Accessing Environment Agency lidar tiles from the web

(updated May 2024)

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Please note that the Defra website is an active application and its appearance may change

As of the 1st September 2015 the Environment Agency (EA) moved away from providing data via their Geomatics Group and instead began providing all their data freely via the Data.Gov.UK portal *https://environment.data.gov.uk/DefraDataDownload/?Mode=survey*

This makes a huge amount of data available for archaeological purposes. One key factor to consider is that what is available from this site now is the actual data. This is great if you have the capacity to view and process it, but could be a problem if you don't. Before doing anything it is recommended that you read the Historic England Guidelines on lidar Using Airborne Lidar in Archaeological Survey: The Light Fantastic which sets out the key facts about what lidar is, what it does and how you might use it for archaeological research.

Then, before using this data you need to consider two things:

- Why you are using Lidar
- What are your IT resources and your ability, and how this may affect your ability to analyse lidar data

The first question is key, because you need to be clear as to what you expect to gain from using the data before you can decide which form of data you need.

The second is equally important because, even if you want to use the actual data, if you don't feel confident that you have the resources you might be better to stick with the jpeg imagery.

Using Jpeg Images

For those who just want access to jpeg images that can be viewed in any viewing package, the options are limited. The Environment Agency has a page on Flickr where these are available https://www.flickr.com/photos/environmentagencyopensurveydata/albums, but this has not been updated since 2015 and there are no plans to add any images. By signing into Flickr you can more easily access the data you're interest in, (and it will stop the Yahoo sign in pop-up from appearing)

Depending on the resolution of the data you need to search either by quarter sheet (2m & 1m) or by km square (50cm smaller) e.g. SK60sw or SK6103.

Unfortunately, the search facility within Flickr is not very user friendly and pretty much requires that you need to know the exact format of the name of the image you're looking for.
For 1m and 2m resolution images the search format is:

(OS quarter sheet)_(type i.e. DSM or DTM)_resolution e.g. SU14ne_DSM_1m or TQ23sw_DTM_2m.

For 50cm and 25cm the format is:

(2km sq.)_(type i.e. DSM or DTM)_resolution e.g. ST8844_DTM_50cm or TF2214_DSM_25cm

For example, if you wish to see the Roman fort of Vindolanda, Northumberland (National Grid NY 77038 66384) this is within the folder 'NY76'. These tiles can be found by searching within the Environment Agency photos using the search 'NY76ne_DSM_1m' or 'NY7666_DSM_50cm' and 'NY7766_DSM_50cm'' as the area of the fort within the tiles 'NY7666 and NY7766'. These images can be downloaded and compared to understand the differences between different file

formats. In both images the playing card shaped fort outline can be seen in the bottom centre of the image. In the DSM image two three pointed sheep shelters can be seen to the north, as well as extra mural activity to the west. However, the DTM image has removed the tree cover, and this has also removed field boundaries (including the sheep folds), as well as the ticket office buildings (located due west of northwest corner of the fort. The field to the northwest of the fort contains evidence of an excavation (the rectangular feature), but also some subtle circular features. These appear faintly in the DTM format, but much more clearly in the DSM. These are all examples of the differences between the formats highlighted in the HE guidance (11-14).

Users should be aware that whilst a JPEG image contains less information than the original data, the image tiles usually contain much more information that can be easily seen by the human eye. Using simple tools within image processing software such as Adobe Photoshop or other similar products (e.g. GIMP) to adjust the contrast range etc will greatly increase your chance of identifying less obvious features. An example of this can be found in the HE guidance (22).

It should be noted that the jpeg imagery available through Flickr does not have any georeferencing information included in it and so cannot be used within a GIS or similar package unless each tile is positioned manually.

Images can, however, be created using the ASCII data described below and the RVT tool.

ASCII Data

Unlike the jpegs discussed in the previous section, the data available through the actual DEFRA website application (*https://environment.data.gov.uk/DefraDataDownload/?Mode=survey*) are much more complex and require processing and specialised software to view. A recently created toolbox makes the creation of various visualisations a lot simpler than was previously possible, but even for these the end product requires some understanding of GIS and image processing.

Assuming that you are happy to continue, the information that can be derived is extremely useful and far superior to the standard jpegs.
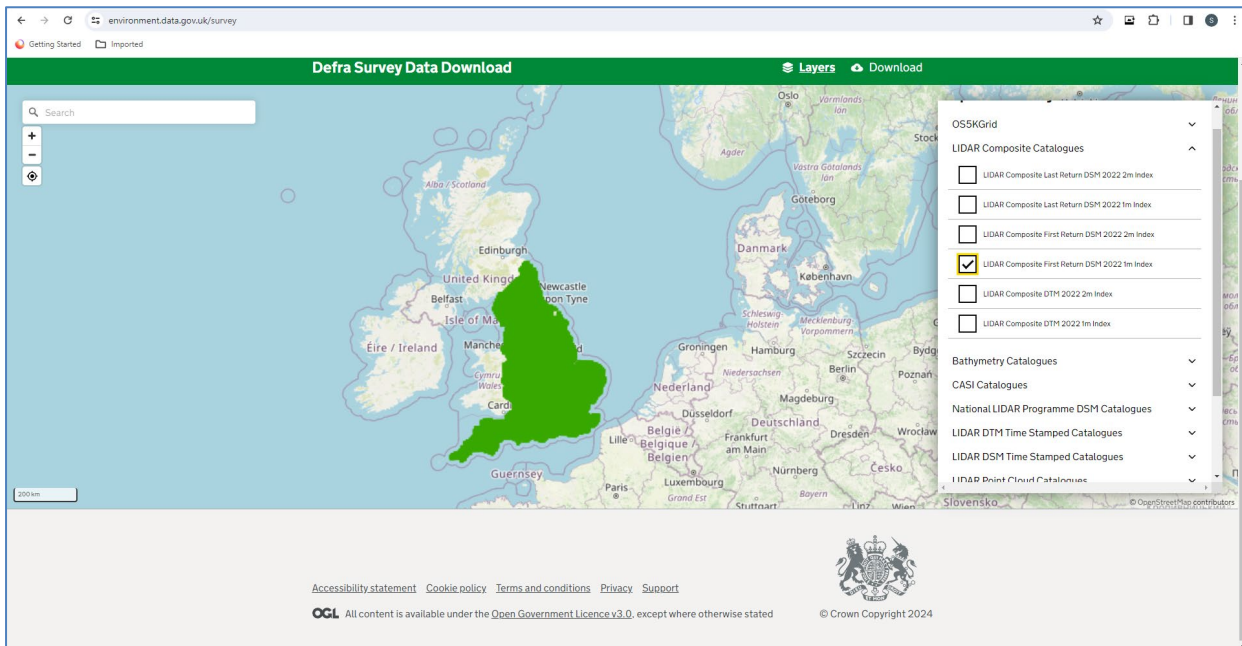
Accessing the data

The first step to using the data is accessing it via the DEFRA website application (*https://environment.data.gov.uk/DefraDataDownload/?Mode=survey*)

When the application opens you see a view of the entire UK and the option to upload a shape file.
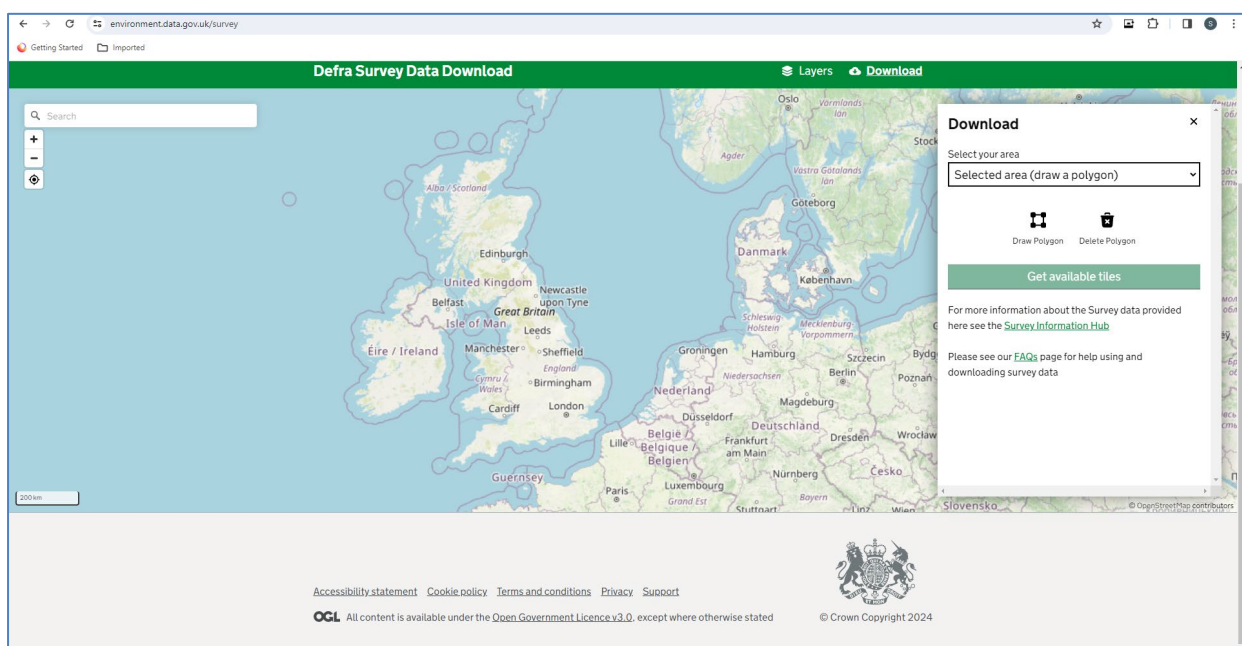
Clicking on the Layer icon ⧉ in the top menu bar reveals the list of available layers

and selecting any element from within the list brings up the extents on the map base.

The lidar data consists of

- LIDAR Composite Catalogues. These are divided by format and resolution into

    o LIDAR Composite Last Return DSM 2022 2m Index

    o LIDAR Composite Last Return DSM 2022 2m Index

    o LIDAR Composite First Return DSM 2022 2m Index

    o LIDAR Composite First Return DSM 2022 1m Index

    o LIDAR Composite DTM 2022 2m Index

    o LIDAR Composite DTM 2022 1m Index

- LIDAR Time Stamped Catalogues. These are divided first DSM v DTM, then by year and then by resolution e.g.

    o 2022

        ▪ LIDAR Tiles DSM 2022 25cm Index

        ▪ LIDAR Tiles DSM 2022 50cm Index

        ▪ LIDAR Tiles DSM 2022 1m Index

- LIDAR Point Cloud Catalogues. These are divided by year

    o LIDAR Point Cloud 2022 Index

    o LIDAR Point Cloud 2021 Index etc

Depending on your particular area of interest you may also find catalogues of vertical and oblique aerial photography, bathymetry data and even multispectral Compact Airborne Spectrographic Imager (CASI) data.

The key difference between the two main datasets (Composite v Timestamped) is highlighted by the way they break down. The Composite data breaks down by spatial resolution i.e. 2m, 1m,

50cm and 25cm, whilst the Timestamped tiles do so first by year and then by spatial resolution. This relates to what data they contain.

The composite, as its name suggests, is made up from a combination of the full EA dataset which has been merged and re-sampled to give the best possible coverage. This means that a 2m resolution tile may contain decimated 50cm and 1m data as well as native captured 2m data. It is impossible using only the composite to know which part of a given tile was surveyed at which resolution.

By contrast the tiles and point clouds contain only the native captured data and so give a clearer picture of what data was captured and when. If it is important to know the date of the capture as well as what is visible (e.g. for HAR assessment) it is important to download both the composite and the individual tiles.

Navigating to area of interest

You can either zoom to your area of interest or enter a location, if you know the name of a reasonably sized settlement in the vicinity.

Once you've zoomed into your area of interest you can see the relevant 5x5 km block equivalent to the Ordnance Survey quarter sheet e.g. SU18NW, SU18NE etc and how this relates to the data.
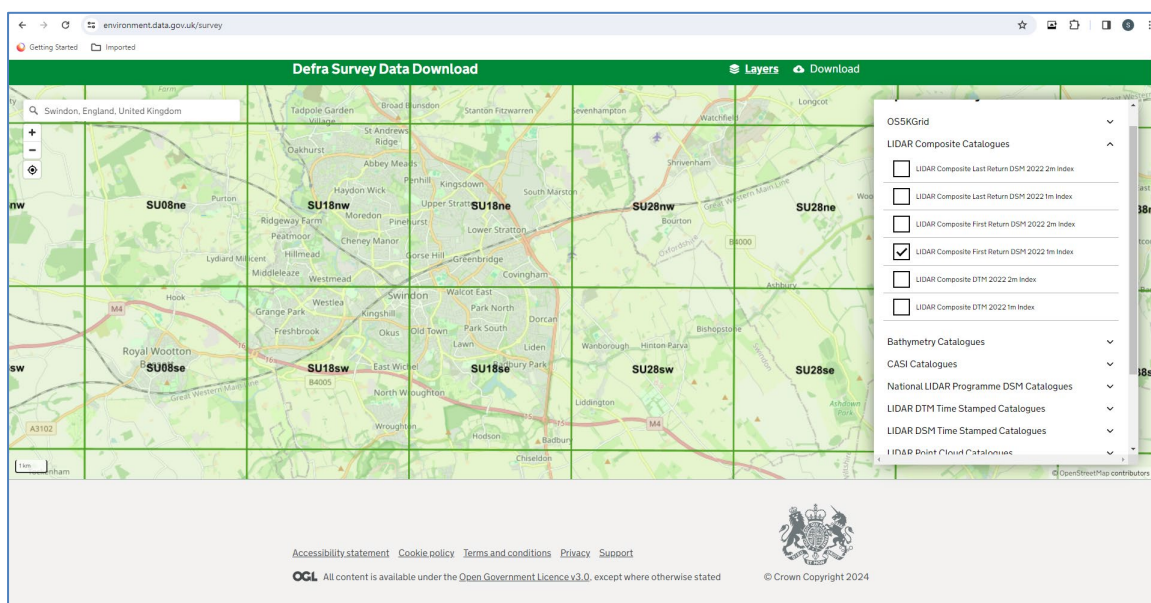
If you have a larger area of interest covering several tiles and you have access to GIS you can download catalogue files with the actual extent of mapping at different resolutions from the DEFRA file sharing service via data.gov at https://data.gov.uk/data/search. Enter "lidar composite" in the search box for a full list. Alternatively, if you have an ArcGIS on-line account you can access the EA lidar data direct via a WMS feed. These are available for the individual composites e.g.

2m data - https://environment.data.gov.uk/spatialdata/survey-index-files/wms?request=GetCapabilities&service=WMS

1m data - https://environment.data.gov.uk/spatialdata/survey-index-files/wms?request=GetCapabilities&service=WMS

The links for these WMS feeds can also be found on the https://data.gov.uk/data/search site.

There are several open source GIS packages available such as QGIS and GRASS, but these require a reasonable knowledge of the principles of GIS.
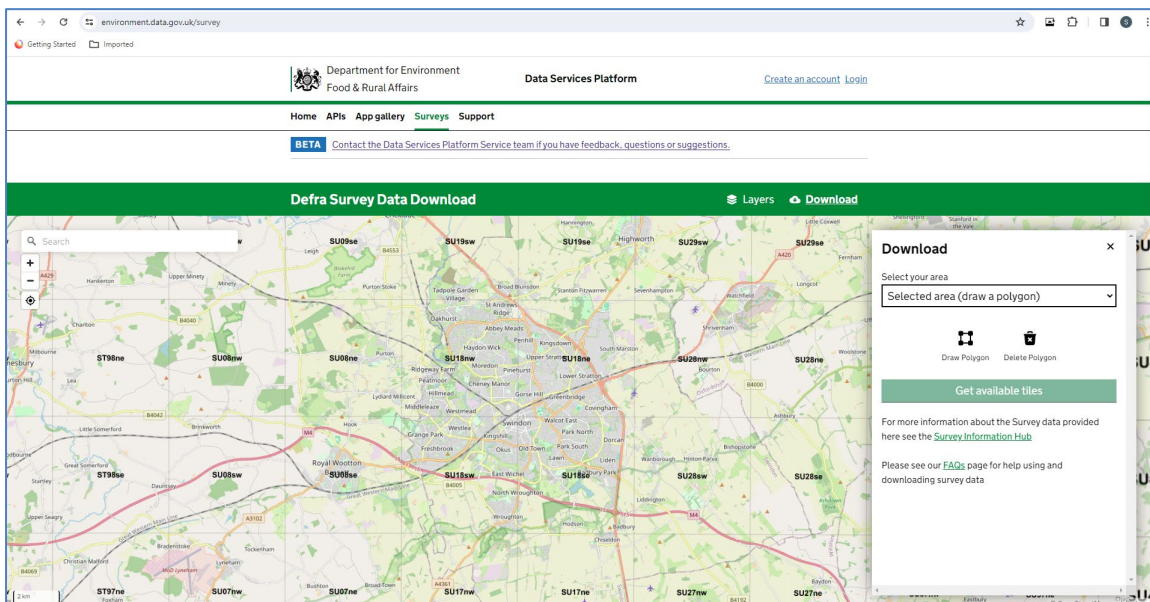
Downloading the data

Once you've established that the data does cover your area of interest, the next step is to download it.

To do so select the download data icon ⬇ in the top menu bar.

There are two ways to define the area for the data you wish to download; either by simply drawing a shape on the map, or by uploading a pre-existing shapefile.

In the case of drawing a shape, you have two options; either drawing a polygon or a freehand shape.
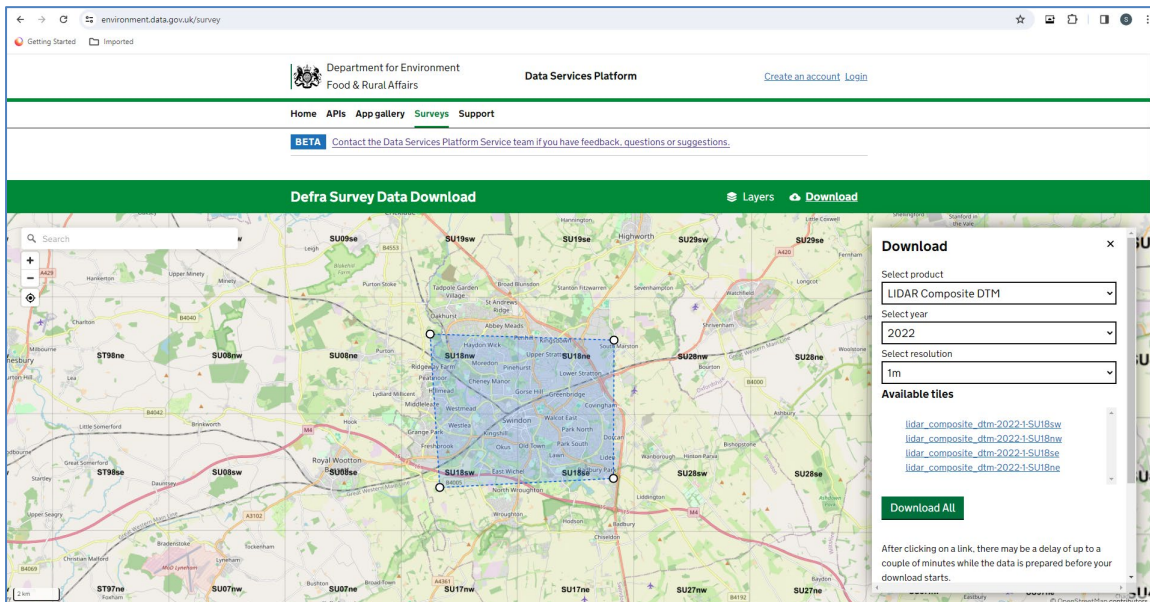
In the case of the shapefile, this must be in the form of a compressed, zipped folder containing at least .shp, .shx, .dbf and .prj files.


Either way, the app will zoom to your area of interest and give you the option to download your data via a tab that says 'Get Available Tiles'.
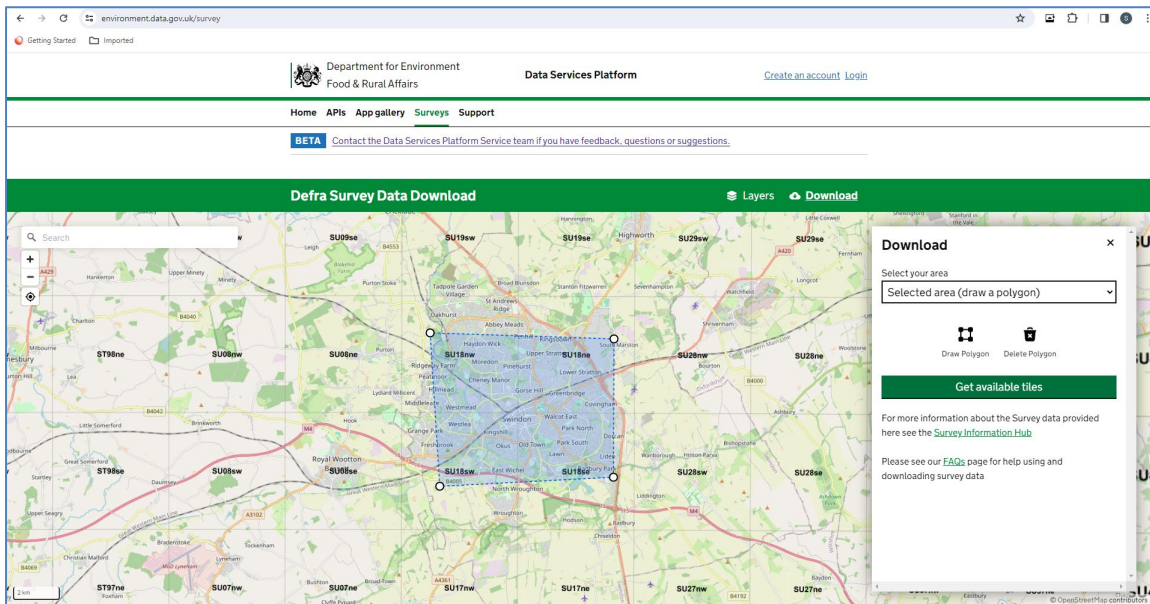
Selecting this option brings up a screen where you can chose from the available data

Depending on the 'Product' you select in the first drop-down, the other options will change e.g. Choosing a Composite the Year is set to Latest, whereas choosing a 'Tile' or 'National Programme' option gives access to whichever years were flown.
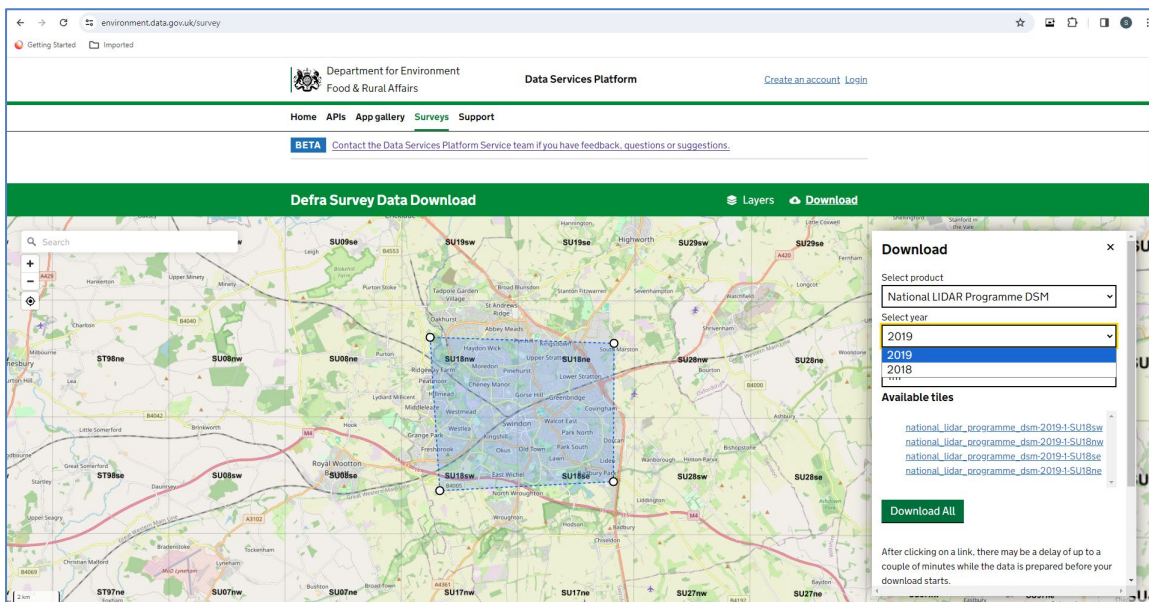
You then have the option to download whichever files you require. These are saved as zipped files in your default directory and need to be extracted to be use. There will be one zipped file per dataset e.g. Lidar-DSM-50CM-2015-SU08se, Lidar-DTM-50CM-2015-SU08se, Lidar-DSM-1M-2015-SU08se. In the event that data is required for more than one quarter sheet, this will again be a separate file e.g. Lidar-DSM-50CM-2015-SU08**se**, Lidar-DSM-50CM-2015-SU08**sw**.

The EA have created a link from their website to a series of FAQs about their data at

https://support.environment.data.gov.uk/space/DPK/15827049/Survey+Data+Catalogue

Using lidar data

As noted above, unlike the jpegs that can be viewed in anything from Paint to PhotoViewer, the ASCII gridded data needs to be viewed using a specialist package such as a GIS that will create surfaces from which it is possible to recognise features of archaeological and other origins.

It used to be the case that you were only able to create these surfaces in GIS, be they commercial or Open Source, but in the last couple of years a simple toolbox has been created that will generate the most common visualisations currently used by archaeologists for interpreting lidar data.

The Relief Visualisation Toolbox (RVT) is freely available from http://iaps.zrc-sazu.si/en/rvt#v together with a manual explaining how it works. In addition a set of *Good Practice Guidelines* have recently been produced to accompany the program http://iaps.zrc-sazu.si/en/publikacije/airborne-laser-scanning-raster-data-visualization-1#v.

The program is very straightforward and can be used to produce the majority of visualisations used by archaeologists simply by adding the ASCII data downloaded from the EA site and selecting the visualisation(s) you want. There are some options to change certain parameters, but the default values will produce adequate results for most data.

If you "Select all" you will generate 11 different visualisations. (The latest version 1.3 has two new options Sky Illumination and Local dominance, but they aren't that useful for most archaeological options so you can probably ignore them.)

One other product of the toolbox is a GeoTIFF DEM that can be viewed interactively in 3D, either in GIS or in specialist viewing software, including some freely downloadable from the web.

Organising files for ease of use

Sort tiles

You now have 22 tiles (plus the basic GeoTIFF created from the ASCII file) for each input tile. There are 11 tiles with no suffix and 11 with either 8-bit or RGB. The tiles without a suffix are full data GeoTIFFs with 32bit data, whereas those with a suffix are reduced 8 bit image files. Whilst you can open the 32 bit images in GIS you can't in Photoshop or CAD. Therefore if you don't have access to such software and wish only to use the image tiles it is best to separate them so that you do not try to work with the wrong sort of file in the wrong sort of environment.

The easiest way to do this is to create a sub-folder called Images (or something similar).

Using the search filter, select all those images containing "RGB" and move to this folder.

Repeat for "8bit".

You now have all the actual image tiles in a separate folder, but these are all large TIFF files (c high 100's to low 1000's KB per image) and will slow any software if used in large numbers.

In order to make them more user-friendly it is advisable to convert these to JPEG files.

This is possible in Paint, which will reduce the files by c50%, however other image processing tools such as Photoshop, or free software such as GIMP, allow conversion with other compression factors enabling reduction by c85%.

This will create JPEG images similar in structure to the JPEGS available through Flickr, but with a much wider range of information. As with the Flickr JPEGs these images contain more information than might be immediately obvious so it is worthwhile processing them as discussed above.

Unfortunately, like the Flickr JPEGs, these images also have no georeferencing information and so cannot be correctly located in GIS or CAD.

Should you wish to use the images in GIS and require them to be correctly geolocated in relation to a map base and each other, you need an additional step of processing. The GeoTIFFs have georeferencing written into the header, but they do not have a separate tfw file, something that is necessary for some programs (e.g. AutoDesk) to ensure their accurate location. Once converted to JPEGs they also lose this information so it is important to create separate TFW world files.

Process GeoTIFFs to create tfw files

This is a complex step only possible with access to GIS or scripting such as Python. There are simple routines within ArcGIS and other open source GIS such as QGIS.

Once the tfw file has been generated, follow the steps above to convert a TIFF to JPEG. Then copy the tfws into the jpeg folder and do a global rename. This is best done through the Command line (cmd) accessed from the Start menu by typing cmd in the Search box.

Navigate to the relevant folder and enter the following:

ren *.tfw *.jpw

By renaming the tfws as jpws, these now work as world files for the JPEGs and will correctly geo-locate them for use in CAD or GIS