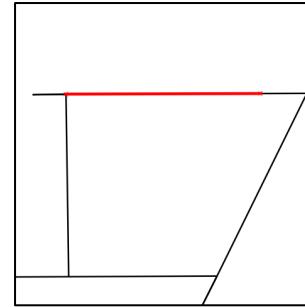


## Topology

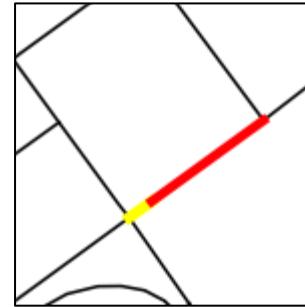
- Breaks geometries at self intersection (1), at shared vertices (2) and where they touch endpoints of other lines (3).



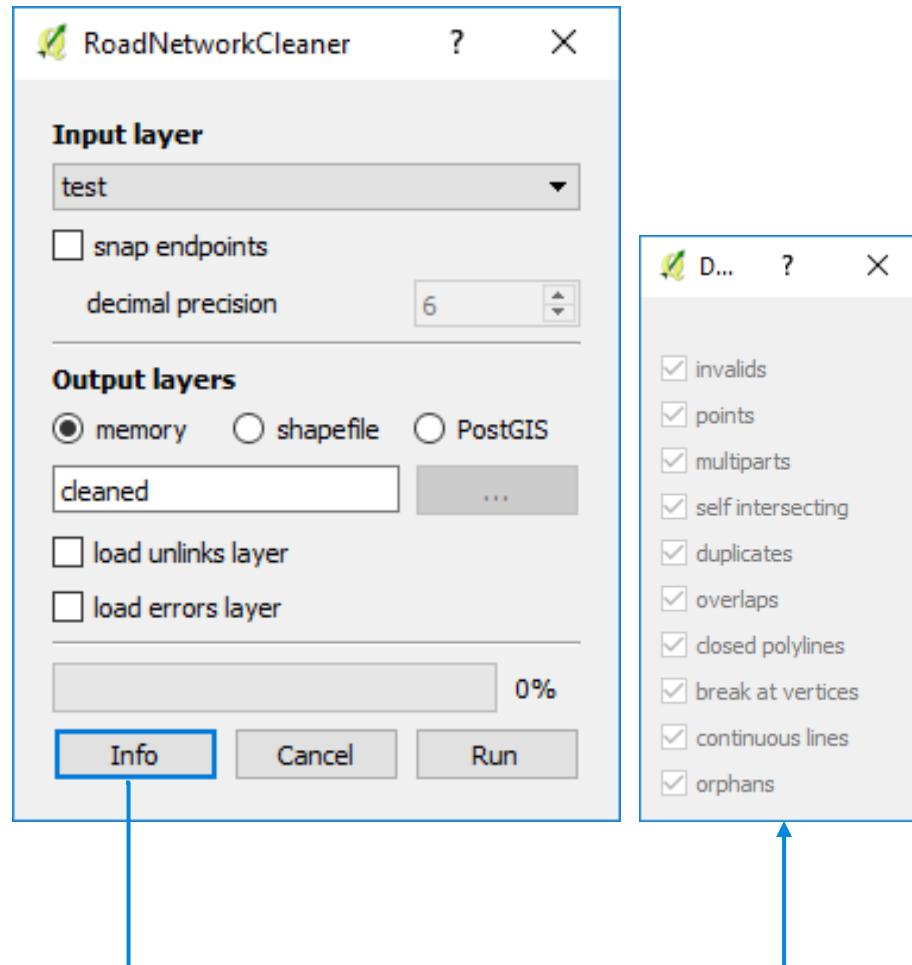
- Removes duplicate and overlapping (1) geometries, closed polylines that do not connect to any other line (2) and isolated lines (3).



- Merges lines between intersections



# Road network cleaner



**Input layer** Choose RCL map to clean. The input can be any QGIS layer.

- **Snap endpoints** The user can specify a decimal precision of the coordinates

**Output layers** The user can choose between a memory QGIS layer a shapefile or a PostGIS database layer.

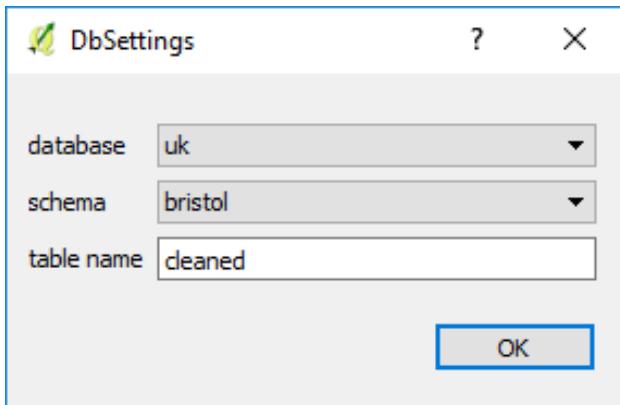
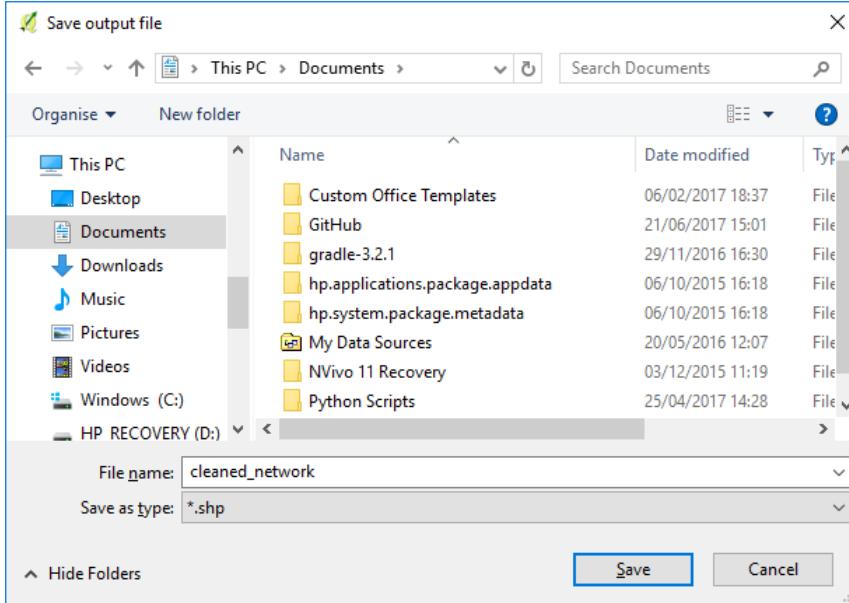
- **Load error layer** The errors that have been corrected by the plugin can be loaded as a memory layer.
- **Load unlinks layer** There is an option to create a memory unlinks layer where the lines of the input layer cross. However, unlinks should be verified by the user as RCL may represent differently unlinked lines.

**Info** See which topological errors are corrected.

**Run** Pressing run will perform the cleaning of the selected map

**Cancel** Pressing close will close and terminate the Road network cleaner

# Road network cleaner



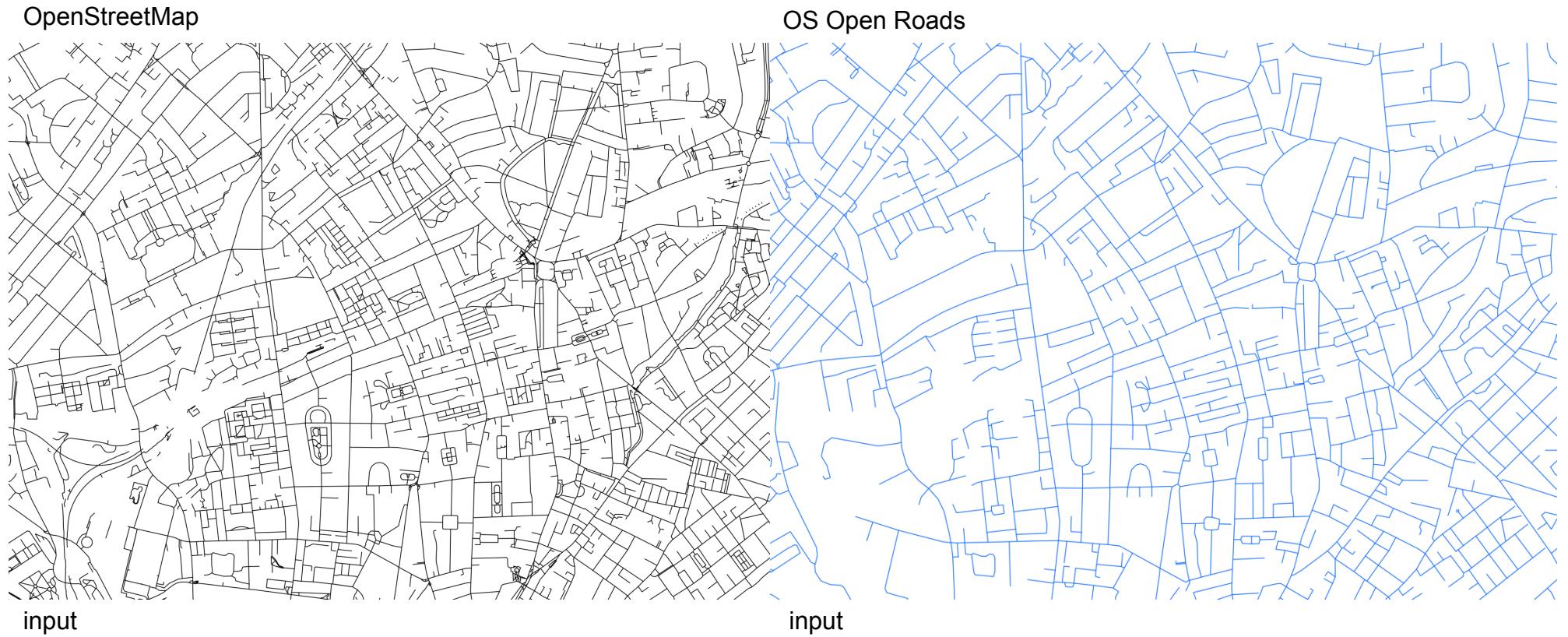
## Shapefile

- **Save output file:** Select the location you wish to save the cleaned shapefile.

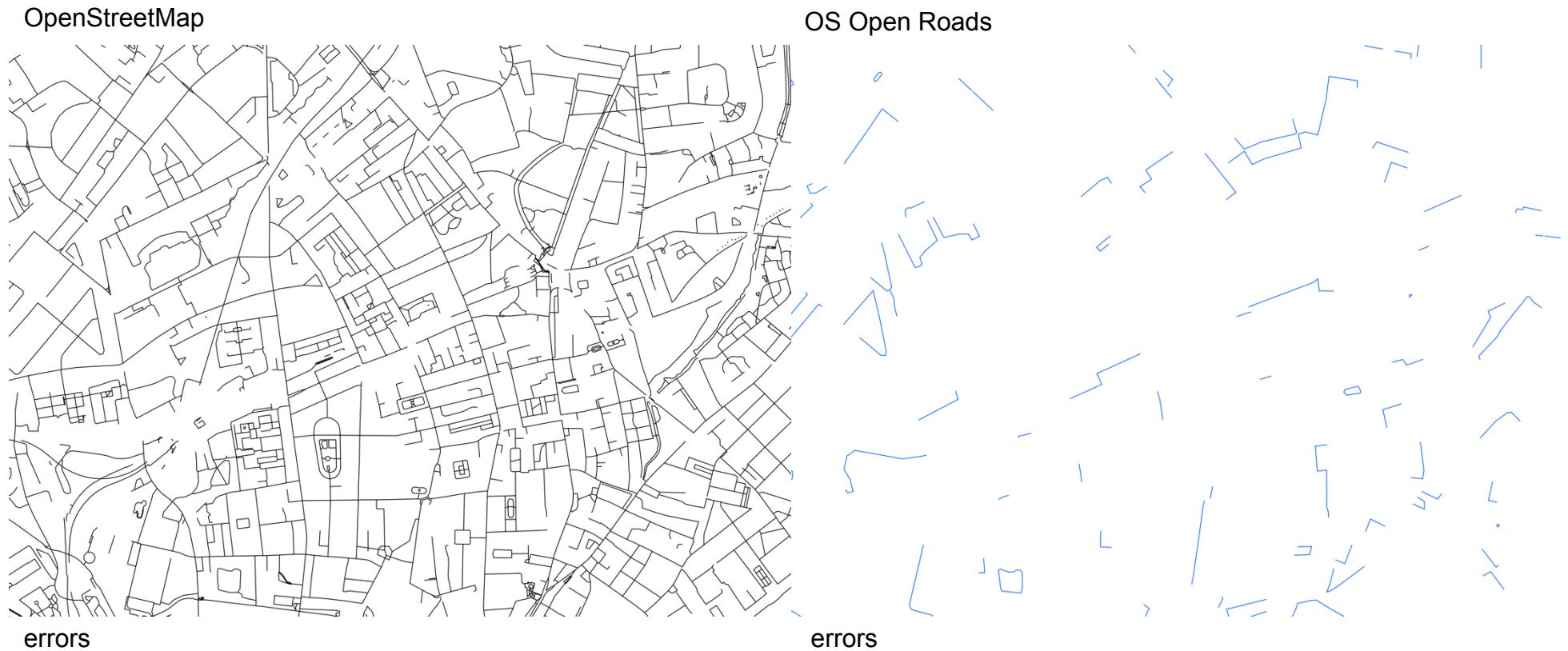
## PostGIS layer

- **Database** Select the database where to save the cleaned layer
- **Schema** Select the schema where to save the cleaned layer
- **Table name** Specify the table name of the cleaned layer or leave it as default ('cleaned')

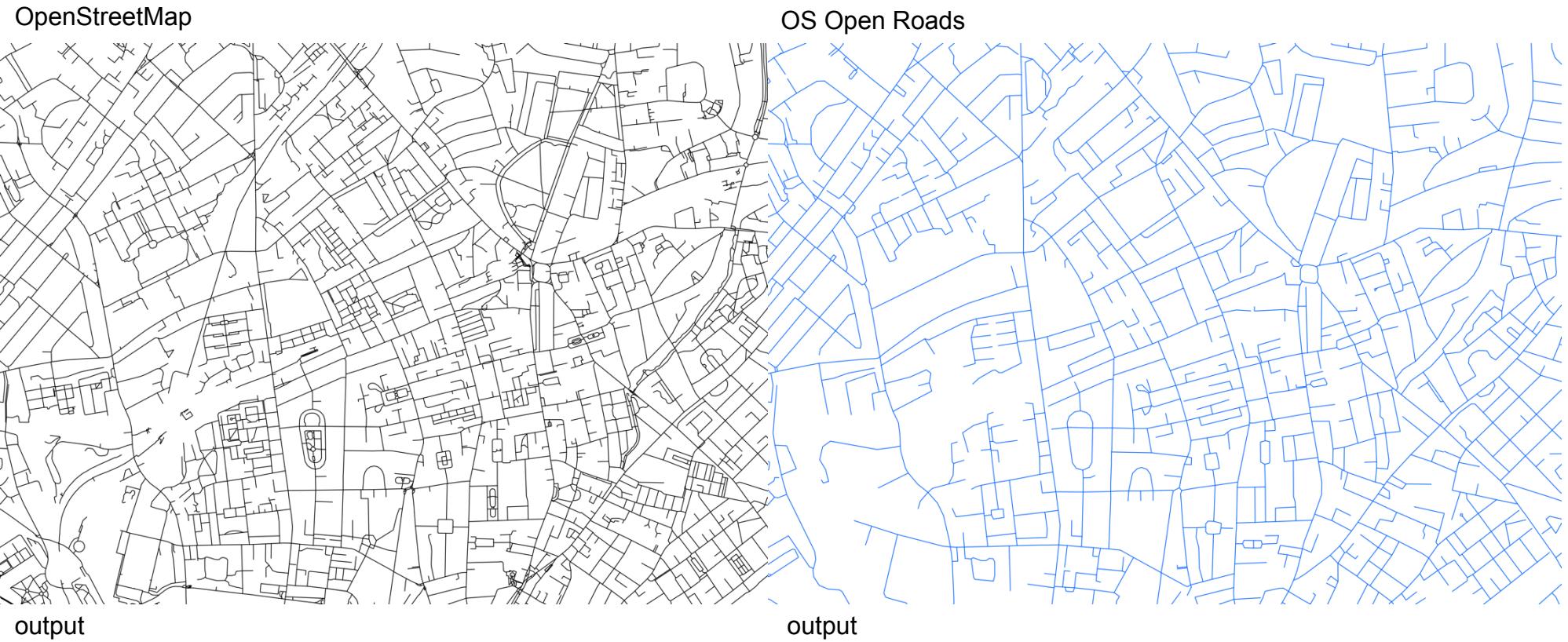
## Cleaning RCL maps



## Cleaning RCL maps

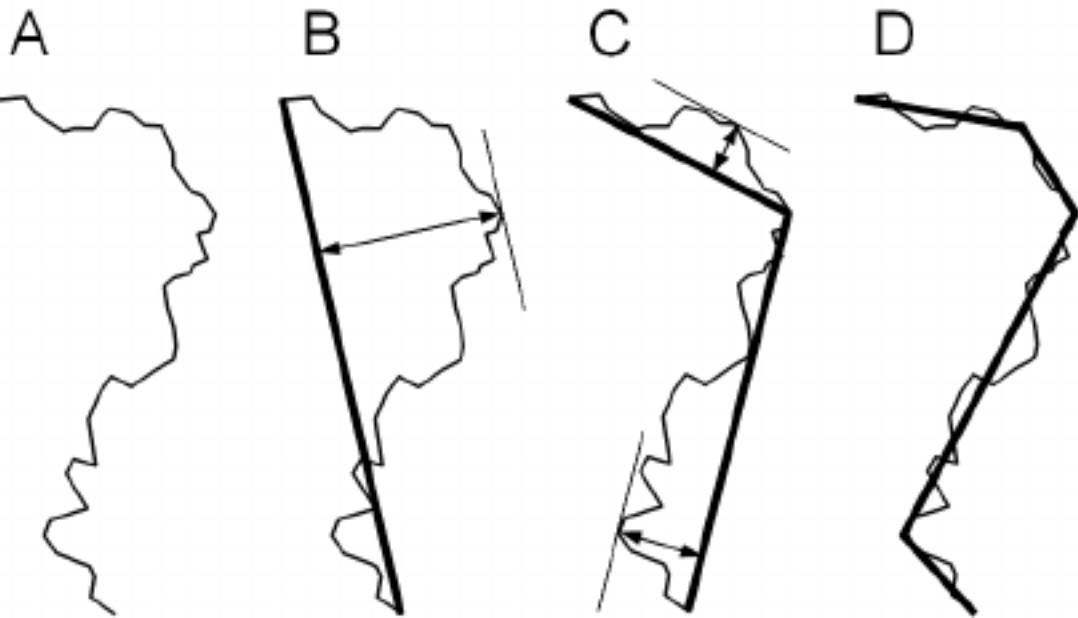


## Cleaning RCL maps



# Simplifying RCL maps

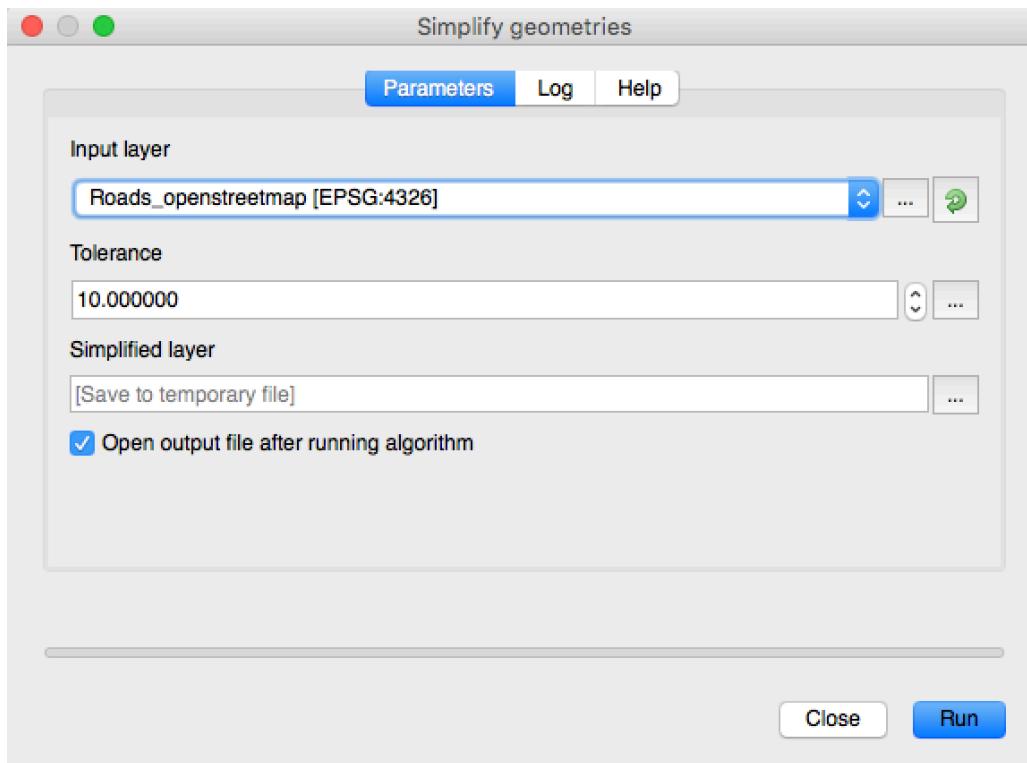
## Douglas-Peucker generalisation algorithm



Source: [https://www.researchgate.net/figure/260758647\\_fig6\\_Figure-6-Simplification-of-a-polygonal-curve-with-the-Douglas-Peucker-algorithm-A](https://www.researchgate.net/figure/260758647_fig6_Figure-6-Simplification-of-a-polygonal-curve-with-the-Douglas-Peucker-algorithm-A)

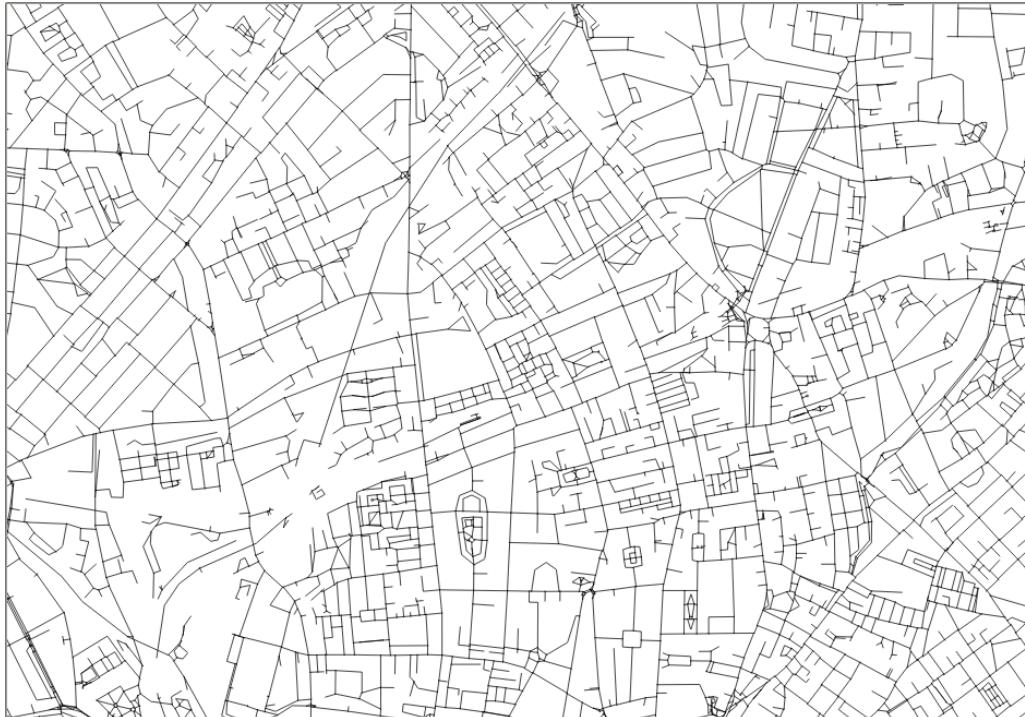
# Simplifying RCL maps

## QGIS – Simplify geometries



# Simplifying RCL maps

OpenStreetMap



Simplification threshold 10

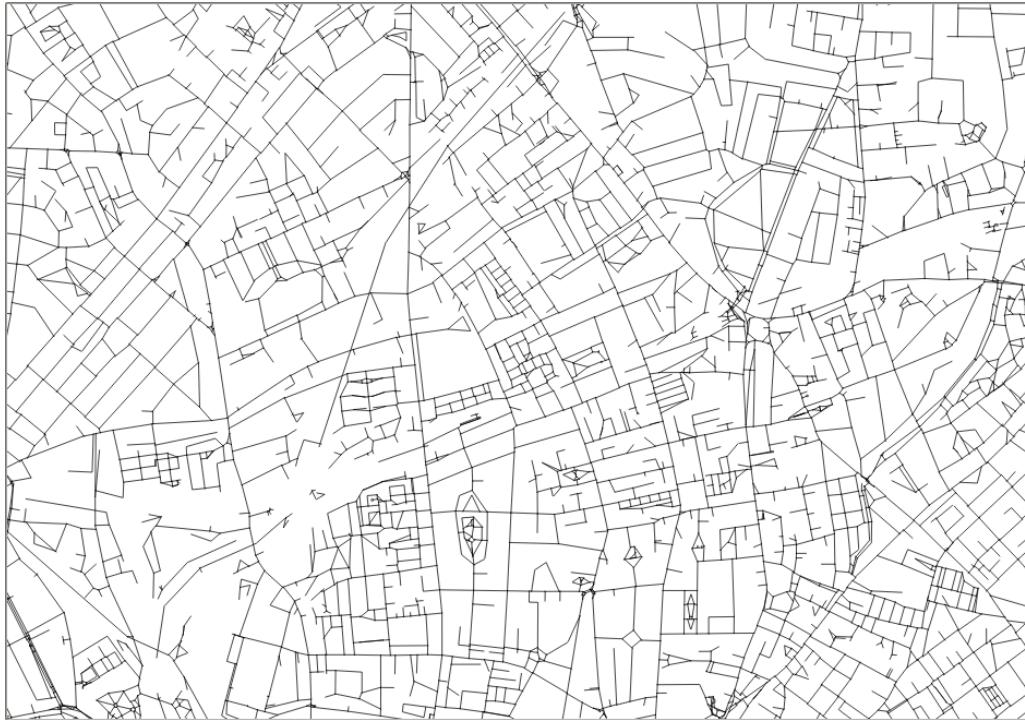
OS Open Roads



Simplification threshold 10

# Simplifying RCL maps

OpenStreetMap



Simplification threshold 20

OS Open Roads



Simplification threshold 20

# Simplifying RCL maps

OS Meridian 2



No simplification

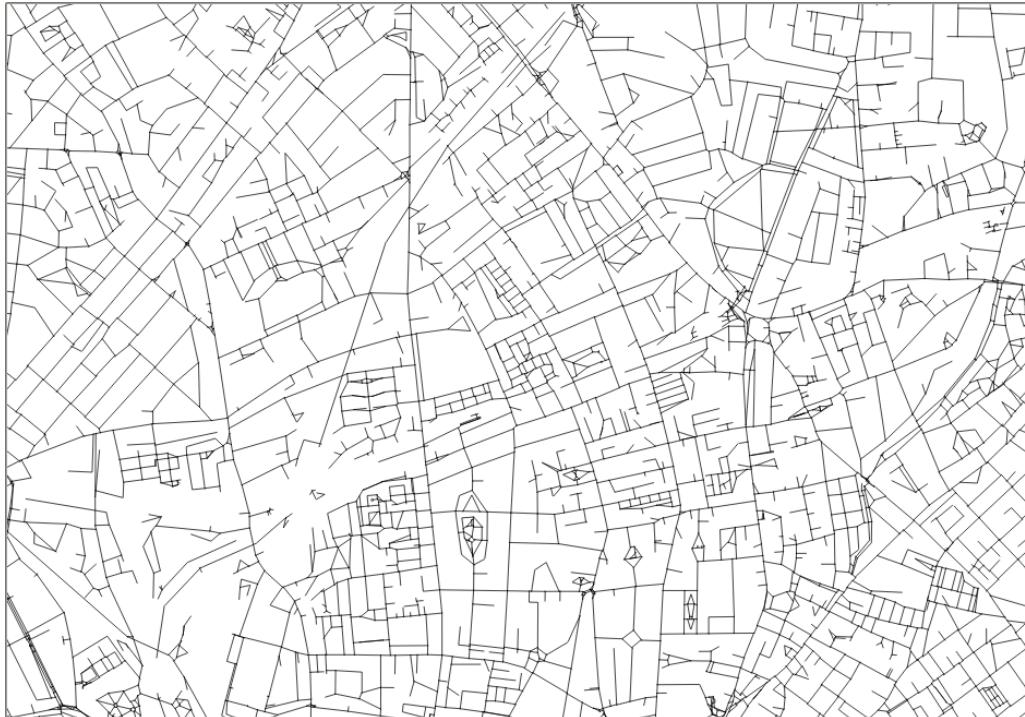
OS Open Roads



Simplification threshold 20

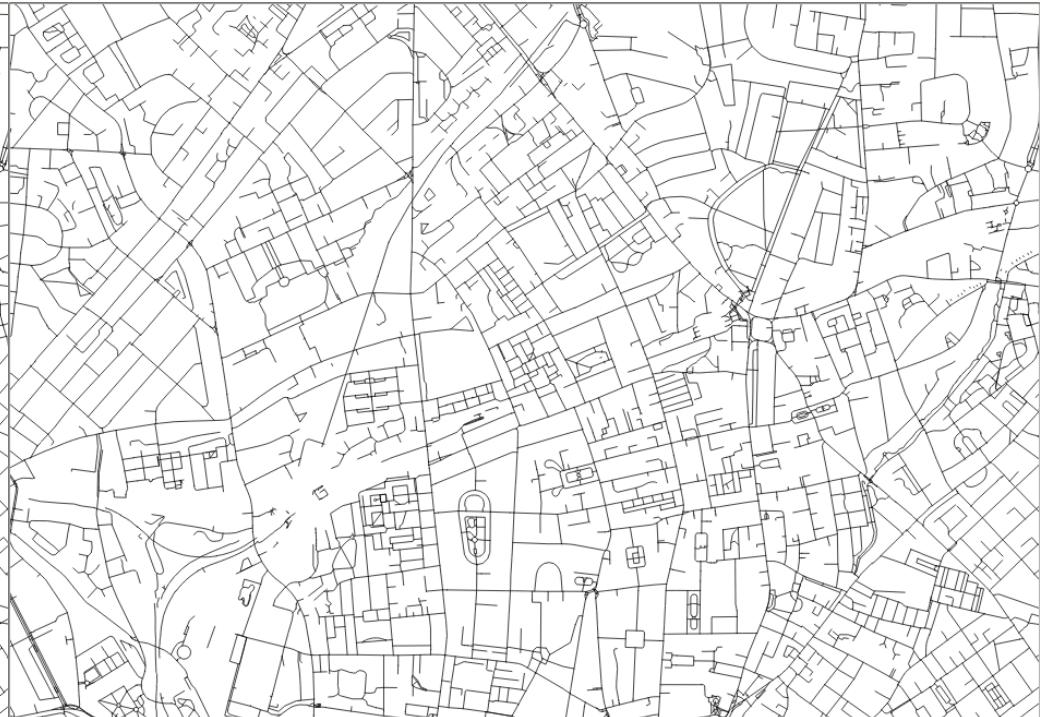
# Simplifying RCL maps

OpenStreetMap – threshold 20



Simplification threshold 20

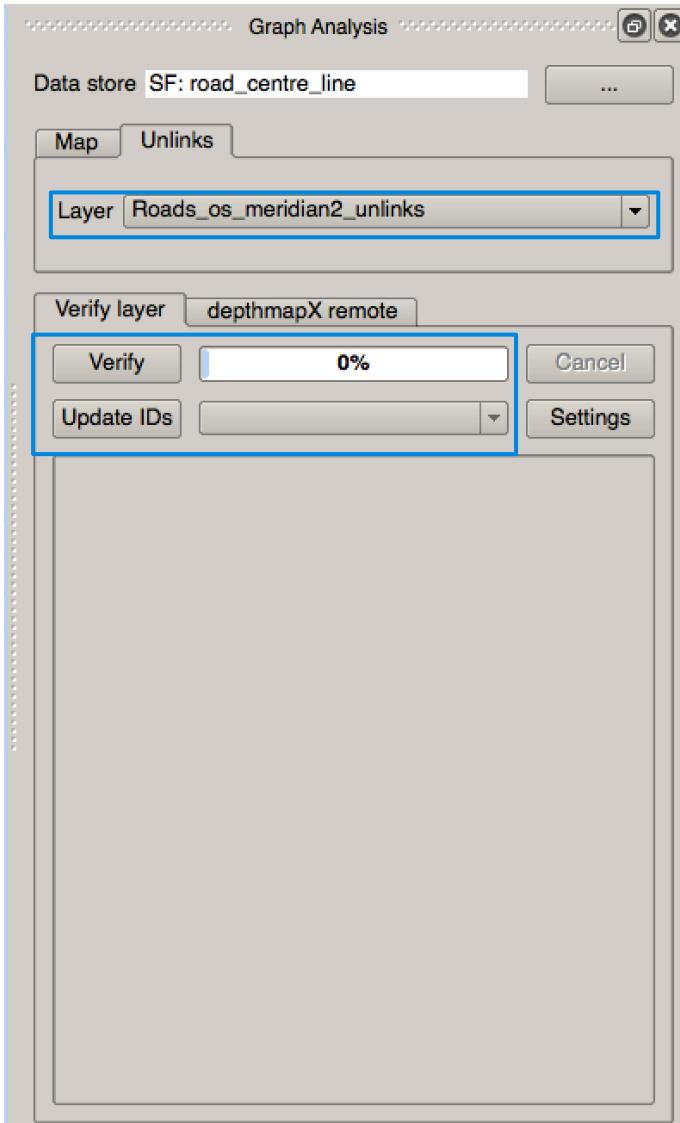
OpenStreetMap



No simplification

# Verifying RCL maps

## Graph Analysis tool

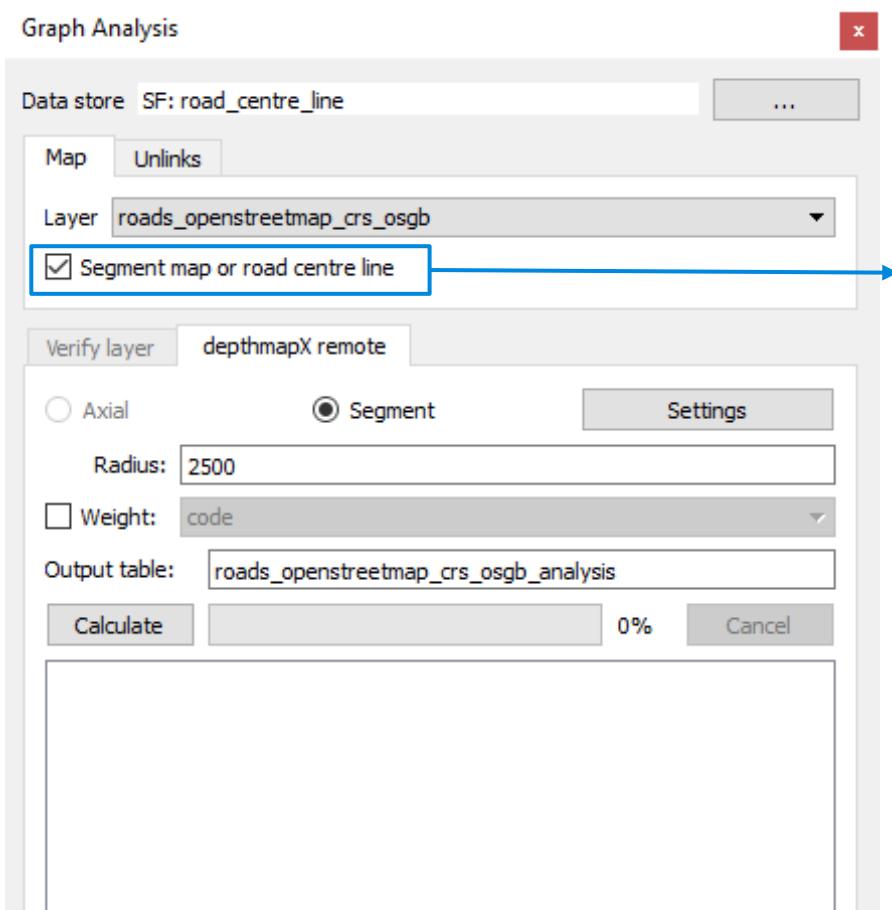


### Unlinks

- **Verify the unlinks:** This is required in the cases where the cleaning tool produces a meaningful unlinks result file, e.g. OS OpenRoads and OS Meridian2.

# Analysing RCL maps

## Graph Analysis tool

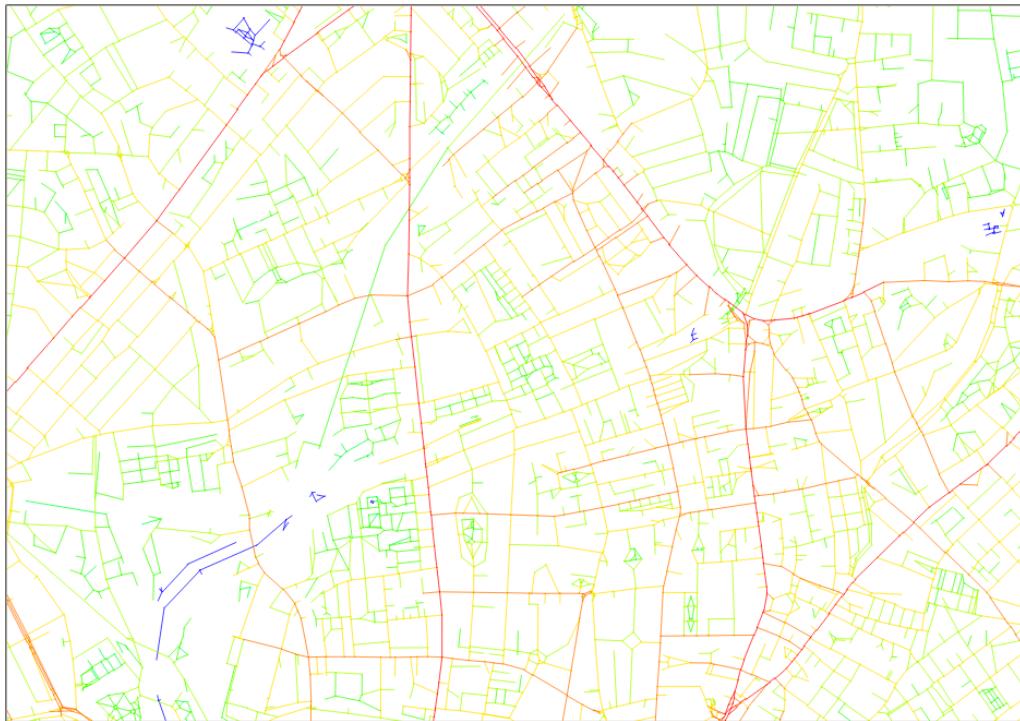


### Map

- **Segment map or road centre line:** Tick this option when you are analysing road centre line maps or axial maps already segmented.

# Analysing RCL maps

OpenStreetMap



Integration RN, 10 equal ranges

OS Open Roads



Integration RN, 10 equal ranges



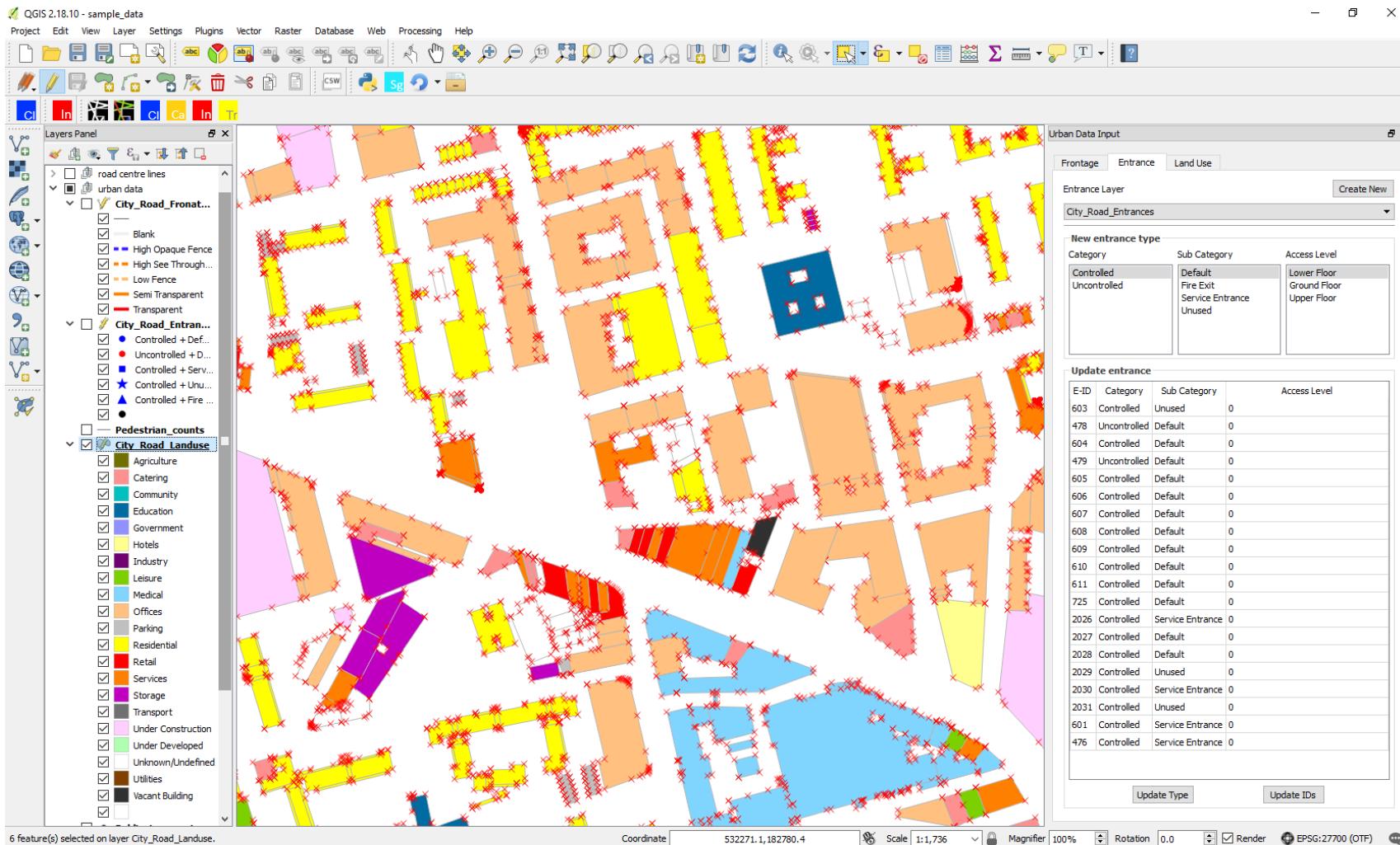
## Task 3

### **Preparing other urban data layers**

Urban Data Input Tool: recoding frontages, entrances and land use surveys

- Creating the data layer
- Drawing new features
- Updating features
- Viewing the attributes

# Urban Data Input Tool



Urban Data Input Tool is a plugin to ease aid the input of urban data like frontage type, entrance type and land use type as per Space Syntax Limited standards. The Space Syntax community is the key users for the plugin. The display styles and categories included are as per Space Syntax Limited Standards.

# Urban Data Input Tool

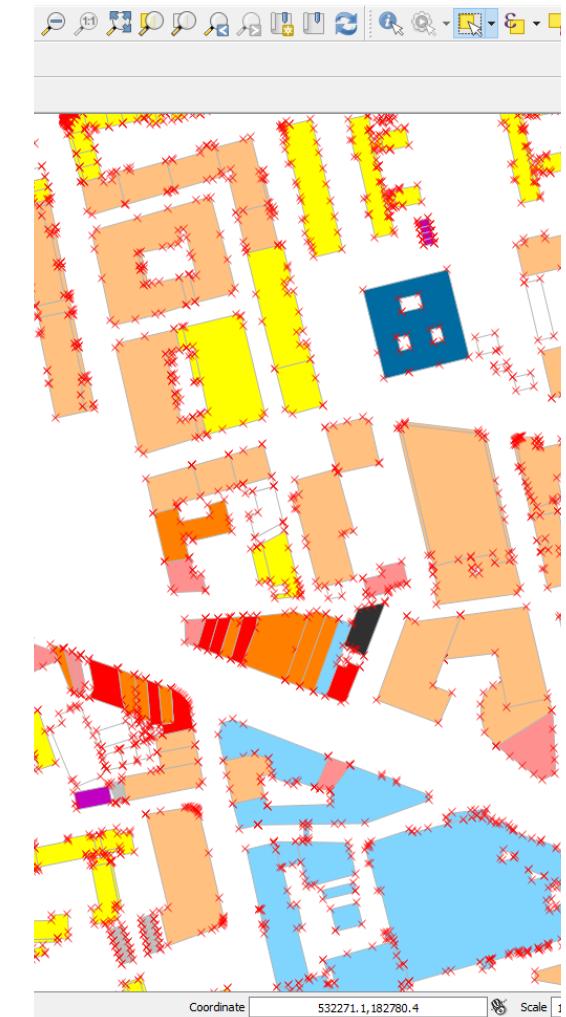
Frontage survey



Entrance survey



Land use survey



# Urban Data Input Tool

## Frontage tool

**Urban Data Input**

**Frontage**   **Entrance**   **Land Use**

**Frontage layer** **Create New**

memory:Frontages

**New frontage type**

Building Fences	Transparent Semi Transparent Blank
--------------------	--

**Update frontage**

F-ID	Group	Type	Length
1 1	Building	Transparent	132.932686002
2 2	Building	Blank	63.8493628295
3 3	Building	Semi Transparent	166.042669713

**Update Type**   **Update ID**   **Update Length**

**Hide lines with no frontage type**   **Hide**

## Entrance tool

**Urban Data Input**

**Frontage**   **Entrance**   **Land Use**

**Entrance Layer** **Create New**

memory:Entrances

**New entrance type**

Category	Sub Category	Access Level
Controlled Uncontrolled	Default	Lower Floor Ground Floor Upper Floor

**Update entrance**

E-ID	Category	Sub Category	Access Level
1 1	Controlled	Service Entrance	Ground Floor
2 2	Controlled	Service Entrance	Ground Floor
3 3	Controlled	Service Entrance	Ground Floor
4 4	Controlled	Service Entrance	Ground Floor
5 5	Controlled	Service Entrance	Ground Floor
6 6	Controlled	Service Entrance	Ground Floor
7 7	Controlled	Default	Ground Floor
8 8	Controlled	Default	Ground Floor
9 9	Controlled	Default	Ground Floor
10 10	Controlled	Default	Ground Floor
11 11	Controlled	Default	Ground Floor
12 12	Uncontrolled	Default	Ground Floor
13 13	Uncontrolled	Default	Ground Floor
14 14	Uncontrolled	Default	Ground Floor
15 15	Uncontrolled	Default	Ground Floor
16 16	Uncontrolled	Default	Ground Floor
17 17	Uncontrolled	Default	Ground Floor

**Update Type**   **Update ID**

## Land use tool

**Urban Data Input**

**Frontage**   **Entrance**   **Land Use**

**Land Use Layer** **Create New**

memory:Land use

**Select Floor**

Ground floor    Lower floor    Upper floor

**New land use type**

Category	Sub Category
Offices Parking Retail Residential Services Storage	Commercial Financial

**Floors**

**Description**

**Update land use**

LU-ID	Floors	Area	GF Category	GF Sub Category
1 1	6	11...	Agriculture	
2 2	5	26...	Government	
3 3	4	13...	Catering	Drinking Establishments
4 4	3	66...	Hotels	
5 5	2	11...	Services	Commercial

**Update Type**   **Update ID**

# Urban Data Input Tool Frontage tool

The screenshot shows the 'Urban Data Input' dialog box with the 'Frontage' tab selected. The 'Frontage layer' dropdown is set to 'memory:Frontages'. The 'New frontage type' section contains two columns: 'Building' and 'Fences'. The 'Building' column has 'Transparent' selected. The 'Fences' column has 'Semi Transparent' selected. A legend titled 'Data categories' lists six types: Blank (light gray), High Opaque Fence (dark blue), High See Through Fence (orange), Low Fence (yellow-orange), Semi Transparent (orange), and Transparent (red). Below the legend is a table titled 'Update frontage' with three rows of data:

F-ID	Group	Type	Length
1 1	Building	Transparent	132.932686002
2 2	Building	Blank	63.8493628295
3 3	Building	Semi Transparent	166.042669713

At the bottom are 'Update Type', 'Update ID', and 'Update Length' buttons, and checkboxes for 'Hide lines with no frontage type' and 'Hide'.

**Create New Frontage layer**

- Using buildings/block dataset
- Without using building/block dataset

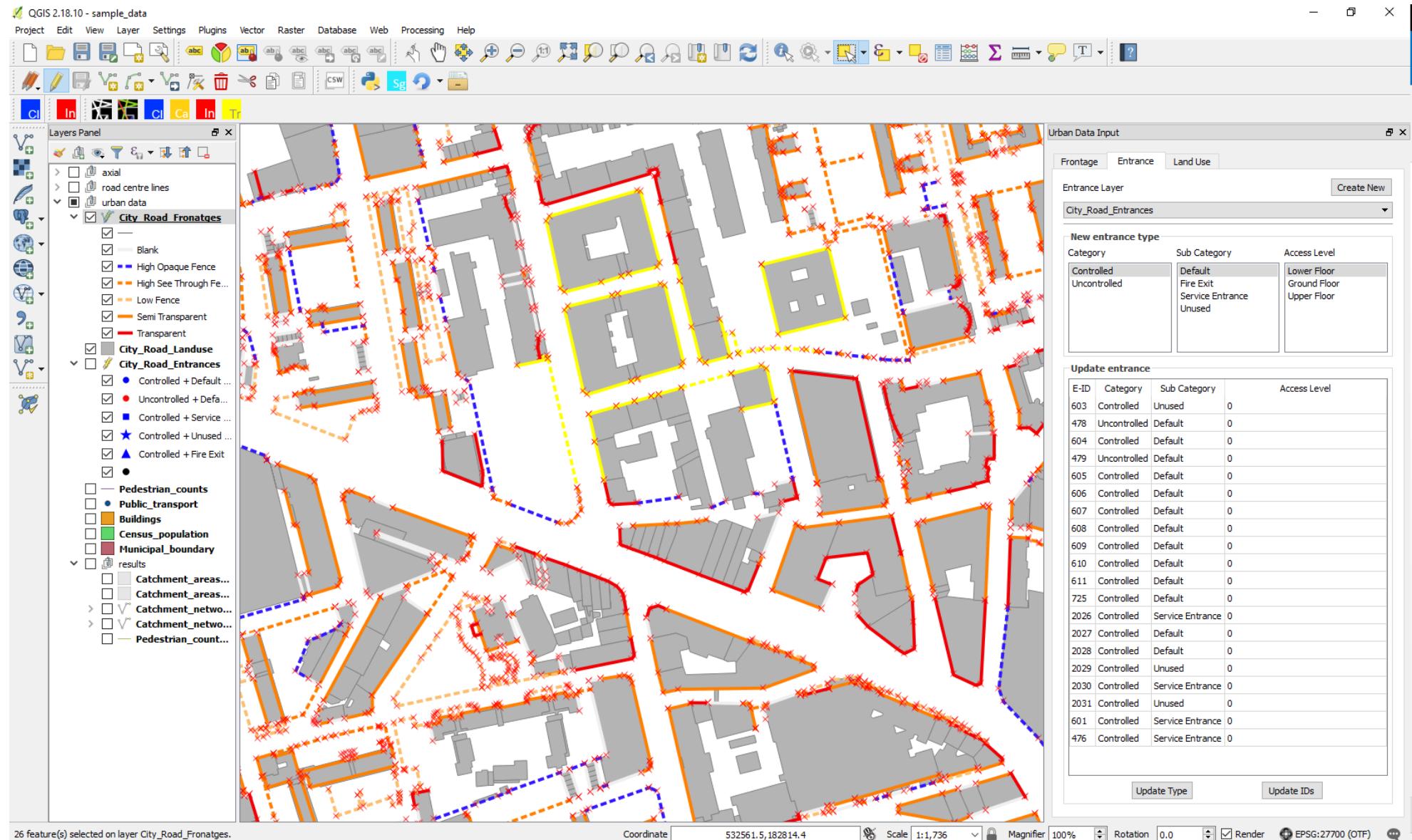
**Frontage Category**

**Selected feature data**

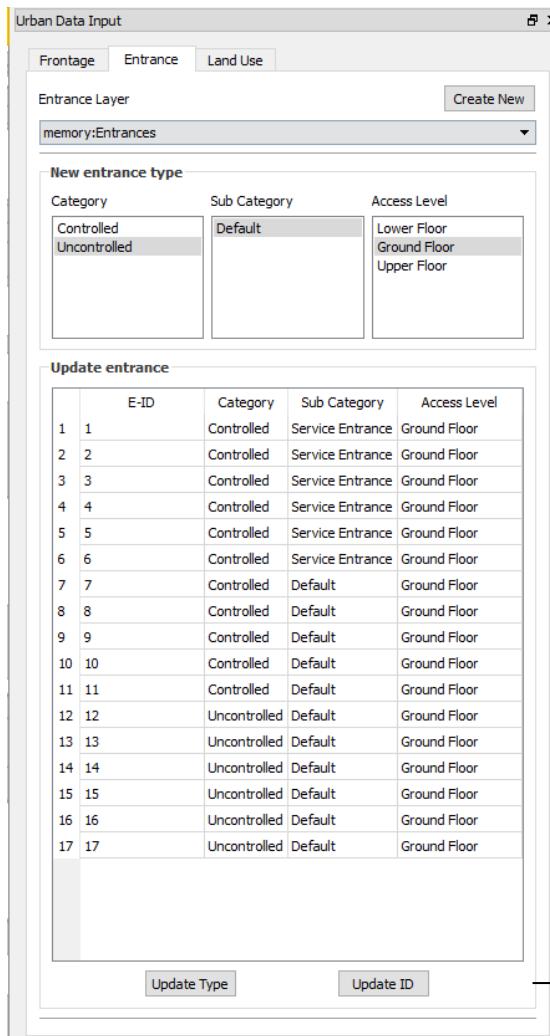
**Update buttons**

**Hide lines with no data**

# Urban Data Input Tool Frontage tool



# Urban Data Input Tool Entrance tool



Create New Entrance layer

Entrance Category

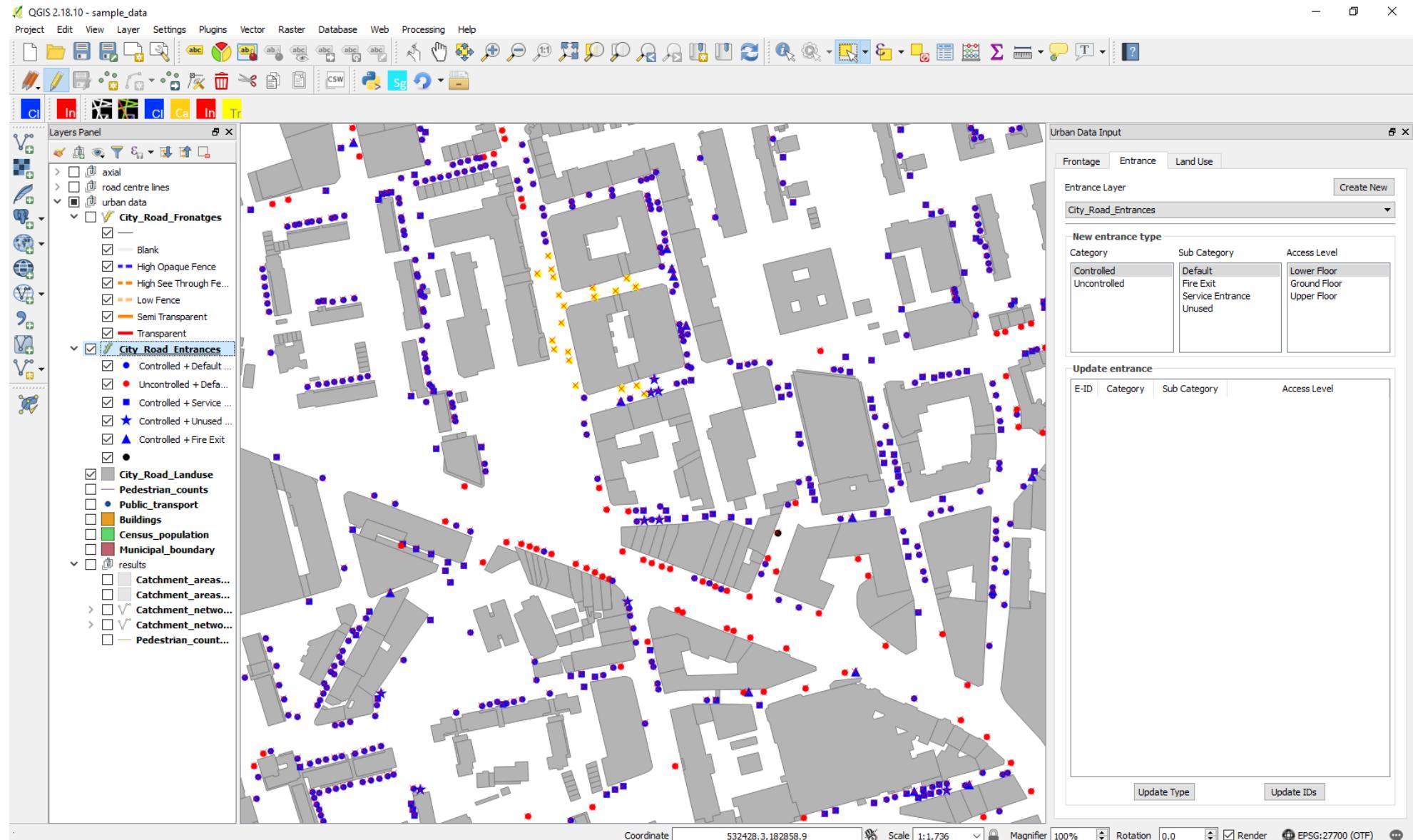
Selected feature data

Update buttons

## Data categories

- Controlled + Default Entrance
- Uncontrolled + Default Entrance
- Controlled + Service Entrance
- ★ Controlled + Unused Entrance
- ▲ Controlled + Fire Exit

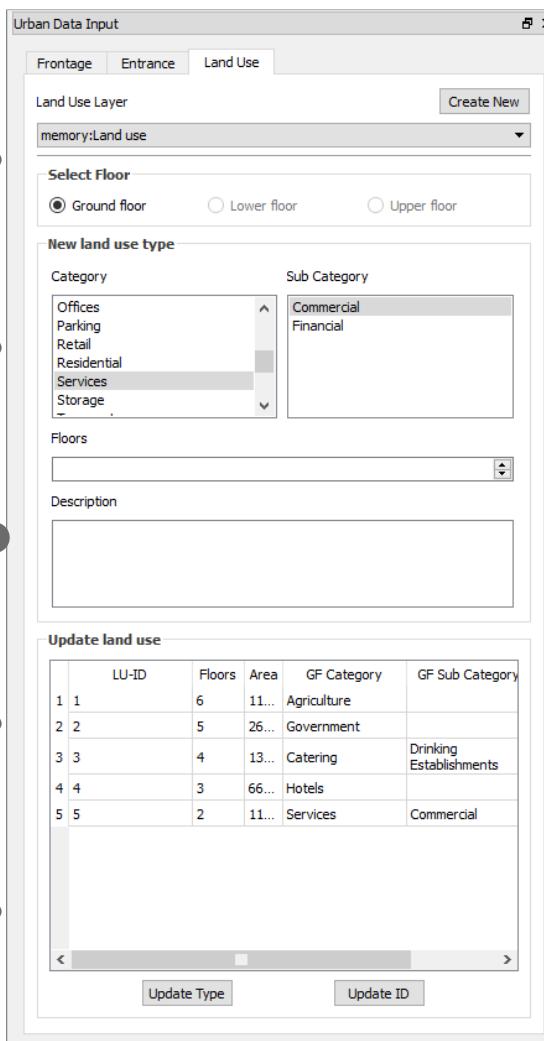
# Urban Data Input Tool Entrance tool



Workshop

Space Syntax Toolkit for QGIS

# Urban Data Input Tool Land use tool



Create New Land use layer

Land use Category

Building data/ description

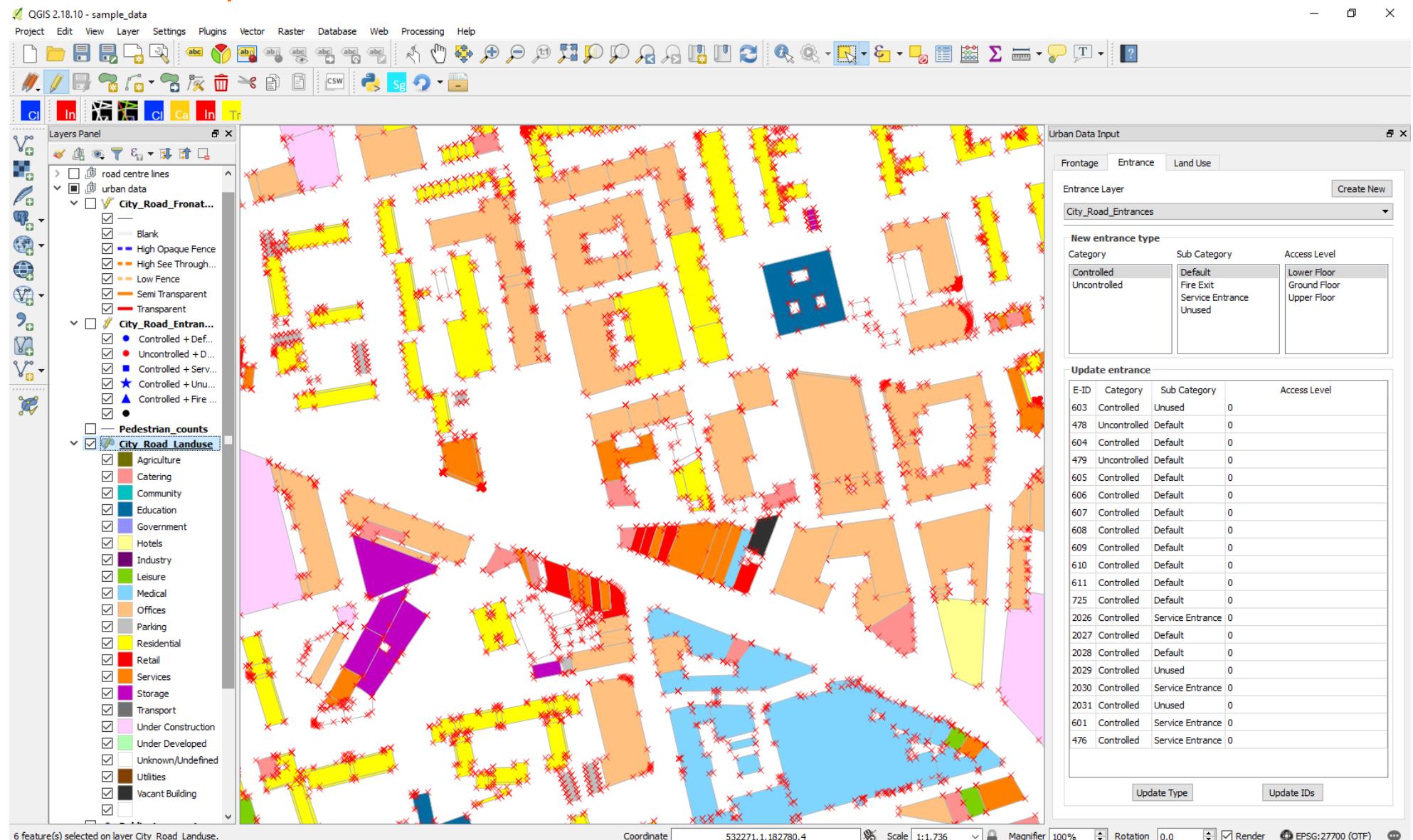
Selected feature data

Update buttons

## Data categories

	Agriculture
	Catering
	Community
	Education
	Government
	Hotels
	Industry
	Leisure
	Medical
	Offices
	Parking
	Residential
	Retail
	Services
	Storage
	Transport
	Under Construction
	Under Developed
	Unknown/Undefined
	Utilities
	Vacant Building

# Urban Data Input Tool Land use tool



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## Task 4

### **Connecting and analysing the various results**

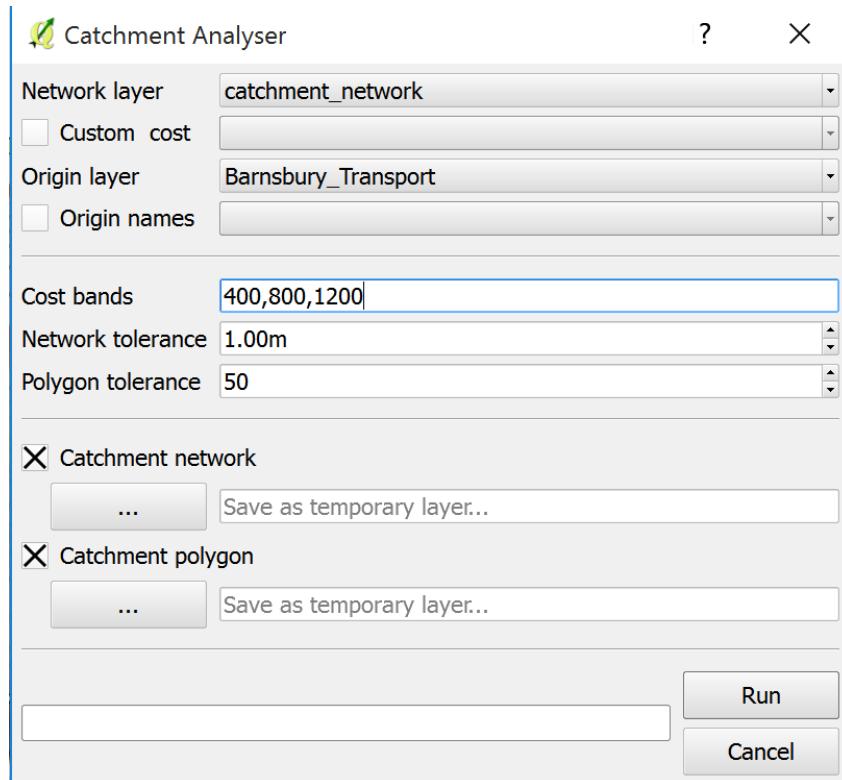
Catchment Analyser: calculating service/catchment areas from different locations (e.g. public transport nodes) along the road centreline network.

# Catchment Analyser



This plugin takes a line-based network and point-based origin layer and calculated the distance from each segment within a given distance or list of distances to each of the origins. The tool outputs the catchment as lines and as a concave hull polygon layer. Credit for the concave hull functionality goes to the algorithm described by Adriano Moreira and Maribel Yasmina Santos.

# Catchment Analyser



**Network layer** Choose the line-based vector layer that comprises a topological network you want to analyse. (projected CRS only!!)

**Custom cost** By default the tool will generate catchments based on the length of the network segments. If checked the tool will apply a weight based on the column selected.

**Origin layer** Choose the point-based vector layer containing the origins from which catchment will be calculated.

**Origin Names** By default the origin names will be based on the feature ids. If checked the tool will run the catchment analysis based on the column selected.

**Cost Bands** This sets the radius for the catchment analysis. For example, 400,800,1200,2000.

**Network tolerance** This is a tolerance for disconnected network. For example, it will connect lines that are within 1m by default.

**Polygon tolerance** The Catchment Analyser tool creates concave hull polygons from a specific origin. The polygon tolerance defines the level of 'concaveness' of the catchment. The lower the value, the more concave and the higher the value the more convex.

**Catchment network** The tool provides a catchment network output based on the original network layer with cost information on every origin. If checked the tool will generate the network as a temporary layer or as a shapefile using the browse button.

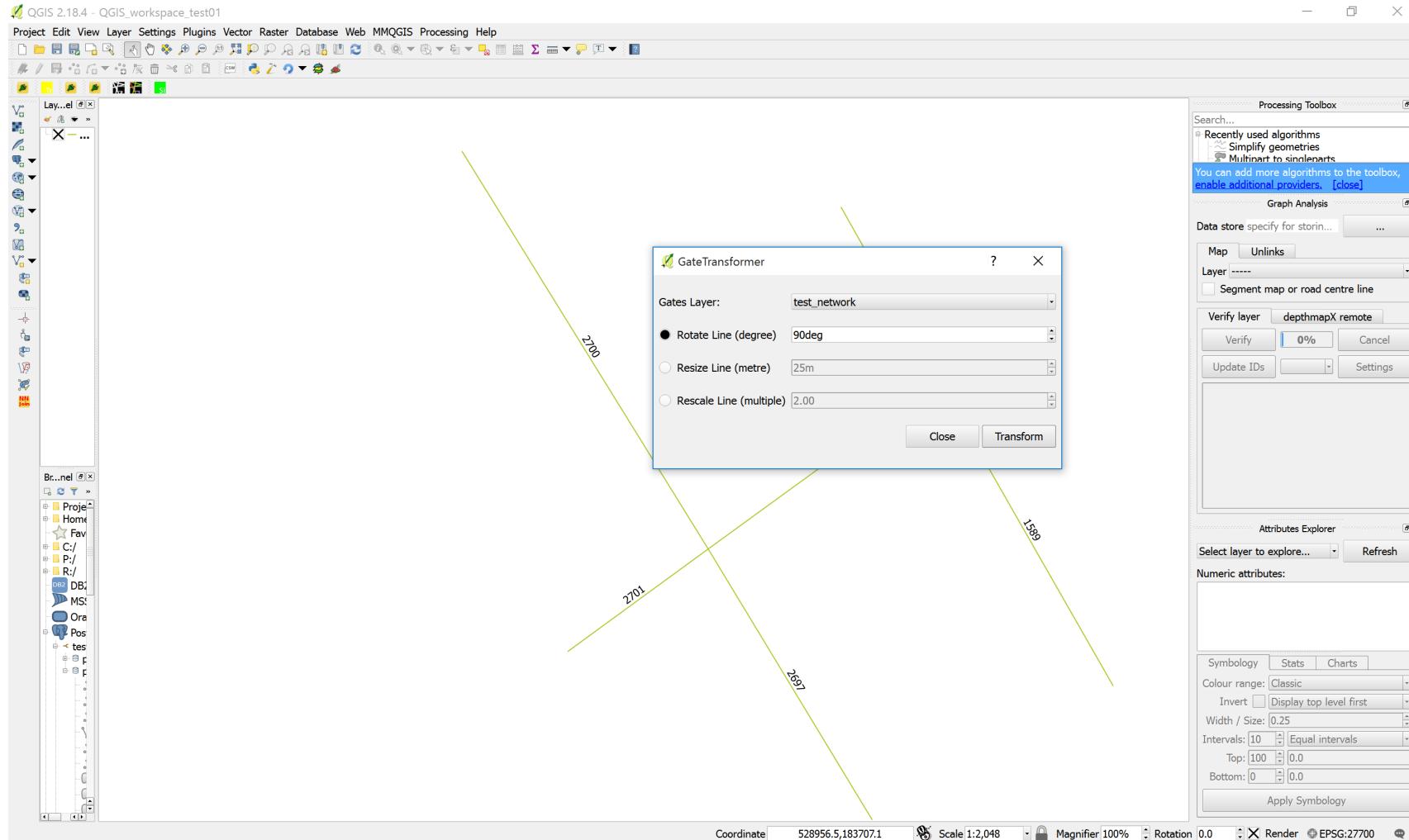
**Catchment polygon** The tool provides a catchment polygon output for each origin and each specified cost. If checked the tool will generate the polygons as a temporary layer or as a shapefile using the browse button.

## Task 4

### **Connecting and analysing the various results**

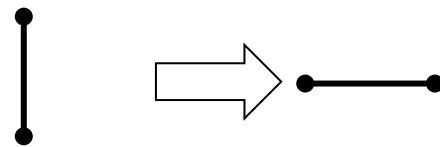
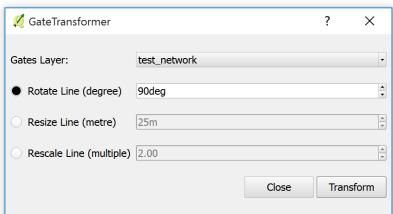
- Gate Transformer: preparing pedestrian counts
- Connecting the centrality measures with pedestrian counts
- Connecting the catchment results with pedestrian counts
- Statistical analysis of two variables

# Gate Transformer

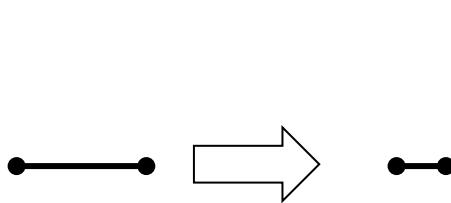
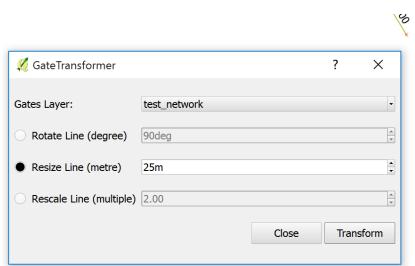


Gate Transformer is a plugin to modify the geometry of gates used in space syntax movement observations. Gates are usually drawn perpendicular to the axial line, with varying lengths. For presentation of movement observations the typical output is a map showing lines along the axial lines to indicate the movement direction. The gates should all be rotated 90degrees and have the same length.

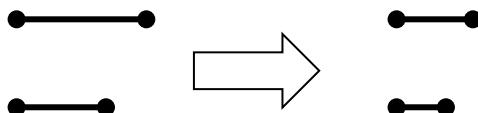
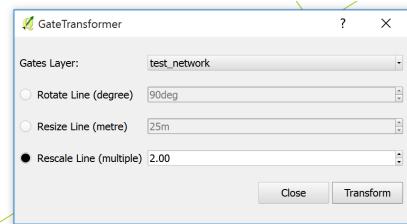
# Gate Transformer



## Rotate Line



## Resize Line



## Rescale Line

**Gates layer** Choose the line-based gate layer from the drop-down menu that you want to transform

**Rotate Line** (degree) Define the angle in degrees for rotating the selected gates

**Resize Line** (metre) Define the length in metres for resizing the selected gates

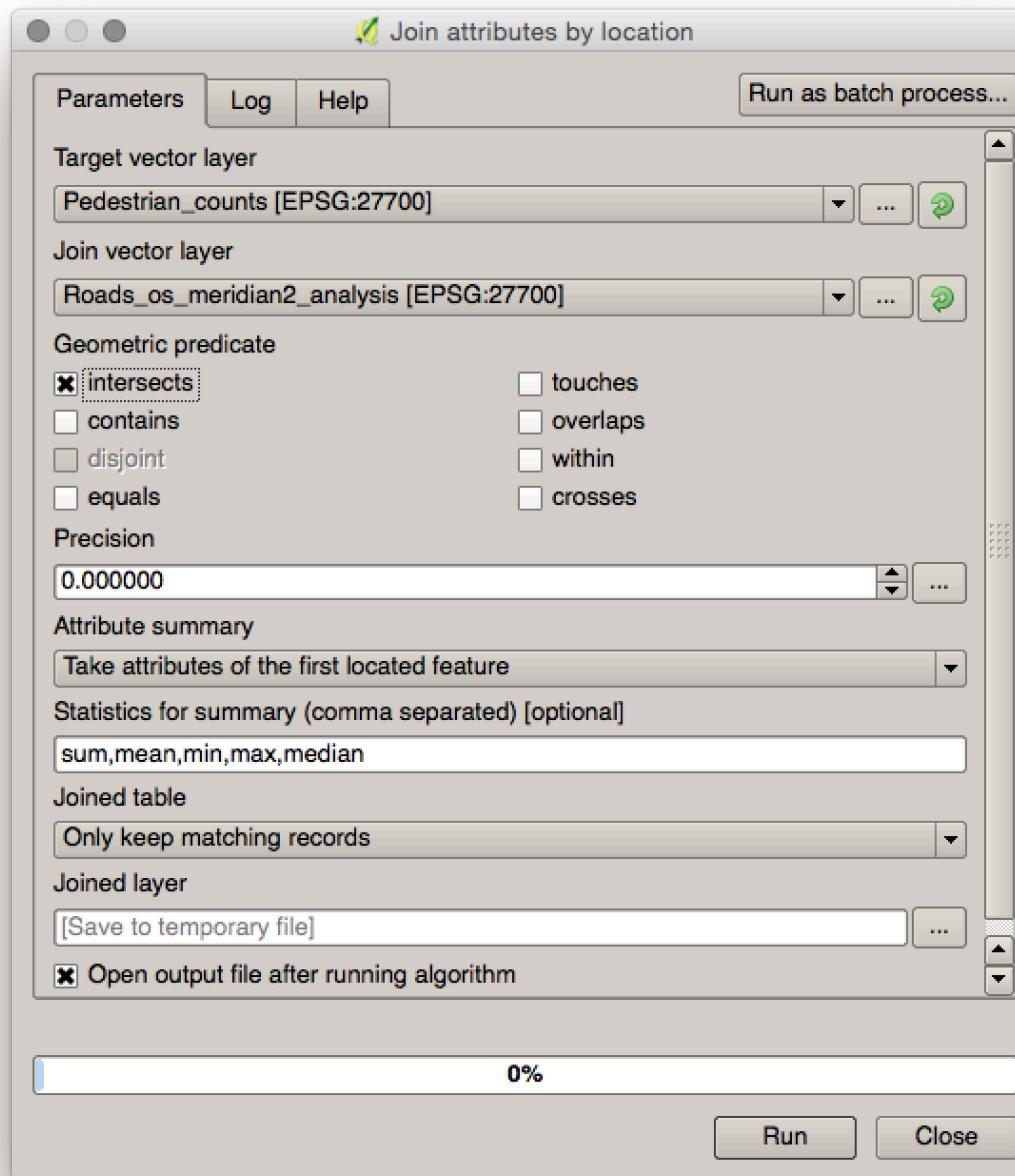
**Rescale Line (multiple)** Define the multiple in ratio for rescaling the selected gates

**Transform** Pressing the transform button will activate the analysis for the selected transformation

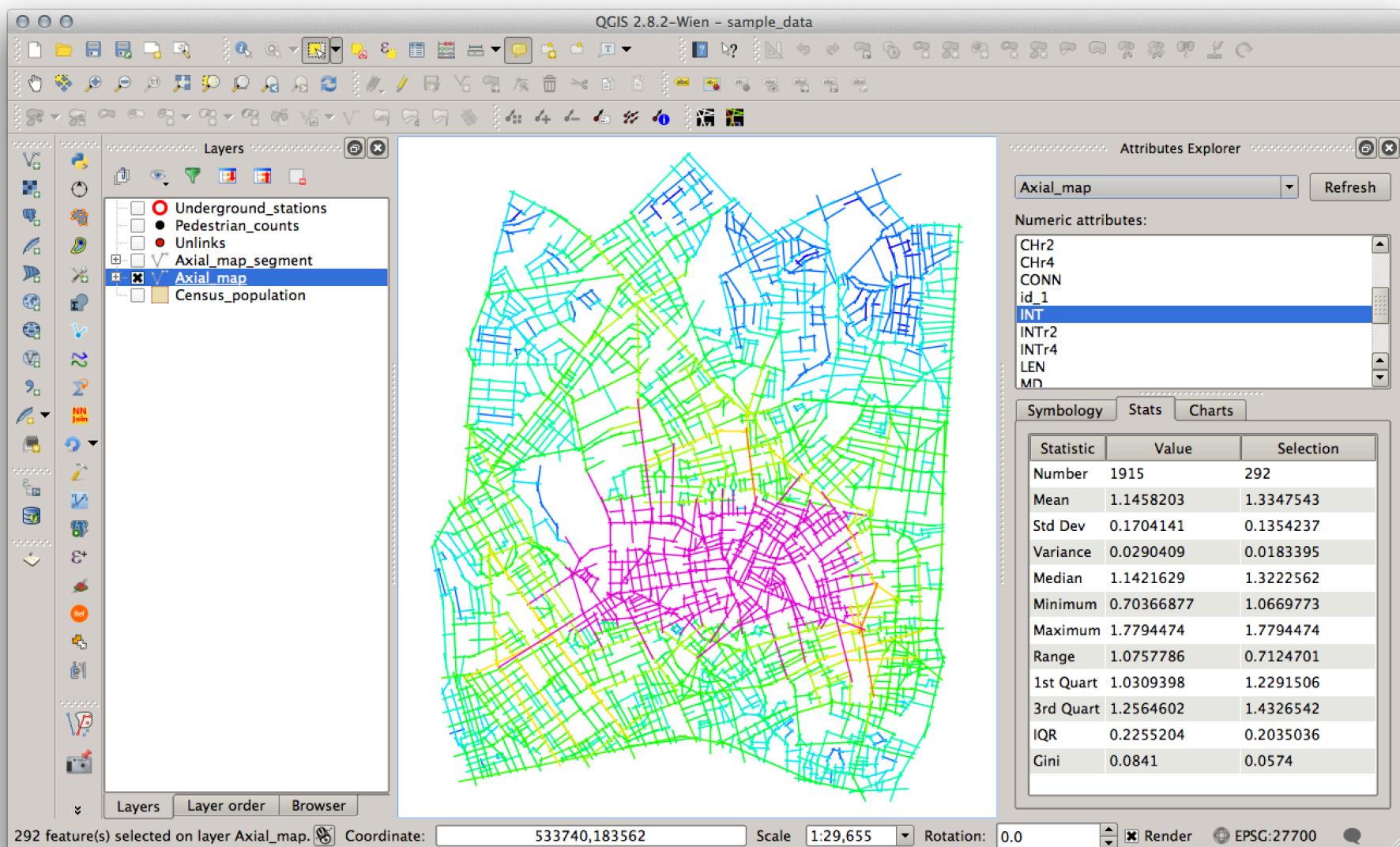
**Close** Pressing close will close and terminate the Gate Transformer

# Connecting layers by spatial join

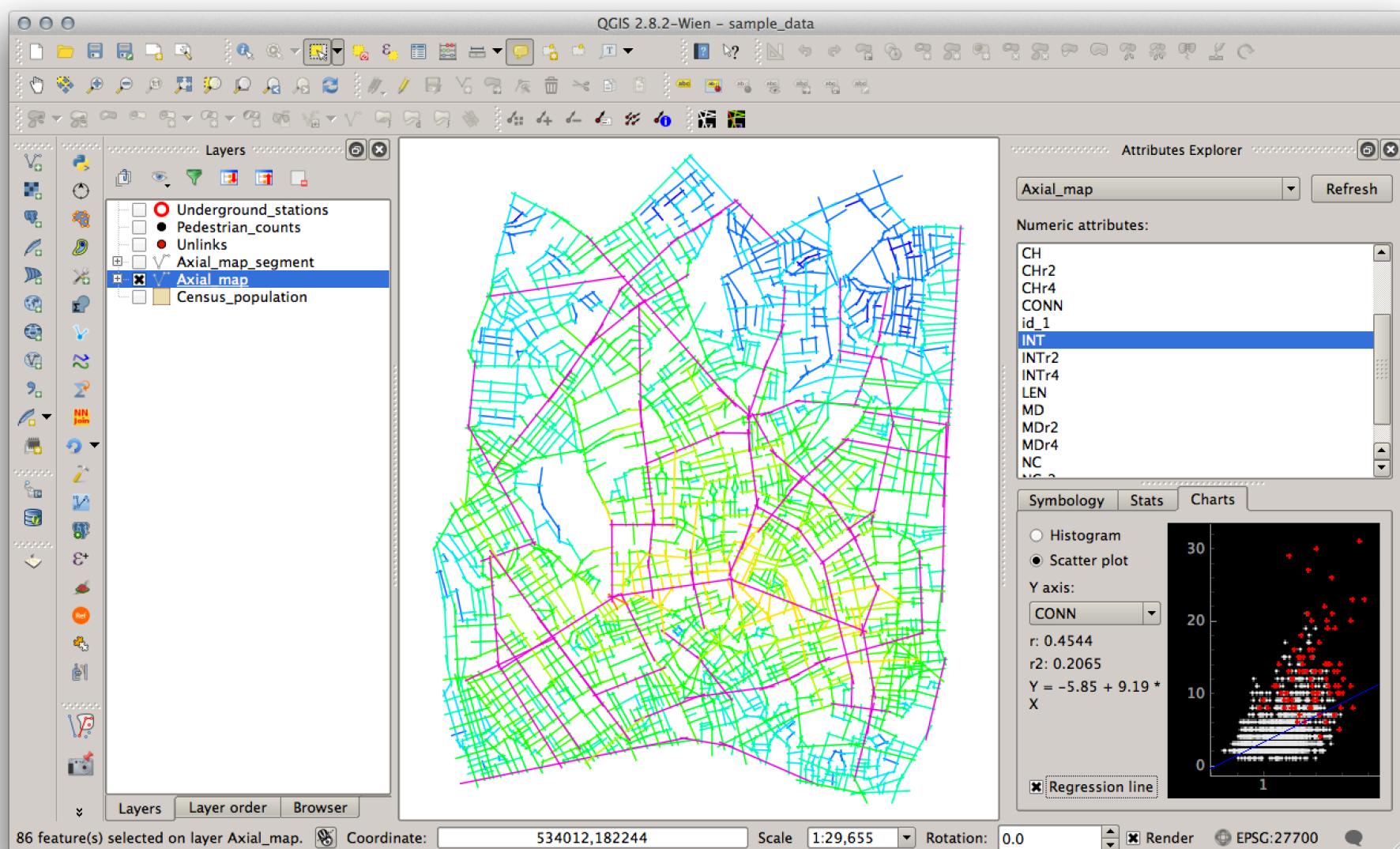
Use the 'Join attributes by location' from the processing toolbox



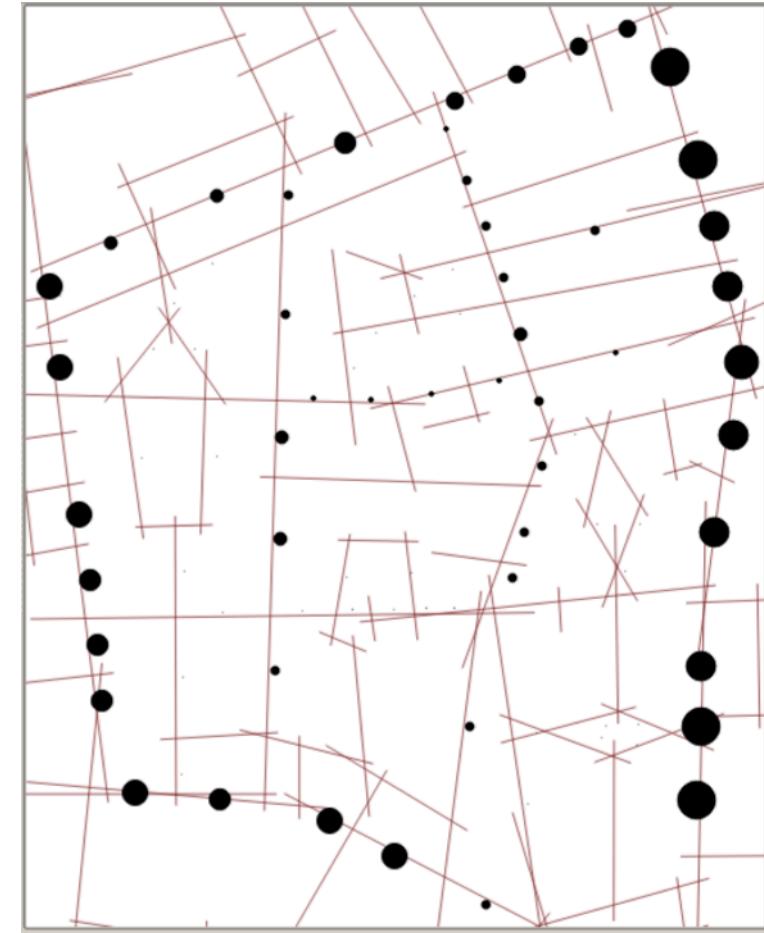
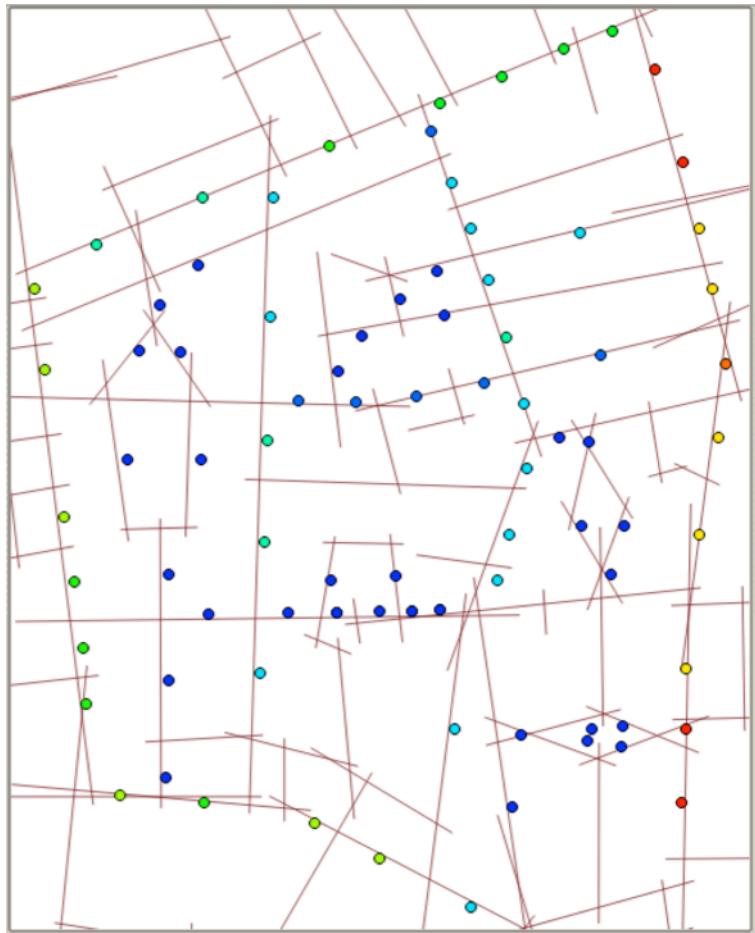
## Statistical analysis of a single variable



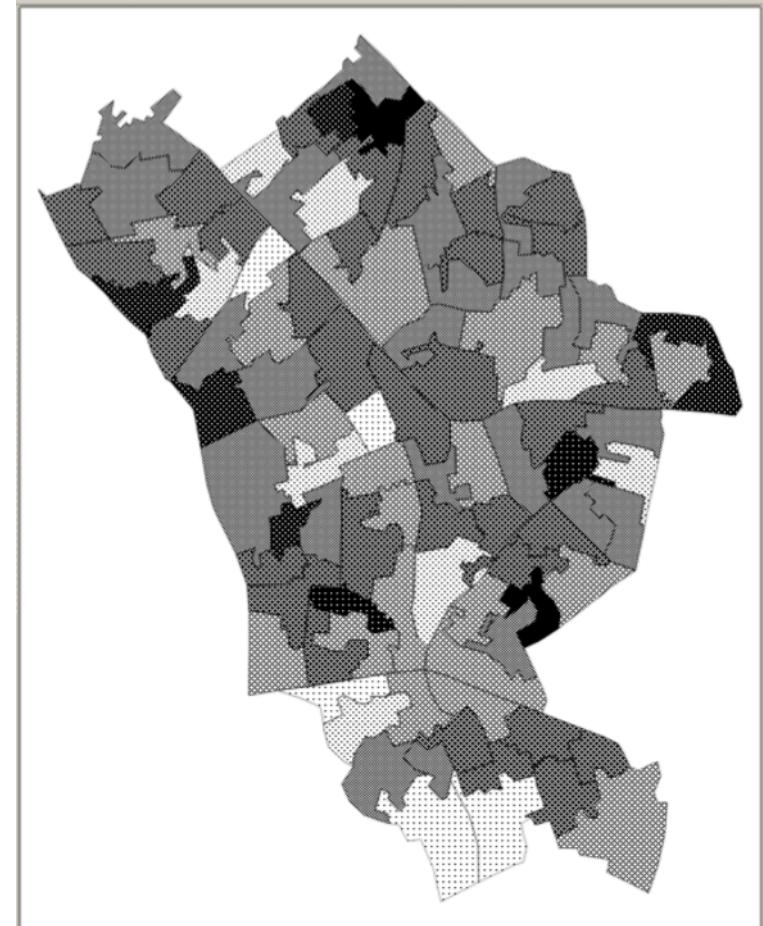
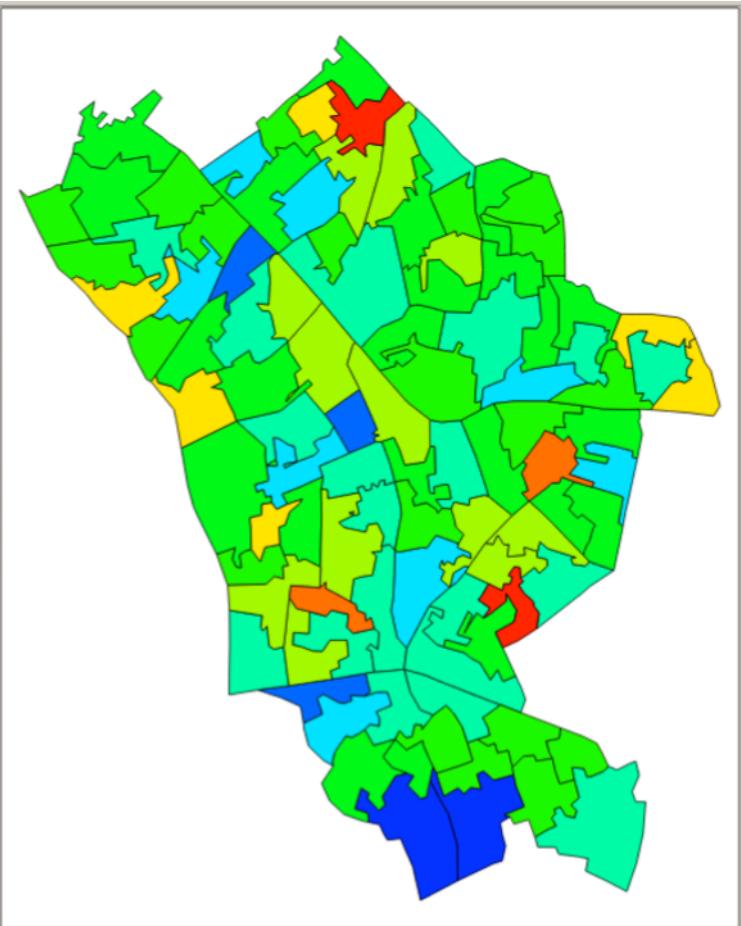
## Statistical analysis of two variables



## Visualising other layers with Attributes Explorer



## Visualising other layers with Attributes Explorer



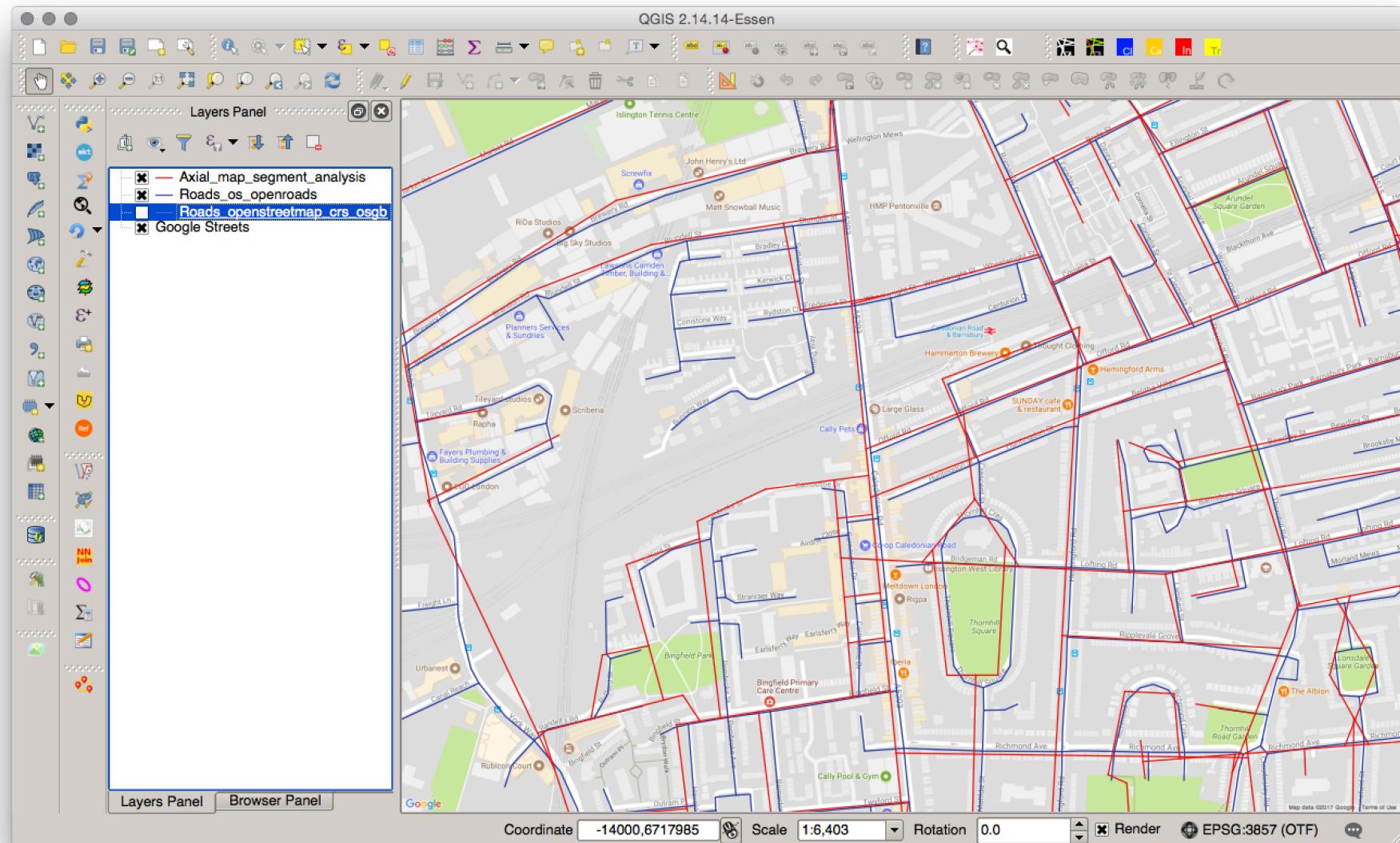
## Questions and Discussion

### **QGIS methods for space syntax research**

- Road centre lines: an approximation of segment maps?
- Road centre lines: which model is more appropriate?
- Connecting and analysing other data layers
- Analysis with R and other statistics packages
- Open to questions from the participants

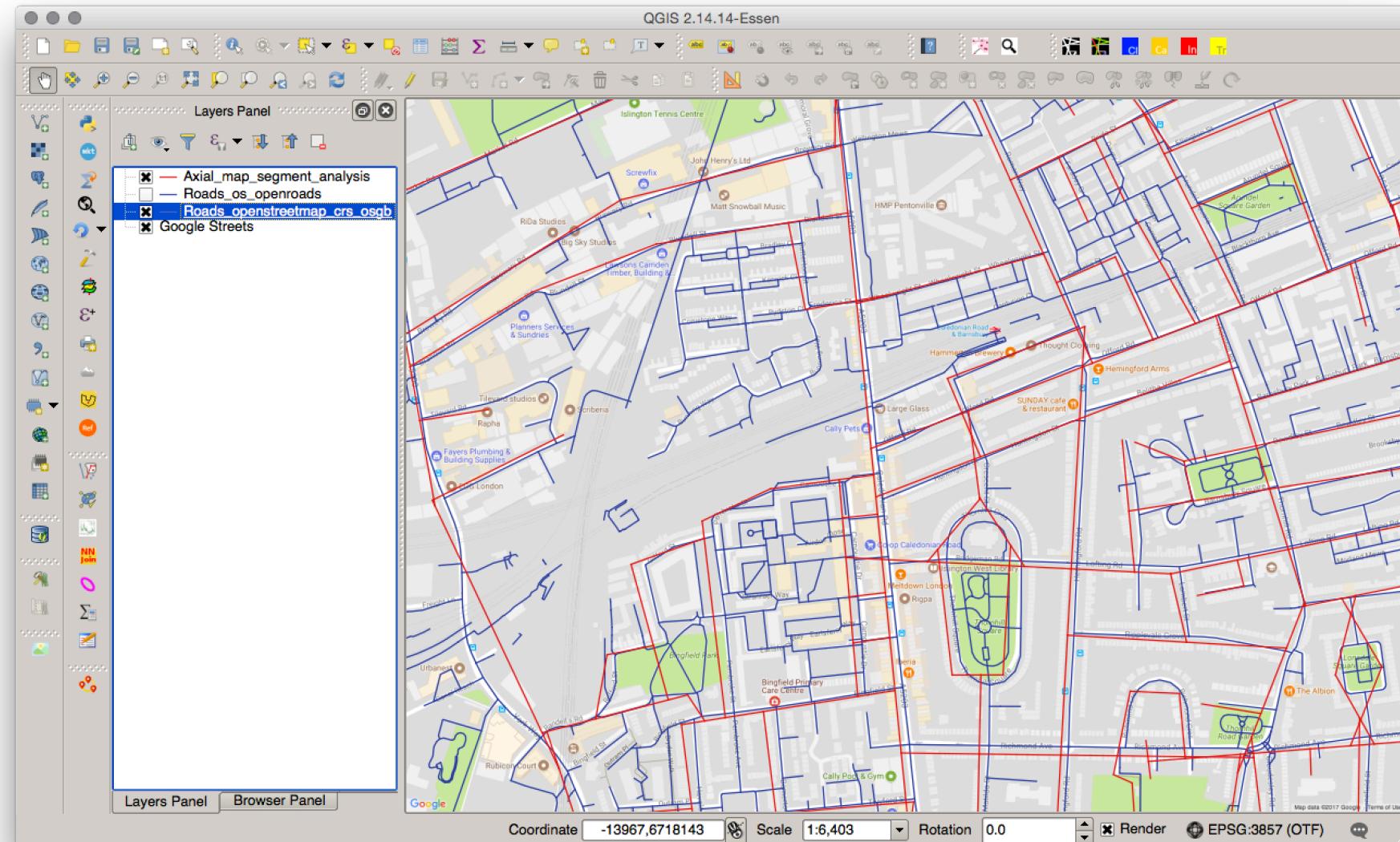
# Questions and Discussion

## Road centre lines: an approximation of segment maps?



# Questions and Discussion

Road centre lines: which model is more appropriate?



# SST Github repository

<https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit>

The screenshot shows the GitHub repository page for 'qgisSpaceSyntaxToolkit' owned by 'SpaceGroupUCL'. The repository has 168 commits, 6 branches, 13 releases, and 2 contributors. The latest commit was made 17 seconds ago. The repository follows the GPL-3.0 license. A 'Clone or download' button is visible. The README.md file is displayed, featuring the title 'Space Syntax Toolkit for QGIS' and a 'News' section with updates from July 2017, June 2017, and November 2016.

Space Syntax Toolkit for QGIS

168 commits 6 branches 13 releases 2 contributors GPL-3.0

Branch: master New pull request Create new file Upload files Find file Clone or download

jorgegil committed on GitHub Update README.md Latest commit 9876824 17 seconds ago

documents replaced exercises 5 hours ago

esstoolkit sample data update with v0.2.0 14 hours ago

sample\_data sample data update with v0.2.0 14 hours ago

.gitignore help updates 20 days ago

LICENSE.txt metadata and license update a year ago

README.md Update README.md 17 seconds ago

README.md

## Space Syntax Toolkit for QGIS

### News

03.07.2017 - SST workshop at the 11th International Space Syntax Symposium, in Lisbon, Portugal

30.06.2017 - SST 0.2.0 has been released, including several new modules.

06.11.2016 - For the latest information on the Space Syntax Toolkit you should now consult the [Wiki](#) and its [FAQ](#).

# SST Issues

<https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit/issues>

The screenshot shows the GitHub interface for the repository "SpaceGroupUCL / qgisSpaceSyntaxToolkit". The top navigation bar includes links for "This repository", "Search", "Pull requests", "Issues", "Marketplace", and "Gist". Below the navigation, there are buttons for "Unwatch" (11), "Star" (24), and "Fork" (11). The main content area displays a list of 53 open issues. The issues are listed in descending order of creation date, with the most recent at the top. Each issue card includes a title, a brief description, labels (e.g., "bug", "enhancement", "Graph Analysis"), and a "New issue" button.

Issue #	Title	Labels	Comments
#162	RCL Cleaner results fail to load if memory layer name is changed	bug	1
#161	FeatureRenderer deprecation warning	Attribute Explorer	1
#153	Cancelling analysis does not stop depthmapX process	bug Graph Analysis help wanted	1
#150	Update wiki for segment/rcl options	enhancement Graph Analysis	1
#142	Features suggestion: order of columns and short names	enhancement Graph Analysis new feature	2
#137	MMD in Qgis	Graph Analysis new feature	2
#134	Statistics and charts do not consider layer filters	Attribute Explorer enhancement	1
#132	Interface appears docked on the QGIS main window	bug General	1
#131	Update user manual to explain CRS limitation	enhancement Graph Analysis	1
#129	Failed to Import Analysis Results (Mac OSX)	bug Graph Analysis help wanted	3
#126	Allow the use of geographic CRS	enhancement Graph Analysis	1

Workshop

Space Syntax Toolkit for QGIS

# SST Wiki

<https://github.com/SpaceGroupUCL/qgisSpaceSyntaxToolkit/wiki>

The screenshot shows the GitHub repository page for "SpaceGroupUCL / qgisSpaceSyntaxToolkit". The top navigation bar includes links for "This repository", "Search", "Pull requests", "Issues", "Marketplace", and "Gist". Below the repository name, there are buttons for "Unwatch" (11), "Star" (24), and "Fork" (11). The main navigation tabs are "Code", "Issues 53", "Pull requests 0", "Projects 0", "Wiki" (which is highlighted in orange), and "Insights". A "Edit" button and a green "New Page" button are visible on the right.

**Home**

Jorge Gil edited this page 6 days ago · 9 revisions

#Welcome to the Space Syntax Toolkit wiki!

This is an extended version of the "User Guide", open to contributions from the SST user community. It covers the contents of the user guide, describing the installation, functionality and basic usage of the SST. But it also includes corrections and updates to this content. In addition, it has new sections such as FAQ and simple tutorials or step by step guides.

We welcome your suggestions and contributions to this wiki! Get in touch via the space syntax toolkit mailing list on Jiscmail.

This wiki does not aim to explain the theory and methods of space syntax, nor the standard features and operation of QGIS or depthmapX. Please refer to the respective literature and documentation for information on these other essential aspects, namely:

- Space Syntax Online Training Platform – <http://www.spacesyntax.net/online-training-platform/>
- Space Syntax methodologies manual – <http://discovery.ucl.ac.uk/1415080/>
- depthmapX - <https://varoudis.github.io/depthmapX/>
- Introduction to Depthmap 10 – [http://archtech.gr/varoudis/depthmapX/LearningMaterial/introduction\\_depthmap-v10-website.pdf](http://archtech.gr/varoudis/depthmapX/LearningMaterial/introduction_depthmap-v10-website.pdf)
- QGIS User Guide – [http://docs.qgis.org/2.14/en/docs/user\\_manual/](http://docs.qgis.org/2.14/en/docs/user_manual/)
- QGIS Training Manual – [http://docs.qgis.org/2.14/en/docs/training\\_manual/](http://docs.qgis.org/2.14/en/docs/training_manual/)
- QGIS Gentle introduction to GIS – <http://qgis.org/gentle-introduction/>

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<https://github.com/SpaceGr...>

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## **Thank you!**

SST mailing list:

[https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=SPACESYNTAX-  
TOOLKIT](https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=SPACESYNTAX-TOOLKIT)

Space syntax mailing list:

<https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=SPACESYNTAX>