University of BRISTOL
Department of Anthropology
and Archaeology

Geophysical Survey Report

Magnetometry Survey at Wain's Hill, Poets Walk, Clevedon.

HER HER21987
Report 2023/02

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and

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Specialist Teaching Technician

NGR ST 39085 70655
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Summary

This report describes the results of a magnetometry survey carried out at Wain's Hill, Clevedon, North Somerset (centred on ST 39085 70655) as part of the Undergraduate disseration for Tyler White. The aim of the survey was to improve the interpretability of the previous resistivity survey conducted in 2006. The magnetometry survey revealed new potentially significant archaeological anomalies that were not detected by the previous survey, however the survey's limitations due to time and resource constraints suggest that the Site should be surveyed in its entirety to achieve a more comprehensive understanding of its archaeological background.

Contributions

The survey was undertaken with the great assistance of Ben Watson, Charlotte Harman, and Donal Lucy.
Acknowledgements
Thanks to Melanie Barge from Historic England and Cat Lodge and Ewan Hale from the North Somerset HER.

Archive Location

The project archive is deposited with the University of Bristol Research Data Storage Repository (Data.Birs) under the title "Magnetometry Survey at Wain's Hill, Poets Walk, Clevedon".

OASIS Id: archaeol12-516857

Chronology

Following the Forum on Information Standards in Heritage thesauri (version 24).

Abbreviations

AD	Anno Domini	**HER**	Historic Enviroment Record
AOD	Above Ordnance Dartum	**Km**	Kilometer
BC	Before Christ	**m**	Meter
c.	Circa	**NGR**	National Grid Reference
nT	nano Tesla	**OS**	Ordnance Survey

Survey

28th January and 5th March 2023.

Refrence

Birkett, A. T. R., White, T., (2024). Geophysical Survey Report: Magnetometry Survey at Wain's Hill, Poets Walk, Clevedon. (Geophysical Survey Report: 2023/02). University of Bristol: Department of Anthropology and Archaeology

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1. Non-Technical Summary

1.0.1. This Geophysical Survey Report covers the work undertaken at Wains Hill, between January 28th and March 5th, 2023 by Tyler White, an Undergraduate at the Department of Anthropology and Archaeology, University of Bristol, and Alexander Birkett, the Specialist Teaching Technician, also at the Department of Anthropology and Archaeology, University of Bristol.

1.0.2. This report presents the results of a magnetometry survey undertaken to expand the geotechnical survey work undertaken at the site, continuing from the work undertaken by Smisson in 2006..

1.0.3. The results identified some features that had previously not been identified in the previous survey work, including ridge-and-furrow earthworks. Other features identified are less certain, but do suggest at some areas of potential archaeological interest, including linear and curvilinear features that may represent structures.

2. Site Location

2.0.1. The 2.50-hectare site (Scheduled Monument 1007908) occupies a slight coastal promontory which juts south-west from the coast of Clevedon, North Somerset, into the Mouth of the River Severn. The survey area (Figure 1) is defined by a natural hill-slope (15 meters high) to the east which runs from north (ST 3915 7077) to south (ST 3914 7059), and a tarmac footpath (Poet's Walk Coastal Footpath) along the remaining cardinal directions.

2.0.2. The inter-tidal zone at the base of the promontory's south side extends to Middle Hope, Weston-Super-Mare, along the coastline of the Bristol Channel. From southwest to northeast, the site overlooks the Bristol Channel and the Welsh coastline beyond, extending from the islands of Steep Holm and Flat Holm to the Severn Tunnel. The site overlooks the mainland from northeast to southeast, transitioning from the built-up residential areas of Clevedon to a more rural setting, characterised by open fields and farmland which sit against the backdrop of the Mendip Hills.

2.0.3. The topography of site is characterised by a gentle to moderate slopes which terminate at the flatter, though not completely horizontal, summit which occupies approximately 0.85 hectares at a maximum of 36.00 meters AOD.

2.0.4. The underlying geology of the site has been mapped as Carboniferous Limestone of the Black Rock Limestone Subgroup. No superficial deposits have been recorded. Carboniferous limestones demonstrate a weaker response to magnetometers than other limestone formations, which show a 'good' response (English Heritage 2008, p.15).

2.0.5. The overlying soils on the site are shallow (<0.5 meters) with some outcropping (infrequent), characterised as freely draining, slightly acid but base-rich loamy soils (Cranfield University, 2023).

3. Aims and Objectives

3.1. Survey Funding

3.1.1. No funding was used for the survey. Equipment and support was provided by the University of Bristol's Department of Anthropology as part of the Undergraduate Dissertation of Tyler White.

3.2. Survey Aims

3.2.1. The aim of the survey is to attempt to enhance the quality of data beyond that of the Smisson (2006) survey, providing a more interpretable dataset (Figure 2).

3.3. Survey Objectives

3.3.1. To achieve the above, magnetometry techniques will be applied to the site.

4. Methodology

4.1. Permissions

4.1.1. As the site is a scheduled [List Entry Number: 1007908] a Section 42 licence to survey on the site was obtained (Case No: SL00234404).

4.2. Dates of Survey

4.2.1. The survey was conducted on January 28th and March 5th, 2023.

4.3. Location of Survey

4.3.1. Due to limited time and resources, it became apparent early on that a complete survey of the site was not feasible. As a result, the existing data gathered by Smisson of the site was reviewed to inform the subsequent survey grid layout (Smisson 2006; Figure 2). It was decided to target the areas with the highest archaeological potential.

4.3.2. In total 0.92 hectares were surveyed, comprising twenty-three 20.00 m x 20.00 m grids were laid out and geolocated using a Topcon HiPer HR GNSS GPS in a Base and Rover RTK setup (Figure 1).

4.3.3. This covers roughly half the surveyable area of the site, but only one-third of the total Scheduled area.

4.4. Data Capture

4.4.1. The survey was conducted using a Bartington Grad 601-2 dual sensor fluxgate gradiometer.

4.4.2. The sample interval was set to 0.25m intervals (four readings per metre).

4.4.3. The traverse interval was set to 1.00 metres, within 20.00 x 20.00 metre grids.

4.4.4. Grids 01 to 22 were conducted in a zig-zag pattern, starting westerly in the lowest left corner of the grid.

4.4.5. Grid 23 used linear traverses to account for the pillbox and ditch behind it. This was started facing east from its respective lowest left corner.

4.4.6. The instrument was balanced against the local magnetism on each day of the survey in an area of low noise measuring roughly 100m^2.

4.4.7. The instrument was set to detect magnetic variation in the order of 0.01 nT.

4.4.8. This gradiometer consists of two magnetically sensitive sensors positioned vertically, with a 1-meter gap between them. Each sensor measures the strength of the Earth's magnetic field in nano Teslas (nT), and the instrument records the discrepancy between the readings obtained from each sensor. By comparing these readings are relative to the background magnetism as calibrated during the 'balancing' stage. As a result, the instrument is capable of detecting subtle variations or irregularities in the magnetic field caused by materials near the Earth's surface, particularly within the top meter.

4.5. Data Processing

4.5.1. Data was offloaded onto a laptop and opened in TerraSurveyor 3.0.37.

4.5.2. The grids were assembled into their relative position and orientation.

4.5.3. The GPS coordinates of the grids were offloaded into ArcGIS Pro 3.0.3.

4.5.4. So not to remove any anomalies of archaeological potential, or to create any spurious responses that could be considered anomalies with archaeological potential, the raw data from the magnetometry survey was minimally processed to both enhance the data's visuals and remove any defects (Gaffney and Gater 2011, pp.102-104). The following processing options (filters) were applied to the raw data:

i) Clip from -100.00 to 100.00 nT

ii) Clip from -20.00 to 20.00 nT
iii) DeStripe Median Sensors (Grids, All)
iv) Interpolate (X & Y Doubled)

4.5.1. The assembled and processed grids were exported as TIFF image files.

4.6. Data Presentation

4.6.1. The assembled and processed grids TIFF were imported into ArcGIS Pro 3.0.3 and georeferenced using the grid coordinates (Figure 3).

4.6.2. The interpretation of the results was conducted within ArcGIS Pro, with the responses highlighted and outlined using georeferenced polygons and linear trends noted with georeferenced polylines (Figure 4 & Figure 5).

4.6.3. These responses and linear trends were classified according to the following classifications:

Classification	Definition
Natural	Features likely of natural origin
Modern	Definite or known modern features
?Modern	Features likely of modern origin
Archaeological	Definite or known archaeological features
?Archaeological	Features likely of archaeological interest
Magnetic response	Features or areas of noticeably positive or negative magnetism, suggesting interest but of unclear origin
Ferrous	Dipole responses from ferrous objects
Trend	Linear features of noticeably positive or negative magnetism

5. Results

5.1. Results Overview

5.1.1. The gradiometer survey has identified a number of anomalies in the survey area that could be archaeologically significant. It is worth bearing in mind, however, the inherent limitations of non-intrusive archaeology. Whilst every effort has been made to accurately identify and interpret anomalies of potential archaeological significance, there is a possibility that some of these may have been missed or misinterpreted and further investigation of the site/survey results may be required in order to achieve a fuller understanding of the site.

5.2. Ferrous Material

5.2.1. Dipolar anomalies consist of a single positive response and an associated negative one – representing a single feature. Iron objects or small magnetic rocks are the most likely cause of these anomalies in the majority of cases.

5.3. Archaeological Features

5.3.1. Negative linear trends to the east in grids 15 to 20 may relate ridge and furrow cultivation. These anomalies appear largely straight with slight curves, pointing to a medieval rather than a post-medieval origin.

5.3.2. Positive linear trends running north-west and south-east, evident in grids 10 & 14 and 7 & 6, may represent potential field boundaries that potentially relate to the ridge and furrow features identified in grids 15 to 20.

5.3.3. The survey area contains several pit-like anomalies which may be archaeological. The smaller of these features tends to occur around the central survey area, with larger pits towards the

north and south.

5.3.4. These demonstrate at least one curved alignment (grid 14) and a concentration of pits that appear to form alignments resembling squares, parallelograms or rectangles (grids 8, 7 & 6), suggesting they relate to post-built structures.

5.3.5. The survey findings reveal several positive L-shaped anomalies (grid 6 & 8). These cannot confidently be interpreted, though may represent small enclosures associated with agricultural use.

5.3.6. The increased magnetic responses could be archaeological. Though many of these do not appear to form coherent features the increased density of responses around grids 6–8 & 12–14 brings attention to a zone of positive circular and linear anomalies, perhaps associated with a core settlement area on the site.

5.4. Modern Features

5.4.1. A mostly negative response is seen around and to the north of the pillbox south and is likely associated with ground disturbance during its construction.

5.4.2. A large negative magnetic response in grid 13 may represent the area of backfill from its construction.

5.5. Natural

5.5.1. A very blurry response, mainly along the rampart east, is of possible natural origin. These anomalies do not have any regular form, increasing the likelihood they represent natural phenomena.

6. Conclusions

6.1. Summary of Survey Results

6.1.1. In conclusion, the application of magnetometry techniques to the site has provided additional insights into the sites archaeological background. The survey aimed to enhance the interpretability of the data produced from previous investigations, and the revelation of clearer and more distinguishable features allow for more plausible interpretations.

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Figures

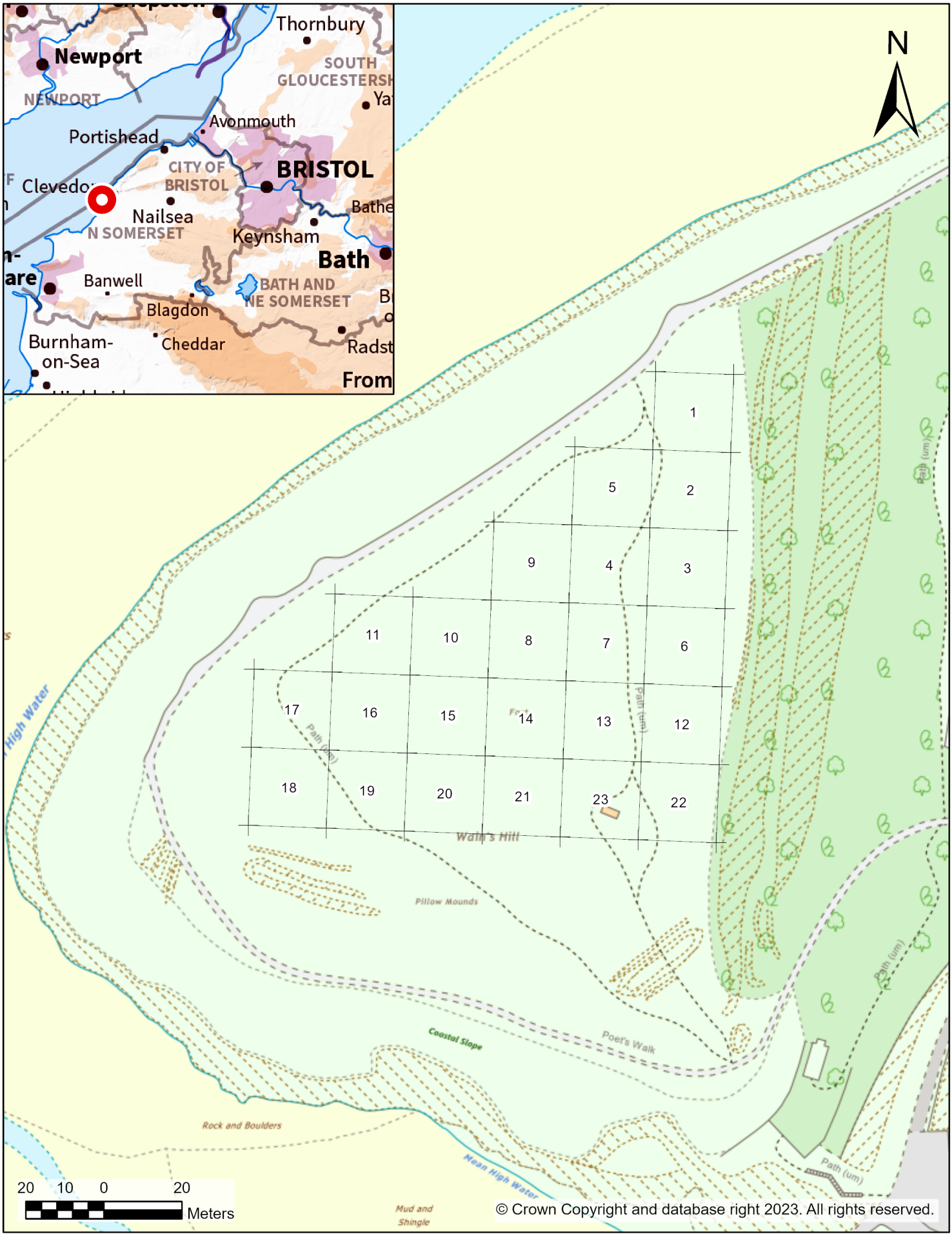

Figure 1. Grid layout and location of survey.

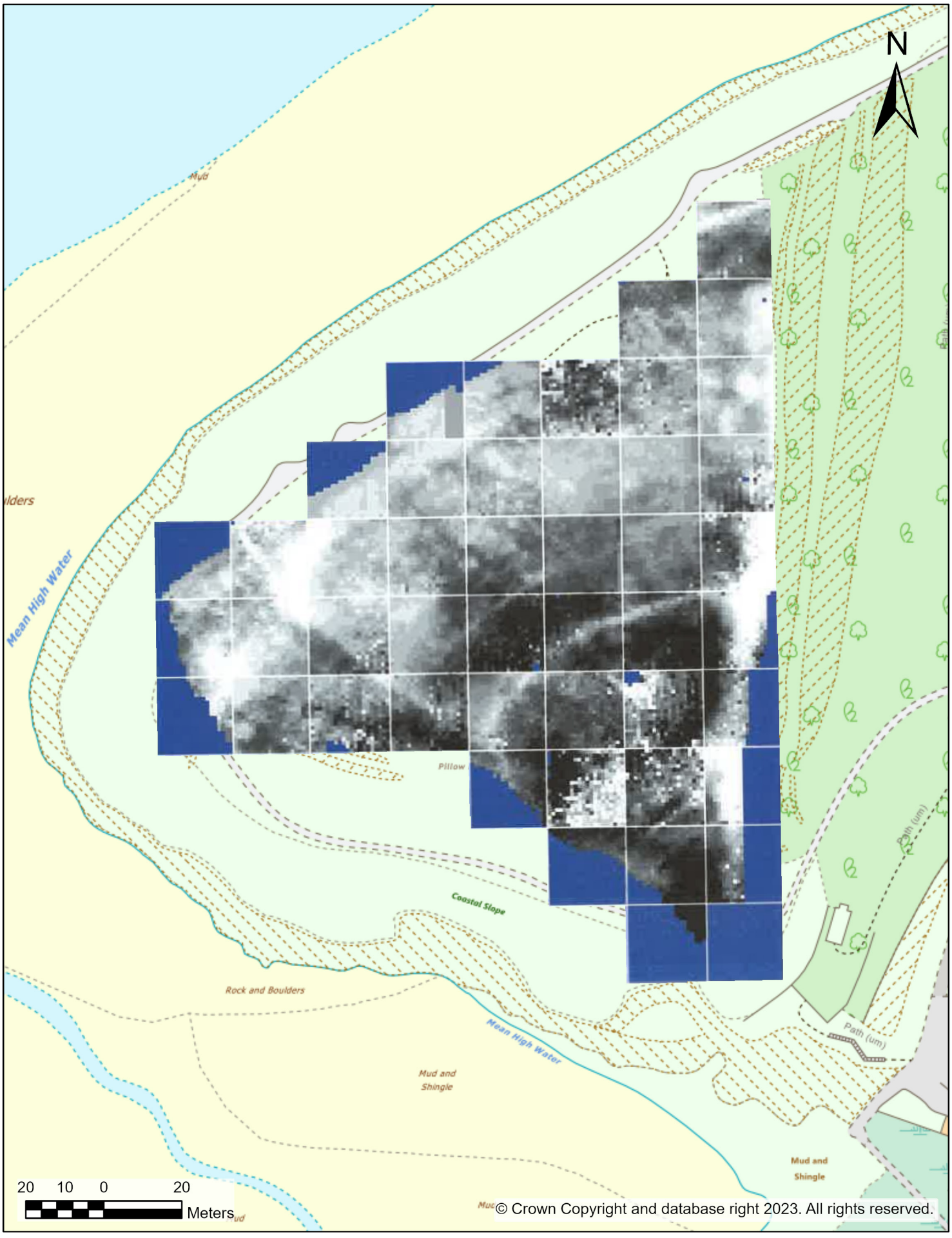

Figure 2. Estimated location and layout of 2006 resistivity survey.

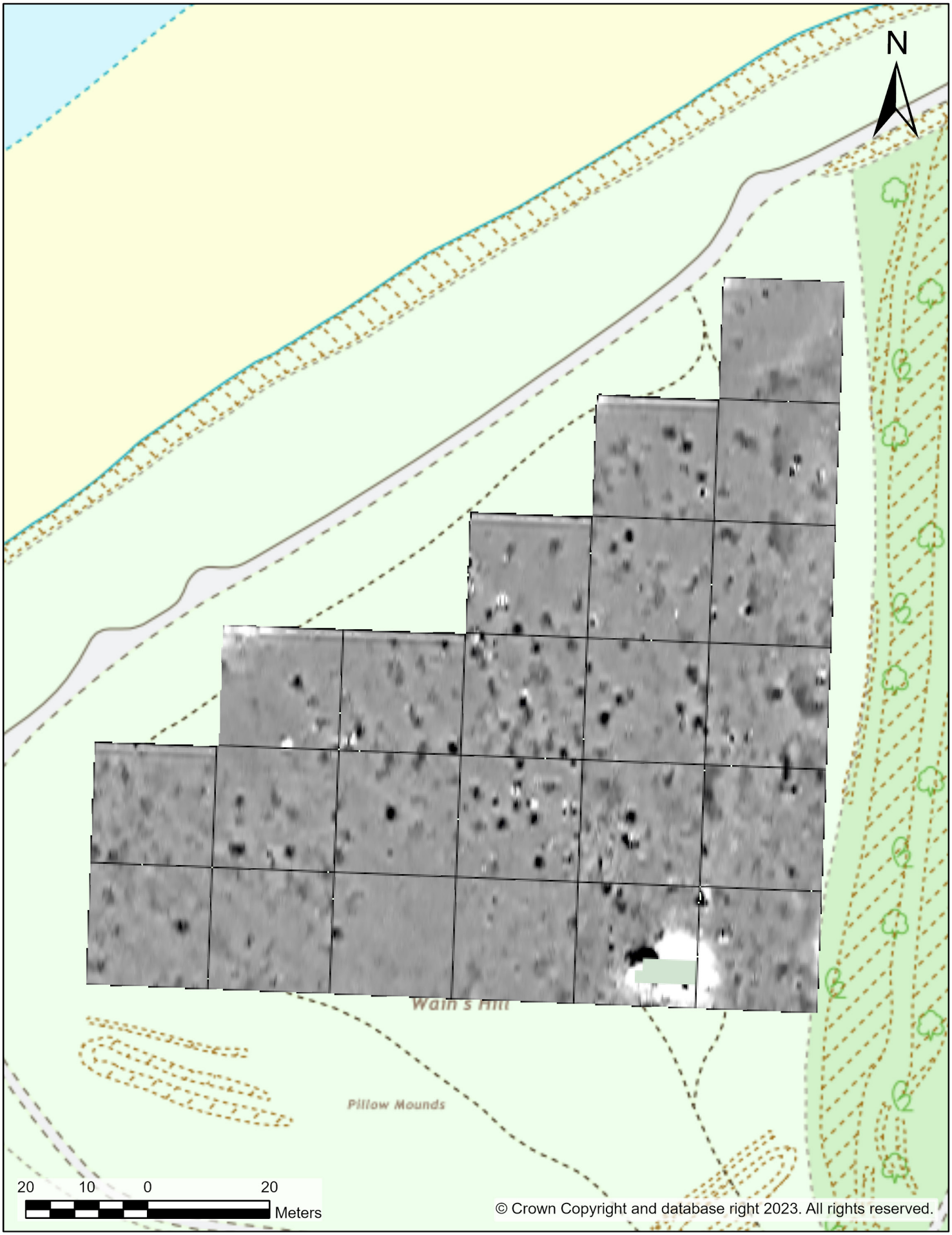

Figure 3. Processed results of survey.

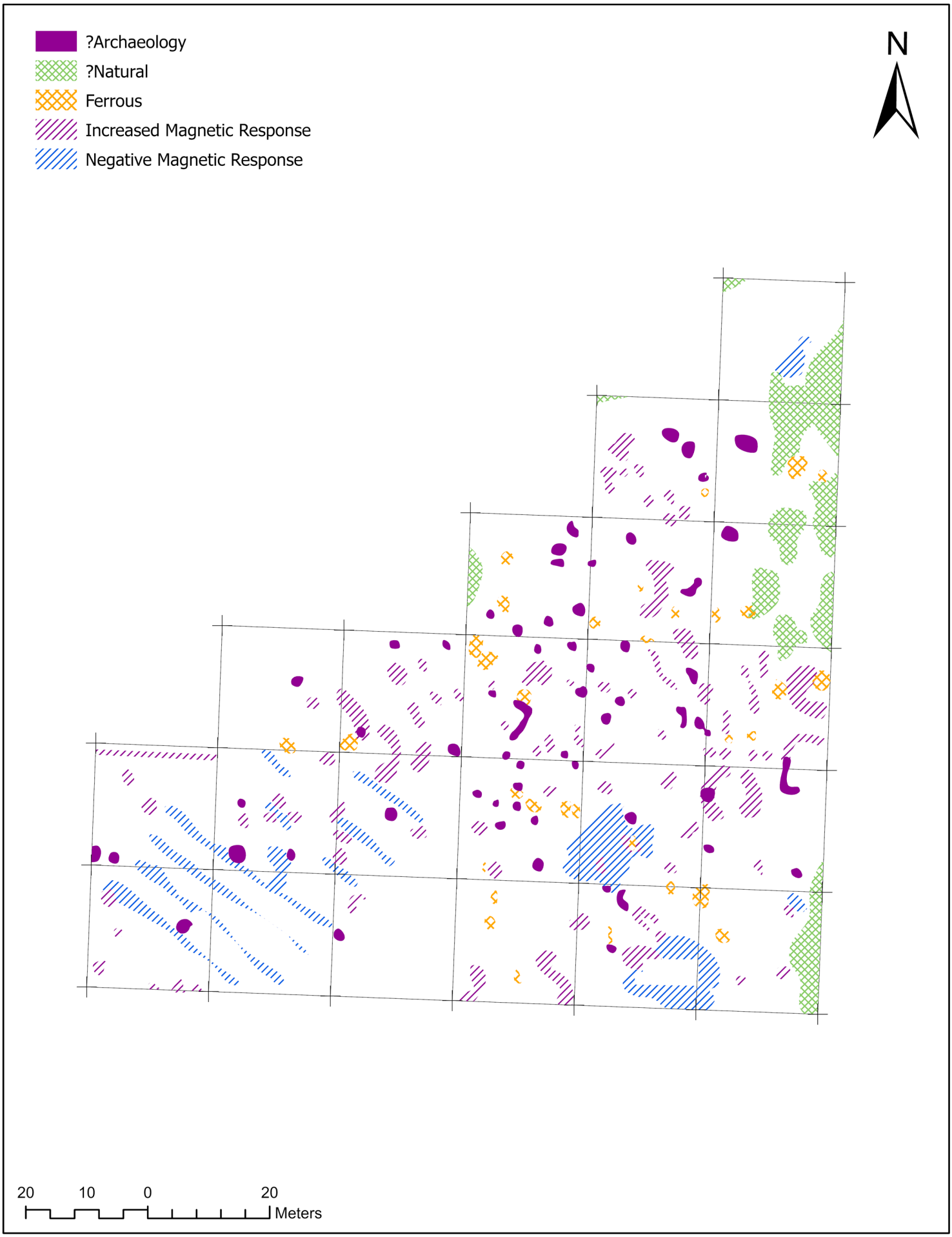

Figure 4. Interpreted results of survey outlining features of archaeological potential.

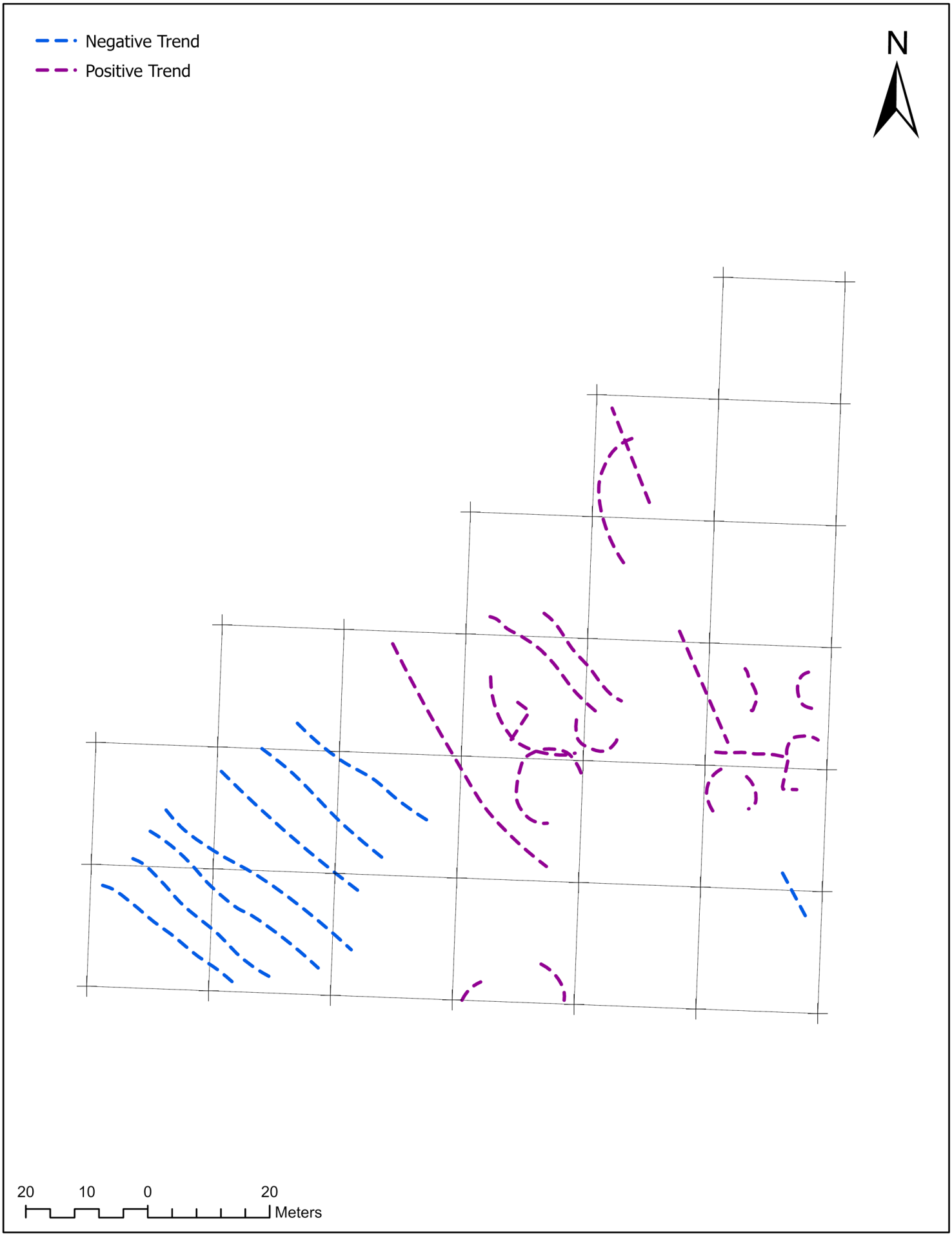

Figure 5. Interpreted results of survey outlining linear trends of archaeological potential.