GEOPHYSICAL SURVEY REPORT

Wisloe, Slimbridge, Gloucester

Clients

The Ernest Cook Trust

and

Gloucestershire County Council

Survey Report

08779

OASIS Ref. No.

sumogeop1-519556

Date

23 July 2024

Survey Report 08779: Wisloe, Slimbridge, Gloucester

Survey dates	29 August – 11 September 2023
Report Date	23 July 2024
Report approved	Dr John Gater BSc DSc(Hon) MCIfA FSA

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3 SURVEY TECHNIQUE

3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by CIFA (2014, updated 2020), Historic England (2008), and the European Archaeology Council (EAC) (2016).

Bartington Cart System Traverse Interval 1.0m Sample Interval 0.125m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes instrument striping effects and edge discontinuities over the whole of the data set.

4 SUMMARY OF RESULTS

4.1 A magnetometry survey of Wisloe has mapped an extensive Romano-British roadside settlement, covering at least 12 hectares in size in the southernmost parcel of the site, it is located along the route of the Roman road and the HER has recorded cropmarks, some of which correspond with the anomalies. Three other smaller clusters of settlement activity are also visible in the magnetic data. These responses indicate numerous enclosures, tracks, pits and ditches. The survey also identified anomalies of an uncertain origin, corroborated and conjectural field boundaries, ridge and furrow, ploughing activity, magnetic disturbance and services.

5 INTRODUCTION

5.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for residential development. This survey forms part of an archaeological investigation being undertaken by **The Ernest Cook Trust** and **Gloucestershire County Council.**

5.2 Site Details

NGR / Postcode	SO 74562 02511 / GL2 7AF
Location	The site is spread across four different areas (A-D) and the entire site is situated approximately 9.5km southwest of Stroud. Area A lies between the A38 to the west and the M5 to the east. It is bounded to the north by the A4135 and south by a railway track. Area B is situated north of the A4135 and is encompassed to the east By Dursley Road, to the north by Wisloe Road and to the west by Wisloe Stables Farm. Area C is comprised of horse paddocks and is bounded to the east by the A38, the south by Wisloe Road, the east by Dursley Road and to the north by White House Farm. Adjacently east, on the other side of Dursley Road, Area D is located, which lies directly west of the M5 and has private roads to the north and south.
HER	Gloucestershire
OASIS Ref. No.	Sumogeop1-519556
District	Stroud
Parish	Slimbridge Civil Parish
Topography	Generally Flat
Land Use	Arable / Paddocks
Geology (BGS 2023)	Bedrock: Blue Lias Formation and Charmouth Mudstone Formation Superficial Cheltenham Sand and Gravel - Sand and gravel
Soils (CU 2023)	Soilscape 5: Feely draining lime-rich loamy soils
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	*c.* 76 ha

5.3 ***Archaeological Background (HER 2019)***

5.3.1 There are no designated heritage assets within the site, however there are several non-designated assets recorded within and in close proximity to the survey area. An archaeological Heritage assessment was carried out by Cotswold Archaeology for Land at Wisloe, Slimbridge.

and the report identified a high potential for Romano-British remains associated with roadside settlement.

5.3.2 Crop marks either side of the former Roman road (7365) have been interpreted as representing possible roadside settlement and activity. In Area A, the HER records a possible roadside camp including linear and curvilinear ditches (17989, 48819) and systematic field-walking recorded an assemblage of Romano-British pottery sherds and building fragments, as well as coins reported from chance finds. Further possible Roman settlement remains are present in Area D (16675), represented by cropmarks of possible enclosures and trackways. In Area C, presently undated cropmark features representing a circular and rectangular enclosure and a possible track are recorded (20390), Although undated, their form is suggestive of Romano-British settlement trends.

Beyond the site there is further evidence for settlement activity; cropmarks indicative of an enclosure are recorded in the field immediately northwest of Area A (16676) on the other side of the former Roman road. A series of metal detecting rallies took place in the fields surrounding Slimbridge village, and in the southernmost field is adjacent to the northwest of Area C, over 1000 coins dating from the late 3rd - 4th century were discovered.

5.4 *Aims and Objectives*

5.4.1 To locate and characterise any anomalies of possible archaeological interest within the study area.

6 RESULTS

6.1 *The survey has been divided into four survey areas (Areas A - D) and specific anomalies have been given numerical labels [1] [2] which appear in the text below, as well as on the Interpretation Figure(s).*

6.2 *Probable / Possible Archaeology*

6.2.1 Area A

6.2.2 There is a complex of magnetic responses in Area A, indicating a range of features of archaeological interest. The results are dominated by a large partial rectangular ditch [1] measuring some 185m by 135m and extending beyond the survey area. It corresponds with location of a Roman camp recorded in the HER (17989, 48819). It is on a northwest-southeast alignment and the magnetic anomalies cover an area of over 2 hectares in size. It is likely that the cropmarks (16676) recorded in the adjacent field beyond the A36 Bristol Road, mark the western extent of the camp, giving an overall size of approximately 4 hectares. Within the camp there is a high concentration of ditch-like responses, linear trends, pit-like anomalies and zones of increased magnetic response, typical features of a Romano-British settlement. Magnetic anomalies extend south-eastwards from the settlement, which are consistent with a Roman Vicus. There appear to be at least two phases of settlement activity, with a rectilinear enclosure [2] visible northeast of this camp. Further ditches and linear responses are visible to the south and east of the camp. They include rectilinear enclosures and field systems, curving trackways, plus oval and irregular curved enclosures.

6.2.3 Area C

6.2.4 A well-defined rectangular enclosure [2], measuring approximately 75m x 70m is visible in Area C and there are numerous internal sub-dividing ditches, plus pits and linear trends. The anomalies correspond with features recorded in the HER (20390), namely a rectangular and circular enclosure. A ditch [3] has been identified extending northwards from the enclosure, as noted in the HER (20390). Another ditch-like response [4] could be extending westward from the enclosure may lead towards the former Roman road (7365).

6.2.5 Area D

6.2.6 The HER records possible enclosures and trackways (16675), and the magnetometer survey results correspond well with this evidence. A sub-rectangular enclosure [5] has been identified, measuring approximately 46m x 47m, with a partial inner ditch also visible. Two parallel trends extending southwards from the enclosure may mark the location of a trackway. And to the east there are a number of discrete responses and trends [6], which appear to form other enclosures. However, ridge and furrow ploughing is present in this part of the site and it has made interpretating the anomalies with confidence difficult. To the east of Area C, ditch-like responses, linear trends and pit-like anomalies [7] suggest another settlement. In the centre of Area C, two clusters of pit-like anomalies have been identified.

6.2.7 In the north-east of Area D several trends are visible [8] which appear to form rectangular patterns, while they are weak they could mark the locations of a complex of enclosures, and some of the parallel trends may be trackways.

6.3 ***Uncertain***

6.3.1 Several weak linear trends have been detected across the site which have been assigned to the category of *Uncertain*, however, given the quantity of archaeological responses present in the site, an archaeological provenance cannot be entirely dismissed. Some of these responses could have been caused by natural or agricultural processes.

6.4 ***Former Field Boundary – Corroborated / Conjectural***

6.4.1 A number of linear anomalies have been mapped across the site, most of which can be corroborated with former field boundaries that are visible on historic maps of the area (Fig.29).

6.4.2 In Areas A and D, linear anomalies have been assigned to the category of conjectural field boundaries, as they follow the alignment of corroborated field boundaries and are typical of such responses.

6.5 *Agricultural – Ridge and Furrow / Ploughing / Land Drains*

6.5.1 A series of linear, roughly parallel, trends have been detected across the majority of the site, on varied alignments. These are indicative of a former ridge and furrow agricultural scheme.

6.5.2 More closely spaced, magnetically weak, parallel linear anomalies are mapped traversing northeast-southwest in Area A and are a result of modern ploughing effects.

6.5.3 Weak linear dipolar ferrous response have been plotted in Area A which mark the routes of land drains.

6.6 *Service*

6.6.1 Across the site, strong linear dipolar ferrous responses have been recorded which mark the routes of service pipes or electric cables.

6.7 *Ferrous / Magnetic Disturbance*

6.7.1 An broad band of magnetic disturbance is visible in Area A, to the south and south-east of the Roman camp, and may be a relatively modern feature. However, an archaeological origin should not be ruled out.

6.7.2 Several ferrous responses across the site represent the location of pipes, other ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

7 DATA APPRAISAL & CONFIDENCE ASSESSMENT

7.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable. The results from this survey clearly demonstrate that the technique has worked well.

8 CONCLUSION

Several extensive clusters of magnetic anomalies indicative of archaeological sites, including a Roman camp, have been identified in many of the survey areas. The range of archaeological features includes rectilinear and curvilinear enclosures, trackways, ring-ditches, pits and ditches, some which extend beyond the boundaries of the site. The geophysical results correspond well with the existing cropmark records in the HER, but the magnetic data have provided a more detailed picture and recorded a far greater number of archaeological features, of which the most prominent is the identification of the Roman Camp.

9 REFERENCES

BGS 2022 — British Geological Survey, Geology of Britain viewer [accessed 23/07/2024] *website*: (http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps)

CIfA 2014 Amended 2020 — *Standard and Guidance for Archaeological Geophysical Survey.* Amended 2020. CIfA Guidance note. Chartered Institute for Archaeologists, Reading https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics_3.pdf

CU 2022 — The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 23/07/2024] website: http://mapapps2.bgs.ac.uk/ukso/home.html

EAC 2016 — *EAC Guidelines for the Use of Geophysics in Archaeology,* European Archaeological Council, Guidelines 2.

EH 2008 — *Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Swindon (now withdrawn, but used for evaluating suitability of soil types)

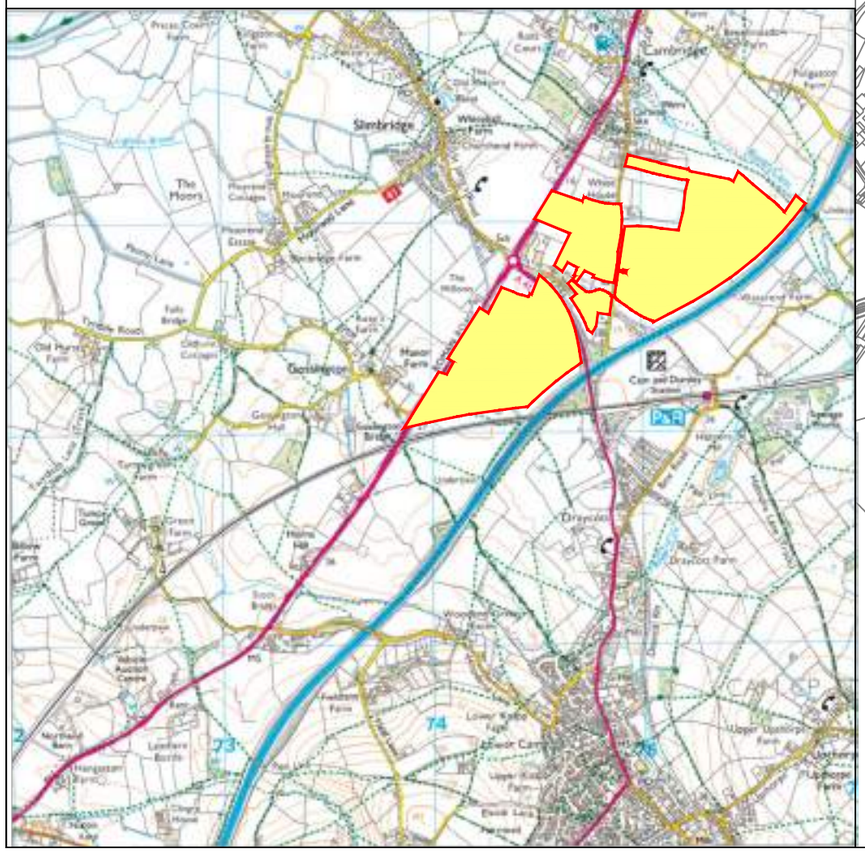
HER 2019 — *Land at Wisloe Green, Slimbridge/Cambridge Gloucestershire.* Cotswold Archaeology, Heritage Assessment, 2019

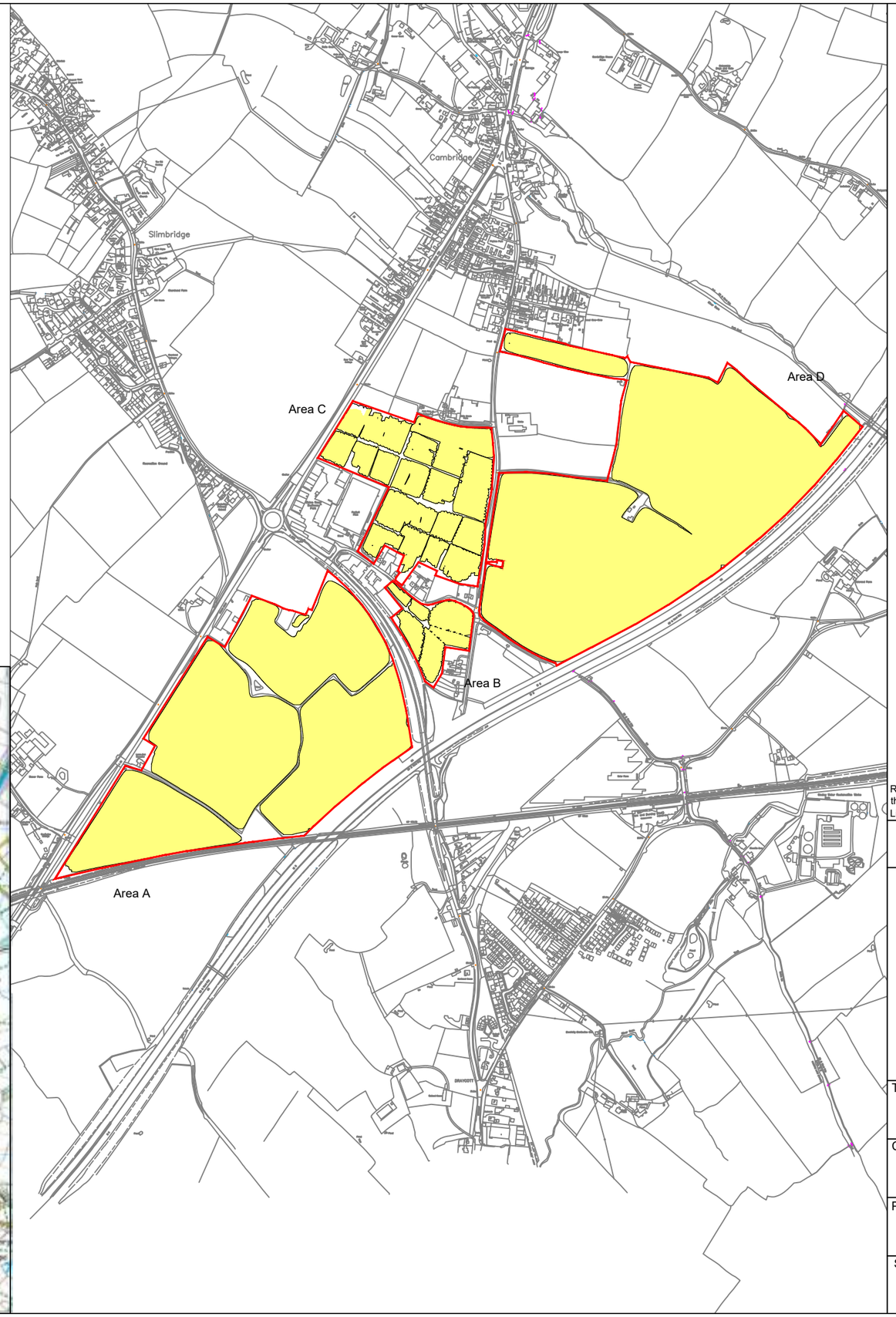
HG 2022 — Heritage Gateway Online Viewer [accessed 23/07/2024] website*:* https://www.heritagegateway.org.uk/gateway/

10 ARCHIVE

10.1 The minimally processed data, data images, XY traces and a copy of this report are stored in **SUMO Geophysics Ltd.'s** digital archive, on an internal RAID configured NAS drive in the Midlands Office. These data are also backed up to the Cloud for off-site storage**.**

10.2 The Grey Literature will be archived with OASIS and the relevant HER within a period of 12 months.





Survey Areas

N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Site Location

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
NOT TO SCALE

Fig No:
01

Area A

Area B

Area C

Area D

N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 300
1:6000 @ A3

Fig No:
02

Area A

Area B

Area C

Area D

N

+100nT

-100nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 300
1:6000 @ A3

Fig No:
03

Slimbridge

Area A

Area B

Area C

Area D

N

KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 300
1: 6000 @ A3

Fig No:
04

N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Area A

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
05

N

+100nT

-100nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots of Area A

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
06

Area A

N

KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Area A

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
07

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Area B

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

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Fig No:
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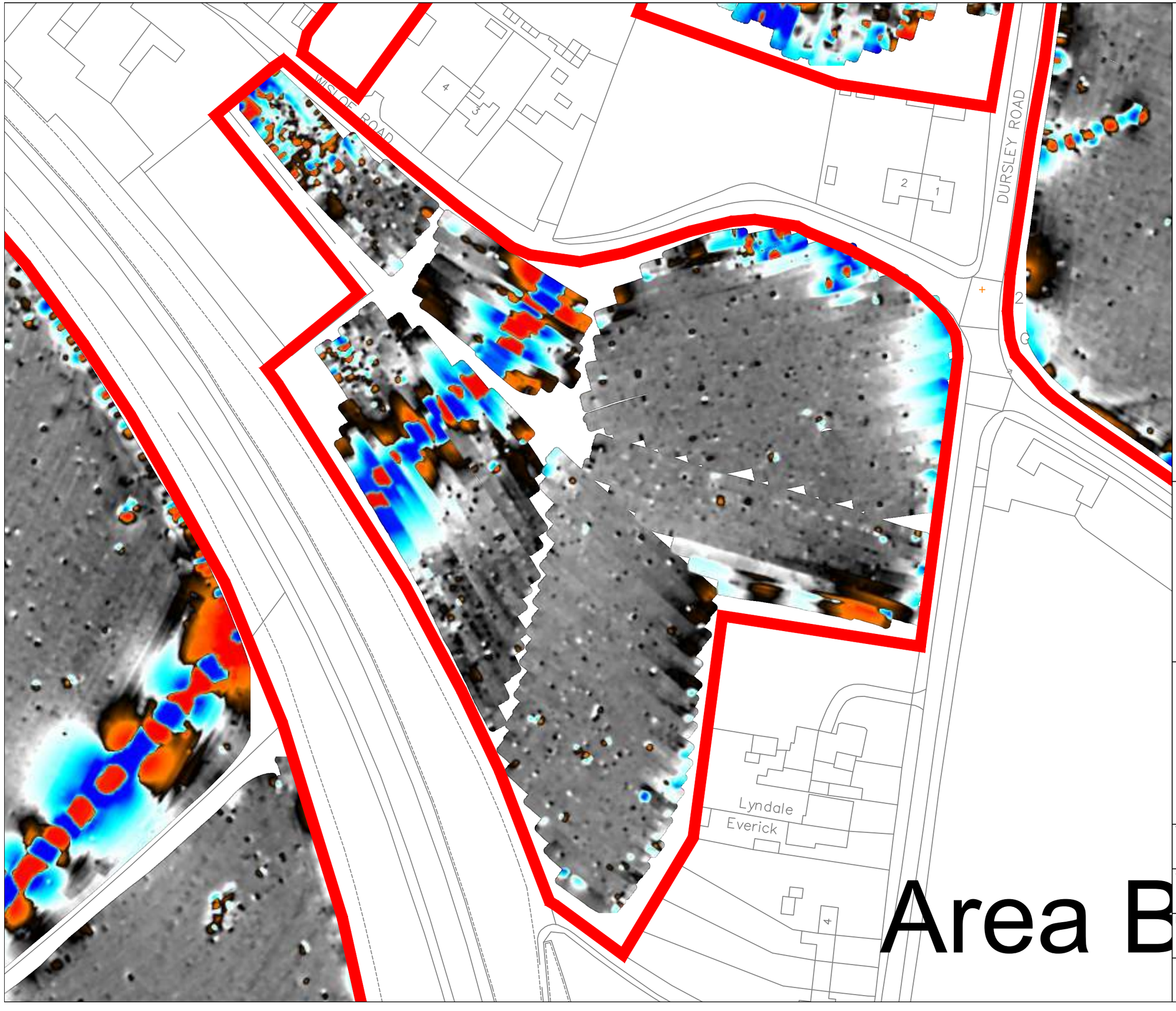

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-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

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Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 50
1:1000 @ A3

Fig No:
09

WISLOE ROAD

DURSLEY ROAD

4

3

2

1

Lyndale

Everick

4

Area B

N

KEY

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	Possible archaeology (discrete anomaly / trend / increased response)
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	Former field boundary (conjectural)
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	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Area B

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 50
1: 1000 @ A3

Fig No:
10

Area C

N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Area C

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 87.5
1:1750 @ A3

Fig No:
11

Area C

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+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots of Area C

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
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Fig No:
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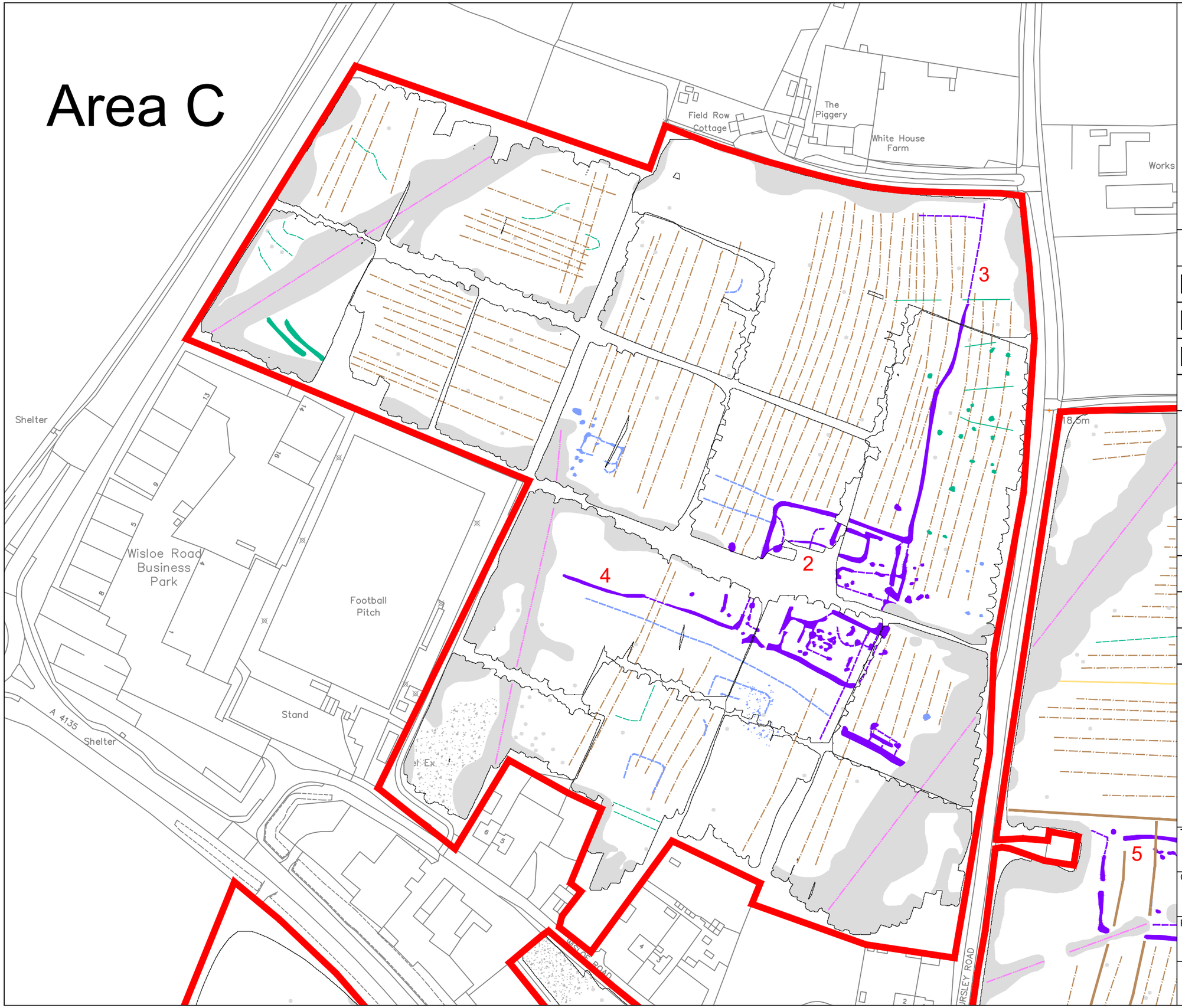
Area C



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KEY

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sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Area C

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
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1: 1750 @ A3

Fig No:
04

N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Area D

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
14

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots of Area D

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
15

Area D

N

KEY

	Probable archaeology (discrete anomaly / trend / increased response)
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	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
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	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Area D

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
16

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Archaeology in Area A

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

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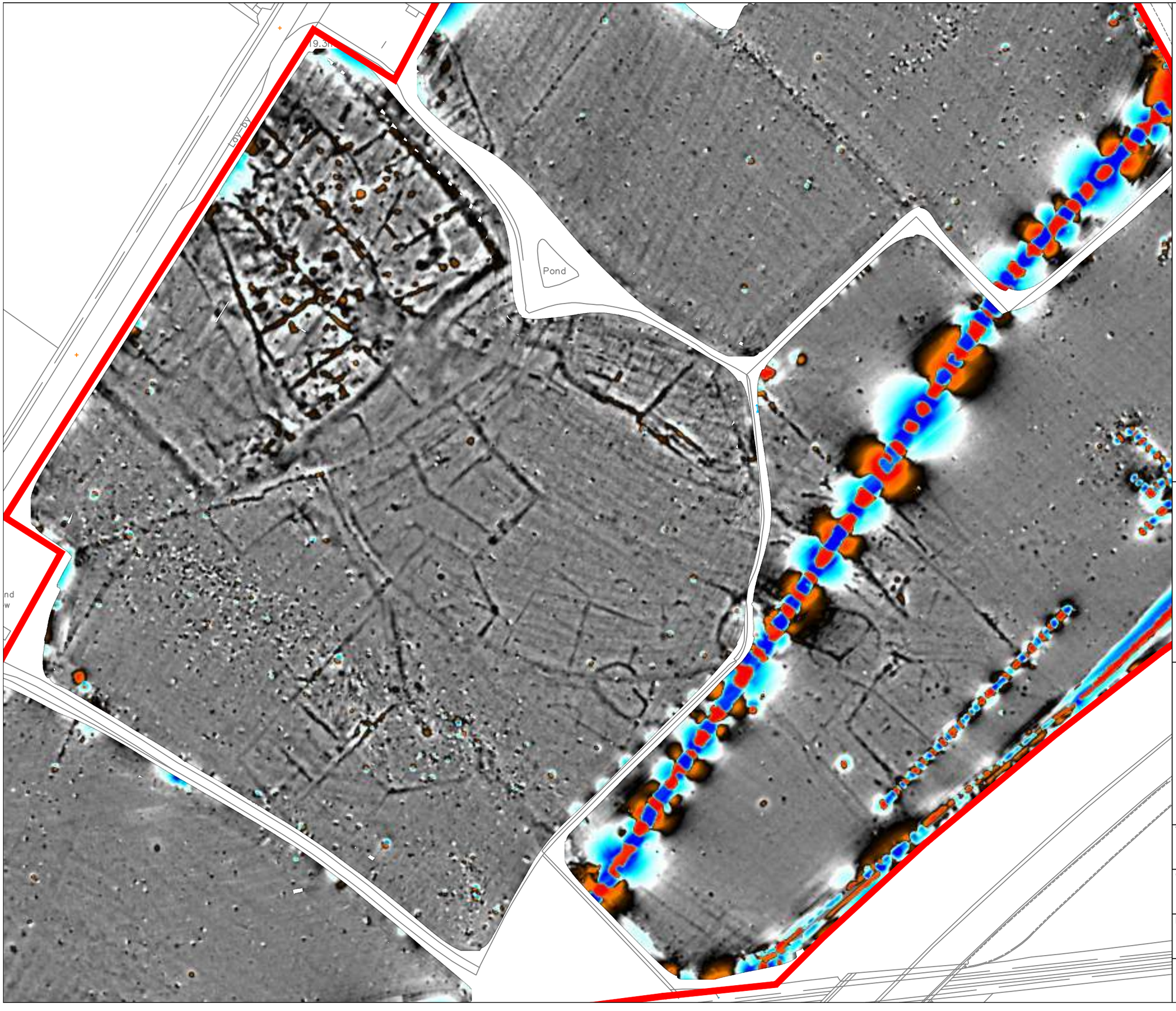

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-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots of Archaeology in Area A

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

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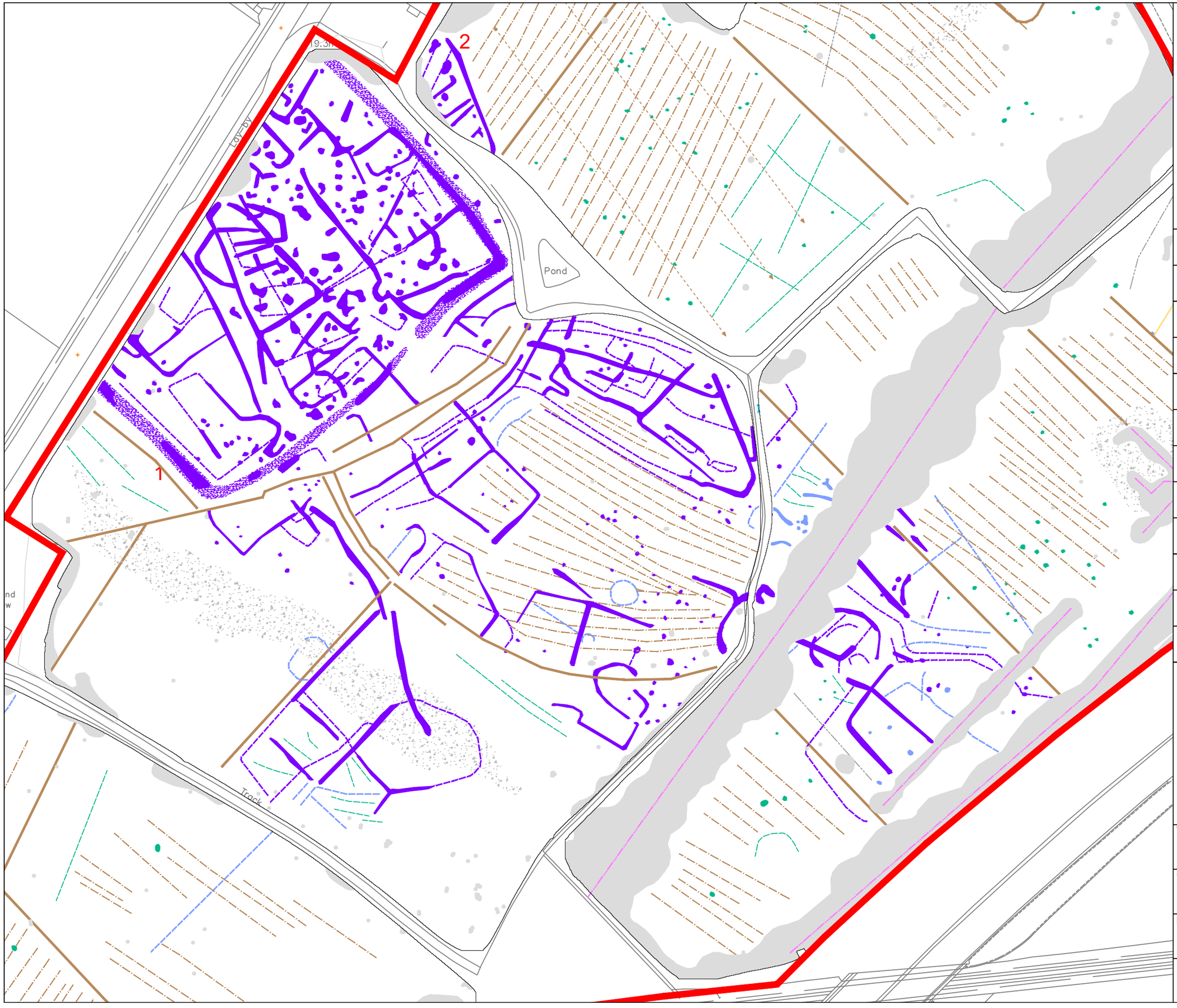

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KEY

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	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Archaeology in Area A

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 87.5
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Fig No:
19

N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Arcaheology in Area C

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 50
1:1000 @ A3

Fig No:
20

N

+100nT

-100nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots of Archaeology in Area C

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

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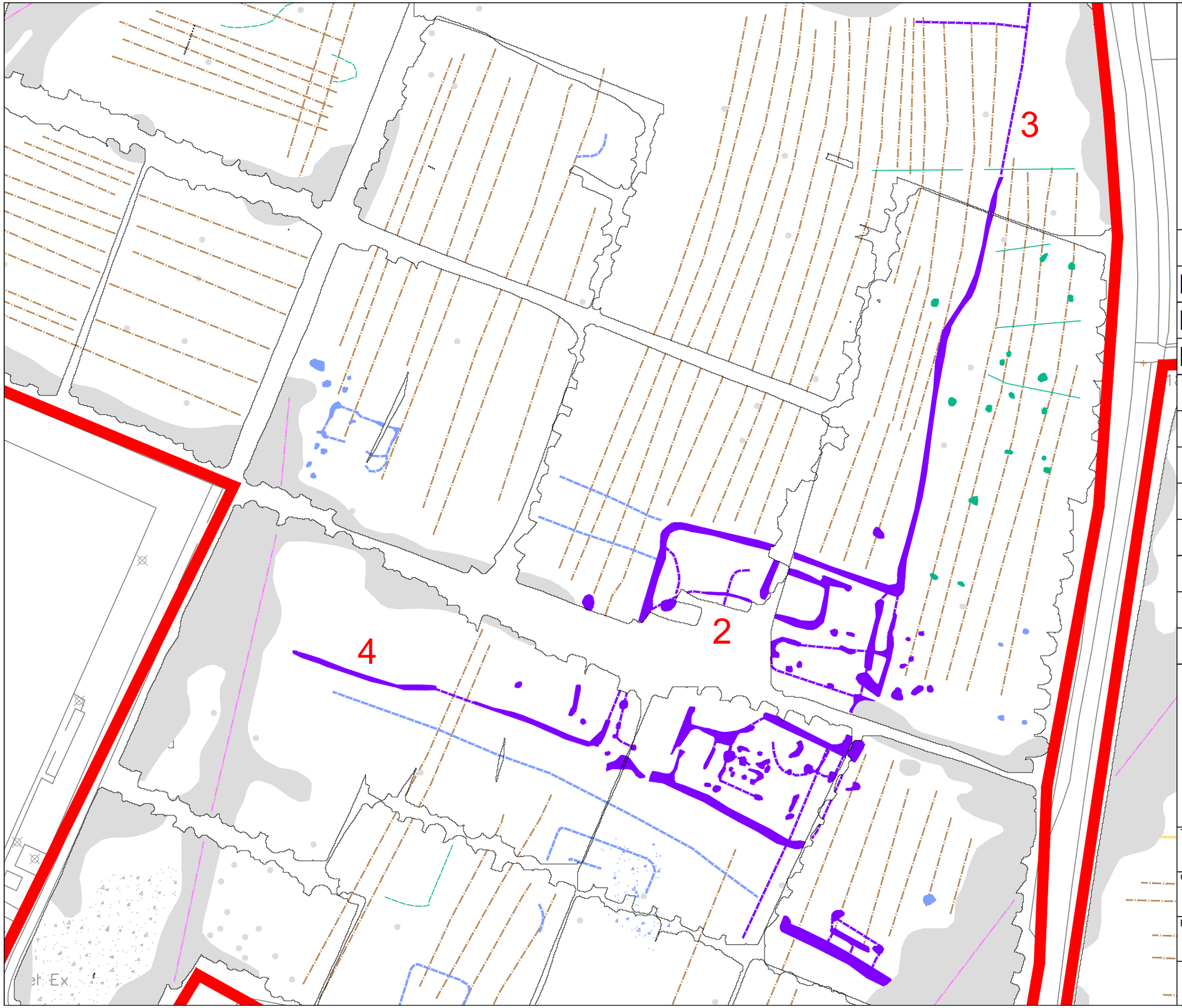

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	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Archaeology in Area C

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 50
1: 1000@ A3

Fig No:
22

N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots of Archaeology in Area D

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

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Fig No:
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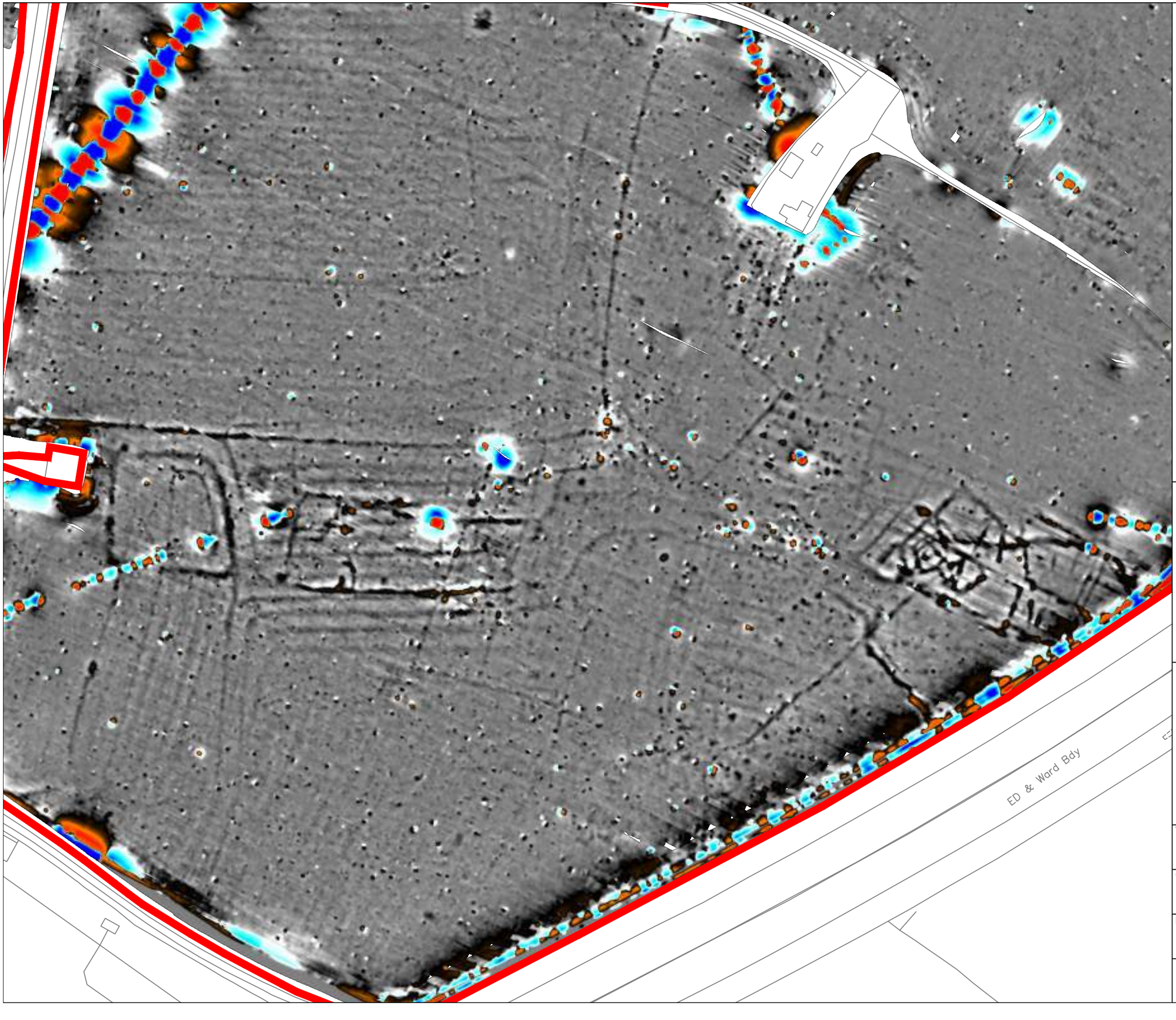

N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots of Archaeology in Area D

Client:
The Ernest Cook Trust and Gloucstershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
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Fig No:
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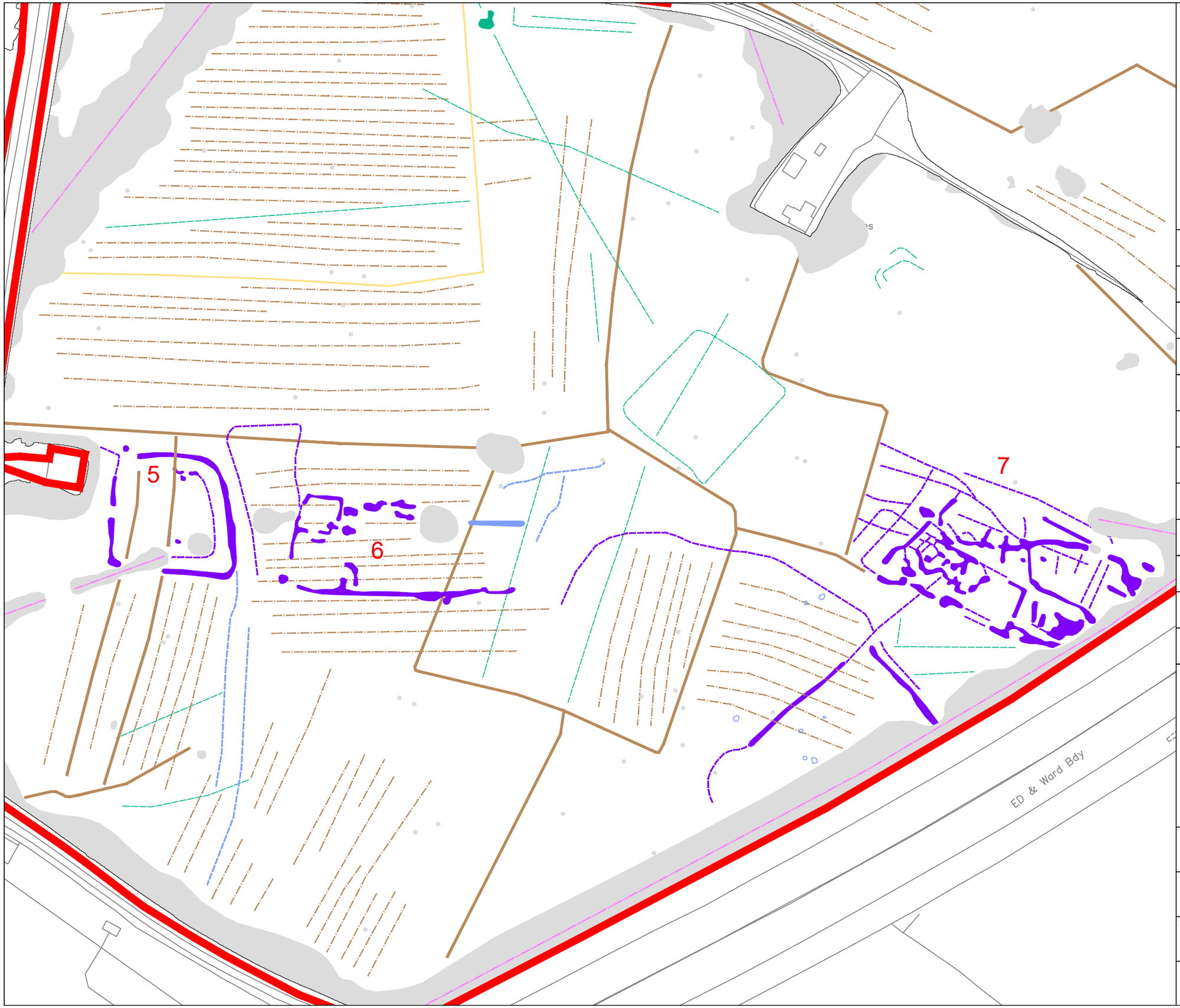

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	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation of Archaeology in Area D

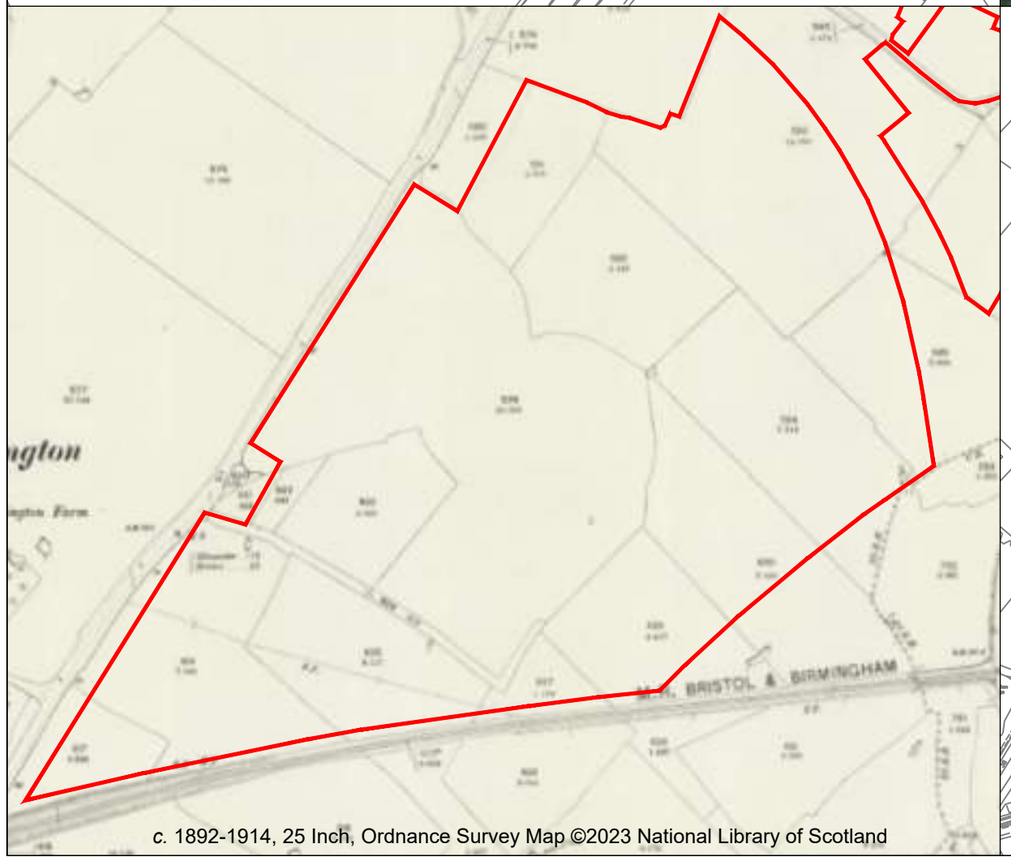
Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

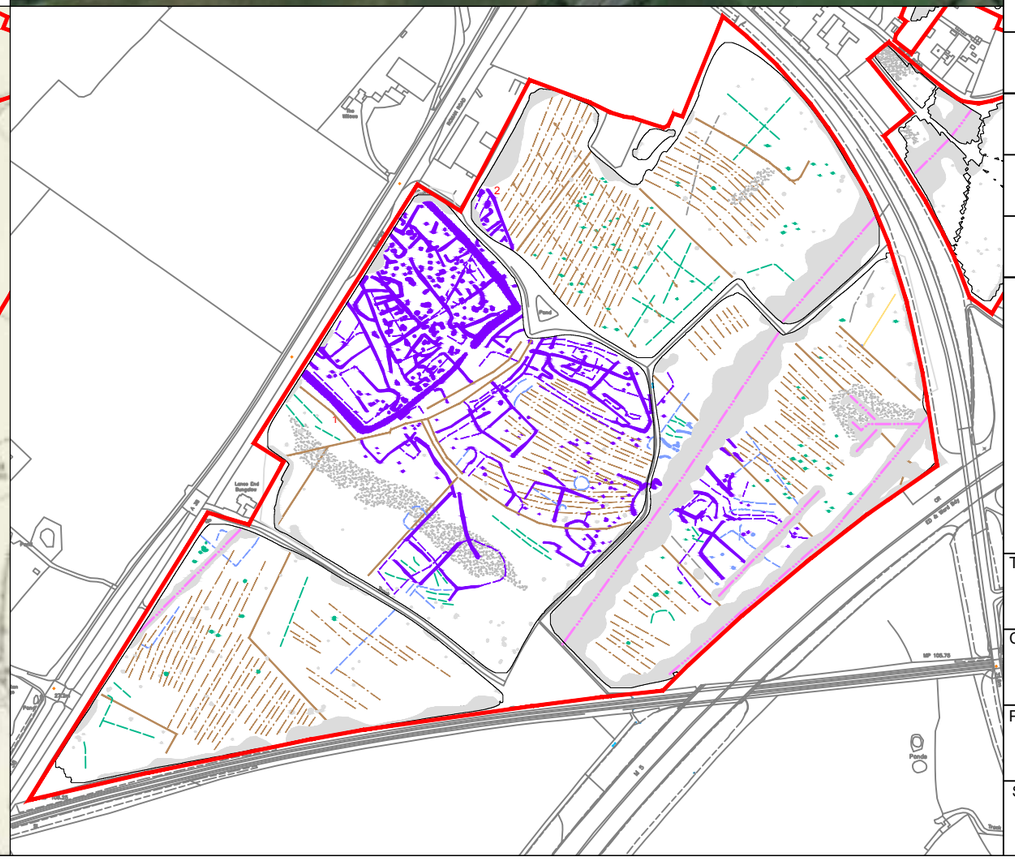
Scale:
0 metres 75
1: 1500@ A3

Fig No:
25

Area A



c. 1892-1914, 25 Inch, Ordnance Survey Map ©2023 National Library of Scotland



N

KEY

	Probable archaeology (discrete anomaly / trend / increased response)
	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

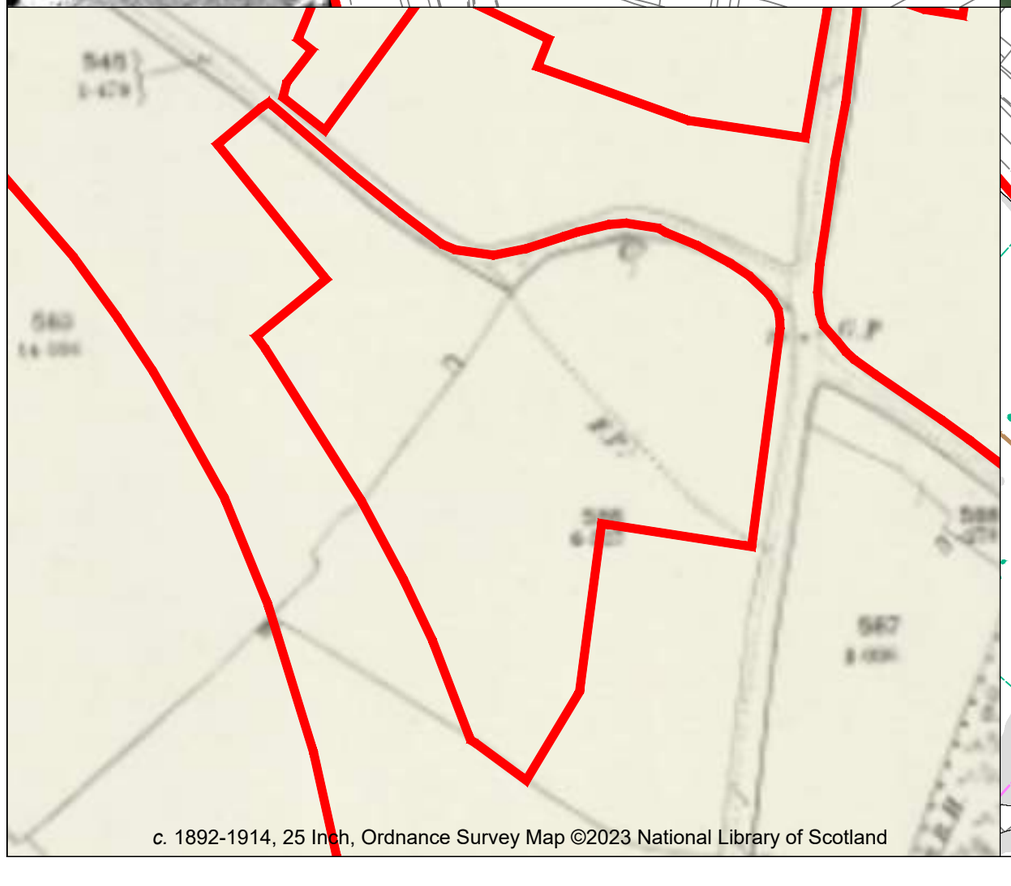
Title: Greyscale Plots, 2013 Aerial Image, *c.* 1892-1914 Ordnance Survey Map and Interpretation of Area A

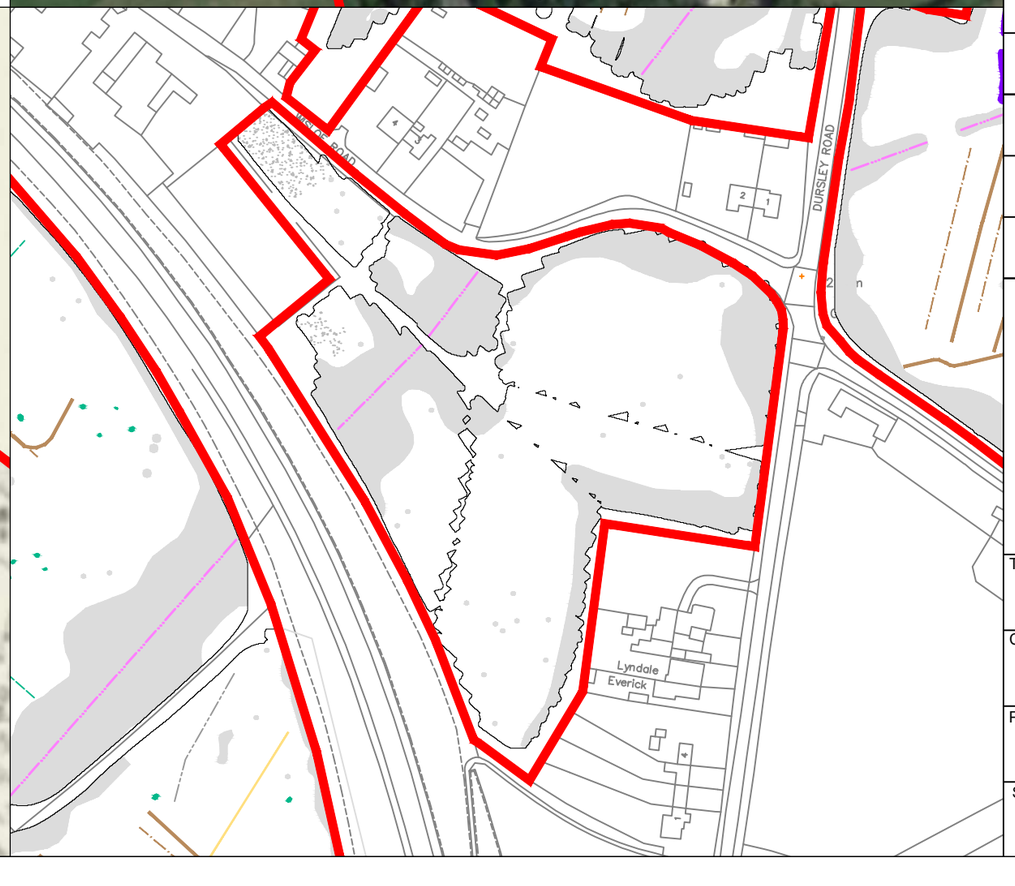
Client: The Ernest Cook Trust and Gloucestershire County Council

Project: 08879 - Wisloe, Slimbridge, Gloucestershire

Scale: NOT TO SCALE

Fig No: 26





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KEY

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	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Greyscale Plots, 2013 Aerial Image, *c.* 1892-1914 Ordnance Survey Map and Interpretation of Area B

Client: The Ernest Cook Trust and Gloucestershire County Council

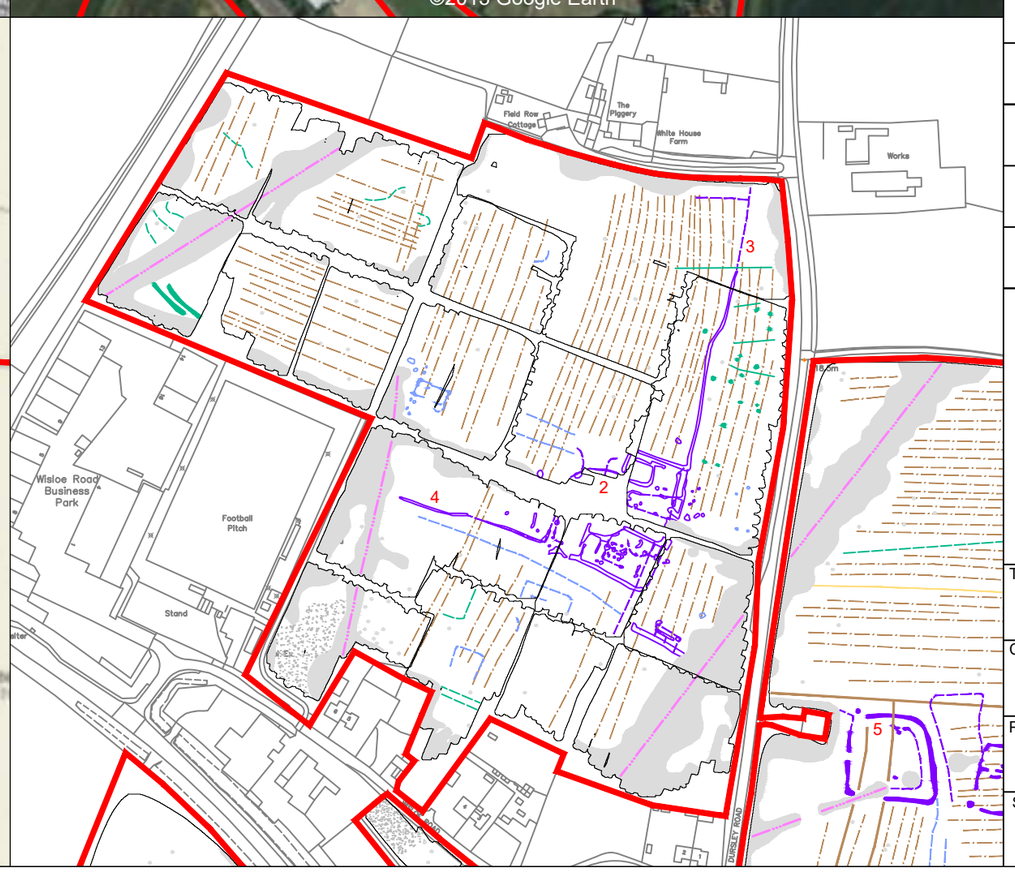
Project: 08879 - Wisloe, Slimbridge, Gloucestershire

Scale: NOT TO SCALE

Fig No: 27

rea C

c. 1892-1914, 25 Inch, Ordnance Survey Map ©2023 National Library of Scotland



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KEY

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	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

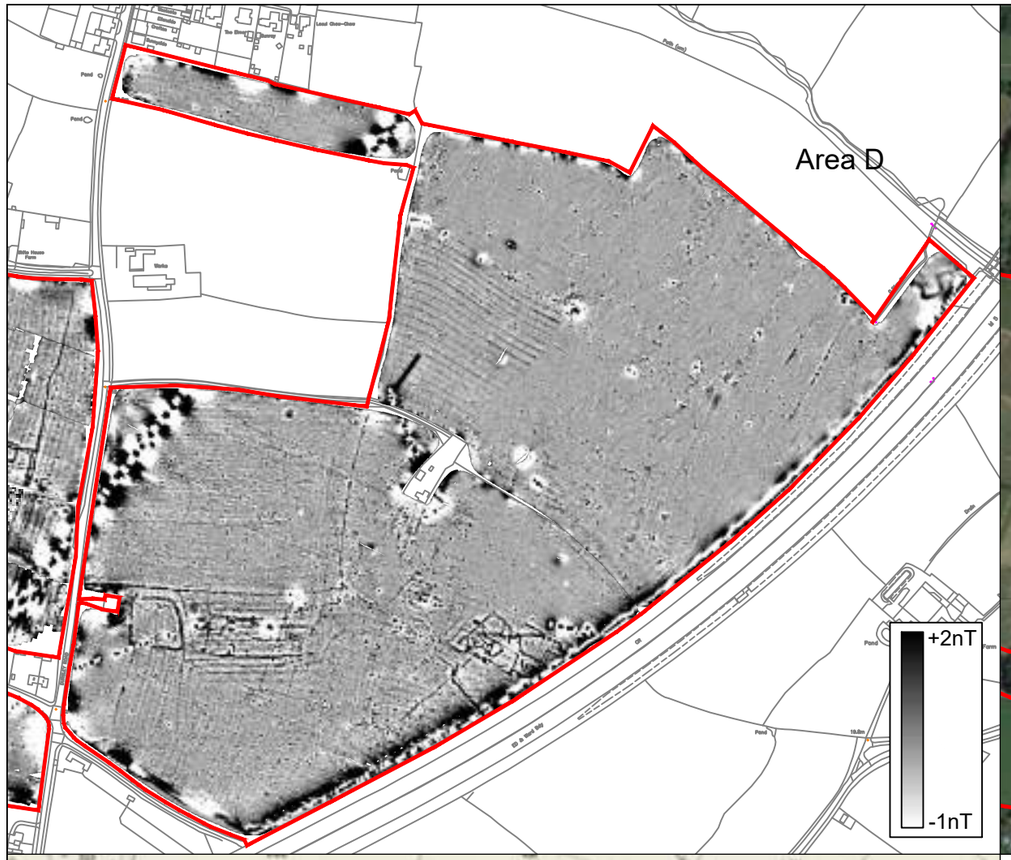
Title: Greyscale Plots, 2013 Aerial Image, *c.* 1892-1914 Ordnance Survey Map and Interpretation of Area C

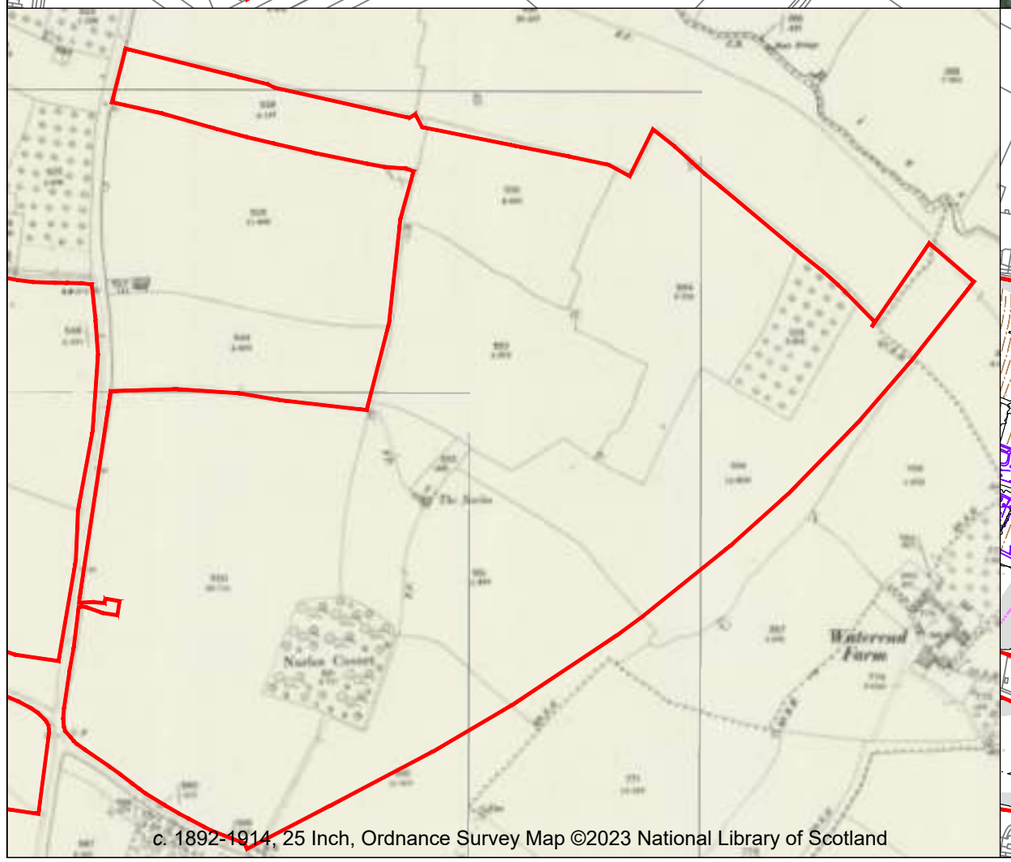
Client: The Ernest Cook Trust and Gloucestershire County Council

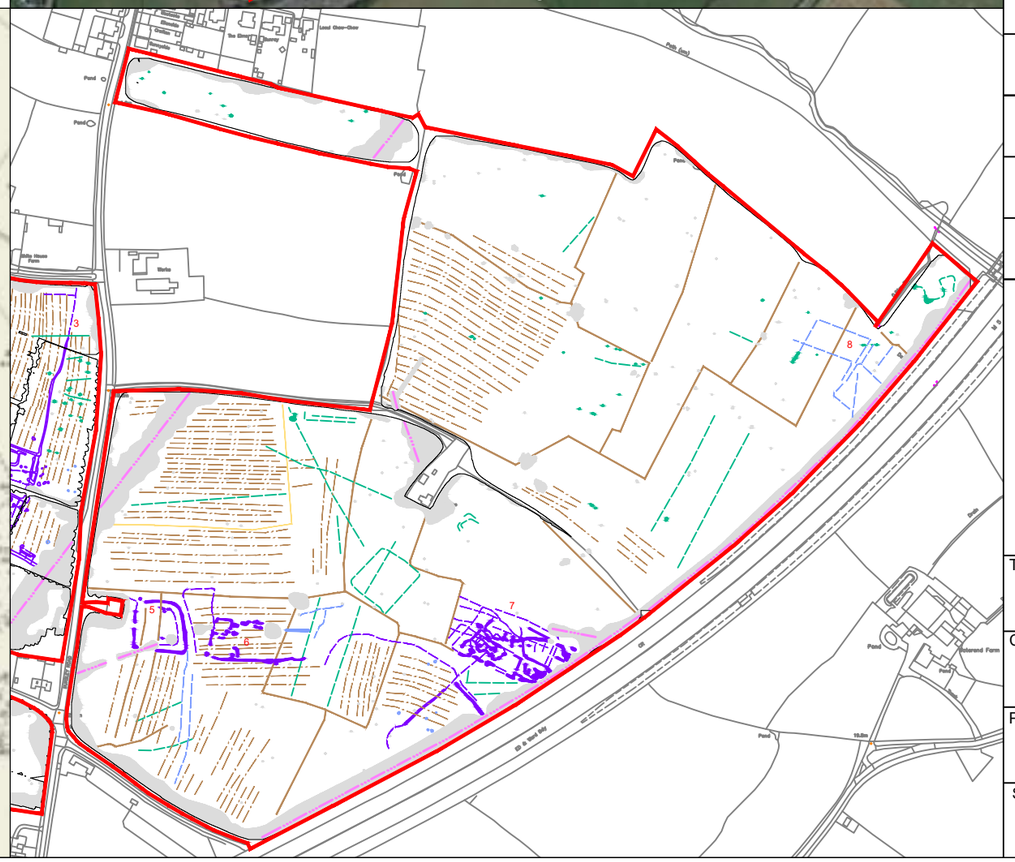
Project: 08879 - Wisloe, Slimbridge, Gloucestershire

Scale: NOT TO SCALE

Fig No: 28







N

KEY

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	Possible archaeology (discrete anomaly / trend / increased response)
	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (ridge and furrow)
	Agriculture (plough)
	Land drain
	Magnetic disturbance
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Greyscale Plots, 2013 Aerial Image, *c.* 1892-1914 Ordnance Survey Map and Interpretation of Area D

Client: The Ernest Cook Trust and Gloucstershire County Council

Project: 08879 - Wisloe, Slimbridge, Gloucestershire

Scale: NOT TO SCALE

Fig No: 29

Area A

Area B

Area C

Area D

N

+10nT

-10nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Minimally Processed Data - Greyscale Plots

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 300
1:6000 @ A3

Fig No:
30

Area A

N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots of Area A(clipped at +/-15nT)

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
31

WISLOE ROAD

DURSLEY ROAD

4

3

2

1

2

GP

Lyndale

Everick

4

Area B

N

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:

XY Trace Plots of Area B(clipped at +/-15nT)

Client:

The Ernest Cook Trust and Gloucestershire County Council

Project:

08879 - Wisloe, Slimbridge, Gloucestershire

Scale:

0 metres 50

1:1000 @ A3

Fig No:

32

Area C

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots of Area C (clipped at +/-15nT)

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 87.5
1:1750 @ A3

Fig No:
33

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots of Area D (clipped at +/-15nT)

Client:
The Ernest Cook Trust and Gloucestershire County Council

Project:
08879 - Wisloe, Slimbridge, Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
34

Appendix A - Technical Information: Magnetometer Survey Method, Processing and Presentation

Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (CIfA 2014) and the European Archaeological Council (EAC 2016).

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: Bartington *Grad* 601-2

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Presentation of results and interpretation

The presentation of the results includes a ‘minimally processed data’ and a ‘processed data’ greyscale plot. Magnetic anomalies are identified, interpreted and plotted onto the ‘Interpretation’ drawings.

When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to other existing evidence, the anomalies will be given specific categories, such as: Abbey Wall or Roman Road. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: Probable, or Possible Archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification Possible.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology / Probable Archaeology	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
Possible Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Former Field Boundary (probable & possible)	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Land Drain	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
Service	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
Ferrous	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology* / *Natural* or (in the case of linear responses) *Possible Archaeology* / *Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

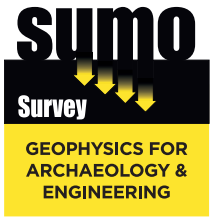
Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

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