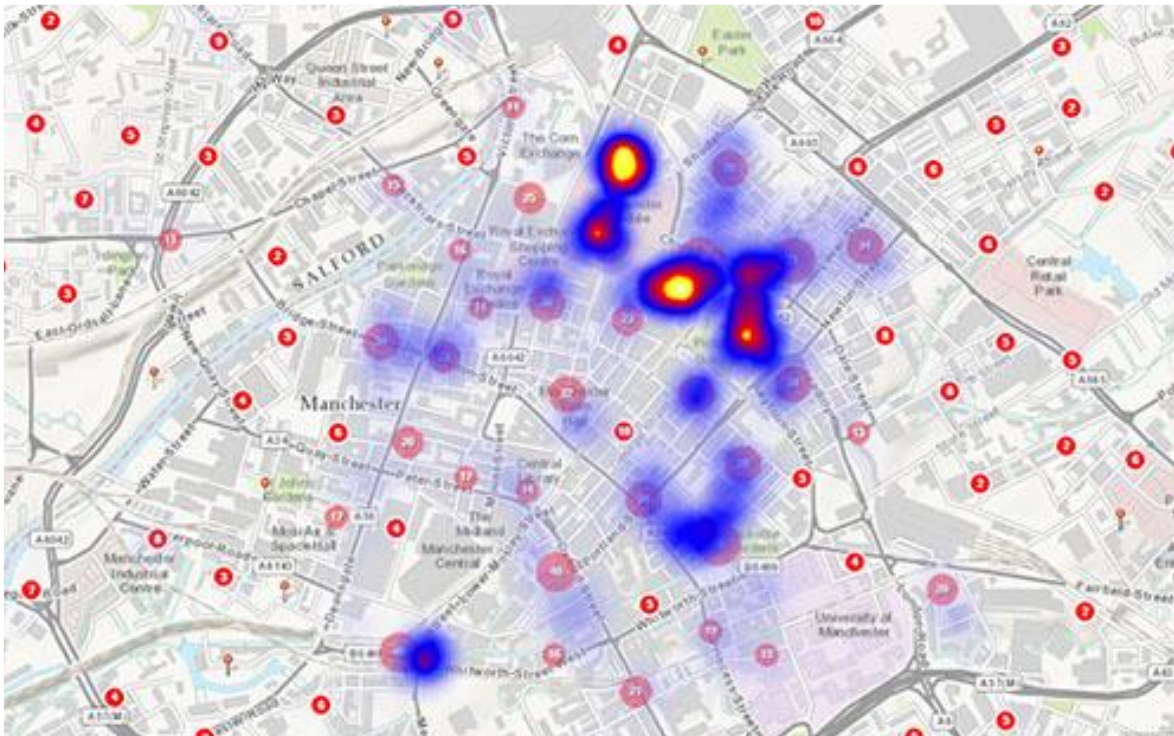


Analysing crime data in Maps for Office and ArcGIS Online



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Introduction

ArcGIS Online is a Web-based system that allows you to create interactive maps and applications (apps), and share them with the world across the Internet. ArcGIS Online also gives you access to data, maps and apps already created by other people within the worldwide community of GIS users.

Tutorial Overview

In this tutorial, you will import crime data from the UK's Police website and perform some spatial analysis. The data can then be analysed to answer questions such as (specific to the sample dataset):

- Where are the large clusters of crime incidents in Manchester?
- Where are the burglary hot spots?
- Which LSOA has the highest normalised burglary rate?

Skills

By completing this tutorial, you will become comfortable with the following GIS skills:

1. Adding data into ArcGIS Online
2. Creating a feature service
3. Using different spatial analysis tools to interpret crime data

Time Required

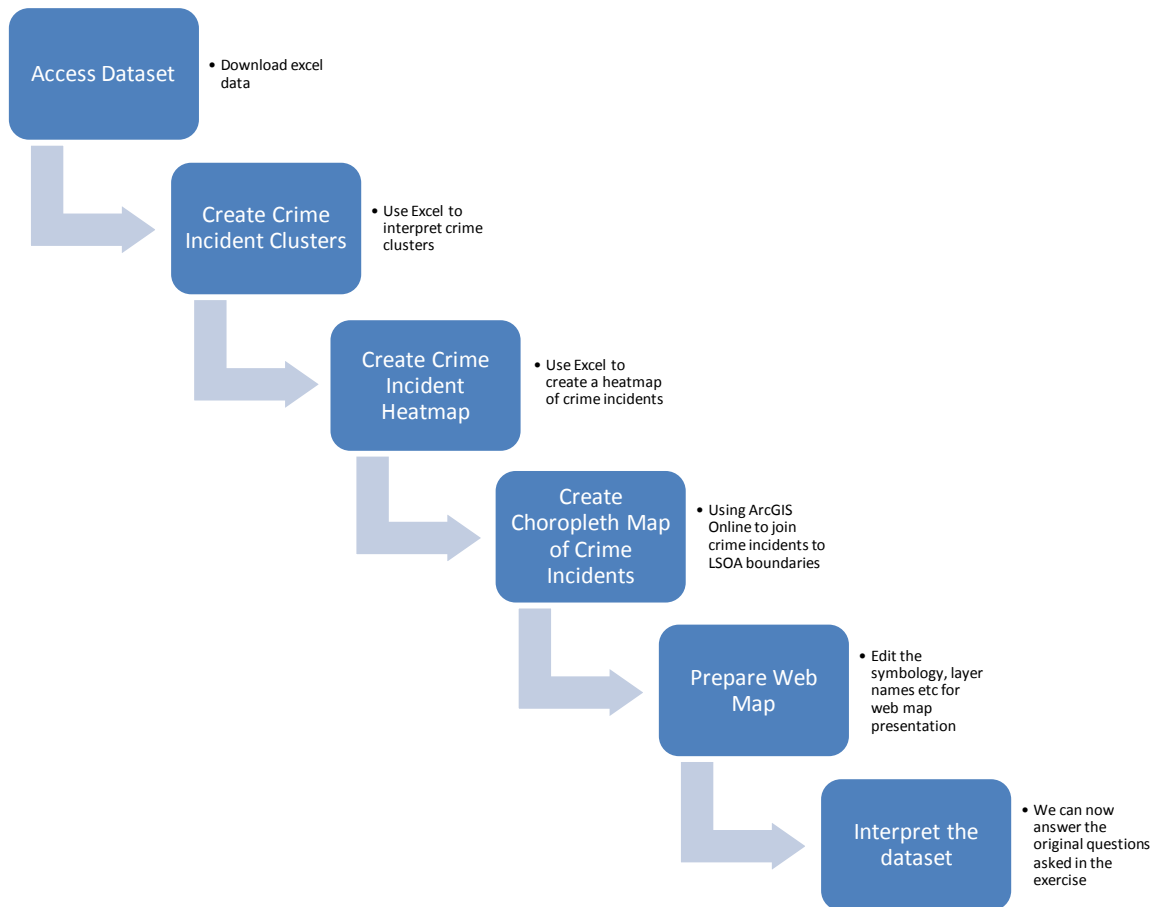
The following classroom time is required to complete this tutorial:

- 20 – 30 minutes

Materials Required

- Internet browser (e.g., Internet Explorer, Mozilla Firefox, Google Chrome, Safari). Esri UK recommends Google Chrome as this generally gives better performance.
- Microsoft Excel 2010 or 2013.

Tutorial workflow – Teacher Information



All of the help documentation for ArcGIS Online can be found at:
<http://resources.arcgis.com/en/help/arcgisonline/index.html>

Part A: Access Dataset

In this section, you will add the dataset to the ArcGIS Online map viewer.

1. Open your internet browser, go to <http://data.police.uk>

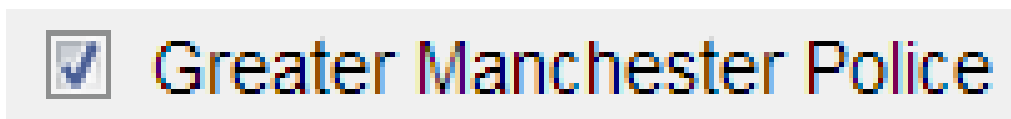
Note: if the link is broken, or you want to use a sample dataset that this tutorial is based on, skip to step 5 and download the sample dataset.

2. Click on '**DOWNLOADS**':



This page allows you to download crime data any police force in England and Wales in CSV format which is broken down by LSOA.

3. For this tutorial, select the latest month available only and select your police force. We have chosen '**Greater Manchester Police**' for the month of September 2013 for this tutorial.



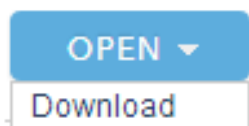
4. Don't choose the option to include outcome data and then

Generate file

5. Click **Download now** to download your file.

Download now

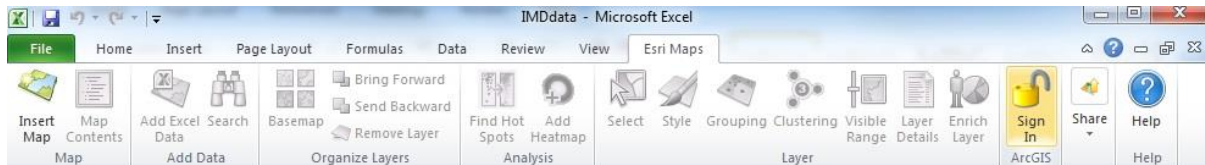
Alternatively, click [here](#) to download a sample dataset of all crimes in Manchester for the month of September 2013. After opening the link, Select **Open** then **Download**.




6. Double click the dataset to start up Excel. If you don't have Esri Maps for Office installed, follow the instructions in Excel tutorial.


Get familiar with the fields that are in the dataset. You will see that there are several attributes for each crime such as what type of crime it was and where it occurred.

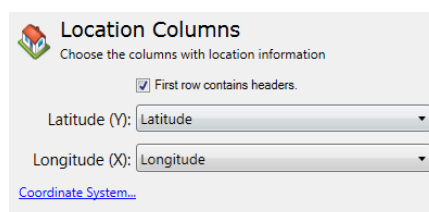
7. Click on the **Esri Maps** tab on the ribbon at the top.
8. Many of the buttons will be greyed out and un-clickable. This is because you will need to sign into your organisational account using the sign in button with the padlock. Once you have signed in, you are ready to use Esri maps for Office.



9. Once signed in, click .
10. We are first going to look at the spatial distribution of all crimes. Click any of the cells with data in. Then press **Ctrl + A**. This should highlight all cells.



11. Click
12. This should bring up the '**Location Type**' window. Select  **Latitude, Longitude** and then click 'Next'.
13. The '**Location Columns**' window should be displayed. As the first row contains the field header information, leave the tick box checked. Make sure the **Latitude** and **Longitude** fields match up and click 'Add'.



14. For this tutorial's dataset, there are over 25000 crimes so it may take a few seconds to 'geocode' the dataset and display the points on the map.

15. You should now have a map that looks similar to the map in the screenshot below:

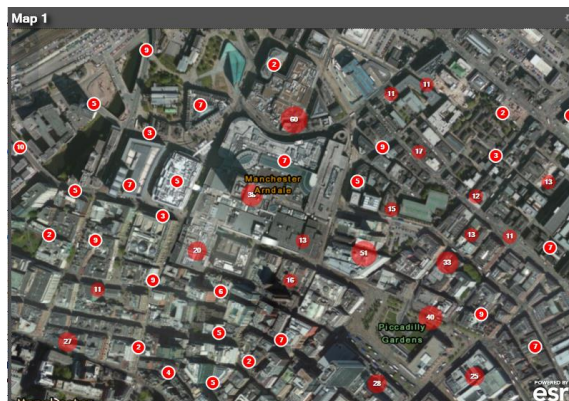


Part B: Create Crime Incident Heatmap

1. The first type of analysis is using '**Clustering**'. You will see that the data is clustered automatically because it is an easier way to visualise large datasets. It is not as easy to spot patterns in a large dataset if each point feature is displayed as many points overlap.
2. We can now zoom in on the cluster to investigate where the large clusters of points are located. Either double click the map itself or use the + and – buttons to the side of the map box. Zoom in on the largest clusters each time you zoom. As you zoom in to a large scale (closer to the Earth's surface), you will notice that the highest clustering values are in the centre of Manchester. You will also see clustering at a street level. Zoom in to a similar scale shown in the screenshot below. Note: The

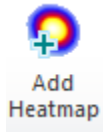


'Basemap' has also been changed using the **Basemap** option in the '**Organize Layers**' tools.



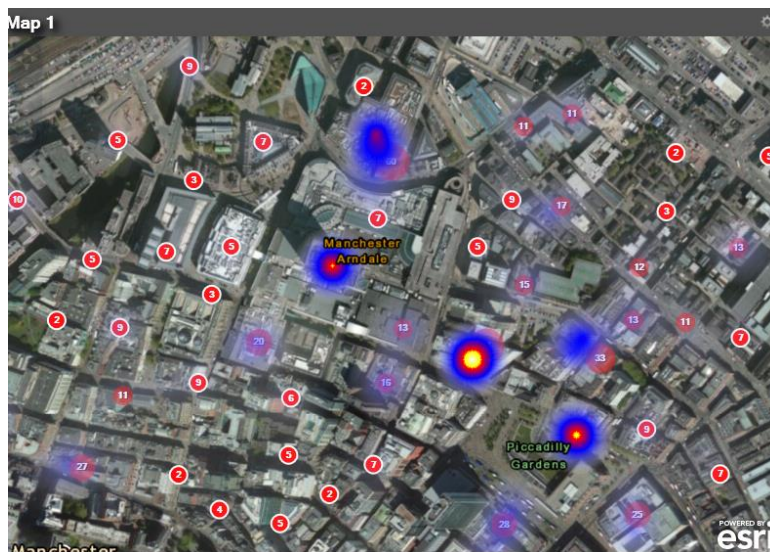
Part C: Create Crime Incident Heatmap

- Another way of visualising your dataset is by producing a 'Heatmap'. Click on



in the 'Analysis tools'.

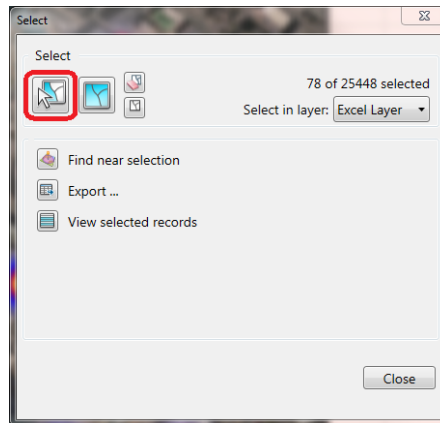
- You should now have a heatmap of the data points within your map extent. This heatmap shows the geographic density of crimes using colours to represent a high concentration of points. You should have a similar map to the one in the screenshot below:



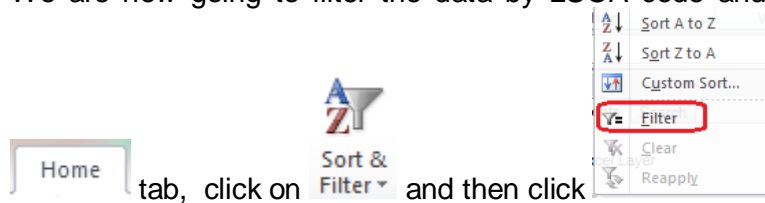
Further investigation could be done on the number of crimes in each crime category within



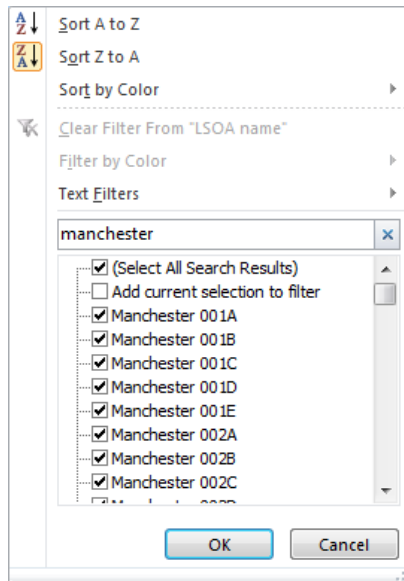
this map extent. To do this, click on **Select** in the 'layer tools', then click on 'Select features by drawing a rectangle'.



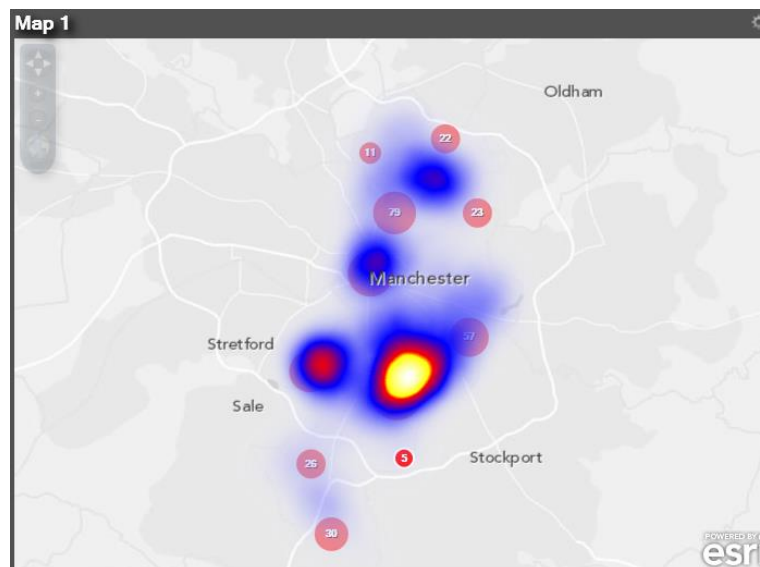
5. On the map, draw a rectangle. This will select the points on the map which can then be exported out for further analysis using the '**Export**' option and selecting '**Selected Records**'. The exported dataset could be used for the next spatial analysis tools.
6. For this exercise, we are now going to investigate burglaries in the month of September within the Manchester LSOAs. Close the Select window and click any of the cells with data in, Then press Ctrl + A. This should highlight all cells.
7. We are now going to filter the data by LSOA code and crime category. Click the



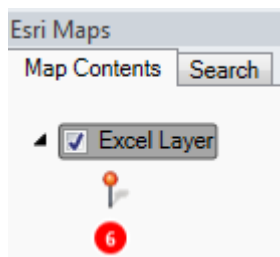
8. You should now see drop down arrows on all field headers. Click on the arrow in the '**LSOA name**' field (column I) LSOA name ▼
9. Type '**manchester**' as in the screenshot and click 'OK'.



10. We now need to do the same but filter on the '**Crime type**' field (column J). This time in the filter, type '**burglary**'. Notice, the heatmap changes based on the filtering.
11. Zoom out so that you can see all clusters in the map window.
12. You should now have a map similar to the one in the screenshot below. In this example, the basemap has been changed to '**Light gray canvas**'. This is a suitable basemap for smaller scales like this one as the clusters can be clearly visualised.



13. We are now going to share this layer by uploading it our Organizational account. Select the layer under '**Map Contents**' so that it is highlighted:

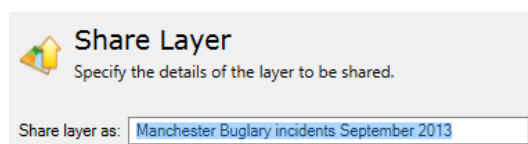


Note: The heatmap layer cannot be shared with ArcGIS Online.

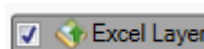


14. This should now enable the  option. Click on this.

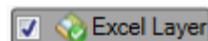
15. Enter an appropriate title and click 'OK'. Note: You could share this layer with a group you have set up for a student exercise.



This will start the upload process and you will see an arrow next to the layer.



When finished, you will see a tick next to the layer



Part D: Create Choropleth Map of Crime Incidents





Open your internet browser, go to www.arcgis.com and sign in with your organizational account credentials, using the '**SIGN IN**' button in the top right-hand corner.

SIGN IN

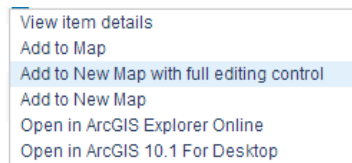
1. Click **MY CONTENT** at the top of the webpage.

Note: You can create folders to organize your content. For example, you could create a folder called '**Crime exercise**' to add your content to.


2. In your **Home** folder (top folder on the left), you should now see the layer you uploaded from Excel:

	 Manchester_Burglary_Incidents_Septe...	CSV	Nov 8, 2013	Not Shared
	 Manchester_Burglary_Incidents_Septe...	Features	Nov 8, 2013	Not Shared

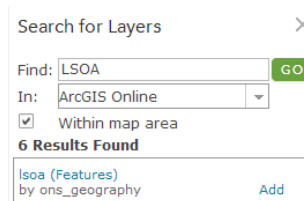
- Click on the drop down next to the Feature Service (Type: Features) that has been created and select **'Add to New Map with full editing control'**:



- You will see that all crime incidents have been added to the map as points.
- We are now going to investigate how many burglaries are taking place within each LSOA using the ArcGIS Online analysis tools.


- The first step is to add in the LSOA boundary layer. Click on  and select **'Search for layers'**. Type **'LSOA'** and search in ArcGIS Online, checking the box to search **'Within the map area'**.

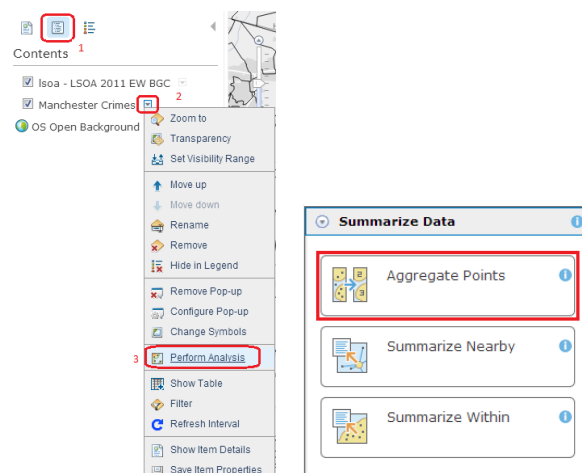
- One of the first results should be **'Issoa'** by **'ons_geography'**:




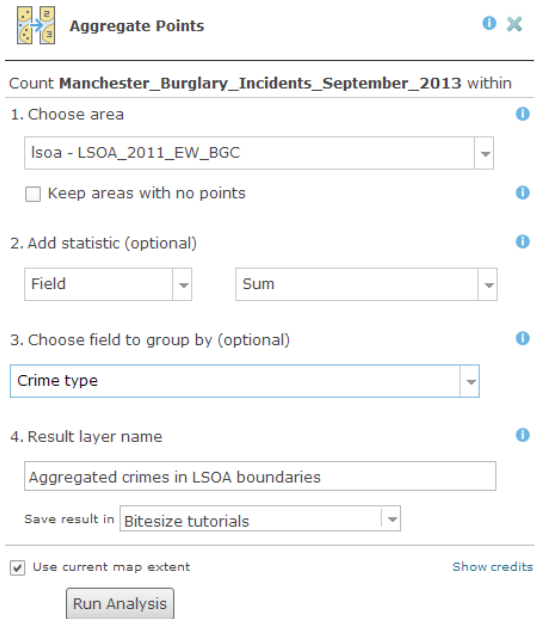
- Click on  and then

DONE ADDING LAYERS

- Click on the  button to see the layers in your map viewer, then the drop down arrow next to your crime incident layer and click on **'Perform Analysis'**.



10. Select **'Summarize Data'** and then **'Aggregate Points'**. You can click on the  symbol to find out more about each tool.
11. Ensure ALL crime incidents are in your map extent and select **'Use current map extent'**.
12. Set up the fields like in the screenshot below. What this will do is sum the crimes in each LSOA and provide statistics on each type of crime. Save the result in the folder of your choice.



Aggregate Points

Count **Manchester_Burglary_Incidents_September_2013** within

1. Choose area

Isoa - LSOA_2011_EW_BGC

☐ Keep areas with no points

2. Add statistic (optional)

Field Sum

3. Choose field to group by (optional)

Crime type

4. Result layer name

Aggregated crimes in LSOA boundaries

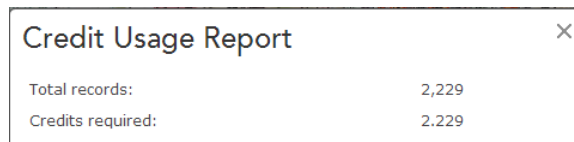
Save result in Bitesize tutorials

☒ Use current map extent [Show credits](#)

Run Analysis

13. Click [Show credits](#). It is important to understand the credit model as you have a limited amount of these. In this example, there is a total of 2,229 features in the extent (a combination of LSOA boundaries and crime incident points). For this analysis tool, 1 credit is used per 1,000 features analysed. Once all fields have been set, click

Run Analysis

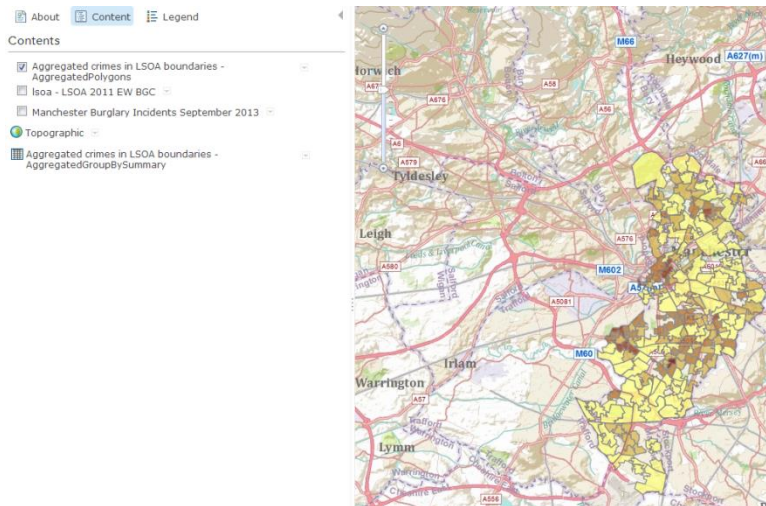



Credit Usage Report

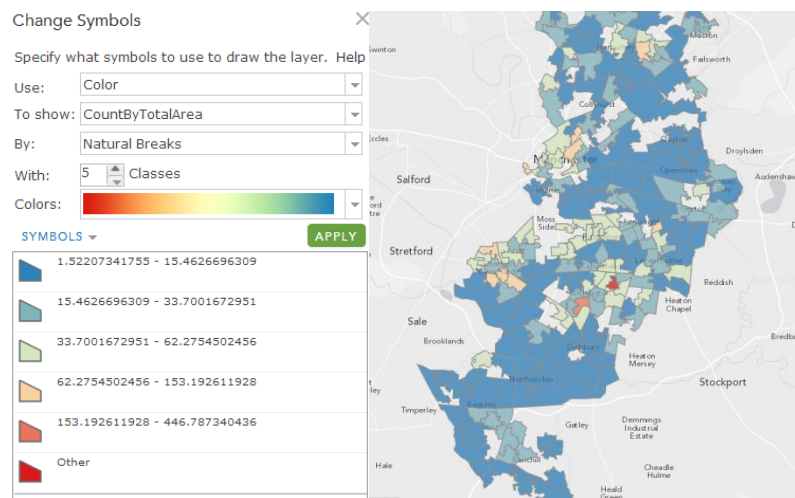
Total records: 2,229

Credits required: 2.229

14. You should now have a new layer similar to the screenshot below:



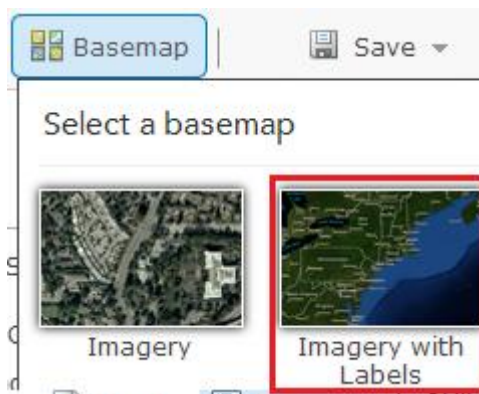
15. Click on the drop down next to the new layer and select  **Change Symbols**
16. In the new layer, there is a field called '**CountByTotalArea**' which is a normalized value based on the size of the LSOA. This means that the number of crimes are in proportion to size of the LSOA and are symbolised this way, rather than the number of points in each LSOA.
17. In this example, we have high crime rates represented in red, and low crime rates represented in blue:







18. We can now clearly see that there is one LSOA that had a very high number of burglaries in September 2013 which can be investigated in more detail.

Part E: Prepare Web Map

1. Zoom in on the LSOA with the highest number of crimes per area and change the basemap to to '**Imagery with Labels**' to get a better understanding of the geography.



2. A visual investigation can now be done as to why these properties have been targeted by burglars. We can also create a report with this information to Greater Manchester Police so that they can delegate more resources to the area.
3. We can finish off preparing a web map for the Police force by changing the symbology of the Crime Incidents layer by clicking the drop down next to the layer and select  **Change Symbols**
4. Select '**A Single Symbol**' and click 
5. Click the drop down and select '**Safety Health**' and select an appropriate symbol for a burglary.
6. Tidy up the table of contents. We can remove the original LSOA layer we used and rename the other two layers by clicking the drop down next to each layer and select  **Rename**
7. The web map can now be shared by clicking  **Share**. Again, if you have a group set up, this could be used by students to share their web map with a group or get a URL link to the map.

Part F: Interpret the dataset

- Where are the large clusters of crime incidents in Manchester?

Large clusters of crimes were found to be in the centre of Manchester.

- Where are the crime hot spots?

We found that the crime hotspots were in and around the Arndale centre in the centre of Manchester.

- Which LSOA has the highest normalised burglary rate?

From the aggregated layer we created, it was found that E01005312 had the highest normalized burglary rate.

You have now completed the “Advanced Crime Analysis” tutorial. Having completed the exercises you should now be more familiar with how GIS can be used to spatially analyse crime data and interpret it to come to meaningful conclusions.