

The Data Journalist

Chapter 7 tutorial

Geocoding in ArcGIS Desktop

Summary: In many cases, online geocoding services are all you will need to convert addresses and other location data into geographic data. When you have a larger number of points to geocode, however, and available lookup data, the case for doing the job yourself can be compelling. This tutorial shows you how to geocode addresses using the Qgis' built-in geocoding utility. If you are unsure of the basics of the Qgis user interface, see the quick tour of [ArcGIS desktop tutorial](#).

For this exercise, we'll use a city of Ottawa's discarded needles file -- obtained through a freedom-of-information request -- that contains geographic information, but NOT longitude and latitude coordinates. In many instances when obtaining datasets from open-data websites or freedom-of-information requests, you will get addresses, that is, a field with the number, address name and suffix (example: 2132 Bank St.).

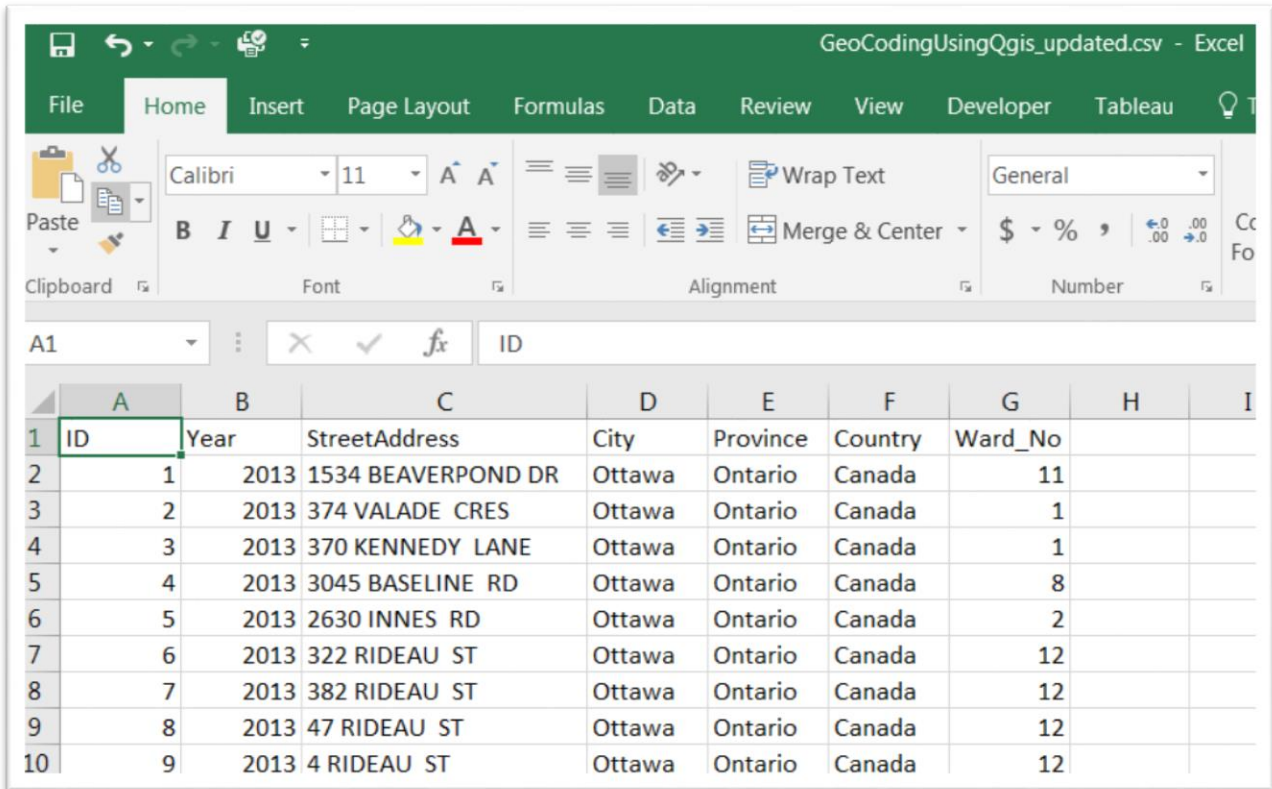
While Fusion Tables can use street address, combined with the city, town or county, province or state, and country, all combined in one column to place the locations on a map, Qgis needs longitude and latitude coordinates. The good news is that Qgis can take the address information we've just described, and use open-sourced geocoding services to locate the latitude and longitude coordinates.

While Fusion Tables needs the street address, city, province and country combined in one column, Qgis requires that they be separated in four respective fields. If the fields are not separated in this manner, you'll have to use some of the techniques described in the "[Working with specialized functions in Excel](#)" tutorial that accompanies Chapter 4. If the address fields are separated, then you can follow the steps outlined in this tutorial.

Skills you will learn:

How to geocode in Qgis.

To download the discarded needle csv file we'll be using for geocoding, please click [here](#).



	A	B	C	D	E	F	G	H	I
1	ID	Year	StreetAddress	City	Province	Country	Ward_No		
2	1	2013	1534 BEAVERPOND DR	Ottawa	Ontario	Canada	11		
3	2	2013	374 VALADE CRES	Ottawa	Ontario	Canada	1		
4	3	2013	370 KENNEDY LANE	Ottawa	Ontario	Canada	1		
5	4	2013	3045 BASELINE RD	Ottawa	Ontario	Canada	8		
6	5	2013	2630 INNES RD	Ottawa	Ontario	Canada	2		
7	6	2013	322 RIDEAU ST	Ottawa	Ontario	Canada	12		
8	7	2013	382 RIDEAU ST	Ottawa	Ontario	Canada	12		
9	8	2013	47 RIDEAU ST	Ottawa	Ontario	Canada	12		
10	9	2013	4 RIDEAU ST	Ottawa	Ontario	Canada	12		

As discussed above, the address fields are separated fields for each piece of geographic information:

- i. Street Address: 1534 Beaverpond DR
- ii. City: Ottawa
- iii. Province: Ontario
- iv. Country: Canada

There is one address in the csv file we're about to download that will have to be cleaned. ID #58's address – row 59 in the csv file which says “1021 ST. BLVD” -- will have to be cleaned to say correct street name, “1021 ST. LAURENT BLVD”. To edit the address entry, double click on the address cell and enter the new address.

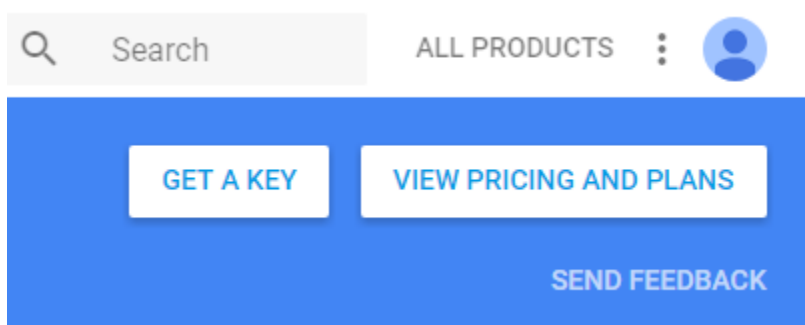
ID	Year	StreetAddress	City	Province	Country	Ward_No	Column1
59	58	2013	1021 ST. LAURENT BLVD	Ottawa	Ontario	Canada	11

Save the file as a new CSV file, following the usual steps: File, Save As, Browse and then save to your desired directory.

File name:	GeoCodingUsingQgis_updated_clean.csv
Save as type:	CSV UTF-8 (Comma delimited) (*.csv)

Before geocoding in Qgis, we'll have to acquire a Google Maps API by clicking [this link](#). The [usage limit](#) for Google Maps APIs is 2,500 free requests per day.

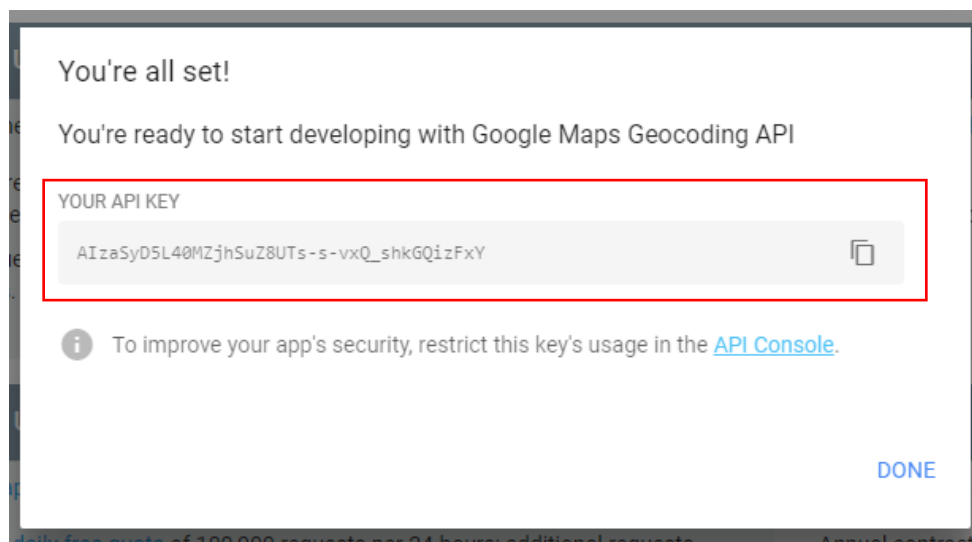
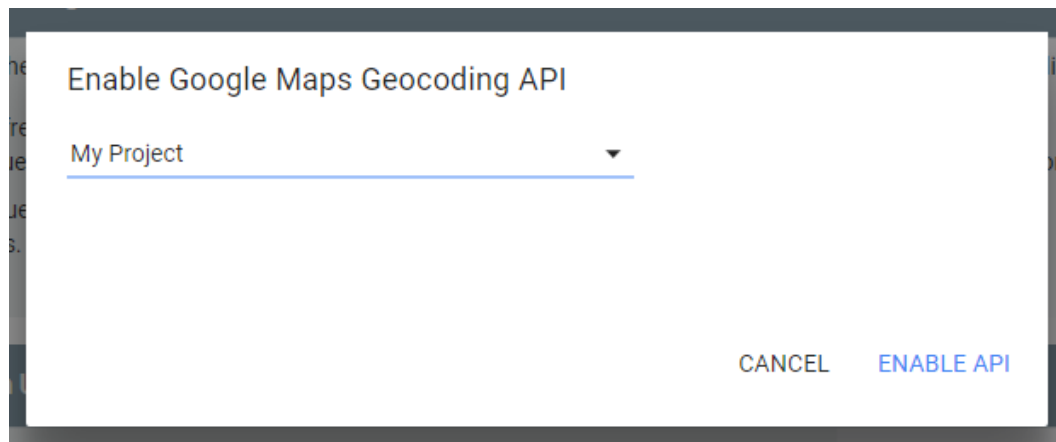
Select "GET A KEY" from the menu to the left. You may be prompted to sign into your Google Account if you haven't already done so.



Select "My Project" from the drop-down menu.

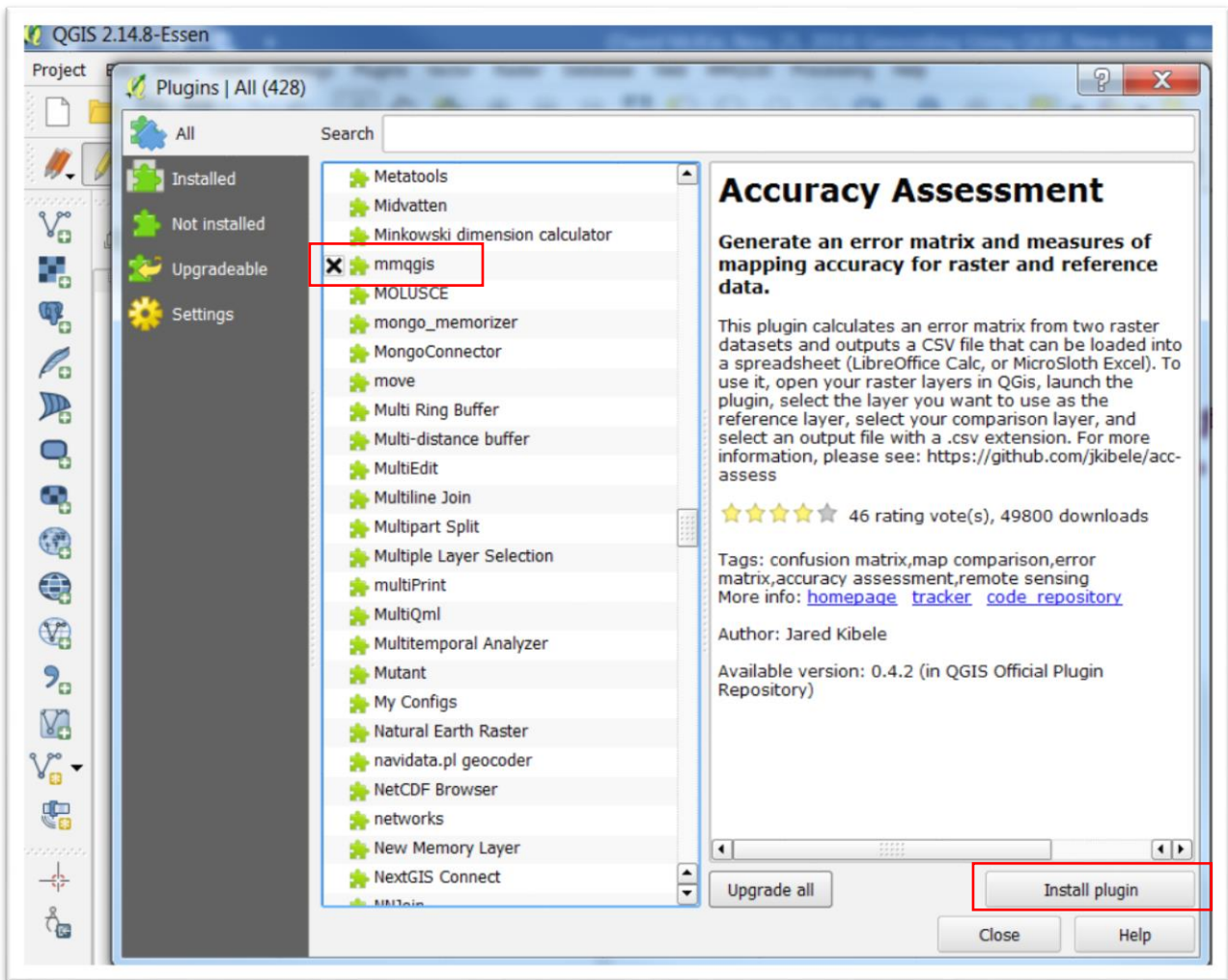
Click "Enable API".

Copy the API key, which you will need in QGIS.

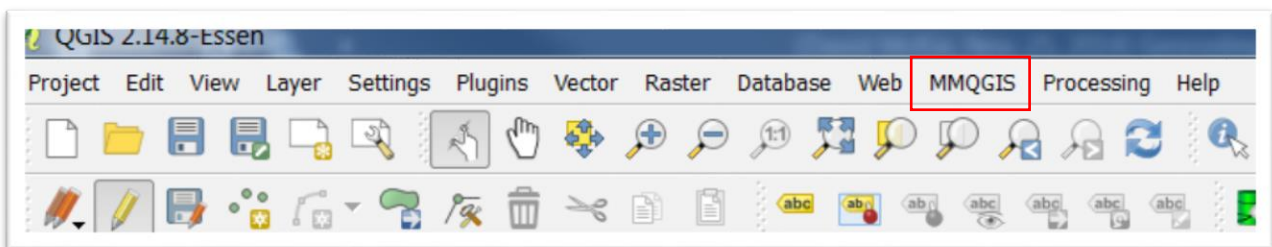


Be sure to keep the copied version of the API key in a secure, easy-to-remember place.

To geocode in QGIS, you'll have to install the "mmqgis" plugin. In QGIS, click on Plugins > Manage and Install Plug-ins. Scroll down and click on "mmqgis" and click install.

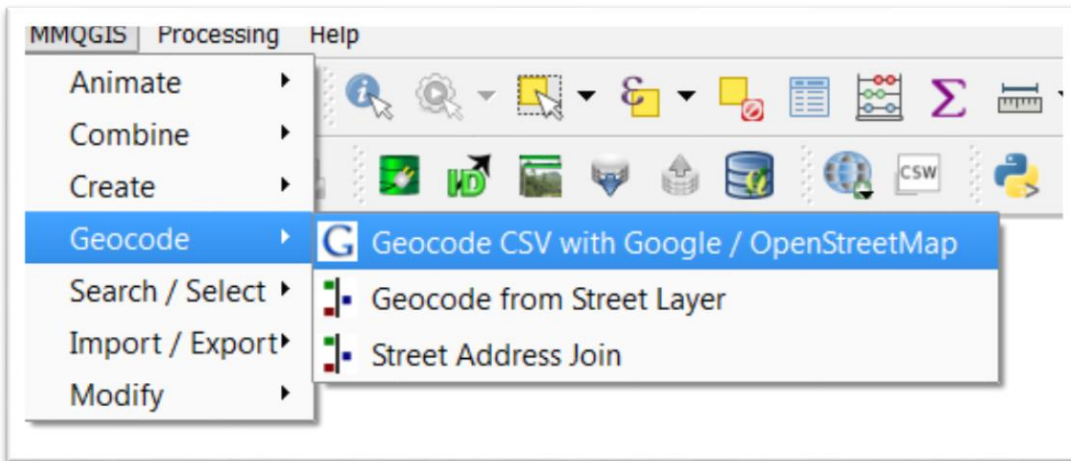


Once installed, you should see the “MMQGIS” in the menu bar.



Import the discarded syringe file through the MMQGIS plugin.

Click on MMQGIS (which will be located on the menu at the top) > Geocode > Geocode CSV with Google/OpenStreetMap.



Browse. Click your file to populate QGIS' "Web Service Geocode" dialogue box.

Even though it indicates that this step is "(optional)", you must copy the API key that you've saved into the "Google API Key" dialogue box. Make sure that the "Input CSV File" is the cleaned CSV file.

Web Service Geocode

Input CSV File (UTF-8)
DUR.4208-5508-E/Geocoding/GeoCodingUsingQgis_updated_clean.csv Browse...

Address Field
StreetAddress

City Field
City

State Field
Province

Country Field
Country

Web Service
Google Maps

Google API Key (optional)
aSyCiihx4D12E0FIA0eGQyVH9tYLYcxfp0Y

Output Shapefile
DUR.4208-5508-E/Geocoding/GeoCodingUsingQgis_updated_clean.shp Browse...

Not Found Output List
/kentj/Documents/GitHub/JOURL.4208-5508-E/Geocoding/notfound.csv Browse...

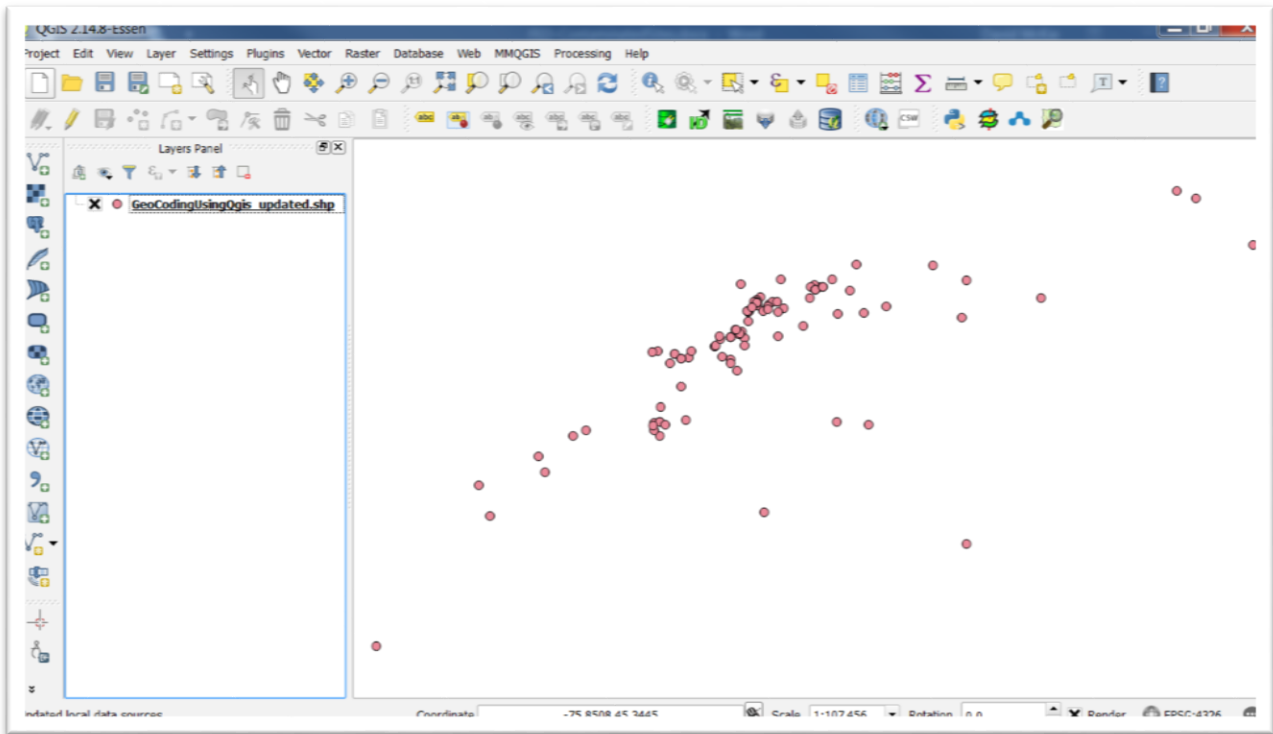
OK Cancel

Not only will the web service geocode the address with longitude and latitude coordinates, but QGIS will create a shape file. For the purposes of this exercise, just ignore the category below the “Output Shapefile” label, and select OK.

The actual geoprocessing could take a few minutes, after which time, the points will be plotted.

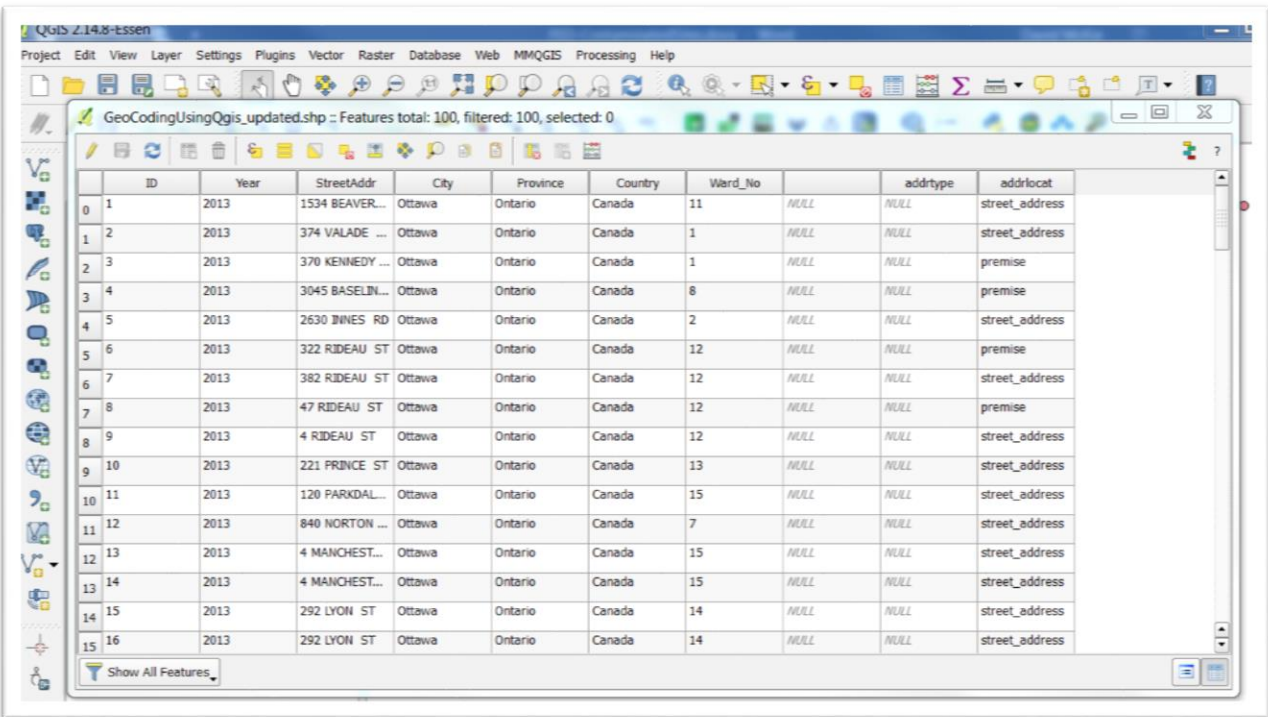
Once completed, the geocoded points will appear on the map. (NOTE: QGIS can be unpredictable. So, if the process stalls, or seems to be taking too long, try it

again.)



All the points should be plotted in Ottawa. If not, then you can correct the mistakes in QGIS, or the csv file, and then re-saving it and importing it once again. For the most part, web-based, geocoding services work well, though it's ALWAYS good

practice to check for inaccuracies that can be easily fixed.

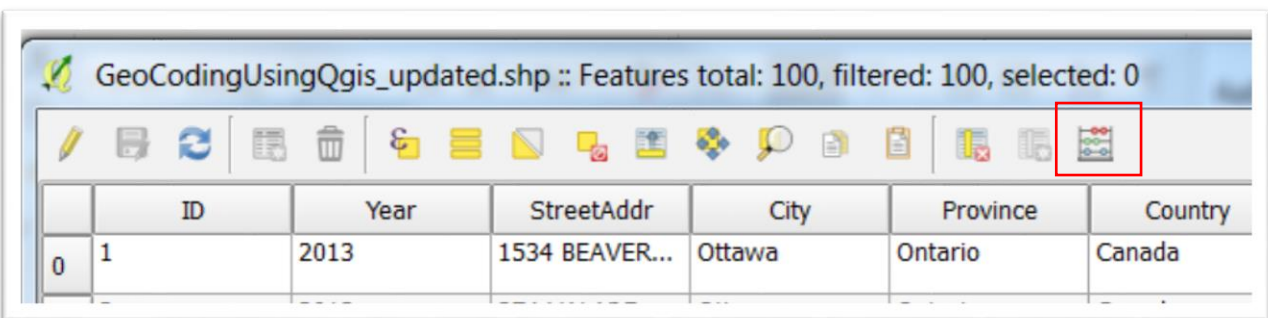


	ID	Year	StreetAddr	City	Province	Country	Ward_No	addtype	addlocat
0	1	2013	1534 BEAVER...	Ottawa	Ontario	Canada	11	NULL	street_address
1	2	2013	374 VALADE ...	Ottawa	Ontario	Canada	1	NULL	street_address
2	3	2013	370 KENNEDY ...	Ottawa	Ontario	Canada	1	NULL	premise
3	4	2013	3045 BASELIN...	Ottawa	Ontario	Canada	8	NULL	premise
4	5	2013	2630 JONES RD	Ottawa	Ontario	Canada	2	NULL	street_address
5	6	2013	322 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	premise
6	7	2013	382 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	street_address
7	8	2013	47 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	premise
8	9	2013	4 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	street_address
9	10	2013	221 PRINCE ST	Ottawa	Ontario	Canada	13	NULL	street_address
10	11	2013	120 PARKDAL...	Ottawa	Ontario	Canada	15	NULL	street_address
11	12	2013	840 NORTON ...	Ottawa	Ontario	Canada	7	NULL	street_address
12	13	2013	4 MANCHEST...	Ottawa	Ontario	Canada	15	NULL	street_address
13	14	2013	4 MANCHEST...	Ottawa	Ontario	Canada	15	NULL	street_address
14	15	2013	292 LYON ST	Ottawa	Ontario	Canada	14	NULL	street_address
15	16	2013	292 LYON ST	Ottawa	Ontario	Canada	14	NULL	street_address

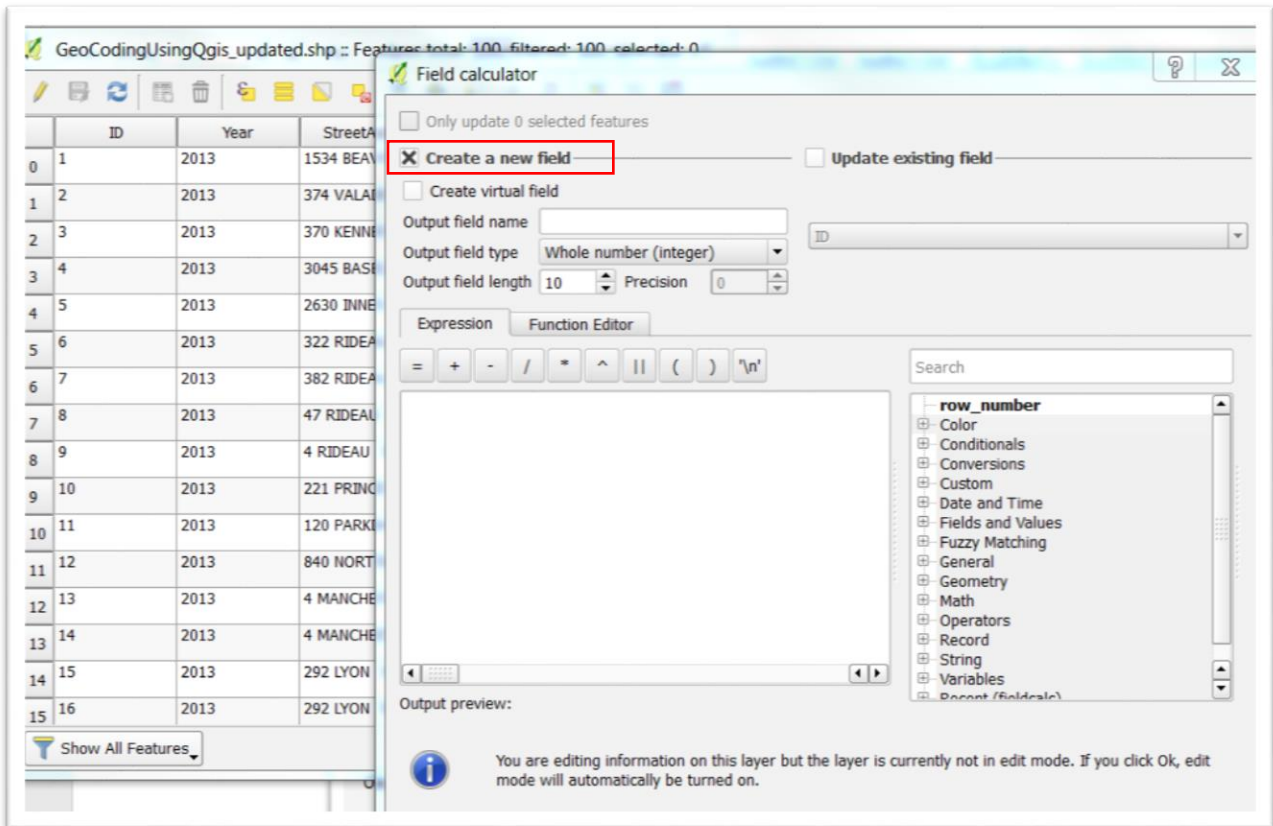
You'll notice that the attribute table does not show the longitude and latitude coordinates, even though QGIS is using them to map the locations.

To obtain columns with the longitude and latitudes, we'll have to use the QGIS field calculator.

Stay in the attribute table, and select the "open field calculator" icon to the far right of the menu.



	ID	Year	StreetAddr	City	Province	Country
0	1	2013	1534 BEAVER...	Ottawa	Ontario	Canada



Make sure the box to the left of “Create a new field” is checked.

Next to “Output field name” type “X” for X-axis.

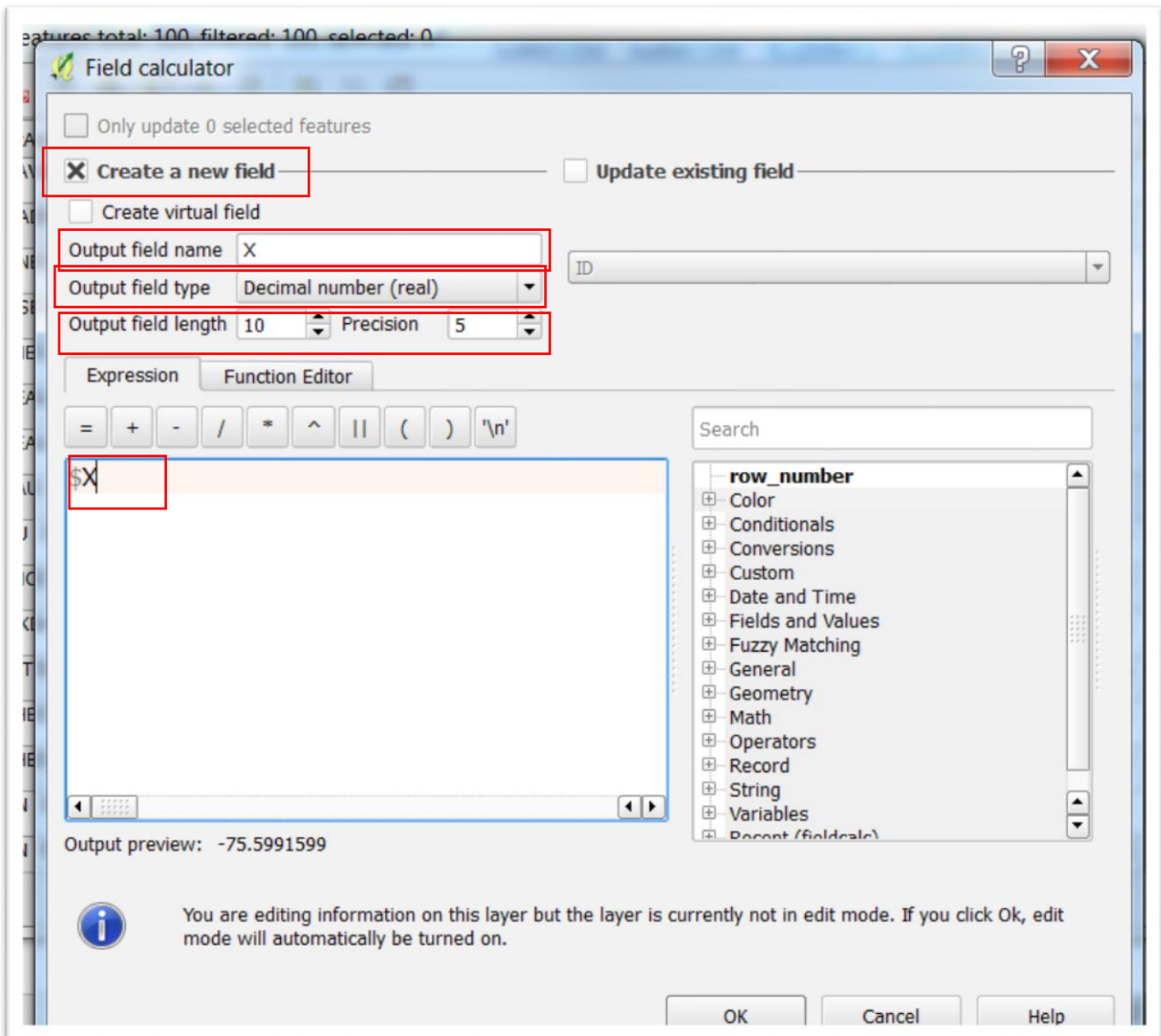
The “Output field type” is a “Decimal number (real)”

Output field length is 10 (Note: older versions of QGIS call this “Output field width”)

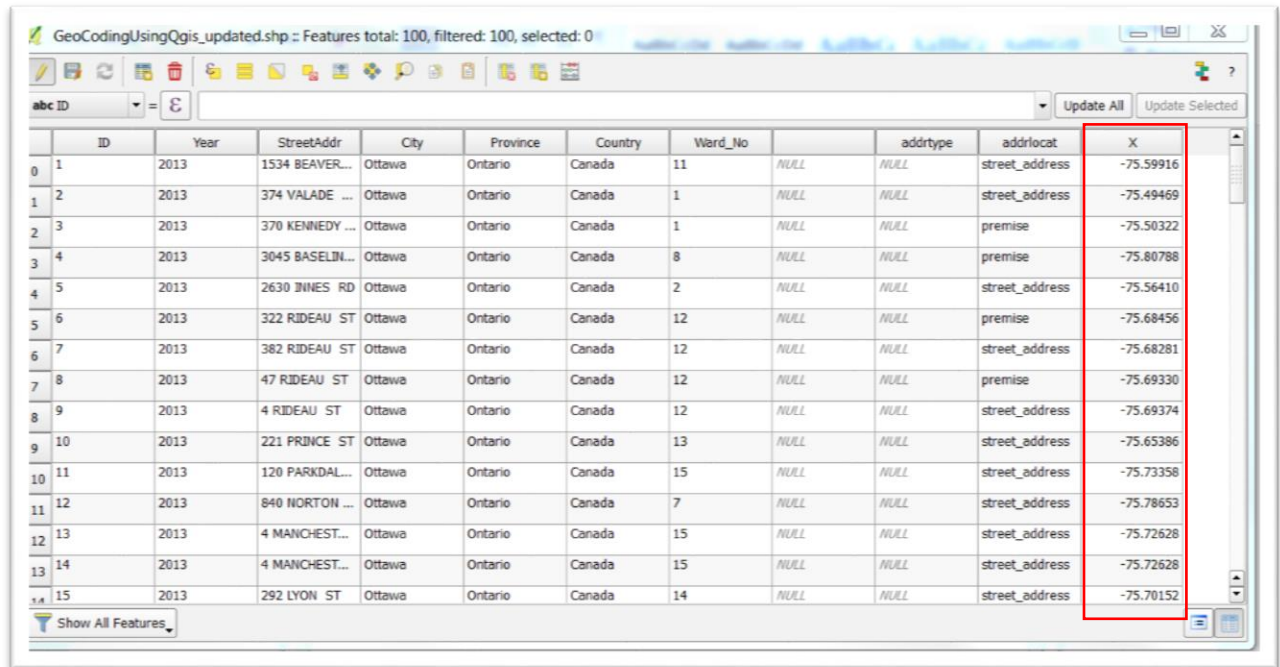
The “Precision” is 5 (for the five decimal points).

In the “Expression” box, type “\$X”.

Your “Field calculator” dialogue box should look like this:



Select the “OK” tab.



GeoCodingUsingQgis_updated.shp :: Features total: 100, filtered: 100, selected: 0

	ID	Year	StreetAddr	City	Province	Country	Ward_No		addrtype	addrlocat	X
0	1	2013	1534 BEAVER...	Ottawa	Ontario	Canada	11	NULL	NULL	street_address	-75.59916
1	2	2013	374 VALADE ...	Ottawa	Ontario	Canada	1	NULL	NULL	street_address	-75.49469
2	3	2013	370 KENNEDY ...	Ottawa	Ontario	Canada	1	NULL	NULL	premise	-75.50322
3	4	2013	3045 BASELIN...	Ottawa	Ontario	Canada	8	NULL	NULL	premise	-75.80788
4	5	2013	2630 JONES RD	Ottawa	Ontario	Canada	2	NULL	NULL	street_address	-75.56410
5	6	2013	322 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	premise	-75.68456
6	7	2013	382 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	street_address	-75.68281
7	8	2013	47 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	premise	-75.69330
8	9	2013	4 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	street_address	-75.69374
9	10	2013	221 PRINCE ST	Ottawa	Ontario	Canada	13	NULL	NULL	street_address	-75.65386
10	11	2013	120 PARKDAL...	Ottawa	Ontario	Canada	15	NULL	NULL	street_address	-75.73358
11	12	2013	840 NORTON ...	Ottawa	Ontario	Canada	7	NULL	NULL	street_address	-75.78653
12	13	2013	4 MANCHEST...	Ottawa	Ontario	Canada	15	NULL	NULL	street_address	-75.72628
13	14	2013	4 MANCHEST...	Ottawa	Ontario	Canada	15	NULL	NULL	street_address	-75.72628
14	15	2013	292 LYON ST	Ottawa	Ontario	Canada	14	NULL	NULL	street_address	-75.70152

Show All Features

We now have a column displaying the “X” coordinates.

Repeat the same process for the latitude, which will be the “Y” coordinate.

Field calculator

☐ Only update 0 selected features

☒ Create a new field ☐ Update existing field

☐ Create virtual field

Output field name: Y

Output field type: Decimal number (real)

Output field length: 10 Precision: 5

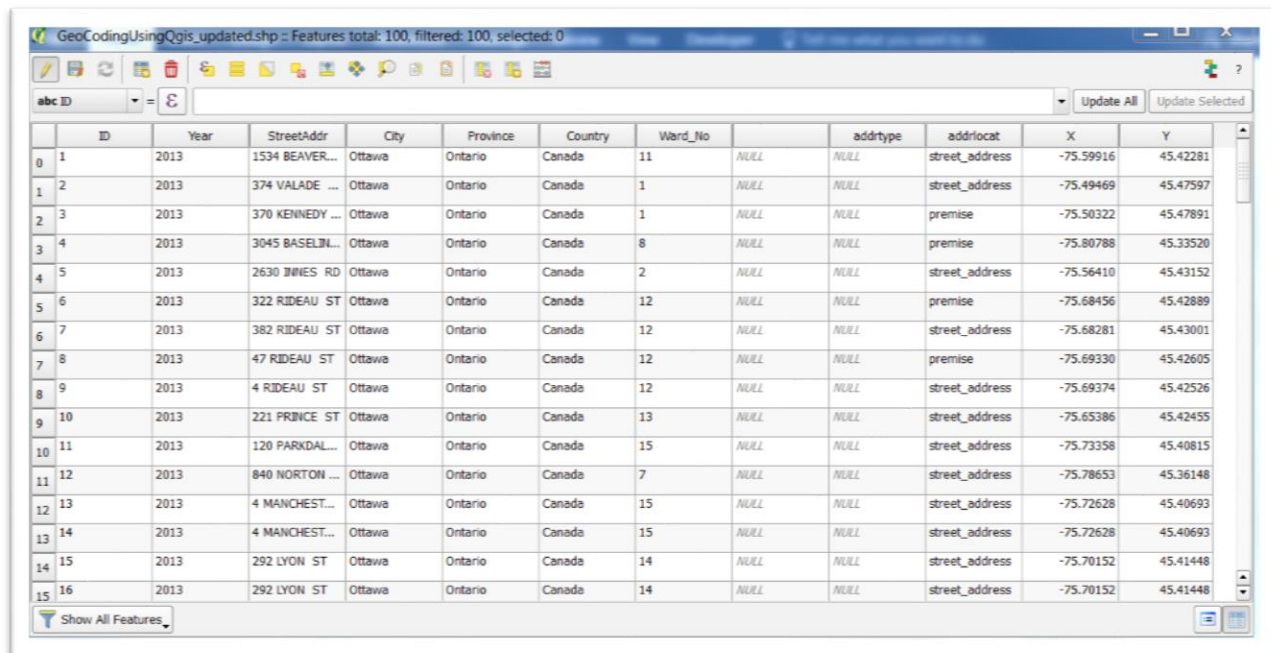
Expression: \$Y

Function Editor: Search

- row_number
- Color
- Conditionals
- Conversions
- Custom
- Date and Time
- Fields and Values
- Fuzzy Matching
- General
- Geometry
- Math
- Operators
- Record
- String
- Variables
- Recent (fieldcalc)

Output preview: 45.4228082

OK Cancel Help



GeoCodingUsingQgis_updated.shp : Features total: 100, filtered: 100, selected: 0

	ID	Year	StreetAddr	City	Province	Country	Ward_No		addtype	addriocat	X	Y
0	1	2013	1534 BEAVER...	Ottawa	Ontario	Canada	11	NULL	NULL	street_address	-75.59916	45.42281
1	2	2013	374 VALADE ...	Ottawa	Ontario	Canada	1	NULL	NULL	street_address	-75.49469	45.47597
2	3	2013	370 KENNEDY ...	Ottawa	Ontario	Canada	1	NULL	NULL	premise	-75.50322	45.47891
3	4	2013	3045 BASELIN...	Ottawa	Ontario	Canada	8	NULL	NULL	premise	-75.80788	45.33520
4	5	2013	2630 INNES RD	Ottawa	Ontario	Canada	2	NULL	NULL	street_address	-75.56410	45.43152
5	6	2013	322 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	premise	-75.68456	45.42889
6	7	2013	382 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	street_address	-75.68281	45.43001
7	8	2013	47 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	premise	-75.69330	45.42605
8	9	2013	4 RIDEAU ST	Ottawa	Ontario	Canada	12	NULL	NULL	street_address	-75.69374	45.42526
9	10	2013	221 PRINCE ST	Ottawa	Ontario	Canada	13	NULL	NULL	street_address	-75.65386	45.42455
10	11	2013	120 PARKDAL...	Ottawa	Ontario	Canada	15	NULL	NULL	street_address	-75.73358	45.40815
11	12	2013	840 NORTON ...	Ottawa	Ontario	Canada	7	NULL	NULL	street_address	-75.78653	45.36148
12	13	2013	4 MANCHEST...	Ottawa	Ontario	Canada	15	NULL	NULL	street_address	-75.72628	45.40693
13	14	2013	4 MANCHEST...	Ottawa	Ontario	Canada	15	NULL	NULL	street_address	-75.72628	45.40693
14	15	2013	292 LYON ST	Ottawa	Ontario	Canada	14	NULL	NULL	street_address	-75.70152	45.41448
15	16	2013	292 LYON ST	Ottawa	Ontario	Canada	14	NULL	NULL	street_address	-75.70152	45.41448

Show All Features

Before we continue, a quick word about X and Y coordinates. Latitude = Y because lines of latitude are horizontal lines which run north and south. Longitude is the X axis that moves east to west. The Data Journalist covers these geographic concepts on pages 161-2 of Chapter 7, “Working with GIS Programs.”

The new columns will allow you to display these locations online using other tools such as ArcGIS Online, Fusion Tables, or Tableau, once you ‘ve exported the layer as a csv file.

The X and Y coordinates will also allow you to perform the kinds of spatial joins in QGIS that we learned in the “7_13_SpatialJoinsQGISDesktop” [tutorial](#).

Of course, there are other free methods, including [Canadian Post Codes GeoCoder](#), which provides postal codes, forward sortation areas (FSAs) and their accompanying latitude and longitude coordinates.

You can import the GeoCoder data into QGIS or MySQL, and then join the postal codes to the postal codes contained in csv files that identify locations such as parking-ticket violations or restaurants that have failed multiple inspections. Conducting the join, produces a new file with latitude and longitude coordinates, which can then be mapped for greater accuracy as we have seen in this tutorial.

