

CR4



— **ArcGIS (ArcMap) tutorial** —

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Adapted from M.Y. Landingin & S. Burgess



What is ArcGIS?

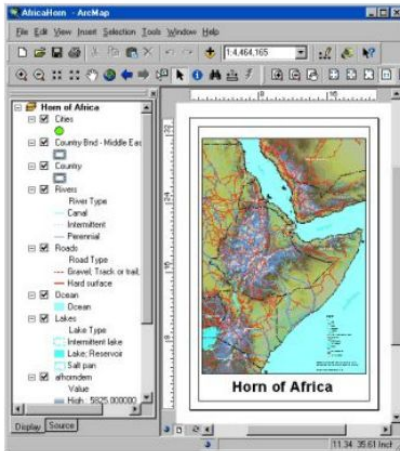
- ArcGIS is a geographic information system (GIS) for working with maps and geographic information, created by Esri.
- **ArcMap** is the main component of Esri's ArcGIS suite of geospatial programs, often used primarily to create, edit, and analyse maps.
- **Who uses ArcGIS?**
 - Anyone working with geographic data, maps... geospatial specialists, planners, architects...
 - Arch/Planning students often use ArcGIS for spatial context analysis



Key ArcGIS Tools

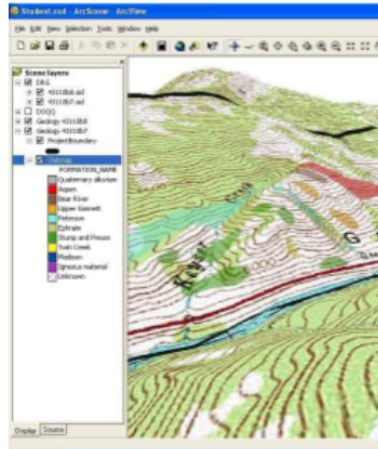
ArcMap

To view, edit and query geospatial data and create maps.



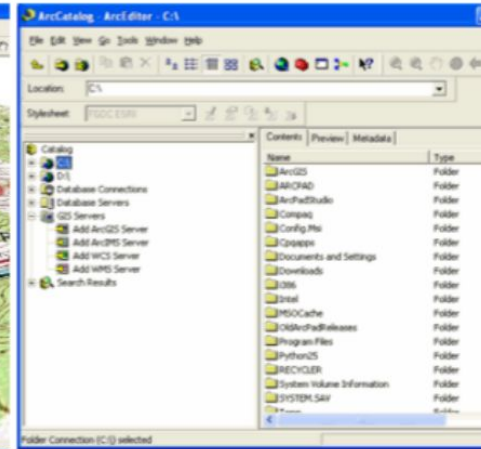
ArcScene

3D visualisation application, allowing you to view GIS data in 3D.



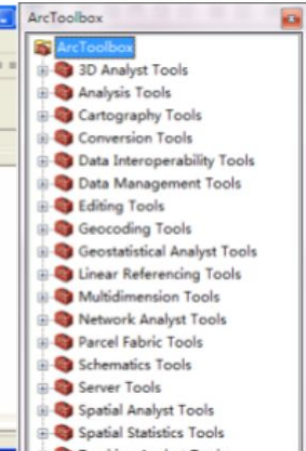
ArcCatalog

A data management application used to browse datasets and files.



ArcToolbox

Contains geoprocessing, data conversion and analysis tools.



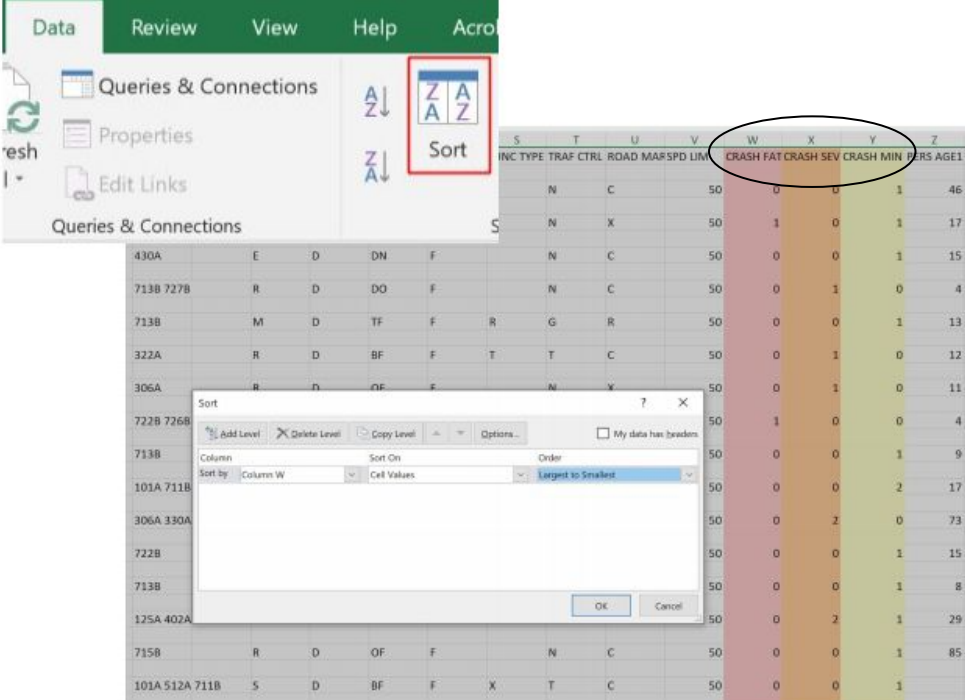


Sorting Excel Data

- ArcMap requires different categories of information to be represented in different files.
 - Therefore, the data should be organized from **largest to smallest** to remove 0 values
 - Then, each category of data must be saved and imported into ArcGIS in **separate Excel files**.

Sorting Excel Data Example

- **What fields need to be separated?**
 - For example car crash entries can be separated by the severity of the crash: fatal, severe or minor
1. To select all data, press **Ctrl + A** (Command + A for Mac) twice.
 2. While highlighted, look at the top bar and select **Data > Sort**.
 3. In the pop-up window, select **Sort by >** infill the **chosen column** (i.e crash fatal) > **Largest to Smallest** > Click **Ok**.



The screenshot shows the Microsoft Excel interface. The 'Data' tab is active, and the 'Sort' button in the ribbon is highlighted with a red box. A 'Sort' dialog box is open, showing 'Sort by' set to 'Column W' and 'Order' set to 'Largest to Smallest'. The background spreadsheet shows columns W, X, Y, and Z with data for 'CRASH FAT', 'CRASH SEV', 'CRASH MIN', and 'CRASH AGE1'.

	S	T	U	V	W	X	Y	Z			
	INC TYPE	TRAF	CTRL	ROAD	MARSPD	LIN	CRASH FAT	CRASH SEV	CRASH MIN	PERS	AGE1
	N		C		50	0	0	0	1		46
	N		X		50	1	0	0	1		17
430A	E	D	DN	F	N	C	50	0	0	1	15
713B 727B	R	D	DO	F	N	C	50	0	1	0	4
713B	M	D	TF	F	R	G	R	50	0	0	13
322A	R	D	BF	F	T	T	C	50	0	1	12
306A	R	D	DF	F	N	Y	50	0	1	0	11
722B 726B					50	1	0	0	0	4	
713B					50	0	0	0	1	9	
101A 711B					50	0	0	0	2	17	
306A 330A					50	0	2	0	0	73	
722B					50	0	0	0	1	15	
713B					50	0	0	0	1	8	
125A 402A					50	0	2	1	1	29	
715B	R	D	OF	F	N	C	50	0	0	1	85
101A 512A 711B	S	D	BF	F	X	T	C	50	0	0	1

Now all the data entries required will be in order from largest to smallest, meaning you can remove entries that have no/ a zero value easily if you wish....



Sorting Excel Data Example (Cont.)

- **Separate data and create a Excel Workbook (not multiple sheets) for each category**
 - If your map requires values above zero, then select and save them in a separate file.
1. After sorting **ONE COLUMN** (i.e crash fatal from largest to smallest), **click + drag** from the top left of all the data to the right, down to where the entries are greater than zero
 2. Do not miss columns to the **right** of the desired entry
 3. Copy the data **Ctrl + C** (Command + C for Mac)
 4. Create a new Excel Workbook/ an entirely new spreadsheet **File > New > Blank Workbook**
 5. **Paste in cell A1 Ctrl + V** (Command + V for Mac)
 6. Check that the column letters and data match the original file

V	W	X	Y	Z	AA	AB	AC
1	CRASH FATAL CNT	CRASH SEV CNT	CRASH MIN CNT	PERS AGE	PERS AGE	EASTING	NORTHING
2	0	0	0	4	1761375	5913149	
3	1	0	0	10	1788800	5908576	
4	1	0	0	4	1767887	5907775	
5	1	0	0	12	1765499	5899156	
6	1	0	0	4	1770407	5900363	
7	1	0	0	7	1770330	5908235	
8	1	0	0	2	1763778	5913152	
9	1	0	0	12	1751590	5915252	
10	1	0	0	7	1760267	5913487	
11	1	0	0	6	1760426	5913711	
12	1	0	0	6	1763986	5906969	
13	1	0	0	5	1765918	5899597	
14	1	0	0	3	1760993	5918167	
15	1	0	0	5	1766284	5905188	
16	1	0	0	5	1757320	5928846	
17	1	0	0	5	1762606	5907895	
18	1	0	0	4	1765125	5905428	
19	1	0	0	3	1769943	5902057	
20	1	0	0	11	1744110	5923658	
21	1	0	0	11	1734477	5989912	
22	1	0	0	8	1747995	5964299	
23	0	0	0	6	1766823	5900940	

V	W	X	Y	Z	AA	AB	AC
1	CRASH FATAL CNT	CRASH SEV CNT	CRASH MIN CNT	PERS AGE	PERS AGE	EASTING	NORTHING
2	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
3	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
4	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
5	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
6	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
7	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
8	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
9	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
10	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
11	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
12	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
13	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
14	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
15	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
16	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
17	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
18	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
19	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
20	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
21	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
22	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
23	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
24	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
25	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
26	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
27	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
28	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
29	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
30	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
31	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
32	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
33	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
34	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
35	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
36	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
37	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
38	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
39	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
40	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
41	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
42	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
43	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
44	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
45	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
46	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
47	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB
48	855 PO	2030 NA	1653 NA	1100 NA	1800 NB	1700 NA	1800 NB
49	1825 NB	1905 NA	1127 NA	1345 PO	2312 NA	1630 NB	1540 NA
50	1530 NB	2032 NA	1345 NA	1203 DA	1328 NB	2000 BB	2045 NB

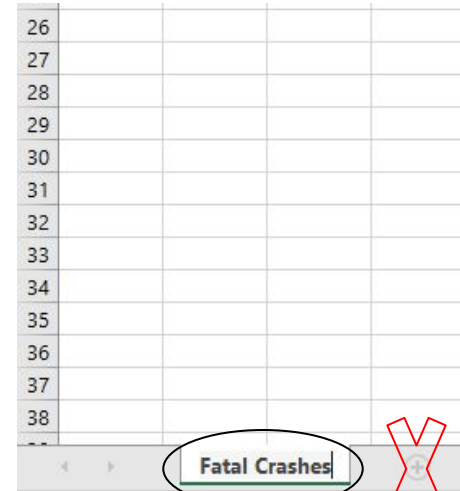




Sorting Excel Data Example (Cont.)

- **Save the Excel Workbook with a relevant title**
 - Means when you input into ArcGIS, you know what data you are working with
- 1. **Title** each Workbook clearly, including the sheet (i.e Fatal crashes)
- 2. Always save to a clear folder on your **USB (File> Save as)**
- 3. Save as an older version of Excel to ensure compatibility (**97-2003 Workbook** is suitable)

Repeat the whole sort > new workbook process for each category of information you want to input into ArcGIS (i.e crash severe and crash minor)



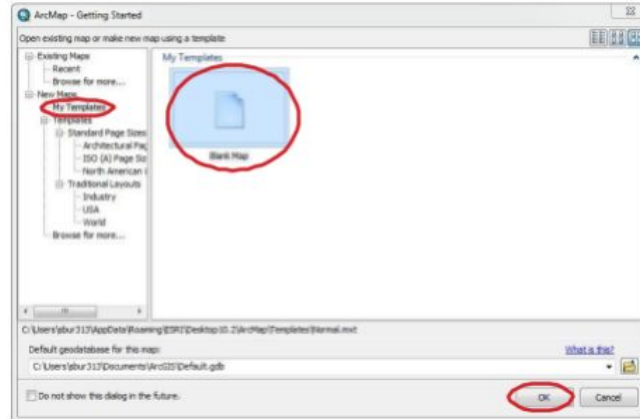


Starting with ArcMap

Open ArcMap by searching “arcmaph” in the Start Menu and selecting it.

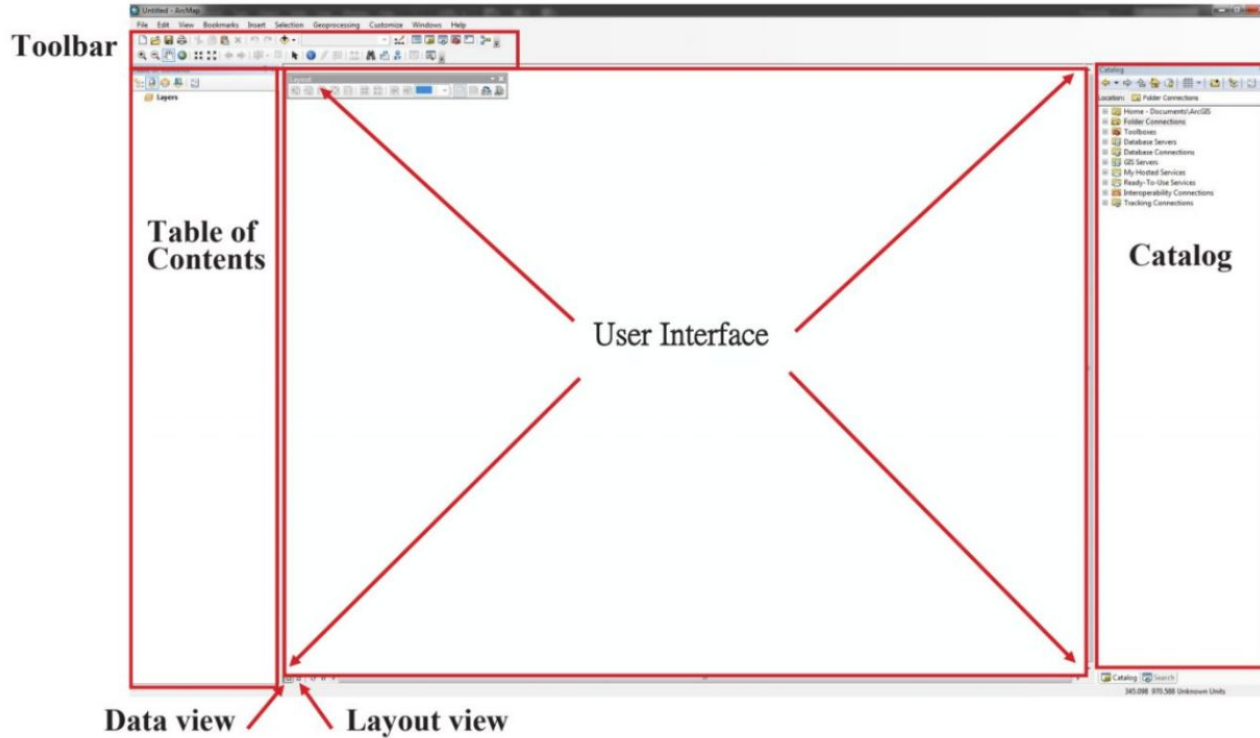


Select *My Templates* from the lefthand menu that pops up, and select *Blank Map*. Click OK.





Navigating ArcMap





Typical process of using ArcMap

1. Retrieve and prepare your geospatial data
 - *e.g. basemap data, object of study (e.g. statistics, crash data)*
2. Import the data into ArcMap (Data view)
3. Visually configure spatial data (Data view)
 - *e.g. design map showing different points of interest*
4. Prepare for presentation/printing (Layout View)



Retrieve and prepare your geospatial data

Useful sources of geospatial data:

- Auckland GeoMaps – specific to Auckland
<https://geomapspublic.aucklandcouncil.govt.nz/>
- **GeoDataHub (only for UoA)**
<https://geodatahub.library.auckland.ac.nz/>
- Land Information New Zealand Data Service
<https://data.linz.govt.nz/>
- Stats NZ
- ...And many more with a little Google search!

“Geospatial data”

- Is information related to geography (e.g. physical or human).
- Can be spatially expressed (e.g. map).
- Uses a geographic reference (e.g. coordinates, eastings etc.)



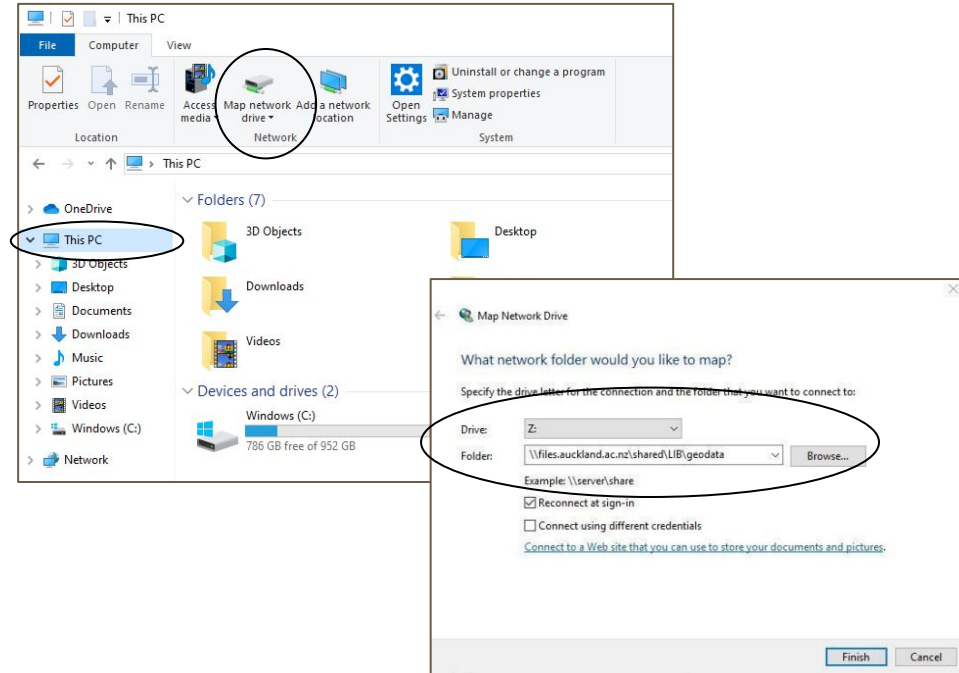
Access the GeoDataHub on University Computers:

1. Open **File Explorer** from bottom task bar (on Windows setup)
2. Right-click **This PC** from the left pane
3. Select **Map network drive**.
4. On the pop-up window, select a drive letter (e.g. Z:) and insert the following link:

`\\files.auckland.ac.nz\shared\LIB\geodata`

5. Select **Finish**.

GeoDataHub should now appear under your linked networks under This PC.





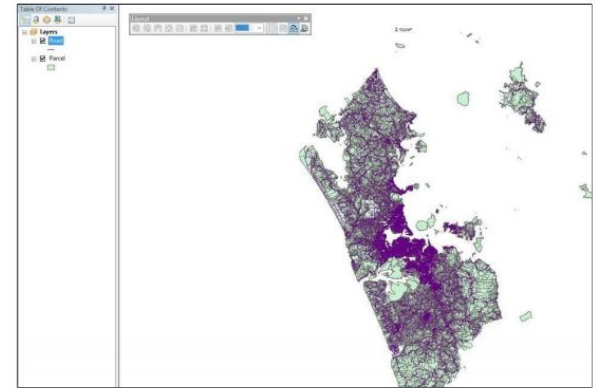
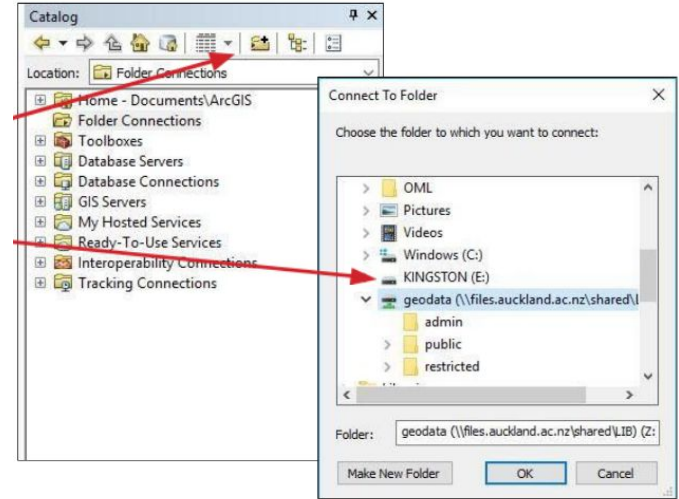
GeoDataHub

Importing GeoDataHub into ArcMap:

1. On ArcMap, go to **Catalog** (right side of screen).
2. Select **Folder Connections**. In the pop-up window, find the folder link to GeoDataHub.
3. Once **selected**, the GeoDataHub should appear in your **Catalog** under **Folder Connections**.
4. Drag and drop geospatial data you wish to include the centre of the screen.

For example, add parcel data:

1. In your GeoDataHub folder, navigate to restricted > Auckland > AucklandCouncil_data > property > 2013_property_address
2. Drag the Parcel.shp file into the centre of the screen.

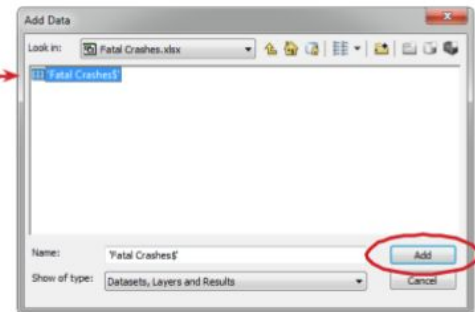
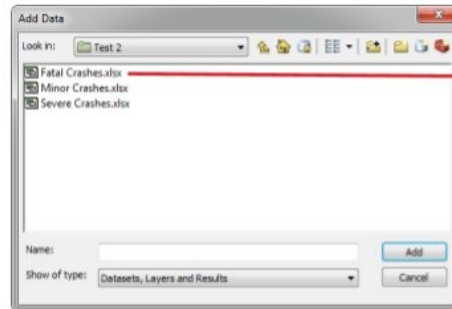
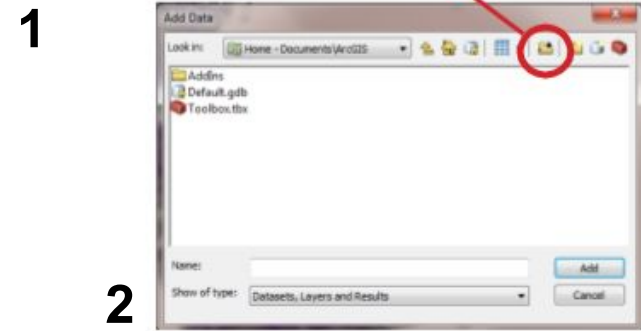
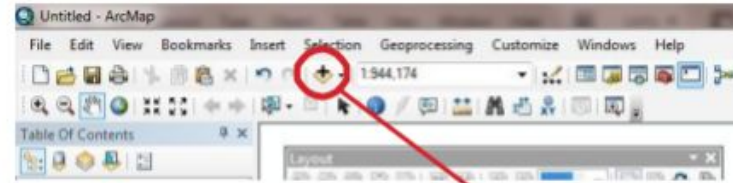




Importing Excel Data

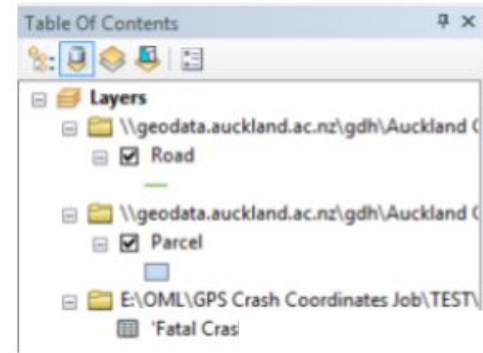
Note: In order to have separate symbols for different categories of data in ArcMap, they must be in separate Excel files. They must be saved in the .xlsx (Excel Workbook) file format.

1. Select the **Add Data** button located in the menu bar
2. Click **Connect to Folder**, and navigate to the place you saved the Excel Workbook(s)
3. **Double click** one Workbook
4. Select the **only** sheet that appears (only one should appear)

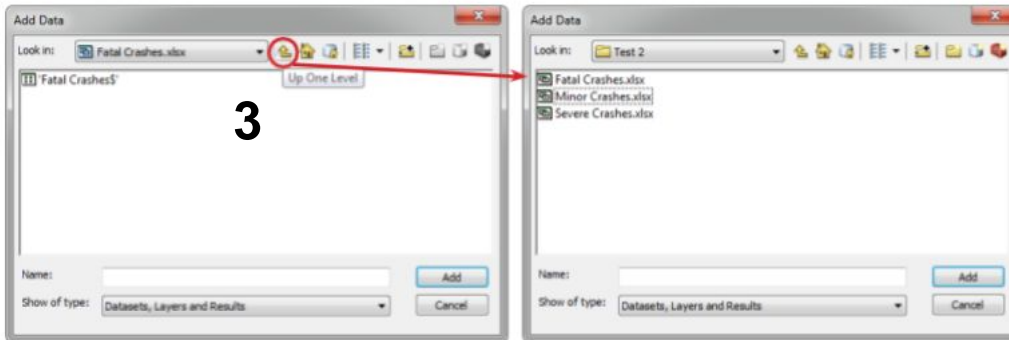


Importing Excel Data (Cont.)

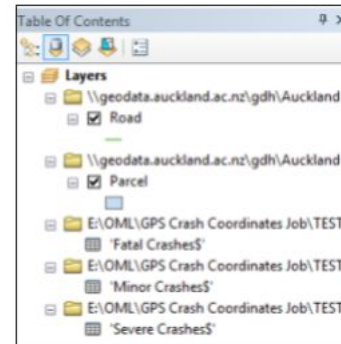
1. The sheet will now appear in your **Table of Contents**.
From now on these sheets are referred to as tables
2. **Repeat** the steps from the previous slide for however many workbooks you have
3. **TIP:** Use the UP arrow to get to the previous folder to select another workbook.
4. What your table of contents might look like when complete



1



2

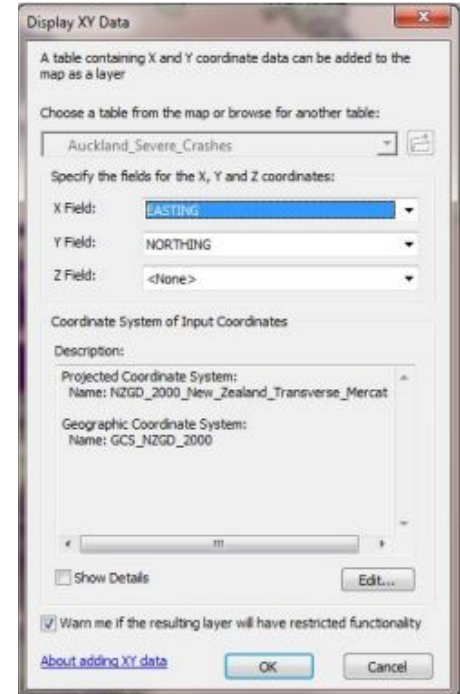
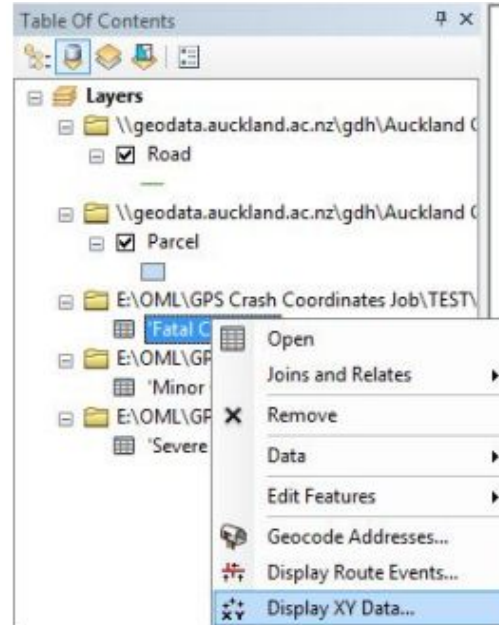


4



Plotting XY points (placement of data)

1. **Right click** on one of the tables and select **Display XY Data**
2. In the pop-up window, select **EASTING** for the X Field. Select **NORTHING** for the Y Field
3. You must also select the **Coordinate System** we want the data to use (differs worldwide)
4. It is likely that the coordinate system will already be set, as the Parcel.shp and Road.shp files set a default system shown (far right)...
5. If not, select Edit... and navigate to **Projected Coordinate Systems > National Grids > New Zealand > Select NZGC 2000 New Zealand Transverse Mercator**

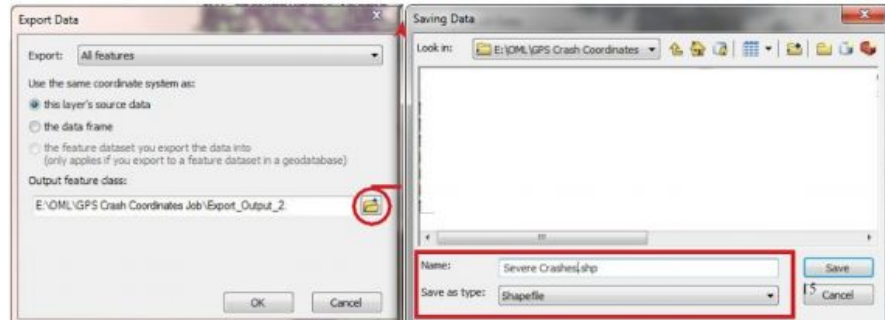
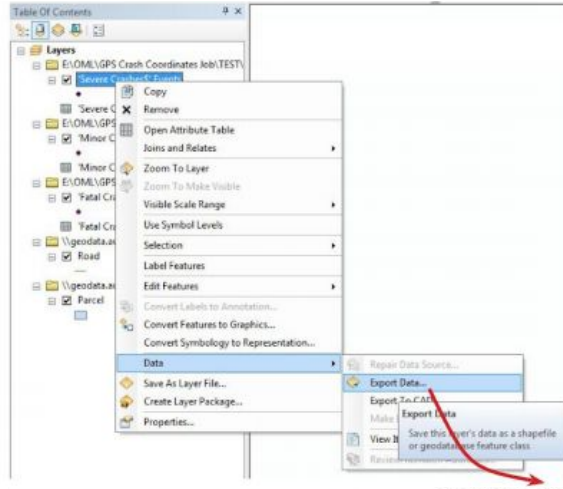


Repeat these steps for each table that requires points on the map. They will each appear once complete.

Exporting the Points as Shapefiles

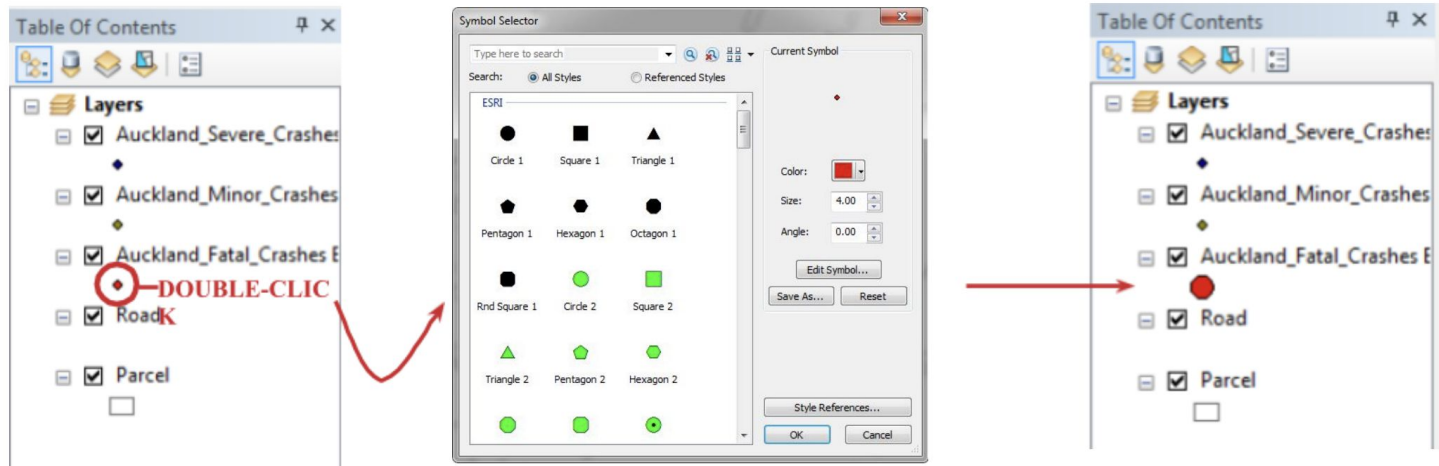
Note: In order to use the data you've already plotted and to ensure you can re-access it, it is vital to export and save the files as shapefiles (.shp).

1. Right click on a layer in the **Table of Contents**, select **Data > Export Data...**
2. Browse to select the **folder** you want to save the shapefile to (keep it on your USB again)
3. Rename file and ensure **Save type is Shapefile**.
4. When asked if you would like to add the exported layer to the map, **select yes**. You can then delete the 'table' layer if you wish to keep the Table of Contents tidy.



Visually configure spatial data

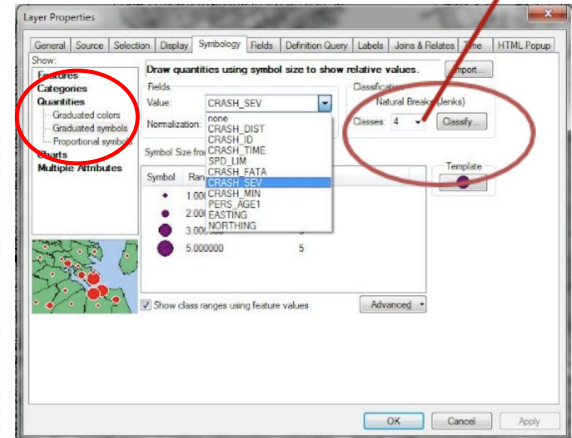
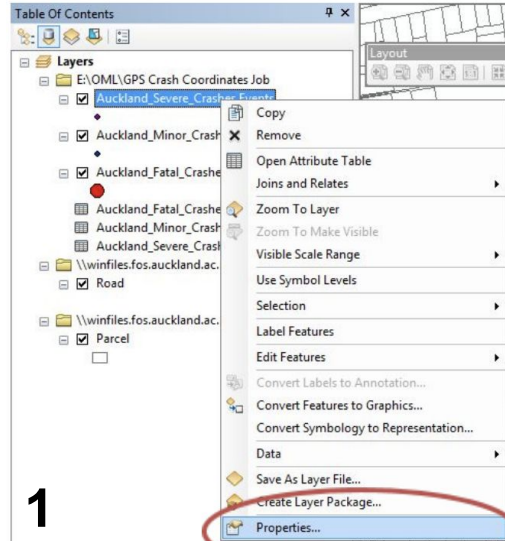
- You can configure the appearance of spatial data. Editing the symbology is critical in determining how information is visualised- legibility & impact.
- In the **Table of Contents**, **double-click** on the small symbol icon under the layer name
 - Adjust** in the pop-up window
 - Click OK** to apply the changes





Visually configure spatial data (cont.)

- You can also create 'Graduated Symbols'
- This makes higher data values appear larger (i.e the more serious the car crash, the bigger the symbol)

1. **Right click** on the chosen layer in the **Table of Contents > Select Properties**
2. In the pop-up window, select **Symbology**
3. Right hand side, select **Quantities > Graduated Symbols**
4. In **value**, select the relevant layer
5. Under **classification**, **classes** refers to the number of the different types of dots (i.e if you have 5 different brackets of minor crashes, you could put 5 so each is represented by a different size dot. Alternatively, you could put 2, and will appear as a scale (see right).



Symbol	Range	Label
	1.000000	1
	2.000000 - 5.000000	2 - 5



Presentation (Layout view)

Key tips:

- In the top menu, navigate to **File > Page and Print Setup** to change paper size and orientation
- In ArcMap, there are two different views, which are accessed by buttons on the bottom left corner of the screen: **Data View** (where all our editing has been done) and the **Layout View** (where you create a map- shows frame).
- In the top menu, navigate to **Insert** to add features e.g. title, legend, scale

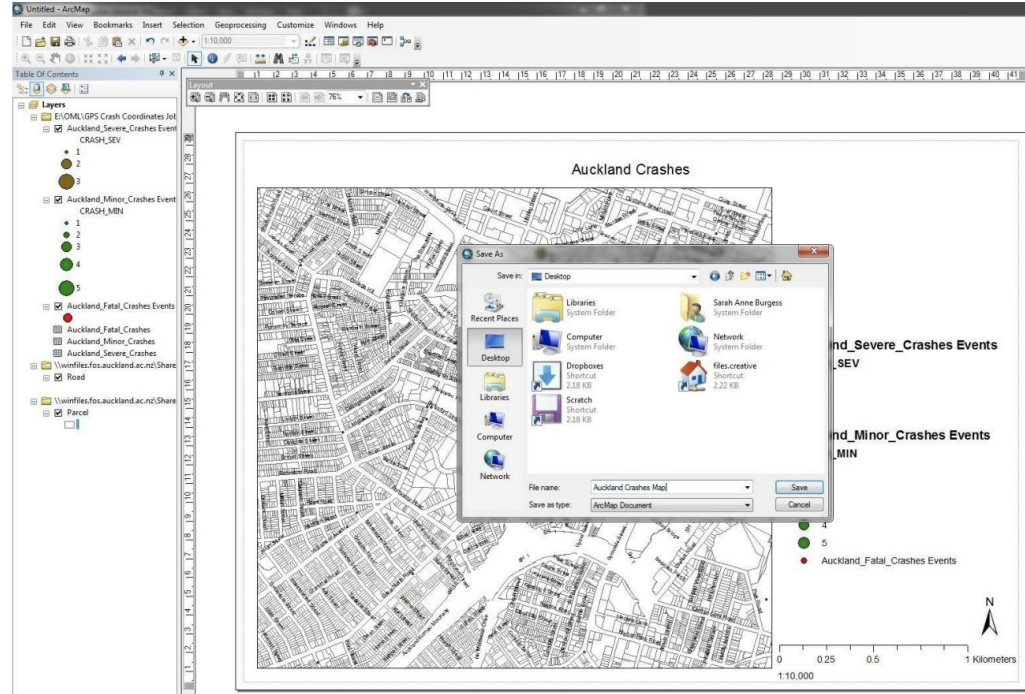




Saving and Printing

Key tips:

- **File > Save As...**
- Recommend that you export the map as a .pdf:
File > Export > PDF
- Open the .pdf one you've saved to print



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