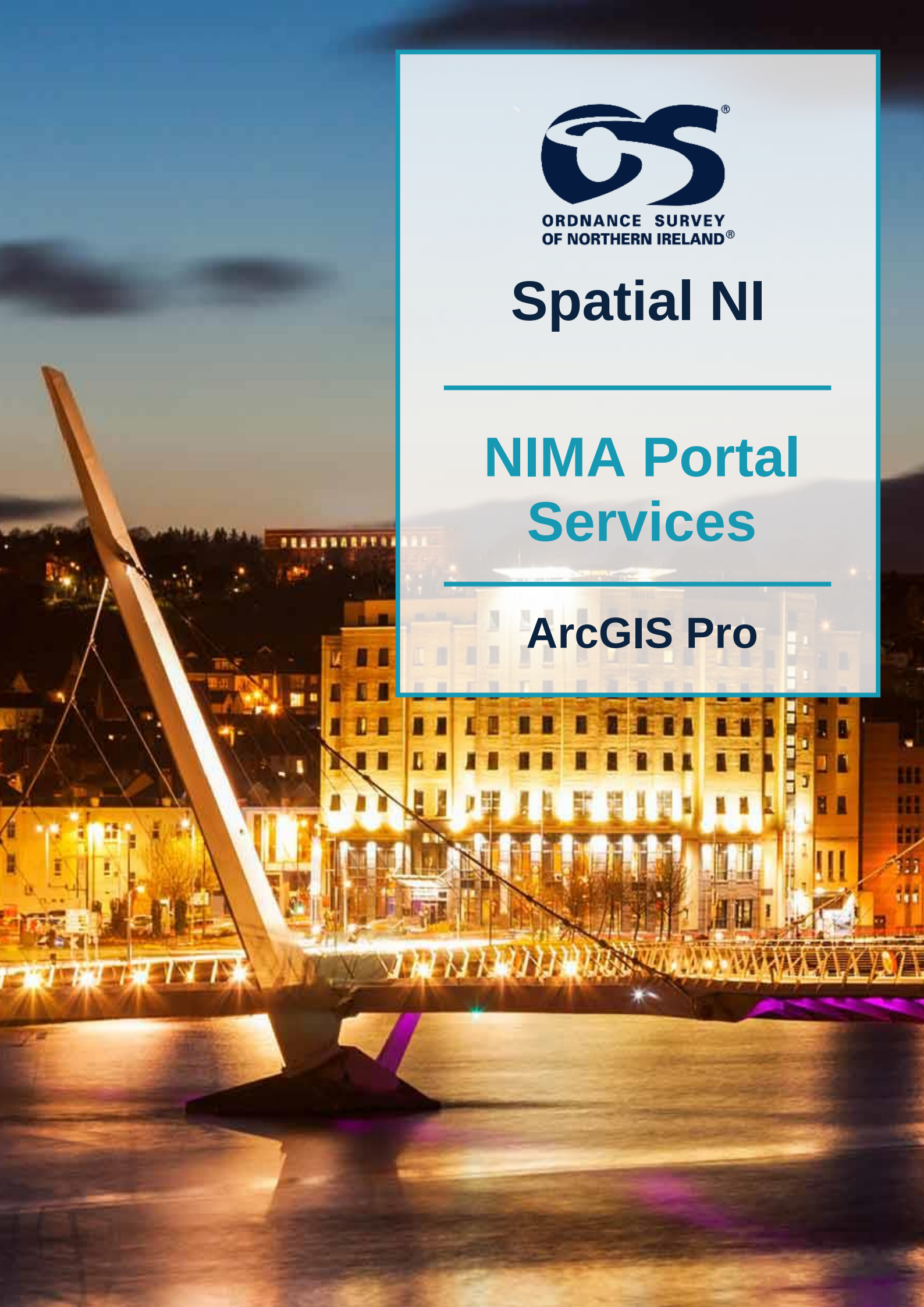

ORDNANCE SURVEY OF NORTHERN IRELAND®

Spatial NI

NIMA Portal Services

ArcGIS Pro

Document Version

Version	Purpose for Change	Date
1.0	Creation	01 April 2019

Software Version

The guidance in this document has been written for use with ArcGIS Pro 2.3.0.

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About This Guide

This guide has been written to assist you when using web services from the Spatial NI Portal for NIMA (Northern Ireland Mapping Agreement) participants in ArcGIS Pro.

Text highlighted in **bold** are actions that you will need to complete.

When you see this box…

Go Further Box:

Discover more amazing ways you can use the Spatial NI services, OR Top tips for using ArcGIS Pro.

What is Spatial NI?

Spatial NI is Ordnance Survey of Northern Ireland's web mapping platform. It provides you with access to not only Ordnance Survey's authoritative mapping data, but other geospatial information from multiple providers across the public and private sectors.

Components of Spatial NI:

Spatial NI Website

The Spatial NI website enables the public citizen to view and interrogate OSNI maps with other spatial data. It also contains a handy gallery of other mapping applications.

Spatial NI NIMA Portal

Access the Spatial Data Infrastructure (SDI) available to all recipients of the Northern Ireland Mapping Agreement (NIMA) - (Login is required).

Spatial NI for INSPIRE

Spatial NI for INSPIRE provides a network of spatial data, accessible under the INSPIRE Directive, that can be used to promote and support environmental protection

What is the Spatial NI NIMA Portal?

The Spatial NI NIMA portal is a Spatial Data Infrastructure (SDI) available to all NIMA participants in Northern Ireland. It is a "one stop shop" for finding spatial data and facilitates the use of this data in both web applications and desktop software.

Functionality available includes:

- The ability to view and interrogate OSNI and other geospatial information in a web application
- The ability to search our catalogue of services and view the service metadata
- The ability to add services to ArcGIS Pro and complete complex spatial analysis

Who can gain Access to the Spatial NI NIMA Portal?

Access to the Spatial NI NIMA portal is available to all NIMA participants. This includes all Northern Ireland Civil Servants, Local Government staff and employees of approved Arm's Length Bodies (ALB's).

How to gain Access to the Spatial NI NIMA Portal?

The Spatial NI NIMA portal is configured to provide a single sign-on experience for all NIMA users. This is made possible by using technology called Active Directory Federated Services (ADFS).

For Northern Ireland Civil Servants, this has already been configured for you.

For other NIMA participants, you need to have an instance of ADFS on your own infrastructure. Trust then needs to be established between your infrastructure and the Spatial NI platform.

If you would like to know more on how to configure this access, email us for advice.

What is ArcGIS Pro?

ArcGIS Pro is Esri's next-generation desktop GIS product which provides professional 2D and 3D mapping in an intuitive user interface. You can think of ArcGIS Pro as a software program that advances visualisation, analytics, image processing, data management and integration.

Easily mash up data from multiple sources to make maps that are as smart as they are beautiful. Use the powerful analytical tools to identify hidden patterns and trends in your data.

We recommend ArcGIS Pro as the optimal desktop software to interact with the Spatial NI NIMA Portal. All the analysis of ArcMap just with handy new features including: multiple portal connections, project organisation, ribbon based interface and multiple active panes. All of these allowing for quick and easy access to the content and tools you use. Pro is completely integrated with ArcGIS Online so sharing, viewing and accessing data from your online content will be much easier.

New to using ArcGIS Pro?

Complete Esri's online training to find out how you can make the most of ArcGIS Pro and all the new features it offers.

Accessing Spatial NI

Spatial NI contains a wealth of geospatial data from a diverse range of organisations. This information can be easily leveraged within ArcGIS Pro to help you complete analysis, identify trends and make informed decisions.

Spatial NI has facilitated two methods by which you can easily leverage content into ArcGIS Pro.

These are:

- Spatial NI NIMA Portal – A high availability instance of ArcGIS Enterprise which offers you a single sign-on experience. This is facilitated by using Active Directory Federated Service (ADFS).
- ArcGIS Online (AGOL) – Easily access content via your own organisations AGOL account. You will need to have a level 2 named user within your organisation to connect via this method.

You can also access the Spatial NI NIMA Portal in your web browser. Check out our guide on how to do this.

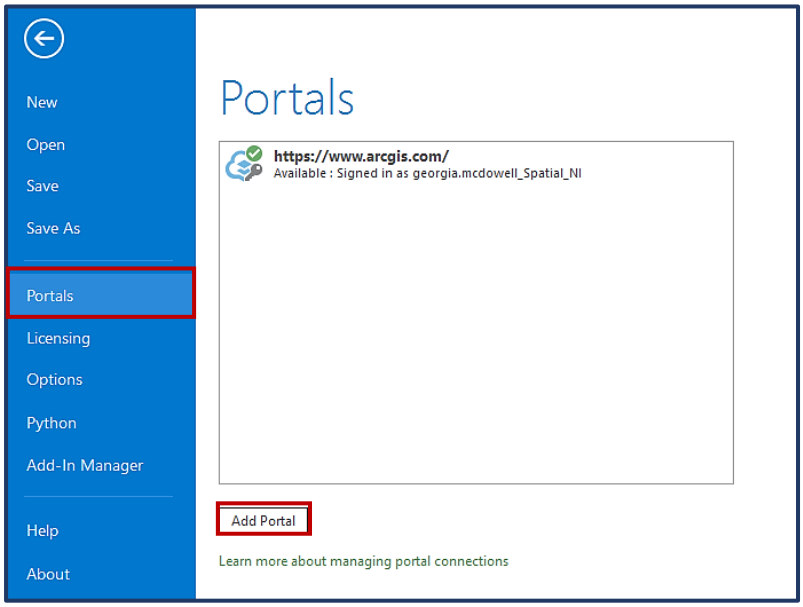
Licencing ArcGIS Pro

ArcGIS Pro can be licenced via two methods:

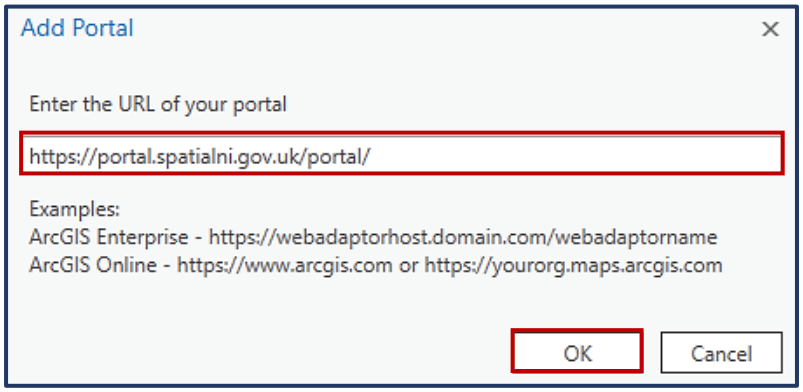
- Standalone – This licence is deployed during the install process. Once you launch ArcGIS Pro, the software will open and be ready for use.
- Concurrent – The licence is taken from a licencing portal, either ArcGIS Enterprise or ArcGIS Online. A pop-up will prompt you for your credentials and you can check your login status from in the top right of the ArcGIS Pro window.

Connecting to Spatial NI via the NIMA Portal

1. Open ArcGIS Pro, navigate to the **Project tab** on the ribbon. From the side menu, select the **Portals tab**. Click **Add Portal**.



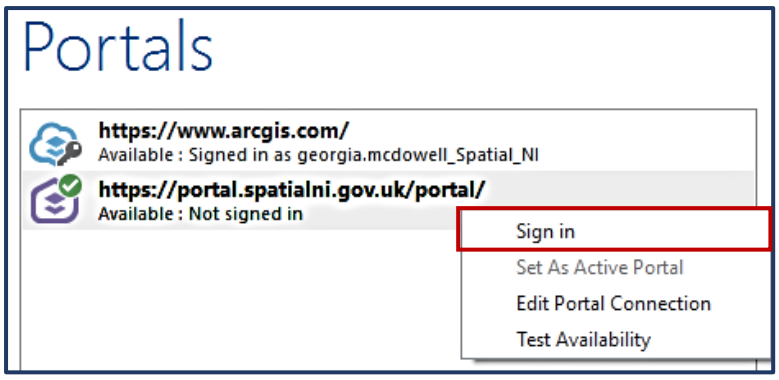
2. In the dialogue box, enter the URL for the **Spatial NI NIMA Portal:** https://portal.spatialni.gov.uk/portal



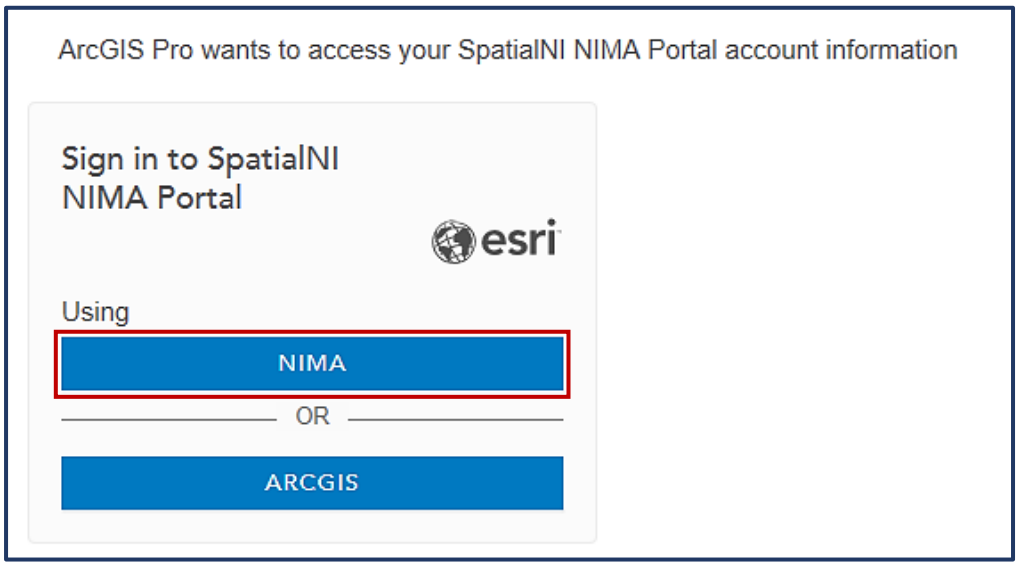
Sign In

To view content, you must sign in.

1. **Right-click** on the Spatial NI NIMA portal and select **Sign in**.



1. Select **Using NIMA** from the pop-up window. Once you select **NIMA** other ADFS screens will guide you through the login process. This will change the status of the portal to **Available: Signed in as …** It is possible to be signed into more than one portal, however only data from one portal is accessible at a time.

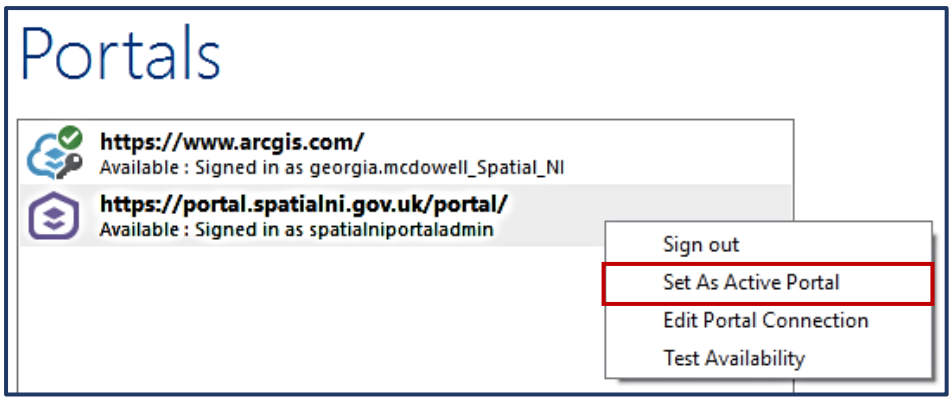


Your Active Portal

Only content from your active portal will be available in your ArcGIS Pro project.

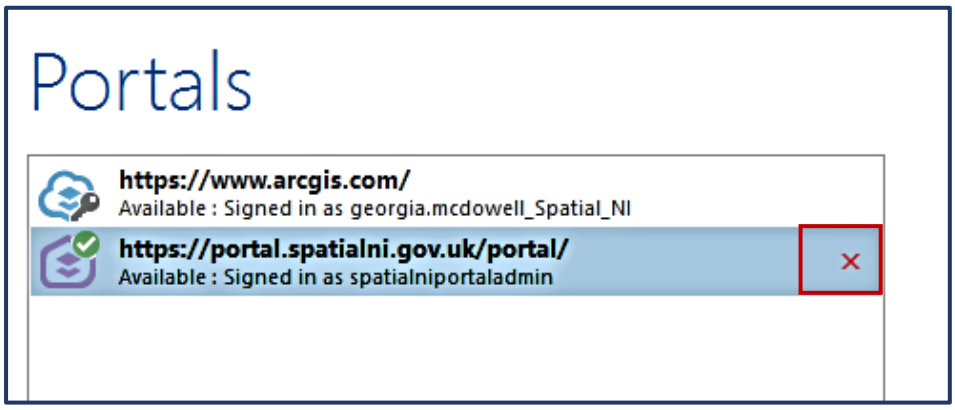
1. **Right-click** the desired portal from the list of added portals. Select **Set as Active Portal**.

***NOTE**: This will place a green tick above the portal symbol , indicating that it is active. This portal will remain the default active portal whenever signed into ArcGIS Pro, until manually changed.

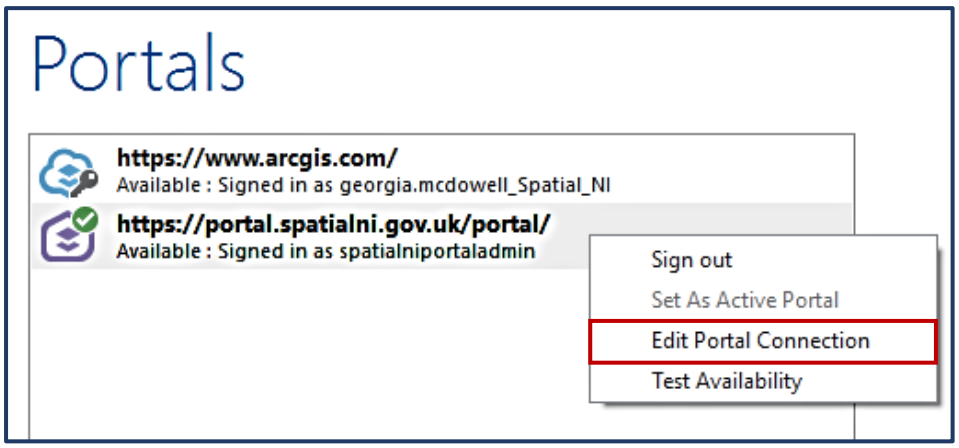


Remove and Edit Portal Connections

1. To remove a portal, navigate to the **Project tab** on the ribbon and select **Portals**.
2. Hover the curser over the **Portal link** you want to remove. Click the **red 'X'** which appears on the right of the portal URL.

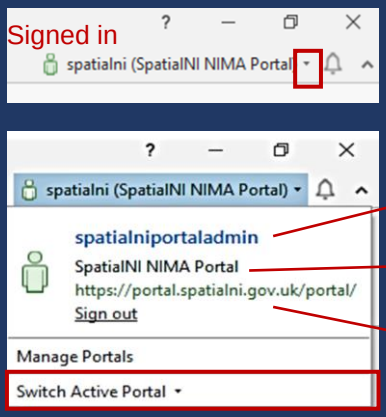


3. To edit a portal connection, **right-click** on the portal URL and select **Edit Portal Connection**. This function allows you to edit the connection URL for the selected portal.



Quickly Manage your Portals:

To check that you are signed into a portal and what portal it is, refer to the top right corner of the ArcGIS Pro window.



You can easily use content from multiple portals in ArcGIS Pro. To easily change between active portals:

Select **Switch Active Portal**. Choose the portal from the list from which you want to leverage content.

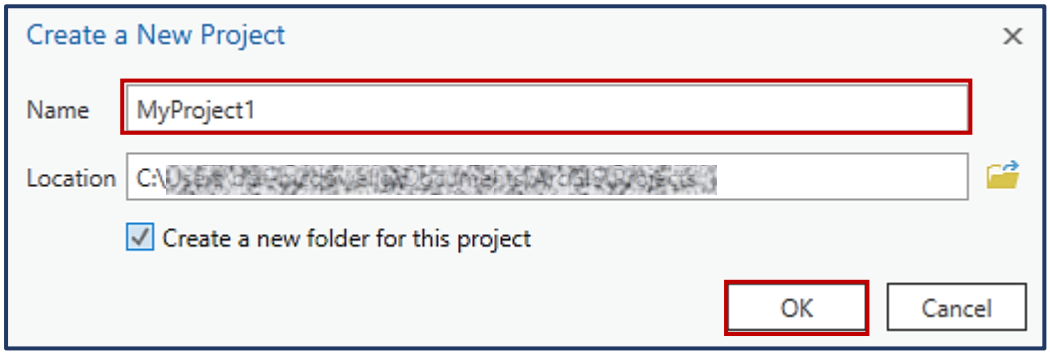
Creating a New Project

ArcGIS Pro allows you to store all map elements within one work area. A project contains maps, layouts, tasks, and connections to servers, databases, toolboxes, folders, styles, and much more. One project can contain multiple maps and scenes, and is able to display these at the same time, creating a dynamic workspace.

Follow the steps below to create a new project:

1. Upon launching; ArcGIS Pro will display any previously saved projects available to open OR the right-hand panel gives options to create a new project. Depending on the type of data you will be using, select either;
    a. **Scene** (Global/Local) for 3D data
    b. **Map** for 2D data
    c. **Blank** will not automatically open a map or scene

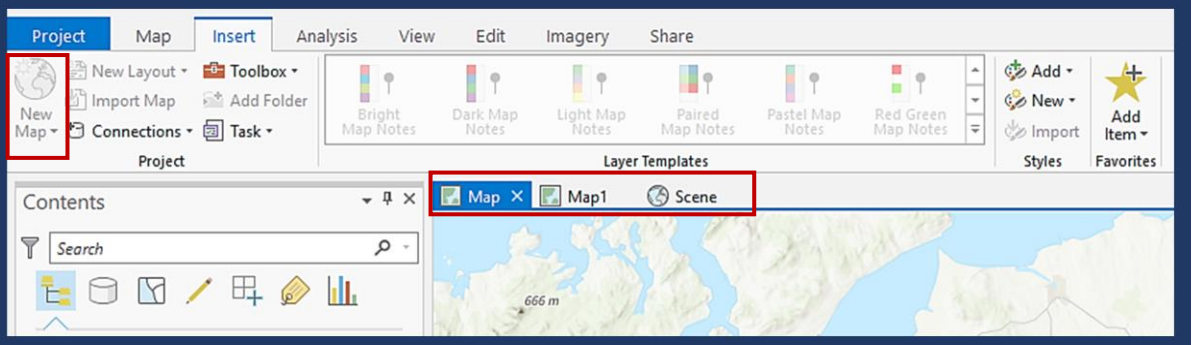
2. When creating a new project, assign a relevant name and storage location folder.



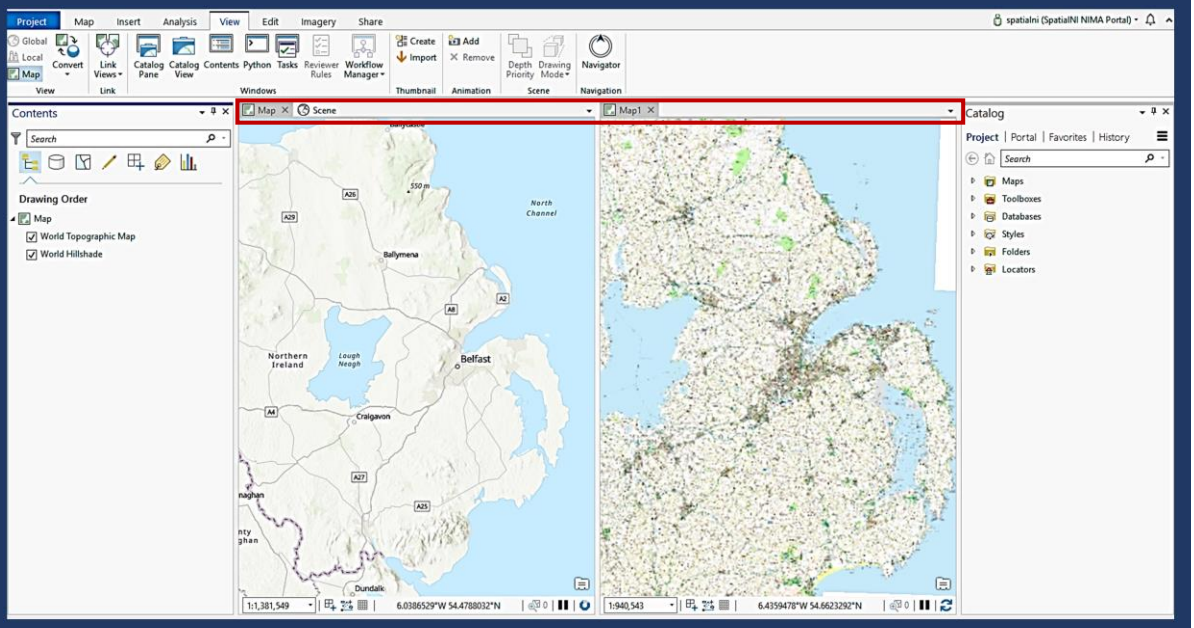
3. The new project will open, displaying the **Contents** and **Catalog** panes. These panes can be moved or closed.

Viewing Multiple Maps: In ArcGIS Pro it is possible to open multiple map and scene files within the same workspace. This is very useful when viewing the same location using various maps.

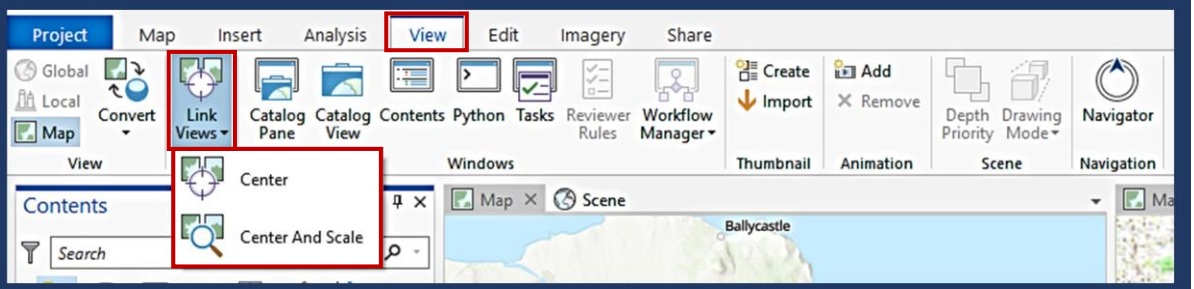
1. Insert a new map or scene, it will appear as a new tab.



2. The tabs can be separated by dragging the tab to the right/left of the map pane. This creates a duel viewing workspace.



3. It is possible to connect these two maps displaying the same location and/or scale. Click Link Views in the View tab and select your desired connection. This means as you move or zoom on one map, the other mirrors this change.



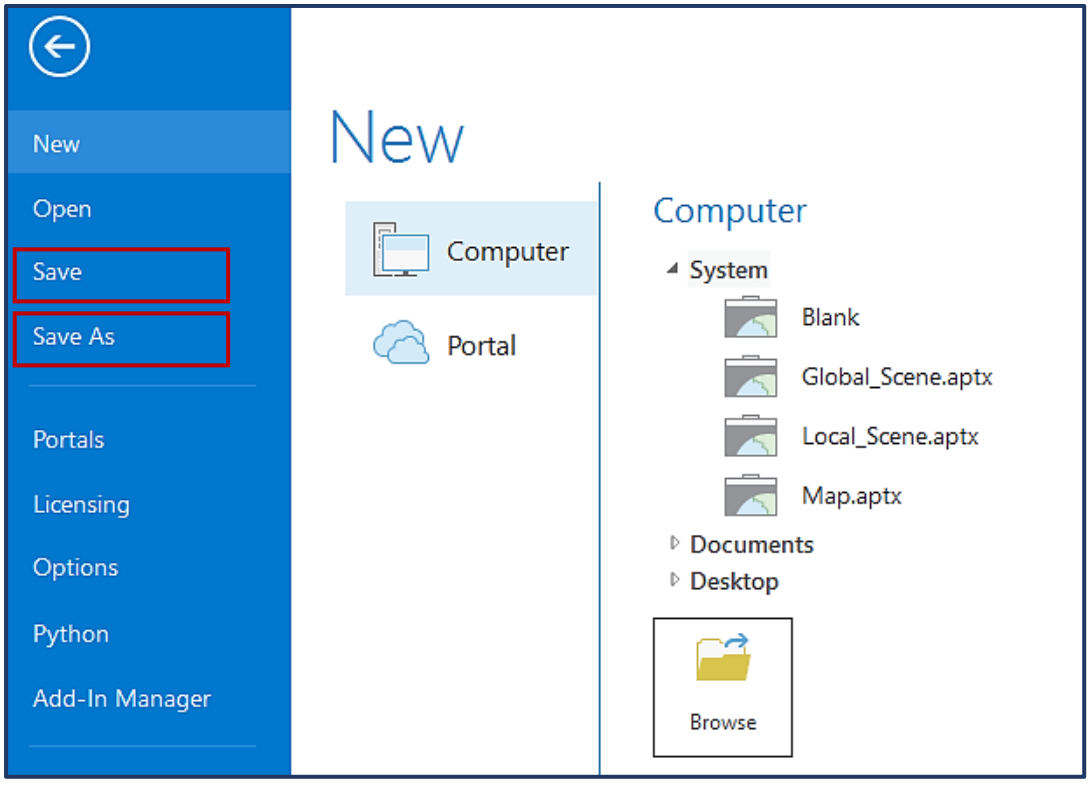
Saving a Project

When creating the project, a folder was created either to a custom location or by default in ArcGIS → Projects. Any saves will update this folder and will include the following information:

- Items stored in the project such as maps, layouts, tasks, charts, geoprocessing history, and animations.
- Connections to items stored outside the project such as folders, databases, servers, toolboxes, locators, and custom styles.
- A list of the system styles available in the project.
- Which views are open, and which view is the active view.
- Your favourite geoprocessing tools and raster functions for the project.

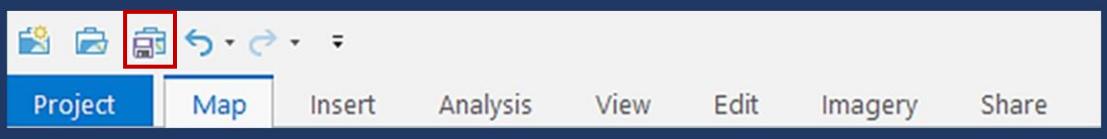
To save your current project, navigate to the **Project tab** on the ribbon.

1. Select the **Save tab** to save to the current project folder, or **Save As** to save a new project.

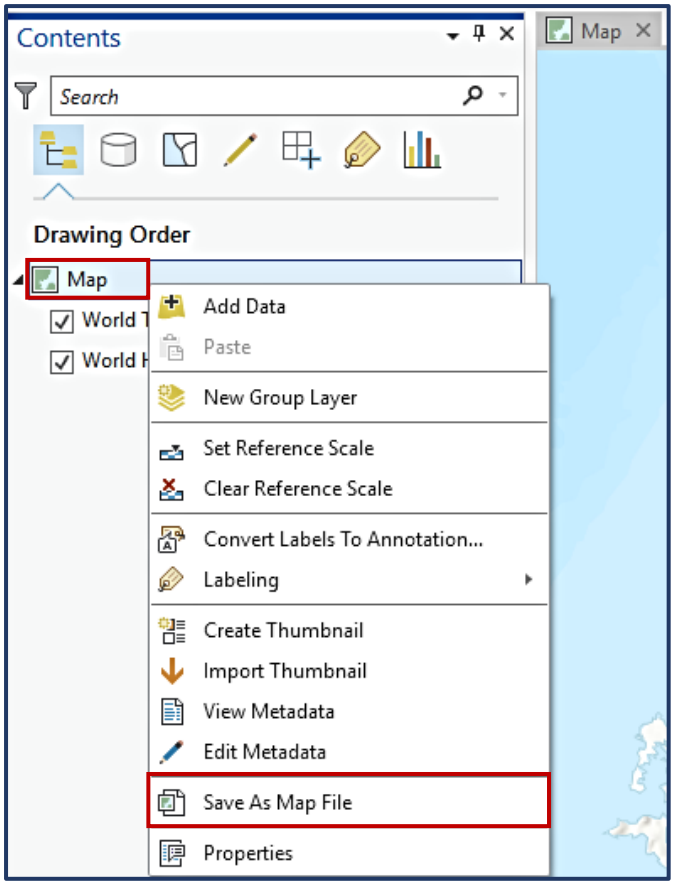


Quick save:

To save changes to the project quickly, select the **save project icon** on the quick access toolbar.



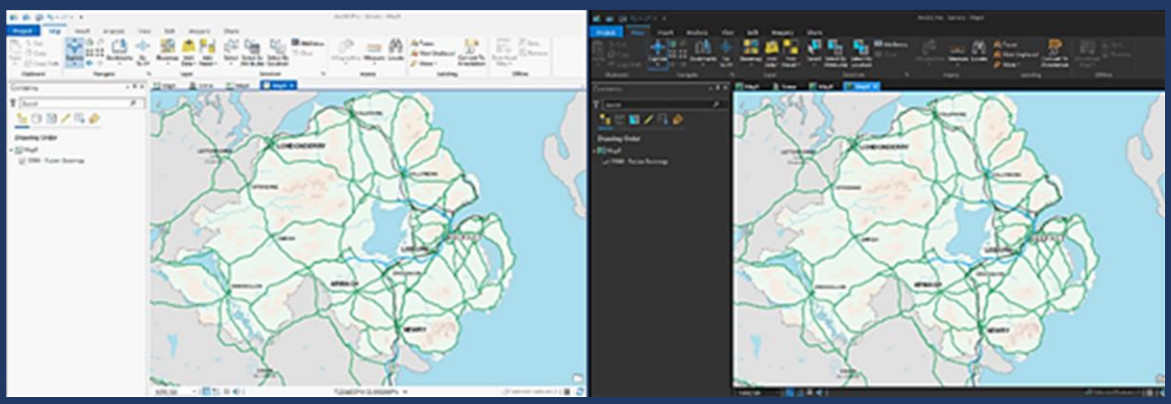
2. To save a map independent of the project; **right-click** the **Map title** in the contents pane and select **Save as map file**.



ArcPro Theme:

You can change the theme of your ArcGIS Pro from the Light theme to the Dark theme. This can be good when mapping for long periods of time, to reduce eye strain.

Navigate to the **Project tab → Options → General → Application Theme →** Drop-down menu **Dark/Light.**



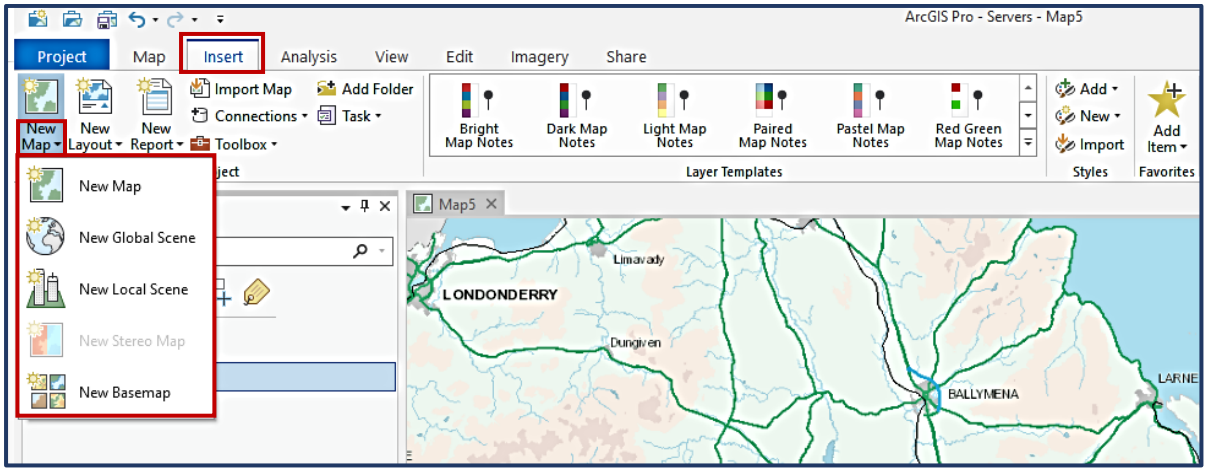
Finding and Viewing Content

Spatial NI provides two types of services accessible via the NIMA portal. These are:

- Basemaps – non editable cached maps which display OSNI data in a variety of styles and scales.
- Operational Content – Other OSNI and third party organisations data. This can be either cached raster or editable vector data.

Inserting a new map/scene:

1. To insert a New Map/Scene navigate to the **Insert tab** on the ribbon menu. Click the drop-down menu for **New Map.**

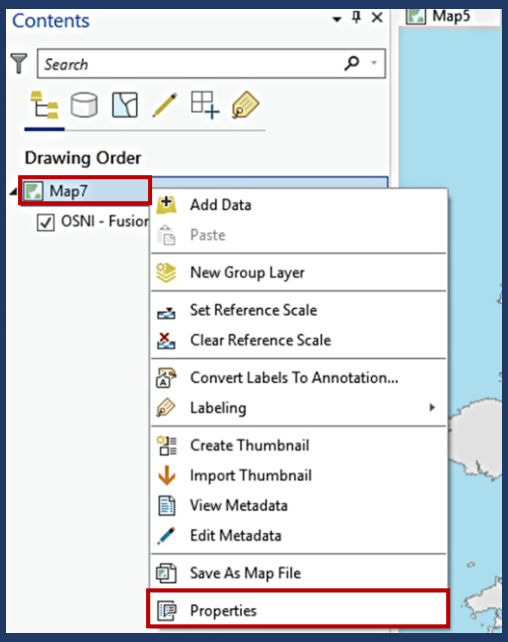


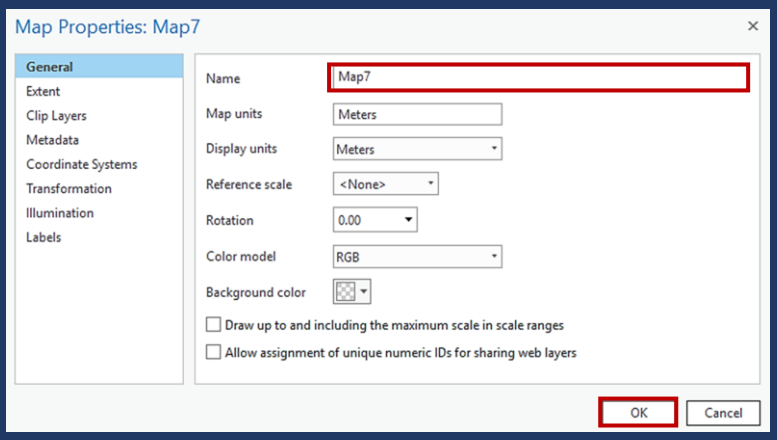
2. To add a new map file to your project, select **New Map** within this drop menu. This type of workspace is primarily used for 2D data (no z values).
3. Select **New Global Scene** to open a workspace compatible with 3D data viewable on a global scale. Equally select **New Local Scene** for 3D data within a local view, for example a countrywide scale.

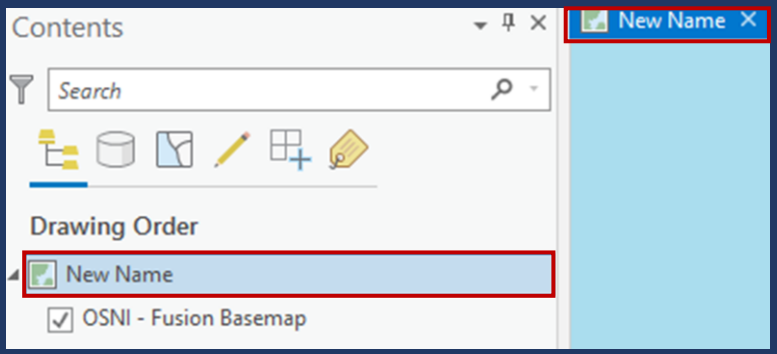
Rename Your Map:

Giving your map a descriptive name can make it easier to find appropriate content within your projects map storage folder.

Right-Click the map title within the **Content pane**, and select **Properties**.







***Quick Access**: Select the map title within the Contents pane and press F2 on the keyboard. Type the new name directly in the Contents pane.

Selecting a Spatial NI Basemap

When connected to the **Spatial NI NIMA Portal** you will have access to our basemaps. These are a collection of non-editable cached maps, which display OSNI data in a variety of styles and scales. The basemap is the lowest layer of the map and is used to give spatial context to the feature layers above.

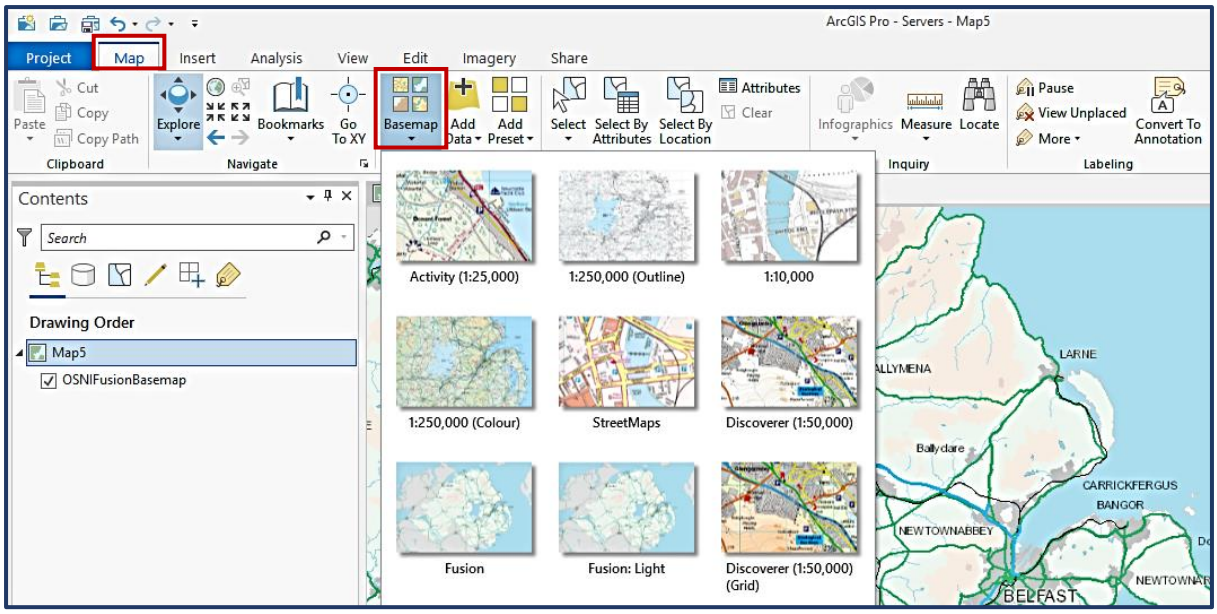
A selection of Spatial NI basemaps are available which are summarised below:

Basemap Name	Description	Cache Scales
(1:250,000) Colour	A coloured raster map of NI highlighting features such as: roads golf courses, settlements, and sites of interest.	1:550,000 - 1:120,000
(1:250,000) Outline	A black and white outline raster map of NI highlighting features such as: roads golf courses, settlements, and sites of interest.	1:550,000 - 1:120,000
1:10,000	A largescale derived raster map showing detailed information on features such as roads, fields, water and settlements.	1:20,000 - 1:5,000
Activity (1:25,000)	A series of raster maps tailored to outdoor leisure activities centred on six regions of NI (e.g. The Mournes).	1:30,000 - 1:10,000
Discoverer (1:50,000)	A mid-scale raster map giving full coverage of NI showing all roads, tourist information and relief.	1:60,000 - 1:20,000
Discoverer (1:50,000)(Grid)	A mid-scale raster map giving full coverage of NI showing all roads, tourist information and relief. This includes the Irish grid reference lines.	1:60,000 - 1:20,000
Fusion	A scalable basemap depicting detail from a NI scale to the most detailed (derived from OSNI Fusion). This includes data from Ordnance Survey Ireland.	1: 2,000,000 - 1:500
Fusion Light	A grayscale styling of the Fusion basemap.	1: 2,000,000 - 1:500
Orthophotography	High quality 3-band Ariel photography offering a detailed birds-eye view of the landscape.	1: 2,000,000 - 1:500
Streetmap	A detailed raster map showing clear street level information for towns and cities in NI.	1:20,000 - 1:5,000

*This list is continually being updated as and when new data becomes available.

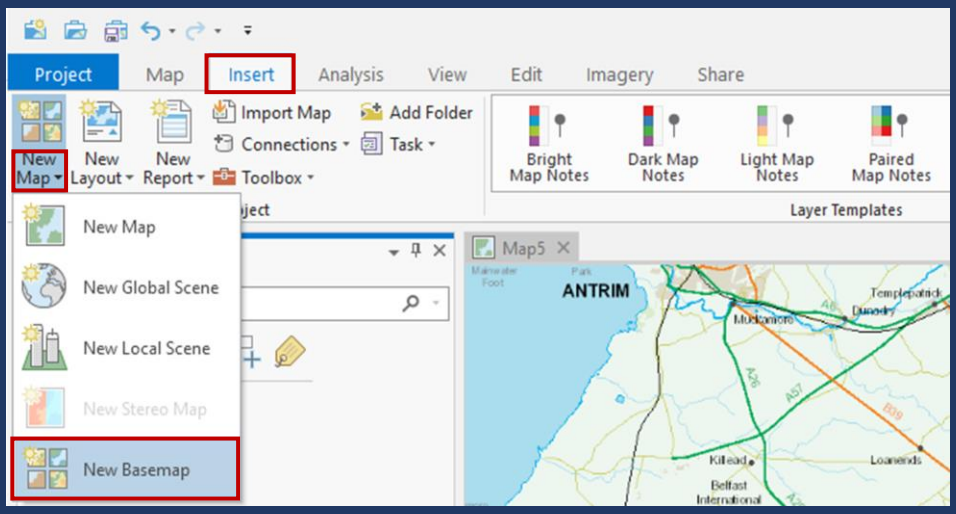
To add a Spatial NI basemap, navigate to the **Map tab** on the ribbon and select **Basemap** within the **Layer** section. A window will appear showing the selection of Basemaps available from the Spatial NI NIMA Portal.

Click on the basemap tile to replace your current basemap with the selected.



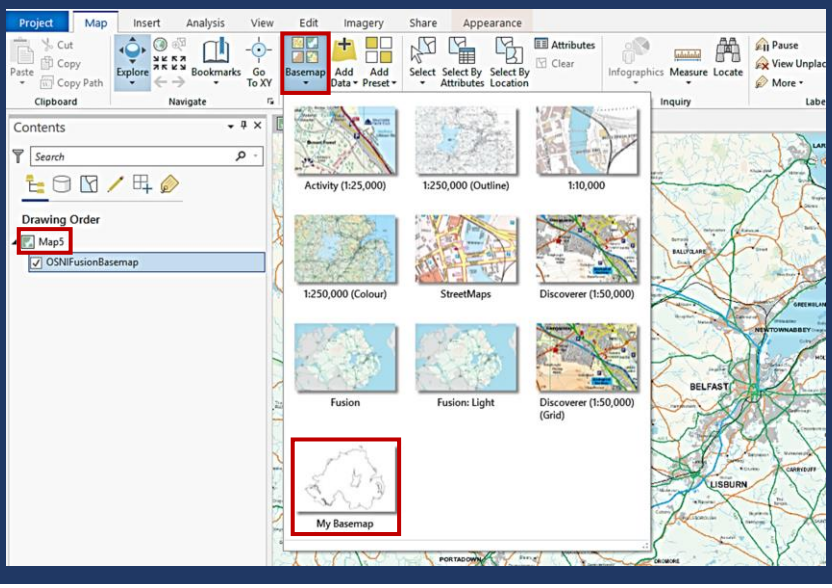
Creating your own Basemap:

1. To create a basemap using your own layer; navigate to the **Insert tab** on the ribbon. Click on the drop-down menu for **New Map** and select **New Basemap**. This will open a blank workspace.



2. **Add data** you wish to use as a basemap to this workspace.
3. **Rename** your basemap by **double left-clicking** the basemap name in the **Contents pane.**

4. **Save** the project. Navigate back to your **map** and open the basemaps menu. Your personal basemap will be available to add.



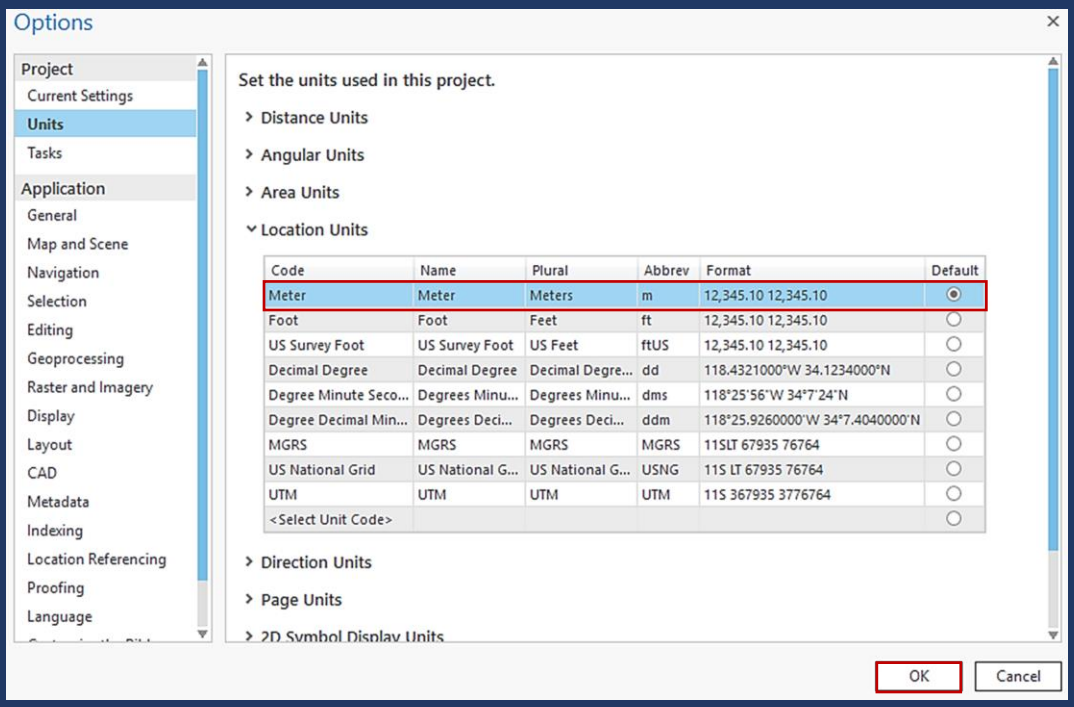
Spatial NI Operational Content

The Spatial NI NIMA Portal provides access to a range of other OSNI and third party organisations data. This content can be either cached raster or editable vector data. You can add this data on top of a basemap in your map to visualise hidden patterns and trends or complete further detailed GIS analysis.

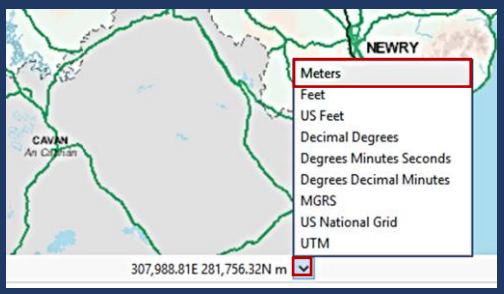
Location Units (Irish Grid):

Spatial NI's content is projected in Irish Grid. For navigation purposes it is important that the live location units displayed at the bottom of the map pane is in meters (m) East / North. By default the units are Decimal Degrees, to change the default units:

Project → Options → Units → Location Units. Click OK.



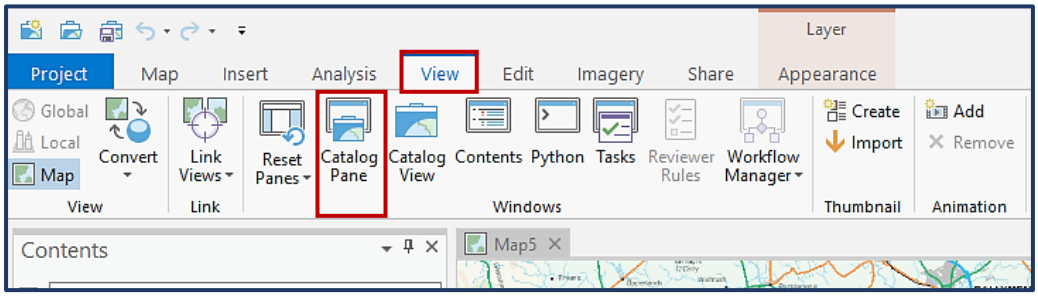
To change the location units for only the map pane displayed: At the bottom of the map pane, click the **drop-down menu** adjacent to the displayed units → Select **Meters**.



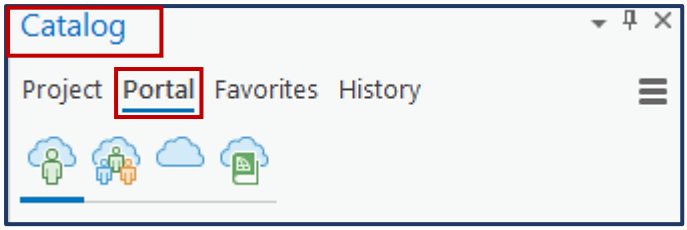
Adding Content from Spatial NI Portal

To add data, you will need your **Map,** the **Contents pane** and the **Catalog pane** displayed.

1. If your **Catalog pane** is not displayed; navigate to the **View tab** on the ribbon and select **Catalog pane** from the **Windows section**.



2. Within the **Catalog pane** select the **Portal tab**; displaying four options;



My Content: This contains content that you personally own with the connected portal.

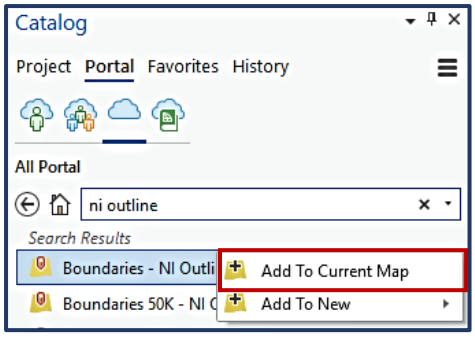
Groups: This contains content that has been shared to you via a group on the portal. All groups that you have access to will be displayed in a list, double left-click on the group that contains the content you wish to add.

All Portal: This contains content that is shared within the organisation or that is shared with everyone. To see content you will need to search for a key word (tag) relating to the layer you want to add. Within a search it will also display anything within **My Content** or **Groups**.

Living Atlas: This contains content owned and shared by Esri: This content is disabled for the Spatial NI NIMA portal.

3. To add content from the portal, within any of these tabs either; **right-click** on the desired layer and select **Add to Current Map** OR **drag and drop** the layer into the **map pane** or **contents pane**.

The feature layer will appear as the top layer in the contents list along with any symbology.



Add Data via a Group

Content has been organised into groups which any user can join upon request. The groups should be used as folders to find similar data quickly without searching through 'All Portal' for a related tag each time.

Joining a group is quick and easy:

1. **Sign into** the NIMA Portal web interface.
2. Within the **Groups tab**, navigate to **My Organisation** to see the full list of Spatial NI Groups.
3. To join the group, enter the groups page and click **Join Group**.
4. **Refresh** your portal in **ArcGIS Pro** to see the joined group(s).

Spatial NI Groups:

Group Name	Description	Want to Join?	
Basemap Gallery	Contains webmaps used within the NIMA Portal basemap gallery.	✓	✗
Environment	Contains current and historical environment feature layers, incl. NI designated sites.	✓	✗
Geology	Contains map image layers showing features of NI Geology.	✓	✗
Hydrology	Contains map image layers showing water distribution and flooding data.	✓	✗
OSNI: Elevation	Contains OSNI Terrain data.	✓	✗
OSNI: Historical	Contains historical line drawn and early digital maps of NI throughout the 20th century.	✓	✗
OSNI: Fusion	Contains dynamic feature layers derived from the OSNI Fusion basemap.	✓	✗
OSNI: Imagery	Contains the current orthophotography mosaic and the individual imagery captured by year.	✓	✗
OSNI: Location	Contains pointer services, address information and boundaries for NI.	✓	✗
OSNI: Opendata	Contains the opendata offered by OSNI, including: boundaries, raster basemaps and transport network.	✓	✗
People and Place	Contains data for social interest including: schools playparks, police stations and public areas.	✓	✗
Statistics	Contains statistical data from the NI 2011 census and deprivation maps.	✓	✗

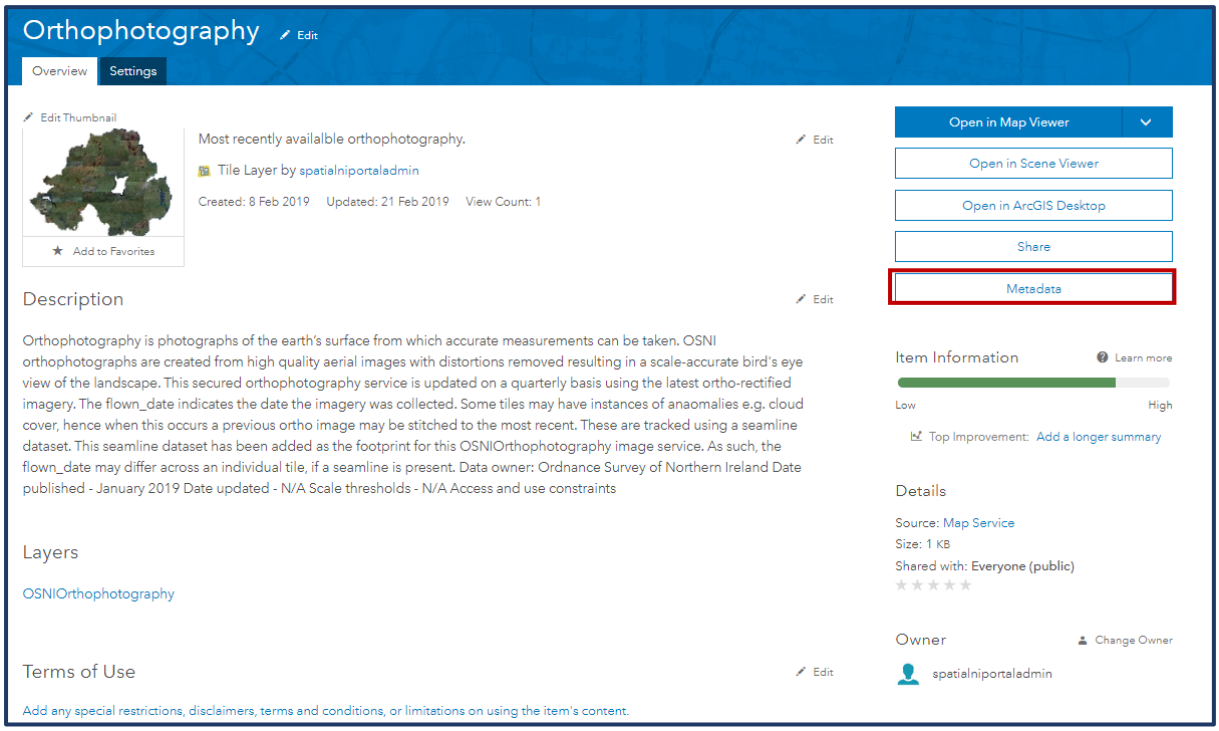
Spatial NI Metadata

Metadata provides information about mapping layers, including: owner, contact details, creation date, data origins, and legal restrictions of use.

The Spatial NI NIMA Portal uses the INSPIRE metadata standard for all hosted content.

Viewing Metadata

Metadata is available from the Spatial NI NIMA Portal web interface within the **Metadata tab** of the **Layer page**. Some of the metadata is already displayed on the Layer home page, such as: Description, Owner, Terms of Use, and Dates.



Using Spatial NI Services

Spatial NI are aware that analysis is a central feature to any GIS project. For some of our operational services, we offer you the ability to complete additional GIS functions depending on the type of service being used. These functions are explained below.

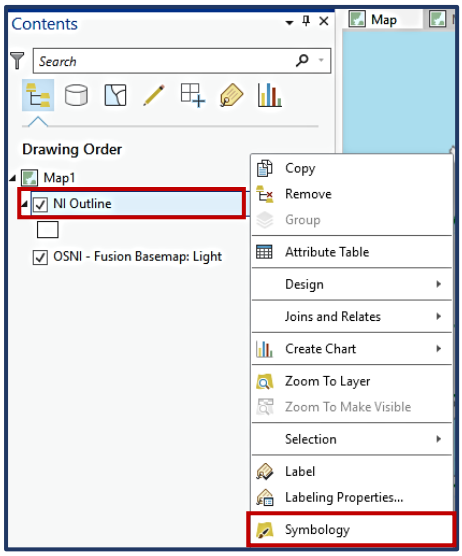
Service Type	Description	Analysis
Tile Layer	Pre-rendered map raster tiles.	You will not be able to complete any analysis using these services.
Imagery Layer	Dynamically displayed raster data.	You will be able to complete imagery based analysis on these services.
Feature Layer	A feature layer is a grouping of similar geographic features (e.g. buildings, land parcels or roads). Features can be points, lines or polygons.	You will be able to view, edit, analyse, and execute queries against features and their attributes. You will also be able to change the layers symbology.
Map Image Layer	A collection of map cartography based on vector data. Map image layers are dynamically rendered image tiles.	You will not be able to complete any analysis using these services.

Symbology

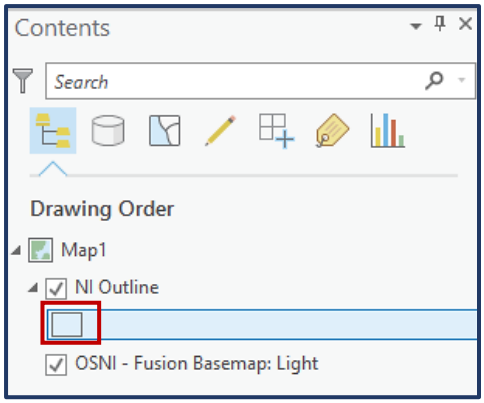
This is the symbols used to display data on a map, including: colour, size and format. Only the symbology of a feature layer is customisable. If you are using a map service or imagery layer from the portal you cannot change the symbology of any features.

To edit the symbology of a layer;

1. **Right-click** on the layer title in the contents pane. From the drop-menu select **Symbology**.



2. You can also, **left-click** on the displayed symbology (viewable when the layer is expanded within the contents pane). This will open the symbology pane.



Types of Symbology

For basic use the tab labelled **Primary Symbology** is sufficient for customising the symbol and style. Within the **Primary symbology tab** you are given a drop-down menu to select the type of symbology that will best display your data. A brief descripting of each symbology type is outline below:

- **Single symbol** - Single symbol symbology applies the same symbol to all features in a layer. This symbology is used for drawing a layer with just one category such as county boundaries.
- **Unique values** - Unique values symbolize qualitative categories of values. Examples include habitat types, planning zones, voting preferences, and soil classifications.
- **Graduated colours** - Graduated colour symbology is used to show a quantitative difference between mapped features by varying the colour of symbols. Data is classified into ranges that are each assigned a different colour from a colour scheme to represent the range.
- **Graduated symbols** - Graduated symbols are used to show a quantitative difference between mapped features by varying the size of symbols. Data is classified into ranges that are each then assigned a symbol size to represent the range.
- **Unclassed colours** - While graduated colours symbology distributes data into discrete classes with unique symbols, unclassed colours symbology distributes a colour scheme evenly across features.
- **Heat Map (point feature layers only)** - Heat map symbology draws point features as a representative surface of relative density. Use heat map symbology when many points are close together and cannot be easily distinguished.
- **Proportional symbology** - Proportional symbology is used to show relative differences in quantities among features.

- **Dot Density** (polygon feature layers only) - Dot density symbology is one way to represent quantities within polygons on a map. With dot density symbology, the data you symbolize is not classified.
- **Dictionary renderer** - Dictionary symbology is used to symbolize layers using a dictionary of symbols configured with multiple attributes. This approach is used when symbol specifications lead to many symbol permutations that would be inappropriate for unique value symbology.

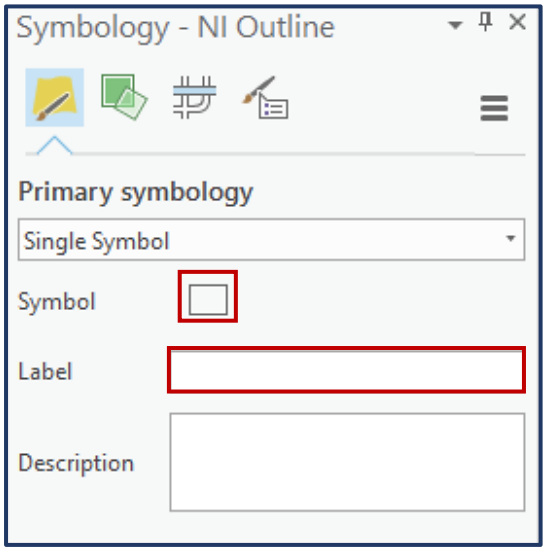
Customising Symbology

After selecting the correct symbology type, ArcGIS Pro will categorise your data to match the format. Depending on the symbology chosen a unique set of options will appear. This example will focus on **single symbol** symbology.

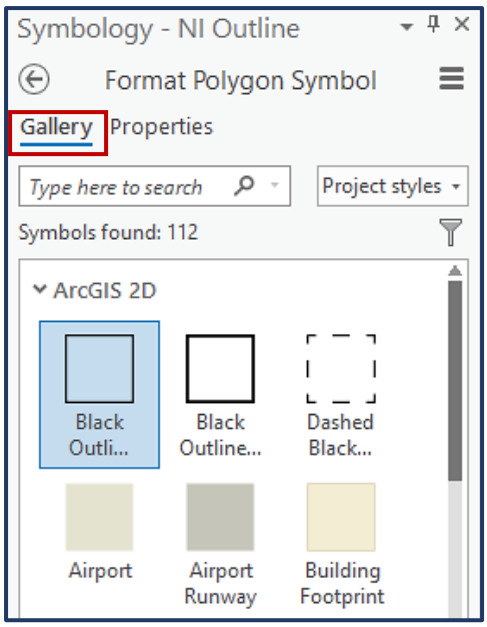
To find help on how to configure any other type of symbology, explore the ArcGIS Pro Symbology Help.

Within the symbology pane:

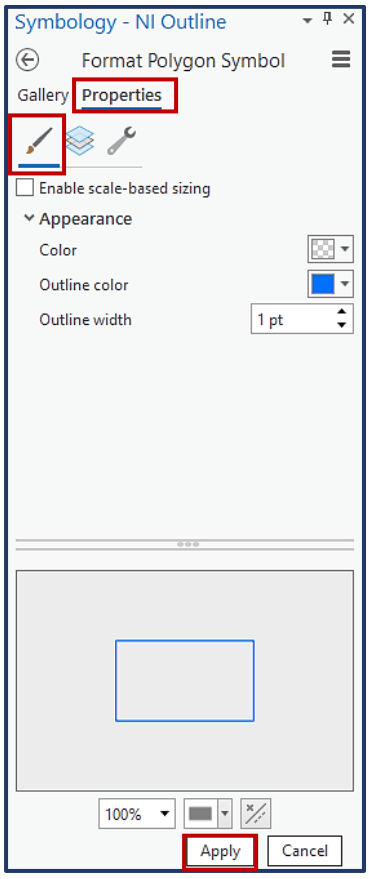
1. **Left-click** on the current displayed symbol to edit the size/colour/shape.
2. A label is not required. However, if you would like a label to appear in the contents pane next to the symbol, enter it into the label box.



3. Within the **Format Point/Polygon Symbol pane** the **Gallery tab** allows you to change the symbol itself. Default symbols are suggested for public map features such as an airport. If using 3D data there are also options for 3D symbols. As you change the symbol, the changes will automatically be updated in the map pane.



4. When your symbol has been selected you can fully customise it by selecting the **Properties tab**. Here you can change the fill and outline colour, symbol size, or insert your own symbol from file. Click **Apply** when all settings are correct to see the new symbology on the map.



***NOTE:** The options within these panes will vary depending on the type of symbology selected and whether it is a point/line/polygon (single symbol).

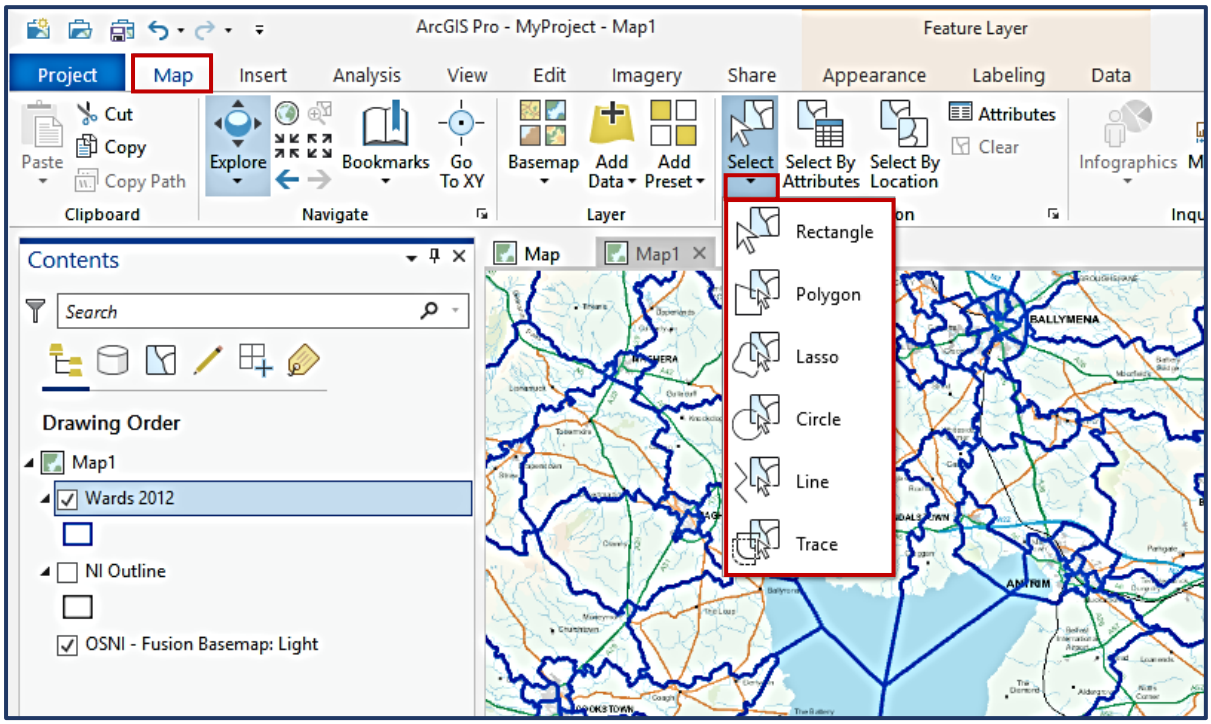
Querying

Query expressions can be used on feature layers or on layers that contain attributes to select a subset of features according to information contained in the attribute table or from a spatial relationship.

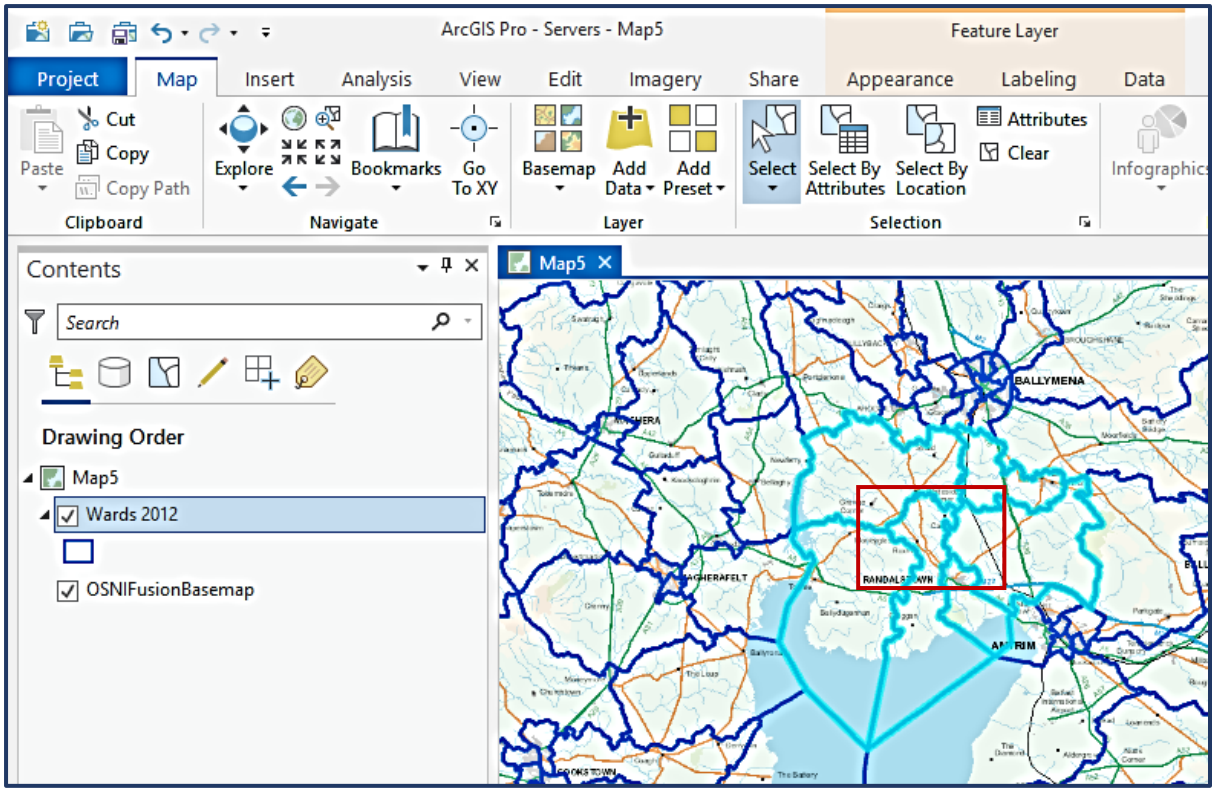
Querying data can be a useful analysis tool as it can focus your target area by isolating records.

Selecting Manually

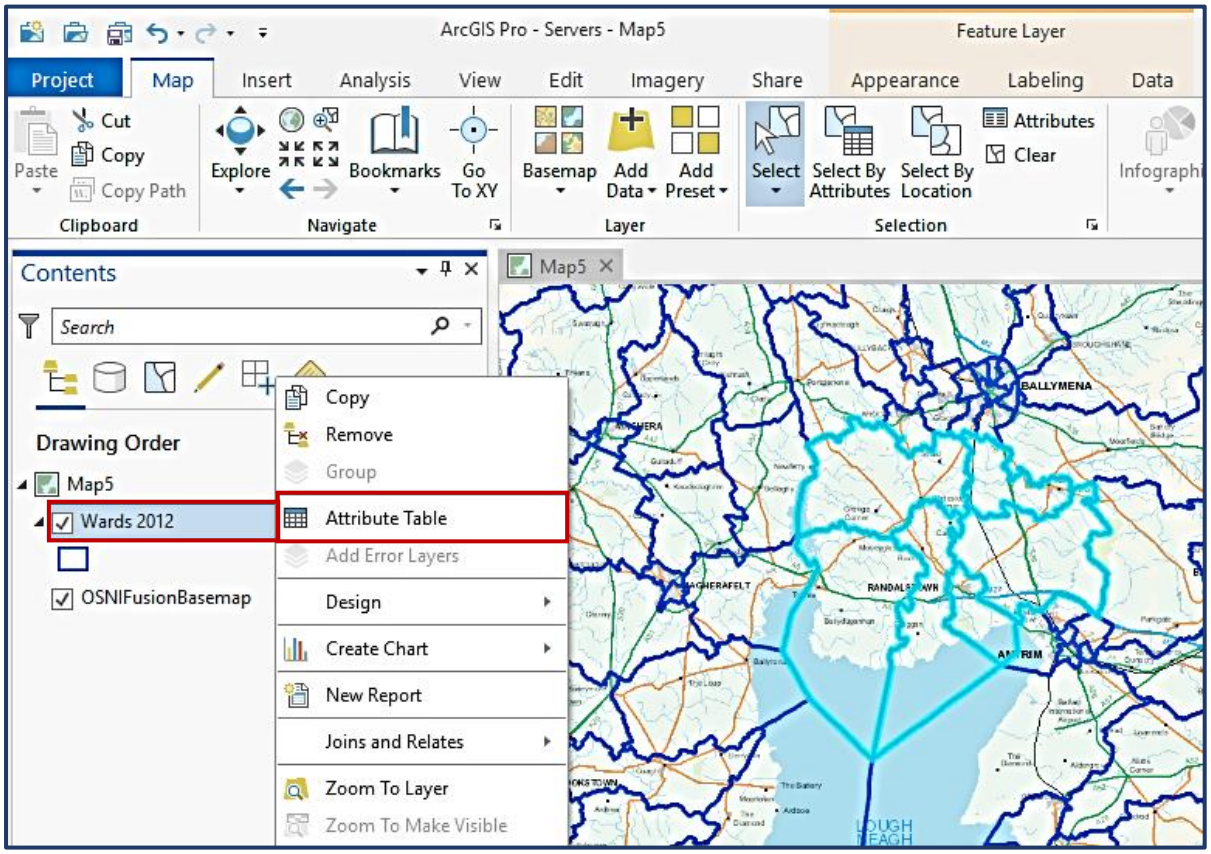
1. Navigate to the **Map tab** on the ribbon.
2. Within the **selection section**, click the **Select drop-down menu**. This allows you to manually select features by drawing on the map.



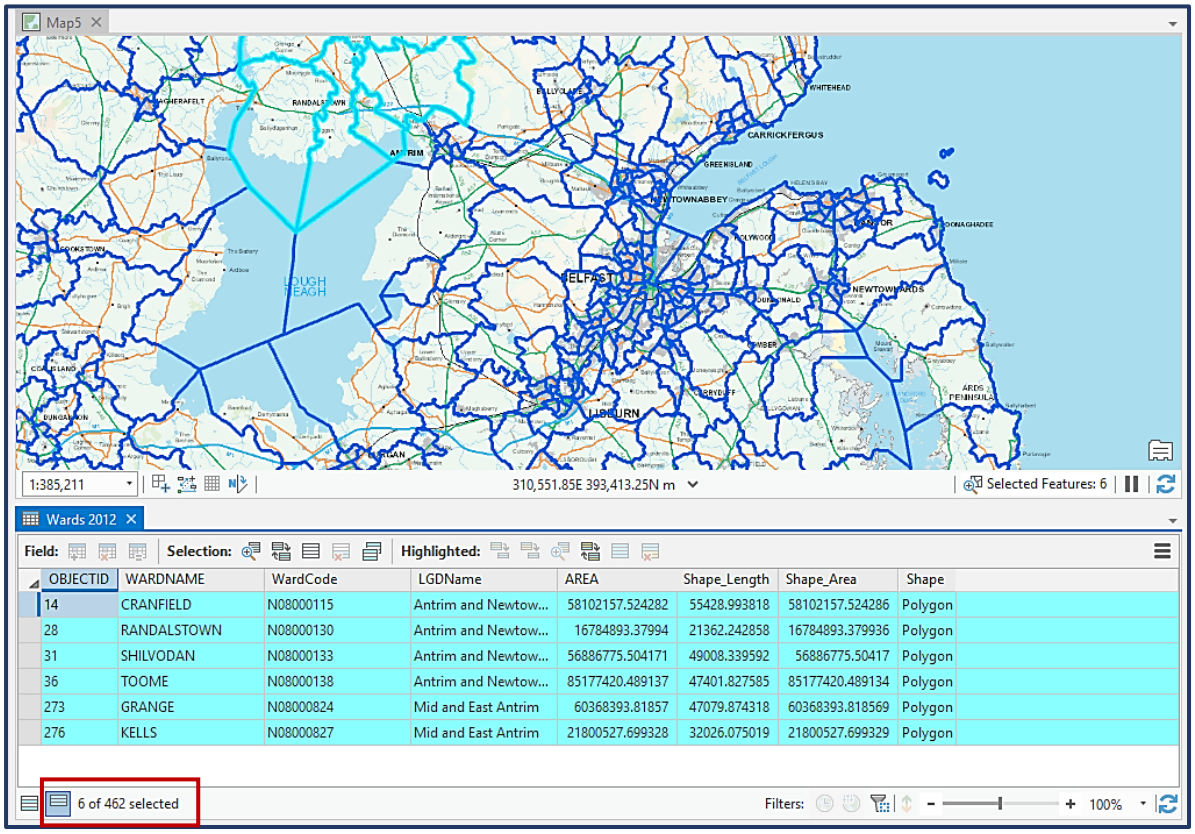
3. Choose the type of selection, and draw this shape on the map. **Left-click and drag** to enclose the targeted area. All the features within this area or that intersect with the selection boundary will be selected. This is indicated by a colour change to the features symbols.



4. You can then view the attributes of the selected features within the attribute table. To view the selected features; **Right-click** on the **feature layer** in the contents pane and select **Attribute table**.

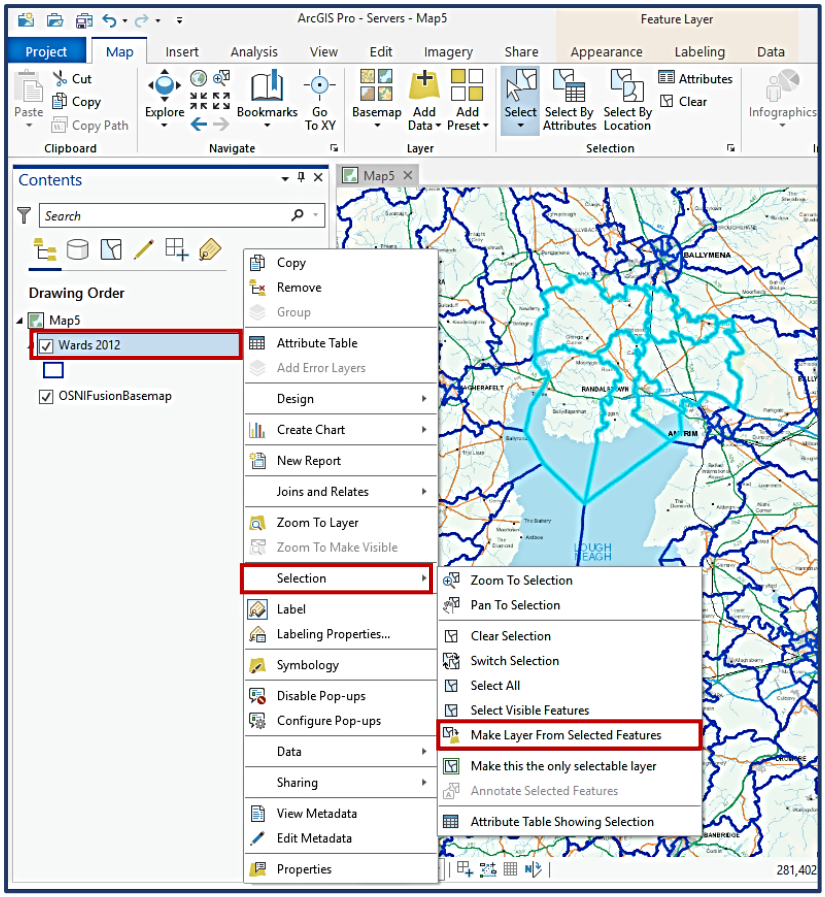


5. The bottom left corner of the attribute table shows the number of selected attributes as part of the total. Click the highlighted symbol to only display the selected attributes.



OBJECTID	WARDNAME	WardCode	LGDName	AREA	Shape_Length	Shape_Area	Shape
14	CRANFIELD	N08000115	Antrim and Newtow...	58102157.524282	55428.993818	58102157.524286	Polygon
28	RANDALSTOWN	N08000130	Antrim and Newtow...	16784893.37994	21362.242858	16784893.379936	Polygon
31	SHILVODAN	N08000133	Antrim and Newtow...	56886775.504171	49008.339592	56886775.50417	Polygon
36	TOOME	N08000138	Antrim and Newtow...	85177420.489137	47401.827585	85177420.489134	Polygon
273	GRANGE	N08000824	Mid and East Antrim	60368393.81857	47079.874318	60368393.818569	Polygon
276	KELLS	N08000827	Mid and East Antrim	21800527.699328	32026.075019	21800527.699329	Polygon

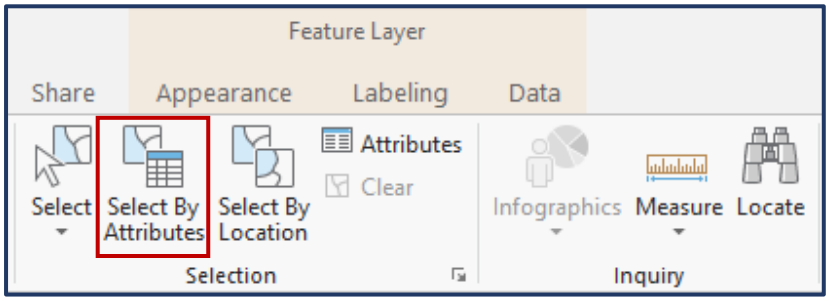
6. Further options are available from the **Selection menu**, **Right-click** the feature layer within the contents pane, and select **Selection**. The highlighted option allows you to create a new layer containing only the selected features, including the content within the attribute table.

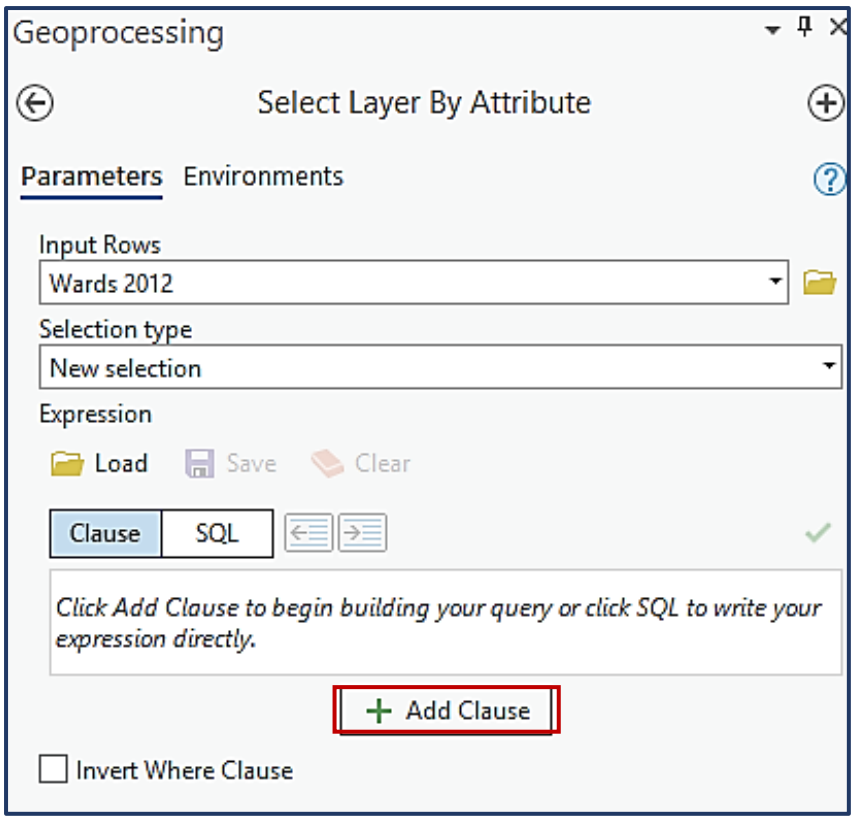


Select by Attributes

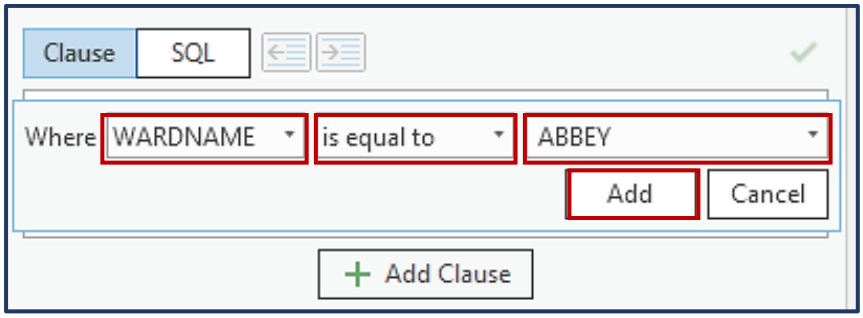
Select by Attributes allows you to select features based on an expression of desired parameters.

1. Click **Select by Attributes** from the **Selection** menu in the **Map ribbon tab**. A new pane will open, titled Geoprocessing.





2. Within the **Parameters tab**, check the **Input Rows** is set to the correct layer and **Selection Type** is also correct. To build an expression click **Add Clause**. An expression is a good way to isolate features with similar data or for data between certain threshold values. Example expression:



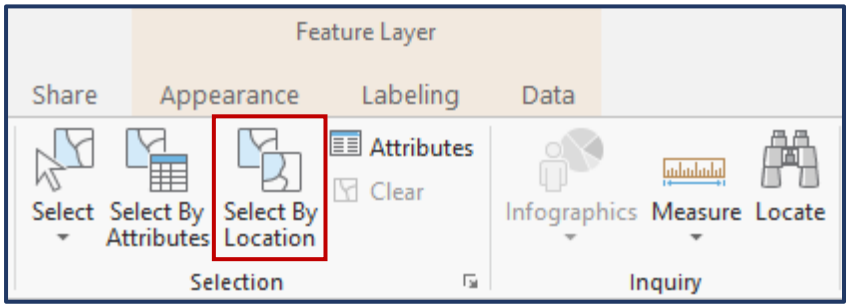
This expression will select all attributes with ‘ABBEY’ within the ‘WARDNAME’ field. This could be combined with another expression to refine the search further.

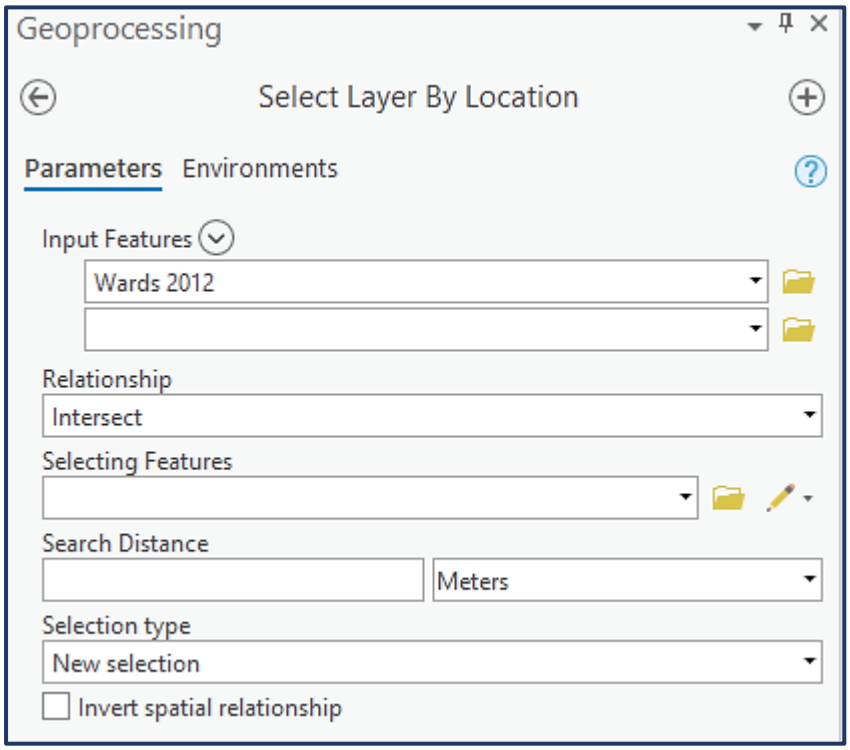
3. Click **Add**, then **Run** when expressions are completed. If your expression has run correctly you will see the successful completion notice at the bottom of the pane, and the results will be displayed on the map.

Select by Location

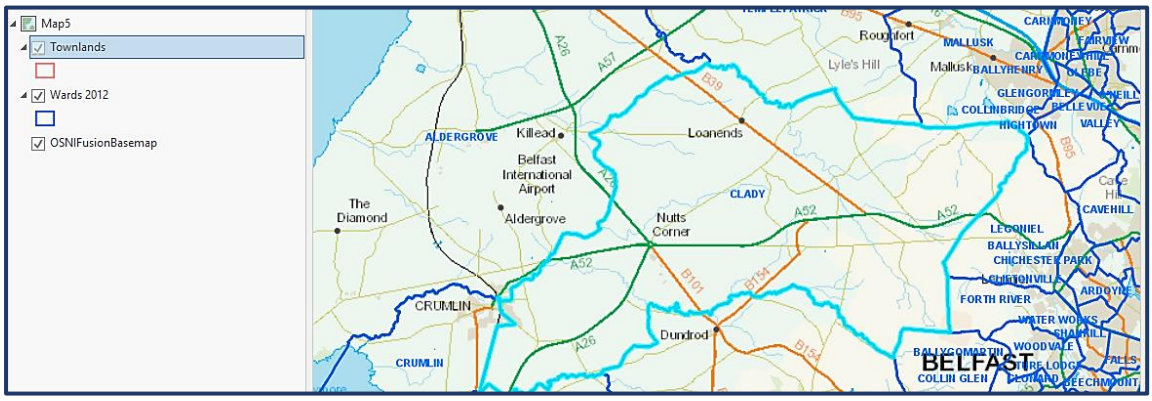
The **Select by Location** tool lets you select features based on their location relative to features in another layer. To use this tool you need at least two feature layers.

1. Click **Select by Location** from the **Selection** menu in the **Map ribbon tab**. A new pane will open, titled Geoprocessing.

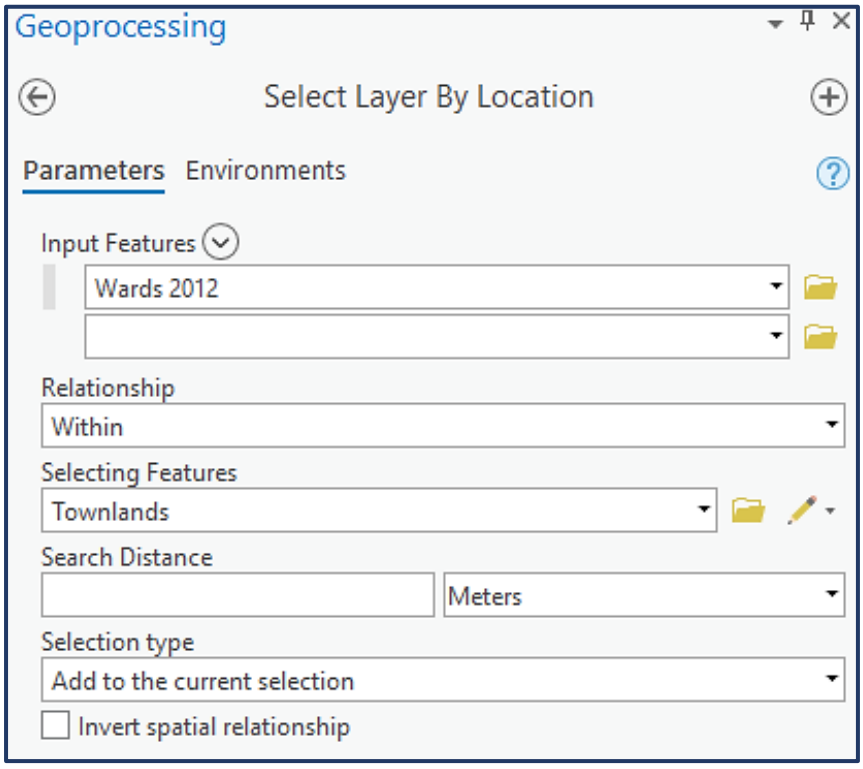




2. For example, I have selected a ward and want to know the names of all the townlands that are completely within this ward boundary.

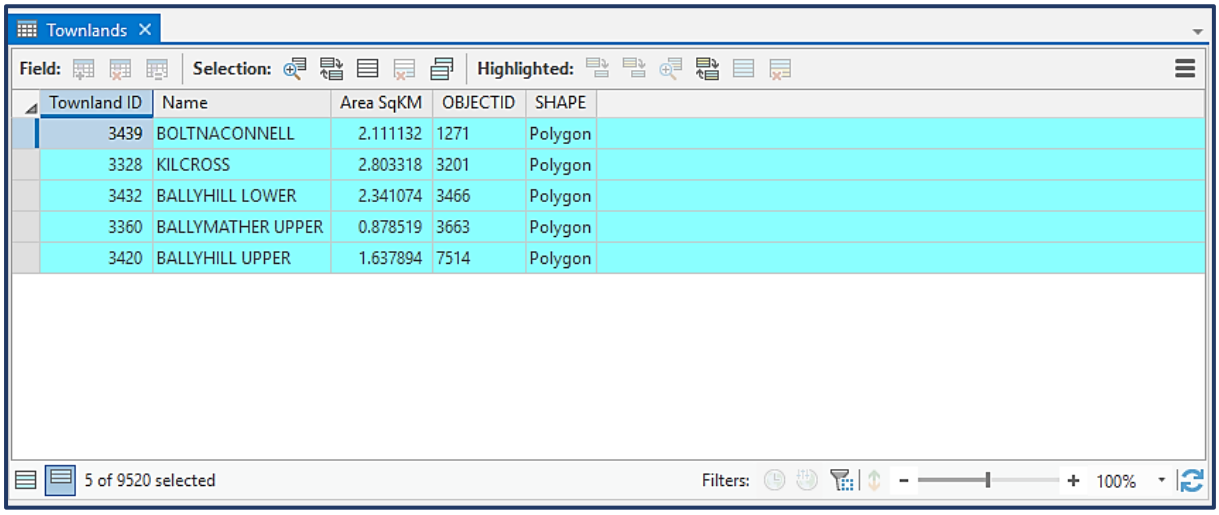


The **Select by Location pane** would be configured as follows:



3. Within the townlands **attribute table** I am able to see that five records have been selected. These are the townlands that are completely within the selected ward boundary.

This example can be applied to many types of datasets. Another example would be finding an amount of data points within a boundary.



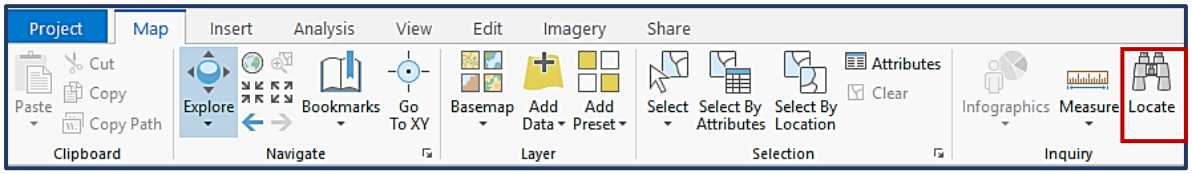
Selected attributes can be exported to a new layer.

1. Right-click the layer that has selected attributes within the Contents pane. Hover over **Selection→**, then click **Make Layer From Selected Features**.
2. A new layer will appear in the Contents pane. This can be renamed appropriately.

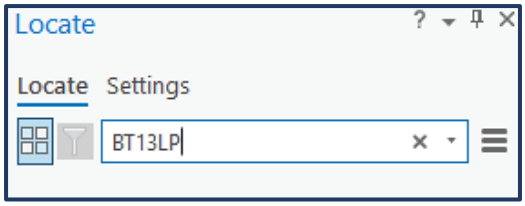
Locate

Locate is a navigation tool, used for finding specific addresses within the map area. The locate tool is linked to the geolocator of your connected portal. By default this is set to Esri's x,y geolocator. However, when signed into the NIMA Portal the locate tool will use Spatial NI's customer Pointer locator.

1. To search an address, Navigate to the **Map tab** on the ribbon and select **Locate**.



2. Enter a location name or Northern Irish postcode into the **search bar** of the **Locate pane**.

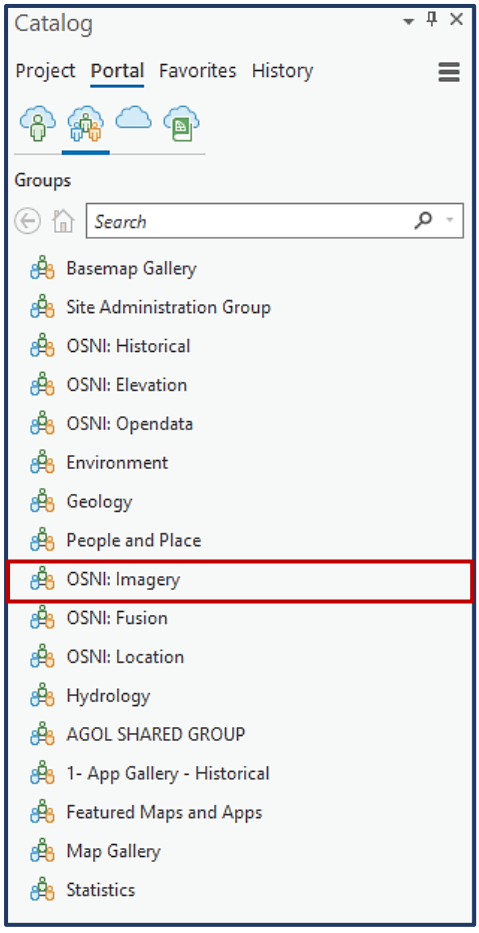


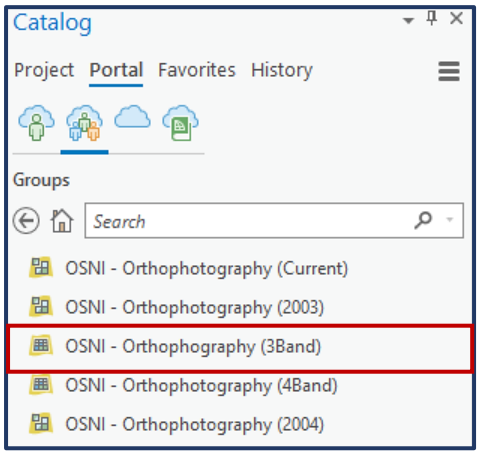
3 Band Image Analysis

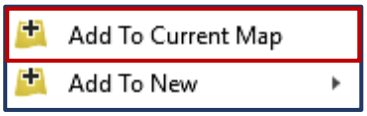
'OSNI - Orthophotography (3 Band)' is a dynamic service derived from all the available orthophotography, with the capability to query.

The orthophotography is structured with seamlines which includes information for the year and specific date that a single image was taken. To query this information in ArcGIS Pro:

1. Add the image layer 'OSNI - Orthophotography (3 Band)' from the NIMA Portal. This is located within the group 'OSNI: Imagery'. Right-click and select Add to Map. See page 8 for connecting to the NIMA Portal.



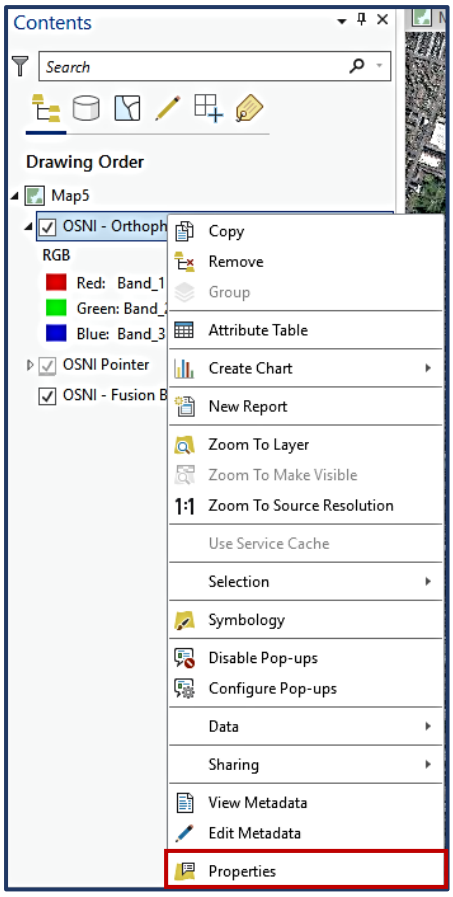




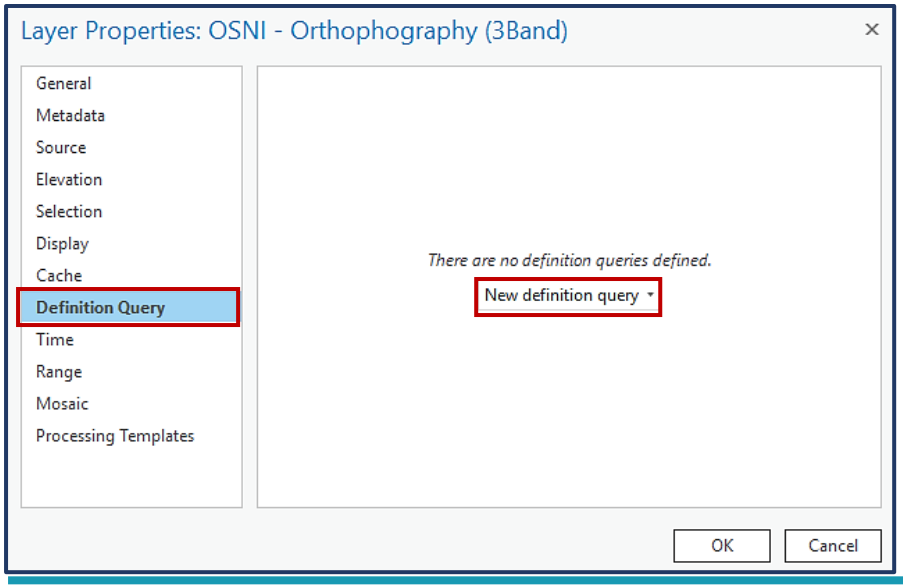
***NOTE:** To view this layer the map must be at **1:20,000 scale** or below.

To query this layer you can either add a **definition query** or **select by attributes**.

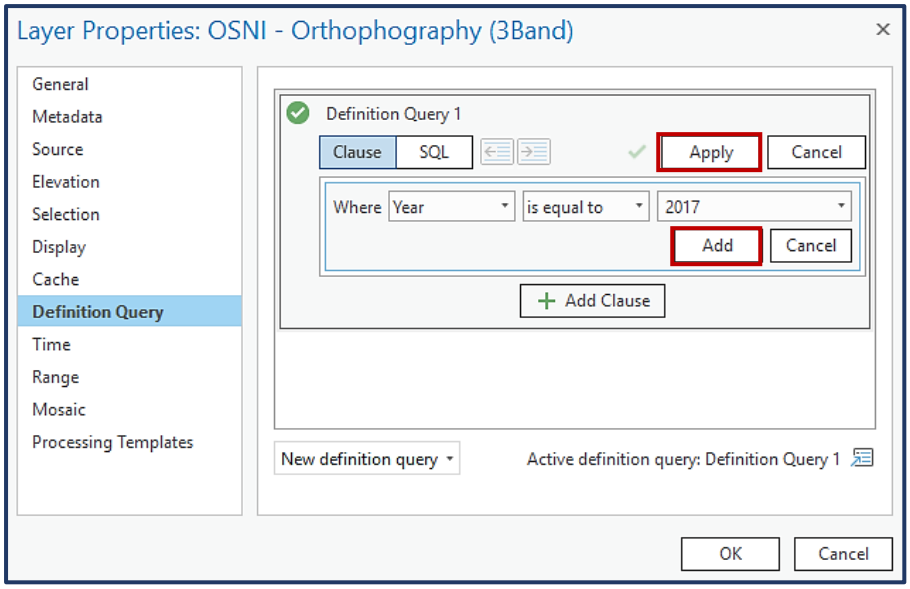
2. Definition query – This will clip the orthophotography images that identify with the query parameters. The images can be queried against flight date or year. **Right-click** the orthophotography (3Band) in the **Contents pane**. Select **Properties**.



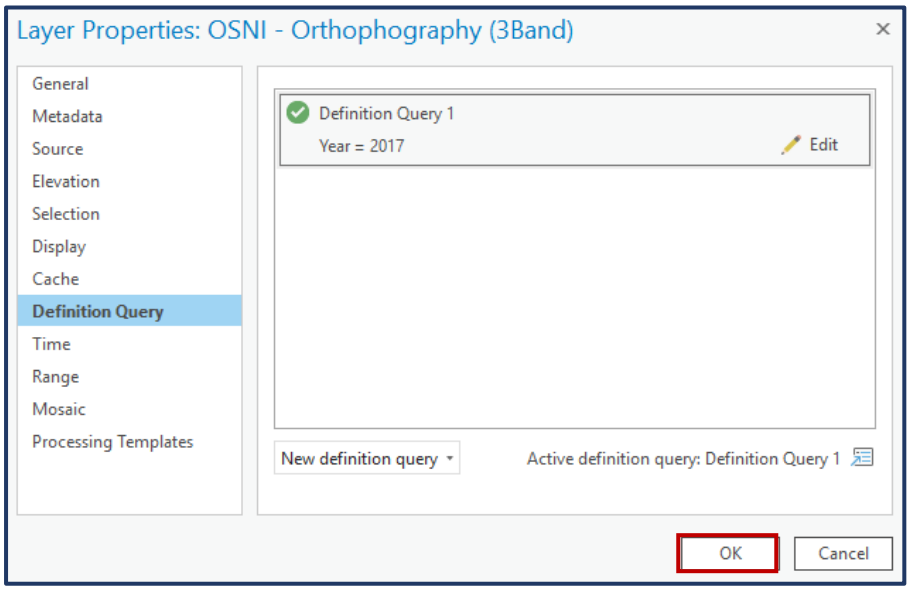
3. Select the **Definition Query tab**, then click **New definition query**.



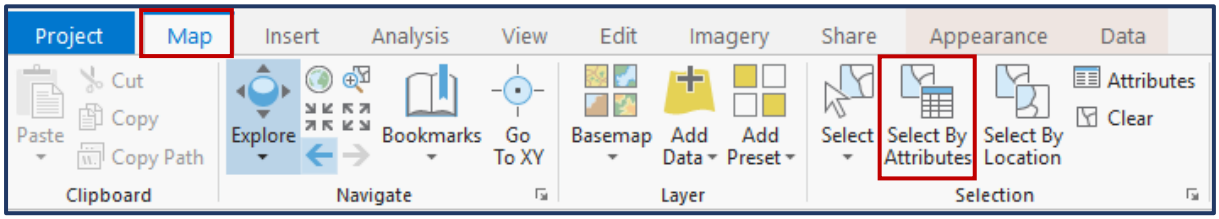
4. Write your query expression within the drop-menus, click **Add**, then either add another clause or click **Apply**.



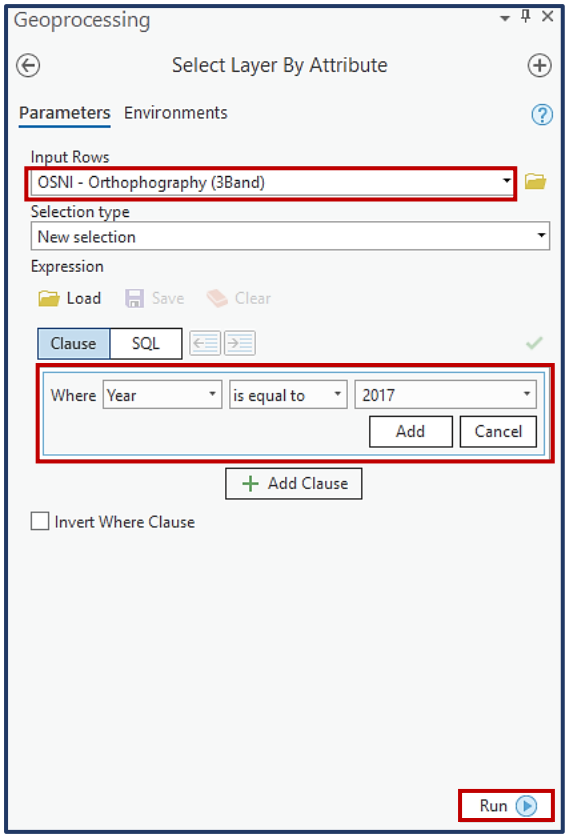
5. Click **OK** to finish. The query will run automatically and display only the images that match the definition query. These records will also be the only ones shown within the attribute table.



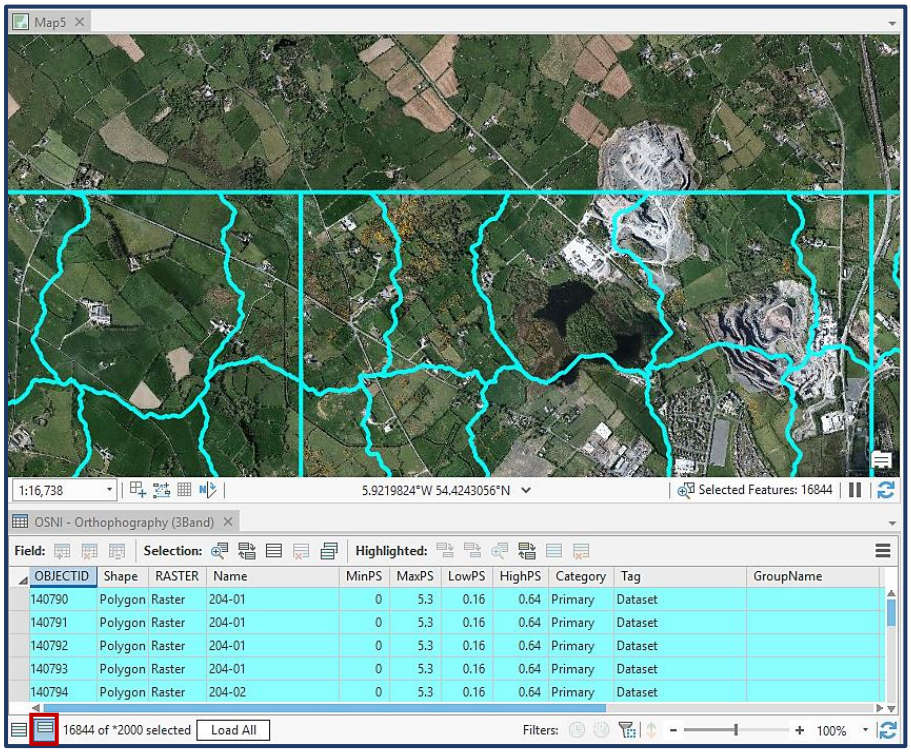
6. Select by Attributes – This will isolate the records that match the query expression within the attribute table and highlight them on the map. Click **Select by Attributes** within the **Map tab**.



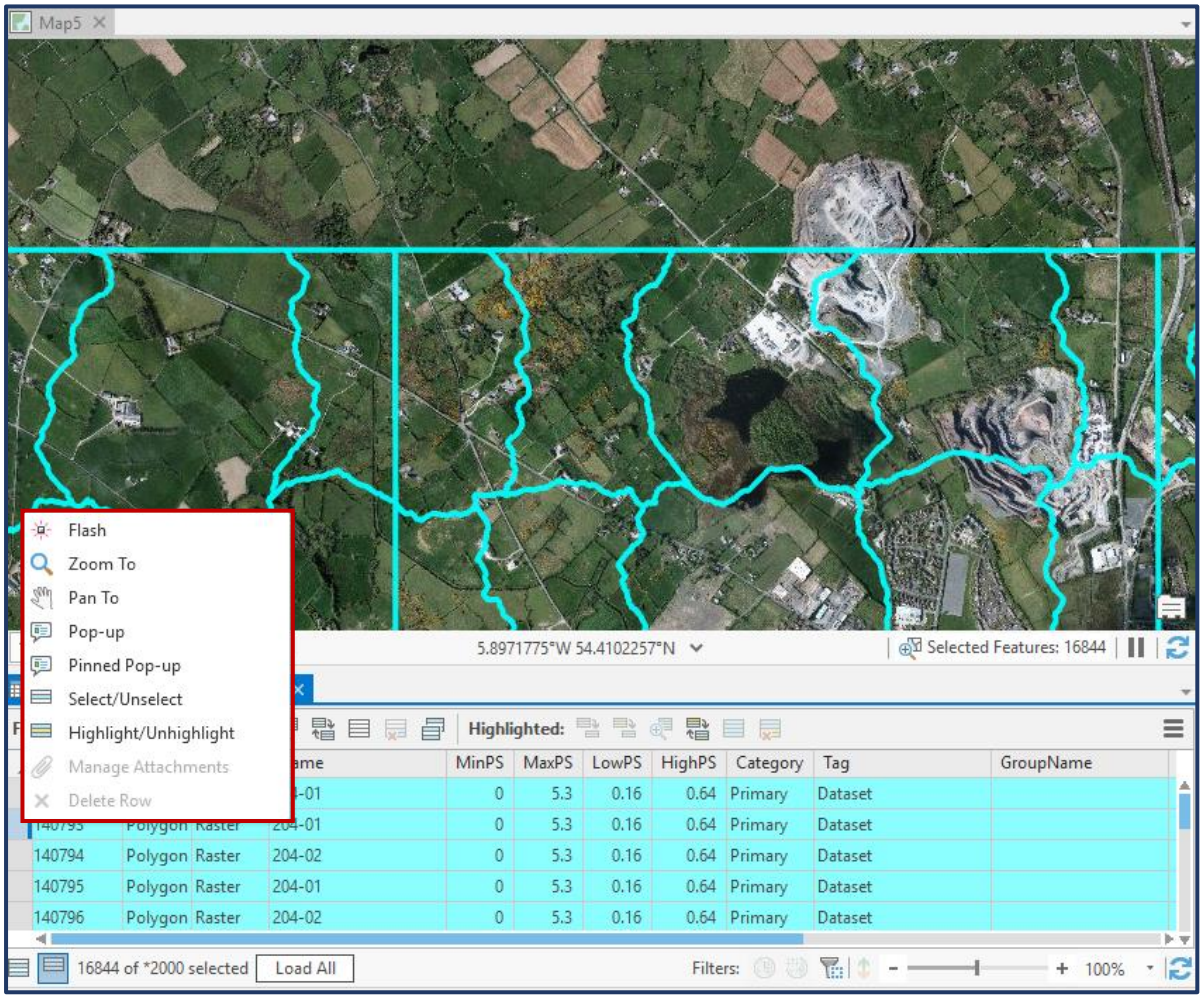
7. Within the **Geoprocessing pane**, select OSNI Orthophotography (3Band) as the **Input row**. **Add** an appropriate expression for the Clause and click **Run**.



8. **Right-click** on the layer within the Contents pane and select the **Attribute Table.** Show selected records. Records matching the expression will be highlighted.



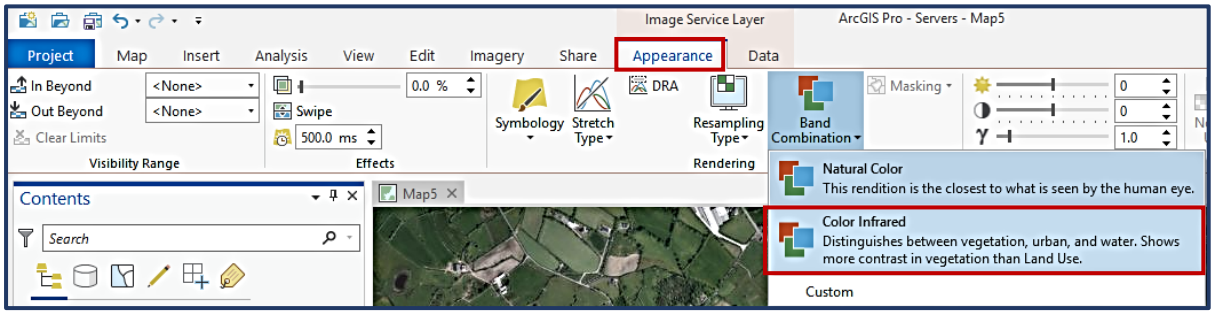
9. **Right-click** the box to the left of the record you are interested in viewing. From here you can **Pan To** the specific image and select a **Pop-up** to view the information about the image in a pop-up window.



4 Band Image Analysis

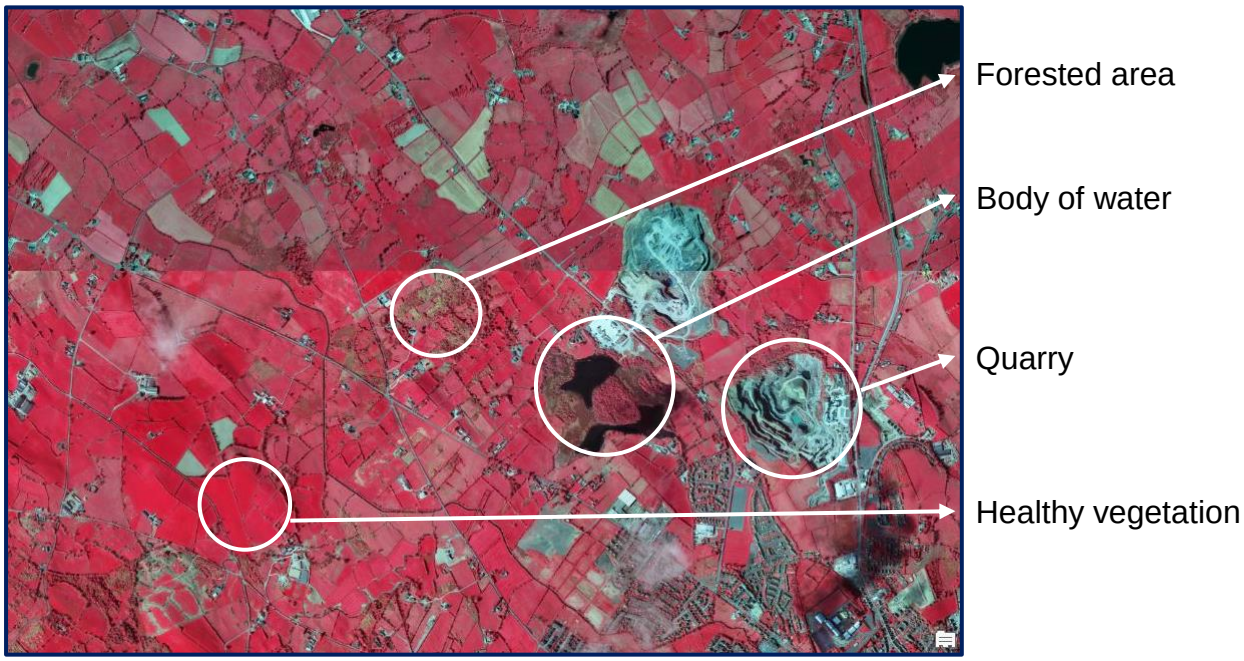
Similar to the 3Band orthophotography layer, OSNI – Orthophotography (4Band) is a service derived from all the available 4Band orthophotography, which can be queried. To query this layer when added to ArcGIS Pro follow the same steps as the 3 Band Image Analysis. 4Band ortho-photos are multispectral images that can show the near infrared band, with the added ability to run analysis, such as Normalised Difference Vegetation Index (NDVI).

1. To view the orthophotography infrared bands, Navigate to the **Appearance tab** within the **Image service layer** (this only appears when the image service is selected in the Contents pane). Click the drop-down menu **Band Combination**, and select **Colour Infrared**.



2. The Infrared band can distinguish between healthy and unhealthy vegetation, urban areas, crop types, bodies of water and forested areas.

*NOTE: An unsupervised classification can be used to easily separate these categories. Find out more.



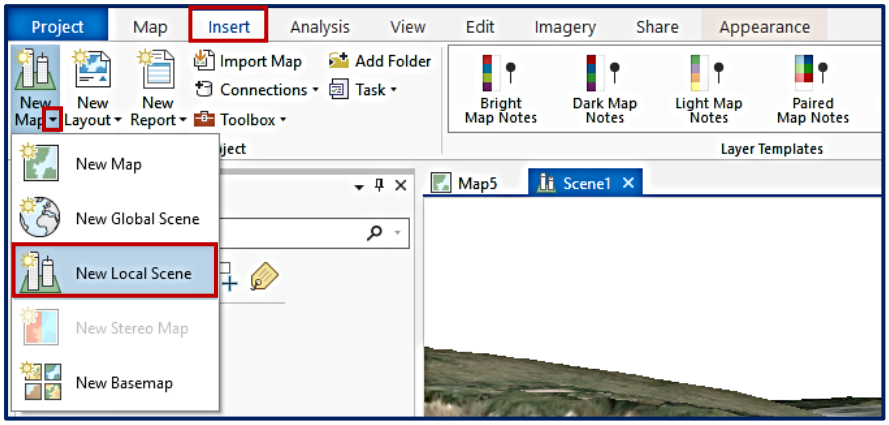
3D Analysis

Spatial NI have developed a terrain service for Northern Ireland. This shows the elevation of the bare Earth without structures, such as buildings. The 'OSNI Terrain' layer is a 1m resolution surface which has been derived from the enhanced 60m DTM.

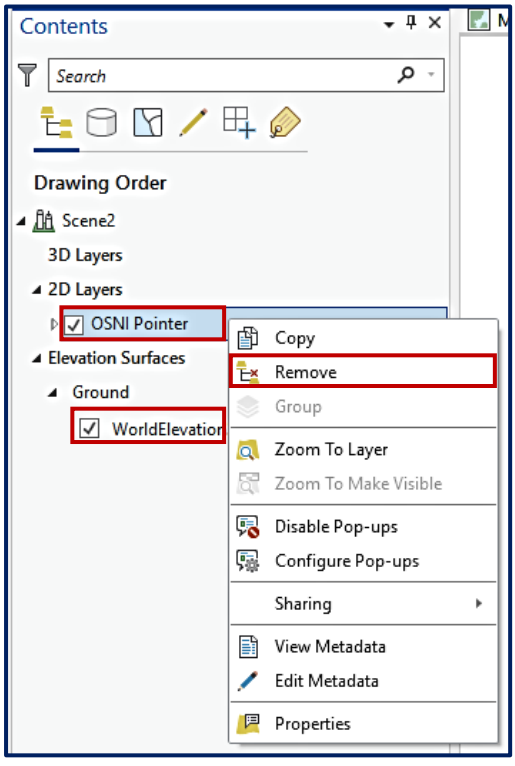
The terrain layer only contains elevation data, to add context an imagery layer will need to be draped over the terrain. This can be done using an ArcGIS Pro scene.

Configuring 3D Terrain

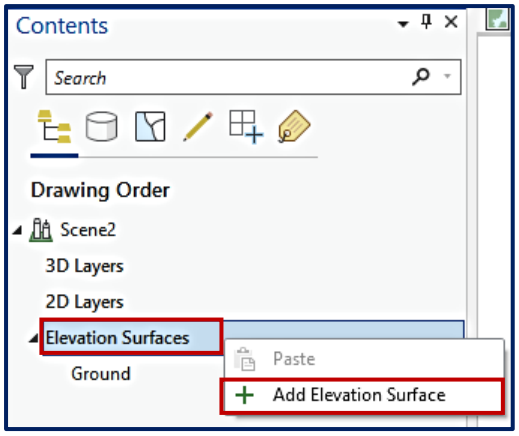
1. Insert a New Local Scene to begin building a 3D map. Click the **drop-down menu** for **New Map** within the **Insert tab**.



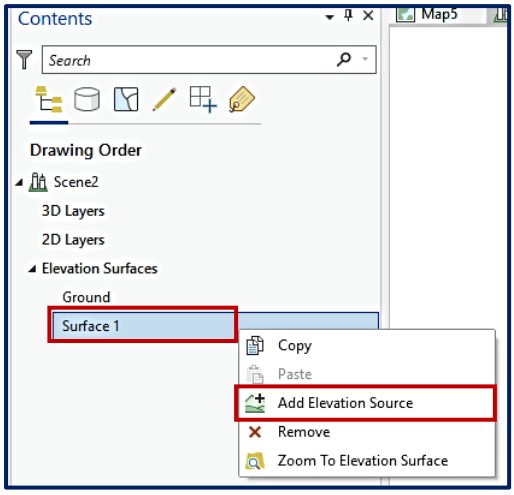
2. By default the scene will include the default basemap in 2D Layers and will set the ground as WorldElevation3D/Terrain3D. Remove both of these layers from the scene. **Right-click** the **layer title** in the Contents pane and click **Remove**.



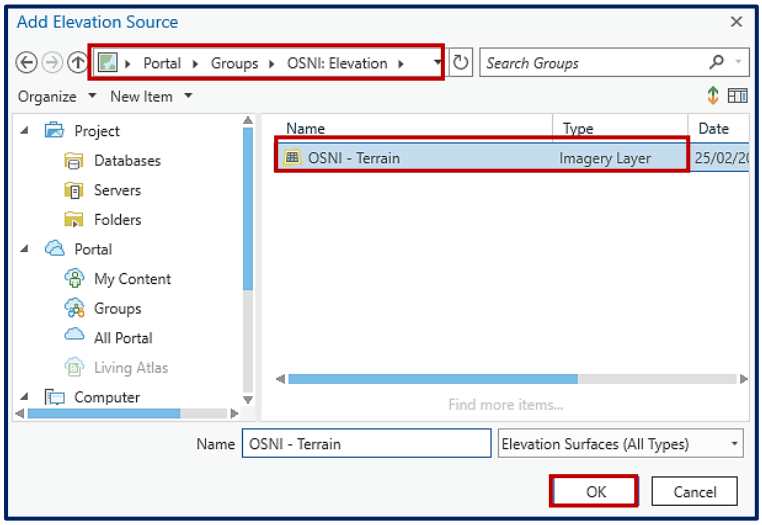
3. To add the OSNI terrain, a new surface needs to be added. **Right-click** Elevation Surfaces in the **Contents pane** and select **Add Elevation Surface**.



4. **Right-click** Surface 1 within the **Contents pane** and select **Add Elevation Source**.



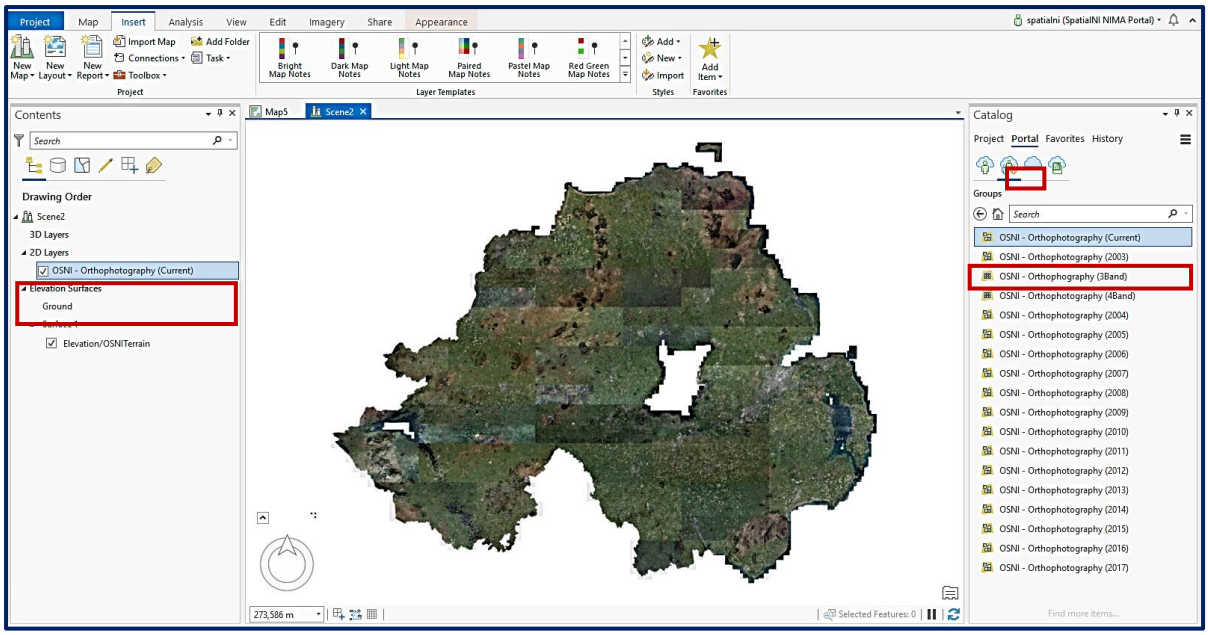
5. Make sure you are connected to the **NIMA portal**. A pop-up window will allow you to search the portal to find the **OSNI Terrain** imagery layer, which is held in the 'OSNI: Elevation' group. When selected click **OK**.



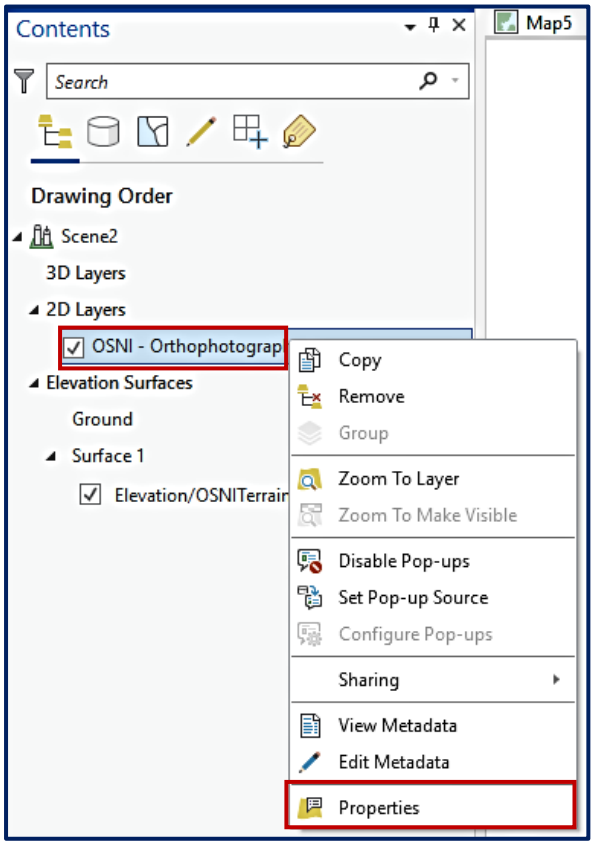
Creating a Scene

The OSNI Terrain is now set as Surface 1 in the Contents pane. At this stage nothing will appear in the map pane. Add imagery to complete your 3D map.

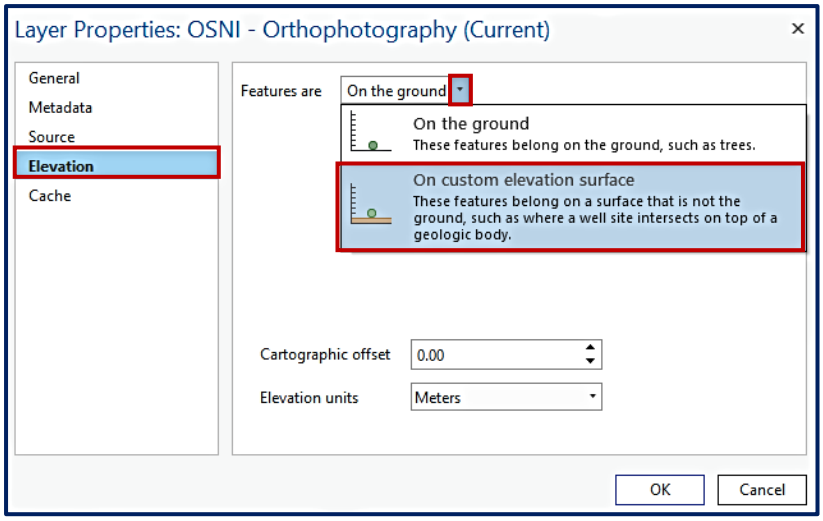
1. **Add** the **OSNI Orthophotography** from the NIMA portal via the **Catalog pane**.



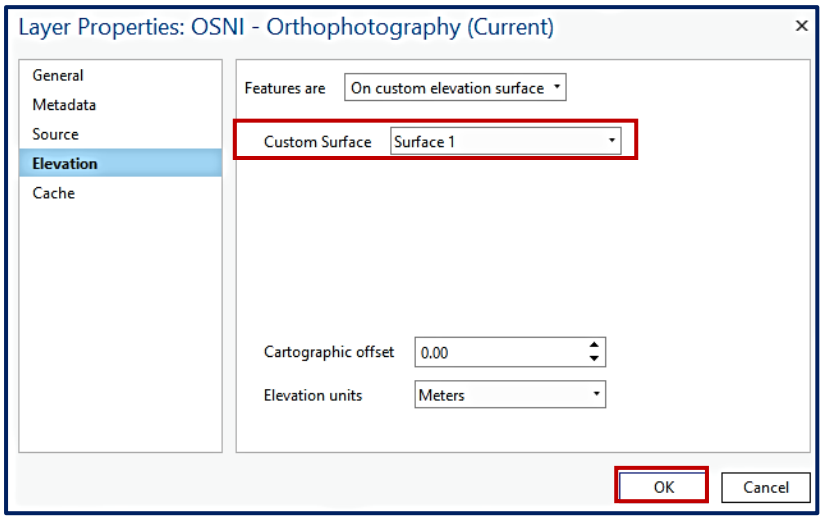
2. To drape the orthophotography over the terrain you need to set the layers ground source to be the OSNI Terrain. Right-click the orthophotography layer title in the **Content pane** and select **Properties**.



3. Within the **Properties window**, navigate to the **Elevation tab** and click the **'Features are'** drop-down menu. Select **On Custom Elevation Surface**.



4. Set **Custom Surface** to **Surface 1**, which contains the OSNI Terrain layer. Click **OK**.



5. Zoom in to a scale below 1:20,000 to activate the terrain.

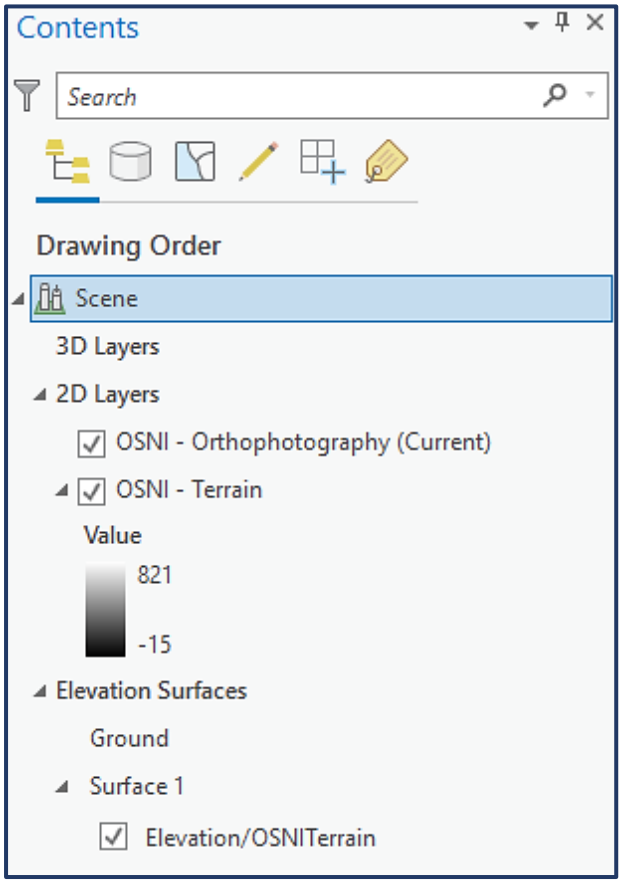
***NOTE:** Because these layers are now linked, the orthophotography may not draw at scales beyond 1:20,000. If you need to reposition your map, temporally turn off the Terrain layer and the orthophotography will redraw.

3D Analysis Tools

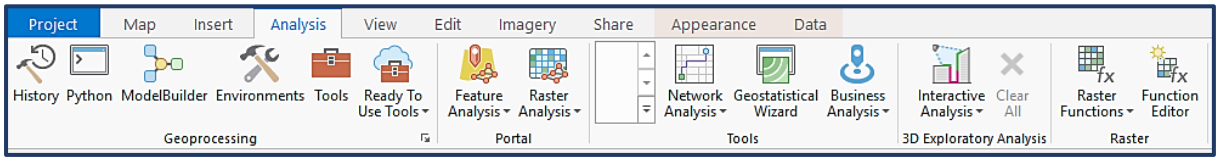
The OSNI terrain data can be used to analyse the height of the bare earth above sea level at any given point, due to its Z value. Outlined below are a few techniques that can be used in ArcGIS Pro to enhance/analyse 3D data.

Contour Lines → A line on a map joining points of equal height.

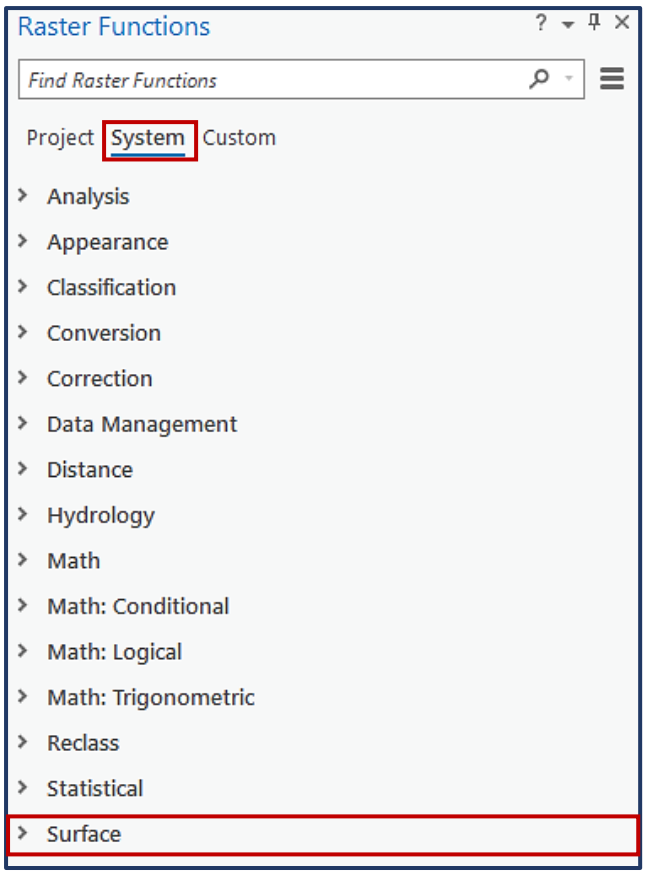
1. Before adding contour lines, add the OSNI:Terrain raster service to your **Contents pane** from the NIMA Portal, then **Order** as shown below:



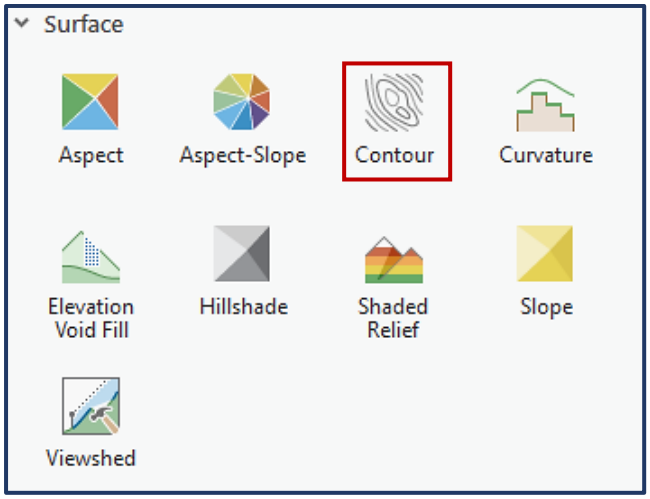
2. Navigate to the **Analysis tab** on the ribbon and select **Raster Functions**.



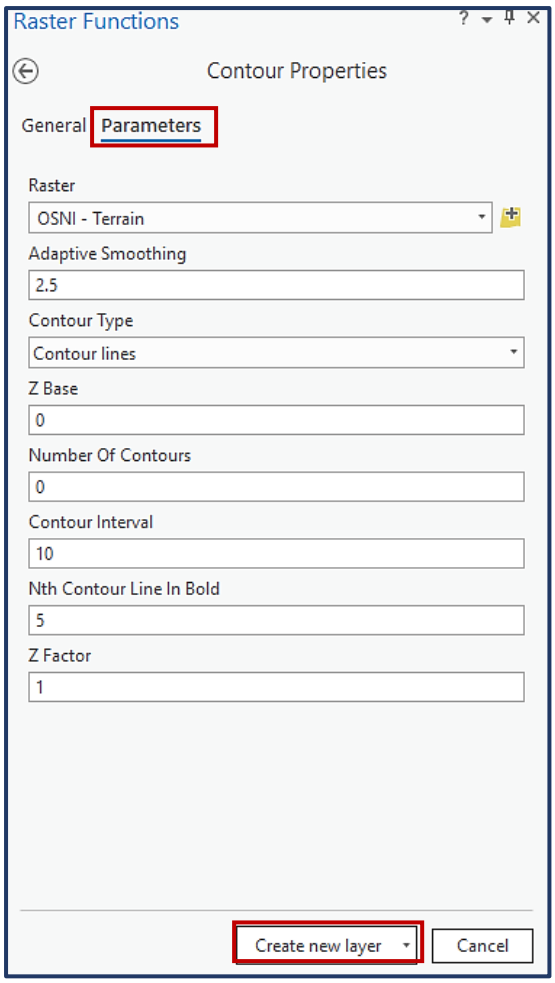
3. Within the **Raster Functions pane→ System**, select the **Surface** drop-down menu



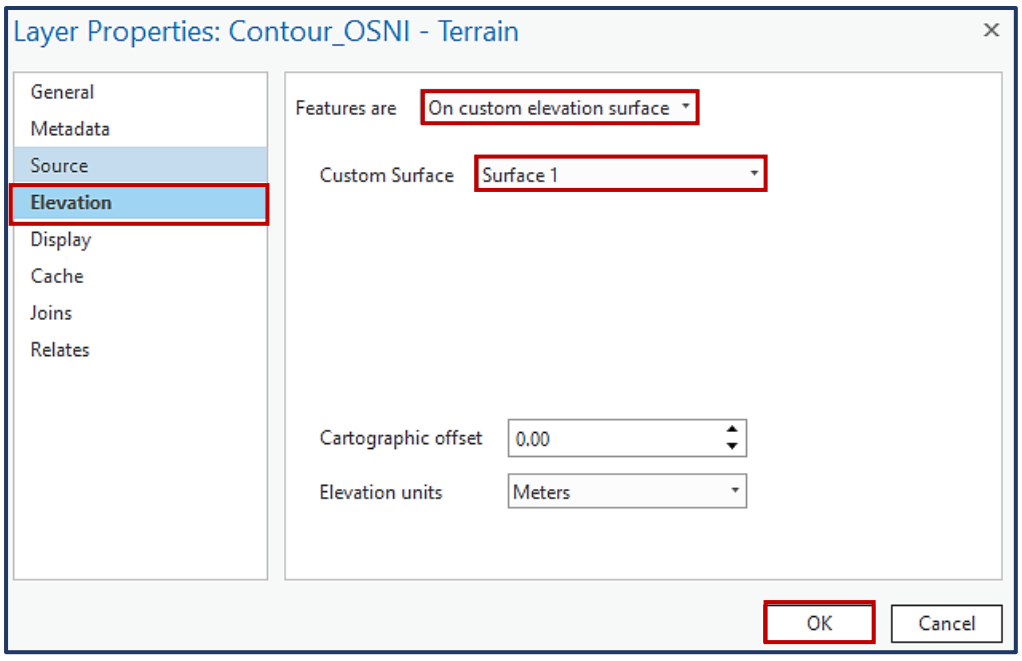
4. Select **Contour** for the list of available surface tools.



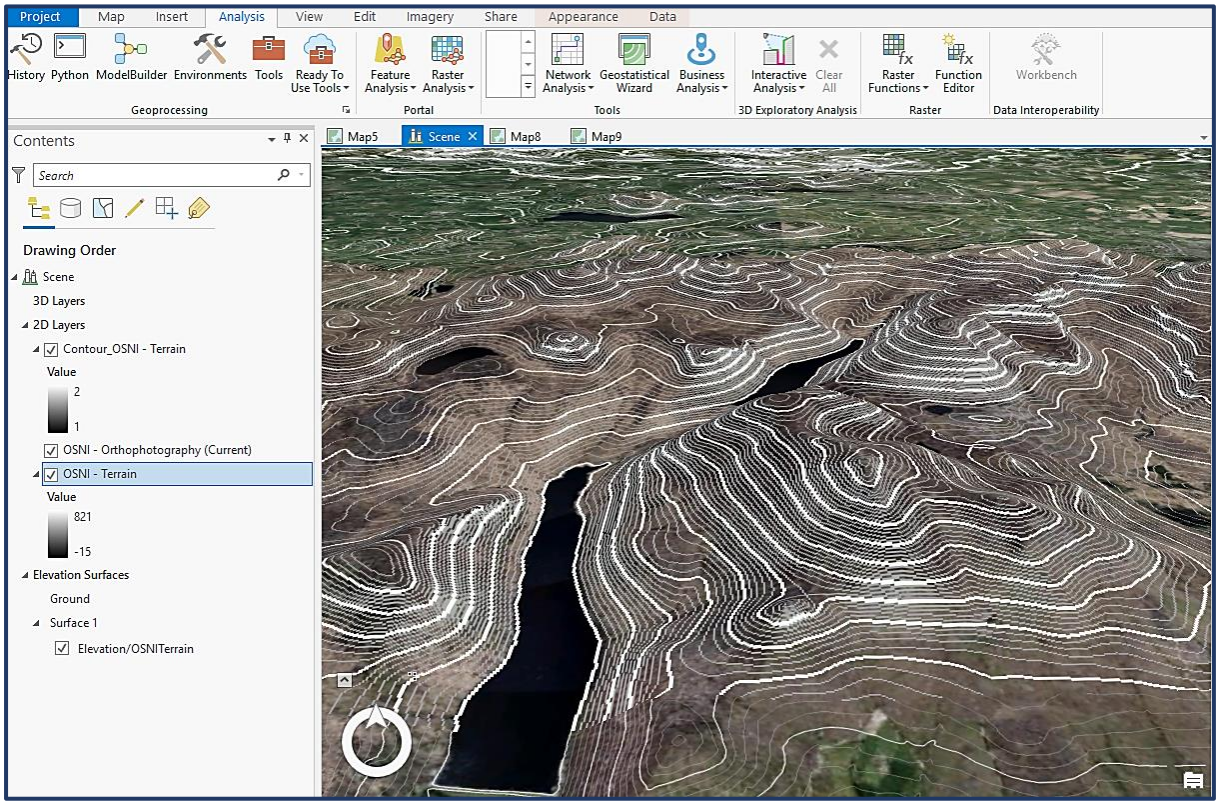
5. Within the **Contour Properties** pane; set the **Raster** as OSNI – Terrain, **Contour Type** as Contour Lines, **Contour Interval** as 10 (m), and **Nth Contour** Line in Bold as 5. These settings will draw a contour line every 10 meters and will highlight in Bold every 50 meters. When complete click **Create new layer**.



6. The Contour layer will appear in the **Contents pane**, make sure that it is the uppermost layer. **Right-click** the Contour layer and click **Properties**. In the **Layer Properties pane** navigate to the **Elevation tab** and set the custom elevation surface to **Surface 1** (OSNI Terrain). Click **OK**.

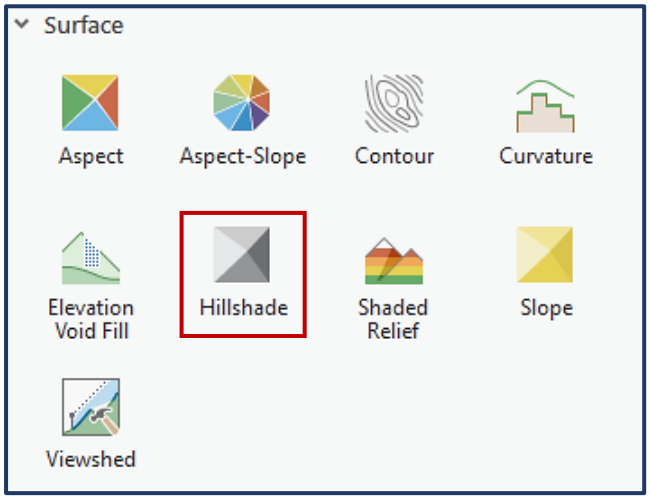


7. The contour will now appear draped over the elevated orthophotography. The contour symbology can be changed to personal preference via the Symbology pane.



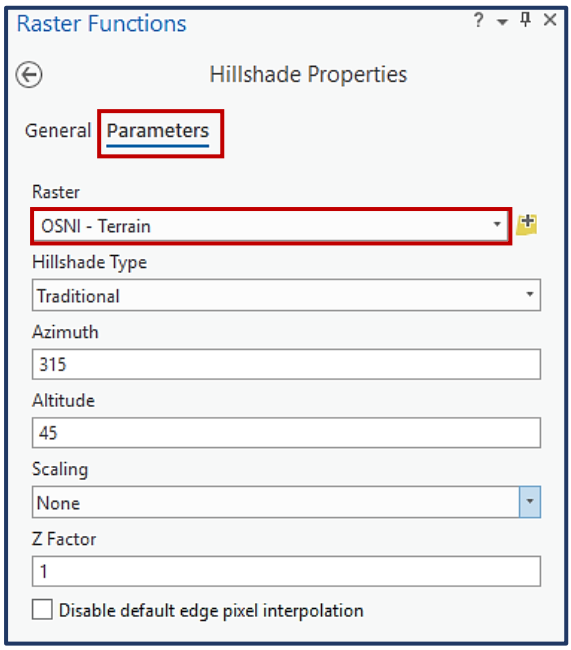
Hillshade → A greyscale 3D representation of the surface, with the sun's relative position taken into account.

1. Follow **steps 1-3** of Contour lines. Then select **Hillshade** from the list of available surface tools.



2. Within the **Hillshade Properties** pane; set the **Raster** as OSNI – Terrain, and customise the **Azimuth** and **Altitude** according to the purpose for analysis. The example layer below has set the suns position to 45º above the horizon and from NW. Then click **Create New Layer**.

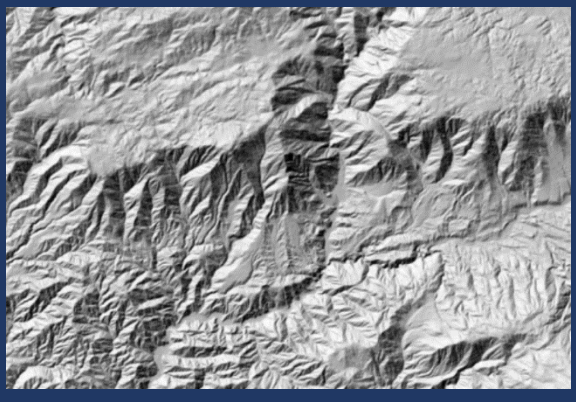
***NOTE:** Altitude is the sun's angle of elevation above the horizon and ranges from 0 to 90 degrees. A value of 0 degrees indicates that the sun is on the horizon. Azimuth is the sun's relative position along the horizon (in degrees). This position is indicated by the angle of the sun measured clockwise from due north. An azimuth of 0 degrees indicates north.



Multidirectional Hillshade:

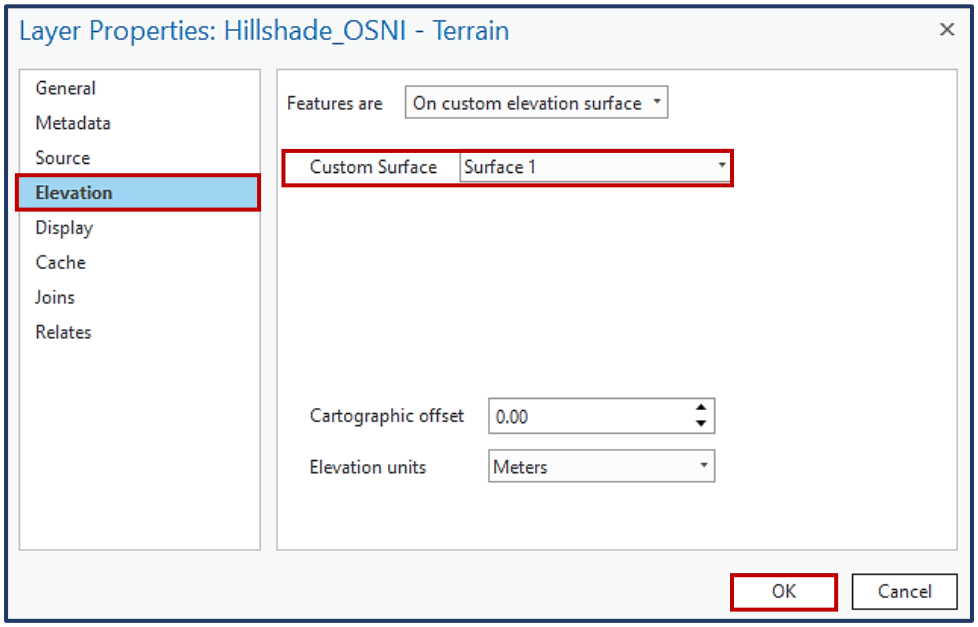
Multidirectional hillshade improves terrain visualization. It combines light from **six different directions** to represent an enhanced visualization of the terrain and to improve the appearance of regions with low relief. It improves the balance between the over-exposed and shadow areas of the map.

Traditional hillshade result:

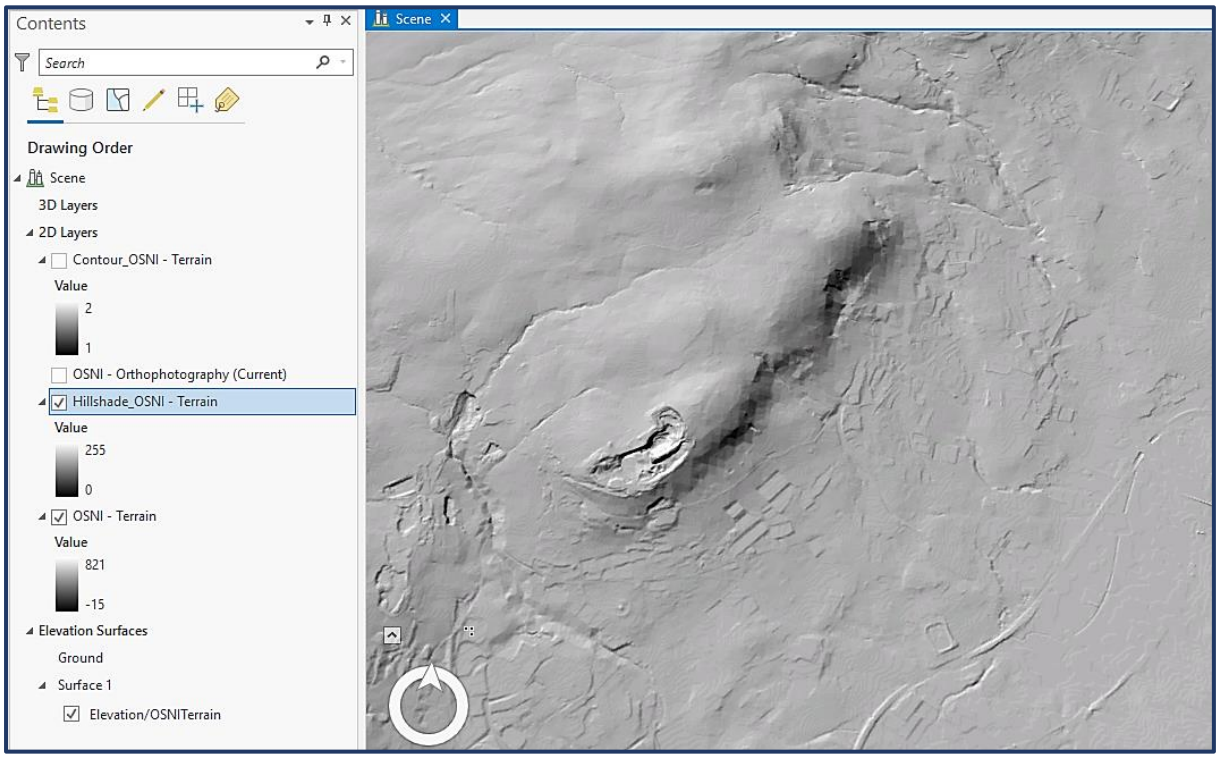


Multidirectional hillshade result:

3. The Hillshade needs to be configured to drape over the terrain. **Right-click** the Hillshade layer and click **Properties**. In the **Layer Properties pane** navigate to the **Elevation tab** and set the custom elevation surface to **Surface 1** (OSNI Terrain). Click **OK**.

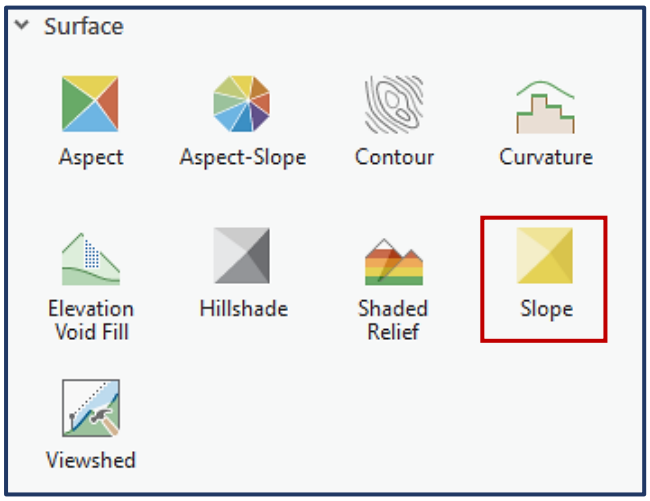


4. Order the **Contents pane** as below to view the Hillshade for analysis. Note that the hillshade is only visible with the Orthophotography if the layer is made partially transparent.



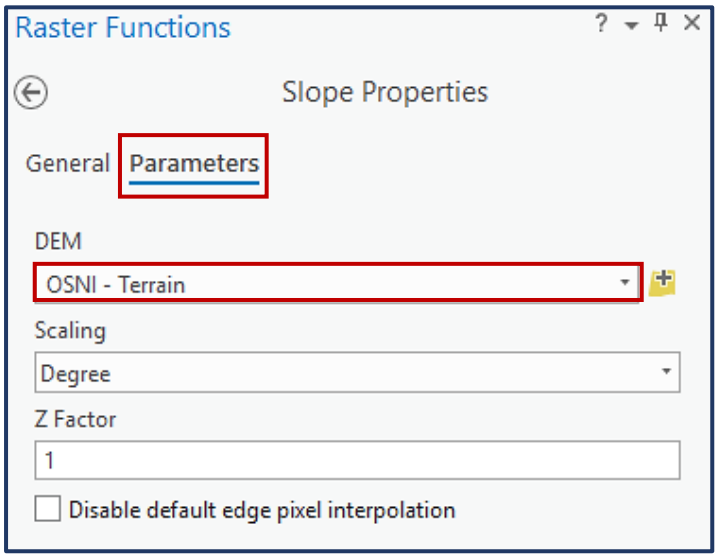
Slope → Represents the rate of change of elevation from one pixel value to its neighbours. It's the first derivative of a DEM/DTM. By default, the slope appears as a grayscale image. This can be modified to a colormap representation.

1. Follow **steps 1-3** of Contour lines. Then select **Slope** from the list of available surface tools.

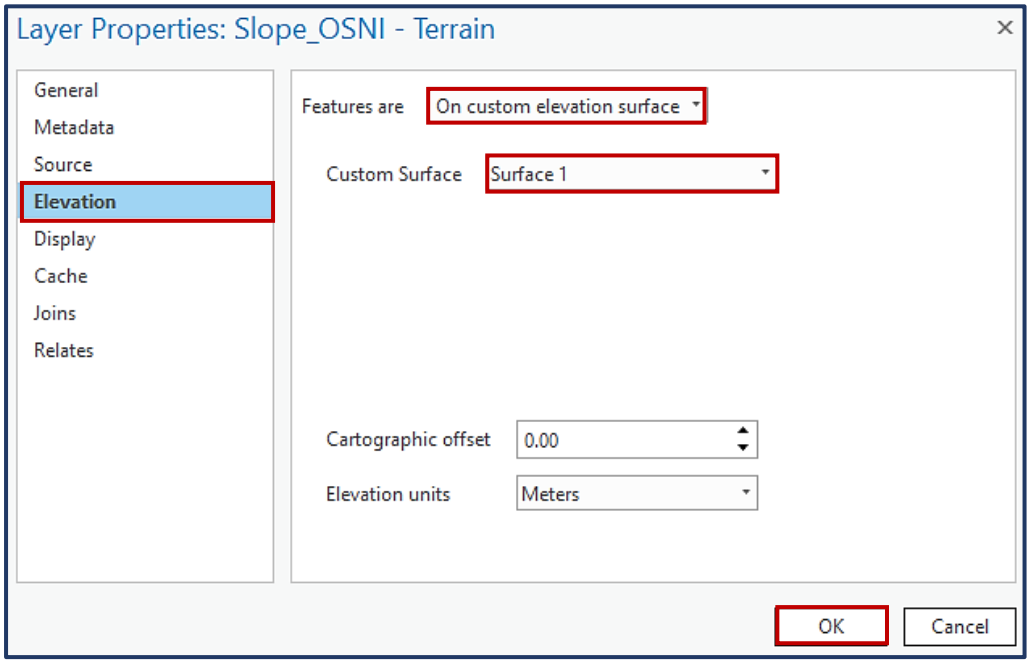


2. Within the **Slope Properties** pane; set the **Raster** as OSNI – Terrain. Then click **Create New Layer**.

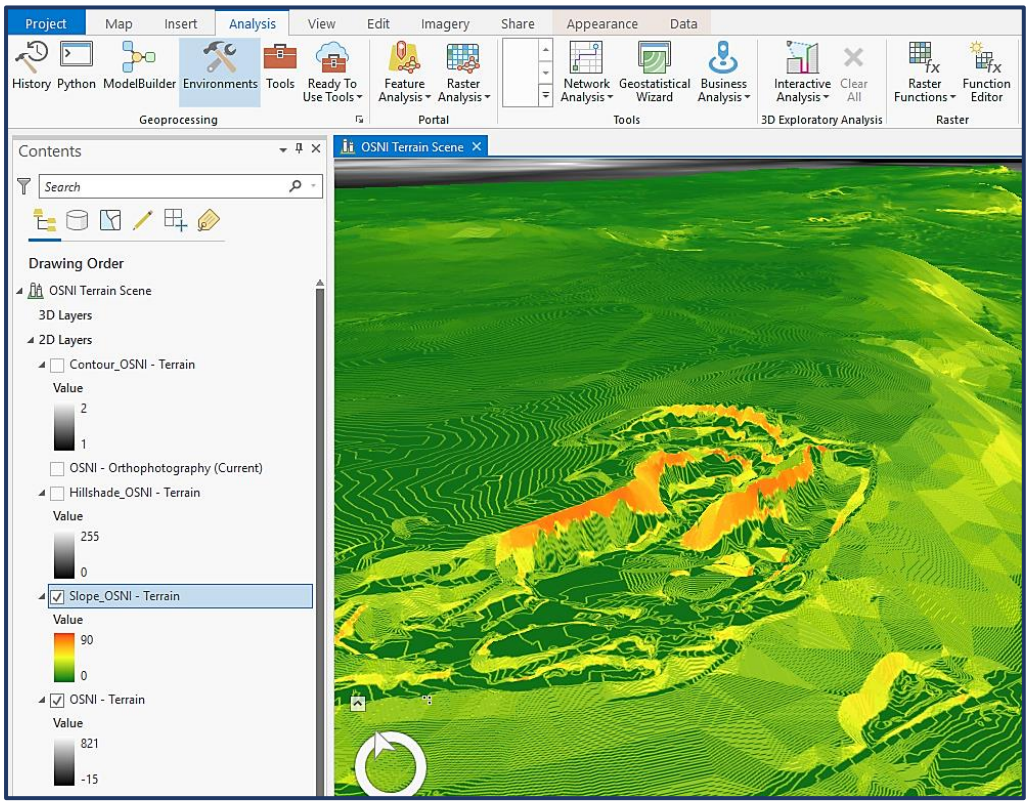
***NOTE:** Scaling options → **Degree:** The inclination of slope is calculated in degrees. The values range from 0 to 90. **Scaled:** The inclination of slope is calculated the same as **Degree**, but the z-factor is adjusted for scale. It uses the Pixel Size Power and Pixel Size Factor values, which account for the resolution changes (scale) as the viewer zooms in and out. **Percent Rise:** The inclination of slope is output as percentage values. The values range from 0 to essentially infinity. A flat surface is 0 percent and a 45-degree surface is 100 percent.



3. The Slope needs to be configured to drape over the terrain. **Right-click** the **Slope layer** and click **Properties**. In the **Layer Properties pane** navigate to the **Elevation tab** and set the custom elevation surface to **Surface 1** (OSNI Terrain). Click **OK**.



4. The slope layer will default in greyscale, however analysis lends itself better to a colour ramp with multiple classifications. See below for styling and layer order.



OSNI Fusion Services

The dynamic OSNI Fusion services are individual feature classes derived from OSNI Fusion. These individual feature classes can be added to ArcGIS Pro, queried and used for editing purposes. The services are available within the **OSNI:Fusion** group on the **Spatial NI NIMA Portal**.

***NOTE:** The dynamic Fusion services are only viewable at **1:5,000 scale** or below.

You can choose to add an individual layer that you wish to query. However, this may appear out of context and it may be more beneficial to add all the individual layers before editing. For viewing purposes it is important that these layers are listed in the correct order in the Contents pane. List as follows (uppermost – lowest):

- OSNI - Fusion: Feature Perimeter
- OSNI - Fusion: Buildings
- OSNI - Fusion: Structures Line
- OSNI - Fusion: Structures Polygon
- OSNI - Fusion: Transport Casing
- OSNI - Fusion: Transport Non-Vehicular
- OSNI - Fusion: Water Tidal Measure
- OSNI - Fusion: Water Course Line
- OSNI - Fusion: Water Course Polygon
- OSNI - Fusion: Standing Water Line
- OSNI - Fusion: Standing Water Polygon
- OSNI - Fusion: Ground Cover (Vegetation)
- OSNI - Fusion: Ground Cover (Man-made)
- OSNI - Fusion: Ground Cover (Bare Soil)
- OSNI - Fusion: Land Parcel
- OSNI - Fusion: Geographic Extent
- OSNI - Fusion: Ireland Sea

Querying

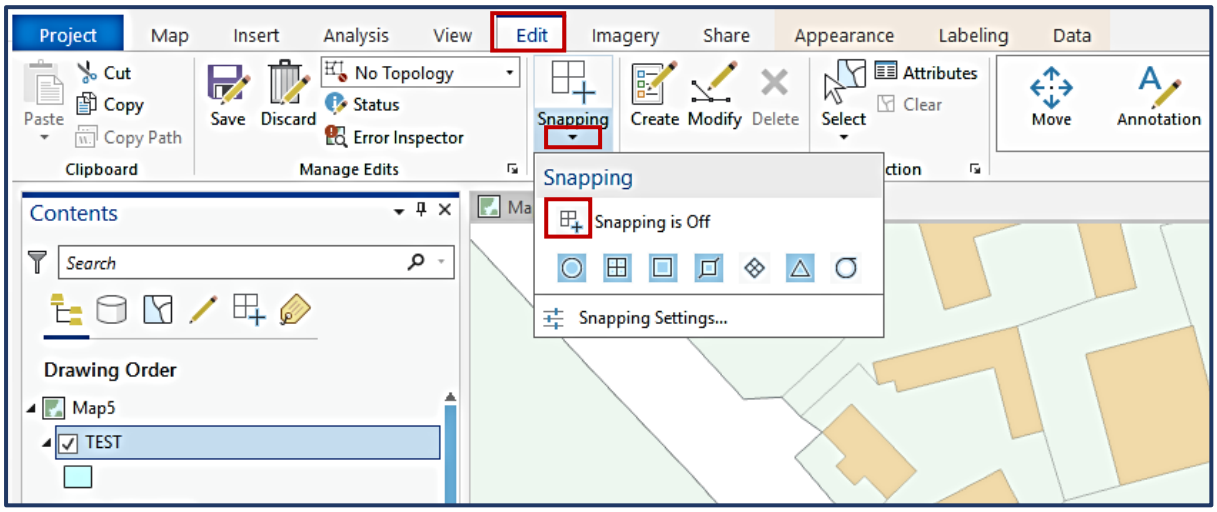
All the dynamic Fusion services can be queried according to a field within the attribute table. Select the desired layer in the Contents pane and right-click to open the Attribute table. Change to the field view to see the data available to query.

Either add a definition query to the feature layer or select by attributes to isolate a select set of records. See ‘Querying – 3 Band Image Analysis’ page 36-40 to get a step by step guide.

Snapping

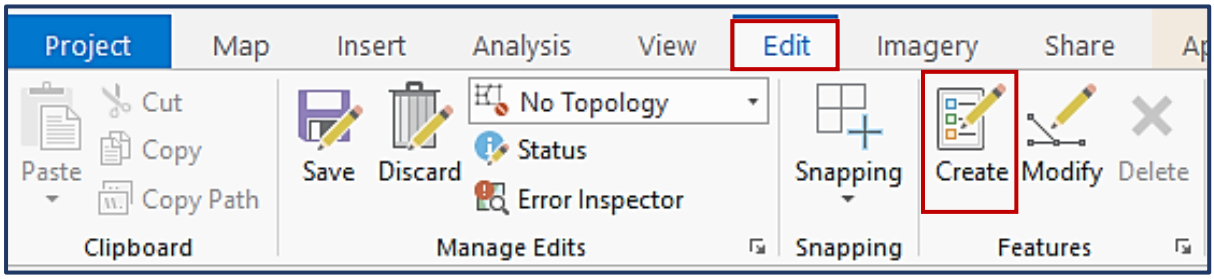
Snapping is a tool used to assist drawing features on a map, in relation to existing points, lines or polygons. To create new features you first need to create a new file geodatabase and feature class (see help box). The new feature can be set to snap to a features: point, end, vertex, edge, mid-point, intersection or tangent.

1. To turn snapping on, highlight your new feature class in the **Contents pane**. Navigate to the **Edit tab** on the ribbon and select the **Snapping drop-down menu**. Click the icon for Turn snapping on.

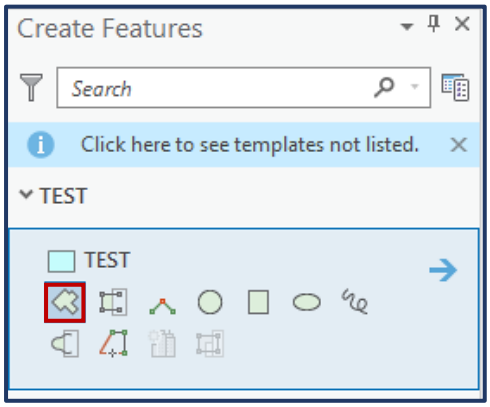


The highlighted icons show the active snapping functions. Click and icon to select/deselect the function.

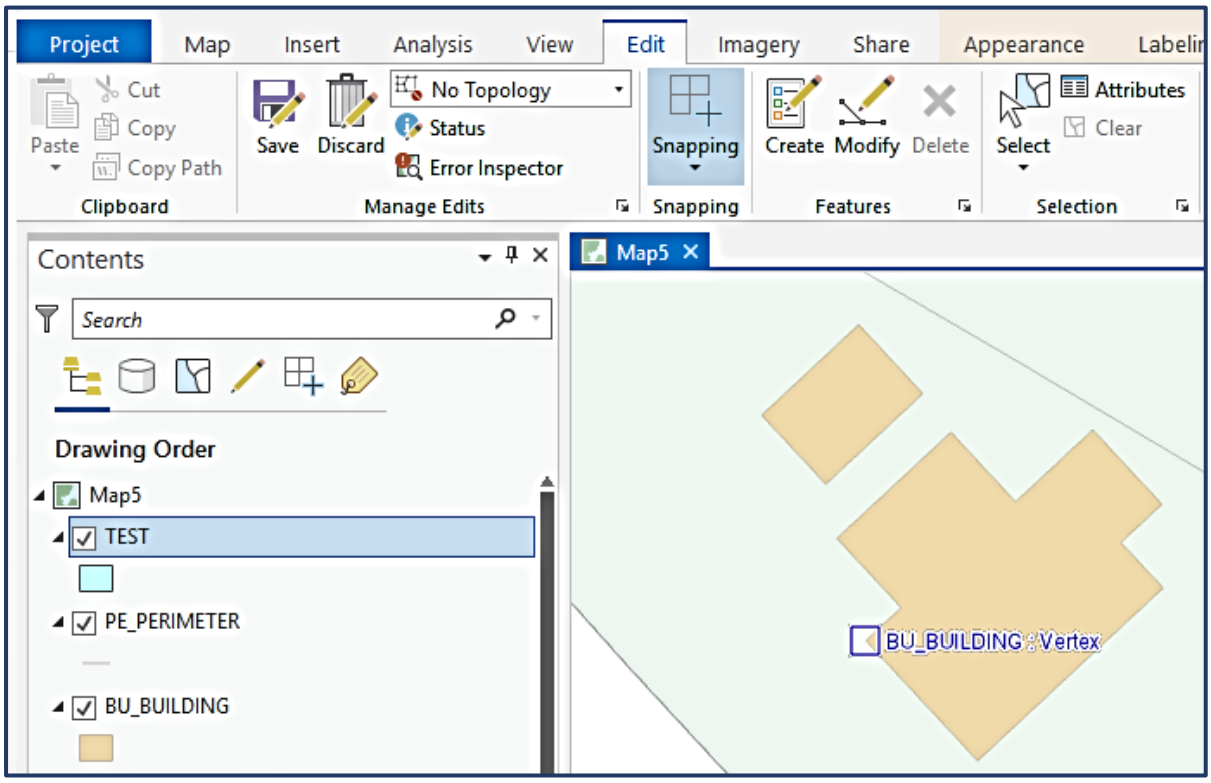
2. To create a new feature, click **Create** within the **Edit tab** on the ribbon.



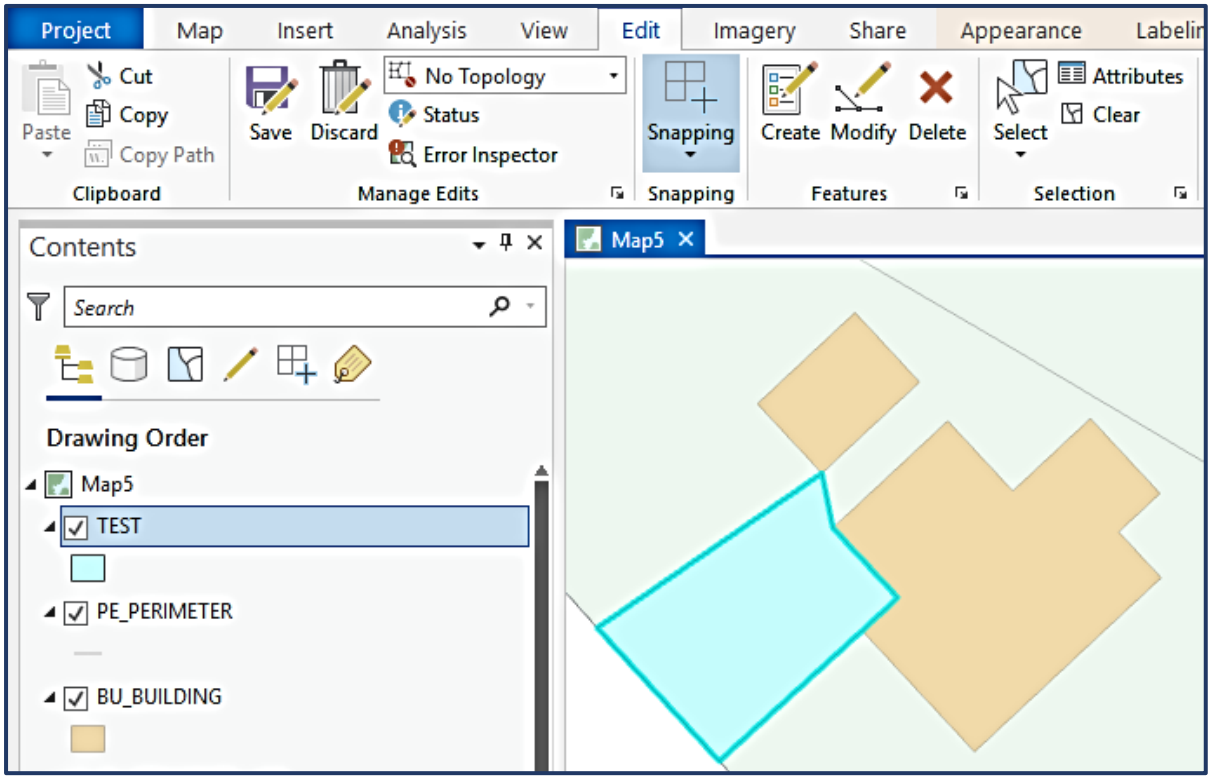
3. The available features will appear in the **Create Features pane**. Shown below is the icon to **create a polygon**.



4. In the **Map pane**, hover over the edges or corners of a map feature to see the snapping possibilities. This will display the name of the layer you are targeting and the type of snap.



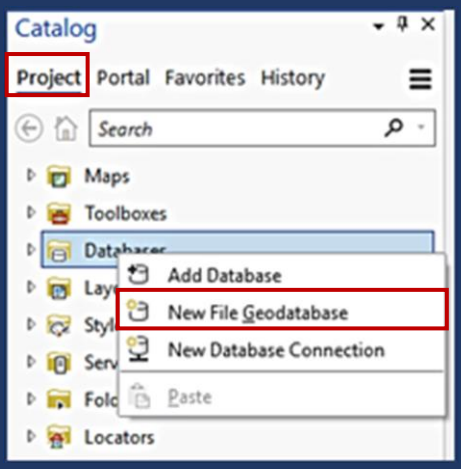
5. When drawing a feature you can use these snap points to seamlessly connect your new feature with an existing map feature.

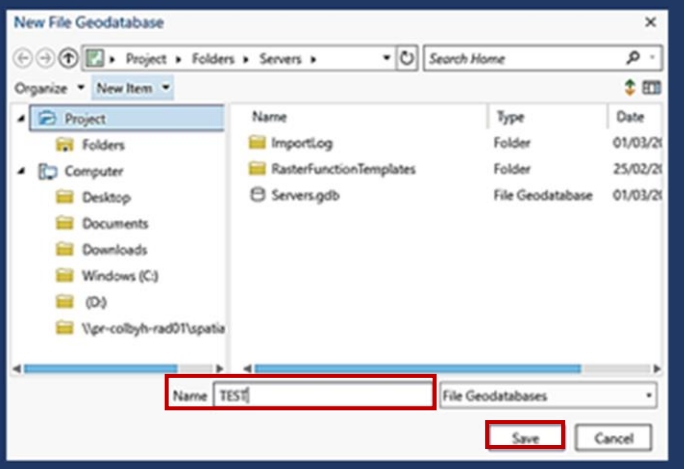


Creating a New File Geodatabase:

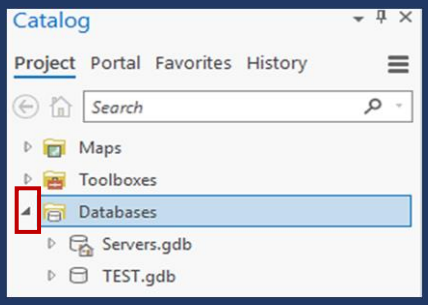
A file geodatabase is stored within your current project in ArcGIS Pro. It is a type of database that allows you to create your own feature classes and content within.

Right-click Databases within the **project tab** of the **Catalog pane** and select **New file Geodatabase**. A pop-up window will require you to enter a name for the new geodatabase, then click **Save**.

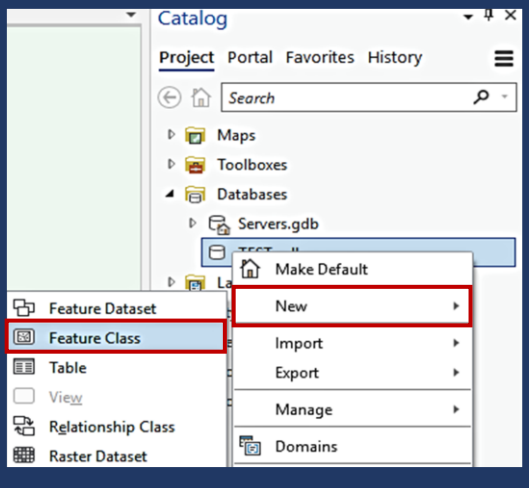




Click the **drop-menu** for Databases to see the new geodatabase (.gdb).



To create features within this gdb, Right-click the geodatabase name and select New → Feature Class.



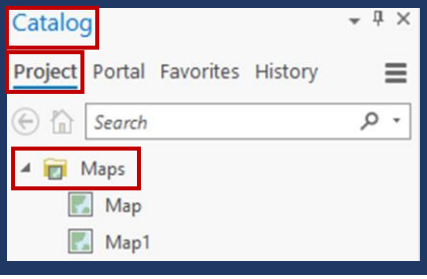
Sharing Maps

Within ArcGIS Pro data can be shared as a complete map package containing originating data links or as exported individual maps.

Finding saved maps:

A map/scene can be closed and not deleted from a project. As long as the project has been saved when the map was open it will be saved within the project folder.

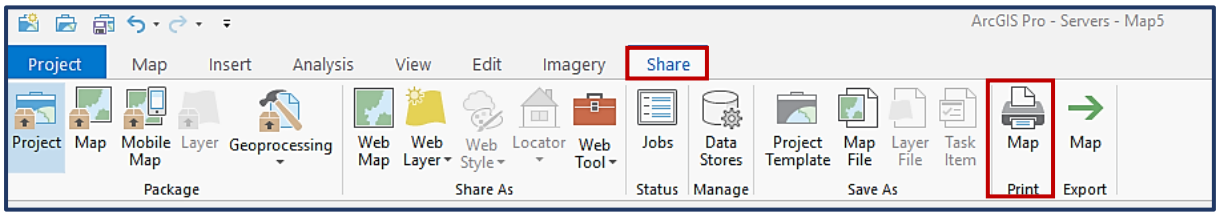
This can be accessed within the **Project tab** of the **Contents pane**. Open the **Maps drop menu** to view all saved maps. **Right-click** the desired map to **open/edit/delete**.



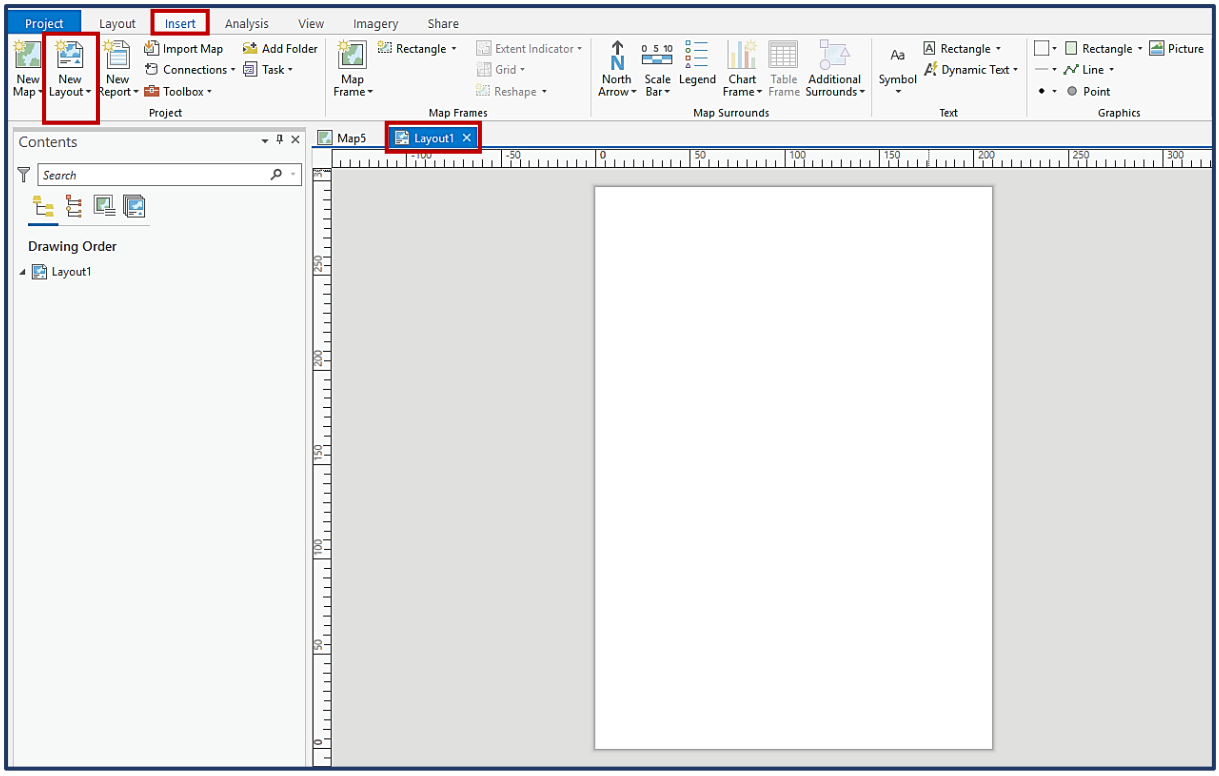
Printing

Spatial NI offers a print service via the NIMA Portal Map Viewer. This print service offers a unique template that will embed your map in a professional and presentable setting. However, this service only works when you are working within the map viewer on the portal website. See below for printing services within ArcGIS Pro:

1. To print a snapshot of you map as its current view within the map pane, select **Print** from the **Share tab** on the ribbon menu. This will open a basic print configuration window linked to your default printer.



2. To print or export your map embedded within a layout; navigate to the **Insert tab** on the ribbon menu, and select **New Layout** within the **Project section**.



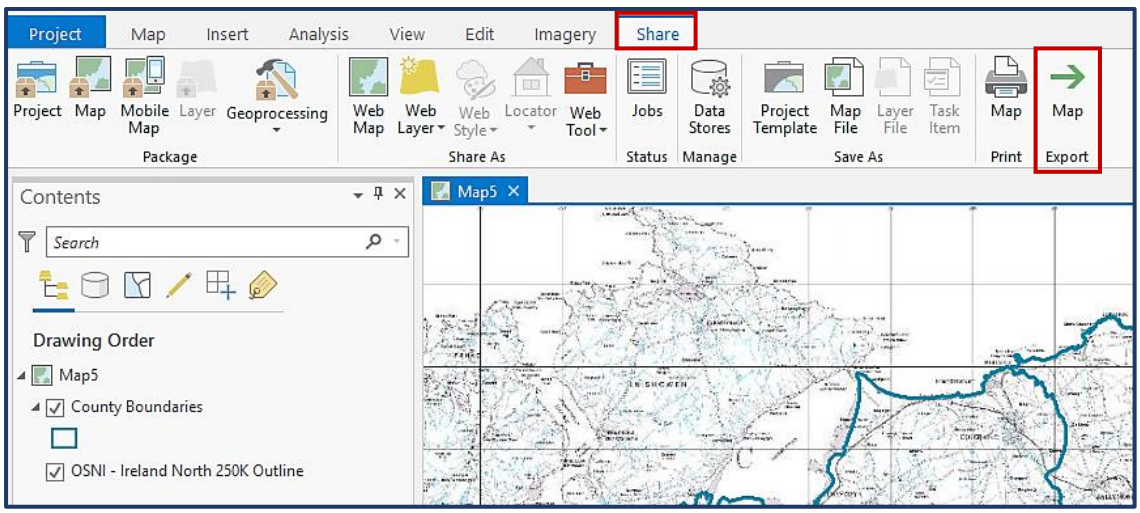
How to configure a map layout Esri.

Exporting

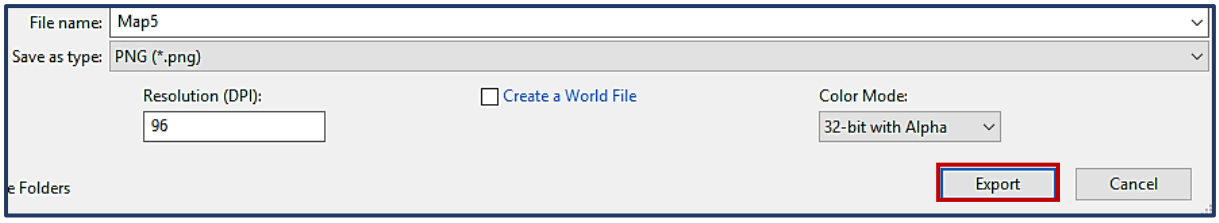
After you've created a map or layout, you can export to several industry-standard file formats.

- Vector Formats: EMF, EPS, PDF, SVG, and SVGZ
- Image Formats: BMP, JPG, PNG, TIFF, TGA, and GIF

1. To export only the view within the map pane, as one of the raster image formats;

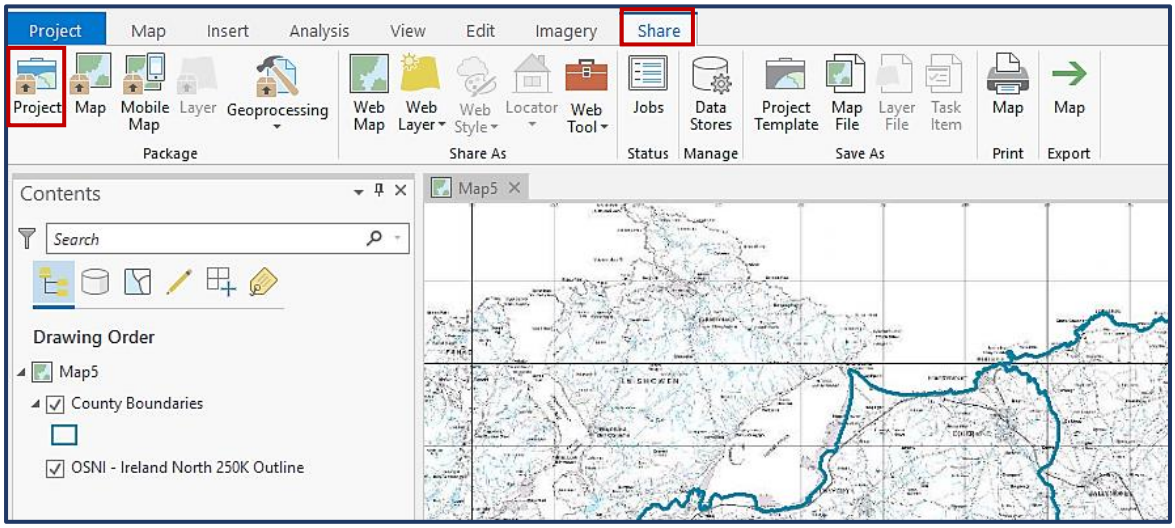


2. Enter the file name, then set the File Type, Resolution and Colour Mode. Click **Export**.

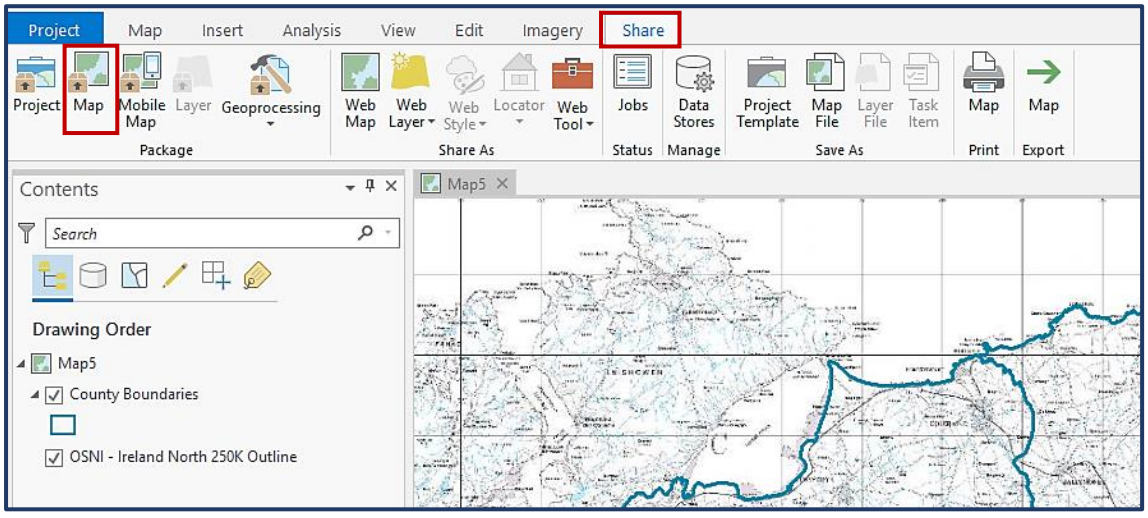


To export a package that contains both the layer(s) and the data/properties embedded, your data can be exported as a project, map, or layer package. To find out more about these and what information is shared follow the Link.

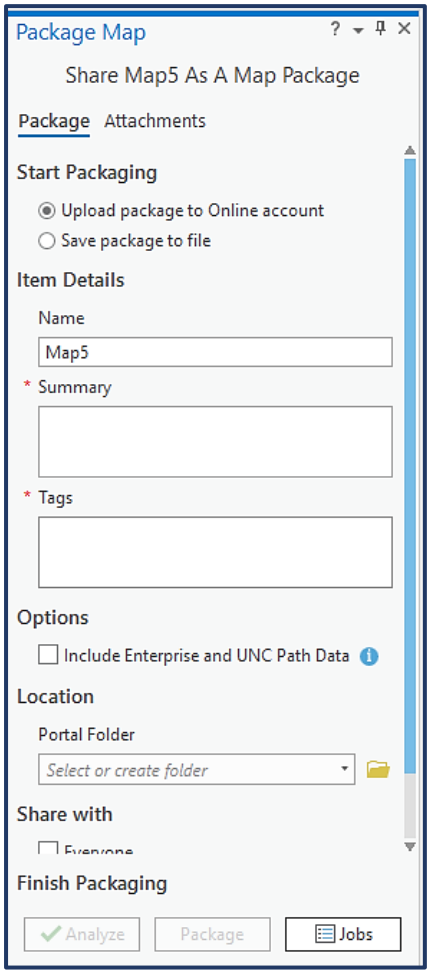
1. To export a project as a project package; navigate to the share tab and click Project.



2. To export a project as a map package; navigate to the share tab and click Map. Make sure that your workspace is currently highlighting the map and data that you are wanting to export.

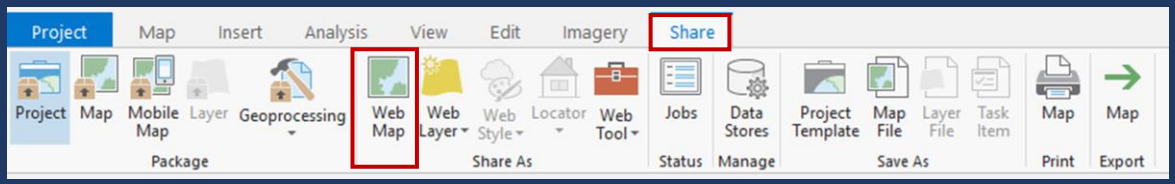


A new pane will open when exporting a package, to allow configuration of settings.



Exporting directly to your AGOL:

Publish a map to your AGOL. The data layers will be published as new web layers and will be included in a web map service along with the selected basemap and any pre-published layers.



A new pane will open to configure export settings.

***Note:** To do this you must be signed into you AGOL as the Active Portal, and your profile must have permissions to publish content.