

Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer and resistance survey

Withypool Hill, Withypool, Exmoor National Park

Centred on NGR (E/N): 283906,134371 (point)

Report: 1612WIT-R-1

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23 March 2017

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Contents

1. Survey description and summary.....	1
2. Survey aims and objectives	2
3. Standards	3
4. Results, discussion and conclusions	3
5. Disclaimer and copyright	7
6. Acknowledgements.....	7
7. Bibliography	7
Appendix 1 Figures.....	8
Appendix 2 Tables.....	22

Figures

Figure 1: geophysical survey area.....	9
Figure 2: magnetometer and resistance survey interpretation,..... anomalies relating to potential archaeology only	10
Figure 3: magnetometer survey interpretation	11
Figure 4: resistance survey interpretation	12
Figure 5: magnetometer survey interpretation over map of barrow (HER MSO8683)	13
Figure 6: resistance survey interpretation over map of barrow (HER MSO8683).....	14
Figure 7: magnetometer and resistance survey interpretation over map of Withypool Stone circle (HER MSO86832).....	15
Figure 8: shade plot of processed magnetometer data	16
Figure 9: contour plot of processed magnetometer data	17
Figure 10: shade plot of processed resistance data	18
Figure 11: contour plot of processed resistance data	19
Figure 12: shade plot of unprocessed magnetometer data	20
Figure 13: shade plot of unprocessed resistance data.....	21

Tables

Table 1: magnetometer data analysis.....	23
Table 2: resistance data analysis	24
Table 3: methodology summary	25
Table 4: processed data metadata, magnetometer survey	26
Table 5: processed data metadata, resistance survey	27

Website: substrata.co.uk

For an overview of Substrata, our archaeological geophysical surveying techniques and the results we obtain.

1 Survey description and summary

1.1 Survey

Type: twin-sensor fluxgate gradiometer (magnetometer)
twin-probe earth resistance
Dates: between 31 January 2017 and 6 February 2017
Area: 3.3ha for each survey
Lead surveyor: Mark Edwards BA
Author: Ross Dean BSc MSc MA MifA

1.2 Client

AC Archaeology Ltd, 4 Halthaies Workshops, Bradninch Nr Exeter, Devon EX5 4QL

1.3 Site information

Site: Withypool Hill
Civil Parish: Withypool and Hawkridge
District: West Somerset
County: Somerset
Local Authority: Exmoor National Park Authority
NGR: SS 839 344 (point)
Ordnance Survey NGR (E/N): 283906,134371 (point)
Nearest Postcode: TA24 7RG

1.4 Historic Environment Record of monuments within the survey area

MSO8683 and scheduled monument 1021261: A bowl barrow on Withypool Hill disturbed by robbing and possible excavation. The barrow mound measures 20.5m in diameter and stands roughly 1.1m high. A modern cairn has been built on the eastern side of the summit.

MSO3191: A small mound is visible on aerial photographs of the 1940s as an earthwork on Withypool Hill. The age and function of the mound are uncertain but it may be associated with military training activities of Second World War date.

MSO8756 and scheduled monument 1021261: A prehistoric cairn is visible as a turf covered stony mound 3.5m in diameter and 0.3m high.

MSO8682 and scheduled monument 1021262: The remains of a stone circle on the southwest slope of Withypool Hill. It is alleged that it once consisted of 100 stones, but survey in 1989 revealed 27 upright stones and 3 fallen ones. The diameter of the circle is approximately 36m.

1.5 Archive

OASIS number: substrat1-280329
Archive: At the time of writing, the archive of this survey will be held by Substrata.

1.6 Introduction

This report presents the results of magnetometer and resistance surveys at the above site, hereafter referred to as the survey area. It has been prepared for AC Archaeology Ltd on behalf of the Exmoor National Park Authority and Historic England. It is part of a larger body of work funded by Historic England aimed at better recording the above listed known monuments to inform future management and prevent further damage, both to the sites and any buried features associated with them. The survey is intended to deploy modern remote prospecting techniques on the sites and part of their setting.

A planned ground penetrating radar survey across the barrow and cairn was abandoned after inspecting the ground conditions. The barrow had a disturbed and stony summit and boggy ground to the north which precluded a good ground contact for the radar equipment. Similar conditions were found on the cairn.

1.7 Summary

Both the magnetic and earth resistance responses were sufficient to be able to differentiate anomalies representing possible archaeological features. Forty-one magnetic data anomalies and twenty-two resistance anomalies were characterised as representing potential archaeological deposits and features.

Both the magnetometer and resistance data contained evidence for structural components with in the bowl barrow situated in the northeast of the geophysical survey area (HER MSO8683). It is clear the resistance data reflected different, probably slightly deeper deposits in the barrow than those represented by the magnetic data. The resistance anomaly groups around and within the barrow strongly suggested the presence of an external encompassing ditch and a barrow with a relatively stony composition. Both data sets contained evidence of disturbance at the barrow summit and the likely presence of robber and/or excavation trenches.

The magnetometer data contained evidence for a number of cairns, only one of which was previously recorded (HER MSO8756). The anomalies manifested as relatively high, positive responses. Such patterns can imply the presence of burnt material.

Two magnetic anomaly groups with characteristics often associated with intense, in-situ heating were recorded adjacent to the bowl barrow. One, and possibly two similar groups were recorded within the Withypool stone circle (HER MSO8682).

A disrupted, sub-circular resistance anomaly group followed the course of a modern path surrounding Withypool stone circle and the most likely explanation is that this anomaly group represents the path. The magnetic data within and around the stone circle has a number of anomalies that could be interpreted as pits or large postholes. Whilst some these are most likely to represent natural deposits, their association with the stone circle made their mapping as potential archaeological deposits prudent. One group appeared to form a linear pattern of potential pits.

Two resistance anomaly groups were likely to represent two small mounds, the age and function of which are uncertain but it may be associated with military training activities of Second World War date (HER entry MMO3191). Other magnetic groups appeared to represent disturbed ground with ferrous material present and these also may be of Second World War date.

Other anomaly groups representing potential archaeological deposits or features are discussed in Section 4.

2 Survey aims and objectives

2.1 Aims

The survey is part of a suite of works funded by Historic England aimed at recording the monuments to inform future management and prevent further damage, both to the sites and any buried features associated with them. The survey is intended to deploy modern remote prospecting techniques on the sites and part of their setting.

2.2 Objectives

1. To identify any below ground structural components of the stone circle and barrows (such as ditches, pits, burning activity, cists, walling etc.).
2. To ascertain the presence/absence of an encircling ditch or kerb to the barrow and cairn.
3. To identify any adjacent archaeological features.
4. To build on our knowledge of surveying sites of this type from previous geophysical survey work carried out at the Chapman Barrows and Porlock Stone Circle.
5. To use a range of modern remote sensing techniques including gradiometry, and earth resistance.

3 Standards

The standards used to complete this survey are defined by the Chartered Institute for Archaeologists (2014a) and Historic England (2010). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service/Digital Antiquity Guides (undated).

4 Results, discussion and conclusions

4.1 Scope and definitions

This survey was designed to record magnetic and resistance anomalies.

A magnetic anomaly is a local variation in the Earth's magnetic field. Such variations can result from differences in the chemistry or magnetism of underlying solid geology, superficial geology and other near-surface deposits including those altered and created by past human activities. Near-surface artefacts can also create magnetic anomalies.

A resistance anomaly is a local variation in the electrical resistance of a soil and is related to its porosity, permeability, saturation, and chemical nature of entrapped fluids (Heimmer and De Vore, 1995:30), all of which can be altered by past human activities. Higher concentrations of ions allow electrical current to pass more easily through the soil, creating a lower electrical resistance.

The terms 'archaeological deposit', 'structure' and 'feature' refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity, excluding recent land maintenance and farming.

Magnetic and resistance anomalies cannot be regarded as physical archaeological deposits, structures or features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeology. They can be, however, indicative of archaeological deposits, structures, features or past human activity.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits, structures, features and past human activity.

The reader is referred to section 5.

4.2 Results

Figure 2 shows the interpretation of the magnetometer and resistance survey data sets and displays the anomalies relating to potential archaeological deposits only.

Figures 3 and 4 provide the complete interpretation of the magnetometer and resistance data sets respectively. The anomaly groups identified as possibly relating to archaeological deposits, structures or features along with their identifying labels. Figures 5 and 6 show the archaeological interpretation of the magnetometer and resistance survey data sets respectively over an Ordnance Survey map of the barrow. Figure 7 shows the combined archaeological interpretation of the magnetometer and resistance survey data sets over a map of Withypool stone circle produced by AC Archaeology. Tables 1 and 2 (magnetometer and resistance surveys respectively) are extracts of the detailed analysis of the survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figures 2 to 7 along with Tables 1 and 2 comprise the analysis of the survey data.

Various plots of the processed data as specified in Tables 4 and 5 are provided in Figures 8 to 11.

Figures 12 and 13 are plots of the unprocessed magnetometer and resistance data along with the relevant metadata.

4.3 Discussion

4.3.1 General points

Discussion scope

Anomalies groups identified in Tables 1 and 2 as possibly representing archaeological deposits or features but which cannot be further characterised are not discussed below. All identified anomaly groups are recorded in the GIS project held the survey archive.

Data collection

Data collection within the survey area was restricted in a few places by boggy ground and vegetation as shown in the figures.

Anomaly characterisation and mapping

Referring to Figures 8 to 11, there are a number of anomaly groups that could be interpreted as relating to large postholes or pits although most will have natural origins. Anomalies of this sort are only mapped as potential archaeology if they are clustered in groups or otherwise form recognisable patterns.

Numerous dipole magnetic anomalies are scattered across the magnetometer data set. These are likely to represent recent ferrous objects. They are only mapped if they could influence the analysis of anomaly groups thought to have an archaeological origin.

Anomalies thought to relate to natural features and recent man-made objects were only mapped where they comprised significant magnetic responses across the dataset that needed clarification.

4.3.2 Magnetometer survey

Referring to Figure 3, based on the analysis of magnetic anomaly groups **m19** and **m20** which coincide with a known cairn described in the Historical Environment Record (HER) entry MSO8756, anomaly groups **m1**, **m2**, **m13 to 18**, **m25**, **m26**, **m28** and **m29** may represent similar cairns within the survey area. The relative magnitude of the positive magnetic response of these anomaly groups is suggestive of re-deposition of heated material but this is not certain.

Groups **m3**, **m4** and **m5** are most likely to represent disturbed ground with some ferrous material located close to a small mound, the age and function of which are uncertain but it may be associated with military training activities of Second World War date (HER entry MMO3191).

The bowl barrow targeted in the northern section of the survey area is thought to have been disturbed by robbing and possible excavation (HER MSO8683). Referring to Figure 5, magnetic anomalies **m7** and **m11** recorded around the periphery of the mound may represent the remnants of an encircling ditch (m7) and possibly a kerb (m11) but it is more likely that relatively shallow deposits and possibly near-surface disturbance are being recorded in the magnetic data. In particular, groups **m9** and **m10** are most likely to represent a modern cairn built on the eastern side of the summit and group and m11 may represent associated stony deposits. Within the cairn, group **m8** may represent a robber or excavation trench and coincides with similar resistance anomalies discussed below (group r10).

Groups **m6** and **m12** have characteristics often associated with high-intensity, in-situ heating of deposits. Given the proximity of the bowl barrow, groups m6 and m12 may be indicative of funerary activities such as cremation.

The magnetic data collected around Withypool stone circle (HER MSO8682) in the south-western section of the survey area includes a number of anomalies that have characteristics that can be associated with large postholes and pits (Figure 7). Group **m31** appears to represent a linear sequence of such features. Groups **m32**, **m33**, **m36** and **m40** are recorded because of their position within or adjacent to the stone circle. They may represent archaeological or natural deposits or a combination of both. Group **m30** may represent

relatively recent ground disturbance along the line of a modern track although an archaeological origin cannot be ruled out.

Anomaly group **m35** coincides with and represents a cairn recorded in a recent survey of the stone circle by AC Archaeology (Figure 7). Group **m38** may represent deposits subjected to high-intensity, in-situ heating such as those associated with metal working or cremation. Group **m37** may represent similar deposits but the position of this group on the line of a modern track and associated erosion suggests that the fortuitous orientation of an anomaly representing an iron or steel object is likely.

4.3.3 Resistance survey

Resistance anomaly groups **r1** and **r2** (Figure 4) are very similar in form and magnitudes. Group **r2** coincides and probably represents a small mound, the age and function of which are uncertain but it may be associated with military training activities of Second World War date (HER entry MMO3191). It is likely that **r1** represents a similar structure.

The resistance anomalies recorded adjacent to and within the bowl barrow situated in the northeast of the survey area (HER MSO8683) are shown in Figure 6. Group **r3** is most likely to represent an encircling ditch and group **r5** probably represents relatively stony deposits within the barrow. The form of **r5** appears to suggest a stony outer bank or revetment although this apparent structure may be the result of significant disruption to the barrow summit. Groups **r9**, **r11** and **r13** are likely to also reflect relatively stony material which has suffered disruption in the past. Groups **r4**, **r8**, **r10** and possibly **r12**, are all most readily explained as reflecting disturbance from robber and/or excavation trenches. Groups **r6** and **r7** may represent structural, relatively earthen deposits within the barrow. It is clear the resistance data reflected different, probably slightly deeper deposits in the barrow than those represented by the magnetic data.

Anomaly group **r18** coincides with a known cairn and are likely to represent this feature. In contrast with the magnetometer data for the same cairn, the resistance data does not appear to contain evidence of the other potential cairns discussed in Section 4.3.2 and **r18** was only characterised because of its proximity to the mapped cairn and the two magnetic anomaly groups **m19** and **m20**.

There are three resistance anomaly groups that have a truncated, sub-circular form (groups **r17**, **r19** and **r20**). They are recorded as representing potential archaeological deposits because of their proximity to the bowl barrow but only excavation would allow an assessment of whether they represent archaeological or natural deposits.

Group **r21** (Figure 7) is most likely to represent relatively compact deposits on and around the modern footpath encompassing Withypool stone circle. As the match between **r21** and the mapped modern path is not exact, there is a possibility that the anomaly group represents a former ditch but the footpath remains the more likely option.

Group **r22** is most likely to represent a footpath or routeway of unknown date and, if modern, less used than those represented by **r101** and **r102**.

4.4 Conclusions

Both the magnetic and earth resistance responses were sufficient to be able to differentiate anomalies representing possible archaeological features. Forty-one magnetic data anomalies and twenty-two resistance anomalies were characterised as representing potential archaeological deposits and features.

Both the magnetometer and resistance data contained evidence for structural components within the bowl barrow situated in the northeast of the geophysical survey area (HER MSO8683). It is clear the resistance data reflected different, probably slightly deeper deposits in the barrow than those represented by the magnetic data. The resistance anomaly groups around and within the barrow strongly suggested the presence of an external

encompassing ditch and a barrow with a relatively stony composition. Both data sets contained evidence of disturbance at the barrow summit and the likely presence of robber and/or excavation trenches.

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Other anomaly groups representing potential archaeological deposits or features are discussed in Section 4.

5 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

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6 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

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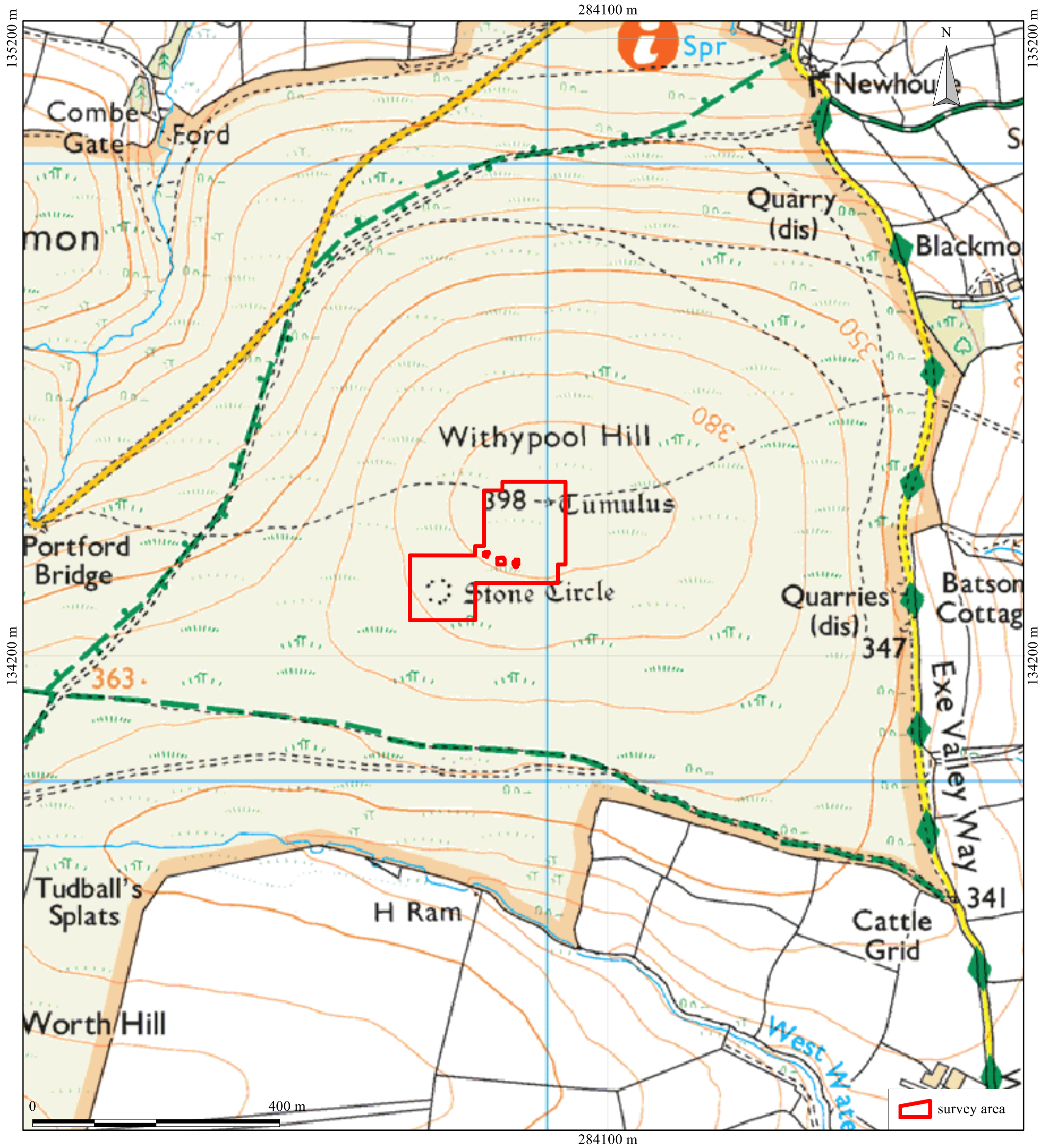
Appendix 1 Supporting plots and analysis table

General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.

A rough rule for interpreting resistance anomalies is that if an x-y trace is drawn of the resistance over an anomaly, then the width of an anomaly at half its maximum height is equal to the width of the buried feature. Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies and it should be noted that the relationship between change in resistance response and depth is not linear (Gaffney and Gater, 2003: 112).



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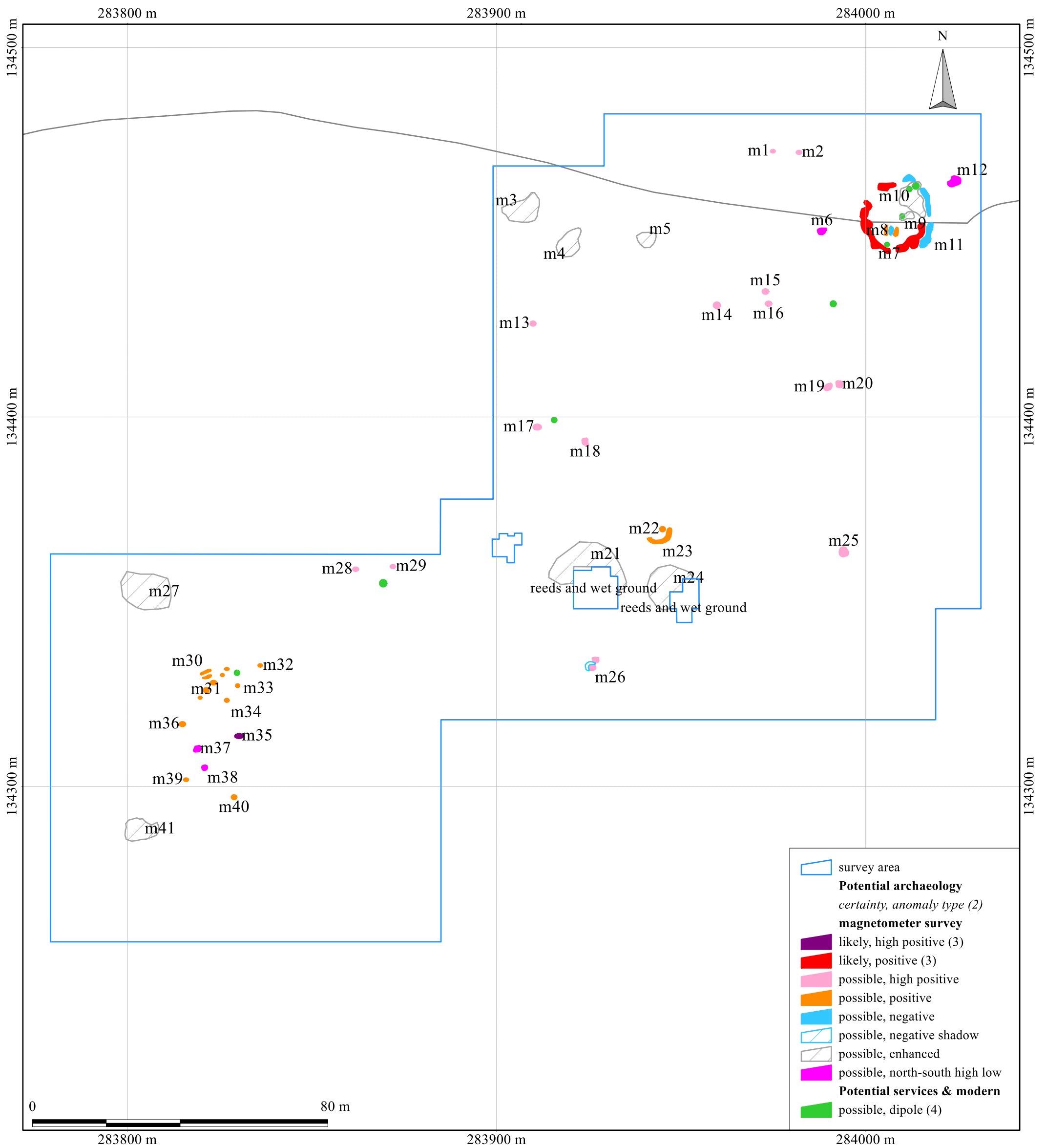
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Figure 1: geophysical survey area

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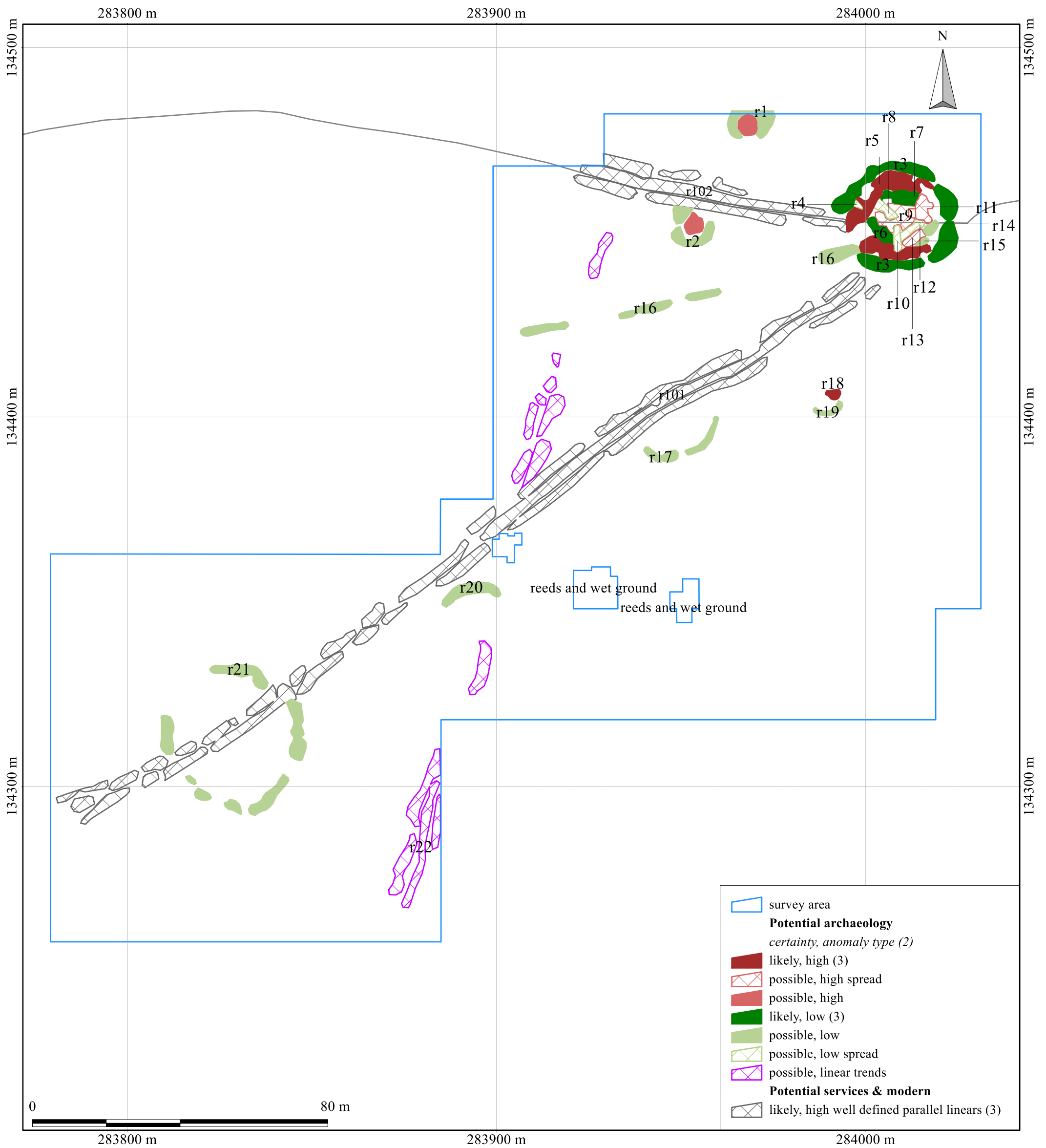
Notes:

1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

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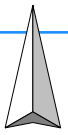
Figure 3: magnetometer survey interpretation

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284000 m

N



m2

m12

m10

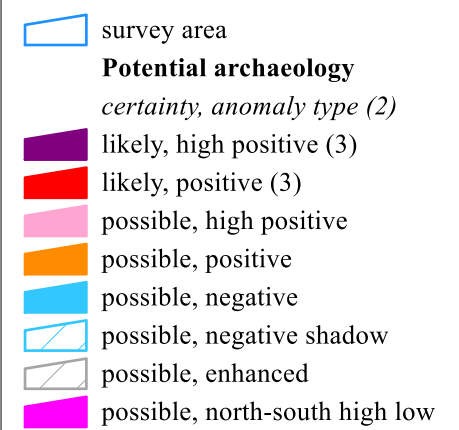
m9

m6

m8

m11

m7



0 20 m

284000 m

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Notes:

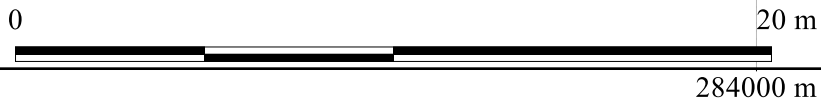
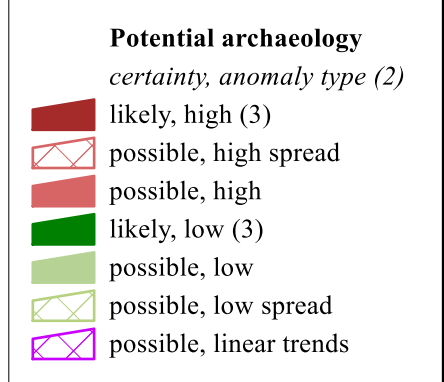
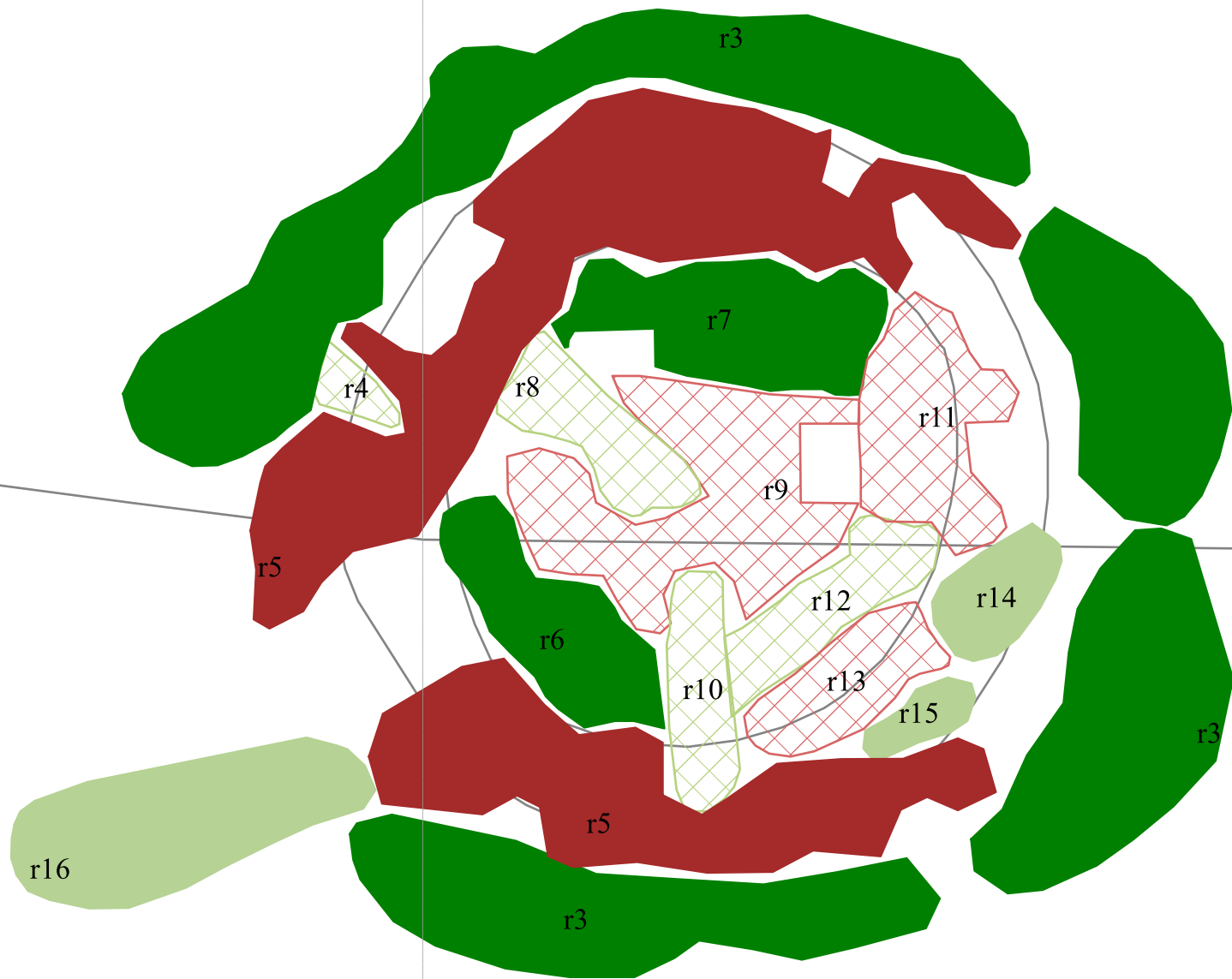
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Figure 5: magnetometer survey interpretation
over map of barrow (HER MSO8683),
anomalies relating to potential archaeology only

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284000 m



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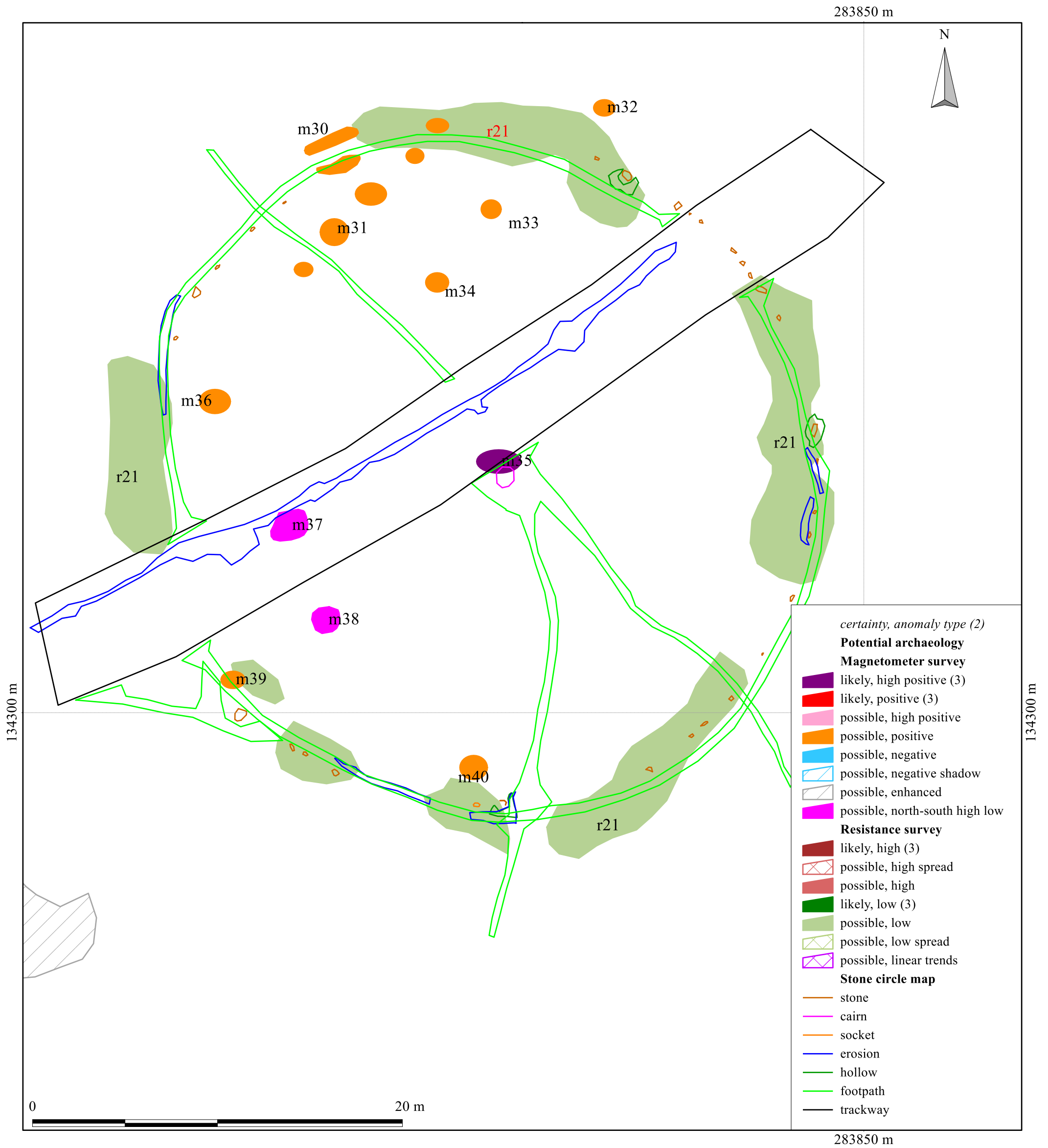
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Figure 6: resistance survey interpretation
 over map of barrow (HER MSO8683),
 anomalies relating to potential archaeology only

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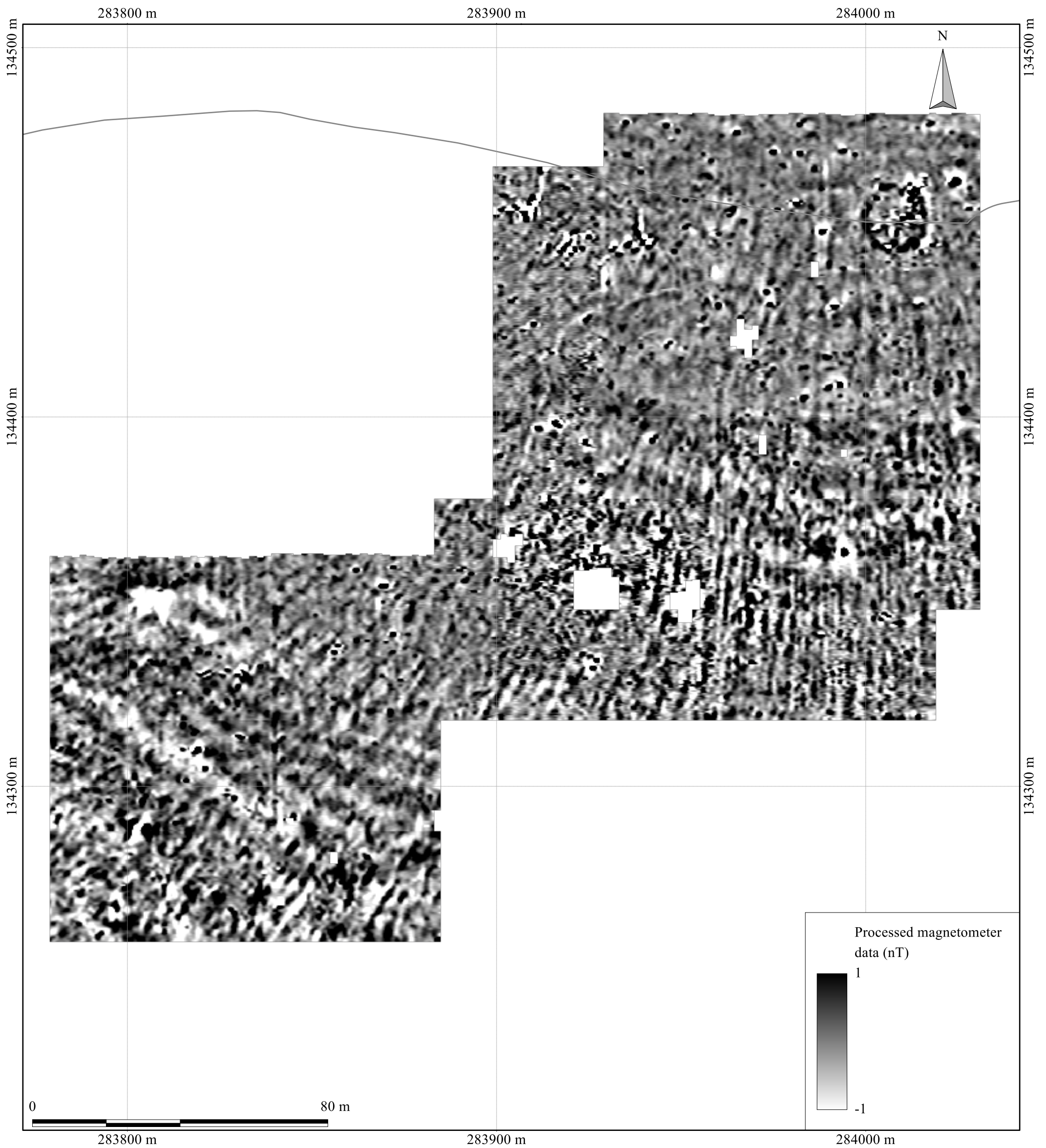
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Figure 7: magnetometer & resistance survey interpretation
over map of Withypool stone circle (HER MSO8682),
anomalies relating to potential archaeology only

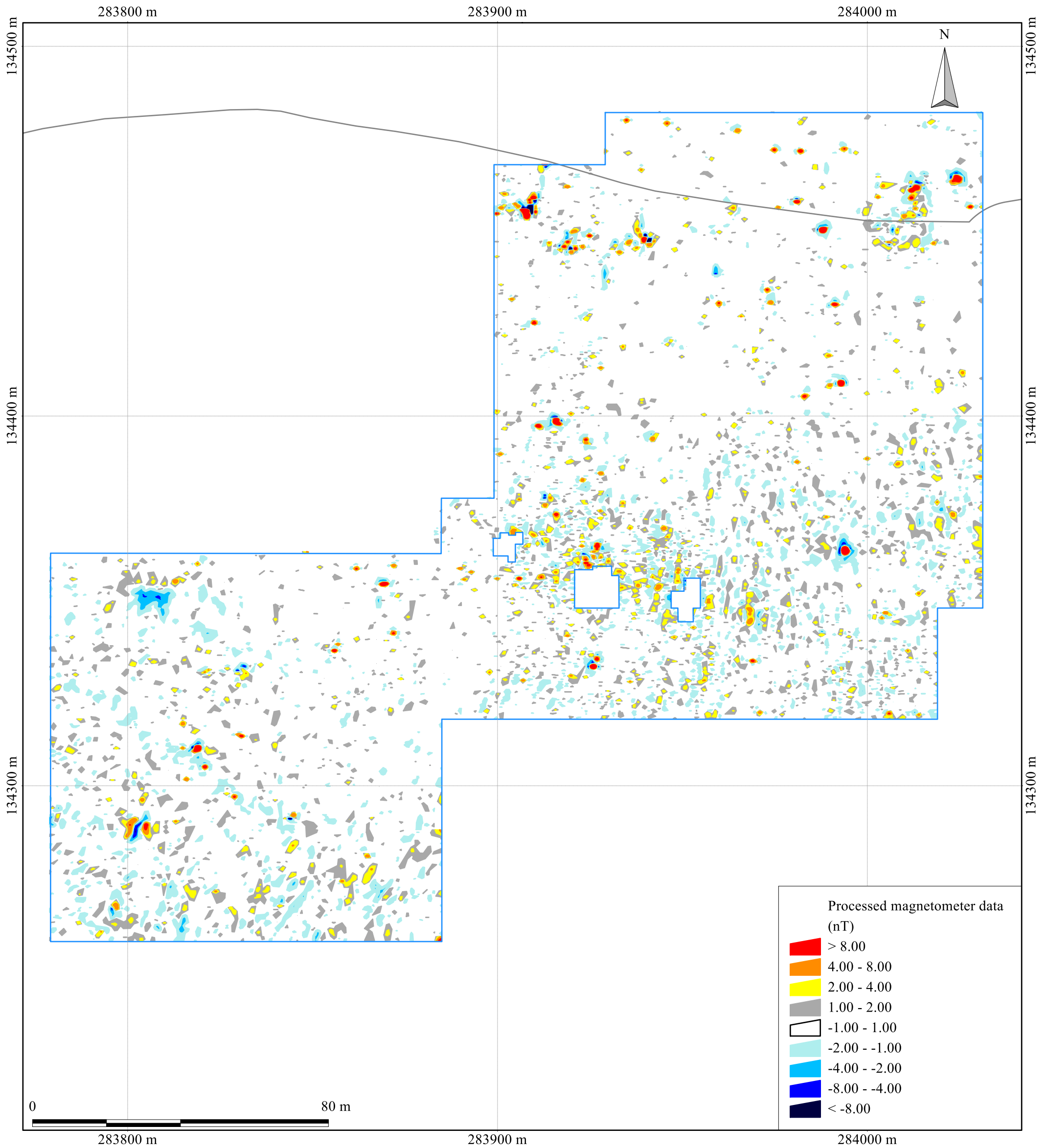
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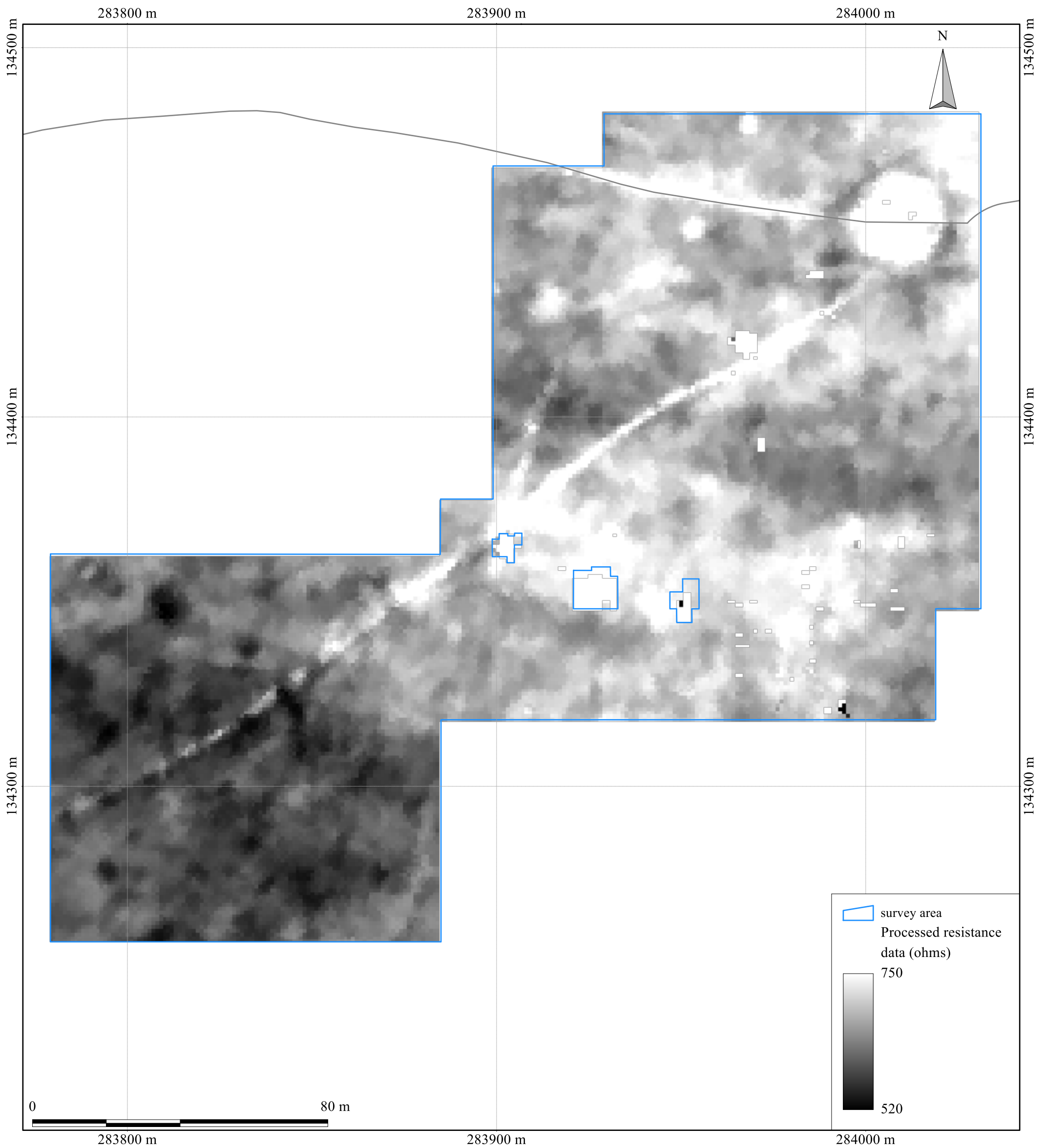
Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing



British Grid
 centre X: 283906.70 m, centre Y: 134356.60 m

Geophysical survey: Copyright Substrata Limited.
 Base map: Copyright Ordnance Survey

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing



British Grid
 centre X: 283906.70 m, centre Y: 134356.60 m

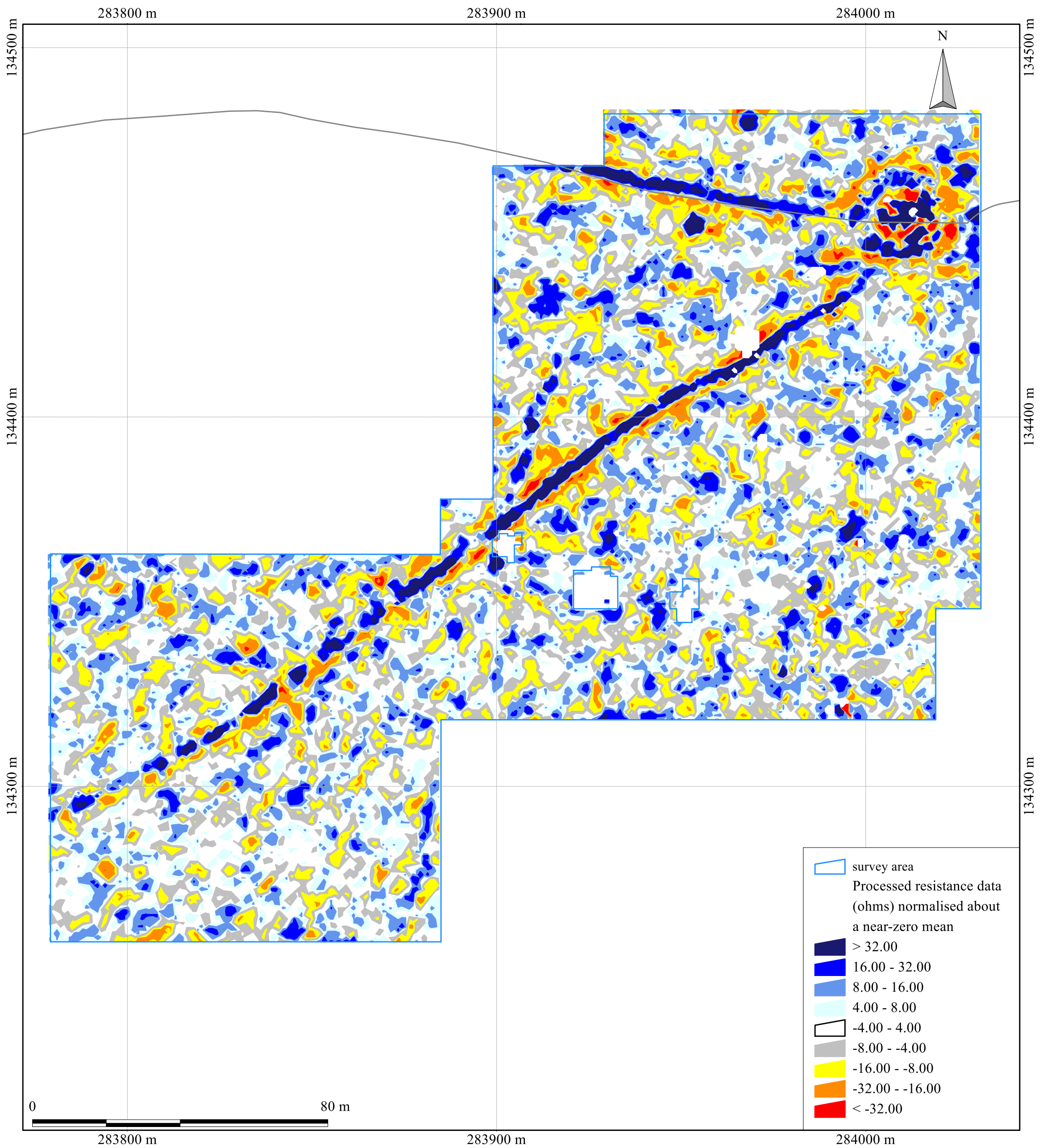
Geophysical survey: Copyright Substrata Limited.
 Base map: Copyright Ordnance Survey

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
 Withypool Hill, Withypool, Exmoor National Park
 Centred on NGR (E/N) 283906,134371
 Report: 1612WIT-R-1

Figure 10: shade plot of processed resistance data

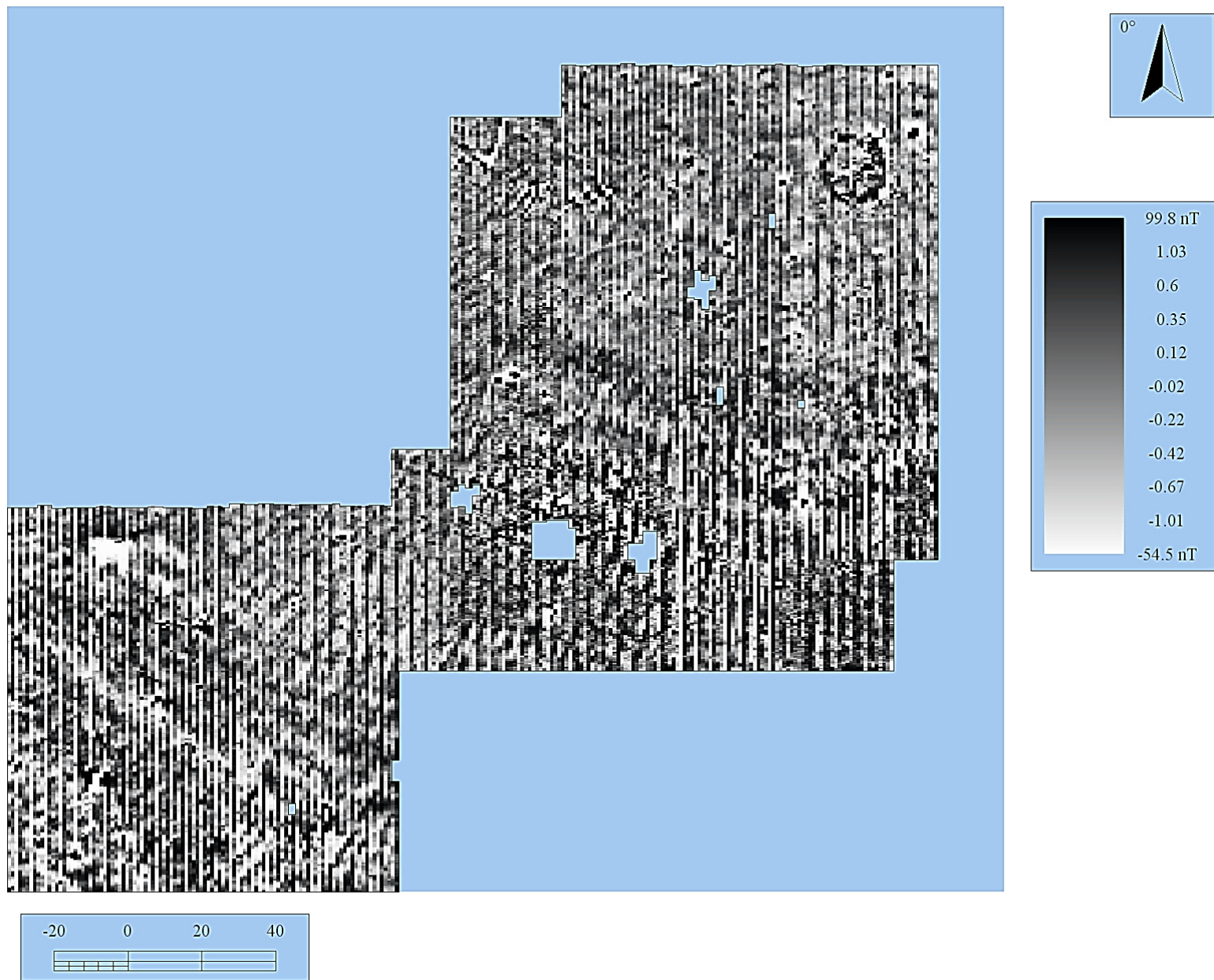
Substrata Limited
 Langstrath, Goodleigh
 Barnstaple, Devon EX39 7LZ
 Tel: 01271 342721
 Email: geophysics@substrata.co.uk
 Web: substrata.co.uk



British Grid
centre X: 283906.70 m, centre Y: 134356.60 m

Geophysical survey: Copyright Substrata Limited.
Base map: Copyright Ordnance Survey

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing



Instrument Type: Bartington Grad 601
 Units: nT
 Direction of 1st Traverse: 0 deg
 Collection Method: ZigZag
 Sensors: 2 @ 0.00 m spacing.
 Dummy Value: 32702

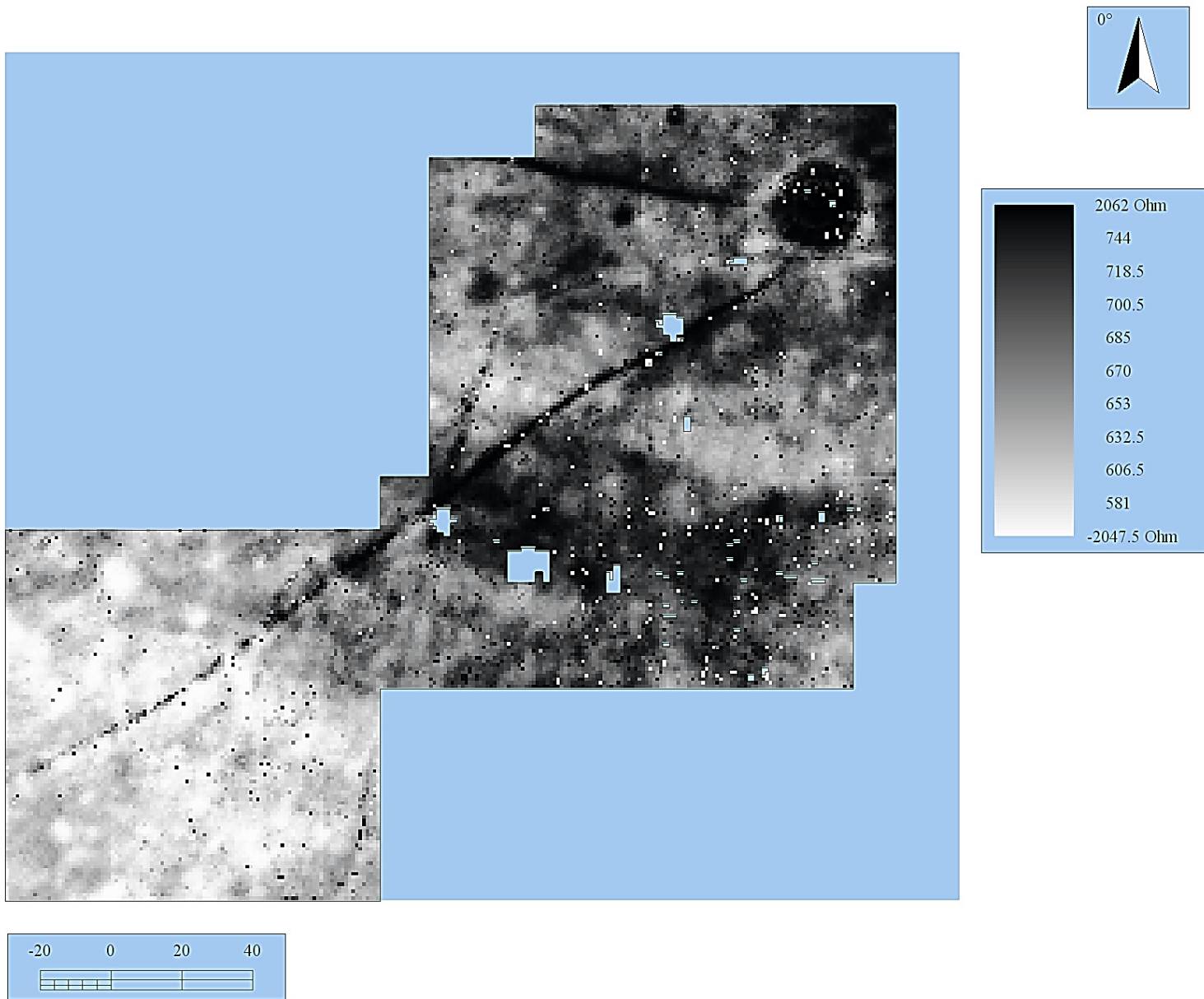
Processes: 1
 1 Base Layer

Dimensions
 Grid Size: 30 m x 30 m
 X Interval: 0.125 m
 Y Interval: 1 m

Stats
 Max: 99.80
 Min: -54.50
 Std Dev: 1.28
 Mean: 0.00
 Median: -0.03

PROGRAM
 Name: TerraSurveyor
 Version: 3.0.31.0

Figure 12: shade plot of unprocessed magnetometer data



Instrument Type: GeoScan (Resistance)
 Units: Ohm
 Direction of 1st Traverse: 0 deg
 Collection Method: ZigZag
 Sensors: 1
 Dummy Value: 32702

Processes: 1
 1 Base Layer

Dimensions
 Grid Size: 30 m x 30 m
 X Interval: 1 m
 Y Interval: 1 m

Stats
 Max: 2062.00
 Min: -2047.50
 Std Dev: 115.56
 Mean: 668.84
 Median: 670.00

PROGRAM
 Name: TerraSurveyor
 Version: 3.0.31.0

Figure 13: shade plot of unprocessed resistance data

Appendix 2 Tables

Site: An archaeological magnetometer and resistance survey
 Withypool Hill, Withypool, Exmoor National Park
 Centred on NGR (E/N) 283906,134371
 Report: 1612WIT-R-1

anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
m1		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m2		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m3		possible, enhanced	irregular	disturbed ground with ferrous elements	anomaly group may represent disturbed ground, possibly associated with a nearby mound that may be ground works from WW2 training activities	HER MM03191 small mound
m4		possible, enhanced	irregular	disturbed ground with ferrous elements	anomaly group may represent disturbed ground, possibly associated with a nearby mound that may be ground works from WW2 training activities	HER MM03191 small mound
m5		possible, enhanced	irregular	disturbed ground with ferrous elements	anomaly group may represent disturbed ground, possibly associated with a nearby mound that may be ground works from WW2 training activities	HER MM03191 small mound
m6		possible, north-south high low		in-situ highly heated deposits	anomaly group has characteristics often associated with in-situ high temperature heating such as cremations or metal smelting	
m7	r5	likely, positive	disrupted sub-circular	barrow ditch deposits	anomaly group coincides with and represents deposits from a bowl barrow recorded in the HER	HER MSO8683 A bowl barrow on Withypool Hill
m8	r10	possible, positive/negative/positive	linear	trench - possible robber trench or drain		HER MSO8683 A bowl barrow on Withypool Hill
m9		possible, enhanced	irregular	disturbed ground	anomaly group may represent relatively recent disturbance such as WW2 training damage or past a mature excavation	HER MMO3191 small mound possibly associated with WW2 training
m10		possible, enhanced	irregular	disturbed ground	anomaly group may represent relatively recent disturbance such as WW2 training damage or construction damage from a modern cairn built on the eastern side of the barrow	HER MMO3191 small mound possibly associated with WW2 training
m11		possible, negative	disrupted curvilinear	barrow deposits?	anomaly group coincides with a bowl barrow recorded in the HER and may represent this or may be a negative 'shadow anomaly' associated with the adjacent magnetic anomaly groups	HER MSO8683 A bowl barrow on Withypool Hill
m12		possible, north-south high low		in-situ highly heated deposits	anomaly group has characteristics often associated with in-situ high temperature heating such as cremations or metal smelting	
m13		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m14		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m15		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m16		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m17		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m18		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m19	r18	possible, high positive	sub-circular	possible heated deposits; possible cairn deposits	anomaly group is one of two coinciding with one mapped cairn	MSO8756 prehistoric cairn visible as a turf covered stony mound
m20		possible, high positive	sub-circular	possible heated deposits; possible cairn deposits	anomaly group is one of two coinciding with one mapped cairn	MSO8756 prehistoric cairn visible as a turf covered stony mound
m21		possible, enhanced	irregular	disturbed deposits - archaeological or natural		
m22		possible, positive	oval	pit?		
m23		possible, positive	curvilinear			
m24		possible, enhanced	irregular	disturbed deposits - archaeological or natural		
m25		possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn	
m26	two groups	possible, high positive	sub-circular	possible heated deposits - may be associated with a cairn	two similar anomaly groups coincide with one mapped cairn; this group may represent a cairn or possibly two adjacent cairns	
		possible, negative shadow	partial sub-circular	stony deposits or 'shadow anomaly'	anomaly group may represent cairn deposits or be a 'shadow anomaly' associated with the adjacent positive anomaly group and not related to ground deposits	
m27		possible, enhanced	irregular	disturbed deposits - archaeological or natural		
m28		possible, high positive	sub-circular	cairn deposits?	anomaly groups are similar in pattern to others attributed to cairns but the magnitude of response is lower	
m29		possible, high positive	sub-circular	cairn deposits?	anomaly groups are similar in pattern to others attributed to cairns but the magnitude of response is lower	
m30		possible, positive	double linear	archaeological deposit or disturbance along the line of a footpath		
m31		possible, positive	linear group of ovals	linear group of pits?	anomaly group is highlighted because it is clear in the dataset, may form a linear feature and is in close proximity to the stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m32		possible, positive	oval	pit?		
m33		possible, positive	oval	pit?	anomaly group is highlighted because it is clear in the dataset and is in close proximity to the stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m34		possible, positive	oval	pit?	anomaly group is highlighted because it is clear in the dataset and is in close proximity to the stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m35		likely, high positive	oval	cairn deposits	anomaly group coincides with a cairn mapped near the centre of Whithypool stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m36		possible, positive	oval	pit?	anomaly group is highlighted because it is clear in the dataset and is in close proximity to the stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m37		possible, north-south high low		in-situ highly heated deposits	anomaly group has characteristics often associated with in-situ high temperature heating such as cremations or metal smelting although in this case the group coincides with disrupted topsoil and may represent a ferrous material such as a horse shoe	
m38		possible, north-south high low		in-situ highly heated deposits	anomaly group has characteristics often associated with in-situ high temperature heating such as cremations or metal smelting although in this case the group coincides with disrupted topsoil and may represent a	
m39		possible, positive	oval	pit?	anomaly group is highlighted because it is clear in the dataset and is in close proximity to the stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m40		possible, positive	oval	pit?	anomaly group is highlighted because it is clear in the dataset and is in close proximity to the stone circle	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill.
m41		possible, enhanced	irregular	disturbed deposits - archaeological or natural		
n/a		possible, dipole		ferrous material	anomaly group probably represents a quite recent iron or steel object; included in the analysis to avoid	

Table 1: magnetometer data analysis

Site: An archaeological magnetometer and resistance survey
 Withypool Hill, Withypool, Exmoor National Park
 Centred on NGR (E/N) 283906,134371
 Report: 1612WIT-R-1

anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
r1	two groups	possible, high	sub-circular	mound deposits	anomaly group may represent a mound that may be associated with WW2 activities	MMO3191 small mound
r2	two groups	possible, low	disrupted sub-circular	mound deposits	anomaly group may represent a mound that may be associated with WW2 activities	MMO3191 small mound
r3	two groups	possible, high	sub-circular	mound deposits	anomaly group may represent a mound that may be associated with WW2 activities	MMO3191 small mound
r4	two groups	possible, low	disrupted sub-circular	mound deposits	anomaly group may represent a mound that may be associated with WW2 activities	MMO3191 small mound
r5		likely, low	disrupted sub-circular	deposits associated with bowl barrow	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r6		possible, low spread	linear	possible robber or excavation trenches	anomaly group coincides with a bowl barrow recorded in the HER; the pattern of this anomaly group implies a later linear disruption of the surrounding deposits and in-fill with relatively less stony deposits	MSO8683 A bowl barrow on Withypool Hill
r7	m7	likely, high	disrupted sub-circular	deposits associated with bowl barrow	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r8		likely, low		deposits associated with bowl barrow	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r9		likely, low		deposits associated with bowl barrow	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r10		possible, low spread	linear	possible robber or excavation trenches	anomaly group coincides with a bowl barrow recorded in the HER; the pattern of this anomaly group implies a later linear disruption of the surrounding deposits and in-fill with relatively less stony deposits	MSO8683 A bowl barrow on Withypool Hill
r11		possible, high spread	irregular	deposits associated with bowl barrow; may be disturbed or dumped	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r12	m8	possible, low spread	linear	possible robber or excavation trenches	anomaly group coincides with a bowl barrow recorded in the HER; the pattern of this anomaly group implies a later linear disruption of the surrounding deposits and in-fill with relatively less stony deposits	MSO8683 A bowl barrow on Withypool Hill
r13		possible, high spread	irregular	irregular	anomaly group coincides with a bowl barrow recorded in the HER; anomaly group is likely to reflect stony deposits from a recent cairn	surveyor observation
r14		possible, low spread	linear	possible robber or excavation trenches	anomaly group coincides with a bowl barrow recorded in the HER; the pattern of this anomaly group implies a later linear disruption of the surrounding deposits and in-fill with relatively less stony deposits	MSO8683 A bowl barrow on Withypool Hill
r15		possible, high spread	linear	deposits associated with bowl barrow; may be disturbed or dumped	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r16		possible, low		deposits associated with bowl barrow	anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r17		possible, low	disrupted linear		anomaly group coincides with a bowl barrow recorded in the HER	MSO8683 A bowl barrow on Withypool Hill
r18	m19	possible, low	semi-circular		anomaly group may represent archaeological deposits or the apparent pattern may be coincidental	
r19		likely, high	sub-circular	cairn deposits	anomaly group coincides with and likely represents a mapped cairn	MSO8756 prehistoric cairn visible as a turf covered stony mound
r20		possible, low	semi-circular		anomaly group may represent archaeological deposits or the apparent pattern may be coincidental	
r21		possible, low	semi-circular		anomaly group may represent archaeological deposits or the apparent pattern may be coincidental	
r22		possible, low	disrupted linear & sub-circular	deposits associated with modern footpath	anomaly group aligns with the modern footpath around Withypool stone circle but does not exactly coincide	MSO8682 The remains of a stone circle on the southwest slope of Withypool Hill
r101		possible, linear trends		former routeway or modern footpath		
r102		likely, high well defined parallel linears		modern footpath		
r103		likely, high well defined parallel linears		modern footpath		

Table 2: resistance data analysis

<p>Documents Survey method statements: Dean (2016 a and b)</p>	
<p>Methodology</p> <ol style="list-style-type: none"> 1. The work was undertaken in accordance with the survey methodology statement. The magnetometer (gradiometer) and resistance surveys were undertaken with reference to standard guidance provided by the Chartered Institute for Archaeologists (2014) and Archaeology Data Service/Digital Antiquity Guides (undated). 2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system. 3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology. 	
<p>Grid <i>Method of Fixing:</i> DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. <i>Composition:</i> 30m by 30m grids <i>Recording:</i> Geo-referenced and recorded using digital map tiles. <i>DGPS used:</i> Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.</p>	
<p>Magnetometer Equipment <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1</p>	<p>Magnetometer Data Capture <i>Sample Interval:</i> 0.125 metres <i>Traverse Interval:</i> 1 metre <i>Data capture:</i> automatic data logger <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN</p>
<p>Resistance Equipment <i>Instrument:</i> Geoscan Research RM15 multi-probe resistance meter <i>Configuration:</i> twin probe <i>Mobile probe spacing:</i> 0.5-metres</p>	<p>Resistance Data Capture <i>Sample Interval:</i> 1 metre <i>Traverse Interval:</i> 1 metre <i>Data capture:</i> automatic data logger <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN</p>
<p>Data Processing, Analysis and Presentation Software IntelliCAD Technology Consortium IntelliCAD 7.2 DW Consulting TerraSurveyor3 Manifold System 8 GIS Microsoft Corp. Office Excel 2013 Microsoft Corp. Office Publisher 2013 Adobe Systems Inc Adobe Acrobat 9 Pro Extended</p>	

Table 3: methodology summary

Instrument Type:	Bartington Grad-601 gradiometer	
Units:	nT	
Direction of 1st Traverse:	see below	
Collection Method:	ZigZag	
Sensors:	2 @ 1.00 m spacing.	
Dummy Value:	32702	
PROGRAM		
Name:	TerraSurveyor	
Version:	3.0.31.0	
Stats		Processes: 5
Max:	102.00	1 Base Layer
Min:	-60.18	2 DeStripe Median Sensors: Grids: All
Std Dev:	1.12	3 De Stagger: Grids: b1.xgd b8.xgd b9.xgd b15.xgd b2.xgd b7.xgd b10.xgd b14.xgd b3.xgd b6.xgd b11.xgd b13.xgd b4.xgd b5.xgd b12.xgd c1.xgd Mode: Both By: 2 intervals
Mean:	0.06	4 De Stagger: Grids: c6.xgd c7.xgd b16.xgd c9.xgd c5.xgd c8.xgd b17.xgd b18.xgd c10.xgd c4.xgd a1.xgd a8.xgd a9.xgd a16.xgd Mode: Both By: 2 intervals
Median:	0.01	5 Interpolate: Match X & Y Doubled.

Table 4: processed data metadata, magnetometer survey

Instrument Type:	Geoscan Research RM15	
Units:	resistance data (ohms) normalised about a near-zero mean	
Direction of 1st Traverse:	0 deg	
Collection Method:	ZigZag	
Sensors:	2 @ 1.00 m spacing.	
Dummy Value:	32702	
PROGRAM		
Name:	TerraSurveyor	
Version:	3.0.25.0	
Figures 8 and 9		
Stats		Processes: 5
Max:	1200.00	1 Base Layer
Min:	520.00	2 Despikethreshold: 1 Window size: 3x3
Std Dev:	62.83	3 Despikethreshold: 1 Window size: 3x3
Mean:	666.47	4 Despikethreshold: 1 Window size: 3x3
Median:	670.00	5 Clip from 520.00 to 1200.00 Ohm
Figures 10 and 11		
Stats		Processes: 8
Max:	70.20	1 Base Layer
Min:	-70.09	2 Despikethreshold: 1 Window size: 3x3
Std Dev:	13.06	3 Despikethreshold: 1 Window size: 3x3
Mean:	-0.02	4 Despikethreshold: 1 Window size: 3x3
Median:	-0.45	5 Clip from 520.00 to 1200.00 Ohm
		6 High pass Gaussian filter: Window: 10 x 10
		7 Interpolate: X & Y Doubled.
		8 Clip at 5.00 SD

Table 5: processed data metadata, resistance survey