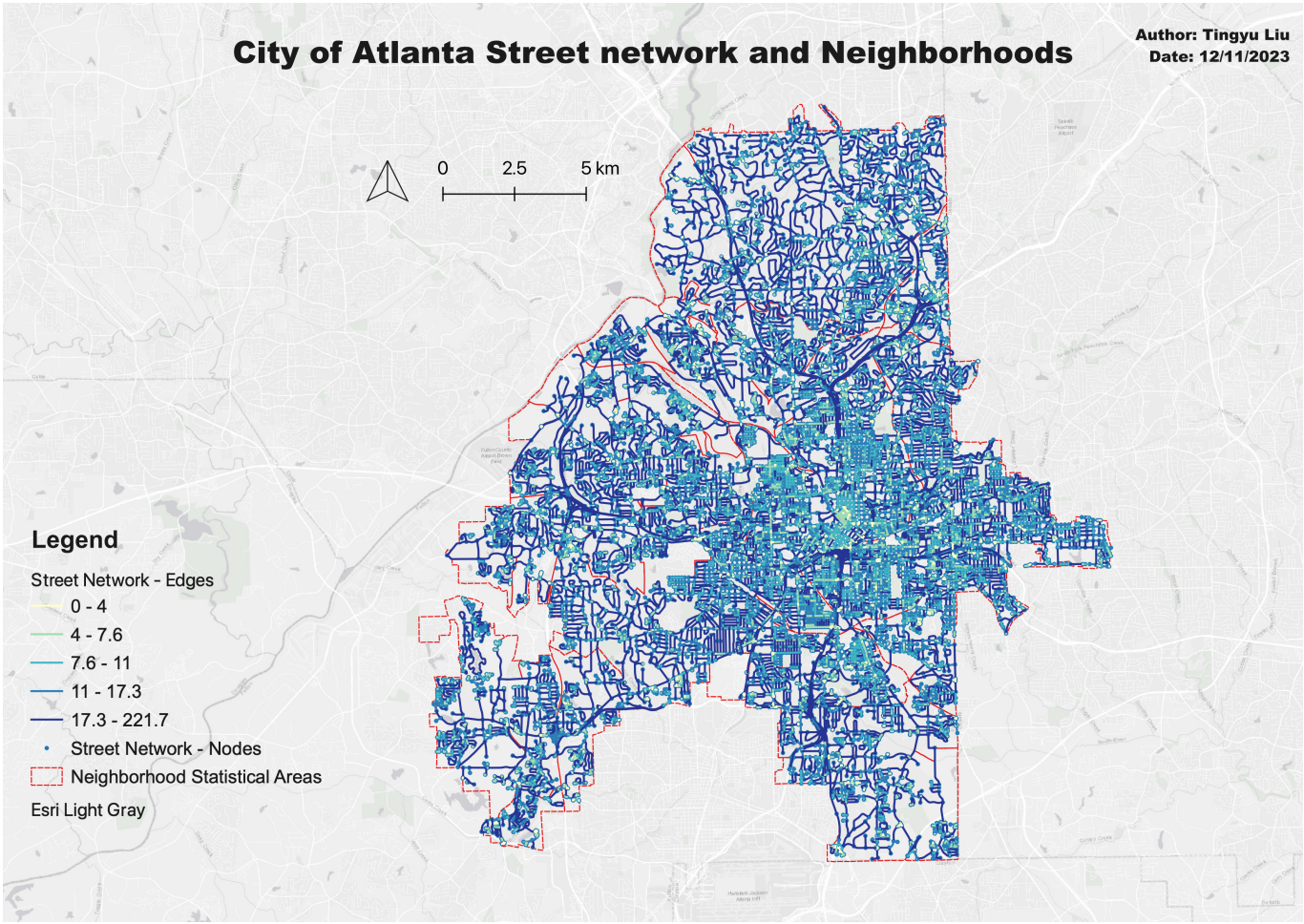
1. Create a drive network model for the city of Atlanta. (5 pts)

Plot a map of the network you built spatially overlaid on top of the neighborhoods.

I used ArcGIS to create a drive network dataset for the city of Atlanta. **The color of each edge represents the driving time.**



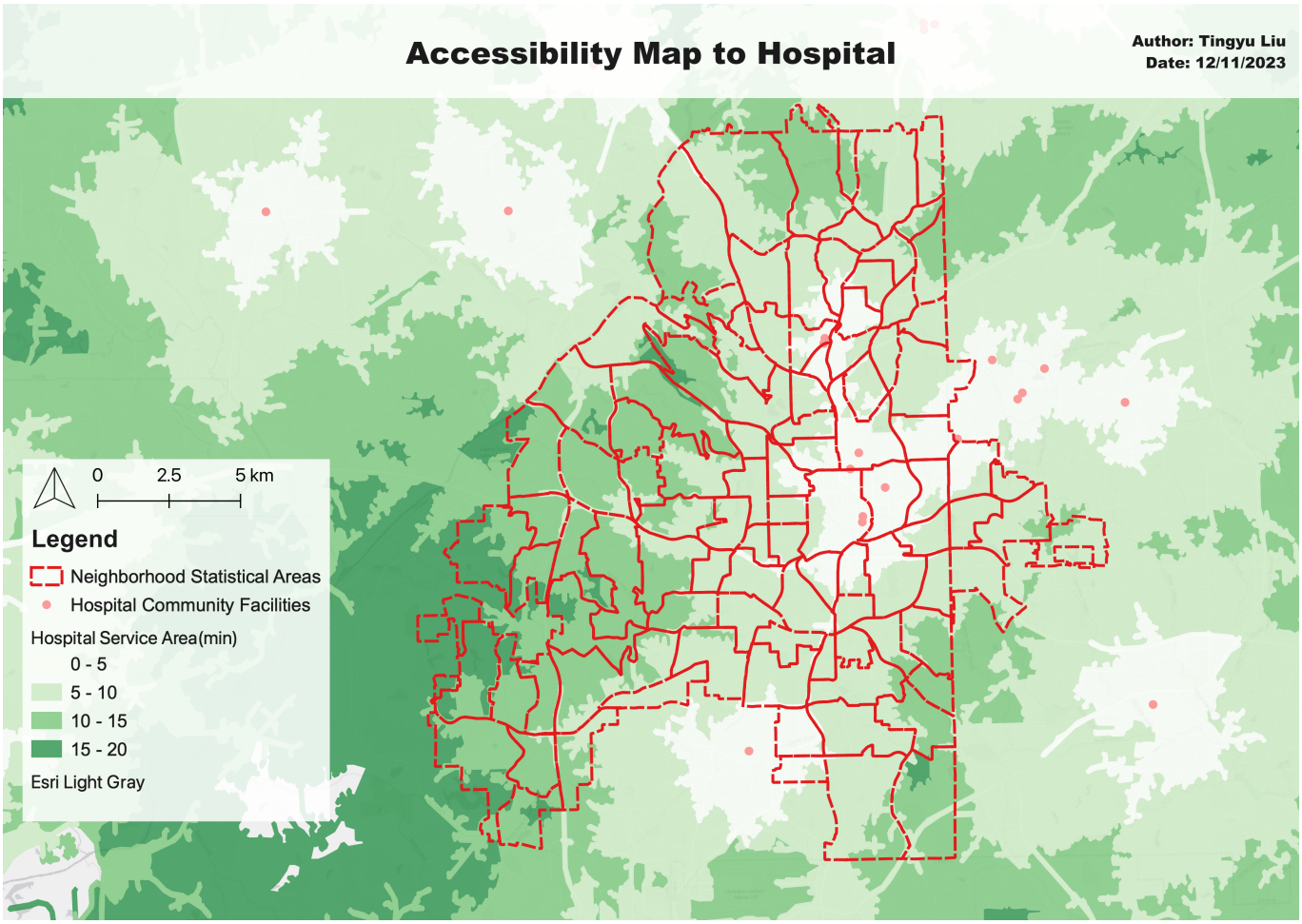
2. Generate accessibility zones using 5 discrete travel time thresholds for health facilities and fire stations. (3 pts)

I used ArcGIS to create service areas for fire stations and hospital respectively. I used the same 5 time thresholds for health facilities and fire stations, which are 0,5,10,15,20 minutes.

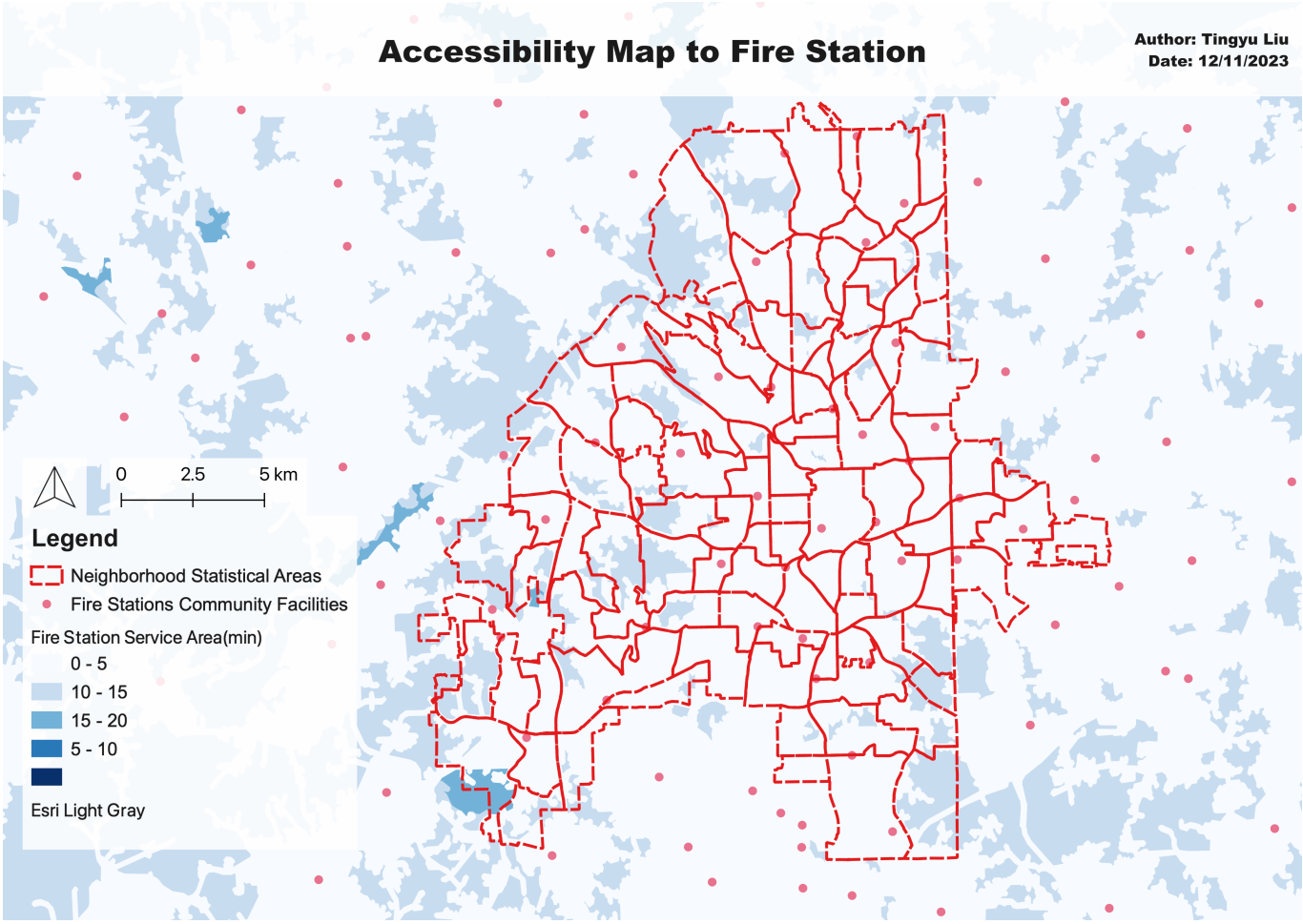
Reasons for choosing this thresholds:

> The range for travel times is determined based on realistic travel times in urban areas and previous studies. A study on the accessibility of urban fire stations in Nanjing, China (Yu,2022) used a range of 0 minutes to 12 minutes, with threshold values of 0, 4, 8, and 12. Taking into account the real driving speed in Atlanta in Atlanta (source), I have chosen a range of 0 to 20 minutes, with equal intervals of 5.

Plot an accessibility map to health stations



Plot an accessibility map to health stations

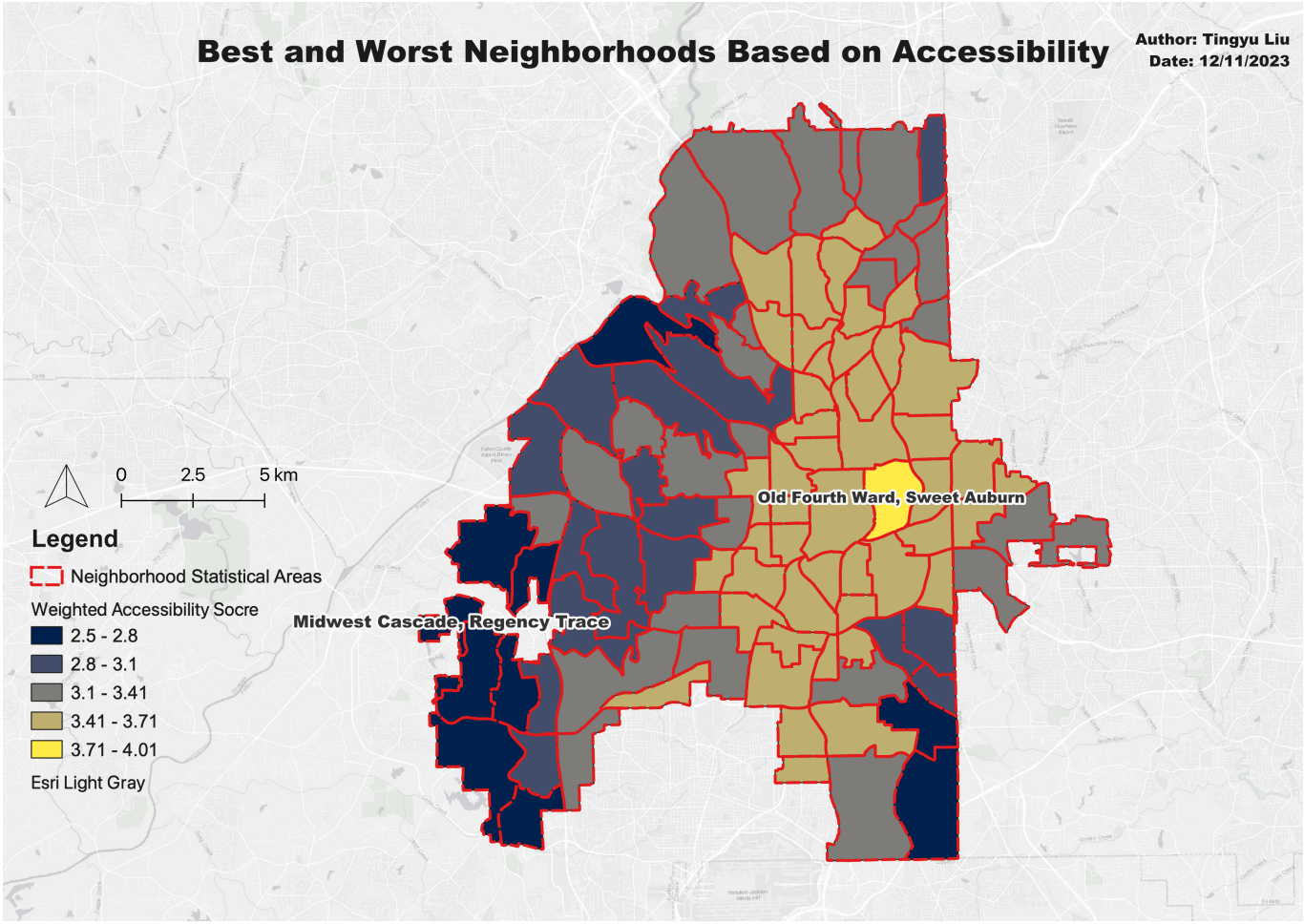


I used the same 5 time thresholds for health facilities and fire stations, which are 0,5,10,15,20 minutes.

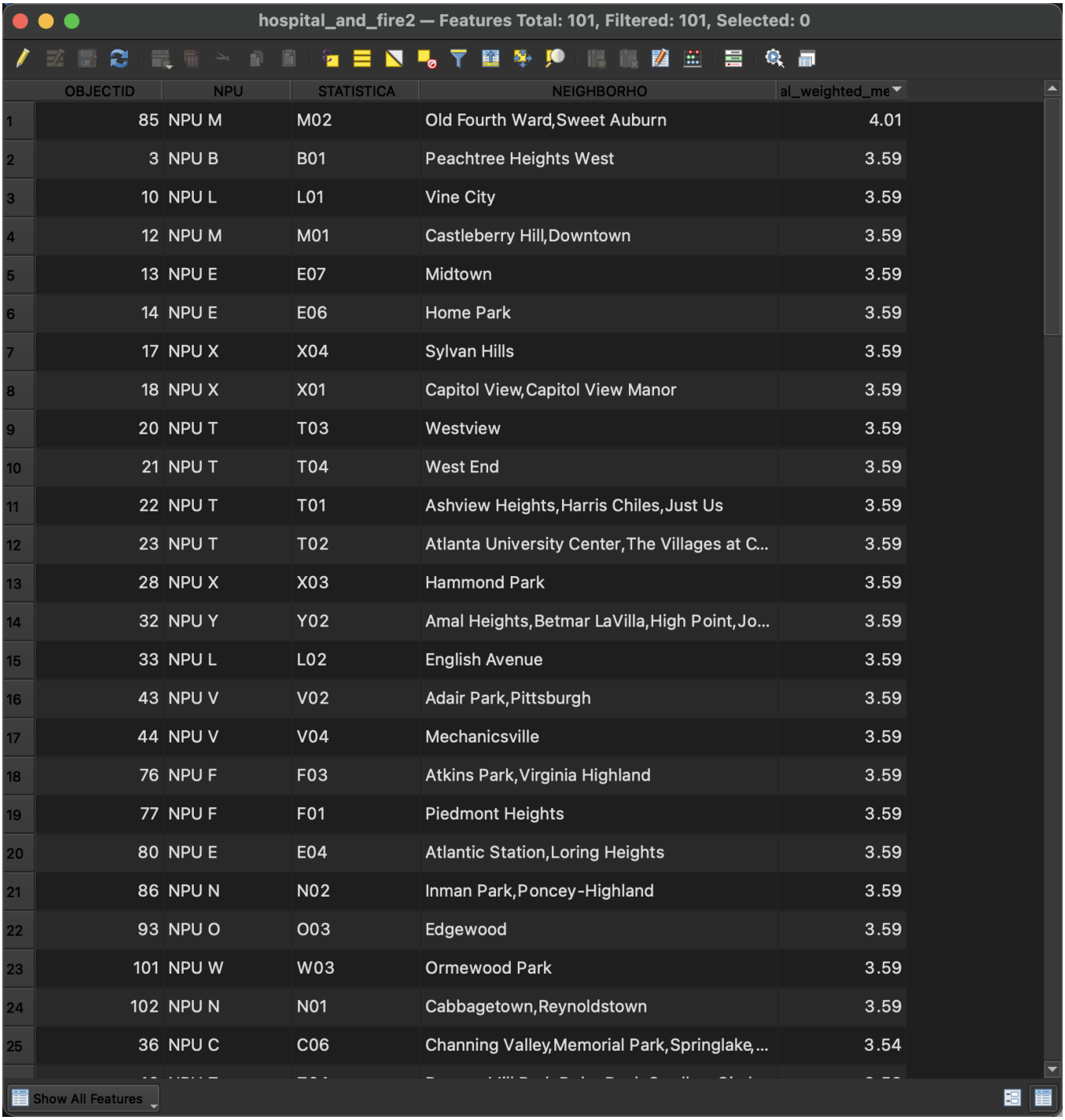
3. Find out the best and worst neighborhoods to live in. (7 pts)

Detail: Add a weight field to the attribute tables representing an ordinal ranked distance away from the facilities and combine the weights together. Overlay neighborhood polygons, calculate the combined/composite weight for each neighborhood, and find out the best and worst neighborhoods to live in based on accessibility to health facilities and fire stations. (7 pts)

I have found that the **best** neighborhood to live in is the **Old Fourth Ward neighborhood** (weighted score 4), while the **worst** is M**idwest Cascade** (weighted score 2.5).

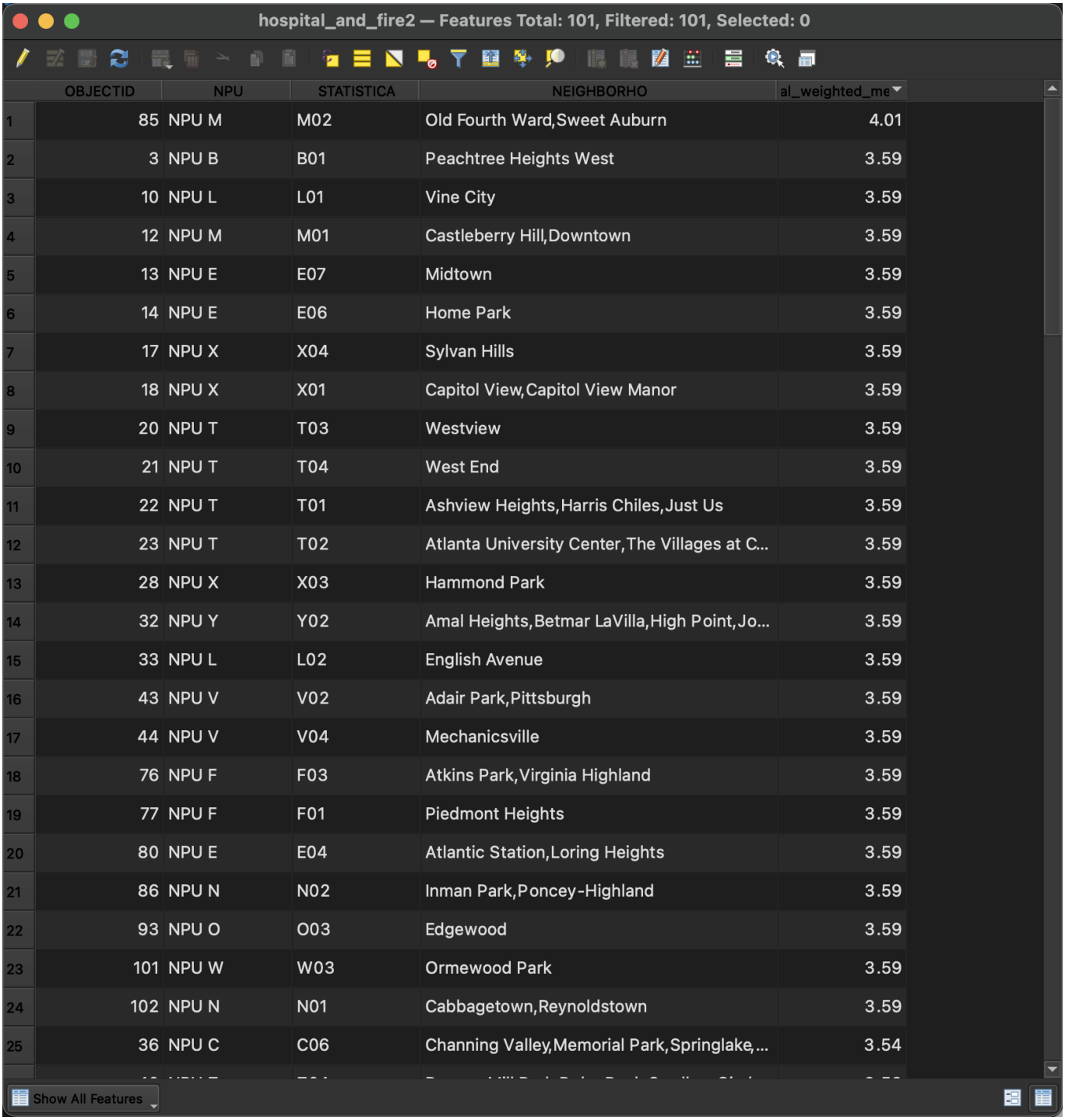

Best and Worst Neighborhoods Based on Accessibility
Author: Tingyu Liu
Date: 12/11/2023
0
2.5
5 km
Legend
Neighborhood Statistical Areas
Weighted Accessibility Socre
2.5 - 2.8
2.8 - 3.1
3.1 - 3.41
3.41 - 3.71
3.71 - 4.01
Esri Light Gray
Old Fourth Ward, Sweet Auburn
Midwest Cascade, Regency Trace

Here is a screenshot of the attribute table, Descending order:



	OBJECTID	NPU	STATISTICA	NEIGHBORHO	al_weighted_me
1	85	NPU M	M02	Old Fourth Ward,Sweet Auburn	4.01
2	3	NPU B	B01	Peachtree Heights West	3.59
3	10	NPU L	L01	Vine City	3.59
4	12	NPU M	M01	Castleberry Hill,Downtown	3.59
5	13	NPU E	E07	Midtown	3.59
6	14	NPU E	E06	Home Park	3.59
7	17	NPU X	X04	Sylvan Hills	3.59
8	18	NPU X	X01	Capitol View,Capitol View Manor	3.59
9	20	NPU T	T03	Westview	3.59
10	21	NPU T	T04	West End	3.59
11	22	NPU T	T01	Ashview Heights,Harris Chiles,Just Us	3.59
12	23	NPU T	T02	Atlanta University Center,The Villages at C...	3.59
13	28	NPU X	X03	Hammond Park	3.59
14	32	NPU Y	Y02	Amal Heights,Betmar LaVilla,High Point,Jo...	3.59
15	33	NPU L	L02	English Avenue	3.59
16	43	NPU V	V02	Adair Park,Pittsburgh	3.59
17	44	NPU V	V04	Mechanicsville	3.59
18	76	NPU F	F03	Atkins Park,Virginia Highland	3.59
19	77	NPU F	F01	Piedmont Heights	3.59
20	80	NPU E	E04	Atlantic Station,Loring Heights	3.59
21	86	NPU N	N02	Inman Park,Poncey-Highland	3.59
22	93	NPU O	O03	Edgewood	3.59
23	101	NPU W	W03	Ormewood Park	3.59
24	102	NPU N	N01	Cabbagetown,Reynoldstown	3.59
25	36	NPU C	C06	Channing Valley,Memorial Park,Springlake,...	3.54

Ascending order:



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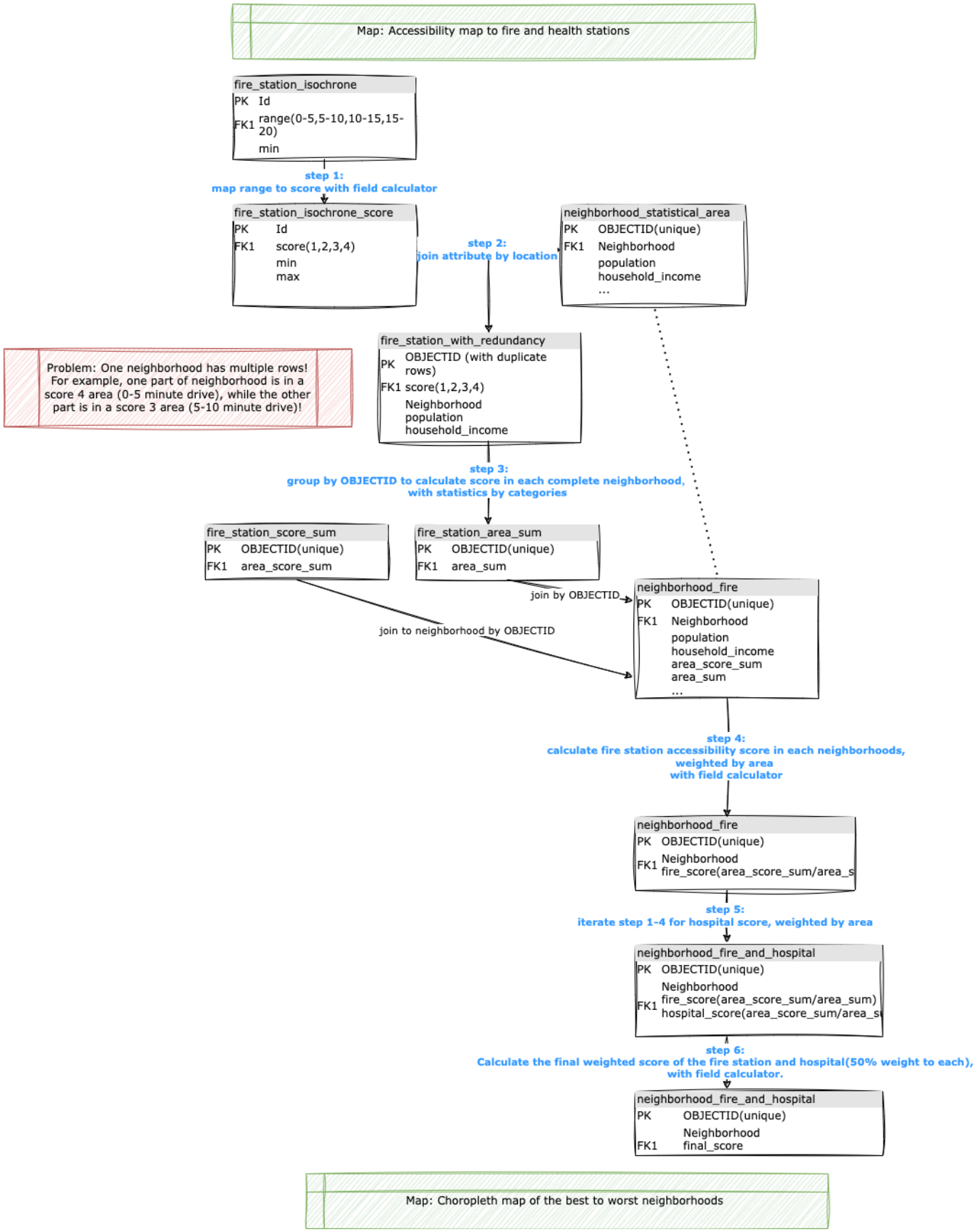
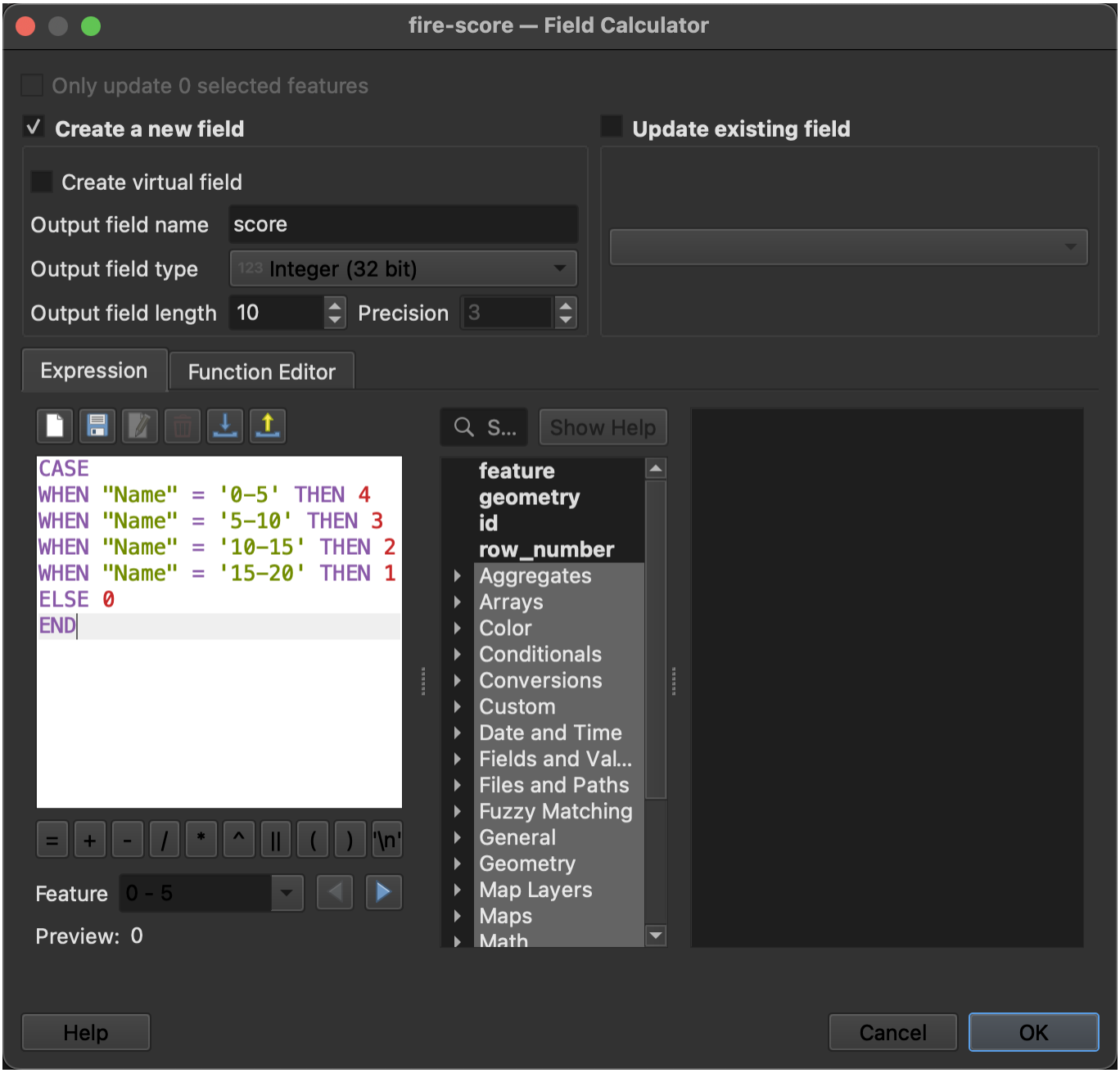
24	102	NPU N	N01	Cabbagetown,Reynoldstown	3.59
25	36	NPU C	C06	Channing Valley,Memorial Park,Springlake,...	3.54

As shown in the data flow chart, my steps are as follows

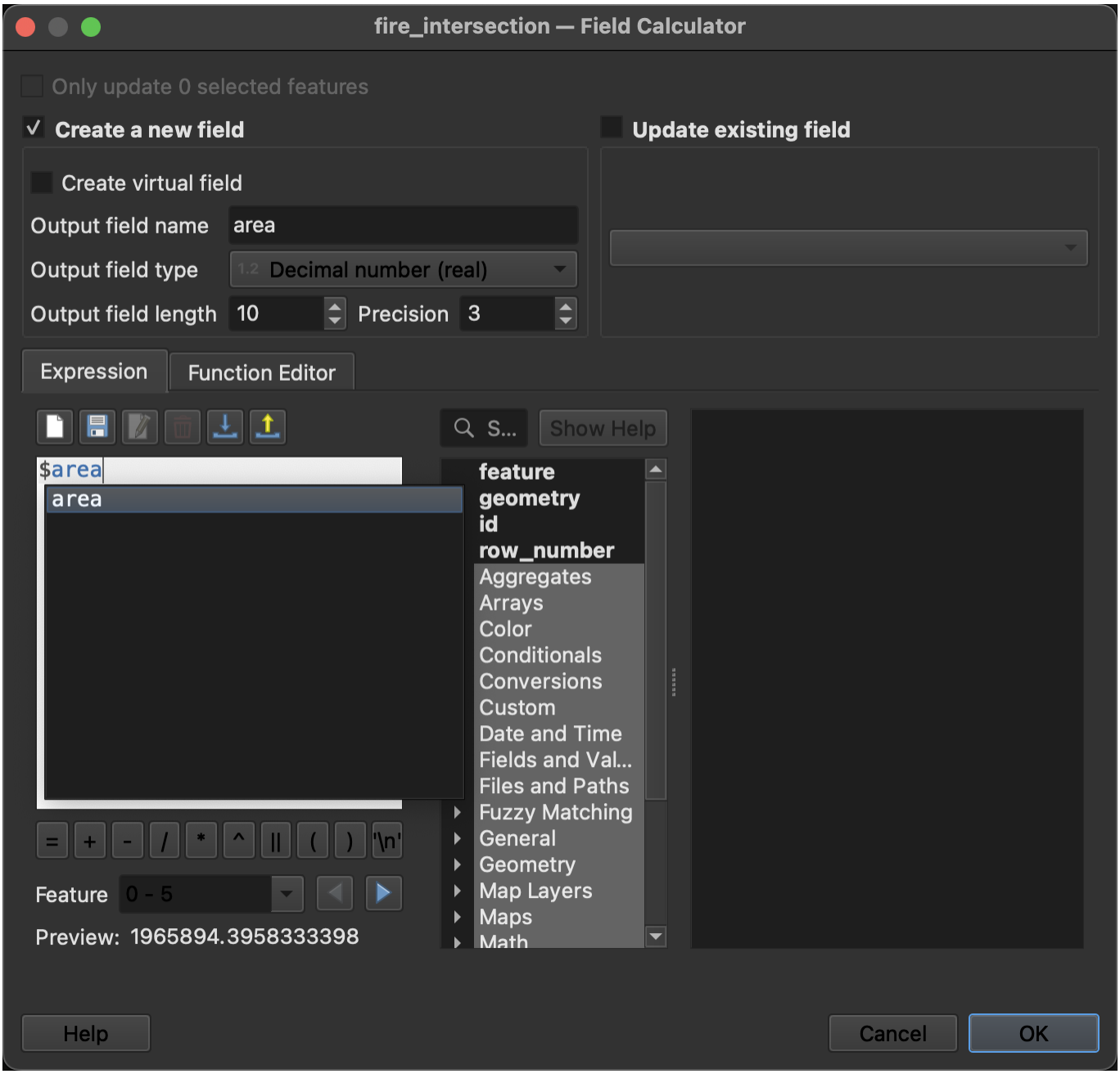


and below are screenshots for each steps mentioned in data flow chart:

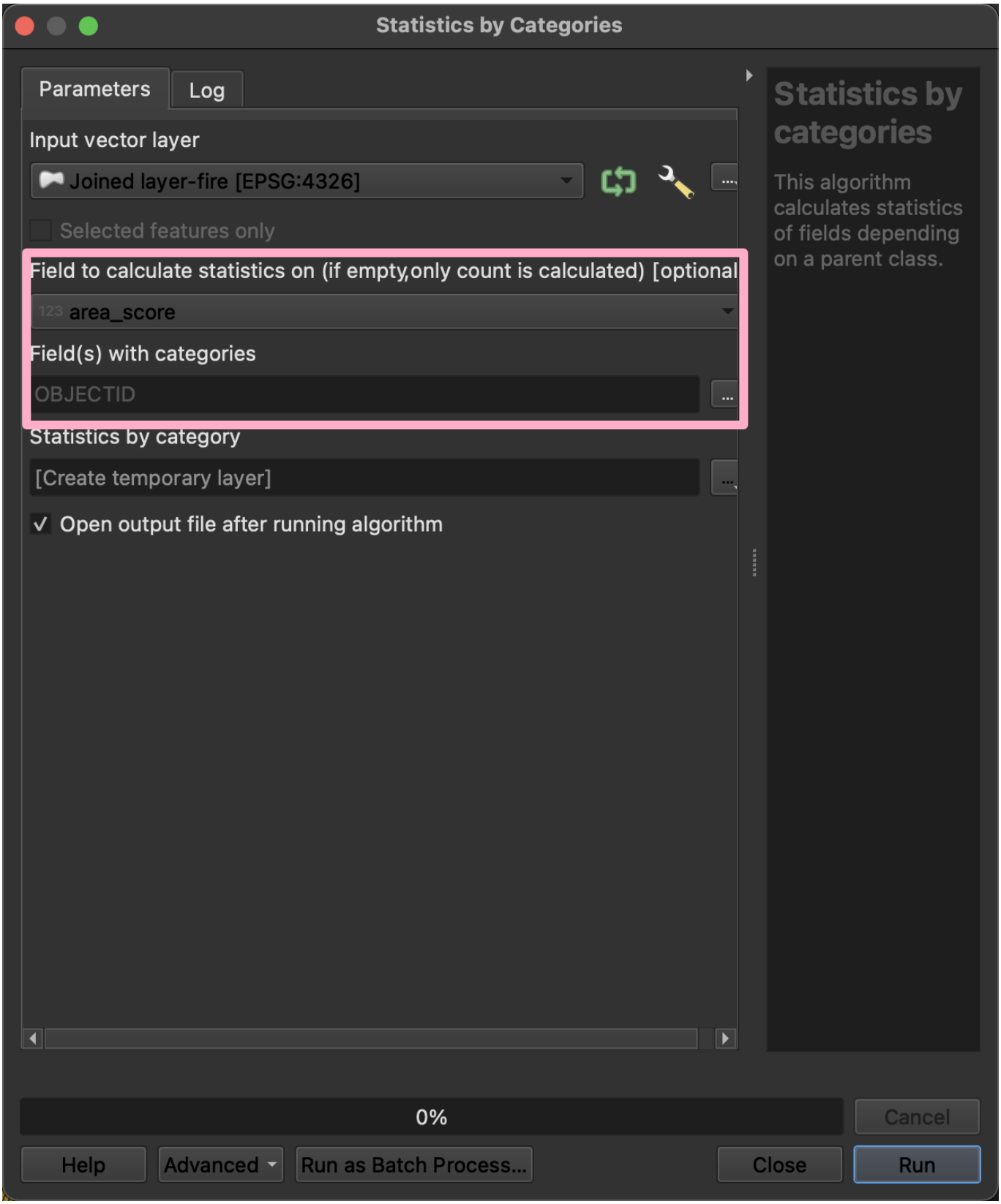
step 1: Map range to score with field calculator

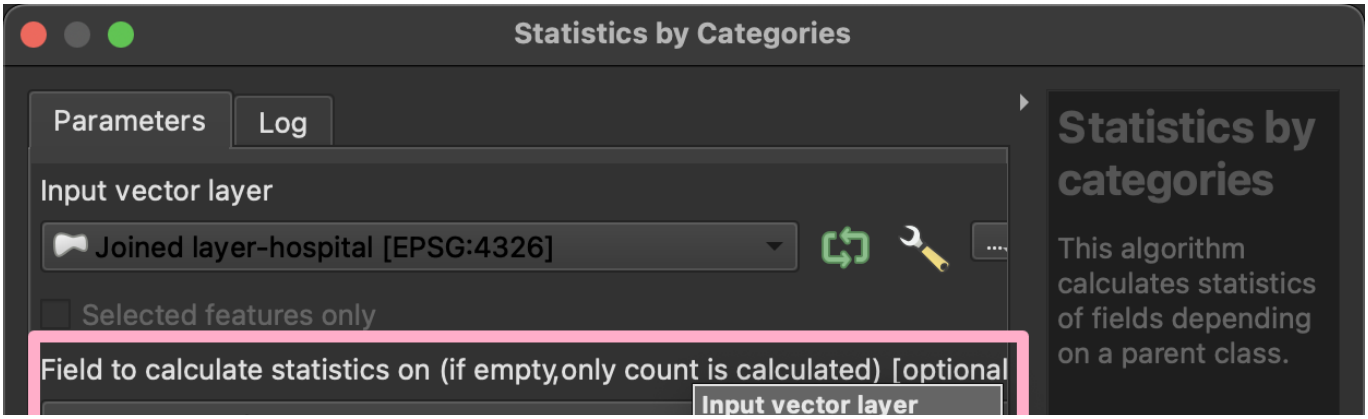


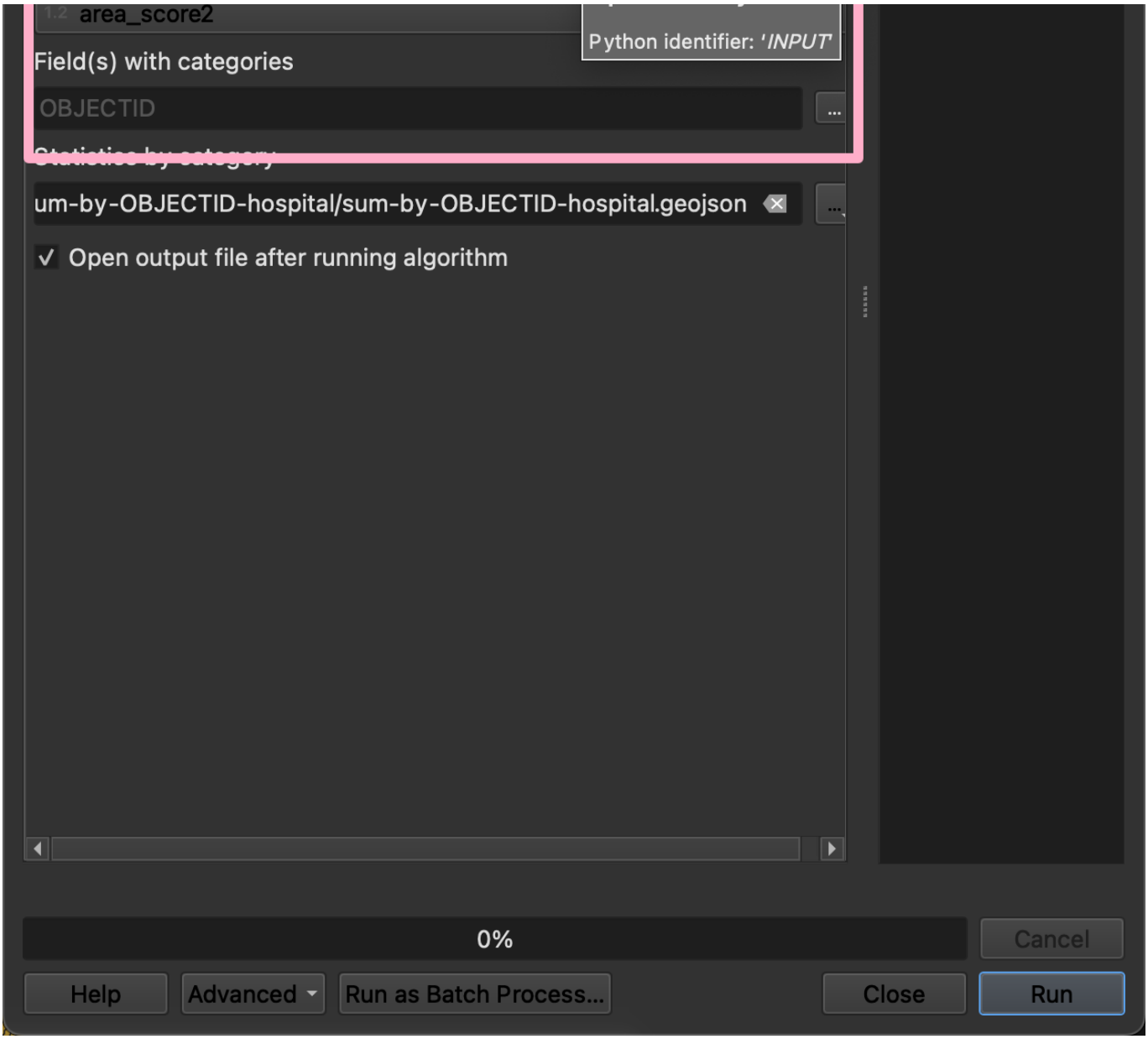
step 2: Join score attributes by location to neighborhood area, and add $area attribute.



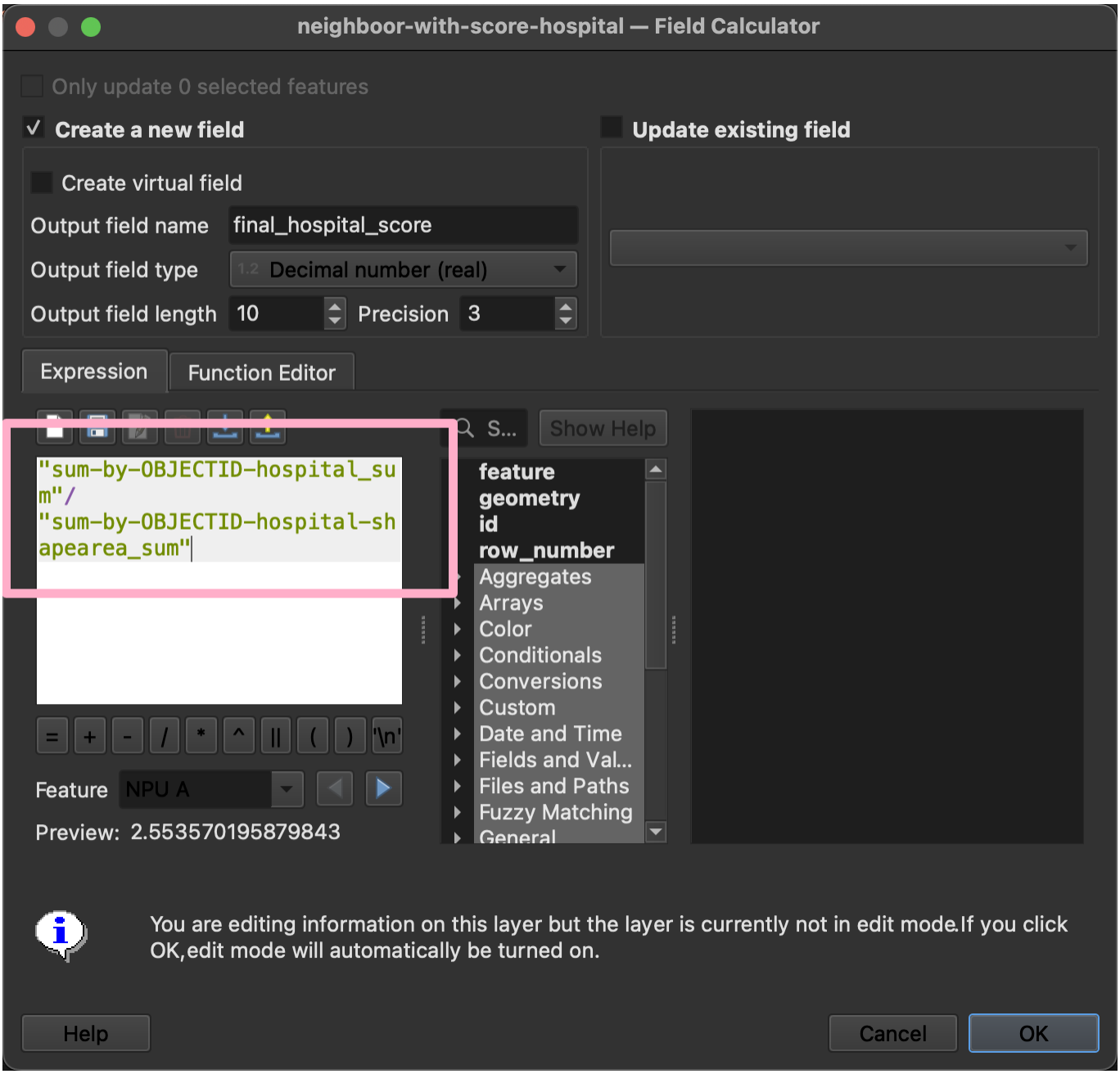
step 3: Group by OBJECTID to calculate score in each complete neighborhood， with statistics by categories.


Statistics by Categories
Parameters
Log
Input vector layer
Joined layer-fire [EPSG:4326]
Selected features only
Field to calculate statistics on (if empty,only count is calculated) [optional
123 area_score
Field(s) with categories
OBJECTID
Statistics by category
[Create temporary layer]
Open output file after running algorithm
Statistics by categories
This algorithm calculates statistics of fields depending on a parent class.
0%
Cancel
Help
Advanced
Run as Batch Process...
Close
Run


Statistics by Categories
Parameters
Log
Input vector layer
Joined layer-hospital [EPSG:4326]
Selected features only
Field to calculate statistics on (if empty,only count is calculated) [optional
Input vector layer
Statistics by categories
This algorithm calculates statistics of fields depending on a parent class.

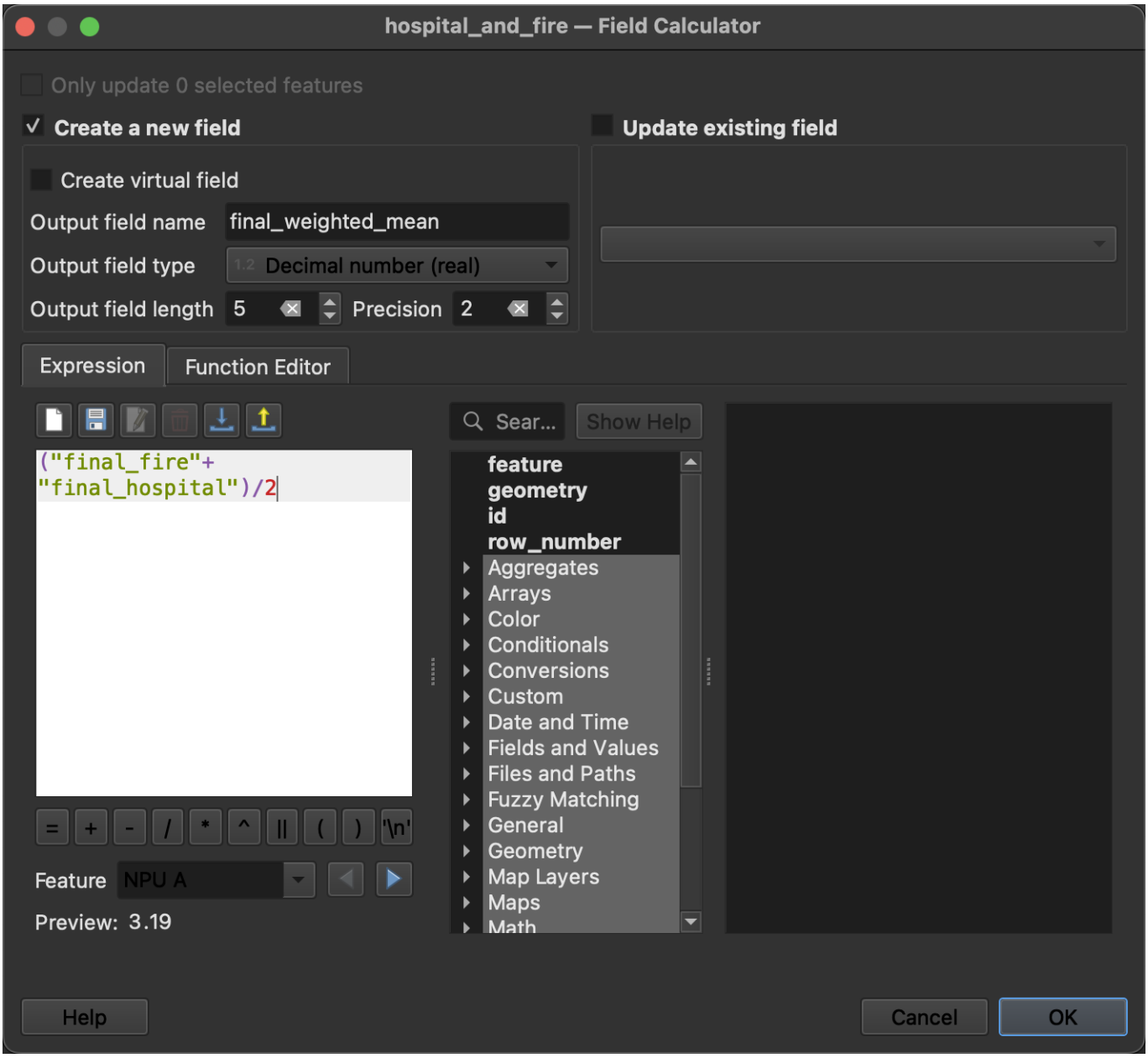


step 4: Calculate fire station accessibility score in each neighborhoods, weighted by area, with field calculator.



step 5: Iterate step 1-4 for hospital accessibility score, weighted by area.

step 6: Calculate the composite weighted score of the fire station and hospital(50% weight to each), with field calculator.


hospital_and_fire — Field Calculator
Only update 0 selected features
Create a new field
Update existing field
Create virtual field
Output field name
final_weighted_mean
Output field type
Decimal number (real)
Output field length
5
Precision
2
Expression
Function Editor
("final_fire"+
"final_hospital")/2
Sear...
Show Help
feature
geometry
id
row_number
Aggregates
Arrays
Color
Conditionals
Conversions
Custom
Date and Time
Fields and Values
Files and Paths
Fuzzy Matching
General
Geometry
Map Layers
Maps
Math
= + - / * ^ || ( ) '\n'
Feature
NPU A
Preview: 3.19
Help
Cancel
OK