

# Geophysics at Historic Environment Scotland



*The CMD Mini Explorer in use at  
Wormiston Rings (DP362905).  
Credit: HES 2021*

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**H**istoric Environment Scotland (HES) has an active long-running archaeological survey programme that includes field work and aerial reconnaissance but has only recently incorporated geophysics. Thanks to funding from the Historic Scotland Foundation, in July 2020 the Survey and Recording team at HES embarked on a new project focused on geophysics. This aims to embed geophysical survey within HES and promote its use and best practice throughout Scotland's heritage sector. I have been employed as a dedicated geophysical survey officer to provide day-to-day management for the project as well as advice and training to staff throughout HES. The team has also acquired a Sensys magnetometer cart system for use over large areas, as well as a CMD mini explorer electromagnetic instrument for more targeted surveys. A ground penetrating radar system is also soon to be added to the toolkit.

One of the key aims of the project is to support the production of guidelines for the use of geophysical survey in Scotland, working with stakeholders across the heritage sector. These guidelines intend to provide advice specific to practitioners working in Scotland and build upon the existing CfA and European Archaeological Council (EAC) advice. Future professional and academic partnerships are also being explored.

A small number of surveys have already been completed by the team, and planning is underway for other work throughout Scotland. These cover a wide range of landscapes and types of sites, from small single-day area surveys to larger survey campaigns. Every project has two key aims. The first is to address a range of archaeological research questions to help improve our understanding of the landscape and sites

surveyed and ultimately inform their future management. The second aim is to provide testbeds for methodological research to improve the use of geophysical survey techniques in Scotland. This includes the investigation of once heavily ploughed areas that have now been laid to pasture, looking at the impact of seasonality on survey results, and the exploration of environments considered challenging for geophysical



*The Sensys MXPDA in use at  
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techniques, such as peatlands. The project also aims to explore ways in which geophysical survey results can be integrated with data obtained through other survey techniques, such as LiDAR data and multi-spectral imagery.

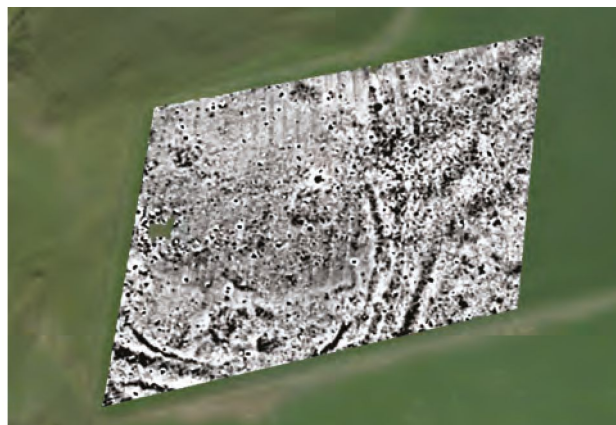
The last aim was the focus of a recent single-day survey undertaken at Wormiston Rings, a hillfort in the Scottish Borders. Alongside magnetometry and electromagnetic survey, multi-spectral and thermal imagery was collected from a UAV, which add to a site record that includes high-resolution LiDAR and traditional aerial photographs. This survey revealed a complex arrangement of enclosing ditches and internal features, adding significant detail to our understanding of the site, and it is helping us learn how to integrate data from multiple sources.

A larger multi-site research project is also underway at various locations within the Antonine Wall World Heritage Site, where the project aims to use geophysical survey to address research and management objectives. Sites to be surveyed include Cleddans fortlet, Duntocher fort, Kinneil House and Seabegs Wood. Results from an early element of this work at Kinneil House have provided promising information, adding detail to our understanding of a site that has already been thoroughly investigated. The survey revealed a previously unknown site, probably of later prehistoric date, just north of the Roman frontier as well as an unexpected 10m<sup>2</sup> ditched feature attached to the rear of the frontier's rampart east of Kinneil fortlet.

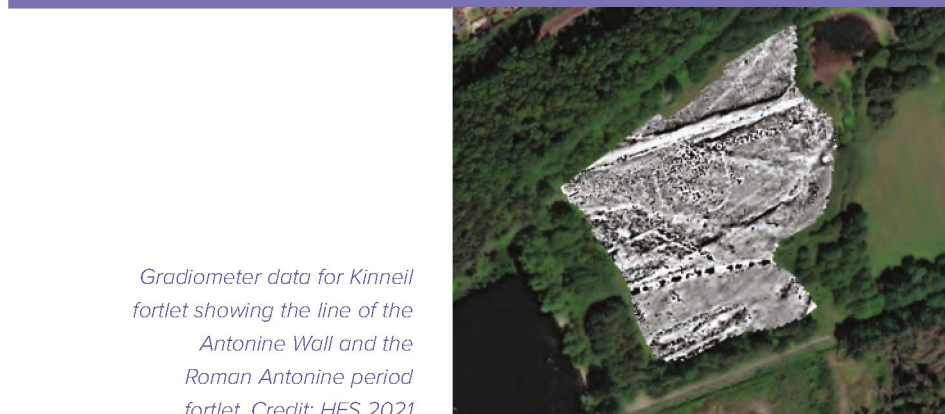
Future surveys are planned at sites such as Machrie Moor stone circles on the Isle of Arran, to investigate a peatland environment and help with the management and understanding of a monument that is the care of HES. The area around the Holywood cursus monuments in Dumfries and Galloway will also be targeted to study the relationship between cropmark information and geophysical survey results. Surveys are also planned in the hills to the east of Kirkcudbright, Dumfries and Galloway, to investigate the immediate environs for

selected examples of the area's well-known prehistoric carved stones, building on the success of HES's *Scotland's Rock Art* project.

***Although this exciting project is in its early days, the team have already made good progress and have a busy calendar of fieldwork planned for the next four years, so watch this space.***



*Gradiometer data for Wormiston Rings showing the multi-phase ditch systems of this Iron Age enclosure. Credit: HES 2021*



*Gradiometer data for Kinneil fortlet showing the line of the Antonine Wall and the Roman Antonine period fortlet. Credit: HES 2021*

**Nick Hannon**

Nick works for Historic Environment Scotland as their Geophysical Survey Officer within the Survey and Recording team. He brings a wealth of experience to the role, having previously worked in both commercial and academic archaeology, specialising in the use and analysis of remotely sensed data. Nick earned his PhD from Canterbury Christ Church University, where he investigated remotely sensed data covering the Antonine Wall World Heritage Site.

