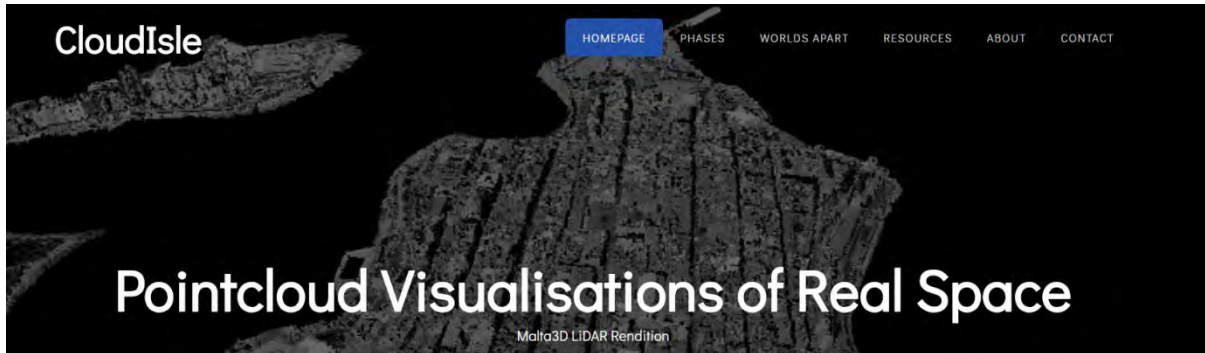


Navigating Cloudisle: 3D Spatial Walkthrough



Reference Publication Site

www.cloudisle.org

REPORT NAME

[Navigating_Cloudisle_2019.pdf](#)

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DOI

DOI: [10.13140/RG.2.2.10137.26727](https://doi.org/10.13140/RG.2.2.10137.26727)

Scope

Walkthrough guidance for the Navigation of Cloudisle 3D datasets.

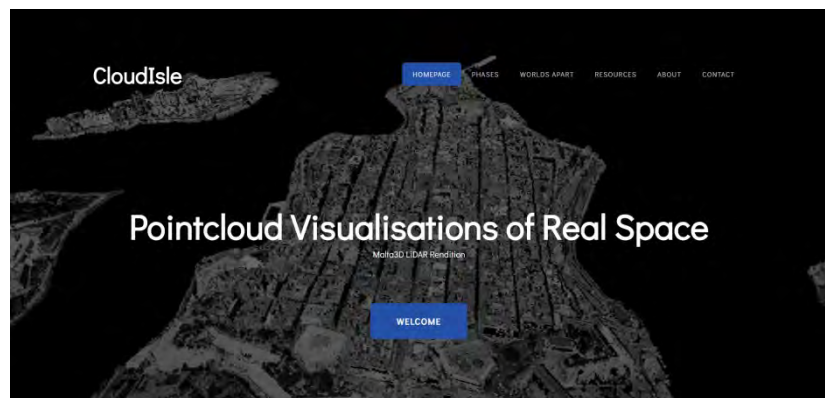
Introduction

Cloudisle is a concept that renders LiDAR data into an online 3D interactive space.

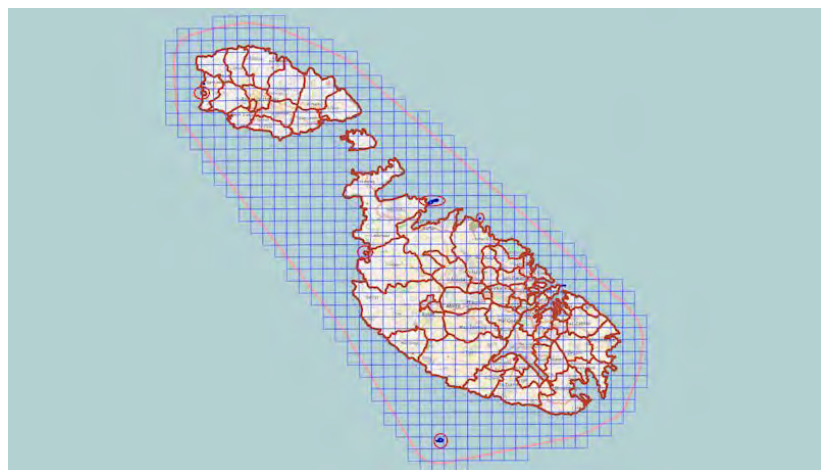
This walkthrough initially through Walk One guides the user to the location where the datasets are launched. Walk Two depicts the steps and options available to navigate the 3D content. Navigating the Cloudisle 3D datasets requires a web browser and for enhanced interaction, a scrollable mouse.

Walk One: Navigating the Main Website

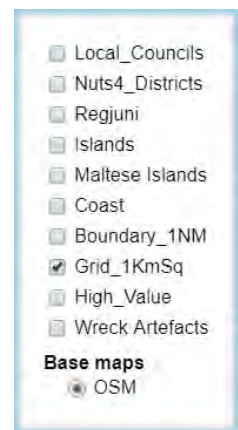
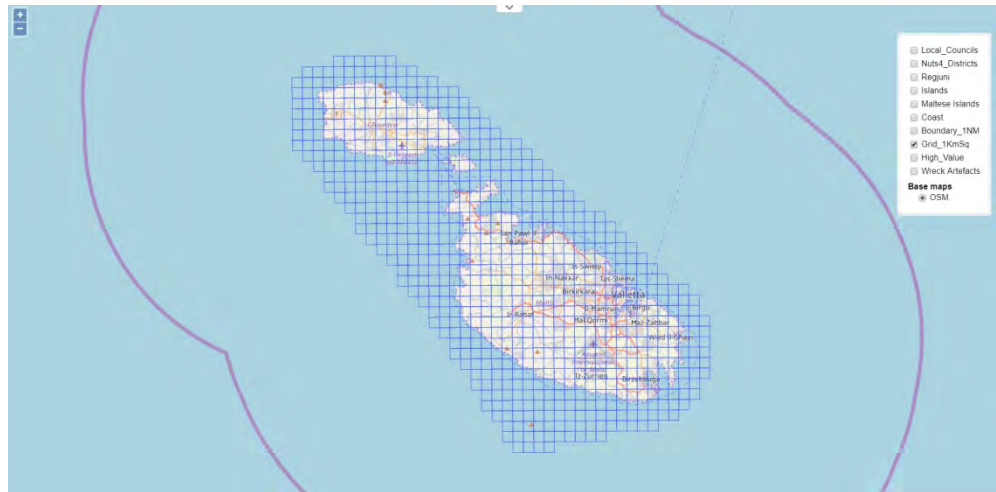
- A) Visiting the website: www.cloudisle.org



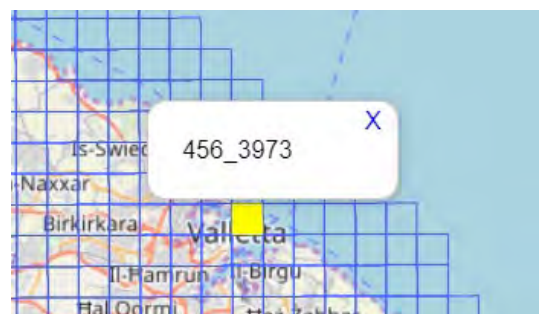
- B) Scroll to Territorial LiDAR Maps and click on the map or navigate (using zooming where preferable) to <http://www.um.edu.mt/projects/cloudisle/DATA1/cloudisle.html>



C) Click on the right Menu icon and choose the preferred choice, in this case the Grid_1KmSQ



D) Choose the desired cell that one wishes to view. 3D map opens in a new browser tab.

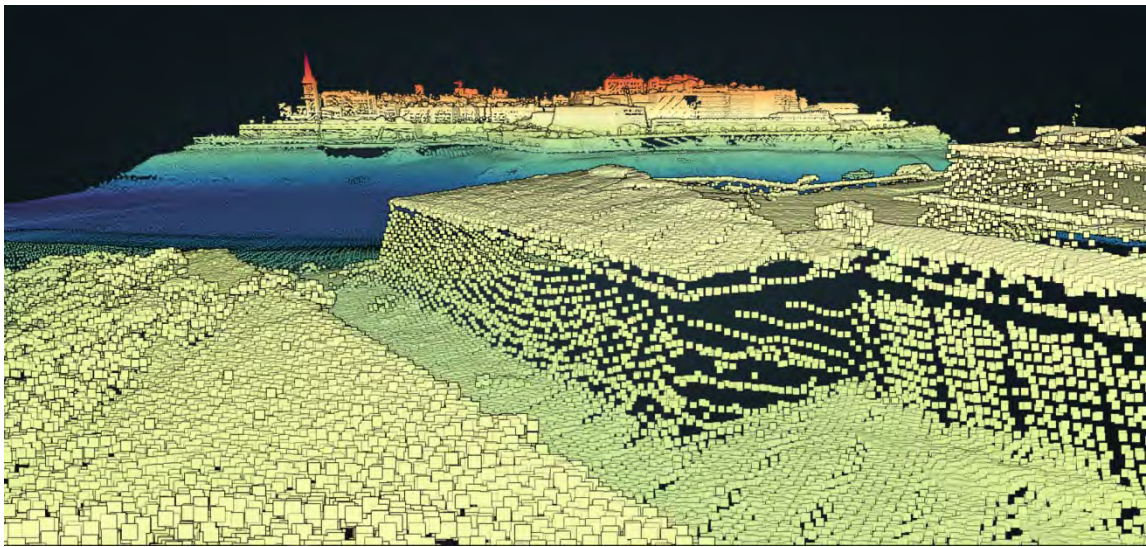


Walk Two: Navigating the 3D Content

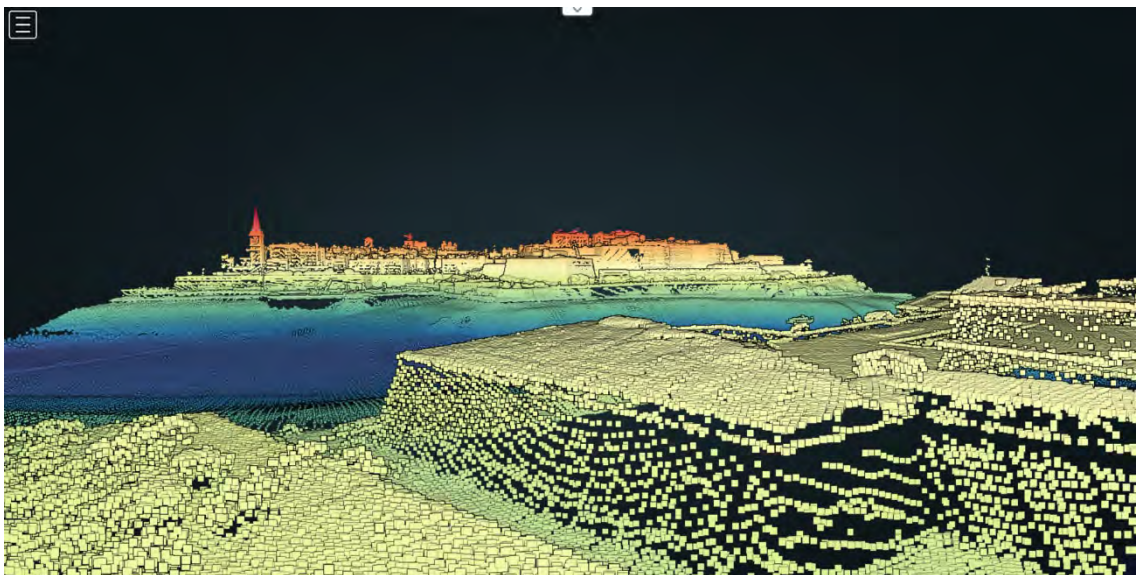
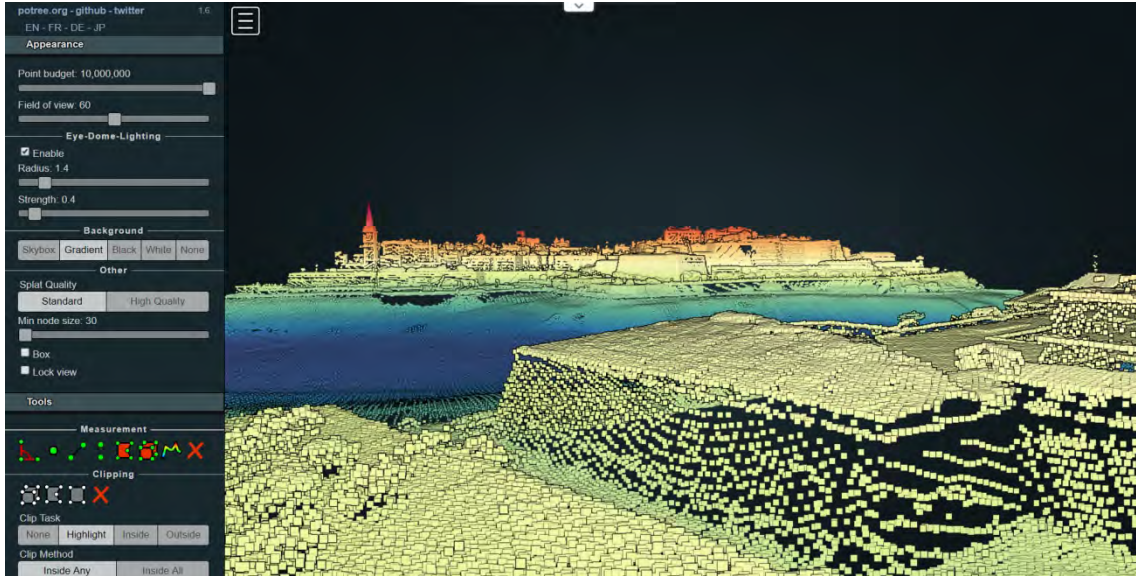
The browser launches a 3D LiDAR (*light detection and ranging*) data file. This is a collection of points scanned through various technologies. The indicated content was scanned as part of the DiNamic ERDF156 (2012 data capture) and the SIntegraM ERDF.02.030 (2018 data capture) projects.

The first section depicts the content window navigation, followed by a section that describes the Menu and its functions.

Section One: Content Window Navigation



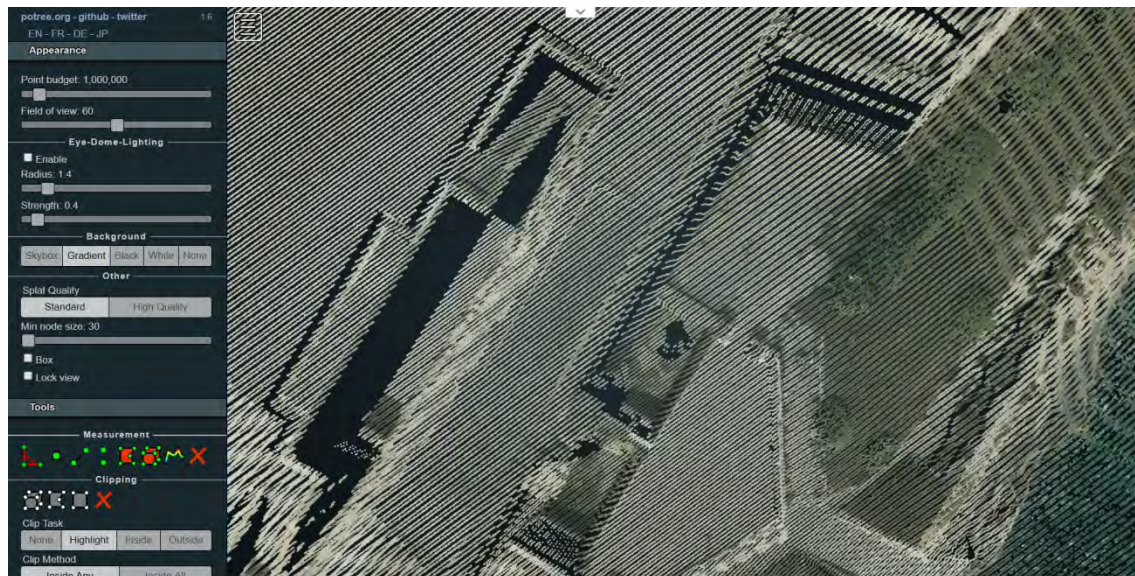
- E) The Window Composition is set through a Content Interaction Menu on the left of the browser and the content display window on the right. Users can increase the display area by clicking on the white Menu icon.



F) Load a LiDAR file of your choice; in this case the Fort Manoel area



G) **Zoom Function:** To zoom into or out of the data layer, scroll using the mouse wheel, trackball or other pointing device. The deeper the zoom, the more detailed points are depicted.



- H) **Move Function:** Move the dataset by clicking and holding the right mouse button and moving the pointing device accordingly.



- I) **Perspective Function:** Rotate the dataset by clicking and holding the left mouse button and moving the device accordingly.

Top View:



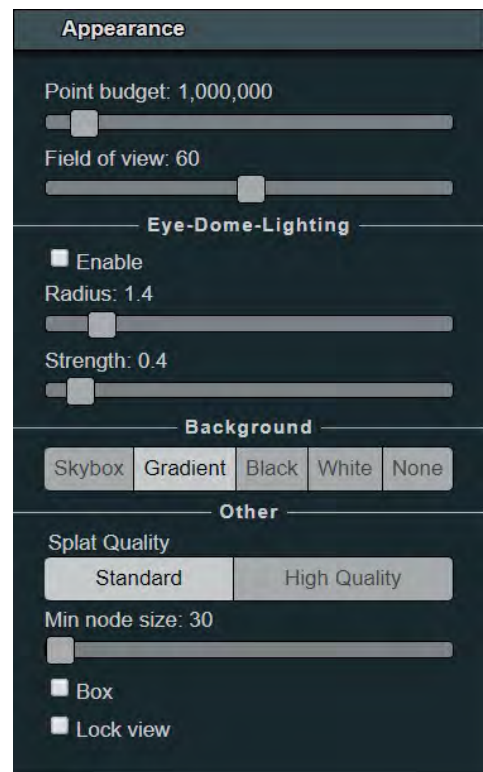
Perspective Views:**Section Two: Menu Functions**

The Main menu is composed of a series of functions as detailed:

- **Appearance** of the content such as the number of points displayed, eye-dome-lighting, background and other functions);
- **Tools** that allow for the measurement, clipping and navigation;
- **Scene** that enables export and object selection and properties manipulation
- **Classification** Filter that enables users to choose the type of category (such as buildings), where such data has been pre-classified
- **About** details the information about the software used to create the Cloudisle datasets. In addition, the text above the Appearance tab depicts the choice of language and the software links.



J) **Appearance: Main Menu**



K) **Appearance: Point Budget**

Adjust the number of points that are to be display: the less the points, the larger the point size, whilst the more detailed the points the greater the potential for more points being displayed during zooming in.

Standard: 1,000,000 points



Low point count: 100,000 points



High point count: 10,000,000 points

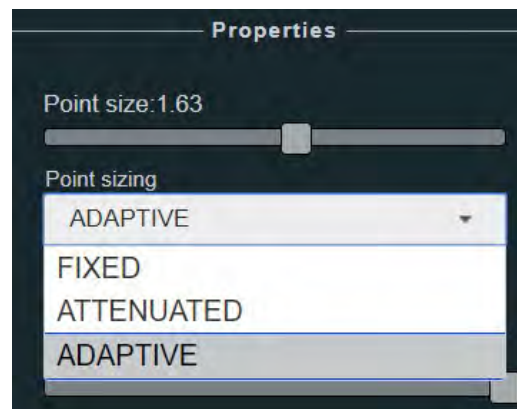


Adjusting the Field of View allows users to zoom in and out within the display.

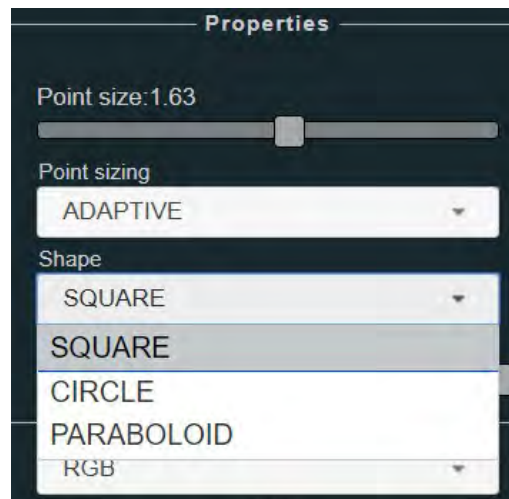
To view the data in different styles, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Point Clouds item. The relative styles are depicted under the **Properties** and **Attributes** tabs.



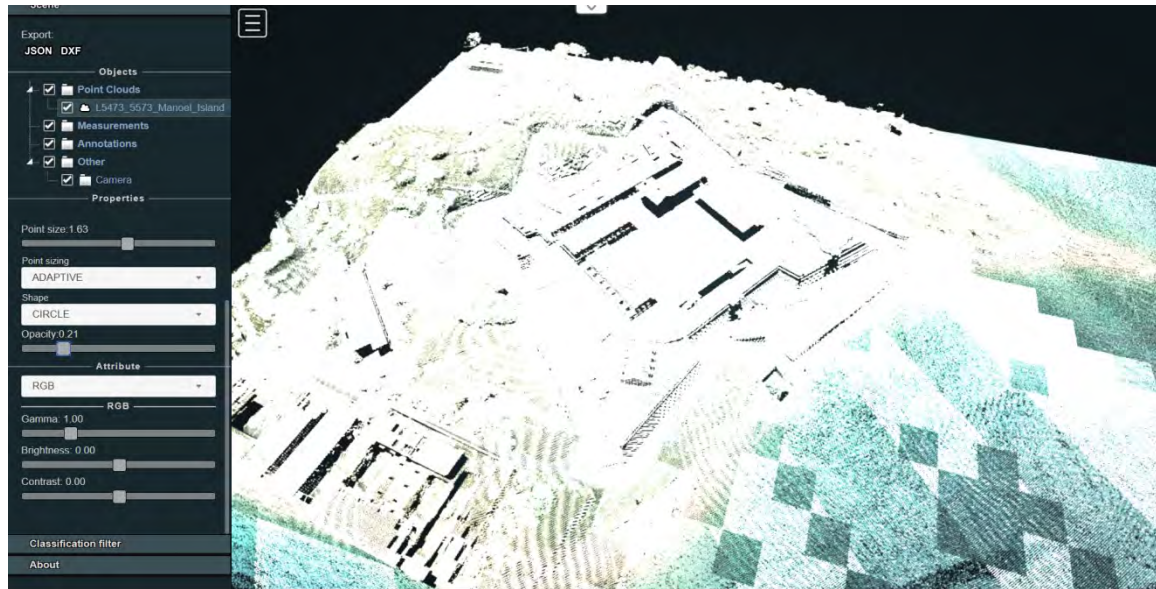
Point Size and Sizing: Point size can be inserted manually or scrolled through the size bar. Users can also choose between Fixed, Attenuated or Adaptive sizing.



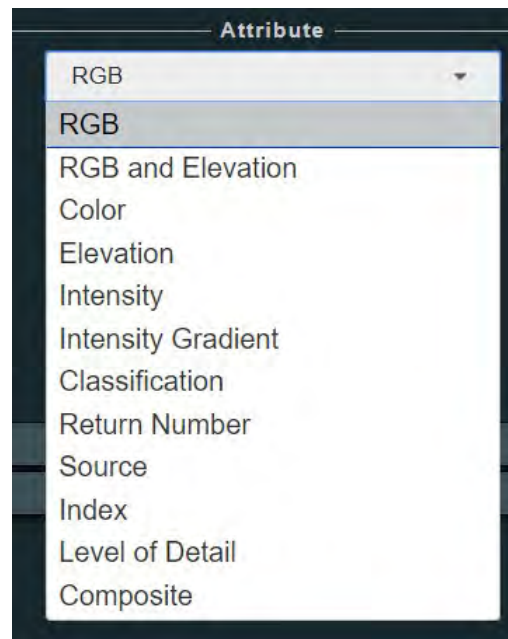
Point Shape: Point shape can be chosen from Square, Circle or Paraboloid.



Point Opacity: Point Opacity allows users to adjust the display opacity.



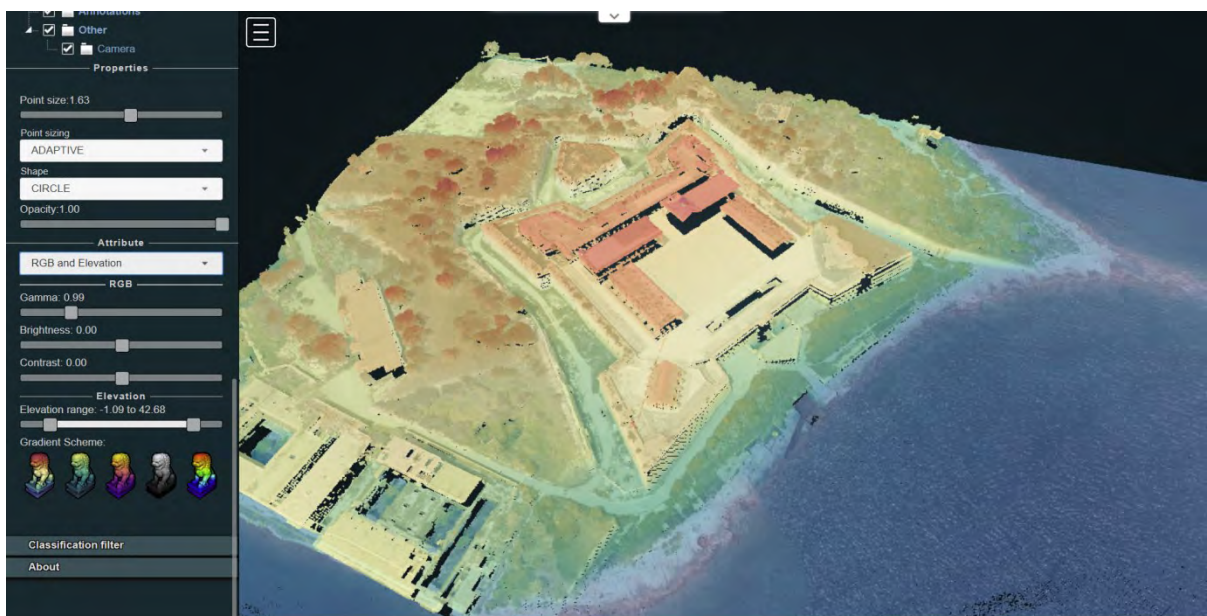
Attribute Menu: The point attribute menu enables users to choose between different display options.

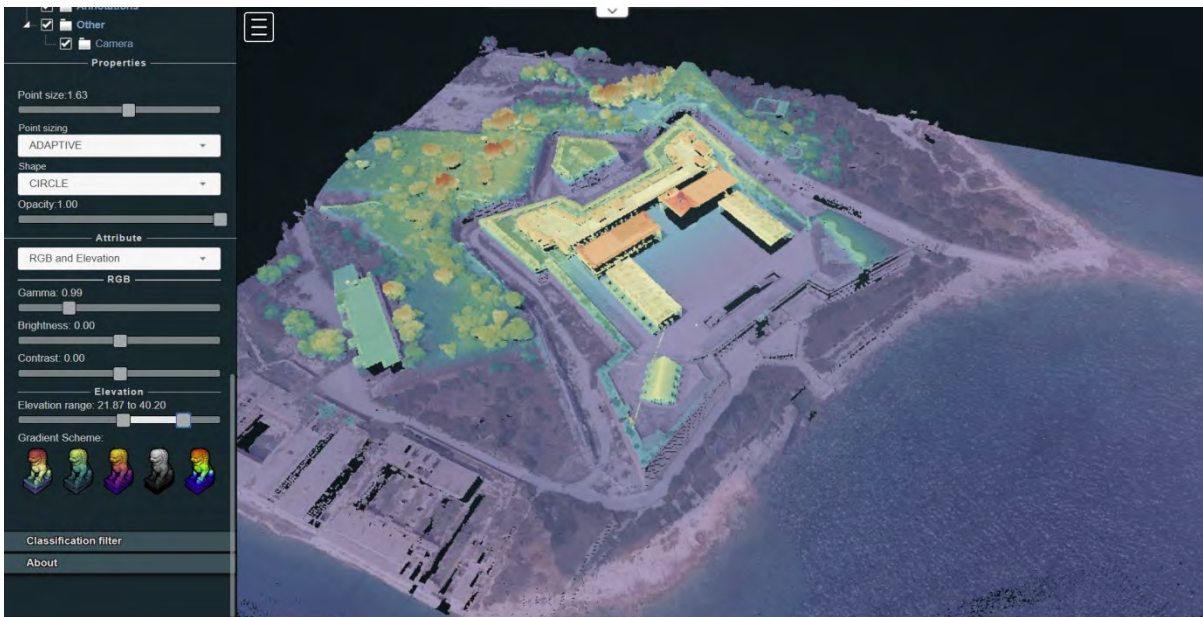


Attribute Menu: RGB. The option allows for changes to the Gamma, Brightness and Contrast parameters.

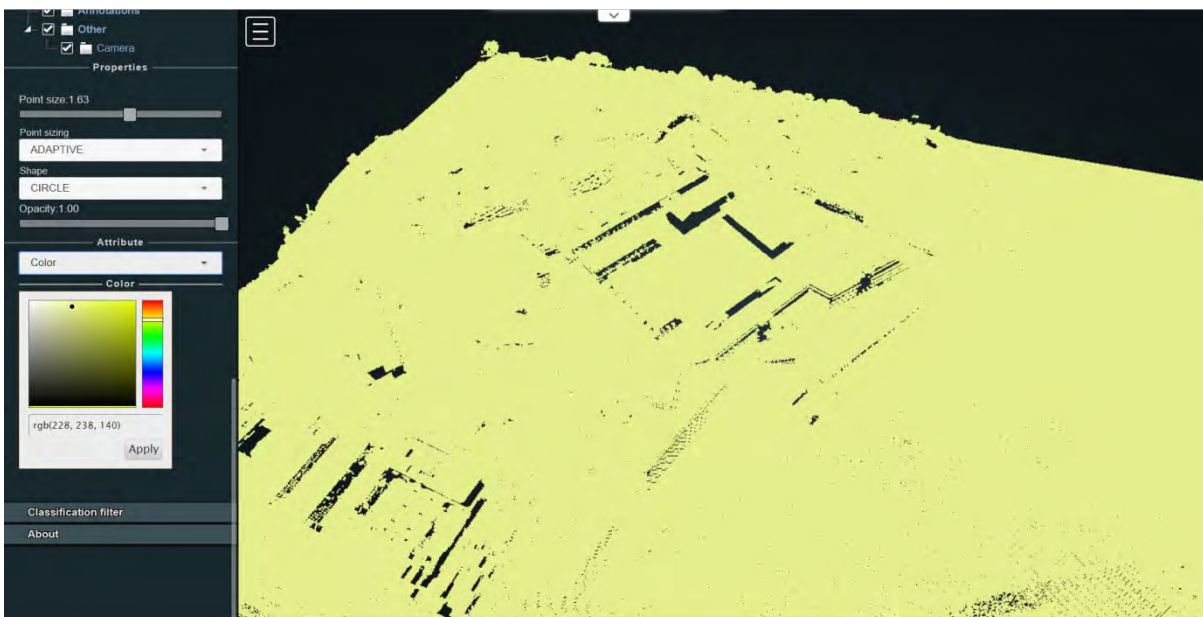


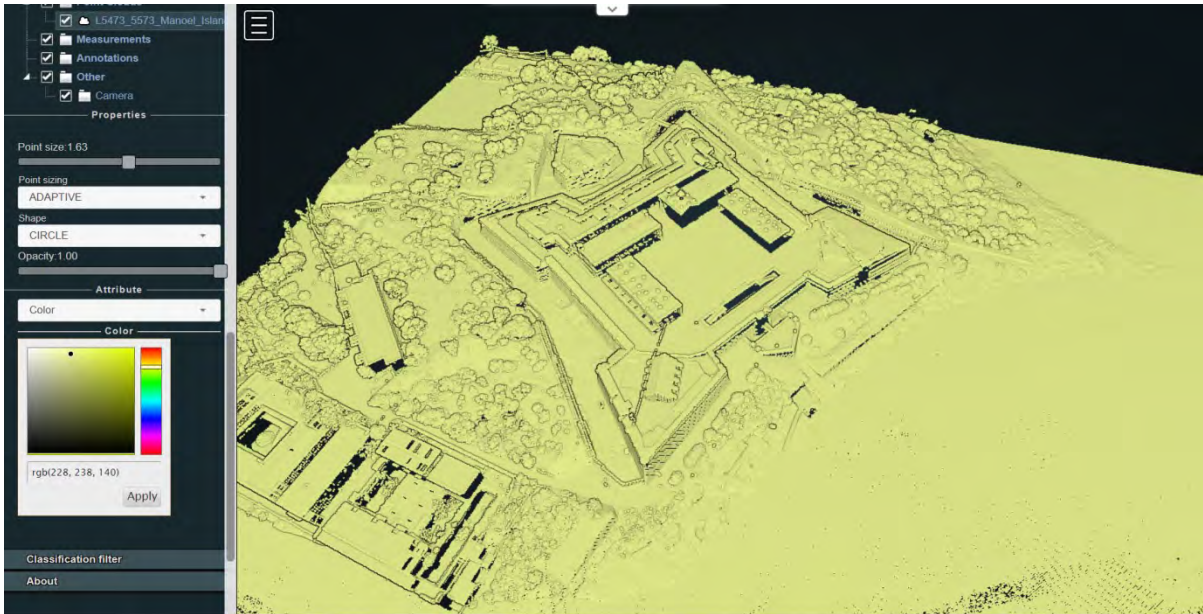
Attribute Menu: RGB and Elevation. The option combines RGB and Elevation. There are various colour schemes that can be used as depicted under the Elevation item below. In addition to the choice between Gamma, Brightness and Contrast parameters, an elevation scroll bar allows for various elevation ranges to be depicted as shown below.



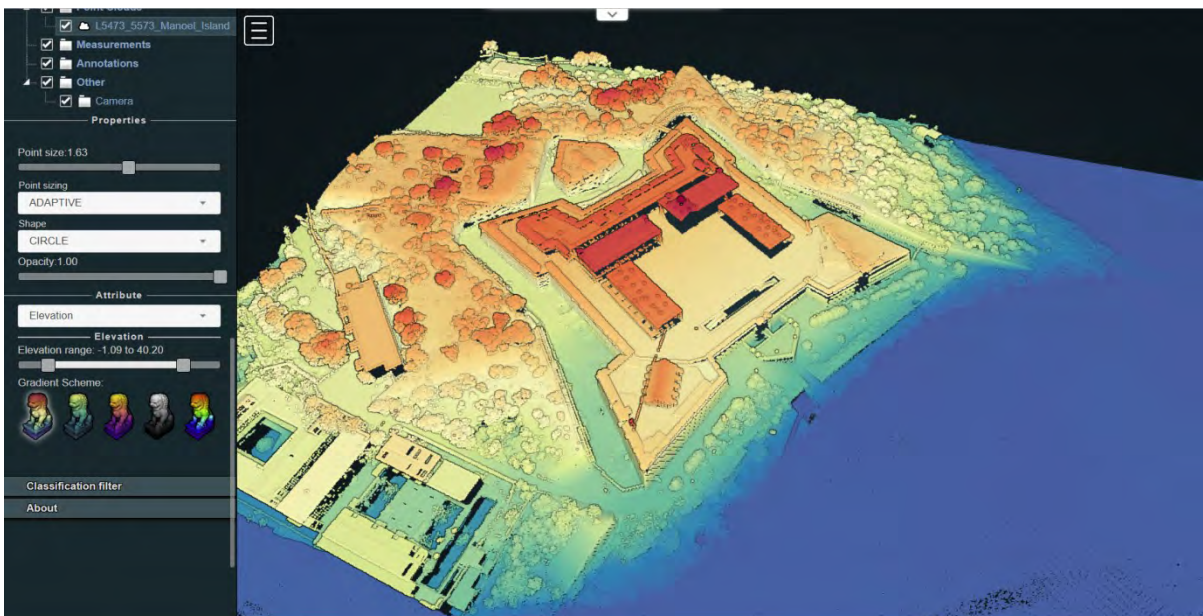


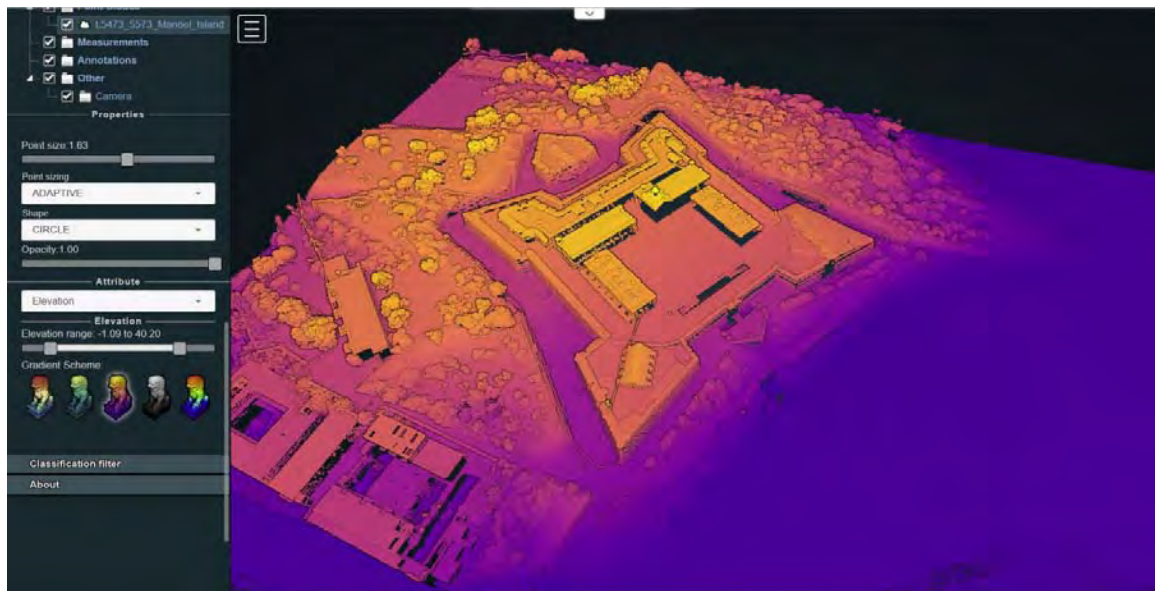
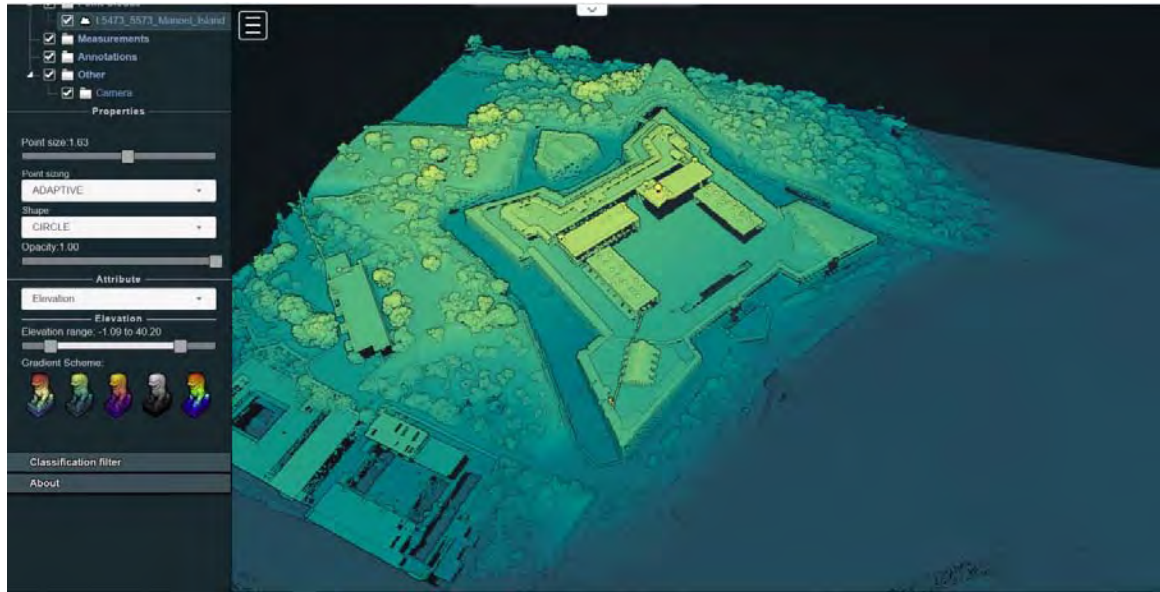
Attribute Menu: Color. The option allows users to choose a colour suitable for their display.

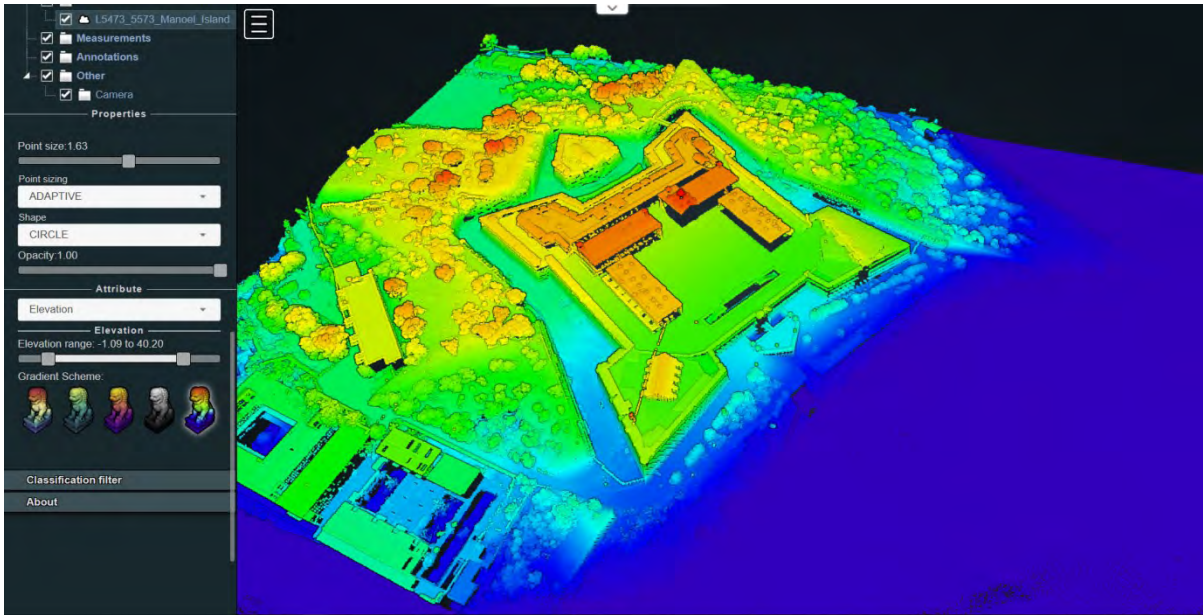




Attribute Menu: Elevation. There are various colour schemes that can be used as depicted below. An elevation scroll bar allows for various elevation ranges to be depicted as shown below.



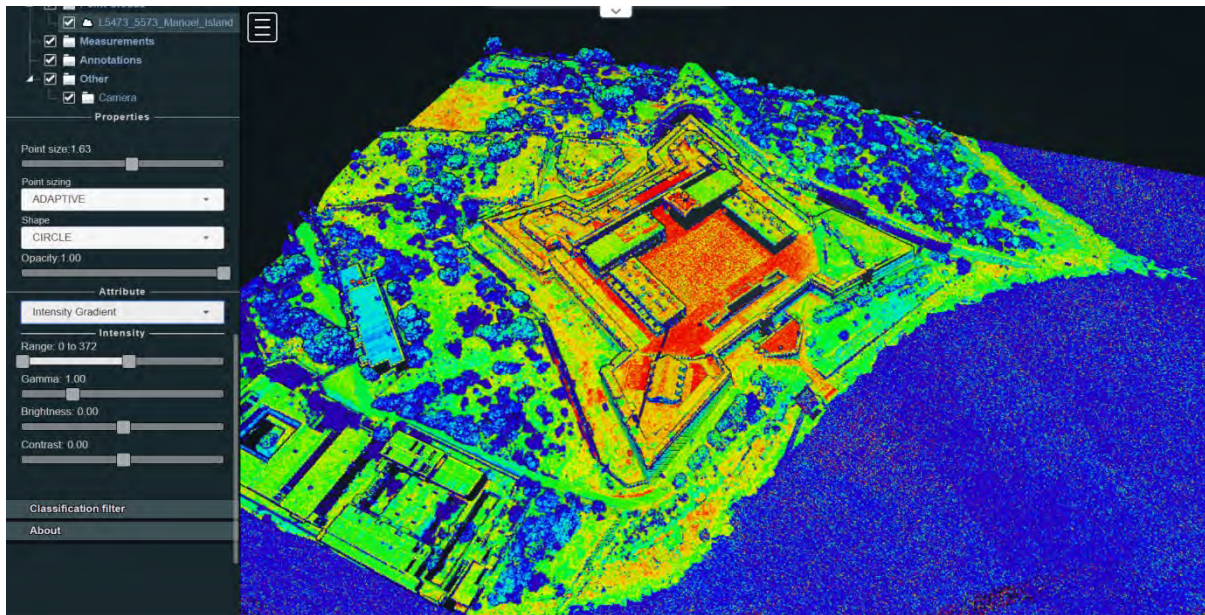




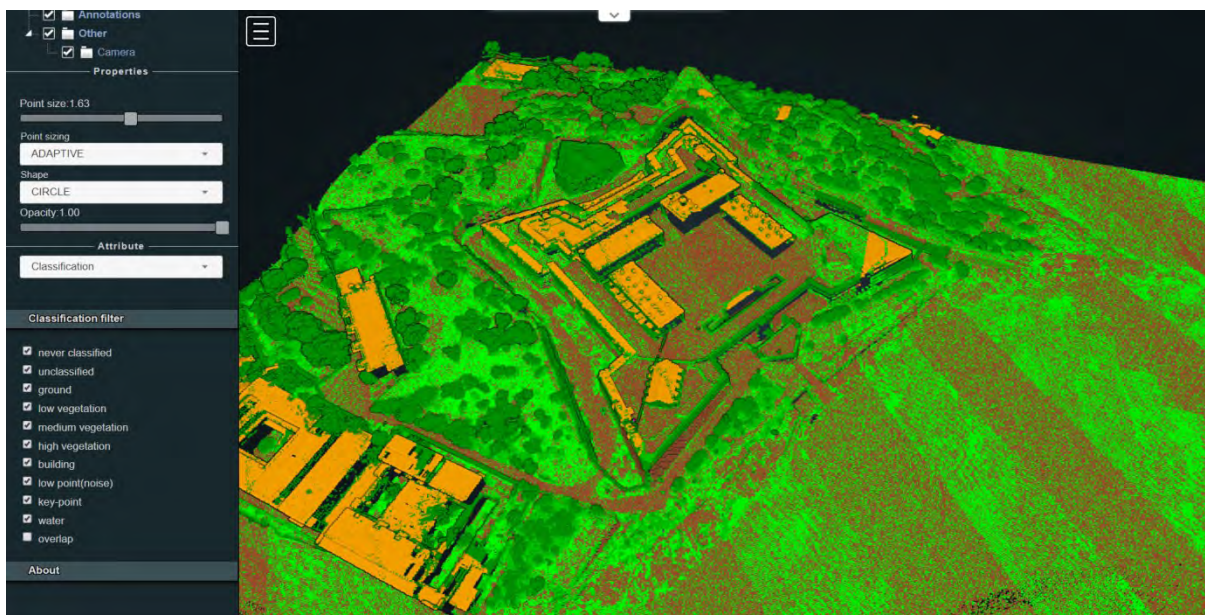
Attribute Menu: Intensity. In addition to the choice between Gamma, Brightness and Contrast parameters, this option include intensity range.

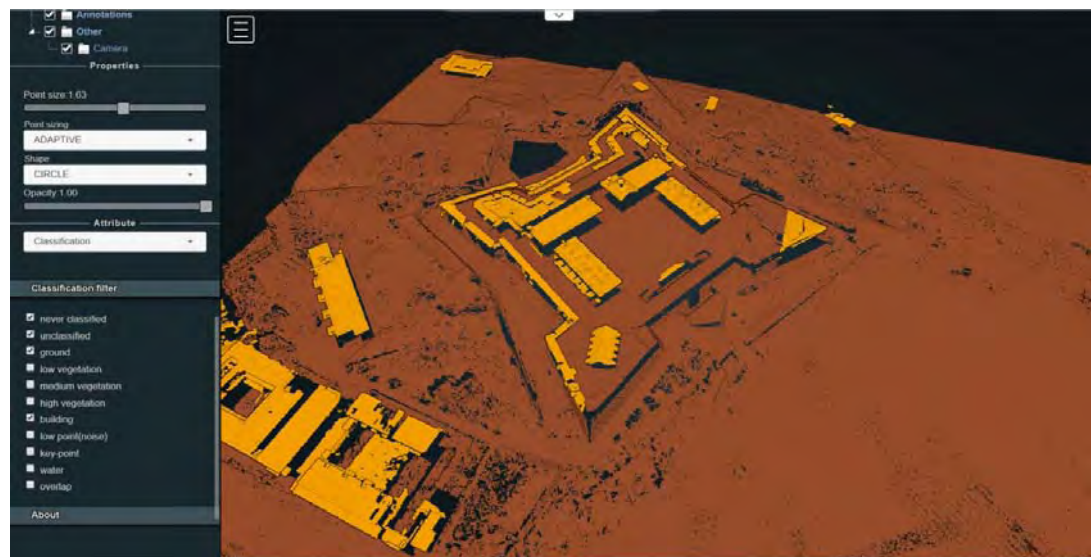


Attribute Menu: Intensity Gradient. Contains the same parameters as Intensity and depicts data as gradient.

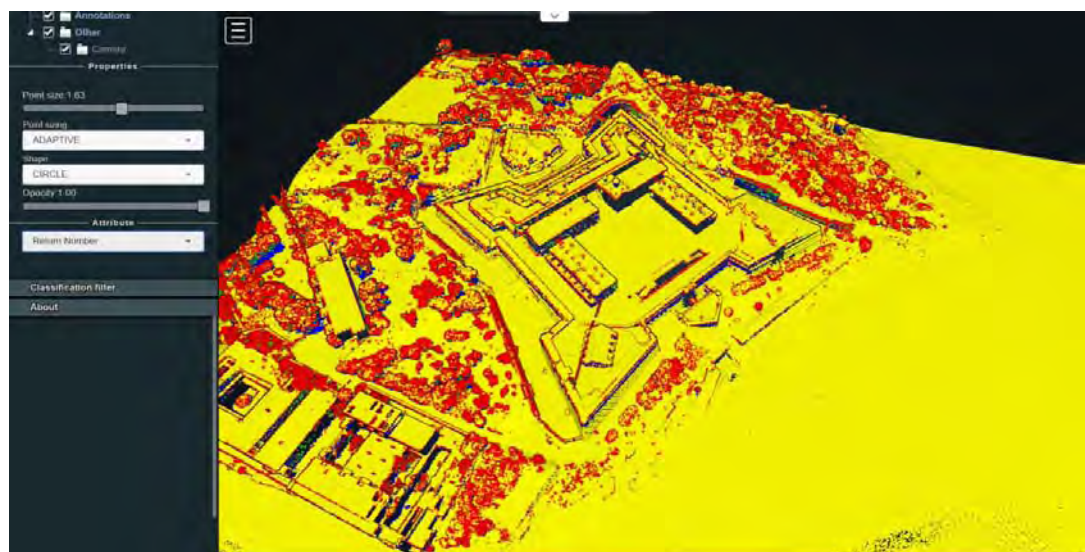


Attribute Menu: Classification. The options highlights the different classifications which can be switched on or off through the Classification tab.

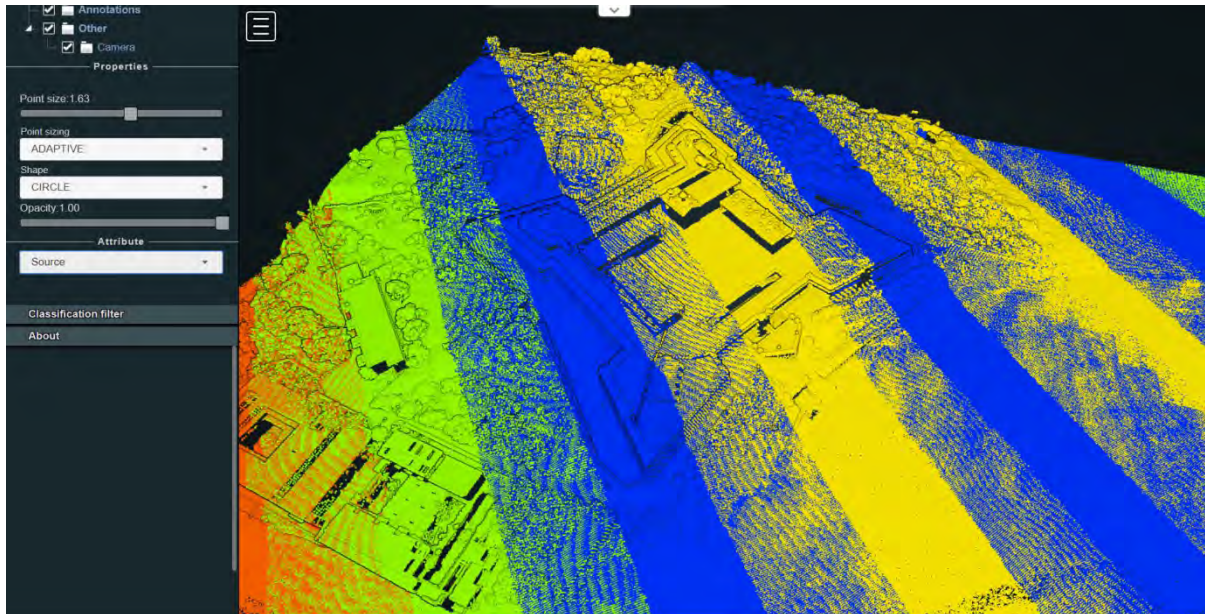




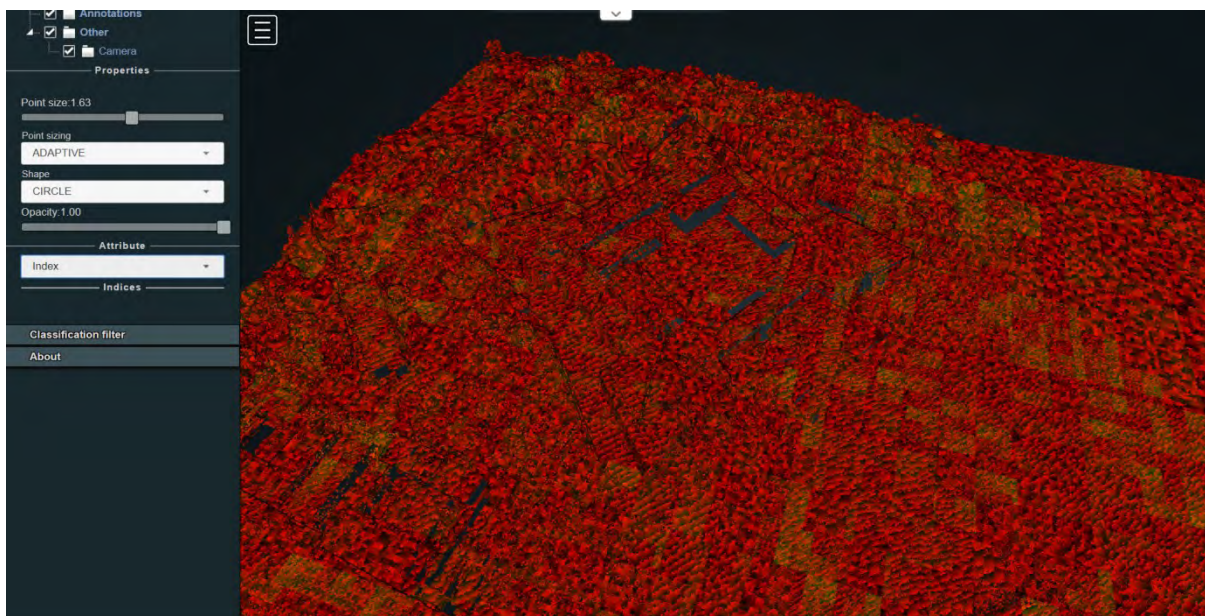
Attribute Menu: Return Number. The LiDAR scan return number.



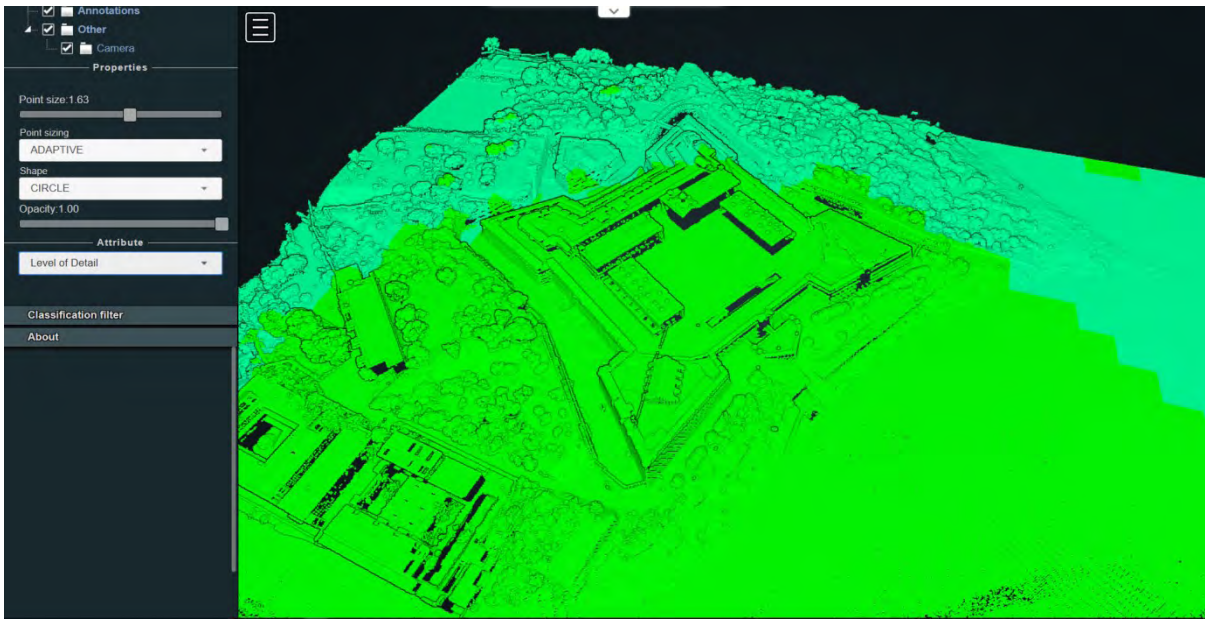
Attribute Menu: Source. The option depicts the scan lines as taken during flight.



Attribute Menu: Index. The scan index



Attribute Menu: Level of Detail. The data Level of Detail



Attribute Menu: Composite. The option combines the different attributes.



L) Appearance: Eye-Dome-Lighting

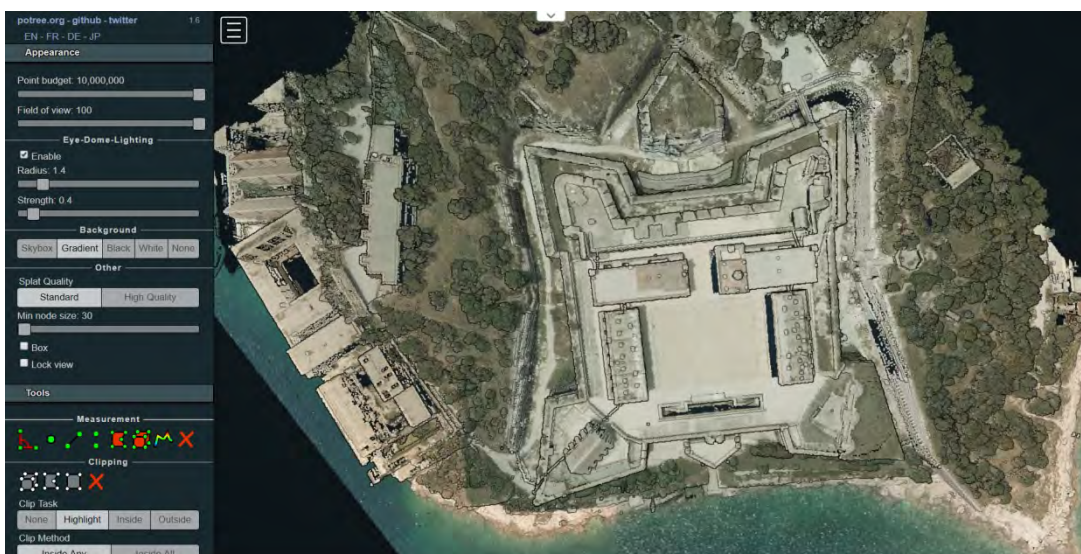
Defn: “Eye-Dome Lighting (EDL) is a non-photorealistic, image-based shading technique designed to improve depth perception in scientific visualization images.” (Boucheny and Ribes, 2011)

Click the Enable Tick Box and adjust the Radius and Strength of the shading effect. Radius increases the thickness of the point outline. Strength increases the strength of the shading which results in a darker image (Schuetz, 2016).

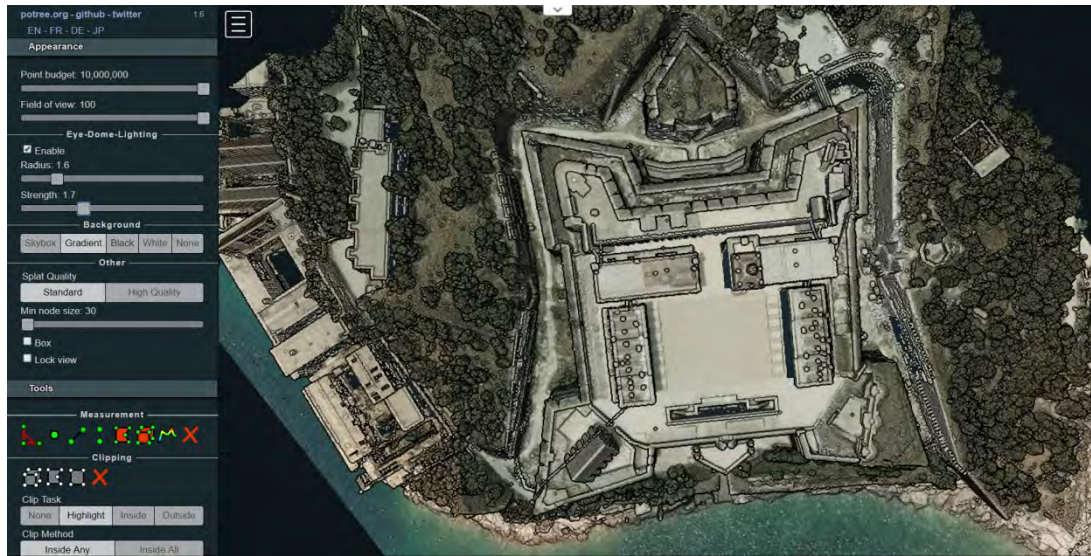
EDL - inactive



EDL – active with radius enhanced



EDL – active with strength enhanced



M) Appearance: Background

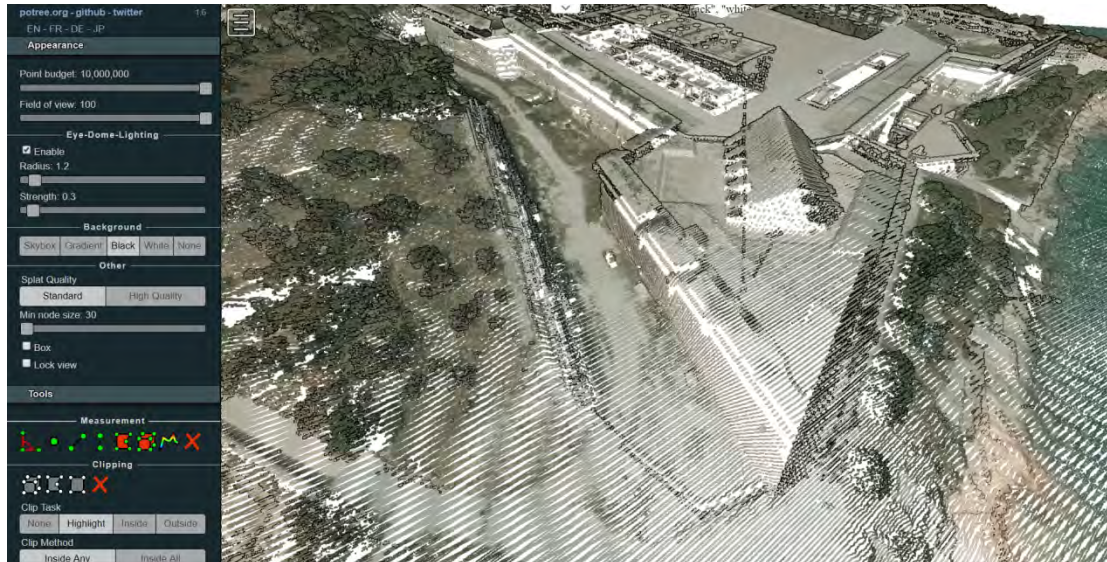
Choose a preferred background that suits the user’s requirements. The example below depicts a cloudy sky rendition. Others show gradient, black, white or none.



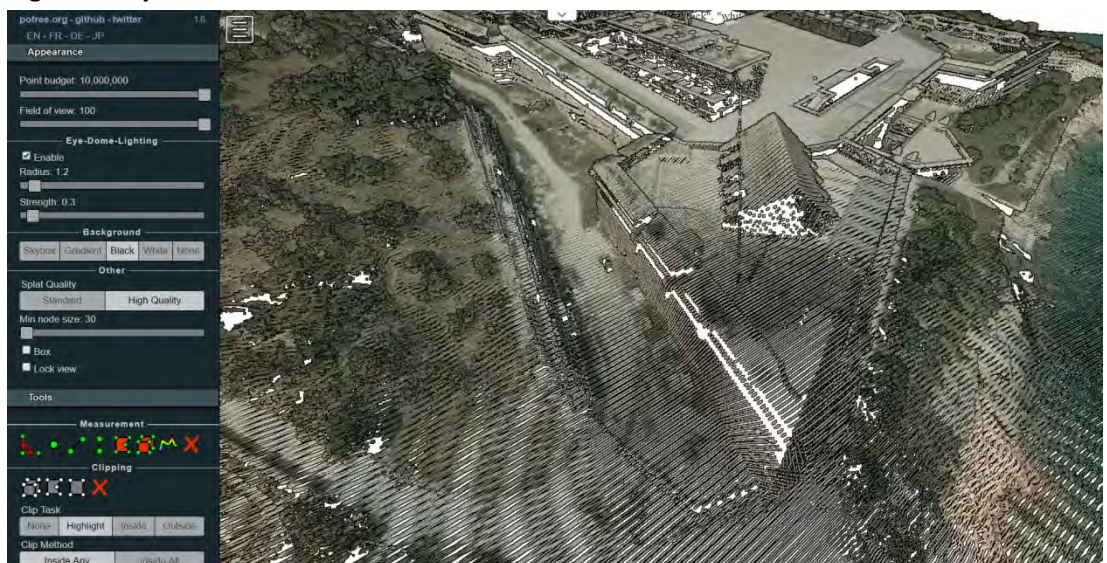
N) **Appearance: Other**

Splat quality enables the blending of points, with High Quality blending creating smoother results.

Standard Quality



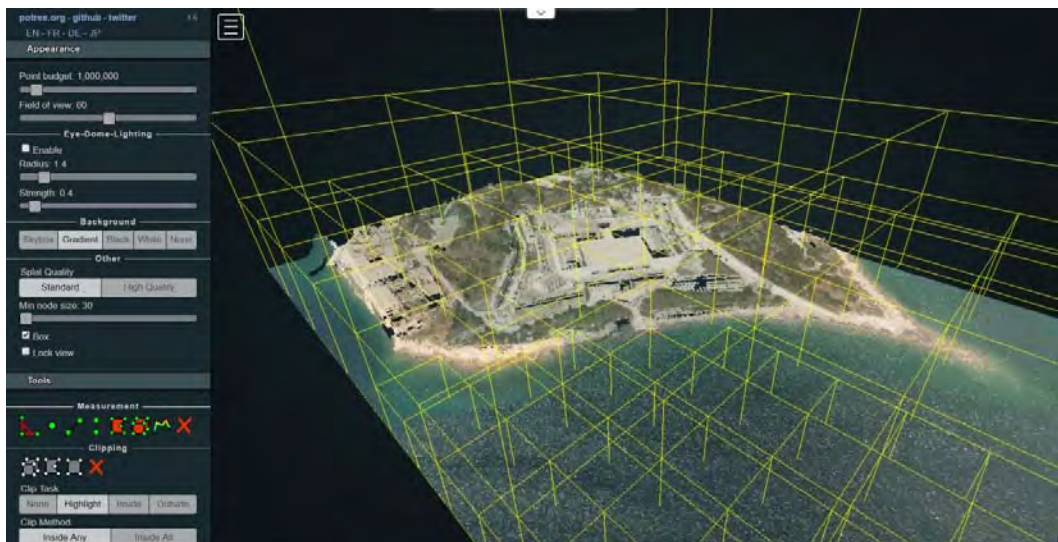
High Quality



Min. Node Size adjusts the point size.



Box identifies the data bounding boxes



0) **Tools: Main Menu**



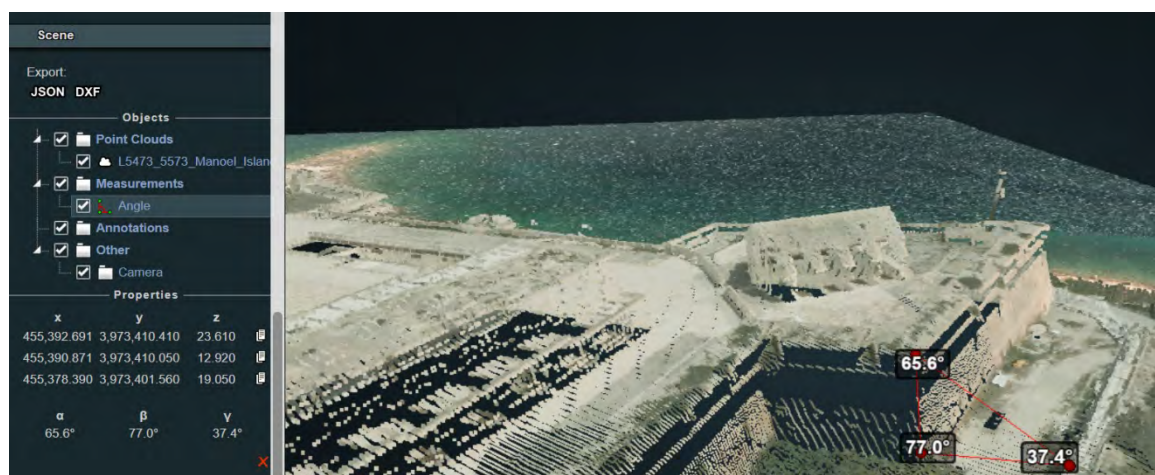
P) **Tools: Measurement**

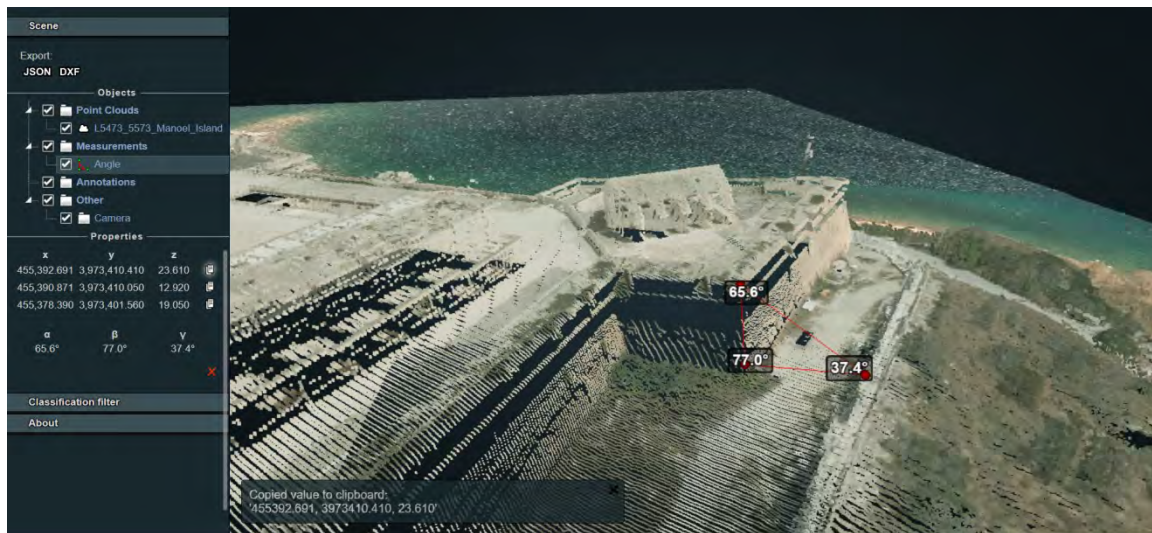
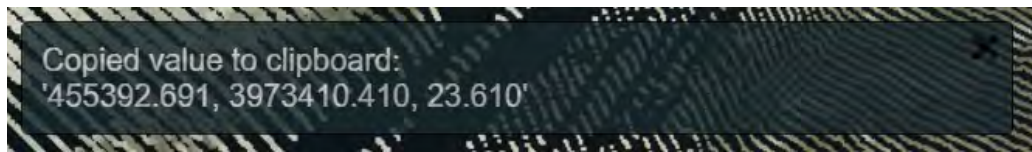
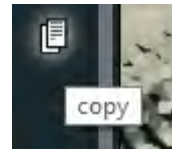
The Measurement sub menu allows users to carry out spatial measurements as follows:

Angle Measurement



To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Measurements item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon. Note that item was saved is depicted at the bottom of the display window.





Click on the **X** icon to remove all measurements.

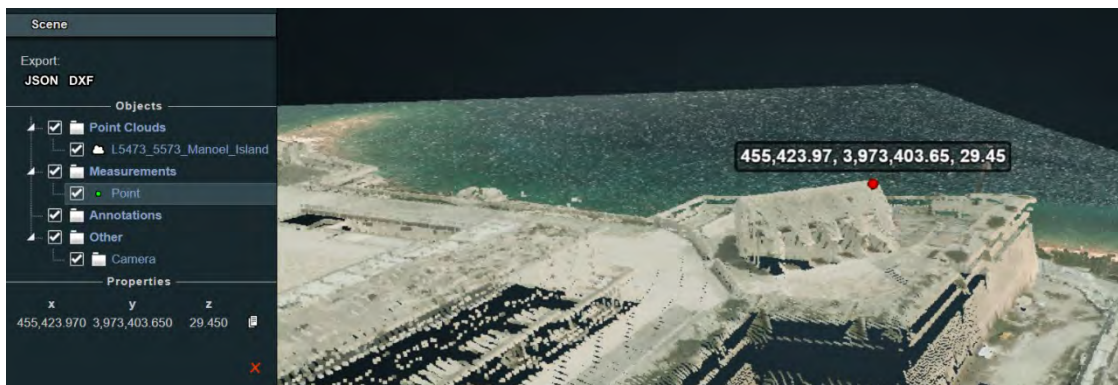
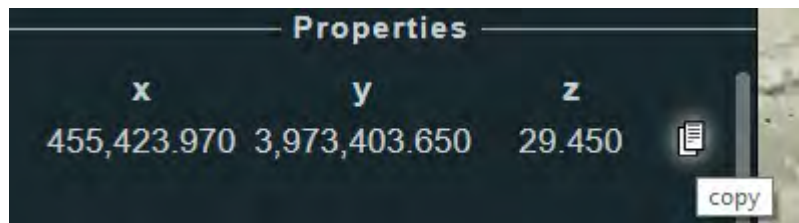


Point Measurement: depicts X (Easting), Y (Northing) and Z (Height) coordinates (m) in European Datum (ED50)





To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Measurements item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon.



Line Measurement: depicts distances between 2 designated points





To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Measurements item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon.

In this case a polyline with multiple segments is measured and the Properties tab lists each segment's distance between the points as well as the total distance measured.



Objects

- Point Clouds
 - L5473_5573_Manoel_Island
- Measurements
 - Distance
- Annotations
- Other
- Camera

Properties

x	y	z	
455,428.541	3,973,374.800	23.570	
455,392.741	3,973,410.450	23.630	
455,399.731	3,973,424.540	23.840	
455,371.351	3,973,441.850	25.550	

Distances: 50.523
15.729
33.286

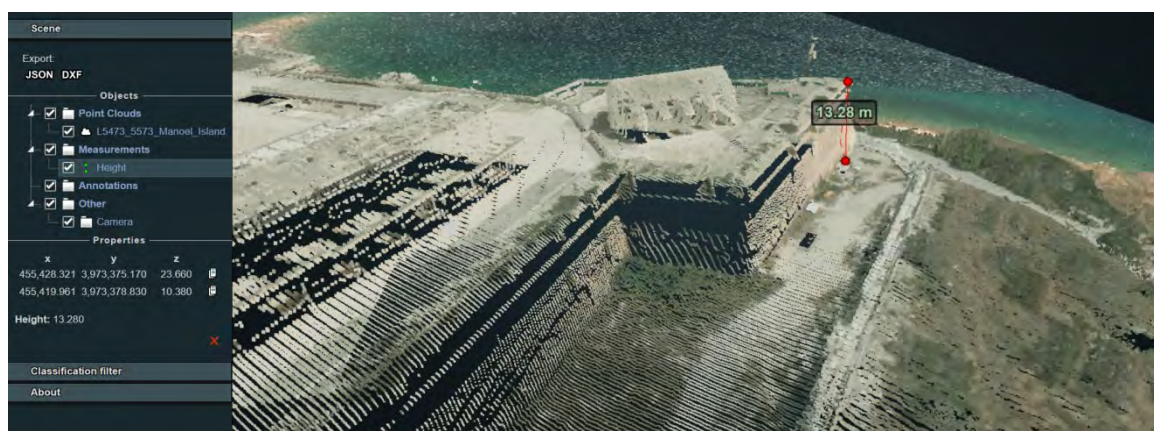
Total: 99.539

Height Measurement: depicts vertical distances between 2 designated points

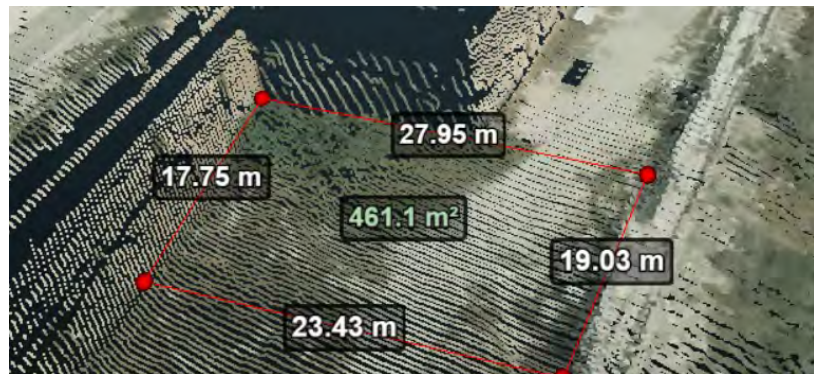


To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Measurements item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon.

In this case two points were measured and the Properties tab lists each points coordinates are recorded and the resultant vertical distance between the points is depicted.



Area Measurement: depicts area in square meters



To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Measurements item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon.

In this case four points were measured and the Properties tab lists each points coordinates are recorded and the resultant area between the points is depicted.



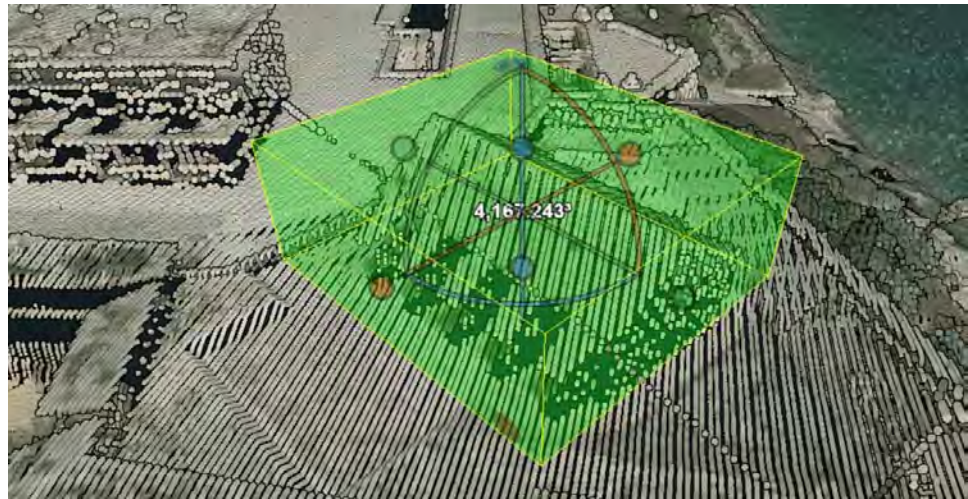
Volume Measurement: depicts area in cubic meters



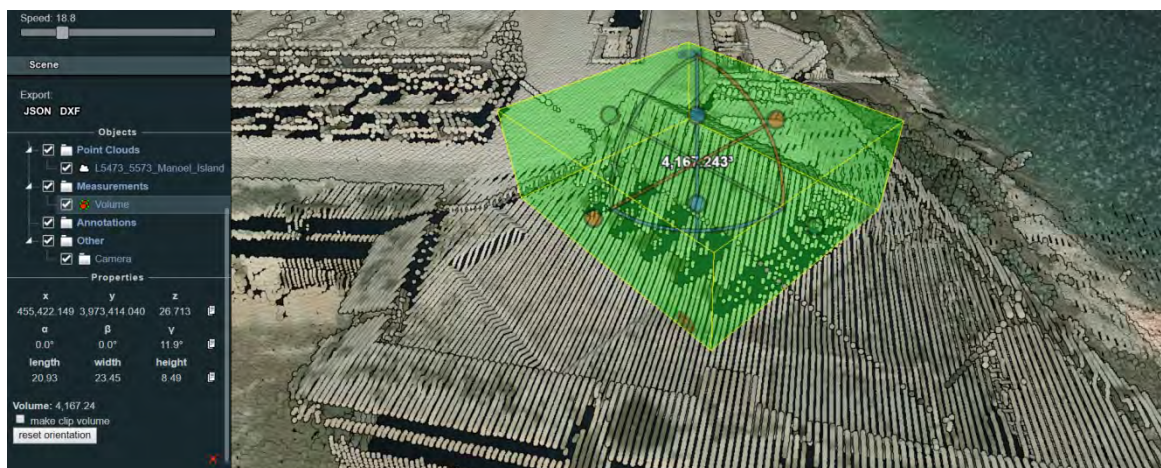
One can adjust the volume through the extension of the volume cube by grabbing the coloured spheres and dragging, whilst movement and rotation can be achieved through the dragging of the coloured lines and arcs respectively.



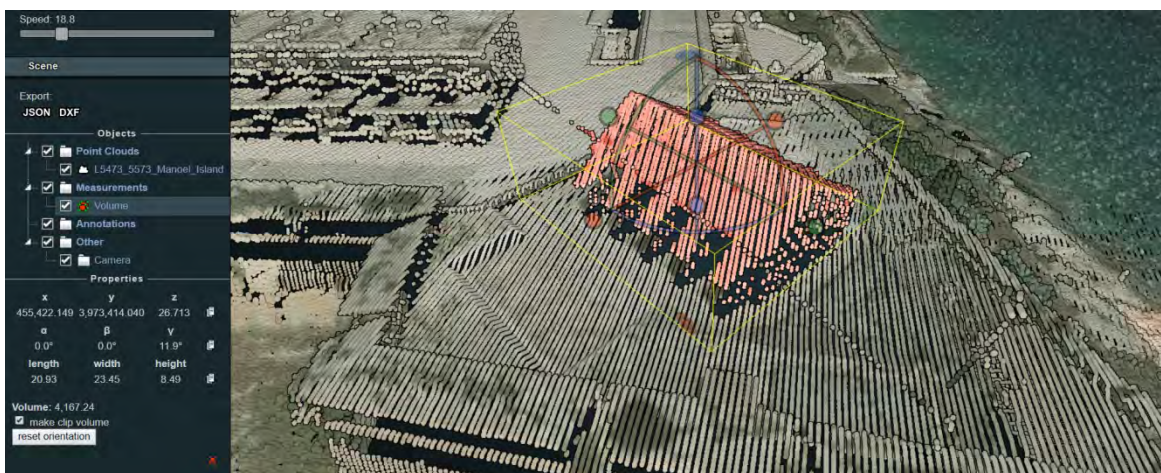
As an example as specific room is chosen for the volume calculation

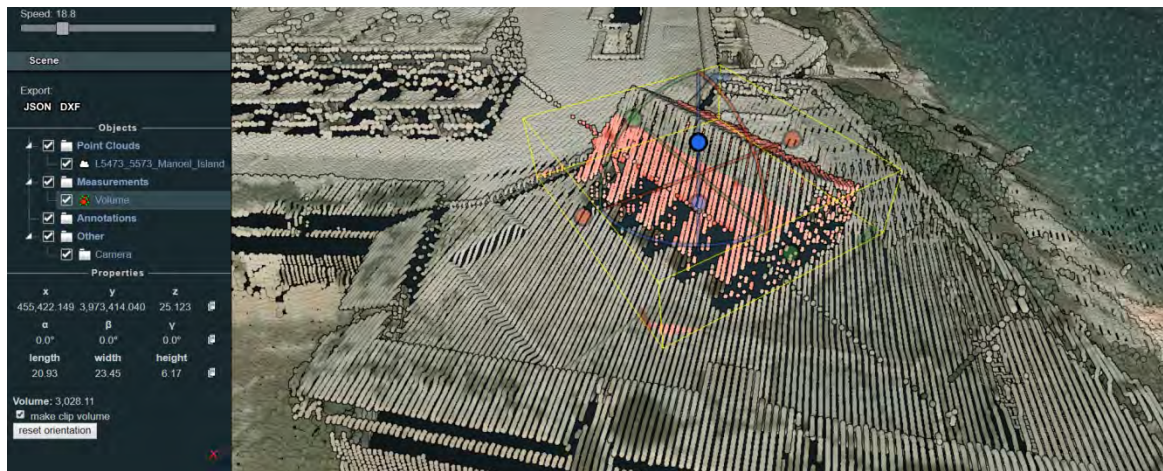


To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the Measurements item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon.



Click on 'make clip volume' to highlight the volume under study and to calculate the different volumes by height adjustment. Drag the spheres to view changing volumes.





Height Profile Measurement: depicts the height profile of a chosen cross section

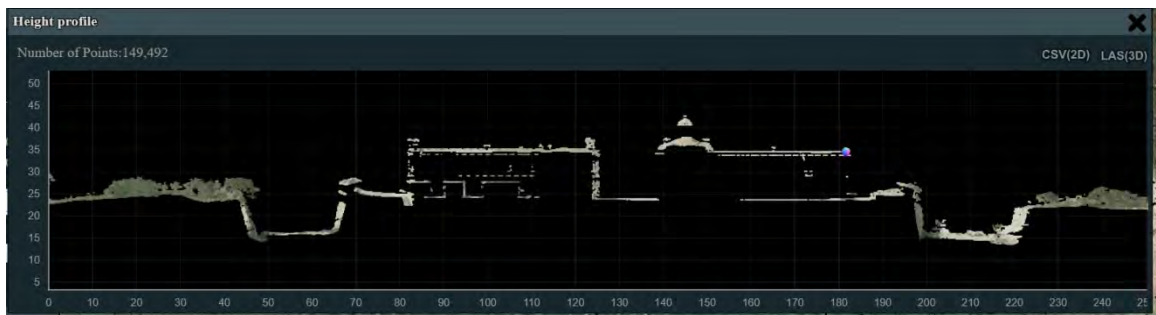


To record the findings, scroll down to the **Scene** Section and the **Objects** sub-section and click on the **Measurements** item. The relative data is depicted under the **Properties** tab, where the data can be saved to the clipboard by clicking on the 'copy' icon.

In this case, the profile width can be increased.



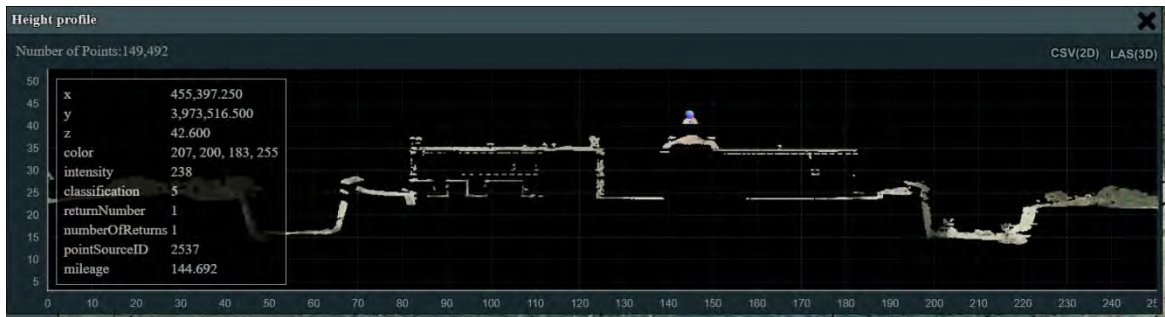
To view a cross-sectional rendition, click on the Show 2d profile tab



Hovering the mouse over the 2d profile depicts the point data, in this case, the highest point of the chapel cupola.



Clicking on the CSV(2D) tab on the top right hand side of the Height profile window will save the data in a .csv file.



Clicking on the LAZ(3D) tab on the top right hand side of the Height profile window will save the data in a .las file.



Q) Tools: Clipping

The Clipping sub menu allows users to carry out clipping actions as follows:

Volume Clip: depicts the clipping actions pertaining to a chosen cross section. Clicking on the Highlight, Inside and Outside tabs clips the object and environment respectively.



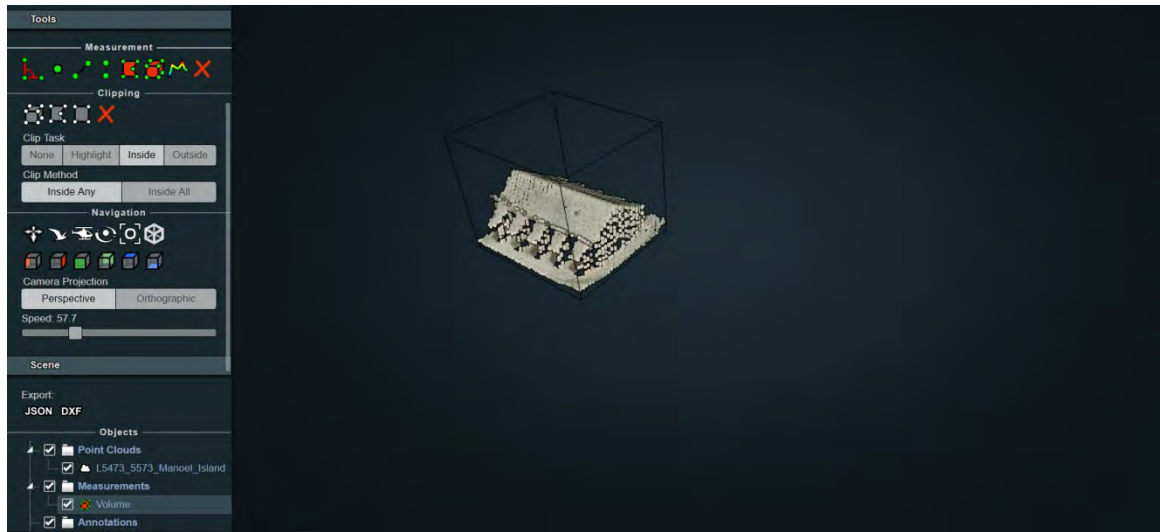
None



Highlight



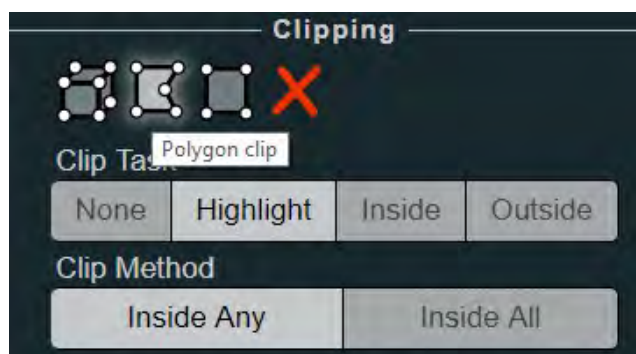
Inside



Outside



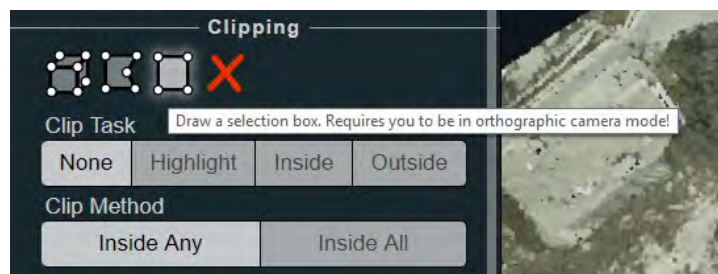
Polygon Clip: depicts the same process as volume clip but requires the drawing of a polygon around the area of interest. Follow the display steps as shown in the volume section shown above.





Box Clip: Selecting a box whilst in orthographic camera mode. Click on the Orthographic tab, then click on the Selection Box and drag a rectangle across the chosen area on the map. Same process as in the previous sections can be carried out.

The Clip Method **Inside All** highlights the content falling within the rectangle whilst **Inside Any** highlights also the other polygons listed in the Scene Objects section.



Inside ALL



Inside ANY



R) **Tools: Navigation**

The Navigation tools can be operated as follows:

Earth Control



Fly Control



Helicopter Control



Orbit Control



Full Extent Control



Navigation Cube Control: depicts a cube that allows instant perspective switch between the Views as indicated in the next depictions.



View: Left



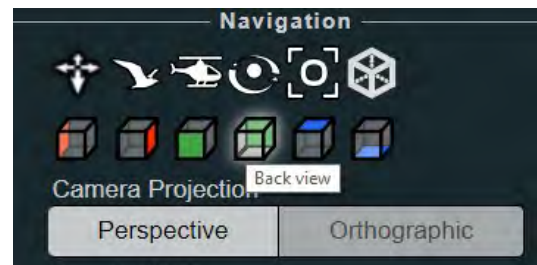
View: Right



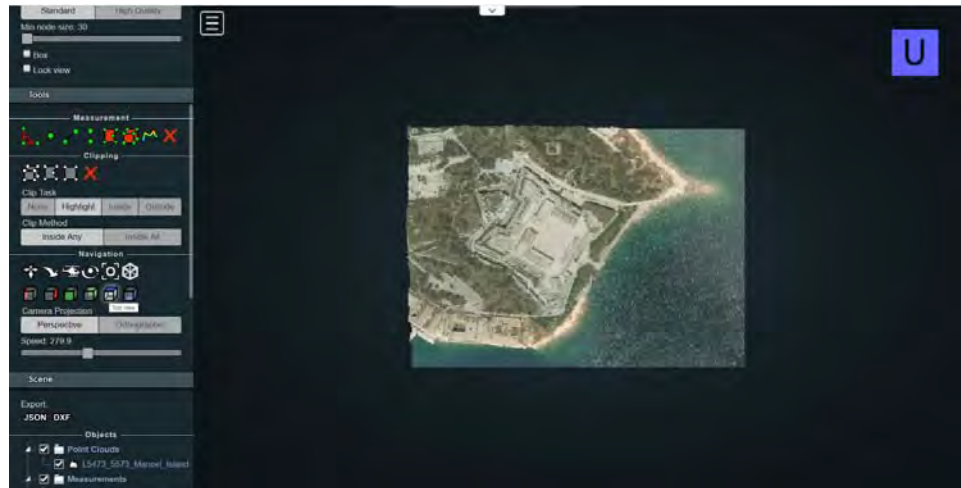
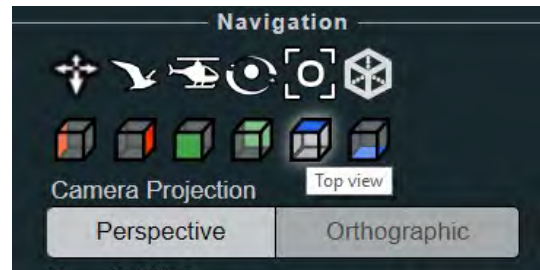
View: Front



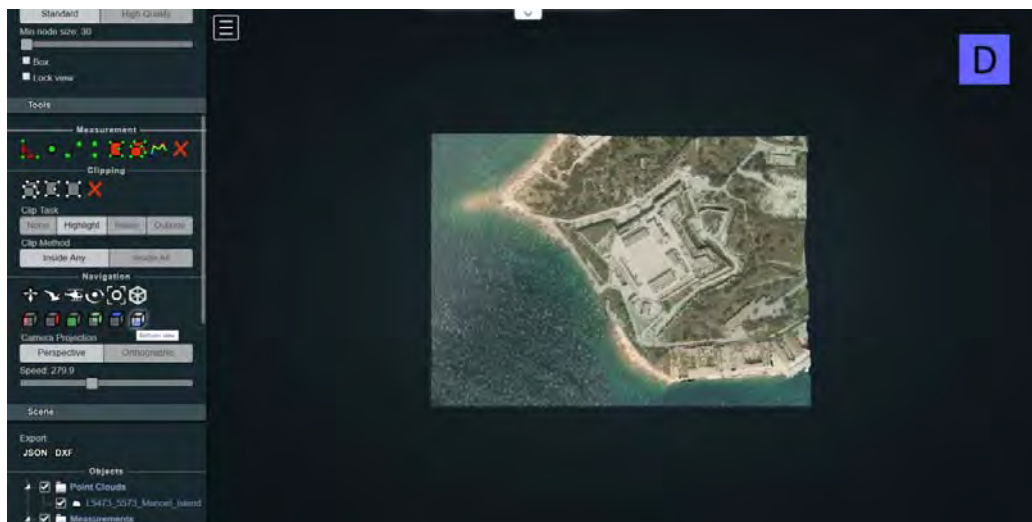
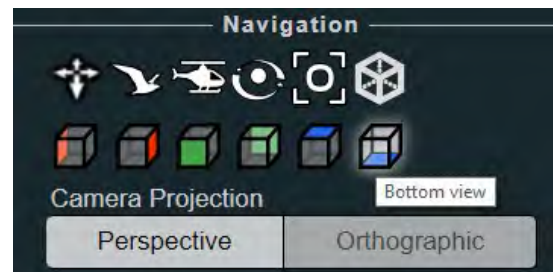
View: Back



View: Top



View: Bottom



References

Boucheny, C. and Ribes A., (April 15, 2011). Eye-Dome Lighting: a non-photorealistic shading technique, URL: <https://blog.kitware.com/eye-dome-lighting-a-non-photorealistic-shading-technique/> accessed on 23 January 2019

Formosa S., (2017). CloudIsle: Pointcloud visualisations of real space: URL <http://www.cloudisle.org>, Launched 28th February 2017

ERDF 156 data, (2013), Developing National Environmental Monitoring Infrastructure and Capacity, Malta Environment & Planning Authority

Schuetz, M., (2016). Potree: Rendering Large Point Clouds in Web Browsers, unpublished Diplom-Ingenieur thesis, Vienna University of Technology