British Geological Survey
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Arolwg Daearegol Prydain
CYNGOR YMCHWILYR AMGYLCHEDD NATURIOL

# Use of an unmanned aerial vehicle to establish dune reactivation baseline

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**Kenfig NNR is a large coastal dune system located in South Wales, UK. Major works to reactivate the dunes were carried out in the winter of 2012/2013.**

**The data presented aims to show the capabilities and benefits of unmanned aerial survey to assist large scale environmental baseline monitoring. Combining a series of digital images it is possible to produce hi resolution georeferenced photogrametry and 3D landscape models. Survey lines can be pre programmed and repeated, using the same software. Unmanned aerial survey provides a low cost and low carbon alternative to traditional airborne survey.**

**Repeat surveys are planned, with the aim of identifying landcover change, principally changes in vegetation, open sand and water filled slacks.**

**Observed changes will be compared with ground based ecological and traditional survey data. Airborne data collection offers a low cost method for environment and conservation managers. Baseline and repeat surveys can compliment traditional ecological ground surveys, supporting both land management decisions and helping to monitor environmental change. The vehicle is currently under development and this work represents a non-commercial, development case study only.**


**Figure 1 :** A study area is selected, flight lines and 'waypoints' are pre programmed. Wind speed and direction are taken into account when planning the orientation of the flight lines. Safe take off and landing areas are identified. Consultation with the site manager was made in advance to ensure there were no nesting birds that would be disturbed.


**Figure 2:** The UAV follows the pre programmed flight lines, collecting hi-resolution digital images with the on board camera. GPS records the location the orientation of the actual flight lines, shown here in red.

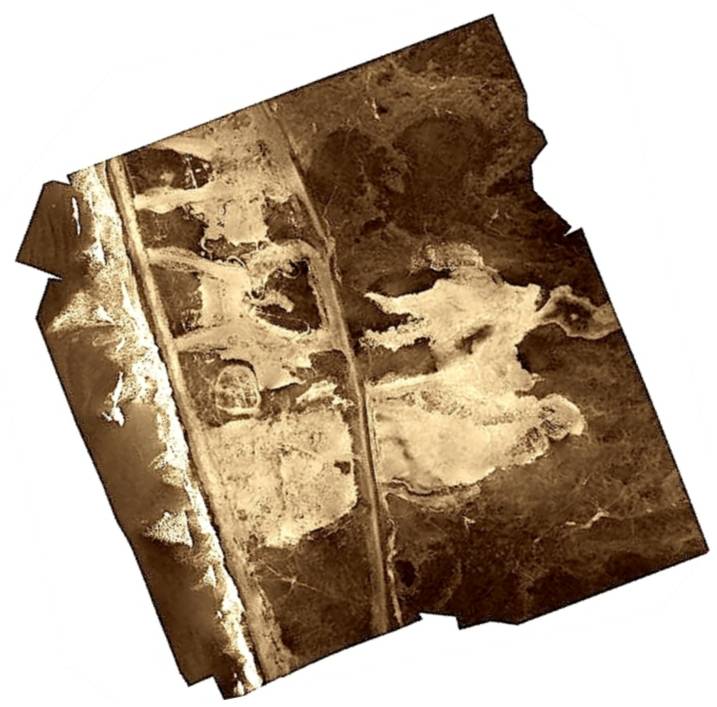

**Figure 3:** The flight produces over 300 digital images. The separate images are joined together to create a single hi-resolution photo. The image is shown with a sepia effect to highlight the areas of open sand.

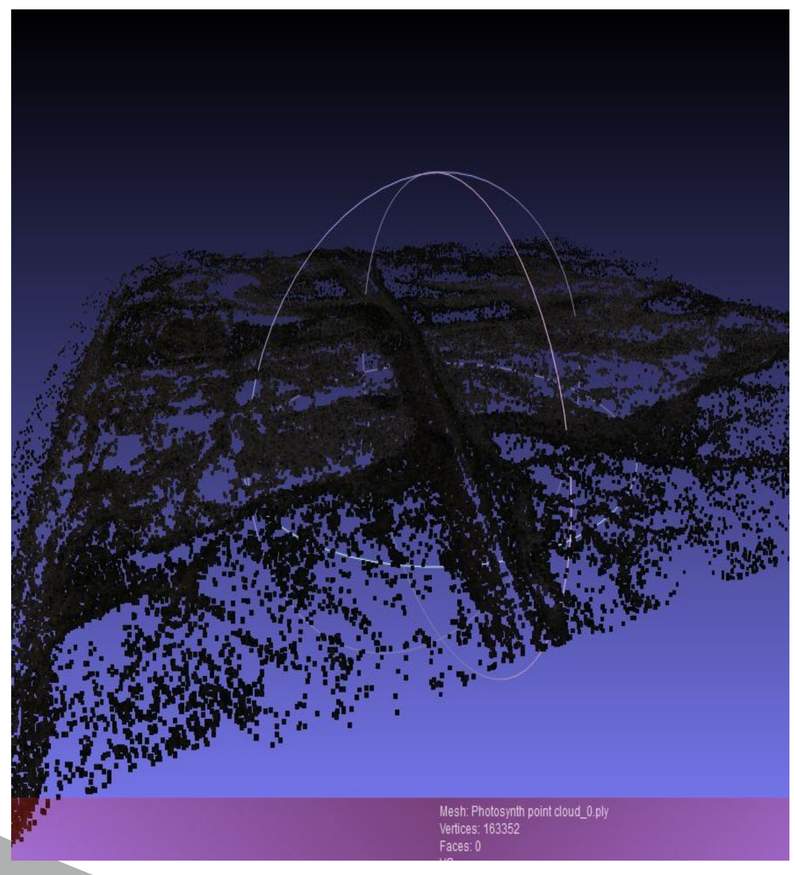


**Figure 4:** Each of the separate digital images can be used to produce a 'pointcloud'. This images shows the individual points which are defined by X, Y and Z co-ordinates.

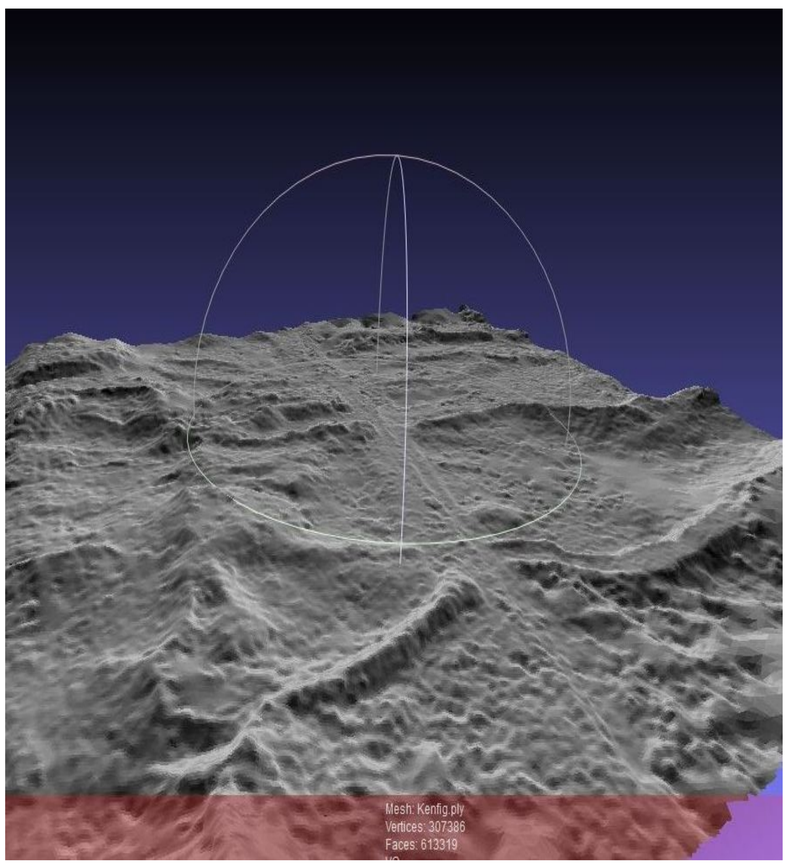


**Figure 5:** The pointcloud data is now turned into a 3D 'mesh'. The mesh provides an easier way for us to observe the ground surface. The software allows rotation of the image and screenshots can be captures from different observation points.

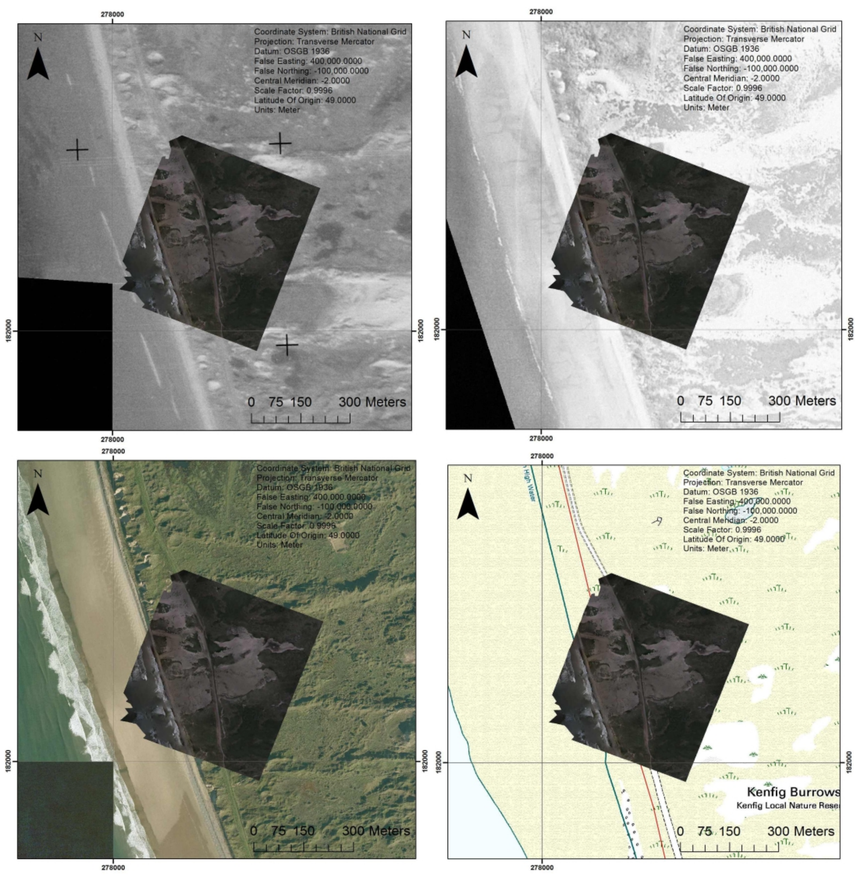


**Figure 6:** Quantifying change against an established baseline is a key goal for most environmental monitoring. Aerial images from top left to bottom right: 1945-7, 1969 and the 2000s (Welsh Government Aerial Photograph Unit) are shown along side the OS 1:10K map . We hope to repeat the flight and compare our digital images and 3D mesh against the data shown in Figures 3-5. We hope to be able to identify areas where sand has migrated, slacks have formed or where vegetation has established.

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