Mapping
using
QGIS v3.16 - v3.28.4

QGIS 3 User Manual for home users

INTRODUCTION

1. The new (2017) map system for the Matienzo Caves Project (MCP) is based on a widely-used free-ware programme, QGIS.
2. The MCP map system has now been updated to use version 3 of QGIS and all the old v2 resources and layers included, with additions.
3. The purpose of the map system is to allow Matienzo cavers to research new and historical information, plan speleological projects, and to disseminate up-to-date information about the cave systems and other sites through web pages and hard copy.
4. Two monitors are a definite advantage but not essential.
5. This manual is aimed towards an information "user" rather than users entering data. The latter function happens during expeditions, visits and before website and map publication of updates. However, the appendices have extra insights which may allow users to start altering styles and entering new info. The QGIS v3 programme has on-line documentation.
6. The downloadable sets of information which are opened in the QGISv3 programme allow investigation of speleological sites known to the MCP. Satellite photos, digital terrain model, cave passage centre lines and widths and site positions are shown on a map with surface details, altitude colours, geological details and contours as separate layers. Aerial videos and 360º panoramas are linked to the map. External web links bring in historic maps and other, possibly useful, resources such as administrative boundaries, Google satellite and OpenStreetMap.
7. A recent function has been the inclusion of potential windfarm work (generators, access road and power cables) that could harm caves and underground drainage, although the threat appears to be receding.
8. QGIS also allows data to be filtered so that unexplored holes, draughting sites, etc. can be singled out.
9. Altitudes of cave passages can also be determined to compare with surface altitude.
10. The fuller MCP-QGIS3 system, used during expeditions and for updating information, additionally allows input of cave grid references through a linked Excel spreadsheet.
11. Updated information will be disseminated to users every few months.
12. The 3D facility has not been fully investigated but seems to be slow, clunky and possibly useful for only a few DEM tiles at once.

INSTALLATION OF THE MATIENZO CAVES PROJECT - QGIS V3 SYSTEM

1. The system comprises 1: the QGISv3 programme and 2: a suite of Matienzo data and information
2. The long term release QGIS v3.28 (Firenze) is being used but this documentation is based on v3.16. Windows 7 or 10 is covered here.
3. **The QGIS v3 programme can be downloaded** from the QGIS web site: *www.qgis.org/*
   At the time of writing, QGIS version 3.28 ("Firenze ") is the most stable offered for download from the front page. However, you may like to try the latest release.
4. A version later than 3.28 should still work, but may be less stable.
5. Double left-click on the downloaded QGIS .exe file.
6. The installation takes about 10 minutes divided between file extraction and installation. The process can appear to "hang" but doesn't.
   6.1. The programme *(QGIS Desktop)* can be started from the folder of QGIS shortcuts installed on the desktop or by typing "QGIS" into the *"Search programs and files"* bar from the *Start* menu. However, double-clicking on the MCP_3_yymmdd.qgs (when downloaded, where *yymmdd* is a date) will start the application with the correct data.
   6.2. To get maximum functionality for exploring the Matienzo data, a number of plugins should be installed.
      6.2.1. More detail about using plugins is shown in the *Plugins* section on page 22.
7. The **Matienzo Caves Project data and information** can be downloaded from the MCP web site (http://www.matienzocaves.org.uk/MCP-QGIS3/index.htm) .
   7.1. The complete, latest version (along with the QGIS3 .exe file + LocalVideos) is also available to Matienzo regulars from Juan by sending a 32Gb memory stick + s.a.e. This may be quicker and more reliable for those

with a slow / unreliable Internet connection. Instructions for installation from the memory stick are included on it. What follows here is installation from downloaded files.

8. There are two ways of installing the update: The manual method is detailed in section 10 below.

   8.1. Automatic installation of the data is provided for Windows 10 users through a script for PowerShell.

   8.2. A **data update** script (file *Update-MCP-QGIS.ps1*) downloads the update zip file, and unpacks and distributes them to the correct folder, overwriting olds versions if the user allows it (recommended!).

   8.3. After using the script, the QGIS map can be started up by double clicking on the latest MCP-QGIS-yymmdd.qgs file in the C:/MCP-QGIS3 folder.

9. **First time users of QGIS v3**

   9.1. First time users: On your C: drive create a folder named *MCP-QGIS3*. This is the container for all Matienzo data and other files. Create a folder *panos* within MCP-QGIS3. This will hold the contents of A1 and A2 (below).

   9.2. First time users will need to download almost 10Gb of data compressed into three zip files:

   > **A1** (3.6Gb) and **A2** (3.82Gb) - the contents of the *panos* folder and **B** (2.19Gb) everything else.

   9.3. Unzip (right-click and Extract all ...) *A1.zip* into the *panos* folder. Repeat for A2.zip. The panos folder should contain 65 jpg files.

   9.4. Unzip *B.zip* and move the unzipped contents of "*B*" - folders and files - into the *MCP-QGIS3* folder.

   9.5. At the end of the download process, the **C:\MCP-QGIS3 folder** should contain the following **folders**: AerialVideos, DTM, Geology, GPS tracks, IndividualCaveSurveys, PanGazer, panos, PatrickWarren, Permit, photos-1956, photos-2010, photos-2014, ShapeFiles, Styles
   and **files**:
   AerialPanos.csv, AerialPanos.xlsx, all.dxf, depressions.csv, depressions2.csv, image-filler.jpg, image-filler2.jpg, logo1.jpg, MCP-QGIS3_UserManual-RemoteUser.docx, MCP data in QGIS v3 - 2020July.docx, MCP_3_200816.qgs, QGIS Filters.txt, QGIS.xlsx, QGIS.xlsx.QGIS.vrt, TopTenPlus.dxf, Video-Instructions.docx, X-codes.csv, X-codes.xlsm.

   9.6. item 8.5 is not a definitive list - there may be additions.

   9.7. A 24Gb folder (*AerialVideosLocal*) is not included, as the same videos can be viewed through the YouTube links. The *AerialVideosLocal* folder can be included from a memory stick and is available on request.

10. **Incremental updates for MCP-QGIS3**. This download will contain new or updated files and/or folders for inclusion in the *C:\MCP-QGIS3* folder. All updates and additions since 16/8/2020 will be included, except for additions to AerialVideosLocal. There is also the option to install the update using a Windows 10 PowerShell script – see the web site.

    10.1. Download and unzip the *MCP-QGIS3-update* folder.

    10.2. This folder must be renamed *MCP-QGIS3* and dragged into the *C:* folder where it should merge with existing *MCP-QGIS3* folder. Replace old files with the new ones when requested.

    10.3. Alternatively, copy the contents of the *MCP-QGIS3-update* folder and paste into *C:/MCP-QGIS3*.

    10.4. If you want to, delete any old .qgs configuration files.

11. A copy of this updated User Manual is found within the *MCP-QGIS3* folder as *MCP-QGIS3_UserManual-RemoteUser.pdf* or as a .docx file.

12. From time-to time, any data update should start at 8 or 10 above.

START

1. Double click on the latest QGIS3 configuration file icon, eg *MCP_3_240525.qgs* to start the programme and load in the map. Have your Internet connection live, otherwise certain layers may be flagged as unavailable.

   1.1. The map is loaded in the same state as when it was last saved. First time start up is likely to be slow - perhaps 2 to 3 minutes on a slow machine.

   1.2. Various "decorations" are shown on the screen. These can be removed through the View/Decorations menu: the title label (untick the Enable Title Label box); the image (Matienzo Caves Project logo) and the Copyright text. If the map is now saved these won't be shown next time.

   1.3. Other decorations include the faint grid - see View/Decorations/Grid - and the compass rose.

USING THE QGIS V3 MAP

INTRODUCTION

1. The programme displays background and Matienzo information in layers, e.g. a layer displaying contour lines, another displaying sites. To examine and extract information from each layer, the layer (or sub-layer) must be
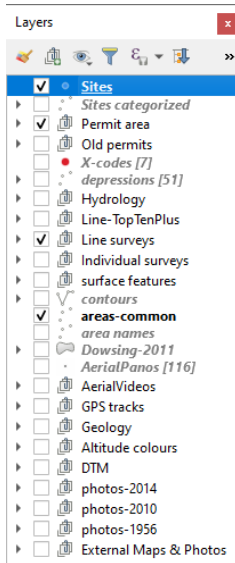
"active" (clicked on in the Layers Panel), normally visible on the map canvas (ticked) and at least one of the icons mentioned in 2.1 must also be active. Failure to make both the **layer** and the appropriate **icon** active leads to frustration!

2.   Many of the programme icons along the top remain unused for day-to-day use. The application is highly competent; current use and investigation of the Matienzo data barely scratches the capability of the programme.

    2.1. The useful icons include four pictured here from the top icon bar

These are the *screen refresh*, *identify features*, *run feature action and the Map Tips* icons. (These might be differently arranged on your screen.)

3.   Zoom in, out and panning (dragging) are controlled by the mouse centre wheel.

4.   If the *Layers Panel* is not seen, selecting *View / Layers / Layers Panel* from the top menu bar will make it visible.

5.   The *Layers Panel* should look something like the screen shot on the left and this controls what can be seen.

    5.1. Layers can be switched on (visible) and off by left-clicking in the tick box.

    5.2. However, a new feature in QGIS v3 allows the user to ctrl-left-click to select / deselect everything from the top down. This can be confusing and may still leave required layers invisible. Try deselecting first then select.

    5.3. Some layers have sub-layers - eg, the *Line surveys* layer can show just the *centre line* or the *passages* or both together. Click on a triangle-pointer to open up the layer or grouped layers.

    5.4. The groups and layers are described below.

    5.5. Layers higher in the *Layers Panel* cover lower layers. The *Digital Terrain (or Elevation) Model (DTM)* layer will smother the photos. However, the *Altitude colours* layer is semi-transparent, allowing the *DTM* layer (if visible) to be seen through it. (To see this effect, try removing the ticks on all layers, then tick *Altitude colours* followed by *DTM*.)

6.   The styles of every visible object can be altered - see Appendix 1.

7.   Nothing is locked within the application or data, so feel free to explore and experiment. You may want to experiment with a copy of the original .qgs file.

WORKING WITH LAYERS FROM THE LAYERS PANEL

1.   The following descriptions are not necessarily in the order showing on the Layers Panel: each layer can be dragged up or down to aid visibility. If a layer disappears, it is likely that it has been inadvertently moved into another layer or group.

2.   If the Layers Panel disappears, it can be brought back through the *View / Panels / Layers Panel.*

3.   Right-clicking over an item in the Layers Panel displays a number of choices including *Zoom to layer.*

4.   There are more (undocumented) layers than outlined here!

Sites (layer must be active / highlighted to explore information)

| Purpose	Show positions of site; links to further information (description; photos, etc)
Resource(s) on disc	C:/MCP-QGIS3/QGIS.xlsx
[Previous source]	[MS *Access* database]
Layer	Sites
Appearance(s) / Style(s)	When zooming in: nothing - then blue dot with white edge - then with code - then with name. A cyan background shows a site documented as draughting. Style: C:MCP-QGIS3/Styles/sites.qml
Map tip icon depressed	Hover over any blue dot shows panel with all site data.
Action icon depressed. Action chosen from drop-down list	Drop down list: Home user would normally click *Choose site description from website*. Matienzo Office users would have access to *local files* and would choose that option. Left-click on blue dot opens browser (Chrome) and brings in the site description. See Appendix 2 to change browser or if there is an error.
Opening up the layer info on the Layer panel	-
Notes	See Appendix 3 for Searching for /choosing / filtering which sites to show.

Sites - categorised (layer must be active / highlighted to explore information)

Purpose	Show position of sites; categorise sites; links to further information.
Resource(s) on disc	C:/MCP-QGIS3/QGIS.xlsx
[Previous source]	[MS *Access* database]
Layer	Sites - categorised
Appearance(s) / Style(s)	When zooming in: nothing - then category code - then with code and name. **D** = dig; **U** = unexplored; **!** (yellow) = still going; **?** = unknown; site dot = exploration "finished". A cyan background to the name indicates a draughting site. Style: C:MCP-QGIS3/Styles/sites-categorised.qml
Map tip icon depressed	Hovering over the top edge of a symbol / letter shows a panel with all the data for that site.
Action icon depressed. Action chosen from drop-down list	Drop down list: Home user would normally click *Choose site description from website*. Matienzo Office users would have access to *local files* and would choose that option. Left-click on blue dot opens browser (Chrome) and brings in the site description. See Appendix 2 to change browser.
Opening up the layer info on the Layer panel	The categories are displayed and can be toggled on / off.

## X-codes (layer must be active / highlighted to explore information)

Purpose	Show position of sites seen but outside the permit area; links to further information.
Resource(s) on disc	C:/MCP-QGIS3/X-codes.csv
[Previous source]	[X-codes.xlsm]
Layer	X-codes
Appearance(s) / Style(s)	When zooming in: a red circle with white surround - then with X code and name. Style: C:MCP-QGIS3/Styles/X-codes.qml
Map tip icon depressed	Hovering over the red dot shows a pink panel with the data for that site. A link on the panel opens up Chrome and the appropriate logbook page found on *Issuu*. See Appendix 2 for changing the browser if necessary.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	X-sites will be given site codes if the permit area changes to include them.

Depressions (layer must be active / highlighted to explore information)

Purpose	Starting at Easter 2019, a number of depressions have been marked (over the *photos-1956* layer) as a separate layer to ease investigation in, what are now, areas thick with trees and undergrowth.
Resource(s) on disc	C:/MCP-QGIS3/Shapefiles/depressions.shp
[Previous source]	-
Layer	depressions
Appearance(s) / Style(s)	A diamond with white surround: red - not investigated; green - explored. Style: C:MCP-QGIS3/Styles/depression.qml
Map tip icon depressed	Hovering over the diamond just shows the D code.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the number of unexplored and investigated depressions. Either type can be toggled on / off.

Notes	Most are focussed on the Monte Llusa area, with one out to the east. If caves are found, a cave site number will be given. When this *depressions* layer is displayed over the modern *2014-photos* layer (perhaps using the *Map Swipe Tool* plugin, it becomes obvious that this feature may prevent pure random wanderings in the jungle. (The information can be loaded into *OruxMaps*.)

line - TopTenPlus (layer must be active / highlighted to explore information)

Purpose	Clearly display just centre line of the major cave systems.
Resource(s) on disc	C:/MCP-QGIS3/TopTenPlus.dxf
[Previous source]	[Filtered out of Survex]
Layer	Line-TopTenPlus
Appearance(s) / Style(s)	Purple centre line with shadow. Style: C:MCP-QGIS3/Styles/cave-lines-shadow.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	-

line surveys group contains *centre line & passages* layers

| Purpose	Display centre line (and passage widths, if available) of the major cave systems.
Resource(s) on disc	C:/MCP-QGIS3/all.dxf
[Previous source]	[Survex all.3d export]
Layers	*Centre line* and *passages* grouped into *line surveys*

centre line (layer must be active / highlighted to explore information)

Purpose	Display centre line of the surveyed caves.
Resource(s) on disc	C:/MCP-QGIS3/all.dxf
[Previous source]	[Survex all.3d export]
Layers	*Centre line* in the *line surveys* group
Appearance(s) / Style(s)	Purple line with shadow. Style: C:MCP-QGIS3/Styles/cave-lines-shadow.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	If details are required of legs, stations, etc., caves in the *Individual Surveys* group are better. (Below) (However, information can be gleaned by studying the *Derived Values* after left clicking on a purple line with the *Identify Features* icon depressed. Altitude information for a station is "Closest vertex z".)

passages **(layer must be active / highlighted to explore information)**

Purpose	Display passage width of the surveyed caves, where it exists.
Resource(s) on disc	C:/MCP-QGIS3/all.dxf
[Previous source]	[Survex all.3d export]
Layers	*passages* in the *line surveys* group
Appearance(s) / Style(s)	Transparent orange polygon. Style: C:MCP-QGIS3/Styles/cave-passage.qml
Map tip icon depressed	-
Action icon depressed. **Action chosen from drop-down list**	-
Opening up the layer info on the Layer panel	-
Notes	If details are required of legs, stations, etc., caves in the *Individual Surveys* group are better. (Below). (However, information can be gleaned by studying the *Derived Values* after left clicking on a line with the *Identify Features* icon depressed.)

Individual surveys group contains group(s) holding *station*, *leg* and *passage* width info.
e.g. 3234 group holds *station*, *leg* and *passage* width info for site 3234.

Purpose	Display station, leg and passage width positions and further information (for any number of individual sites or sites grouped in Survex, e.g. the Four Valleys System). Altitude data is more easily obtained through this group than the overall *line surveys* layer. If relationships between passages are required (and not passage-surface links) then *Survex* will be more quickly informative.
Resource(s) on disc	C:/MCP-QGIS3/IndividualCaveSurveys/3234.gpkg (Also included is a kml file for 0780 Corcada)
[Previous source]	[Survex 3234.3d export]
Layers	*Stations, legs* and *Passage width (polygons)* grouped into 3234.
Appearance(s) / Style(s)	See individual layers
Map tip icon depressed	-
Action icon depressed. **Action chosen from drop-down list**	-
Opening up the layer info on the Layer panel	Clicking on the triangle icon to the left of Individual surveys shows the individual surveys in this group. Currently only site 3234 and #0780. Other sites can be added using Patrick Warren's 3d importer. See Appendix 4.
Notes	

e.g. *station* info for site 3234 (layer must be active / highlighted to explore information)

Purpose	Display station position, name and altitude.
Resource(s) on disc	C:/MCP-QGIS3/IndividualCaveSurveys/3234.gpkg
[Previous source]	[Survex 3234.3d export]
Layers	*Stations* in *3234 group*.
Appearance(s) / Style(s)	Zooming in: station dots revealed, coloured by altitude. Station name revealed. Style: C:\MCP-QGIS3\Styles\colour_stations_by_depth.qml
Map tip icon depressed	Hover over a station: Coordinate shown on the bottom bar; a pop-up pane displays the station altitude and the station name.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Opening up the *stations* layer shows the range of colours allocated to altitudes. The dots may be small and the colours are better seen by opening up the *legs* or *polygons* layers
Notes	

e.g. *leg* info for site 3234 (layer must be active / highlighted to explore information)

Purpose	Display legs linking stations, name and altitude.
Resource(s) on disc	C:/MCP-QGIS3/IndividualCaveSurveys/3234.gpkg
[Previous source]	[Survex 3234.3d export]
Layers	*legs* in *3234 group*.
Appearance(s) / Style(s)	Zooming in: legs revealed, coloured by altitude. Style: C:\MCP-QGIS3\Styles\color_legs_by_depth_lined.qml
Map tip icon depressed	Hover over a station: Coordinate shown on the bottom bar; a pop-up pane displays a nearby station name.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Opening up the *legs* layer shows the range of colours allocated to altitudes.
Notes	

e.g. *polygons* info for site 3234 (layer must be active / highlighted to explore information)

Purpose	Display passage width, name and altitude.
Resource(s) on disc	C:/MCP-QGIS3/IndividualCaveSurveys/3234.gpkg
[Previous source]	[Survex 3234.3d export]
Layers	*Passage width (polygons)* in *3234 group*.
Appearance(s) / Style(s)	Zooming in: station dots revealed, coloured by altitude. Station name revealed. Style: C:\MCP-QGIS3\Styles\colour_polygons_by_elevation_using_ranges.qml
Map tip icon depressed	Hover over a polygon: Coordinate shown on the bottom bar; a pop-up pane displays altitude.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Opening up the *polygons* layer shows the range of colours allocated to altitudes.

Surface features group contains groups and layers holding *pylons, railways, walls-boundaries, water courses and roads tracks* info

| Purpose	Display enough surface features information for wandering spotholers.
Resource(s) on disc	Various from mapas.cantabria.es
[Previous source]	[download from mapas.cantabria.es]
Layers	*Pylons* group with *towers* and *cables* layers *Railways* layer *Walls-boundaries* group containing *boundaries-outline* and *building-fill* layers *Water courses* layer *Roads tracks* groups containing *road fill* and *road outline* layers.
Appearance(s) / Style(s)	See individual layers. Appearance can be altered by changing the Symbology, e.g. the (main) roads can be coloured red instead of green.
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Groups and layers displayed.
Notes	*Water courses* and *road tracks* can be usefully filtered. See the individual group / layer below.

water courses

Purpose	To display streams and rivers. However, the data from mapas,cantabria.es is sometimes unreliable - with streams shown where water never flows.
Resource(s) on disc	C:/MCP-QGIS3/ShapeFiles/surface/ water-course-combined-final-18-02.shp
[Previous source]	[mapas.cantabria.es]
Layers	*Water courses*
Appearance(s) / Style(s)	Zooming in: Water course is 5m wide at scale so becomes larger Style: C:\MCP-QGIS3\Styles\ watercourses.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	This layer is filtered to show just the major streams. See Appendix 3. Filter items shown in qNote plugin.

road tracks group with *road fill* and *road outline* layers

|	
Purpose	To display roads and tracks. The info supplied from the mapas.cantabria.es site is sometimes erratic, showing tracks as roads and vice versa.
Resource(s) on disc	C:/MCP-QGIS3/ShapeFiles/surface/ road-fill-combined-final-18-02.shp and C:/MCP-QGIS3/ShapeFiles/surface/ road-outline-combined-final-18-02.shp
[Previous source]	[mapas.cantabria.es]
Layers	*Road fill* and *road outline*
Appearance(s) / Style(s)	Road / track becomes larger. Style: C:\MCP-QGIS3\Styles\ road-fill.qml and C:\MCP-QGIS3\Styles\ road-outline.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	This layer can be filtered to show just major roads. See Appendix 3. Filter items shown in qNote plugin.

contours layer (layer must be active / highlighted to explore information)

Purpose	Altitude and landform information for wandering spotholers.
Resource(s) on disc	C:\MCP-QGIS3\ShapeFiles\surface\ contours-combined-final-18-02.shp
[Previous source]	[download from mapas.cantabria.es]
Layers	*contours*
Appearance(s) / Style(s)	Zooming in: brown lines every 25m; brown lines every 5m with label every 25m (25m contours are heavier). Depressions shown with blue contours.
Map tip icon depressed	Small panel with altitude displayed.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the three types of contour line:

areas-common layer

Purpose	Area names used by the Matienzo Caves Project. See also *area names*, below.
Resource(s) on disc	C:\MCP-QGIS3\ShapeFiles\areas-common.shp
[Previous source]	[-]
Layers	*areas-common*
Appearance(s) / Style(s)	Zooming in: all names appear. Three styles, small, medium, large depending on "importance". Green letters with white buffer. Peaks have maroon letters
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-

area names layer

Purpose	Display all downloaded area names. See also *areas-common* above.
Resource(s) on disc	C:\MCP-QGIS3\ShapeFiles\ area-names-combined-final-18-02.shp
[Previous source]	[download from mapas.cantabria.es]
Layers	*Area names*
Appearance(s) / Style(s)	Zooming in: all names appear. Green italic letters, white buffer.
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	Not all areas are named. Some have name variants.

Hydrology group contains *resurgences-TracedTo* & *traceDetails* layers

Purpose	Display the routes for water traces and display additional tracing information including time take, resurgence, agent, etc.
Resource(s) on disc	C:/MCP-QGIS3/Shapefiles/ Resurgences-TracedTo.shp and C:/MCP-QGIS3/Shapefiles/ traceDetails.shp
[Previous source]	[water tracing results]
Layers	*Resurgences-TracedTo* and *traceDetails* grouped into *Hydrology*
Appearance(s) / Style(s)	See below
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the two separate layers
Notes	

resurgences-TracedTo

Purpose	Display highlighted names of the resurgences traced to.
Resource(s) on disc	C:/MCP-QGIS3/Shapefiles/ Resurgences-TracedTo.shp
[Previous source]	[water tracing results]
Layers	*Resurgences-TracedTo* in the *Hydrology* group
Appearance(s) / Style(s)	Large dark blue text with a cyan buffer. Style: C:MCP-QGIS3/Styles/ resurgences-TracedTo.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	

traceDetails **(layer must be active / highlighted to explore information)**

Purpose	Display supposed route of water tracing agent and provide more information
Resource(s) on disc	C:/MCP-QGIS3/ShapeFiles/traceDetails.shp
[Previous source]	[various]
Layers	*traceDetails* in the *Hydrology* group
Appearance(s) / Style(s)	Dashed lines enclose a colour-coded route for the water tracing agent: Green - fluorescein; cyan - optical brightening agent; clear - unknown. A chevron next to the route gives the direction and trace code. Style: C:MCP-QGIS3/Styles/ water trace details.qml
Map tip icon depressed	Hovering over a dye trace line brings up a panel showing the following information: Reference; trace start location; trace finish location; time taken; agent; date of the trace. A link is also provided to the MCP water tracing web page.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the three colours of the water trace line
Notes	Some trace routes within certain caves have been guessed. For example, on trace FA-04 (Cubillón - Aguanaz) the OBA might have entered Aguanaz in SJ Inlet and not at the upstream sump.

Dowsing-2011 **layer (layer must be active / highlighted to explore information)**

Purpose	To display the results of dowsing by Dr John Wilcock above possible underground routes over 3 days, July 2011.
Resource(s) on disc	C:/MCP-QGIS3/Shapefiles/ Dowsing-2011.shp
[Previous source]	[dowsing results]
Layers	*Dowsing-2011*
Appearance(s) / Style(s)	Varied appearance depending on the reaction of the dowsing rods. Shaded areas: red - no reaction; dark blue - positive reaction; pale blue with dashed outline - presumed connections between positive areas. Style: C:MCP-QGIS3/Styles/dowsing.qml
Map tip icon depressed	Hovering over any dowsing line shows a panel with information: Dowsing ID; area and reaction type; dowser and date; a description of the dowsing; a link to an overview on the website.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the three styles for the dowsing information.
Notes	

AerialPanos layer (layer must be active / highlighted to explore information)

Purpose	To show the centre of aerial panoramas taken by drone and provide a link to open up each panorama in *PanGazer*.
Resource(s) on disc	C:/MCP-QGIS3/AerialPanos.csv
[Previous source]	[C:/MCP-QGIS3/AerialPanos.xlsx]
Layers	*AerialPanos*
Appearance(s) / Style(s)	Zooming in: transparent blue circles with centre cross - then with smaller circle showing the date and panorama code. Style: C:MCP-QGIS3/Styles/aerial-pano.qml
Map tip icon depressed	Hovering over a cross displays a panel showing: The area; code; date; file location of the panorama.
Action icon depressed. **Action chosen from drop-down list**	"PanGazer" chosen from drop-down list (of one). Left-click (or right-click) on the centre cross. The PanGazer programme is loaded along with the appropriate panorama.
Opening up the layer info on the Layer panel	-
Notes	See Appendix 5 for more info about the *Pangazer* programme.

AerialVideos group (a layer must be active / highlighted to explore information)

Purpose	To show the start-point and directional path of videos taken by drone along with links to start each video, both locally and remotely from YouTube; link to Google Earth to show the 3D flight path. The videos allow comparison between the landscape and the map - searching for new sites - if two screens are used.
Resource(s) on disc	C:/MCP-QGIS3/AerialVideos/ containing kml path files and contents.csv file. C:/MCP-QGIS3/AerialVideosLocal/ containing all the drone videos (by request).
[Previous source]	[Info from Mavic Pro drone]
Layers	*Contents, KMLs-merged home* and *KMLs-merged-path* in the *AerialVideos* group.
Appearance(s) / Style(s)	See separate layers.
Map tip icon depressed	-
Action icon depressed. **Action chosen from drop-down list**	-
Opening up the layer info on the Layer panel	Shows the three grouped layers: *contents*, *KMLs-merged home* and *KML-merged path*
Notes	See Appendix 6 for more info about these features.

KMLs-merged home (layer must be active / highlighted to explore information)

Purpose	Display flight start point with a link to *Google Earth*
Resource(s) on disc	C:/MCP-QGIS3/AerialVideos/ kmls-merged.kml
[Previous source]	[info from Mavic Pro drone]
Layers	*KMLs-merged home* in the *AerialVideos* group
Appearance(s) / Style(s)	Zooming in: Orange circle (home position) - then with a white "H" in an orange circle - then with video code next to home position. Style: C:MCP-QGIS3/Styles/ aerial-video-home.qml
Map tip icon depressed	Video code
Action icon depressed. **Action chosen from drop-down list**	Choose "Google Earth" from drop-down list. Left-click on orange circle will load the flight path into Google Earth.
Opening up the layer info on the Layer panel	-
Notes	See Appendix 6.

KMLs-merged path (layer must be active / highlighted to explore information)

Purpose	To show the directional path of videos taken by drone along with links to start each video, both locally and remotely from YouTube.
Resource(s) on disc	C:/MCP-QGIS3/AerialVideos/ kmls-merged.kml
[Previous source]	[info from Mavic Pro drone]
Layers	*KMLs-merged path* in the *AerialVideos* group
Appearance(s) / Style(s)	Zooming in: A transparent, grey flight path line - then with red chevrons showing the flight direction. Style: C:MCP-QGIS3/Styles/ aerial-video.qml
Map tip icon depressed	Video code
Action icon depressed. **Action chosen from drop-down list**	Choose "YouTube video" from drop-down list, unless you have the *AerialVideosLocal* folder. Left-click anywhere on the grey flight path will load in the remote video.
Opening up the layer info on the Layer panel	-
Notes	See Appendix 6.

GPS tracks group

Purpose	To show GPS tracks and recorded information.
Resource(s) on disc	C:/MCP-QGIS3/GPS tracks/
[Previous source]	[Info from GPS units]
Layers	Contains further groups, organising the tracks by area and date.
Appearance(s) / Style(s)	See example layers below
Map tip icon depressed	-
Action icon depressed. **Action chosen from drop-down list**	-
Opening up the layer info on the Layer panel	Currently shows 5 areas (EMountains, ElNaso, Hazas, MLlusa, Rincon), with dated sub groups in each leading down to single groups that contain *tracks* and *Waypoints* layers. See below.
Notes	See below for example.

e.g. EMountains / 190718_1053Colina

Tracks **(layer must be active / highlighted to explore information)**

Purpose	To show track taken by GPS on surface walks / prospecting.
Resource(s) on disc	C:/MCP-QGIS3/GPS tracks/2019s/ 2019-07-18 1053__20190718_1053.kml
[Previous source]	[info from GPS unit]
Layer	*Tracks*
Appearance(s) / Style(s)	Zooming in: Red line resolves as small triangles on path labelled with the date and chevrons showing the direction. Style: C:MCP-QGIS3/Styles/ GPS-track.qml
Map tip icon depressed	Hovering over the line shows the segment number with start and end date and times.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	-

Waypoints **(layer must be active / highlighted to explore information)**

Purpose	Display points of interest marked during prospecting.
Resource(s) on disc	C:/MCP-QGIS3/GPS tracks/2019s/ 2019-07-18 1053__20190718_1053.kml
[Previous source]	[info from GPS unit]
Layer	*Waypoints*
Appearance(s) / Style(s)	Zooming in: Red circle at the waypoint labelled with red italic text.
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	-

Permit area & Old permits **groups with**
Administrative boundaries, 2014-permit & 2019-Hazas Permit **layers; 2021, 2022 permits;**
(layer must be active / highlighted to explore information)

Purpose	To show the MCP permit area(s) and town hall administrations
Resource(s) on disc	C:/MCP-QGIS3/Permit/ MatienzoMap2014.PERMIT.dxf and C:/MCP-QGIS3/Permit/ HazasPermit2019.shp; shp for '21 and '22
[Previous source]	[Maps and info from Cultura, etc] & external
Layers	*Administrative boundaries* (requires an Internet connection) *, 2021 & 2022 permits grouped in Permit area. 2014-permit* and *2019-HazasPermit* grouped in *Old Permits*
Appearance(s) / Style(s)	Brown line for the area boundaries; red line for the 2021 Permit; blue for the 2022 permit. Zooming out will show all the admin boundaries in Cantabria then the autonomous regions and territories. Style: C:MCP-QGIS3/Styles/ permit-2014.qml
Map tip icon depressed	Hovering over the Permit line shows "PERMIT". With the *Identify features* icon depressed and a boundary left-clicked, the Identify Results pane display some info.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	The N-624 is the northern boundary. Note that the withdrawal of permission to explore on Vizmaya at Hoznayo is not shown on this QGIS map.

Geology **group**

Purpose	Provide geological information.
Resource(s) on disc	61Mb of data in the C:\MCP-QGIS3\Geology folder
[Previous source]	[mapas.cantabria.es]
Layers	The layers in order - top to bottom: *Contacts & Faults; Folding; Mobile formations; Ores & minerals; Layer traces; Lithology codes; Lithology*. The only group is for Dip information.
Appearance(s) / Style(s)	See below for selected layers
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the group and layers mentioned above.
Notes	With all layers, group and sub-layers selected, a full geological map is shown. The appropriate layer within the Geology group must be chosen / highlighted to obtain further information. Some of these layers are further analysed below. Lithology on different geology sheets may have been interpreted differently by different geologists during the initial field surveys, so may show different colours, etc. The original source, mapas.cantabria.es also has a *geomorphology* layer amongst many others. See also Appendix 8.

Contacts & Faults (layer must be active / highlighted to explore information)

Purpose	Show position and provide further info about contacts and faults
Resource(s) on disc	C:/MCP-QGIS3/Geology/ContactoFallas-all.shp
[Previous source]	[mapas.cantabria.es]
Layer	*Contacts & Faults*
Appearance(s) / Style(s)	Various lines with 19 defined decorations to show, e.g. Unconformities, faults (7 styles), etc. Geology sheet borders and political limits are also shown. Style: C:MCP-QGIS3/Styles/ Contacts&Faults.qml
Map tip icon depressed	Small panel describing the feature, the sheet it appears on and its length.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows a legend of the 19 styles. A better view may be seen by double clicking on *Contacts & Faults* to open the Layer Properties and view the *Symbology*.
Notes	-

Folding (layer must be active / highlighted to explore information)

Purpose	Show position and provide further info about folds
Resource(s) on disc	C:/MCP-QGIS3/Geology/EPlegamiento-all.shp
[Previous source]	[mapas.cantabria.es]
Layer	*Folding*
Appearance(s) / Style(s)	Various lines with 5 defined decorations to show: anticline, presumed anticline, syncline, presumed syncline and overturned syncline. Style: C:MCP-QGIS3/Styles/folding.qml
Map tip icon depressed	Small panel describing the fold with its length.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows a legend of the 5 styles. A better view may be seen by double clicking on *Folding* to open the Layer Properties and view the *Symbology*.
Notes	-

Mobile formations (layer must be active / highlighted to explore information)

Purpose	Show position and provide further info about mobile formations
Resource(s) on disc	C:/MCP-QGIS3/Geology/FormasMGeo-all.shp
[Previous source]	[mapas.cantabria.es]
Layer	*Mobile formations*
Appearance(s) / Style(s)	Various areas with 8 defined decorations to show, e.g. slippage or landslide, colluvium, alluvial fan, etc. Style: C:MCP-QGIS3/Styles/mobile-formations.qml
Map tip icon depressed	Small panel describing the fold with its length.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows a legend of the 8 styles. A better view may be seen by double clicking on *Mobile formations* to open the Layer Properties and view the *Symbology*.

Ores & Minerals (layer must be active / highlighted to explore information)

Purpose	Show position and provide further info about ore and mineral extraction.
Resource(s) on disc	C:/MCP-QGIS3/Geology/IndiciosMinerales-all.shp
[Previous source]	[mapas.cantabria.es]
Layer	*Ores & Minerals*
Appearance(s) / Style(s)	A black circle annotated with the deposit. Style: C:MCP-QGIS3/Styles/mobile-formations.qml
Map tip icon depressed	Small panel with the mineral name.
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	-
Notes	Not many. There are 3 indicators west of #1561, Mina Favorita.

Dip group

Purpose	Show information about the dip and place where it was measured.
Resource(s) on disc	C:/MCP-QGIS3/Geology/MedidasEstructurales-all.shp and C:/MCP-QGIS3/Geology/AngulosBuzamiento-all.shp
[Previous source]	[mapas.cantabria.es]
Layers	*Strata and dips* and *dip value*
Appearance(s) / Style(s)	A decorated dip symbol and label showing the direction and dip value. Style: C:MCP-QGIS3/Styles/ strata-dips.qml and dip-value.qml
Map tip icon depressed	Strata & dips: Panel giving dip value and possible interpretation of other numbers. Dip value: -
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Strata and dip: A 4-item legend.

Lithology layer (layer must be active / highlighted to explore information)

Purpose	Show position, types and ages of the various rock units.
Resource(s) on disc	C:/MCP-QGIS3/Geology/UnidadesGeologicas-all.shp
[Previous source]	[mapas.cantabria.es]
Layer	*Lithology*
Appearance(s) / Style(s)	Dozens of different colours and patterns to differentiate rock types, etc Style: C:MCP-QGIS3/Styles/lithology.qml
Map tip icon depressed	Hovering over any rock type: A panel describing the formation; the name; the age range; a link to view the age on a simple geological column; the original sheet number and unit; a link to view the legend for the sheet.
Action icon depressed. **Action chosen from drop-down list**	-
Opening up the layer info on the Layer panel	An opacity slider (allowing photos to be seen underneath) and dozens of colours / patterns to differentiate the formations.
Notes	See also *Lithology codes*

Lithology codes layer (layer must be active / highlighted to explore information)

Purpose	Highlight the unit code for the geological formation.
Resource(s) on disc	C:/MCP-QGIS3/Geology/SiglasUnidades-all.shp
[Previous source]	[mapas.cantabria.es]
Layer	*Lithology codes*
Appearance(s) / Style(s)	Black italic code with white buffer. Style: C:MCP-QGIS3/Styles/lithology-codes.qml
Map tip icon depressed	Hovering over a code repeats the Lithology code
Action icon depressed. **Action chosen from drop-down list**	-
Opening up the layer info on the Layer panel	-
Notes	See *Lithology* layer Map tip panel for the link to the appropriate legend to view more info about the formation.

Altitude colours group

Purpose	To colour altitudes / altitude ranges to further interpret the landscape
Resource(s) on disc	C:\MCP-QGIS3\DTM\MDT_2012_2010_LIDAR folders
[Previous source]	[mapas.cantabria.es]
Layers	38 raster tiles covering the area.
Appearance(s) / Style(s)	Currently, each tile is rainbow coloured from 0 to 900m with a different colour for each 100m range. Other Style files are available. Style: C:MCP-QGIS3/Styles/altitude-colour-02.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the contents of the group - 38 raster files. Each layer (raster) can be further opened to show the applied palette (style) legend.
Notes	Other altitude colour styles are available. See Appendix 7. This *Altitude colours* group, if the style is somewhat transparent, can be successfully used with the following (underlying) DTM group.

DTM group

Purpose	Use LIDAR info to further detail the landscape
Resource(s) on disc	C:\MCP-QGIS3\DTM*.tif and associated files
[Previous source]	[mapas.cantabria.es]
Layers	39 raster tiles covering the area.
Appearance(s) / Style(s)	Currently, a grey scale interpretation. Style: C:MCP-QGIS3/Styles/DTM.qml
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the contents of the group - 38 raster files. Each layer (raster) can be further opened to show the applied palette (style) legend.
Notes	This *Altitude colours* group, if the style is somewhat transparent, can be successfully used with this DTM group.

photo groups: *Photos-2014; photos-2010; photos-1956*

Purpose	View the terrain through recent and archive aerial / satellite photos
Resource(s) on disc	C:\MCP-QGIS3\photos-2014 (41 colour photo jpg tiles), photos-2010 (38 colour photo jpg tiles), photos-1956 (15 B&W photo jpg tiles)
[Previous source]	[mapas.cantabria.es]
Layers	Each tile icon shown within each photo folder
Appearance(s) / Style(s)	As on the jpg
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	Shows the contents of the group - the jpgs
Notes	The 1956(-57) photos are useful for spotting possible depressions / holes that were visible before extensive forestry started in the area. (See *Depressions* layer.) The "Map Swipe Tool" (plugin) is particularly useful for swiping between the 1956 and 2014 or ESRI external photos - to study the differences over 60 years.

External Maps and photos group

Purpose	To provide links to possibly useful old and modern map and aerial photo resources (which may be slow in downloading depending on the Internet speed). A (fast) Internet link is required for all of these resources.
Resource(s) on disc	None
Layers & Groups	There are 4 groups: **Current Maps** *Mapas raster del IGN* is possibly the most useful layer, providing a number of commercially available maps at different zoom levels. **Current Photos** *Current max. res. satellite (PNOA)* The most recent, maximum resolution satellite photo from Plan Nacional de Ortofotografía Aérea. The *ESRI Satellite* photo appears to be the same. **Historic Maps** The earliest (*Original plans*; bottom layer) appears to be the surveyors drawings that provide info for the next map up *MTN50 (1915-1960)* then *MTN50* with *MTN25* the latest. The top two layers provide the sheet codes for the respective maps. **Historic Photos** The oldest at the bottom, latest at the top. The *Vuelo Interministerial (1973-1986)* layer is incomplete, with no information north of Matienzo. Incorporated photos (not needing an Internet connection) are found in the *photos-1956*, *photos-2010* and *photos-2014* layers above.
Appearance(s) / Style(s)	-
Map tip icon depressed	-
Action icon depressed. Action chosen from drop-down list	-
Opening up the layer info on the Layer panel	
Notes	All these layers are Web Map Service layers with info provided from various WMS servers. As such, the download speed can be slow: perhaps 15 seconds when the information is provided as one raster file rather than in tiles. A blue bar and "Getting map via WMS" appears at the base of the canvas window.

PLUGINS

1. Plugins can be installed from the *Plugins / Manage and install plugins* menu
2. Some Plugins are built into QGIS v3. Others can be downloaded: Coordinator; go2streetview; Import .3d file; Lat Lon Tools; MapSwipeTool; PointConnector; Profile tool; ProfileFromPoints; qNote; QuickMapServices; SearchLayers; Send2GE; Spreadsheet layers; ZoomView.
3. A User rather than a person entering data will only possibly be concerned with items 4, 5, 7 and 10 below.
4. **go2streetview** opens up *Google Street View* photographs when a short line is dragged over a road.
    4.1. With the *surface features* layer visible (or at least the *road tracks*), click on the *go2streetview* icon then drag a short line along a road.
    4.2. As long as the road has been traversed by the Google car, a photo appears with the view that can be resized.
    4.3. Dragging the picture or zooming in or out is reflected in the blue icon on the map.
5. **Import .3d** is a plugin by Patrick Warren allowing detailed selection of Survex .3d file parts to display on the map. Colours are used to show altitudes. See Appendix 4.
6. **LatLon tools** is used to input occasional coordinates to check position. Single site input is OK. Multi-input currently not working? Python error?
7. **MapSwipeTool** is used to swipe over the canvas to reveal another layer.
    7.1. Display what is required without the overlay then select (but don't display) the layer to swipe / reveal.
    7.2. Depress the Map Swipe Tool icon and swipe over the screen from left to right or top to bottom.
    7.3. Particularly revealing actions are to swipe the 1956 photos over the 2014 photos or *vice versa* and to swipe the Geology layer over others.
    7.4. Sub layers can also be swiped.
8. **Profile tool** will plot profile lines. Not yet fully investigated. It appears to hang if all the *DTM* or *Altitude Colours* tiles are chosen. Probably a small number of tiles at a time are required.
9. **qNote** provides a note function, for example, to keep filter lines for showing only major rivers or roads. This filter data is also shown in Appendix 2.
10. **QuickMapServices** provides icons to explore and connect to external maps. Some of these maps / links are grouped under *External Maps and Photos*.
11. **Spreadsheet Layers** is used to import the *Sites* layer data.

PRINT OUTS

1. A screen shot of the current window can be taken with *Project / Import/Export / Export map to Image* - a number of formats are available when saving.
    1.1. The resultant file can be printed using any method.
    1.2. This procedure should be OK for most expedition requirements.
    1.3. The scale, grid, compass rose and attribution notice can be turned off or altered.
2. A screen shot can be taken using the *Windows Snipping Tool*, then printed out.
3. The *Layouts* are of great use but beyond the scope of this introductory paper.

Appendices

Appendix 1: Styles

1. The MCP map system has been developed using two large screens with screen resolution 2560 x 1440px and 1920 x 1080px. It may be that a laptop user would prefer different label sizes.
2. Each layer is given its own style and this can be altered for points, lines and polygons.
3. The full details of altering styles is beyond this introduction but is well documented in QGIS 3 literature.
4. Styles can be shown by double-left-clicking over the layer name in the Layers Panel.
   4.1. Within the MCP map styles, most use is made of Symbology, Labels, Actions and Display.
   4.2. For example, the data in the *Sites* layer is currently has the Symbology of a simple marker. Clicking on Simple marker shows that it has a size of 6 pixels.
   4.3. This style can be altered and applied using pixels, metres at scale, etc, etc.
   4.4. To apply a saved style, the Style button at the bottom left of the window accesses a *Load style* option. A possible style for the points would be new-sites.qml. This style is used during expeditions to highlight new sites. (The current style for *Sites* is sites.qml)

   4.5. Labels can also be applied to markers and it is possible to change markers and labels depending on various attributes (eg digs, resurgences, etc could have different markers) and the zoom setting.
   4.6. As an example, use is made of database information to differentiate sites. Untick the *sites* layer, then tick and open up the *Sites-categorised* layer.
   4.7. Double click on *Sites - categorised* to bring up the Layer Properties window. The Symbology window shows that a different letter is show depending on the contents of a database field.
5. Many hours can be spent exploring all the current layers and styles, playing with settings and learning what is possible (beyond the current Matienzo CP map).

Appendix 2: Action menu and browser

1. If a left-click over a blue sites marker (with sites highlighted, the Run feature action icon depressed and the *site description from website* option chosen) doesn't bring up the site description, the script for the action will need altering.
2. To show the script: double-left click on the *sites* layer in the *Layers Panel* and choose the *Actions* icon in the left hand panel. Double click on the "Generic" line to show an "Edit Action" window. The Action Text is:
   "C:\Program Files\Google\Chrome\Application\chrome.exe" "www.matienzocaves.org.uk/descrip/[%cavet%].htm" This starts the Chrome browser and then loads in the correct site description from the web site." [%cavet%]" is the site code. However, the chrome.exe file seems to jump around! It may reside as *"C:\Program Files (x86)\Google\Chrome\Application\chrome.exe"*
3. If you use Internet Explorer instead of Chrome then the first part of the action should (probably) be altered to *C:\ Program Files (x86)\Internet Explorer\iexplore.exe*
4. *C:\Program Files (x86)\Microsoft\Edge\Application\msedge.exe* may be the correct phrase for working with Microsoft Edge.

Appendix 3: Filtering / Searching

1. As an example, the *Sites* layer can be **filtered to show sub-sets** of the data, eg sites which are unexplored, draughting, sinks, dive sites, have archaeological interest, etc.

    1.1. In the Layers Panel, right-click over the Sites layer and left click Filter... (Or ctrl-F)

    1.2. A *Query Builder* window appears which can be resized.

    1.3. Details of the fields are shown below. This also applies to the *Sites - categorised* layer.

   1.4. A simple example. To show unexplored sites on the map, left-click once on the *explored* field; click the *Sample* button to show possible values (NULL, ! (still going), d (dig), u (unexplored)) in the *Values* pane. Build up the query expression by double left-click on explored; click the "=" operator then double left-click the "u" value. Click the Test button to show the filter query works then click the OK button to show just the unexplored sites on the map.

    1.5. If draughting, unexplored sites are required then the filter expression can be built up to show *"explored" = 'u' AND "draught" = '1'*

    1.6. To remove the filter expression, left-click the *Clear* then *OK* buttons at the base of the *Query Builder* window.

    1.7. Different layers can be filtered at the same time, eg showing *Sites* which have an entrance altitude between 210 and 230m with only the 220m *Contour* line shown.

    1.8. However, Filtering removes other sites from view and it may be more convenient to see the *Sites - categorised* layer.
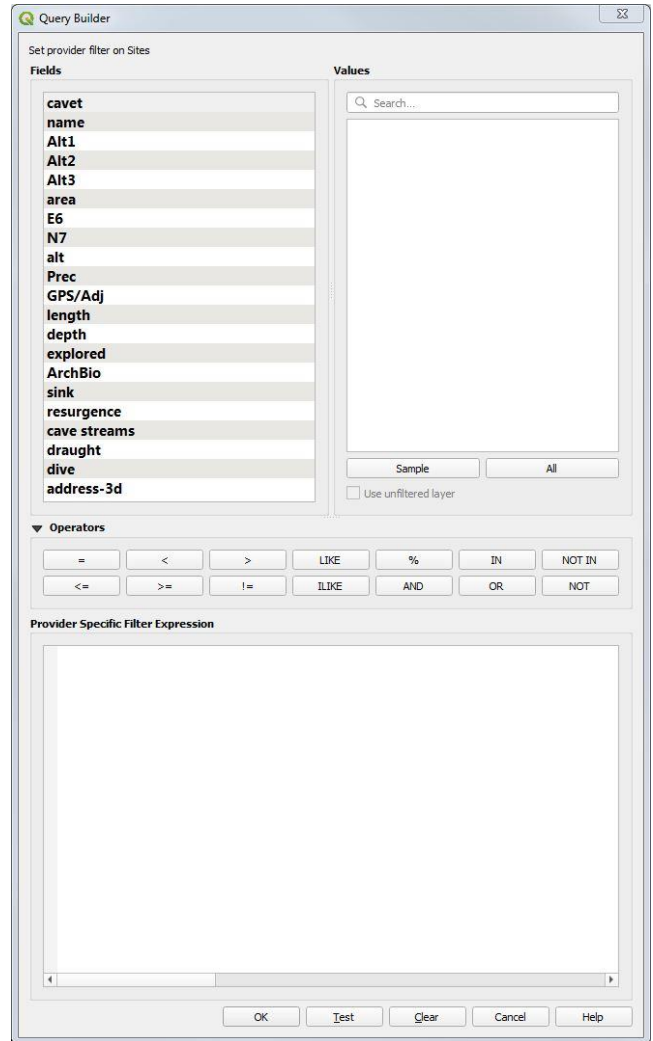
Field	Values	Notes
cavet	0001 to nnnn	The site number/code
name	varies	The name by which the site is usually known, starting with the first significant word
Alt1, Alt2, Alt3	varies	Alternative names, if any.
area	varies	The area in which the site lies. This doesn't necessarily agree with the names in the *area names* layer.
E6, N7	varies	The 6-figure easting and 7-figure northing values for the grid reference (ETRS89 or WGS84).
alt	varies	The altitude of the site.
prec	1, 5, 10, 20, 30, 50, 100	A code for the accuracy in placing the entrance on the map. A "1" doesn't mean accurate to 1 metre, rather "as accurate as possible" probably using a GPS.
GPS/Adj	M, A, G, P	See http://www.matienzocaves.org.uk/surveying-help/SiteCoordinatesAccuracy.pdf
length	varies	Traverse length in metres.
depth	varies	Depth in metres.
explored	!, ?, d, u	In order: "still going"; "unknown status"; "dig"; "unexplored".
ArchBio	A, A?, AB, B	In order: "Archaeological significance"; "possible archaeological significance"; AB "Both archaeological and biological significance", "biological significance".
sink	Drought, flood, normal, unknown	"drought": water sinks in drought conditions; "flood": water only sinks in flood conditions; "normal": water sinks in normal conditions; "unknown": unknown sinking conditions.
resurgence	Drought, flood, normal, unknown	"drought": water resurgences in drought conditions; "flood": water only resurges in flood conditions; "normal": water resurges in normal conditions; "unknown": unknown resurging conditions.
cave streams	yes, >1	The site has an underground stream or more than one.
draught	0, 1	"0": No draught; "1": the site draughts.
dive	Completed, dive potential	
address-3d	varies	The file name of the Survex 3d file.

Searching for a site by code or name

1. A convenient search facility used in QGIS v2 has not been rewritten for v3. Instead, searching through the Attribute Table seems to be the most convenient way.
2. Right-click over *Sites* in the Layers Panel, and select *Open Attribute Table.* (Or press F6; or choose the icon on the top menu bar).
3. The Attribute Table displays all the *Sites* data in various tabular formats. Resize the window and investigate the icons (top and bottom), if necessary so that the window looks like the window to the right.
4. The drop-down box above the left hand panel list gives a choice of data to display (Column Preview).
   4.1. Cavet and name will probably be the most useful.
5. Scroll down the left hand pane until the required site is visible.
   5.1. Ensure that the light bulb and magnifying glass icons are depressed.
6. Select the required site and the map should jump to, and flash the site icon on the map canvas.
7. The Attribute Table window can be docked.
8. Or the Select Search plugin can be used.
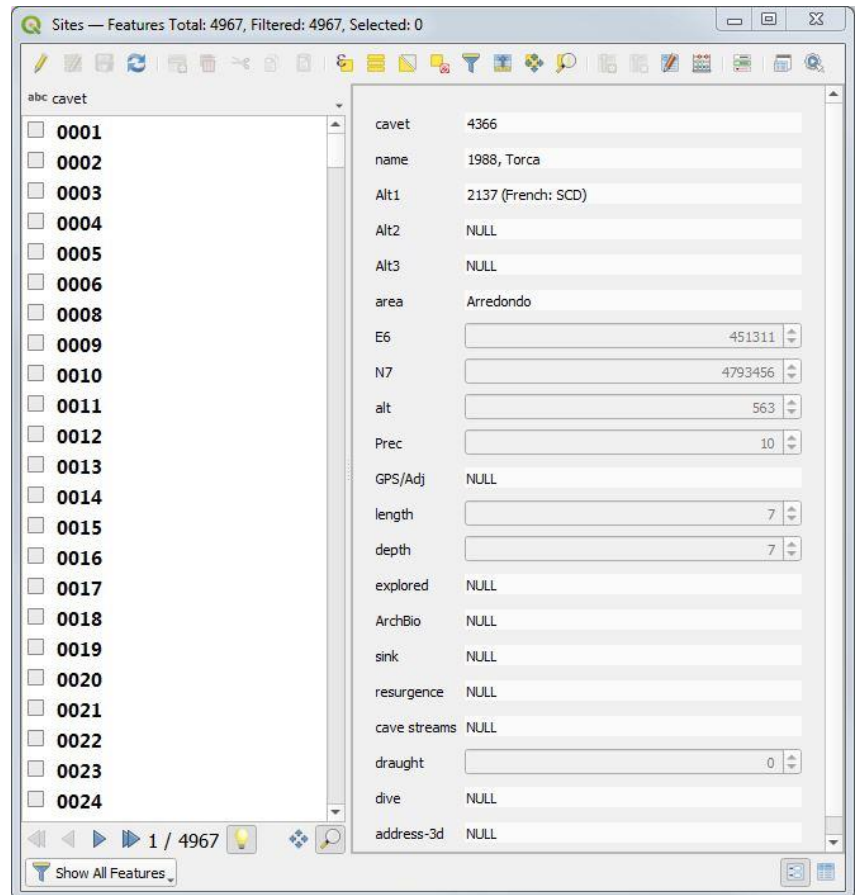
Appendix 4: 3d importer

Patrick Warren's 3d file importer is fully documented at his Github website. This can visited through the menu - *Plugins / Manage and Install Plugins / Import .3d file / homepage* - and links.

Appendix 5: PanGazer

1. The *PanGazer* application is downloaded in the *PanGazer* folder and runs from there. There is no installation process. The application starts up and loads the appropriate panorama when a cross in the blue circle is left-clicked.
2. Any update to the application will be included within a future MCP-QGIS3 update.
3. The application is well documented by the author, Mike Cowlishaw, either from the Help menu or from here: http://speleotrove.com/pangazer/
4. As well as the usual zoom and drag, *PanGazer* features include multiple views, addition of compass points and a link to *Google Maps* to show where the panorama was taken.
5. The panoramas in the *C:/MCP-QGIS3/panos* folder can be viewed outside of the map - just drag the jpg file and drop it into the PanGazer window. A shortcut can also be created for the *Pangazer64.exe* on the desktop.

Appendix 6: Aerial videos

The videos do not necessarily document the whole flight. The camera may not have been filming all the time and certain parts of the downloaded video may not have been used. Also, not all video has been taken looking straight down.

1. As an example, have the flight path over Torca de la Vera Negra (site 0036), on the screen at a scale of about 1:1500. The video code is 0825-SVega.
    1.1. Open up the *AerialVideos* group to show the 3 layers. Select *KMLs-merged path* and select the down arrow on the *Action* icon. The "Local video" is for Office use in Spain and for those who have the *AerialVideosLocal* folder. Choose "YouTube video" then click once anywhere on the grey line.
    1.2. *YouTube* should start automatically in your preferred browser. The *0825-SVega* flight then flies out over the *Vera Negra* shaft entrance, following the path. Two screens are obviously much better to view both map (or satellite photos) with documented holes and video at the same time. Or Google Earth with Matienzo data.
        1.2.1. Having one of the *photos* layers displayed on the map canvas may make it easier to follow the route.
    1.3. With the *KMLs-merged home* layer selected and the *Action icon* depressed, left-clicking in the centre of the orange home circle will start up *Google Earth* and load in the appropriate flight path kml file. This allows the altitudes of paths to be displayed.
        1.3.1. *Google Earth (Pro)* must be installed for this feature to work. If the Matienzo Caves Project Google Earth file is also installed, eg *MATIENZO CAVES 200515.kmz,* then entrances and cave centre lines can be switched on/off, etc

Appendix 7: Altitude colours

1. The Altitude colours layer contains a number of tiles which are given a Symbology using a colour ramp - in this case a rainbow distributed equally between 0 and 900m in 10 classes. (Altitude-colour-02.qml).
    1.1. When the colour(s) of one tile is altered, the style can be copied (right-click over the altered tile in the Layers Panel then Styles/Copy Style. Select all the other tiles and right-click Paste Style.
    1.2. The first tile in the *Altitude colours* layer is *mdt_2012_2010_lidar_0059_0701*, showing the N end of the Matienzo depression.
2. Colours can be used to distinguish say, 200m altitude for a significant cave level or 150m altitude for the upper flood limit in the depression.

Appendix 8: Geology

1. This group of layers and other resources have been imported from the Cantabrian government mapas.cantabria.es site and the geology terms translated to English. (Please report errors / poor translations!).
2. The information has been imported as 6 sheets. The facies colours and patterns used between the sheets are not consistent in all instances and it is possible that the same beds are reported (slightly?) differently across the beds. For example, bottom right on sheet 35_4, limestone (code 1) changes to dolomite (code 6) at the sheet 59_2 boundary.
3. Some layers contain map artefacts and have been bracketed, ie (Pointer lines) and (Fill lines).
4. Remember that, to view more information about each layer, the *Map Tips* icon must be depressed and the relevant layer selected.

ACKNOWLEDGEMENTS
1. Realizado a partir de datos del Gobierno de Cantabria disponibles de forma gratuita en http://mapas.cantabria.es
2. Cave data and site positions produced by participants in the *Matienzo Caves Project* 1960 - now.
3. Map designed and collated by Juan Corrin.

CONCLUSION
Please let me know of errors or omissions which will come to light when sites are filtered. Suggestions for improvements and ideas for Python routines would be welcome!

Juan Corrin 2017-2023; 27th May 2024

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IMPROVEMENTS AND EXTRA FACILITIES

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2. _____

3. _____

4. _____

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