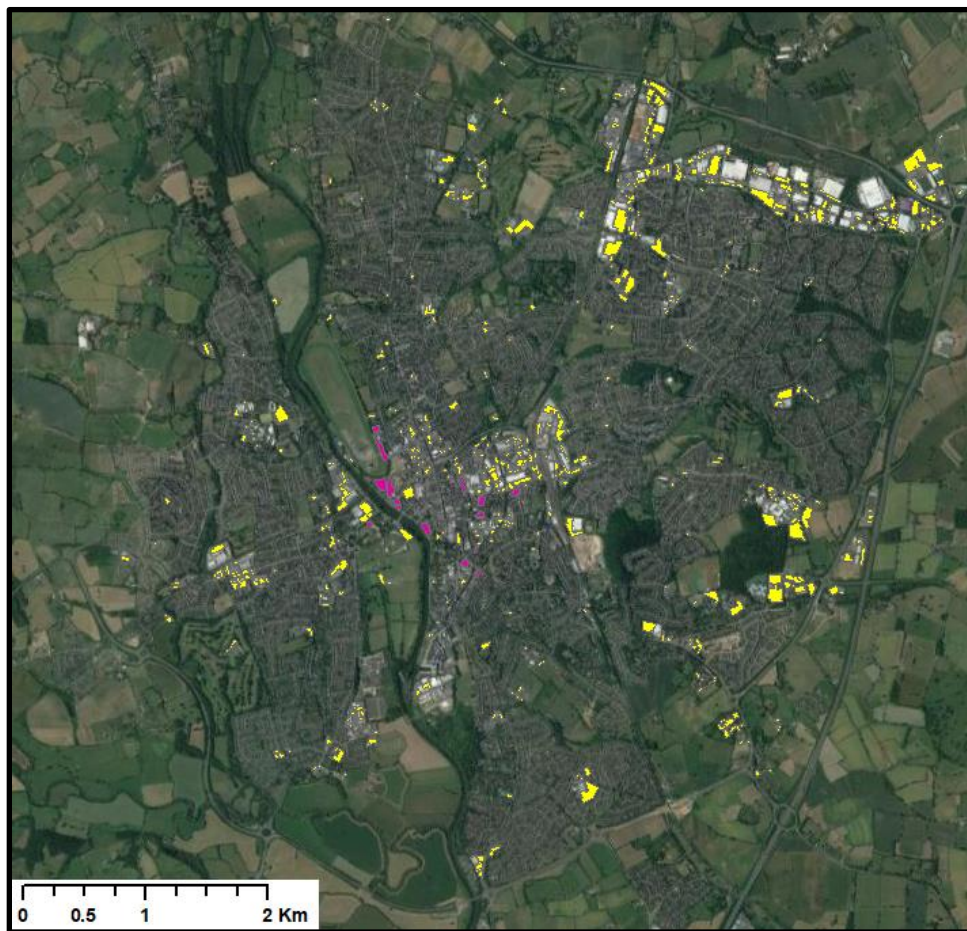

MAPPING CARPARK LOCATION, CAPACITY, AND USE CLASS USING GOOGLE SATELLITE IMAGERY THROUGH ARCGIS

Procedural Guide



Maps & Image Data: Google, ©2021 CNES / Airbus, Getmapping plc,

Infoterra Lt & Bluesky, Landsat / Copernicus, Maxar Technologies



WPI



**University
of Worcester**

Mapping Carpark Location, Capacity, and Use Class using Google Satellite Imagery through ArcGIS:
Procedural Guide

A Product of an Interactive Qualifying Project
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfilment of the requirements for
the degree of Bachelor of Science

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TABLE OF CONTENTS

Table of Figures	iii
1 Preamble	1
2 Input Google Maps Imagery into ArcGIS.....	2
3 Choose a Coordinate System	7
4 Create A Shape File	9
5 Set Up The Attribute Table	14
6 Zone A Carpark.....	19
7 Record Field Data	25
7.1 Setup	25
7.2 Record Nearby Roads.....	25
7.3 Record Abutting Points of Interest	26
7.4 Record the Use Class.....	27
7.5 Calculate the Area	28
7.6 Calculate the Number of Parking Spaces	29
7.7 Record Other Notes	30
8 Create A Layer Package.....	31
9 Merge Layer Packages	36
10 Helpful Hints and Troubleshooting	38
10.1 Change Polygon Appearance	38
10.2 Edit a Polygon's Shape	41
10.3 Show or Hide Layers.....	43
10.4 Open the Table of Contents or Catalog	44

TABLE OF FIGURES

Figure 1: Click "Sign In"	2
Figure 2: Sign In.....	2
Figure 3: Create an Account.....	3
Figure 4: Go to the Map Tab	3
Figure 5: Open the Add Layer from Web Window	4
Figure 6: Add Layer from Web Window	4
Figure 7: Save the Basemap Online	5
Figure 8: Navigate to Your Basemap.....	5
Figure 9: Open the Basemap in ArcGIS Desktop.....	5
Figure 10: Log In.....	6
Figure 11: Save Basemap to a Convenient Location.....	6
Figure 12: Open Google Earth Options Window.....	7
Figure 13: Google Earth Options Window	8
Figure 14: Coordinate System Location	8
Figure 15: Open the Catalog	9
Figure 16: Open a New Shapefile.....	10
Figure 17: New Shapefile Name and Feature Type	11
Figure 18: Set Coordinate System.....	12
Figure 19: Shapefile Properties.....	13
Figure 20: Open Attribute Table	14
Figure 21: Add a Field	15
Figure 22: Area Properties	15
Figure 23: Num_Spaces Properties.....	16
Figure 24: Roads Properties.....	16
Figure 25: Near Properties.....	17
Figure 26: Use_Class Properties.....	17
Figure 27: Notes Properties	18
Figure 28: Add Edit Vertices and Editor Toolbars	19
Figure 29: Start Editing.....	20
Figure 30: Start Editing Window	20
Figure 31: Spatial Reference Warnings.....	21
Figure 32: Create Features Button and Sidebar.....	21
Figure 33: Zoom and Pan	22
Figure 34: Carpark Surround a Building & Un-Parkable Spaces.....	22
Figure 35: Connect Carparks	23
Figure 36: Editor Toolbar (Pan/Zoom to Polygon Drawing Mode)	23
Figure 37: Edit Vertices Toolbar	24
Figure 38: Save Edits	24
Figure 39: Stop Editing	24
Figure 40: Example of Completed Attribute Table	25
Figure 41: Calculate Geometry Window	28
Figure 42: Field Calculator Window	30

Figure 43: Open Layer Properties Window	31
Figure 44: Layer Properties Window	32
Figure 45: Open Layer Package Window	33
Figure 46: Layer Package Window	34
Figure 47: Save Location for Layer Package.....	35
Figure 48. Open the Search Menu.	36
Figure 49. Search “Merge”	36
Figure 50: Select Layers to Merge.....	36
Figure 51: Output Dataset Window	37
Figure 52: Click "OK"	37
Figure 53: Add the Effects Toolbar to your Workspace.....	38
Figure 54: Select the Layer that you would like to make Transparent.....	38
Figure 55: Transparency Slider.....	39
Figure 56: Select the Shapefile's Polygon to Change its Appearance.....	39
Figure 57: Symbol Selector Window.....	40
Figure 58: Edit Vertices Button	41
Figure 59: Modify, Add, or Delete a Vertex	41
Figure 60: Reshape Feature Tool Button	41
Figure 61: Reshape Feature Tool Instructional Text	42
Figure 62: Cut Polygons Tool Button	42
Figure 63: Cut Polygons Tool Instructional Text	42
Figure 64: Hide a Layer	43
Figure 65: Show a Layer	43
Figure 66: Open the Table of Contents or Catalog	44

1 PREAMBLE

Recent trends in the UK and Europe show a decline in car travel as more people are accessing an increasing range of services online, including retail, healthcare and educational opportunities as well as utilizing other means of travel such as walking, biking, and public transportation. This has resulted in a lesser demand for parking in central business districts and retail parks. Cities around the world are exploring innovative ways to repurpose underused parking spaces to promote environmental sustainability and make more efficient use of scarce available 'brownfield' space. Innovative strategies range from using excess parking space for housing, parks, farmers markets, and package delivery storage and staging areas. However, in most cities, very little is known about the location, amount, and use of Private Non-Residential (PNR) parking areas besides municipal carpark facilities.

This approach at quantifying parking capacity uses satellite imagery from Google Maps as well as the functionalities of ArcGIS. First the Google Map satellite imagery must be input into ArcGIS. Next a carpark can be visually identified. Thirdly, the user may polygon is drawn around the carpark using ArcGIS functionality. Finally, additional data associated with each polygon, such as abutting businesses and polygon area, may be recorded in the Attribute Table.

This document aims to outline a standard approach for quantifying PNR parking capacity in an area of interest.

2 INPUT GOOGLE MAPS IMAGERY INTO ARCGIS

Google maps is a widely available resource that can be used for most non-commercial projects with proper attribution. Due to its accessibility and frequent updates, Google Maps can be a very helpful resource when trying to conduct an analysis of PNR carparks.

To import Google Maps imagery into ArcGIS Desktop:

1. Navigate to <https://www.arcgis.com/home/index.html> using your preferred internet browser.
2. Click “Sign In” in the upper-right corner. The ArcGIS Online sign in page should appear.

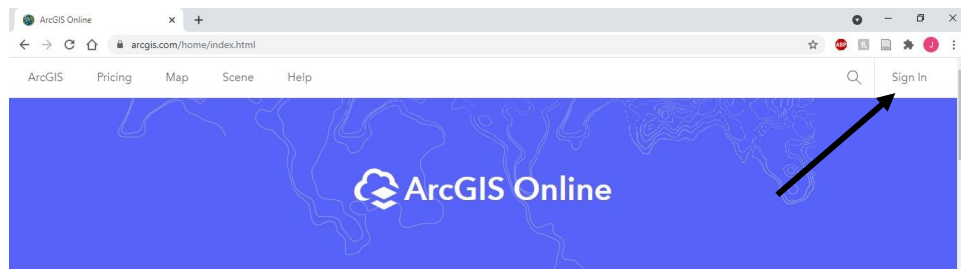


Figure 1: Click "Sign In"

- If you already have an ArcGIS Online account, enter your login details and press “Sign In”.
- If you do not yet have an account, press “Create an account” at the bottom of the page. The Create an ArcGIS Account page should appear.

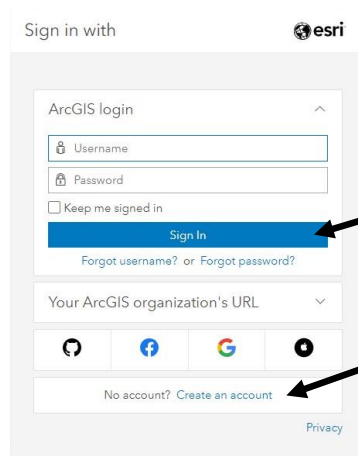


Figure 2: Sign In

- i. Scroll about halfway down the page and select “Create an ArcGIS Public Account”.
- ii. Follow the page’s directions to create an ArcGIS Online Public account.

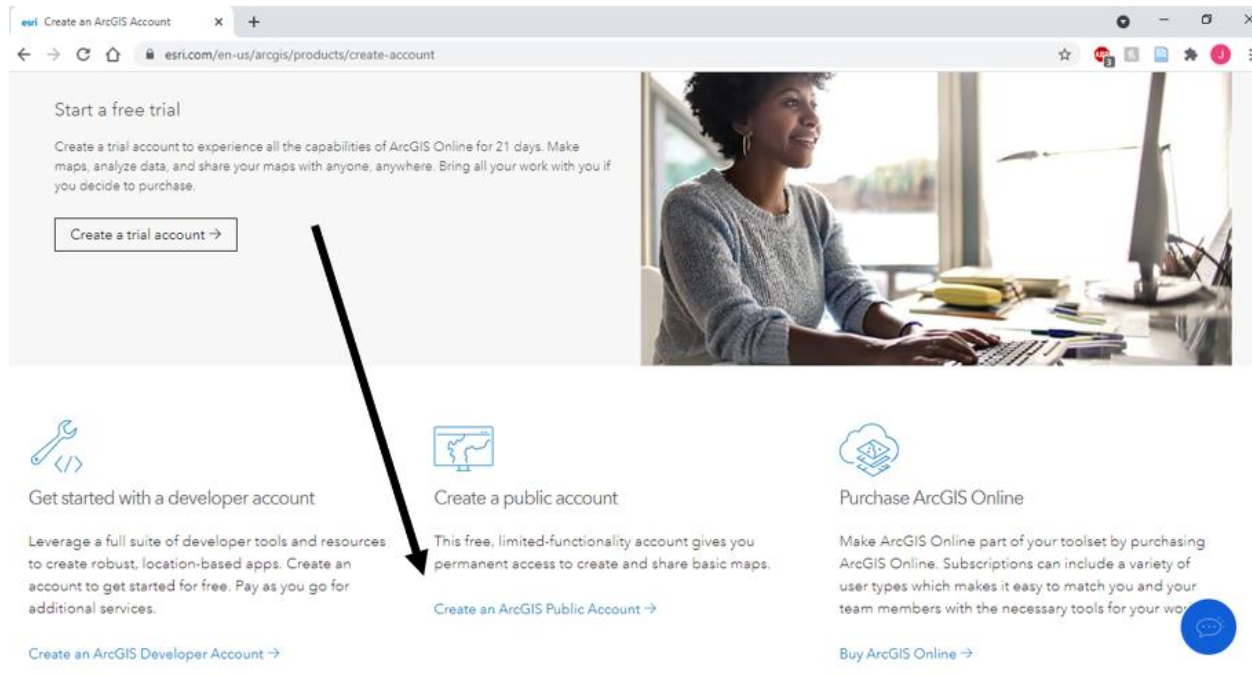


Figure 3. Create an Account

3. Once you are logged into your account, go back to the ArcGIS Online homepage
4. Click "Map" on the top ribbon. This should open the ArcGIS Online Map Viewer.



Figure 4: Go to the Map Tab

5. In the Map Viewer, click "Add" and select "Add Layer from Web" from the drop-down menu.

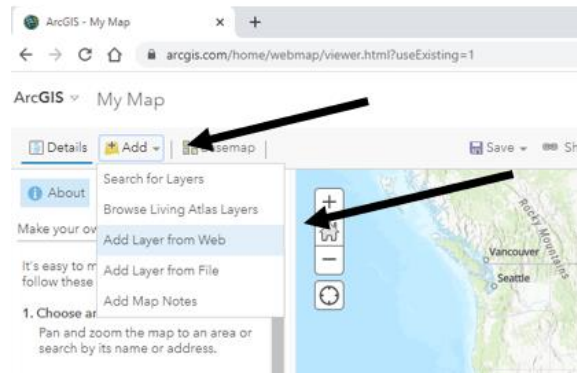


Figure 5: Open the Add Layer from Web Window

6. In the Add Layer from Web popup window, change the type of data to “A Tile Layer”.
7. In the Add Layer from Web popup window, enter a URL in the form of:
<https://mt.google.com/vt/lyrs=s&hl=en&z={level}&x={col}&y={row}>
 - Choose the type of map(s) you want by modifying the [lyrs=s](#) section of the URL
 - lyrs=s ---- Satellite Only
 - lyrs=y ---- Hybrid (Satellite with Street and Business Labels)
 - Enter a title and set the credits as “Google”
 - When complete, press “Add Layer”
 - Repeat until all desired layers are added to the map.

Figure 6: Add Layer from Web Window

8. Once the desired layers are added to your map, press the “Save” button and select “Save” from the drop-down menu. These maps can be used to serve as a base for your mapping project.

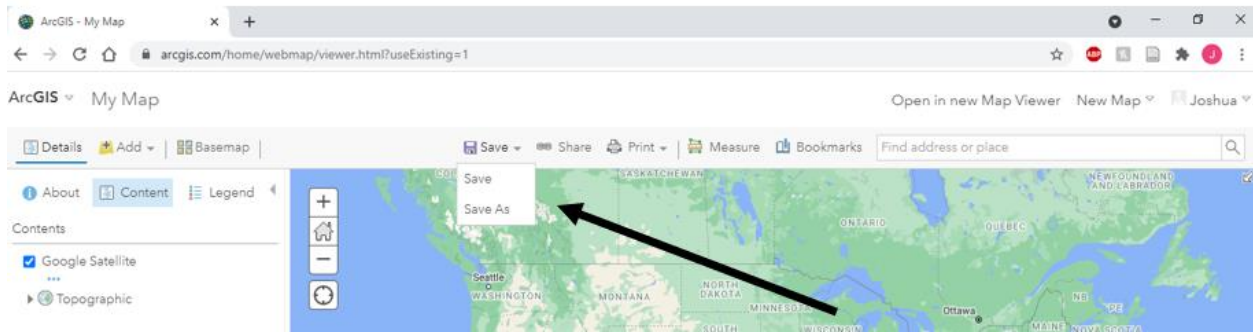


Figure 7: Save the Basemap Online

9. Navigate to your Map through the ArcGIS Online Content menu.
 - a. Click the “ArcGIS” button in the upper-left corner and select “Content”.
 - b. Select the map you saved previously.

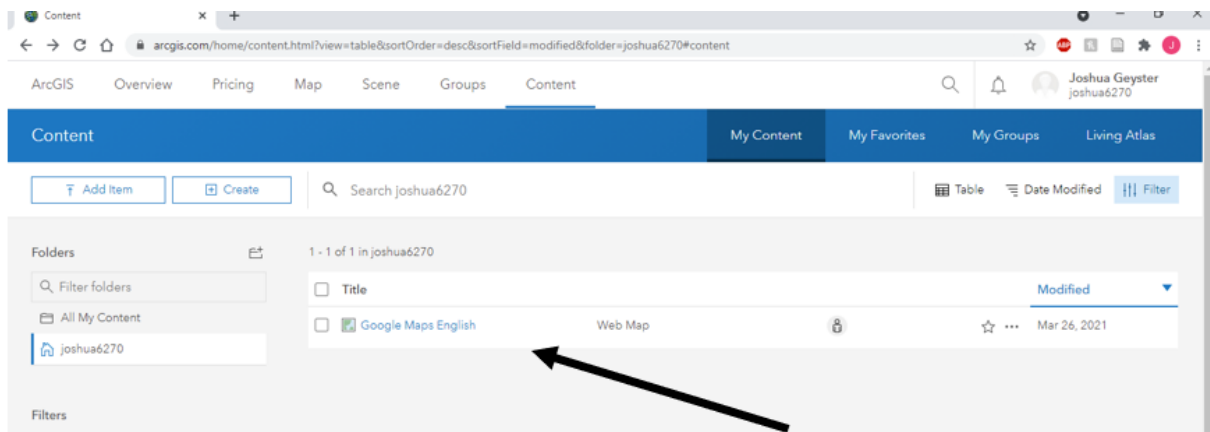


Figure 8: Navigate to Your Basemap

10. On the right side of the new page, you should have the options to open the map in ArcGIS Desktop.

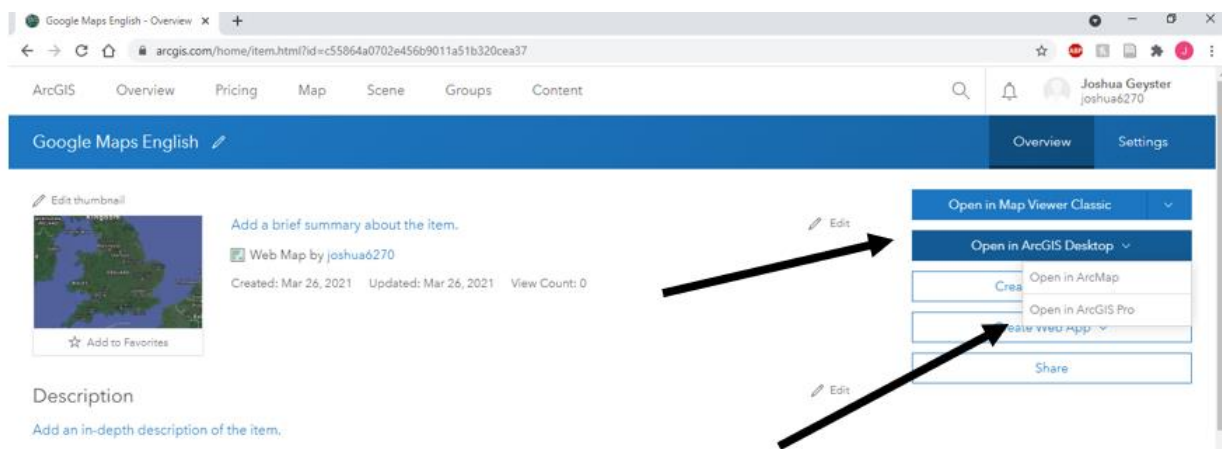


Figure 9: Open the Basemap in ArcGIS Desktop

11. Open the downloaded file and login using your ArcGIS Online credentials.

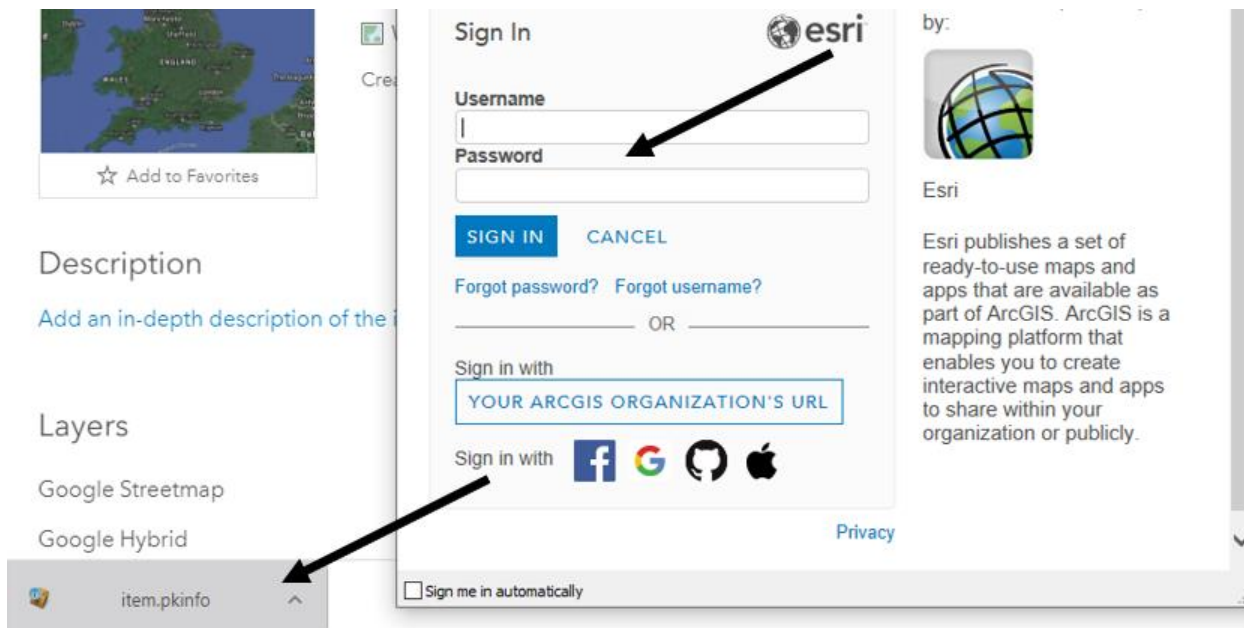


Figure 10: Log In

12. Once the map is open in ArcGIS Desktop, you can resave the file to a convenient location on your computer by going to "Save As..." in the "File" menu.

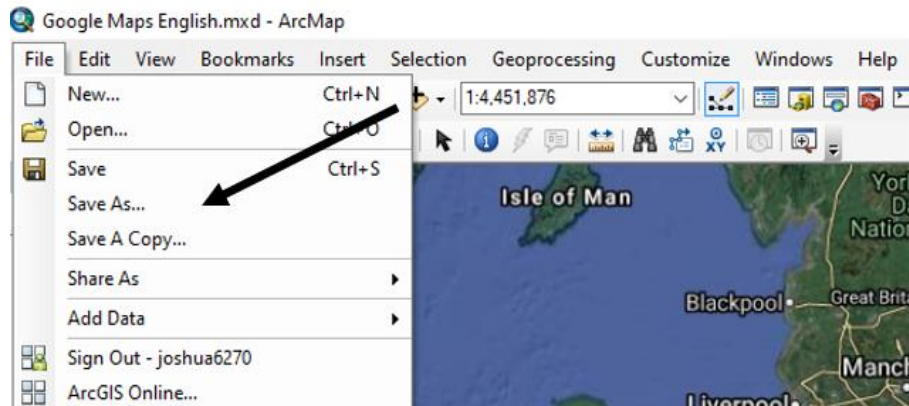


Figure 11: Save Basemap to a Convenient Location

3 CHOOSE A COORDINATE SYSTEM

In order to create accurate measurements using your plotted polygons, you will need to be careful in choosing your polygons' coordinate system. To use ArcGIS's, "Calculate Geometry" feature, you will need to use a projected coordinate system.

To select a coordinate system using Google Earth:

1. Begin by installing or opening the Google Earth Pro Desktop application. Google Earth Pro can be downloaded at <https://www.google.com/earth/versions/#earth-pro>.
2. Once open, navigate to "Tools" in the upper-left toolbar and select "Options" from the drop-down menu.

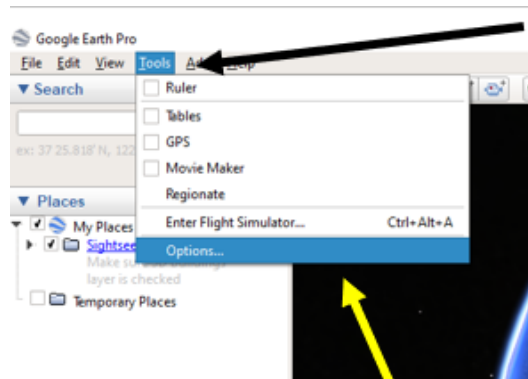


Figure 12: Open Google Earth Options Window.

Image Data: ©2021 Google, ©2021 GeoBasis-DE/BKG, Data SIO, NOAA, U.S. Navy, NGA GEBCO

3. In the 3D View tab, under the Show Lat/Long Setting, select "Universal Transverse Mercator".
4. Apply your settings and exit the options window.

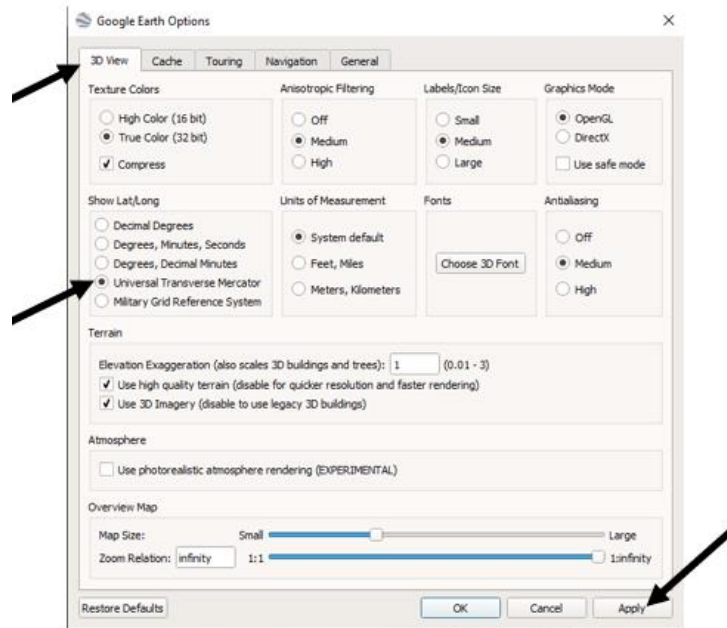


Figure 13: Google Earth Options Window

5. Navigate to the desired location on the Earth globe that you would like to map.
6. In the lower-right corner of the Google Earth Pro Window, you should see the coordinates in Universal Transverse Mercator (UTM) form. The first number denotes the longitudinal section, and the N or S denotes the latitudinal section.
 - In the example shown, the coordinate system for ArcGIS would be WGS 1984 Complex UTM Zone 30N.



Figure 14: Coordinate System Location

Image Data: ©2021 Google

7. Record the coordinate system for later use.

4 CREATE A SHAPE FILE

A Shapefile is used to store the shape data of the polygon drawn around each carpark. In order to create a polygon, you must first create a Shapefile.

To create a Shapefile:

1. Open the Catalog.
 - a. Click “Windows” on the Toolbar.
 - b. Select “Catalog” from the drop-down menu. The catalog appears.

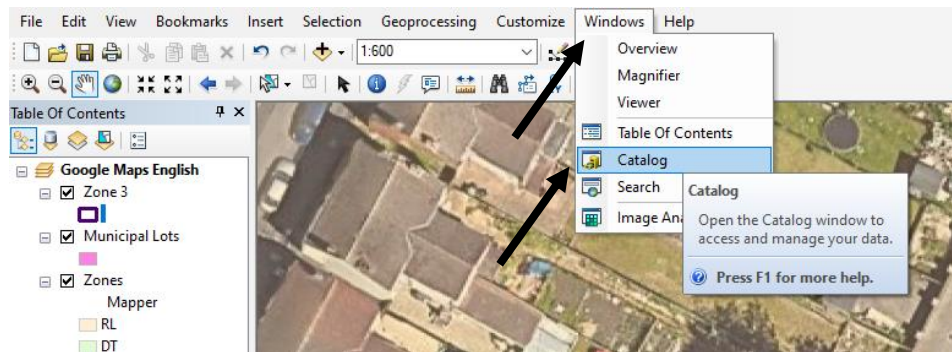


Figure 15: Open the Catalog

2. Open a new Shapefile.
 - a. Right click the folder in which your ArcGIS Basemap is stored. This folder will be labeled “Home-LocationofyourfolderNameofyourFolder”.

In Figure 16, the name of the folder is “ArcGIS” and it is located in “Documents”.
 - b. Hover over “New” from the drop-down menu.
 - c. Select “Shapefile...” from the secondary drop-down menu. The “Create New Shapefile” window appears.

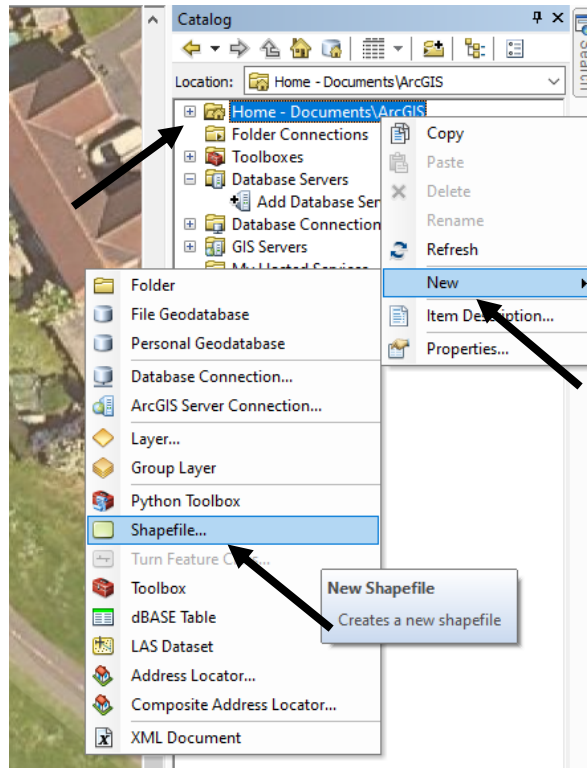


Figure 16: Open a New Shapefile

3. Select properties for the Shapefile.
 - a. Set an appropriate Name.
 - b. Set the Feature Type to "Polygon".

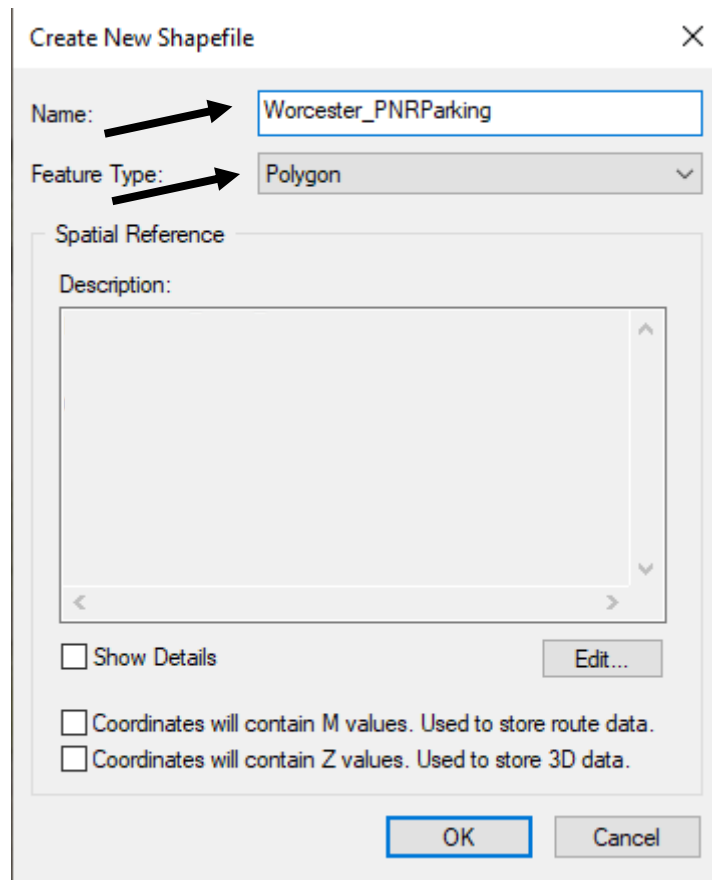


Figure 17: New Shapefile Name and Feature Type

Set the Coordinate System as found in Section 0:

- c. Choose a Coordinate System.
 - i. Click “Edit” below the Description box. The “Spatial Reference Properties” window appears.
 - ii. Type in the name of your desired coordinate system in the search bar and click the search button. The “Projected Coordinate Systems” folder appears.
 - iii. Open the series of folders contained in the “Projected Coordinate Systems” folder by clicking the plus(+) sign to the left of each folder. The desired coordinate system is eventually shown.
 - iv. Select the desired coordinate system.

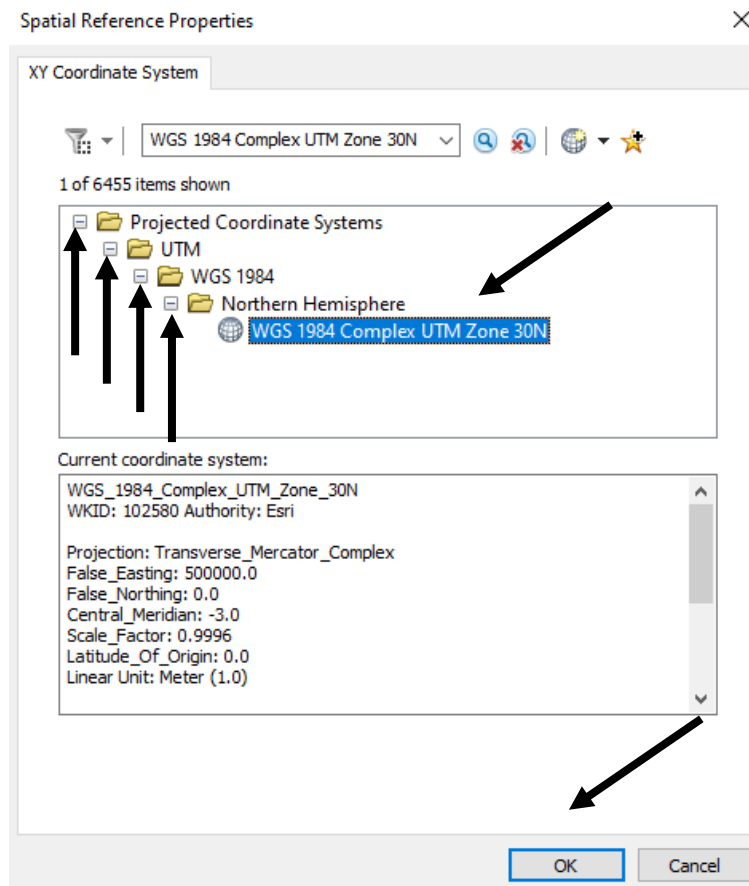


Figure 18: Set Coordinate System

- v. Click “OK”. The “Spatial Reference Properties” window closes, and the Description box now reads the name of your desired coordinate system.

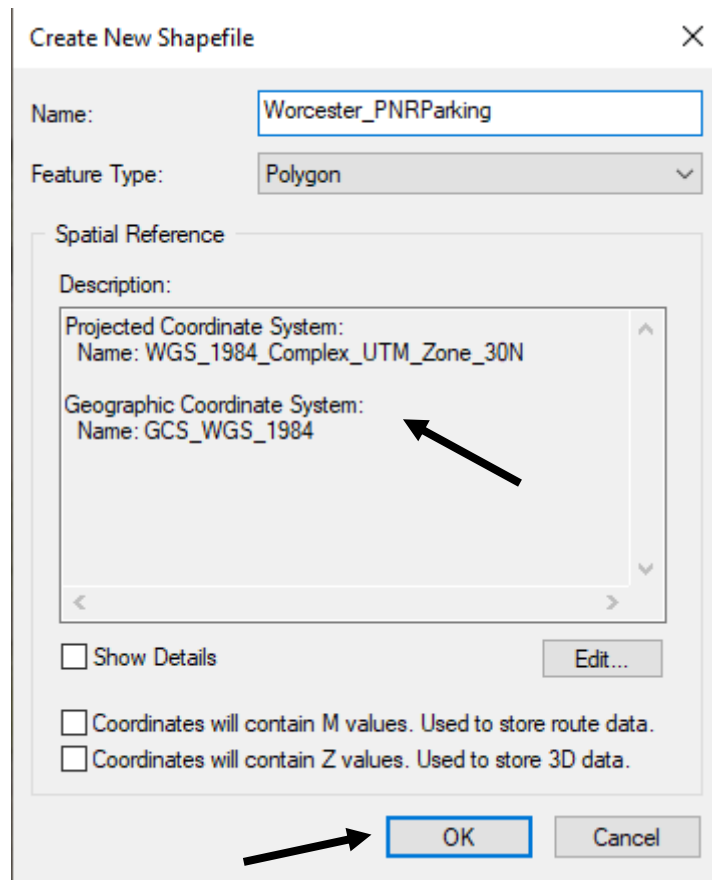


Figure 19: Shapefile Properties

- d. Click "OK". A Shapefile folder is created and saved to the same folder as your Basemap with the name you set in the Name section of the "Create New Shapefile" window.

Note: The Shapefile folder contains multiple files. You need them all to be able to open the Shapefile. Keep them together in the folder for greatest ease.

5 SET UP THE ATTRIBUTE TABLE

The Attribute Table is used to store data about each individual carpark such as abutting businesses and carpark area.

To set up the Attribute Table:

1. Open the Attribute Table
 - a. In the Table of Contents window, right click the shape file of interest.
 - b. Select "Attribute Table" from the drop-down menu. The Attribute Table opens.

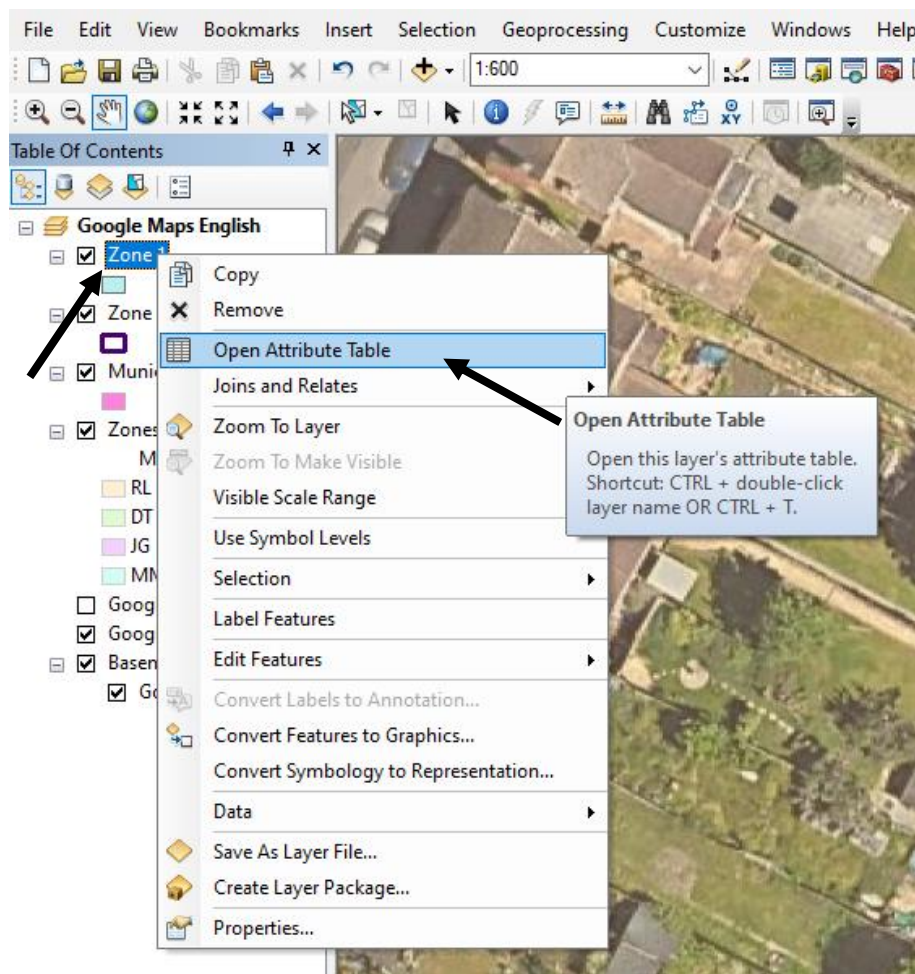



Figure 20: Open Attribute Table

2. Create a new Field in the Attribute Table for each of the following data fields by following Steps 2a through 2c for each data field.
 - a. Open the "Add Field" window.
 - i. Click the  symbol in the top left of the Attribute Table.
 - ii. Select "Add Field..." from the drop-down menu. The "Add Field" window appears.

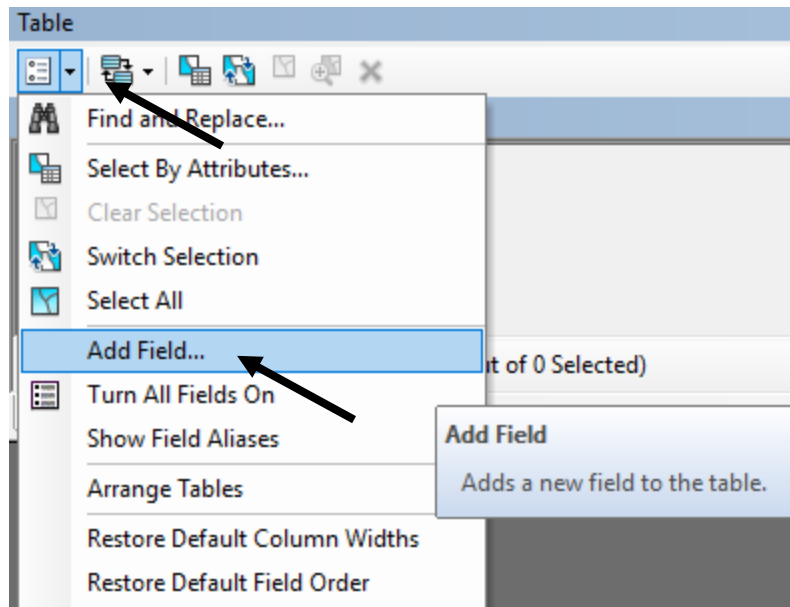


Figure 21: Add a Field

- b. Add the appropriate Field properties as shown below for each of the data fields.
- Area of Each Polygon

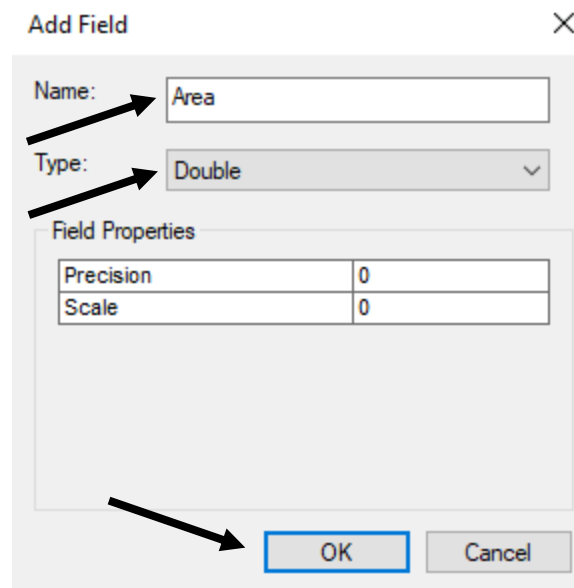


Figure 22: Area Properties

- Approximate Number of Parking Spaces Contained in Each Polygon

The 'Add Field' dialog box is shown with the following details:

- Name:** Num_Spaces
- Type:** Short Integer
- Field Properties:** Precision is set to 0.
- Buttons:** OK and Cancel.

Arrows point to the Name field, the Type dropdown, and the OK button.

Figure 23: Num_Spaces Properties

- Nearby Roads

The 'Add Field' dialog box is shown with the following details:

- Name:** Roads
- Type:** Text
- Field Properties:** Length is set to 254.
- Buttons:** OK and Cancel.

Arrows point to the Name field, the Type dropdown, and the OK button.

Figure 24: Roads Properties

- Abutting Points of Interest

The 'Add Field' dialog box is shown with the following details:

- Name:** A text input field containing the word 'Near'. An arrow points to this field.
- Type:** A dropdown menu set to 'Text'. An arrow points to this dropdown.
- Field Properties:** A section containing a table with one row:

Length	254
--------	-----
- Buttons:** 'OK' and 'Cancel' buttons at the bottom. An arrow points to the 'OK' button.

Figure 25: Near Properties

- Use Class(es) of Abutting Businesses

The 'Add Field' dialog box is shown with the following details:

- Name:** A text input field containing 'Use_Class'. An arrow points to this field.
- Type:** A dropdown menu set to 'Text'. An arrow points to this dropdown.
- Field Properties:** A section containing a table with one row:

Length	254
--------	-----
- Buttons:** 'OK' and 'Cancel' buttons at the bottom. An arrow points to the 'OK' button.

Figure 26: Use_Class Properties

- Other Notes

The image shows a dialog box titled "Add Field" with a close button (X) in the top right corner. Inside the dialog, there are three main sections:

- Name:** A text input field containing the word "Notes". An arrow points to this field.
- Type:** A dropdown menu showing "Text". An arrow points to this dropdown.
- Field Properties:** A section containing a table with one row and two columns. The first column is labeled "Length" and the second column contains the value "254".

At the bottom of the dialog, there are two buttons: "OK" and "Cancel". The "OK" button is highlighted with a blue border, and an arrow points to it.

Figure 27: Notes Properties

- c. Click "OK". The "Add Field" window closes, and the new Field name shows up as a header in the Attribute Table.

6 ZONE A CARPARK

Once ArcGIS is setup with the correct Basemap, coordinate system, and Attribute Table, you can begin the task of zoning carparks. Zoning a carpark consists of drawing a polygon around the carpark.

To open the necessary Toolbars:

1. Click “Customize”.
2. Hover over “Toolbars”.
3. Open the Editor Toolbar.
 - a. Select “Editor”.
4. Open the Edit Vertices Toolbar.
 - a. Repeat Steps 1 and 2.
 - b. Select “Edit Vertices”.

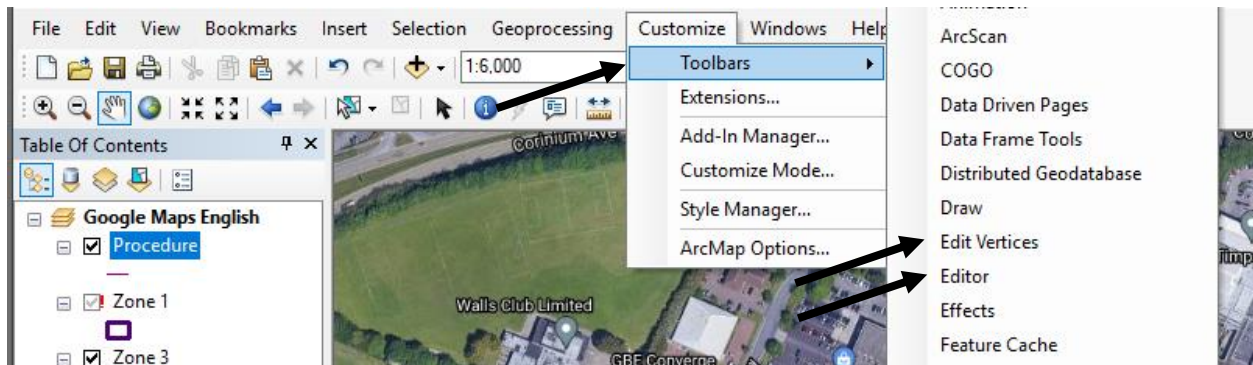


Figure 28: Add Edit Vertices and Editor Toolbars

To zone a carpark:

1. Enter Editing mode and open necessary tool and sidebars.
 - a. Click the Editor button from the Editor toolbar.
 - b. Select “Start Editing” from the drop-down menu. The Start Editing window appears.

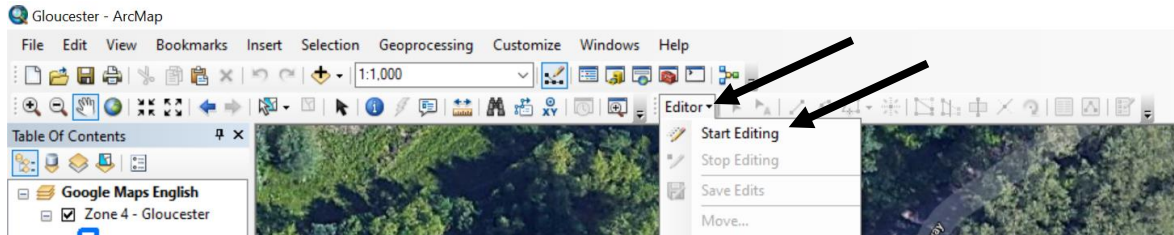


Figure 29: Start Editing

- c. Select the Shapefile you are working in from Start Editing window. The selected Shapefile is highlighted blue.
 - d. Click “OK”.

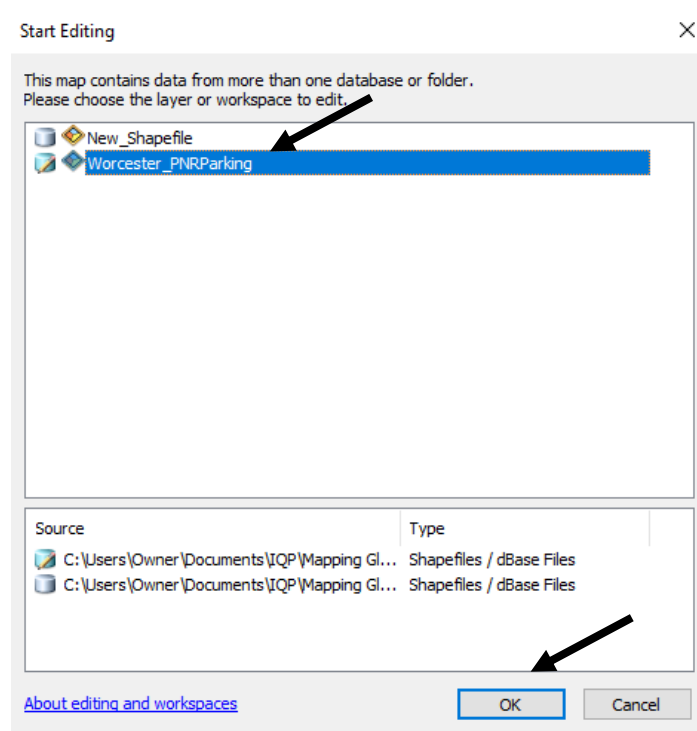


Figure 30: Start Editing Window

- e. If a warning stating that the “Spatial reference does not match data frame.” click “Continue”.

Note: This warning stems from the fact that the Google Basemap uses a different coordinate system than the Shapefile. This is not a problem and can thus be disregarded.

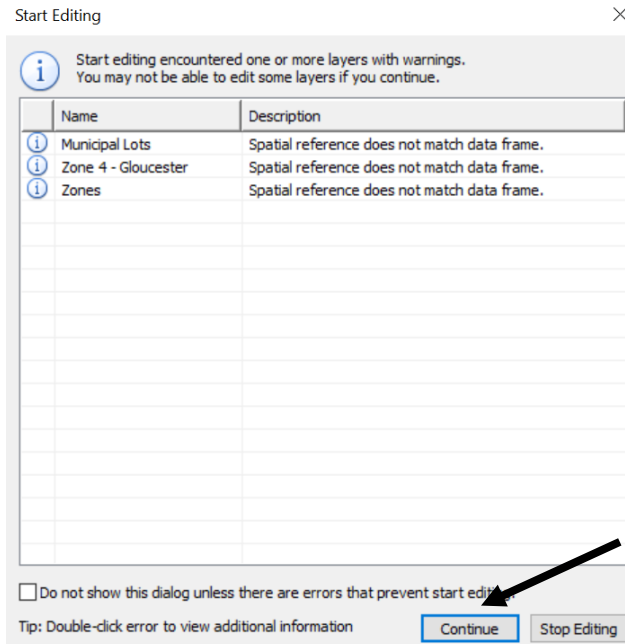



Figure 31: Spatial Reference Warnings

- f. Click the Create Features button () from the Editor toolbar. The Create Features sidebar appears.

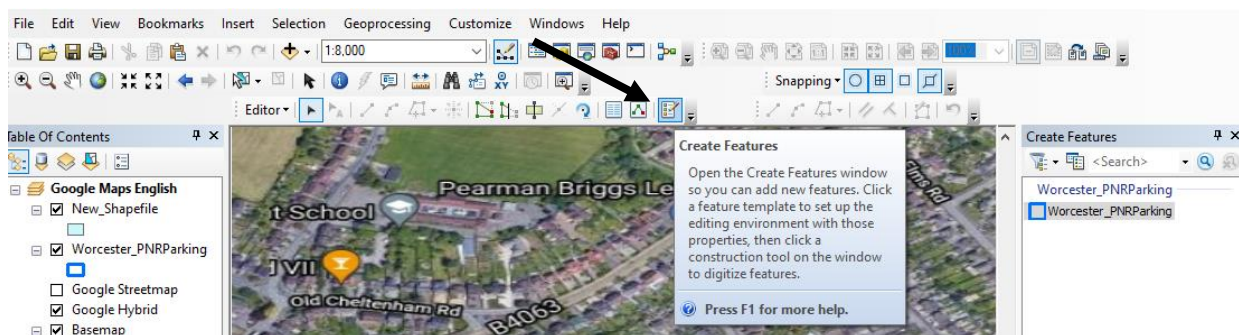


Figure 32: Create Features Button and Sidebar

2. Find a carpark to zone.
 - a. Use the Zoom and Pan functions to locate a carpark.

Note: Depending on the processing speed of your computer, it may be easier to find a carpark using Google Maps satellite imagery in your preferred browser. You will then need to navigate to the found carpark in ArcGIS.

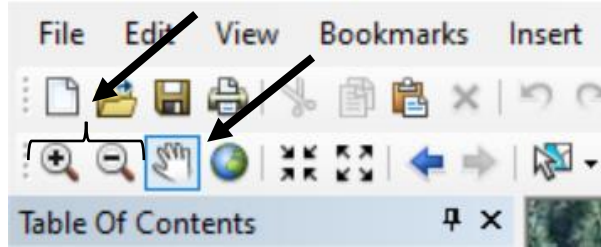


Figure 33: Zoom and Pan

- b. Determine if the located carpark is PNR and has greater than or equal to 15 spaces. Otherwise, do not zone the carpark and return to Step 2a.
 3. Plan which parts of the carpark you will zone and how you will draw the polygon.
 - Leave out long driveways, loading docks, entrance areas and other un-parkable spaces. Adding this area will skew the calculated number of parking spaces.
 - Make your best guess on placing vertices when trees overlap the corner of a carpark. If you can see part of the carpark edge, it can be helpful to imagine where two adjacent edges would meet and place the vertex there.
 - For carpark surrounding a building, pick a narrow part of the carpark to slice the polygon at.

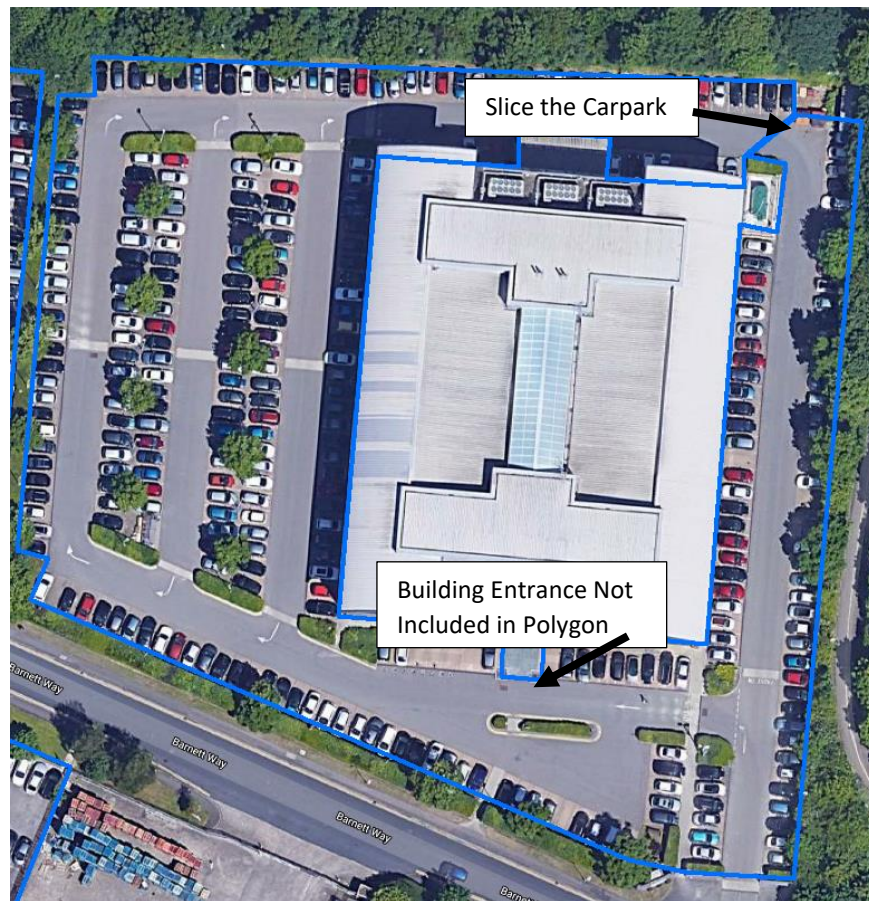


Figure 34: Carpark Surround a Building & Un-Parkable Spaces

- Do not zone the part of a carpark which is being used for storage, such is seen at carpark associated with gardening or hardware stores.
- For two or more disconnected carpark associated with the same point of interest, connect these two carpark with a narrow set of lines. This creates one row in the Attribute Table for both carpark but does not add significant area to the polygon.

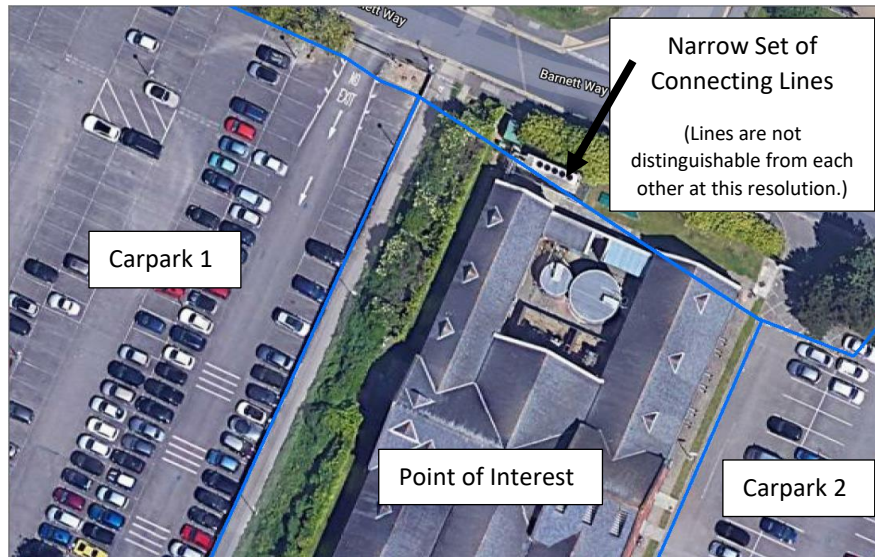


Figure 35: Connect Carparks

4. Draw the polygon.
 - a. Click on the Shapefile you would like to draw the polygon in from the Create Features sidebar. The appearance of the Editor Toolbar and your cursor change.

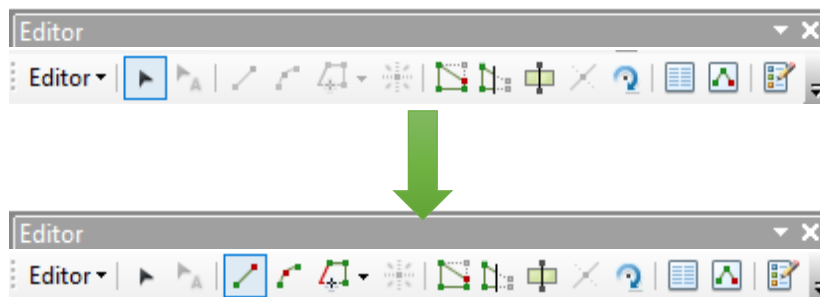


Figure 36: Editor Toolbar (Pan/Zoom to Polygon Drawing Mode)

- b. Click the points at which you want the vertices of the straight-edged polygon. A line appears between each vertex as you make it.
 - c. Close the polygon.
 - i. Double-click when creating the last vertex.
 - OR
 - ii. Make the last vertex as normal; then click the Close Features button (🔒) on the Edit Vertices toolbar.

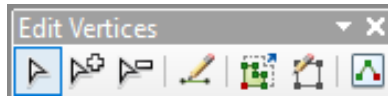


Figure 37: Edit Vertices Toolbar

5. Save your work after drawing a polygon.
 - a. Click the Editor button from the Editor toolbar
 - b. Select "Save Edits" from the drop-down menu.

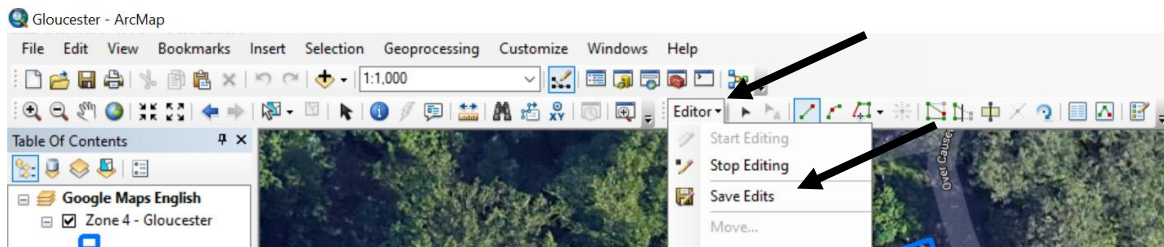


Figure 38: Save Edits

6. Repeat Steps 2 through 4 until all PNR carparks with greater than or equal to 15 lots are zoned.
7. Exit Editing mode.
 - a. Click the Editor button from the Editor toolbar.
 - b. Select "Stop Editing" from the drop-down menu.

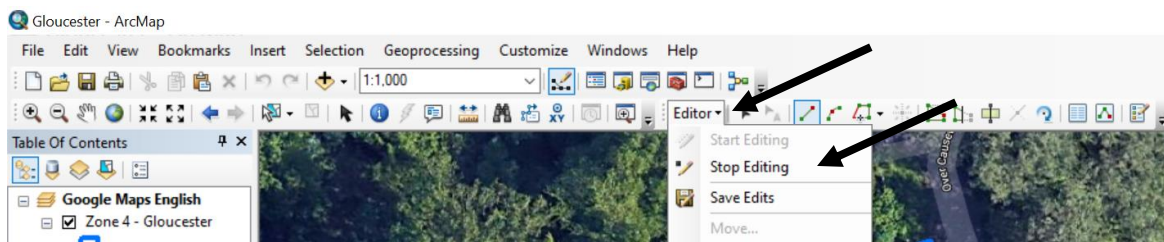


Figure 39: Stop Editing

7 RECORD FIELD DATA

Record data about each carpark in the attribute table such that meaningful connections can be made between the location, size, and use of the carpark later.

7.1 SETUP

To be able to record field data, you must complete a few preliminary steps.

Setup for data recording:

1. Open the attributes table.
2. Enter Editing mode.
3. Enter the appropriate data in each section as detailed below.



FID	Shape *	Id	Area	Num	Roads	Near	Use_Class	Notes
35	Polygon	0	375.70	22	Barnwood Rd	Chestnut Day Nursery	Education	
36	Polygon	0	1868.6	108	Barnwood Rd, Barnwood Ave	Spice House, Wotton Hall Social Club Limited, Gloucester Vale Probus Cl	Leisure, Retail	
37	Polygon	0	567.21	33	Colin Rd, Grove Cres	Banwood Barbers, GDA Deaf and Hard of Hearing Charity	Retail, Employment	
38	Polygon	0	4878.3	282	Barnett Way	Newland Homes, Claranet UK, Jacobs, Complete Auto-Enrolment Solutio	Employment, Retail	
39	Polygon	0	14578.	844	Barnett Way	Lockheed Martin Cyber Works Centre	Employment	
40	Polygon	0	11424.	661	Barnett Way	Timpson, Sainsbury's Cafe, Sainsbury's, Sainsbury's Petrol Station	Leisure, Retail	
41	Polygon	0	7956.3	460	Barnett Way	TSB	Retail	
42	Polygon	0	2904.5	168	Barnett Way	Helping Hands, Pitt Godden & Taylor LLP, thinkproject UK, John Deere Ba	Employment, Retail	"Meteor Court"
43	Polygon	0	780.06	45	Barnett Way	The Sempre Group Ltd	Employment	

Figure 40: Example of Completed Attribute Table

7.2 RECORD NEARBY ROADS

Recording nearby roads can make it easier to determine congestion in key areas. Record nearby roads for each carpark.

To record nearby roads:

1. Click on cell in the Roads field that corresponds with the carpark you want to add data on.
2. Record the name of the road(s) by which the carpark can be accessed. If there are multiple roads, separate them by a comma.

7.3 RECORD ABUTTING POINTS OF INTEREST

Recording abutting points of interest allows the owners of key lots to be more easily identified and contacted. Record abutting points of interest for each carpark.

To record abutting points of interest:

1. Click on cell in the Near field that corresponds with the carpark you want to add data on.
2. Record the abutting points of interest.
 - a. To determine the abutting points of interest, look at the label given in the Google satellite view displayed in ArcGIS. You may have to zoom in.
 - b. If a business or attraction is not labeled, use Google street view to identify the identity of the business/attraction inhabiting the building of interest.
 - i. In your preferred browser, open Google Maps.
 - ii. Move the small orange person in the bottom right corner of google maps onto the street in front of the business/attraction of interest.
 - iii. Navigate down roads, zoom in and out, and rotate your field of vision to find signs etc. that may help you identify abutting buildings.

7.4 RECORD THE USE CLASS

Identifying the use class of abutting points of interest allows meaningful analysis to be later completed on how and when commuters are using certain carparks. Record the use class for each carpark.

To record the use class of the carpark:

1. Click on cell in the Use_Class field that corresponds with the carpark you want to add data on.
2. Look up the function of each nearby business or attraction recorded in the “Near” field using your preferred browser.
 - For example, ALDI is a grocery store.
3. Record the use of each nearby business or attraction as one of the following separated with a comma. If two nearby businesses share the same class, record the class only once.
 - Health
 - Hospitals, Health Clinics, Veterinary Clinics, Dentists Office, Assisted Living Facilities, Counseling Services...
 - Employment
 - Office buildings, Manufacturing Facilities, Courthouses, Taxi Bases...
 - Leisure
 - Beaches, Parks, Restaurant, Fast Food, Places of Worship, Public Gathering Places, Community Centers, Fitness Centers, Dance & Martial Arts Instruction, Sports Fields & Courts, Betting Shops...
 - Education
 - Daycares, Elementary Schools, Secondary Schools, Universities, Vocational Schools...
 - Retail
 - Banks, Post Offices, Grocery Stores, Clothing Stores, Appliance Repair Stores, Convenient Stores, Temporary Lodgings...
 - Transportation
 - Bus Stops, Train Stops, Service Centers...

7.5 CALCULATE THE AREA

Recording the area of the carpark allows meaningful analysis regarding how the carpark may be reused, which use types correspond to the largest carparks, & where the most parking is located. It also allows the calculation of the number of parking spaces per carpark to be completed using formula. Record the area of each carpark.

To calculate the area of the carpark:

Note: Calculation of the area should be performed at the end of the project so the below steps will have to be completed only once. Otherwise, Steps 2 through 5 will have to be completed for each lot.

1. Open the attributes table for carparks that you would like to calculate the areas of.
2. Right-click on the top of the “Area” column and select “Calculate Geometry”.
3. Select “Area” from the drop-down menu.
4. Check that the units are in square meters.
5. Click “OK”. The column fills with the areas for each carpark.

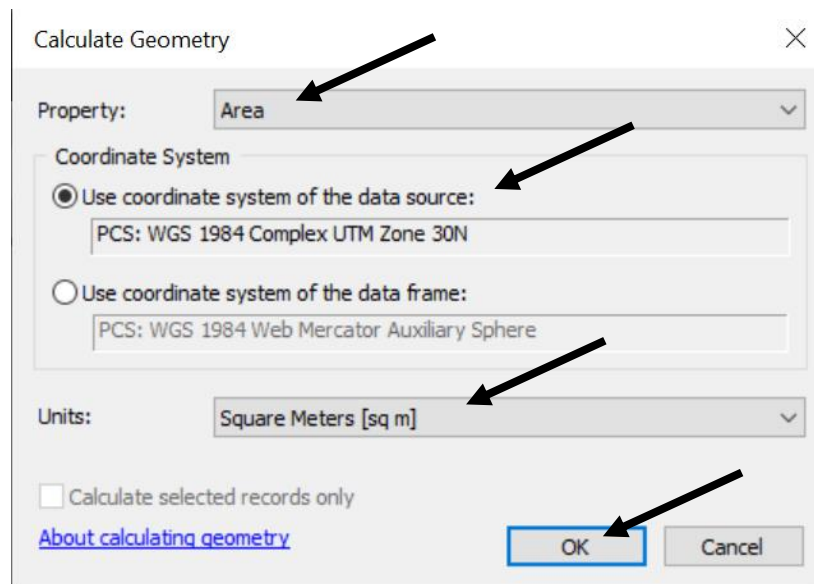


Figure 41: Calculate Geometry Window

7.6 CALCULATE THE NUMBER OF PARKING SPACES

Recording the area of the carpark allows meaningful analysis regarding which use types correspond to the largest carparks, & where the most parking is located. Calculate the number of parking spaces contained in each carpark.

To calculate the number of spaces in the carpark:

Note: Calculation of the number of spaces should be performed at the end of the project so the below steps will have to be completed only once. Otherwise, Steps 2 through 4 will have to be completed for each lot. Calculating the number of parking spaces requires the polygon areas to have been calculated first.

1. Open the Field Calculator
 - a. Right-click on the top of the “Num_Spaces” column.
 - b. Select “Field Calculator” from the drop-down menu.
2. In the “Calc =” box and enter the equation: $([\text{Area}] * 2/3) / 11.52$.

Note: This equation is derived from the fact that about 2/3 of a standard carpark is filled with parking spaces while the extra 1/3 is turning and driving area, and the size of a standard parking spot is 11.52m^2 .

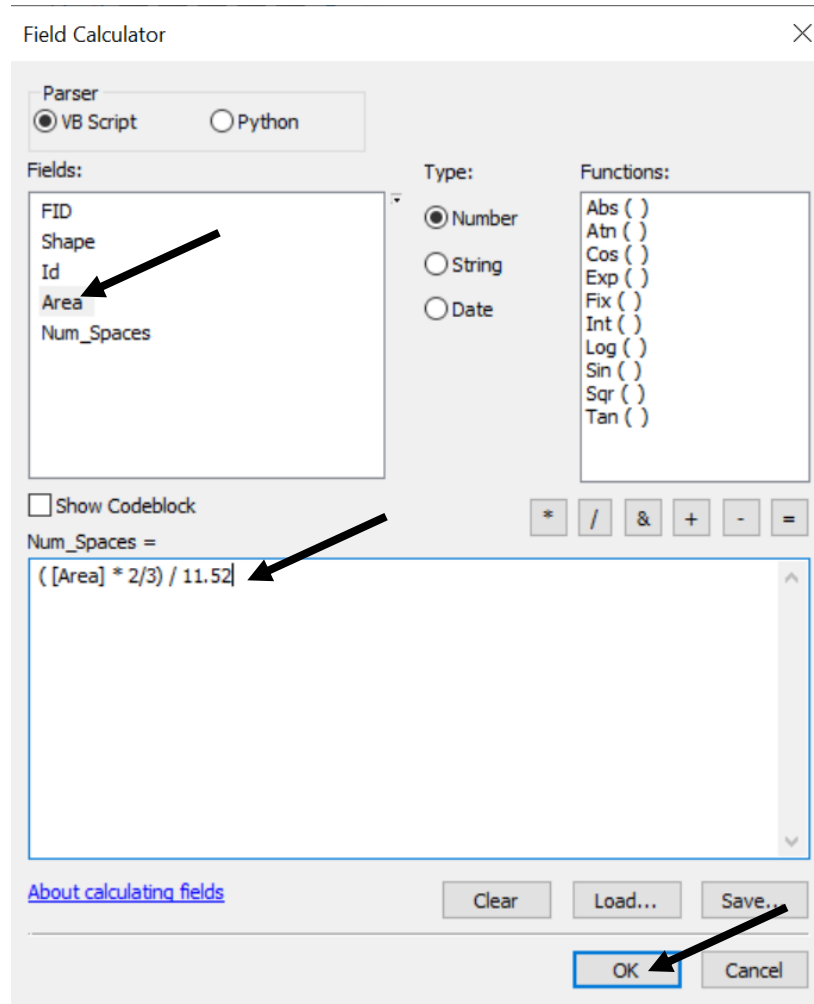


Figure 42: Field Calculator Window

3. Click “Ok”. A box appear that says, “Calculating records ...”. This process will take a few minutes. Once the box closes the column will be filled with the number of spaces.

7.7 RECORD OTHER NOTES

Sometimes you may want to make clarifying notes, point out a feature of interest, or make some other comment on a specific feature of a carpark.

To record other notes:

1. Add any notes you may have in the “Notes” field.

8 CREATE A LAYER PACKAGE

Turning the contents of your Shapefile folder into a Layer Package is the easiest way to package and transfer Shapefile data.

To create a Layer Package:

1. Add a Layer Description.

Note: ArcGIS will not let you save a Shapefile as a Layer Package until you have given it a description.

- a. Right click the name of the Shapefile you would like to create a Layer Package from.
- b. Select “Properties...” from the drop-down menu. The Layer Properties window opens.

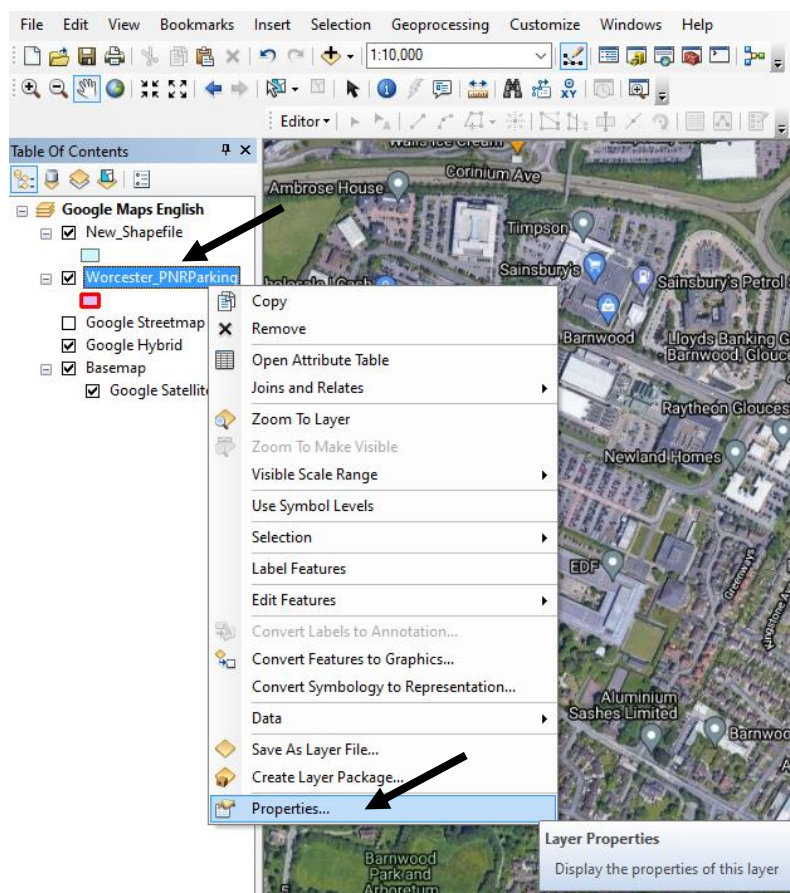


Figure 43: Open Layer Properties Window

- c. Add an appropriate Layer Description in the Description box.
Optional: Add your name or initials to the Credits box.
- d. Click “OK”. The Layer Properties window closes.

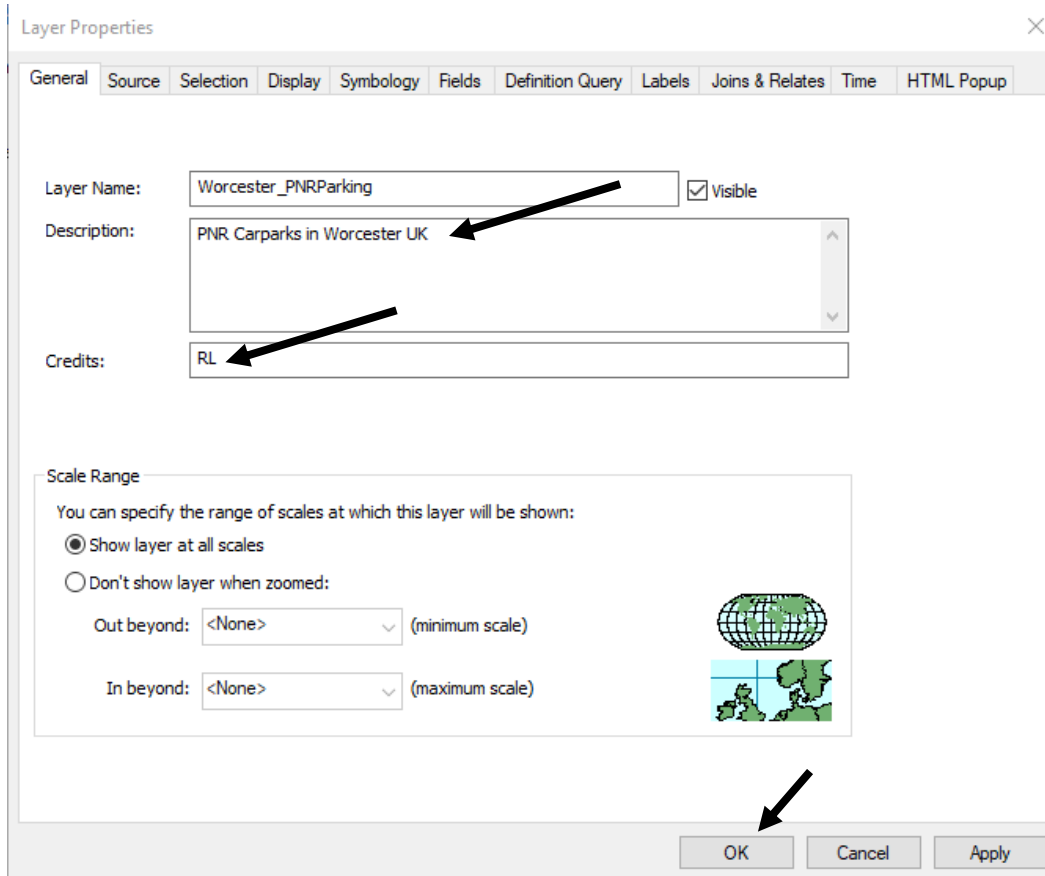


Figure 44: Layer Properties Window

2. Open the Layer Package window for a selected Shapefile.
 - a. Right click the name of the Shapefile you would like to create a Layer Package from.
 - b. Select "Create Layer Package..." from the drop-down menu. The Layer Package window opens.

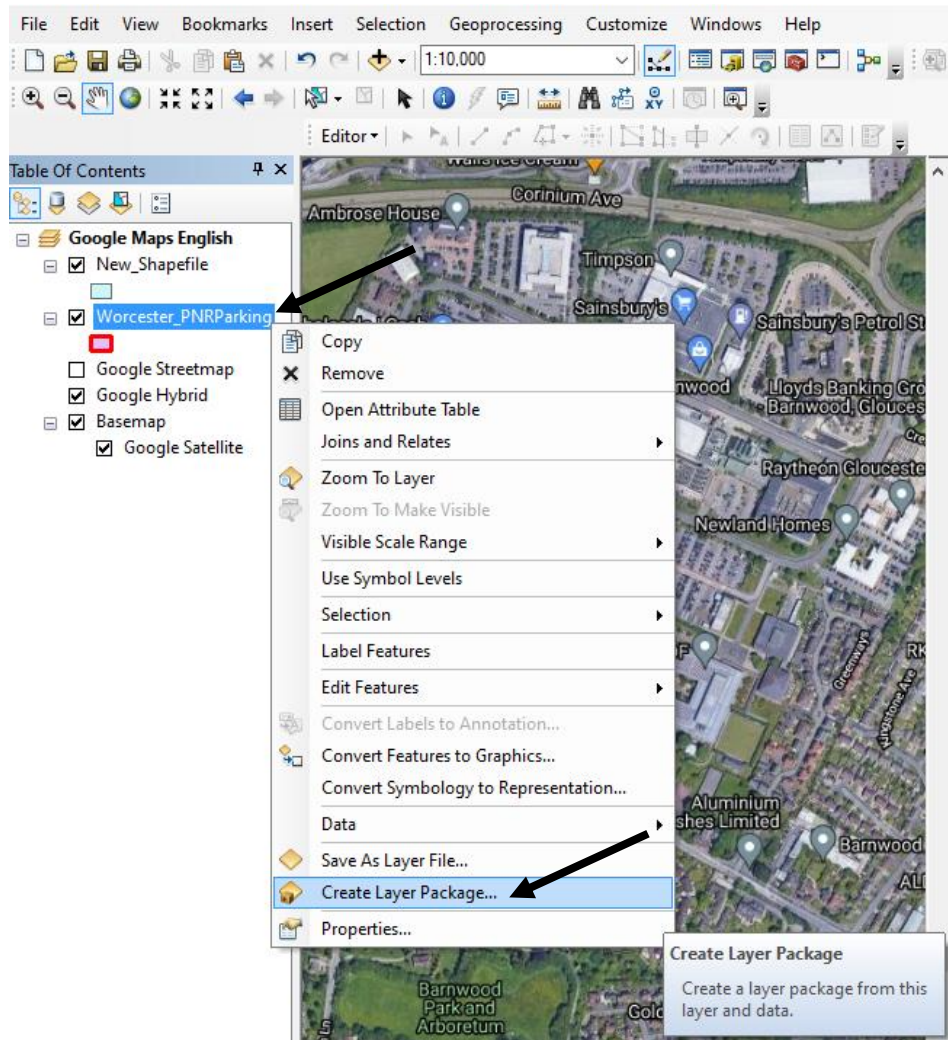


Figure 45: Open Layer Package Window

3. Add an Item Description.
 - a. Click the Item Description tab on the left of the window.
 - b. Add an appropriate summary in the Summary box.
 - c. Add appropriate tags in the Tag box.

Layer Package

Item Description

Additional Files

Item Description

Summary (required):

PNR Carparks in Worcester UK

Tags (required):

Worcester UK Carparks

Choose Your Tags...

Description:


PNR Carparks in Worcester UK

Access and Use Constraints:

Credits:

RL

Figure 46: Layer Package Window

4. Save the Layer Package.
 - a. Click the Layer Package tab on the left of the window.
 - b. Make sure the “Save package to file” option is selected.
 - c. Click the  icon to browse for a save location. The Create Layer Package window opens.

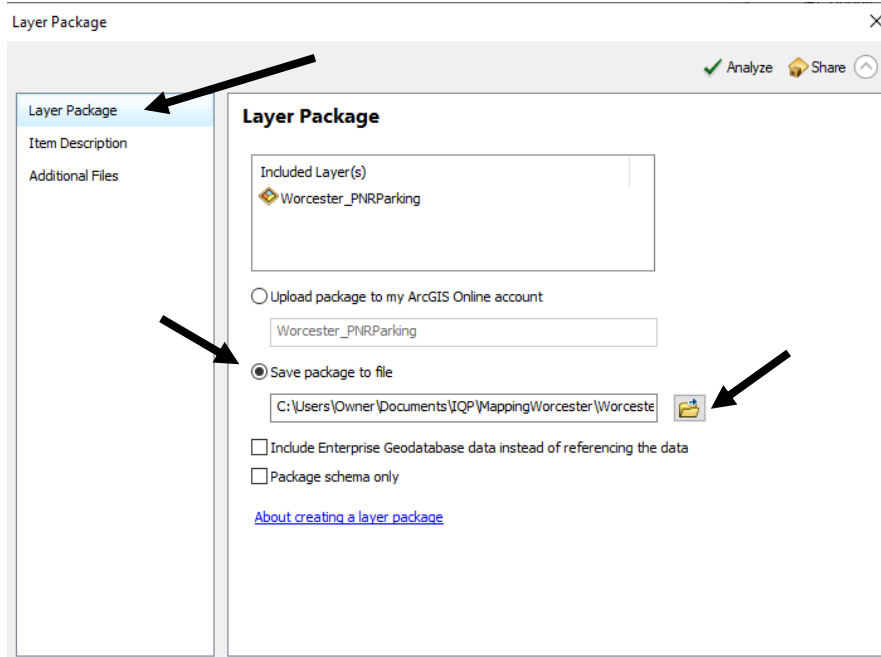
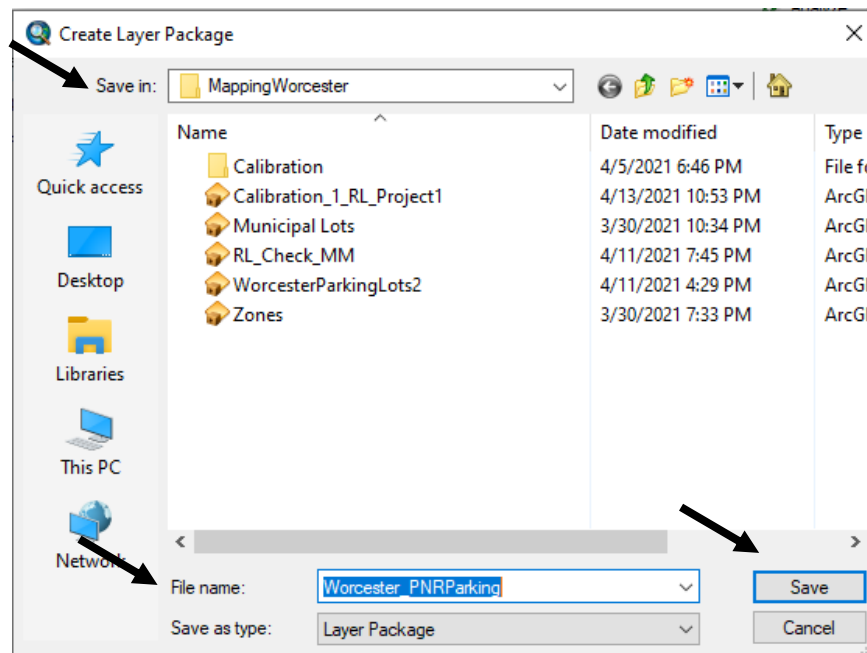


Figure 47: Save Location for Layer Package

- Choose a save location.
- Set a File name.
- Click "Save". The Layer Package is saved to your chosen destination.



9 MERGE LAYER PACKAGES

1. Once all of the layers you would like to merge are added to your project, navigate to the search menu in the standard toolbar.



Figure 48. Open the Search Menu.

2. In the search field, type "Merge". Then select the Merge (Data Management) tool.

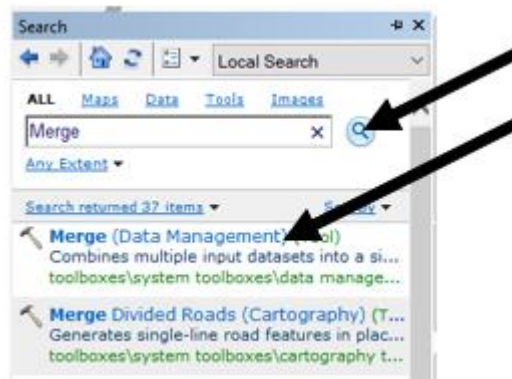


Figure 49. Search "Merge"

3. In the Merge (Data Management) tool, select the layers that you would like to merge together.

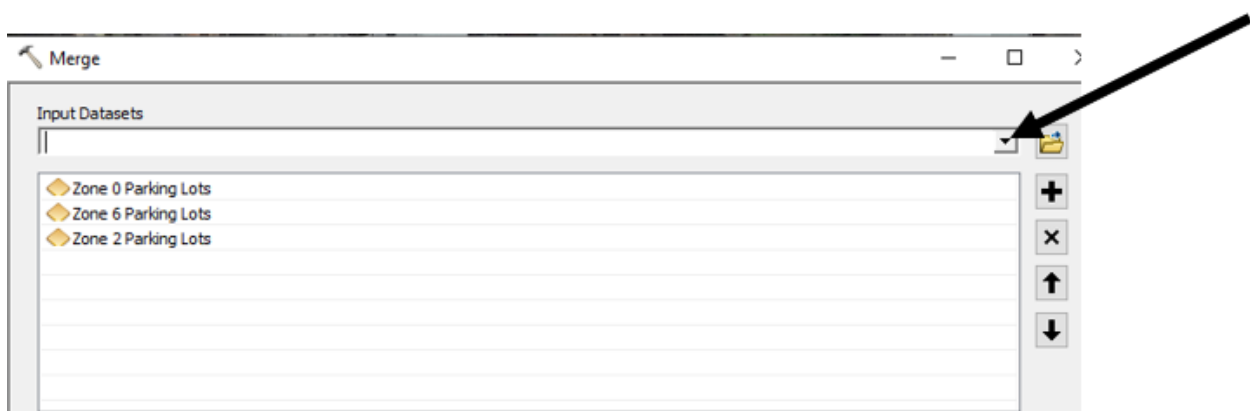


Figure 50: Select Layers to Merge

4. Give the merged layer a name and location. Then, verify that the correct fields from each layer are being combined. If the fields from each layer have the same name, this should be done automatically.

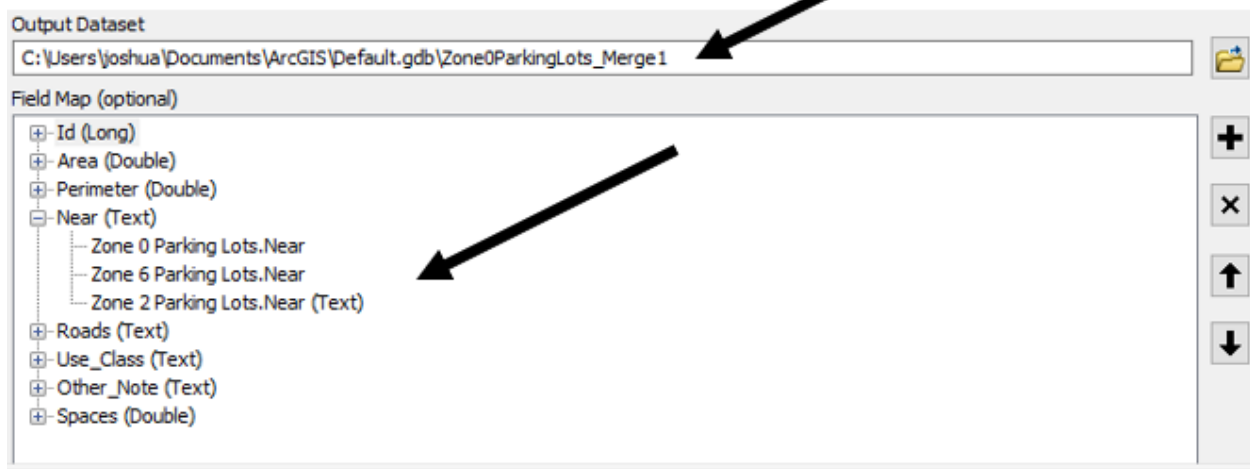


Figure 51: Output Dataset Window

5. When complete, press "OK". Once Arc has finished merging your layers, the new layer should be added to your project.

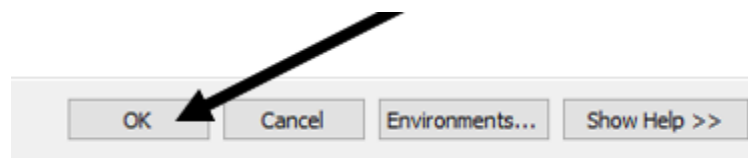


Figure 52: Click "Ok"

10 HELPFUL HINTS AND TROUBLESHOOTING

If you would like some hints to make using ArcGIS a better experience or run into problems, check here.

10.1 CHANGE POLYGON APPEARANCE

It can be helpful to change a polygon's appearance to tell different layers apart or make a single layer easier to see. The polygon fill can be made translucent, both the fill and outline colors can be changed, and the outline width can be increased or decreased.

To make a polygon translucent:

1. Add the Effects toolbar to your workspace.
 - a. Click customize.
 - b. Hover over "Toolbars" from the drop-down menu.
 - c. Select "Effects" From the secondary drop-down menu.

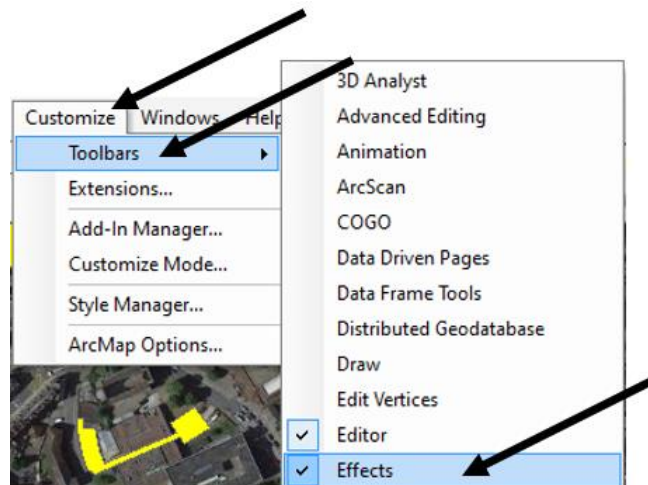


Figure 53: Add the Effects Toolbar to your Workspace

2. In the Effects toolbar, select the layer that you would like to make translucent.

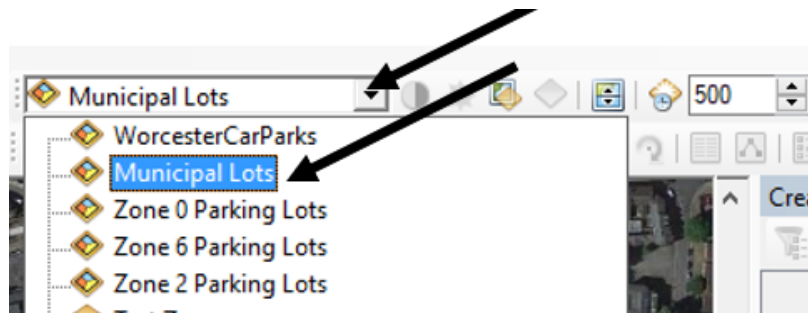


Figure 54: Select the Layer that you would like to make Transparent

3. Select Transparency, then adjust the transparency slider as needed.

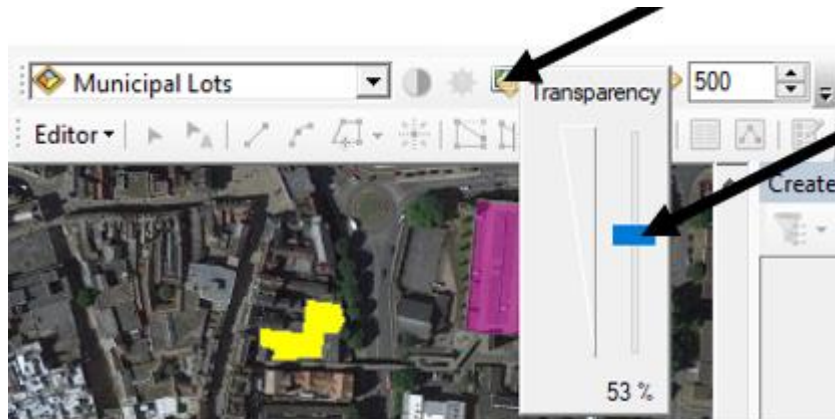


Figure 55: Transparency Slider

To change a polygon's fill, outline color or outline width:

1. Click the colored box under the name of the Shapefile's polygon properties you want to change. The Symbol Selector window opens.

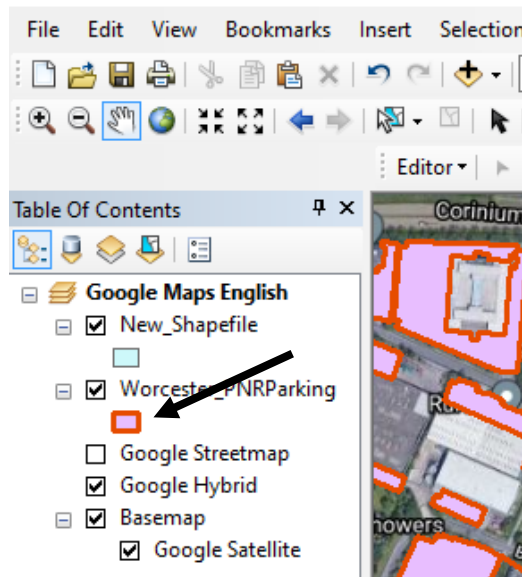


Figure 56: Select the Shapefile's Polygon to Change its Appearance

2. Change your desired properties.

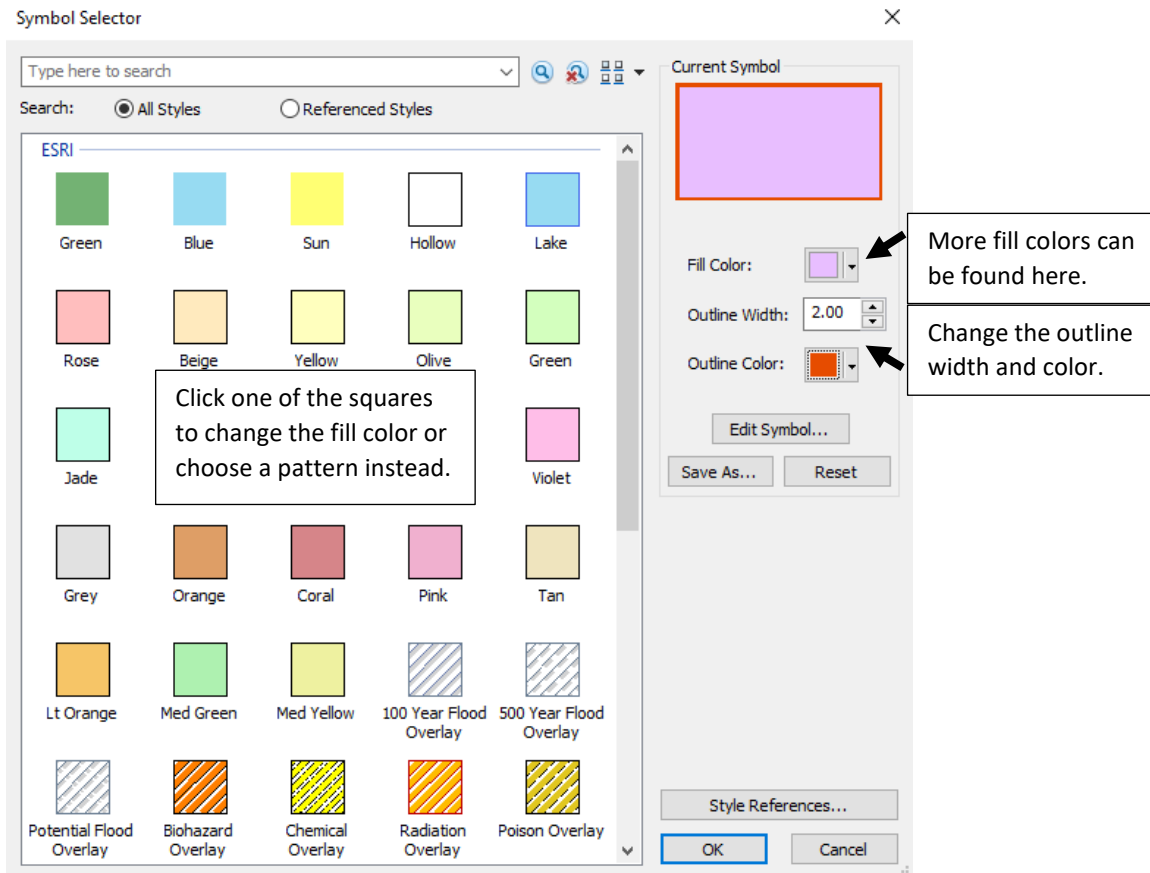


Figure 57: Symbol Selector Window

3. Click "Okay". The Symbol Selector window closes and the polygons in the Shapefile automatically update their appearance.

10.2 EDIT A POLYGON'S SHAPE

If you draw a polygon incorrectly, it is often easier to edit the polygon rather than delete and redraw the polygon. Single polygon vertices can be modified, added, or deleted. Polygon's can also be reshaped and cut.

To edit a vertex:


1. Select the polygon you would like to edit either by clicking the polygon itself on the map or by clicking the attribute table line which corresponds to your chosen polygon.
2. On the Editor Toolbar, Click the Edit Vertices button (). The Edit Vertices toolbar appears if not already open.



Figure 58: Edit Vertices Button

3. Modify, add, or delete a vertex.

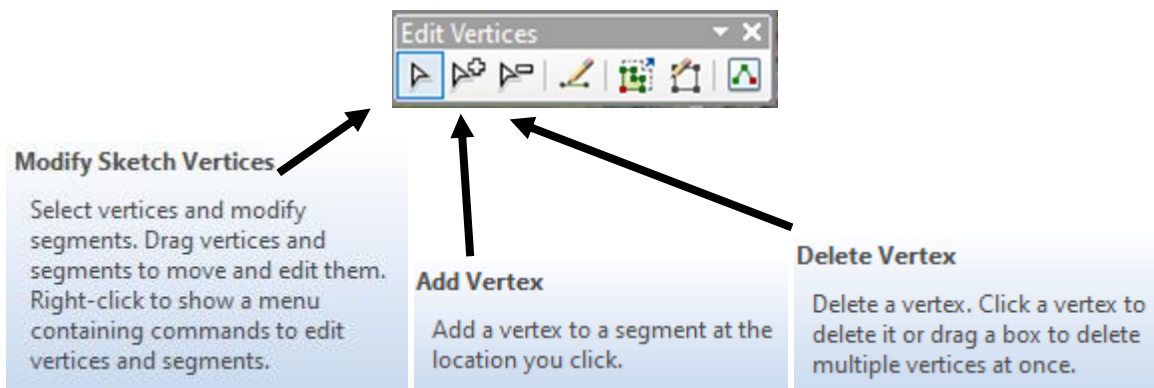


Figure 59: Modify, Add, or Delete a Vertex

- a. Click the appropriate button: Modify Sketch Vertices, Add Vertex, Delete Vertex.
- b. Hover over the button in ArcGIS to see the instructional text for the button.
- c. Follow the instructional text to edit the vertex.

To reshape a polygon:


1. Select the polygon you would like to edit either by clicking the polygon itself on the map or by clicking the attribute table line which corresponds to your chosen polygon.
2. On the Editor Toolbar, Click the Reshape Feature Tool button ().



Figure 60: Reshape Feature Tool Button

3. Hover over the button in ArcGIS to see the instructional text for the button.
4. Follow the instructional text to edit the polygon.

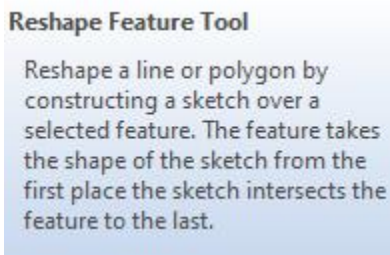


Figure 61: Reshape Feature Tool Instructional Text

To cut a polygon:


1. Select the polygon you would like to edit either by clicking the polygon itself on the map or by clicking the attribute table line which corresponds to your chosen polygon.
2. On the Editor Toolbar, Click the Reshape Feature Tool button ().



Figure 62: Cut Polygons Tool Button

3. Hover over the button in ArcGIS to see the instructional text for the button.
4. Follow the instructional text to edit the polygon.

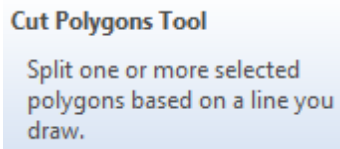


Figure 63: Cut Polygons Tool Instructional Text

10.3 SHOW OR HIDE LAYERS

Sometimes you may not want to see all the layers at once. Layers include Shapefiles and Basemaps.

To hide a layer:

1. Click the checkmark (☒) symbol at the left of the layer name. The layer disappears from the map and the checkmark disappears.

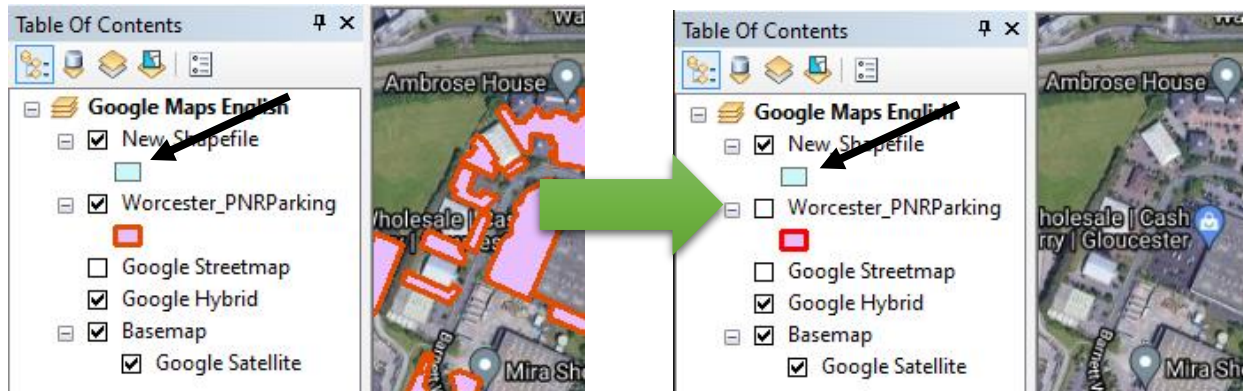


Figure 64: Hide a Layer

To show a hidden layer:

1. Click the empty box (☐) symbol at the left of the layer name. The layer appears and a checkmark fills the box.

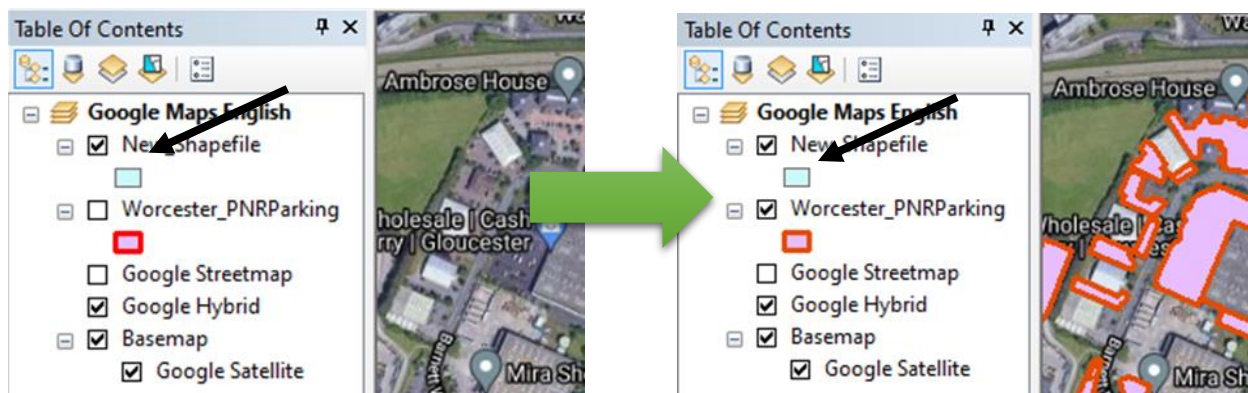


Figure 65: Show a Layer

10.4 OPEN THE TABLE OF CONTENTS OR CATALOG

The Table of Contents and Catalog both open automatically with ArcGIS. However, if you accidentally close them, they are easily reopened.

To open the Table of Contents or Catalog:

1. Click “Windows”.
2. Select “Table of Contents” or “Catalog” from the drop-down menu.

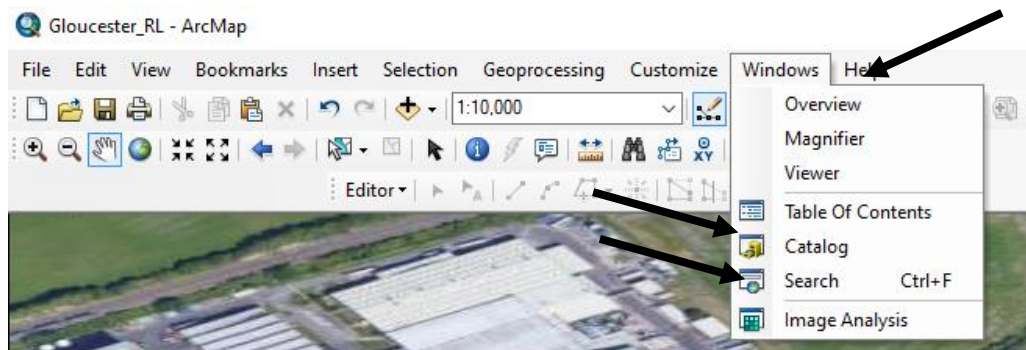


Figure 66: Open the Table of Contents or Catalog