# Calculating Line Lengths and Statistics

## **QGIS** Tutorials and Tips



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# Calculating Line Lengths and Statistics

QGIS has built-in functions to calculate various properties based on the geometry of the feature such as length, area, perimeter etc. This tutorial will show how to use **Field Calculator** to add a column with a value representing length of each feature.

### Overview of the task

We will use a polyline shapefile of railroads in North America and try to determine the total length of railroads in the United States.

### Other skills you will learn

- Using expressions to select features.
- Re-projecting a layer from Geographic to Projected Coordinate Reference System(CRS).
- Viewing statistics for values of an attribute in a layer.

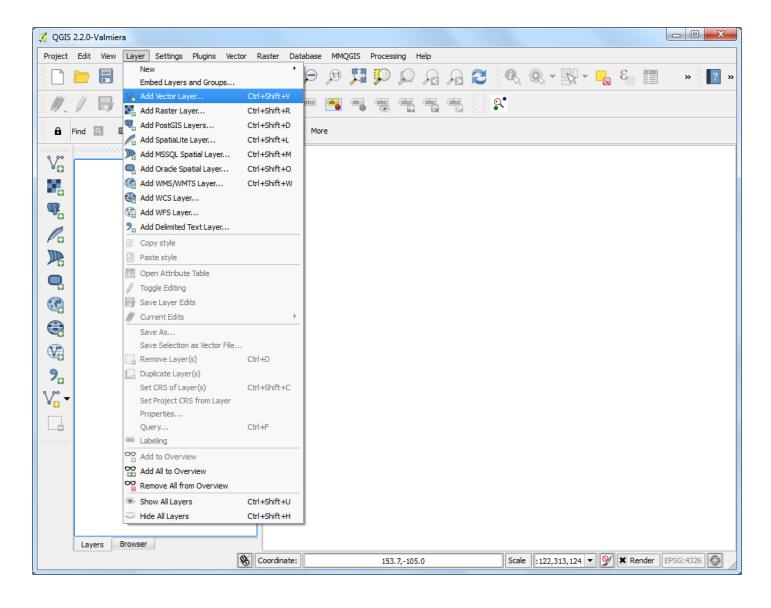
#### Get the data

Natural Earth has a public domain railroads dataset. Download the North America supplement zip file from the portal.

Data Source [NATURALEARTH]

#### Procedure

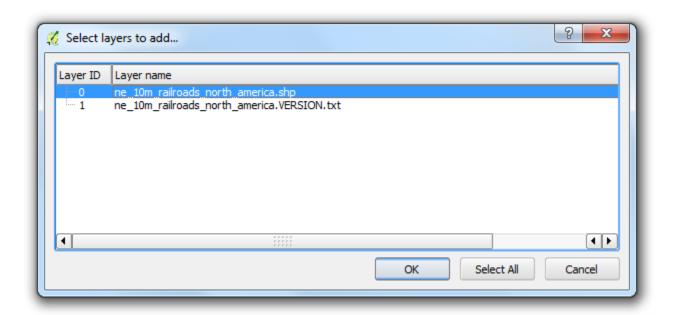
1. Go to Layer ■ Add Vector Layer.



2. Browse to the ne\_10m\_railroads\_north\_america.zip file and click OK.



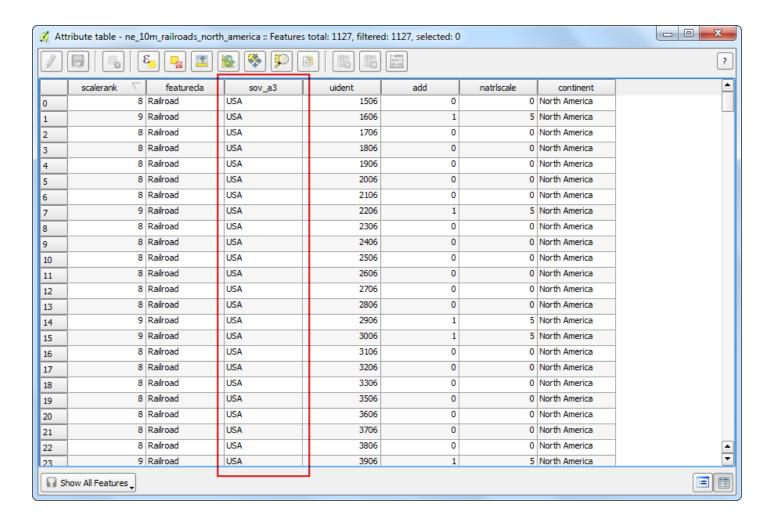
3. In the Select layers to add... dialog, choose ne\_10m\_railroads\_north\_america.shp layer.



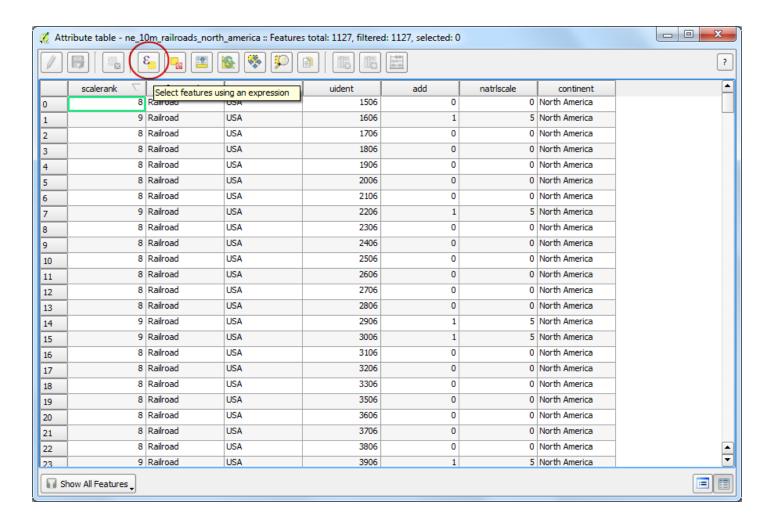
4. Once the layer is loaded, you will notice that the layer has lines representing railroads for all of North America. Since we want to calculate line lengths only for United States railroads, we need to select the lines that fall in the United States. Right-click on the layer and select *Open Attribute Table*.



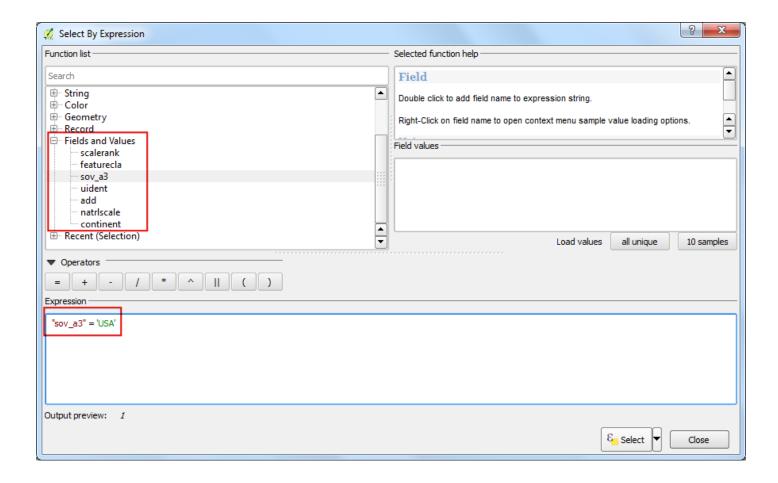
5. The layer has an attribute called sov\_a3. This is the 3 letter code for the country that a particular feature falls in. We can use the value of this attribute to select features that are in USA.



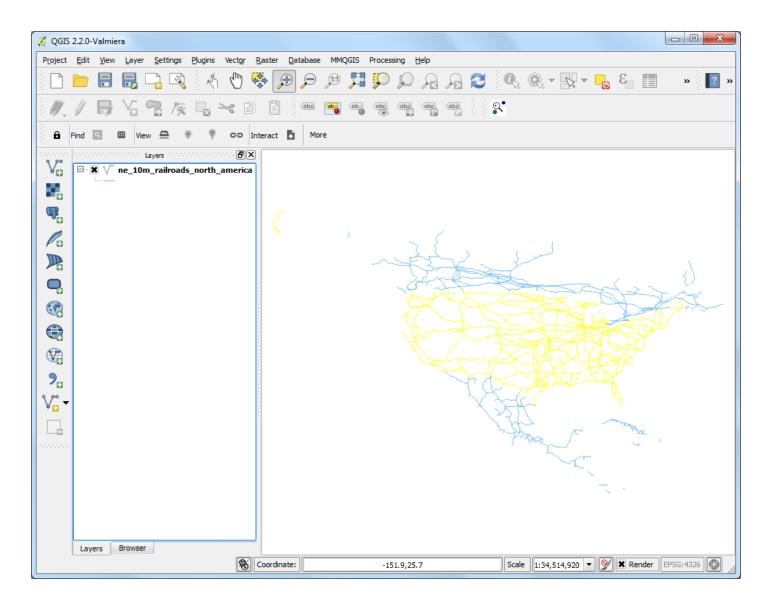
6. In the Attribute Table window, click the Select features using an expression button.



7. A new dialog Select By Expression will open. Find the attribute sov\_a3 under Fields and Values in the Functions list section. Double-click on it to add it to the Expression text area. Complete the expression by typing in "sov\_a3" = 'USA'. Click Select followed by Close.



8. Back in the main QGIS window, you will see that all lines that fall in USA are selected and appear in yellow.



9. Now let's save our selection to a new shapefile. Right-click on the ne\_10m\_railroads\_north\_america layer and select Save Selection As....



10. Click *Browse* and name the output file as usa\_railroads.shp. We also want to change the CRS of the layer. Click on *Browse* next to *CRS*.

#### Note

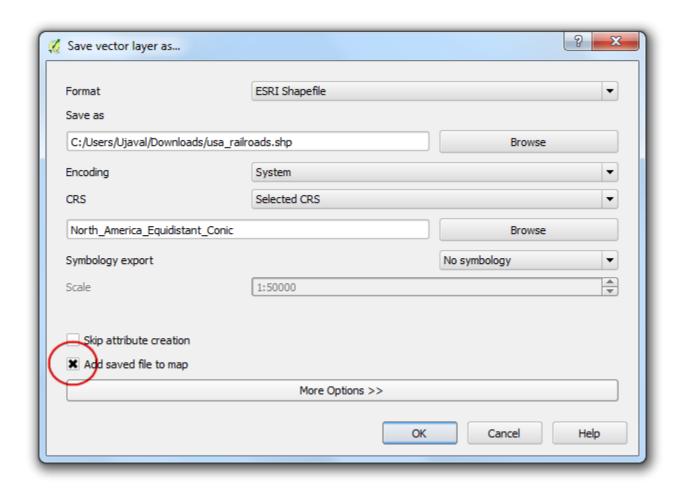
The built-in functions that use a feature's geometry for calculation use the units of the layer's CRS. Geographic Coordinate Reference System(CRS) such as *EPSG:4326* have **degrees** as units - so the length of the feature would be in **degrees** and area in **square degrees** - which is meaningless. You need to use a Projected Coordinate Reference System with units of **meters** or **feet** to perform such calculations.



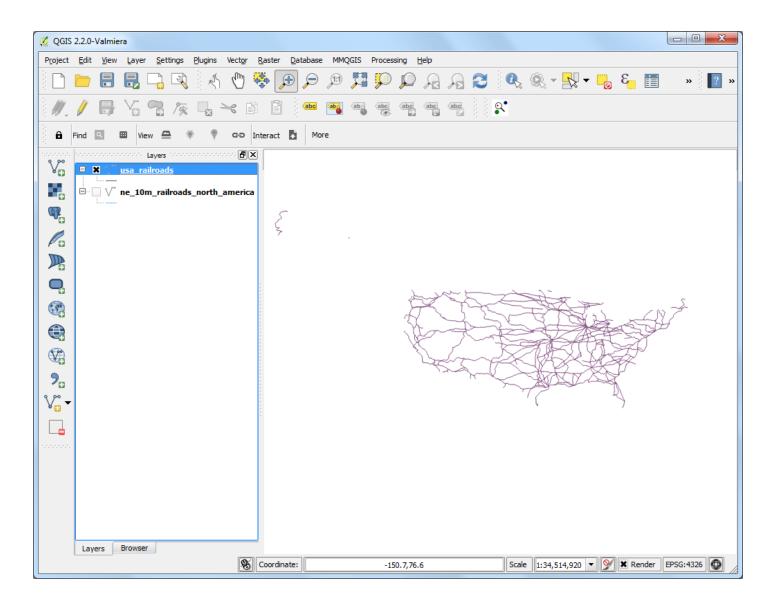
11. Since we are interested in calculating length, let's select an equidistance projection. Type *north* america equ in the *Filter* search box. In the results pane below, select *North\_America\_Equidistant\_Conic EPSG:102010* as the CRS. Click *OK*.



12. In the Save vector layer as... dialog, check the Add saved file to map and click OK.



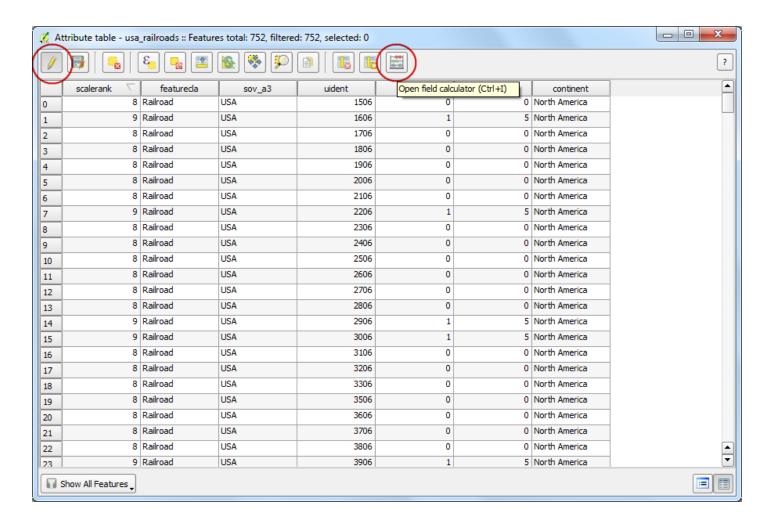
13. Once the export process finishes, you will see a new layer usa\_railroads loaded in QGIS. You can uncheck the box next to ne\_10m\_railroads\_north\_america layer to turn it off as we don't need it anymore.



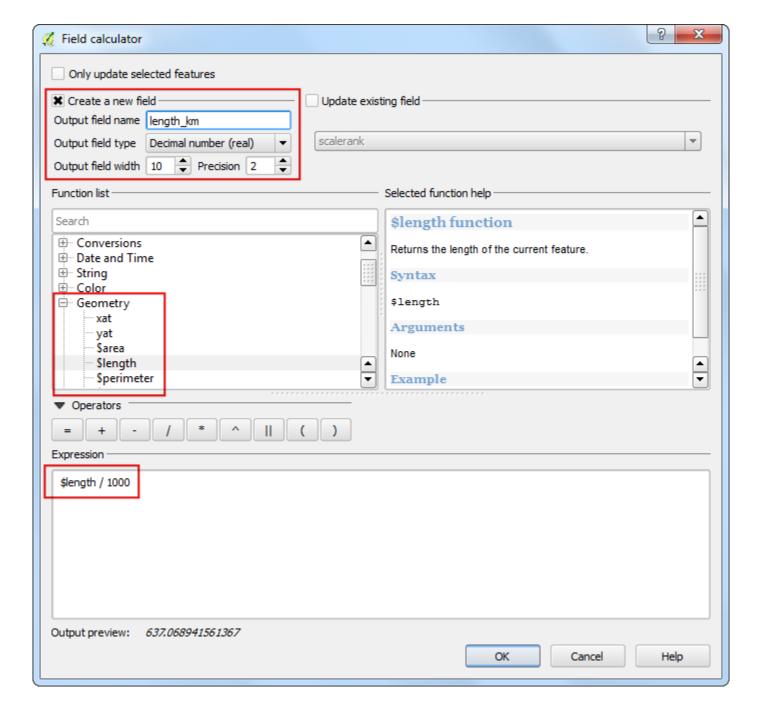
14. Right-click on the usa\_railroads layer and select *Open Attribute Table*.



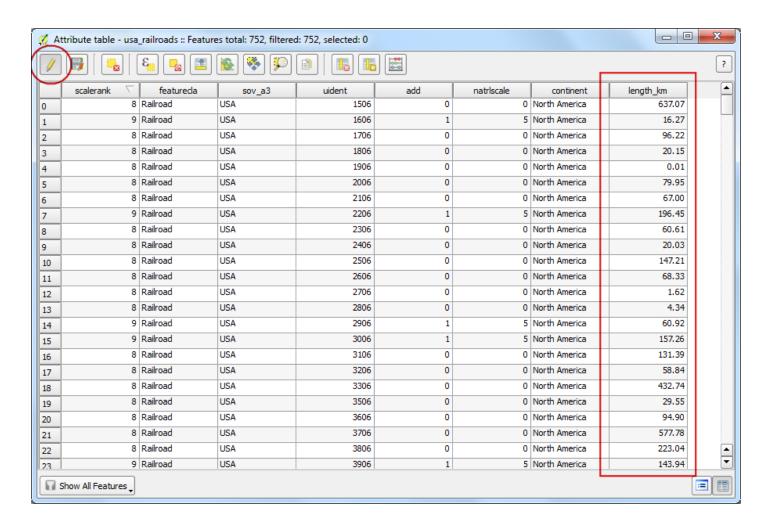
15. Now it is time to add a column with length of each feature. Put the layer in editing mode by clicking on the *Toggle editing* button. Once in editing mode, click the *Open field calculator* button.



16. In the Field Calculator, check Create a new field. Enter length\_km as the Output field name. Choose Decimal number (real) as the Output field type. Change the output Precision to 2. In the Function list panel, find the \$length under Geometry. Double-click it to add it to the Expression. Complete the expression as \$length / 1000 because our layer CRS is in meters unit and we want the output in km. Click OK.



17. Back in *Attribute Table*, you will see a new column *length\_km* appear. Click the *Toggle editing* button to save the changes to the attribute table.



18. Now that we have length of each individual line in our layer, we can easily add it all up and find the **Total** length. Go to *Vector* ■ *Analysis Tools* ■ *Basic Statistics*.



19. Select the *Input Vector layer* as usa\_railroads. Choose the *Target field* as length\_km and click *OK*. You will see various statistics appear. The *Sum* value is the total length of the railroads that we are looking to find.

#### Note

This answer will vary slightly if a different projection is chosen. In practice, line lengths for roads and other linear features are measured on the ground and provided as attributes to the dataset. This method works in absence of such attribute and as an approximation of actual line lengths.

