OXFORDSHIRE
STRATEGIC RAIL FREIGHT INTERCHANGE

DCO Submission

Environmental Statement

Chapter 10: Heritage (built and archaeology)
Appendix 10.2: Geophysical Survey Report

Document 6.10B

On behalf of
Oxfordshire Railfreight Limited

Prepared by SUMO Geophysics Ltd
May 2022

GEOPHYSICAL SURVEY REPORT

Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Client

RPS Consulting Services

OASIS Ref.

sumogeop1-432982

Survey Report

02545

Date

May 2022

Survey Report 02545: Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Survey dates	21 April - 26 May, 28 - 29 June, 6 - 30 September 2021 14-18 February 2022
Field co-ordinator	[redacted]
Field Team	
Report Date	03 May 2021
CAD Illustrations	[redacted]
Report Author	
Project Manager	[redacted]
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2. SURVEY TECHNIQUE

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.

Bartington Grad 601-2	Traverse Interval 1.0m	Sample Interval 0.25m
Bartington Cart System	Traverse Interval 1.0m	Sample Interval 0.125m

3 SUMMARY OF RESULTS

3.1 A detailed magnetometer survey was conducted over approximately 270 hectares of land to the south of Ardley, Oxfordshire and has identified numerous zones of later prehistoric / Romano-British settlement activity. These comprise complex areas of enclosures, ditches, trackways and pits along with a banjo enclosure, a sub-oval enclosure and probable field system, with many of the features corresponding with the locations of cropmarks recorded on Oxfordshire HER. Evidence for ploughing effects plus ridge and furrow can be seen in the results, while a large number of former field boundaries have also been mapped. Modern anomalies including pipes, land drains and tracks are also visible, while approximately half of the site is affected by disturbance from the spread of green waste fertiliser.

4 INTRODUCTION

4.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for the development of a rail freight interchange and associated infrastructure. This survey forms part of an archaeological investigation being undertaken by **RPS Consulting Services**.

4.2 Site details

NGR / Postcode	SP 530 258 / OX27 7PJ
Location	The site is located approximately 4km northwest of Bicester, Oxfordshire, immediately south of the village of Ardley. The disused Upper Heyford Airfield lies immediately to the northwest of the site, with the B430 forming the eastern boundary of the site and Chalgrove Drive to the west.
OASIS Ref.	sumogeop1-432982
District	Cherwell
Parish	Ardley CP / Middleton Stoney CP
Topography	Mostly level with some undulations
Current Land Use	Arable farmland / pasture
Geology (BGS 2021)	Solid: White Limestone Formation - limestone is recorded across the majority of the site, with areas of Forest Marble Formation - limestone and Cornbrash Formation - limestone present in the south-east. Superficial: No superficial deposits are recorded for the majority of the area, though areas of Alluvium are present adjacent to the watercourses within the site
Soils (CU 2021)	Soilscape 5: freely draining lime-rich loamy soils.
Archaeology (OHER 2021)	Oxfordshire Historic Environment Record identifies numerous heritage assets relating to later prehistoric or Romano-British activity within the site. These include an Iron Age banjo enclosure (HER. 17446) with bottleneck entrance on an east-west alignment, a small circular enclosure visible as a cropmark between two linear features (HER. 17448), conjoined rectilinear enclosures indicative of settlement (HER. 17447), a pit alignment extending northwest / southeast across the entire length of a field, along with a further possible banjo enclosure (HER.

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17451) and Roman cremation burials and inhumation (HER. 3335). An undated enclosure with several sub-divisions (HER. 12247) is visible as a cropmark and appears to intersect an additional small banjo enclosure (HER. 13483), an Iron Age / Saxon ditch (HER. 26300) is also recorded along with another probable Iron Age ditch and post holes (HER. 17494), along with undated small rectangular enclosures (HER. 12247). In the southern part of the site, the likely location of Sexintone deserted medieval village (HER. 5491) is recorded, though its exact location is unknown.

Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	*c.* 270 ha

4.3 Aims and Objectives

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

5 RESULTS

The survey has been divided into thirty survey areas (Areas 1-30) and specific anomalies have been given numerical labels [1] [2] *which appear in the text below, as well as on the Interpretation Figure(s).*

5.1 *Probable / Possible Archaeology*

5.1.1 Area 1

What appears to be a partial rectilinear enclosure [46] has been recorded in the north of Area 1 and extends northwards beyond the limits of the survey. The responses are intermittent which may suggest they have been truncated by the ridge and furrow / modern ploughing that has also been recorded in the Area. Located 175m to the south-east is a curving ditch-like anomaly [47] which has also been recorded and categorised as being of possible archaeological interest; again, the responses are intermittent.

5.1.2 Area 2

A sub rectangular enclosure [48] measuring 32m in diameter has been recorded in the east of Area 2. Ditch-like anomalies extend beyond the enclosure and beyond the limits of the survey. A number of short ditch lengths and pit-like anomalies are visible in the centre of the enclosure. A series of rectangular and generally weak linear anomalies [49] have been assigned to the category of possible archaeology. They appear to be orientated on a differing alignment to the above-mentioned enclosure and are parallel with a former field boundary [53] that is recorded in this location. It is unclear if they are of archaeological interest or are uncorroborated former field boundaries; consequently, archaeological origins cannot be entirely discounted. A segmented sub-circular anomaly [50] has also been detected in Area 2 which measures 18m by 27m and is of clear archaeological interest. A number of weak pit-like anomalies have been plotted within the enclosure.

5.1.1 Area 8

A complex series of anomalies including a large, sub-rectangular enclosure [1] and smaller, adjoining rectilinear enclosure [2] have been identified in the southwest. There are indications of further rectilinear enclosures and intersecting ditches plus discrete anomalies which are suggestive of multi-phased later prehistoric / Romano-British activity, while there is also evidence for possible trackways extending east and north-west into Area 4 from the complex. Weaker ditch-type responses [3-4] to the northeast of the enclosure at [2] are less clear in

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their morphology and different in response to those at [1-2] and are indicative of smaller adjoining enclosures and possible ring-ditches, and may be suggestive of a further phase of occupation.

5.1.2 Area 9

A roughly elliptical enclosure [5] and additional weaker linear anomalies and trends have been detected in the north, with the enclosure some 39m x 93m in size and corresponding with a HER record for a tentative crop-marked circular enclosure and linear cropmarks (MOX23331). A curvilinear ditch on the eastern side of the enclosure is indicative of a small annexe, while the tentative linear trends could be indicative of additional ditches of archaeological or agricultural origin.

5.1.3 Area 16

An irregularly-shaped enclosure [6] has been mapped in the east, containing within it two adjoining sub-rectangular enclosures [7]. The enclosure appears to extend outwards towards the south-east and contains a further rectangular enclosure [8]; it also corresponds with the location of a possible settlement complex (MOX23330) identified on the HER. Additional ditches are visible to the south of the enclosure, though their form is less clear, and they may have an agricultural explanation. Evidence for a clear banjo enclosure [9] can also be seen in the data, corresponding with information on the HER for a banjo enclosure with bottleneck entrance (MOX23329) visible as a cropmark in the same location. The feature comprises a sub-oval enclosure some 53m x 64m with two antennae ditches extending eastwards. The level of modern disturbance from green waste fertiliser (see 5.6.1 below) means it is difficult to identify any clear internal features within the enclosure.

5.1.4 Area 18

A further complex of anomalies within an irregular-shaped enclosure [10] with double ditches on its western and north-eastern sides is visible, along with numerous smaller rectilinear enclosures, ditches and discrete anomalies. Within the complex, a small negative rectilinear anomaly [11] some 11m x 12m with possible internal features, has been mapped and could be indicative of walls associated with a former building. The complex corresponds in location with a HER record for an undated enclosure with sub-divisions (MOX4861), and is also in immediate proximity to a possible Iron Age banjo enclosure (MOX4867) identified as a cropmark, though no evidence for such a feature is visible in the data.

5.1.5 Area 26

A series of linear anomalies [12] and tentative linear trends have been mapped; the clear rectilinear anomalies are suggestive of a field system that could be associated with the area of occupation [10-11] to the northwest, and tally with the location of undated rectilinear enclosures (MOX4862) recorded on the HER.

5.1.6 Area 28

A small series of linear, curvilinear and discrete anomalies [13] are indicative of small enclosures and possible pits; this could form a peripheral area of settlement to that evidenced at [10-11] to the north or indeed a separate phase of occupation.

5.1.7 Area 30

Linear ditch-type anomalies [14] and curvilinear trends [15] can be seen which may also form part of a wider field system, or represent smaller enclosures associated with an area of settlement.

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5.2 ***Uncertain***

5.2.1 In Area 8 to the north of the complex of enclosures and ditches at [1-4], a small cluster of negative curvilinear and sub-circular anomalies [16] have been mapped. Each of the responses are approximately 6m in diameter, and it is possible that they are a result of small mounds or earthworks of archaeological interest. However, the responses lie within an area of 'mottled' data which is likely to have a natural explanation; as such, they could simply be a result of localised soil variations.

5.2.2 A tentative rectilinear enclosure [17] plus additional linear trends [18] in Area 28 have uncertain origins, along with numerous other linear trends across the site. It is possible that they represent ditches and are associated with the zones of occupation evident across the whole of the survey area; however, the weak nature of the anomalies and lack of clear form makes further interpretation difficult, particularly in areas affected by green waste, (see 5.6.1) where the trends could represent chance alignments of ferrous debris or have an agricultural explanation.

5.2.3 Moderate strength linear anomalies [19, 20, 21] in Areas 10, 14 and 27 are also of uncertain origin. The strength of the responses indicates that they are most likely to have a modern origin and are thought to relate to possible drains, tracks and modern landscaping features.

5.3 ***Former Field Boundary***

5.3.1 Several linear anomalies [22-37 & 51-55] are mapped across the site, each of which correspond with the location of a former field boundary that can be seen on the 1839 Ardley Tithe Map and available historic Ordnance Survey maps of the site (see Fig 53).

5.3.2 Additional linear anomalies [38-43 & 55] share similar characteristics and alignments to those at [22-37] and are thought to be a result of former boundaries but are not visible on available old maps; hence their conjectural interpretation.

5.4 ***Agricultural – Ploughing / Land Drains / Tracks***

5.4.1 Evidence for modern ploughing activity is seen across large portions of the site, and are visible as closely spaced, magnetically weak, parallel linear anomalies. Evidence for former ridge and furrow cultivation can be seen in Areas 1 and 18 in the form of widely spaced, slightly curved, parallel linear anomalies.

5.4.2 A weak bipolar linear anomaly in Area 3 and a series of linear anomalies in Area 20 are indicative of modern land drains.

5.4.3 Two moderate strength linear anomalies [44-45] have been mapped in Areas 11 and 14 and are result of modern trackways that are visible on aerial imagery of the site.

5.5 ***Natural / Geological / Pedological / Topographic***

5.5.1 A few small amorphous and discrete areas of slightly enhanced magnetic response can be seen in Areas 8 and 11 and they are thought most likely to have a natural explanation, i.e. reflect localised variations in the underlying geology.

5.6 ***Ferrous / Magnetic Disturbance / Green Waste***

5.6.1 Approximately half of the site is affected by the spread of green waste fertiliser which has had a marked effect on the results. Magnetic surveys and the issue of green waste has been

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recognised as an for some time (Gerrard *et al* 2015), however, it is impossible to predict in advance any potentially detrimental effects; it depends on the quantity of inorganic contaminants, including batteries, pieces of metal cans and other ferrous items which result in spurious anomalies or 'noise'. It is notable that while some clear ditches are visible amongst the disturbance, such as the banjo enclosure [10] in Area 16, the sub-oval enclosure [11] in Area 9 and field system [13] in Area 26, it is likely that weaker, more ephemeral features may have been masked.

5.6.2 A number of strong bipolar linear anomalies are mapped in several of the areas across the site. They are a result of underground services such as pipes or cables.

5.6.3 Ferrous responses close to boundaries are due to adjacent fences and gates while areas of made ground can be seen in Areas 8, 13 and 16. 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.

6 DATA APPRAISAL & CONFIDENCE ASSESSMENT

6.1 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 indicate the presence of numerous areas of later prehistoric settlement activity and enclosures; however, a large portion of the site is affected by disturbance from green waste fertiliser which has the potential to mask archaeological anomalies.

7 CONCLUSION

7.1 The survey at Ardley has identified several zones of probable later prehistoric or Romano-British settlement activity including two complex areas of adjoining enclosures, ditches, annexes, pits and possible trackways, each covering an area of approximately 3 hectares. The southernmost of the complexes corresponds with an undated rectangular enclosure with sub-divisions (MOX4861) and possible location of an Iron Age banjo enclosure (MOX4867) recorded on Oxfordshire HER, while the northernmost complex is previously unknown. Further anomalies indicative of areas of later prehistoric occupation are visible in the results and comprise an irregularly-shaped enclosure with internal rectilinear features, a banjo enclosure and sub-oval enclosure, each of which corresponds with locations of cropmarks recorded on the HER (MOX23330; MOX23329; MOX23331). Additional ditches indicative of a field system have also been identified in the data and it is possible that they are associated with the areas of occupation that can be seen across the site. The level of occupation activity in the results indicate that the site lies within a landscape well-settled in the later prehistoric / Romano-British periods.

7.2 A large number of former field boundaries visible in the data can be corroborated with historic maps, while similar responses are thought to relate to other field divisions that are not present on old maps and are therefore conjectural boundaries. Evidence for modern ploughing effects and a small area of former ridge and furrow cultivation can be seen in the results, along with a few land drains and track ways suggesting that the site has a largely agricultural recent history. Approximately half of the site is affected by the spread of green waste fertiliser, while other areas of ferrous disturbance are visible and are a result of nearby metal objects including pipes and fences.

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8 REFERENCES

BGS 2020 British Geological Survey, Geology of Britain viewer [accessed 14/10/2021] *website*: (http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps)

CIfA 2014 *Standard and Guidance for Archaeological Geophysical Survey.* Amended 2016. CIfA Guidance note. Chartered Institute for Archaeologists, Reading http://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics_2.pdf

CU 2020 The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 14/10/2021] *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.

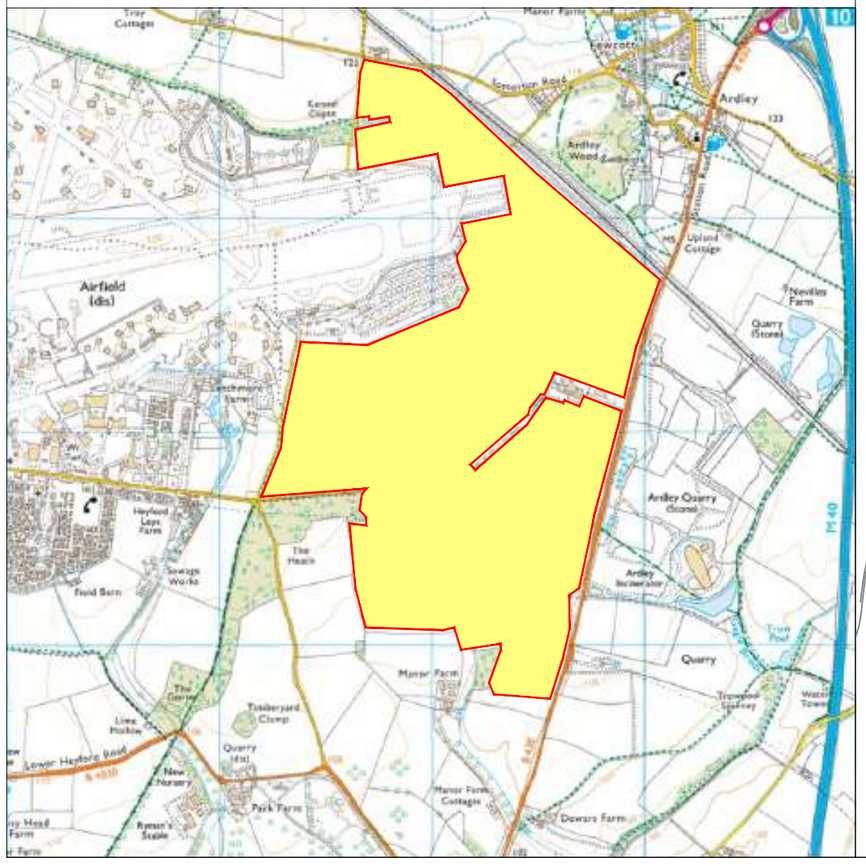
EH 2008 *Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Swindon https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/

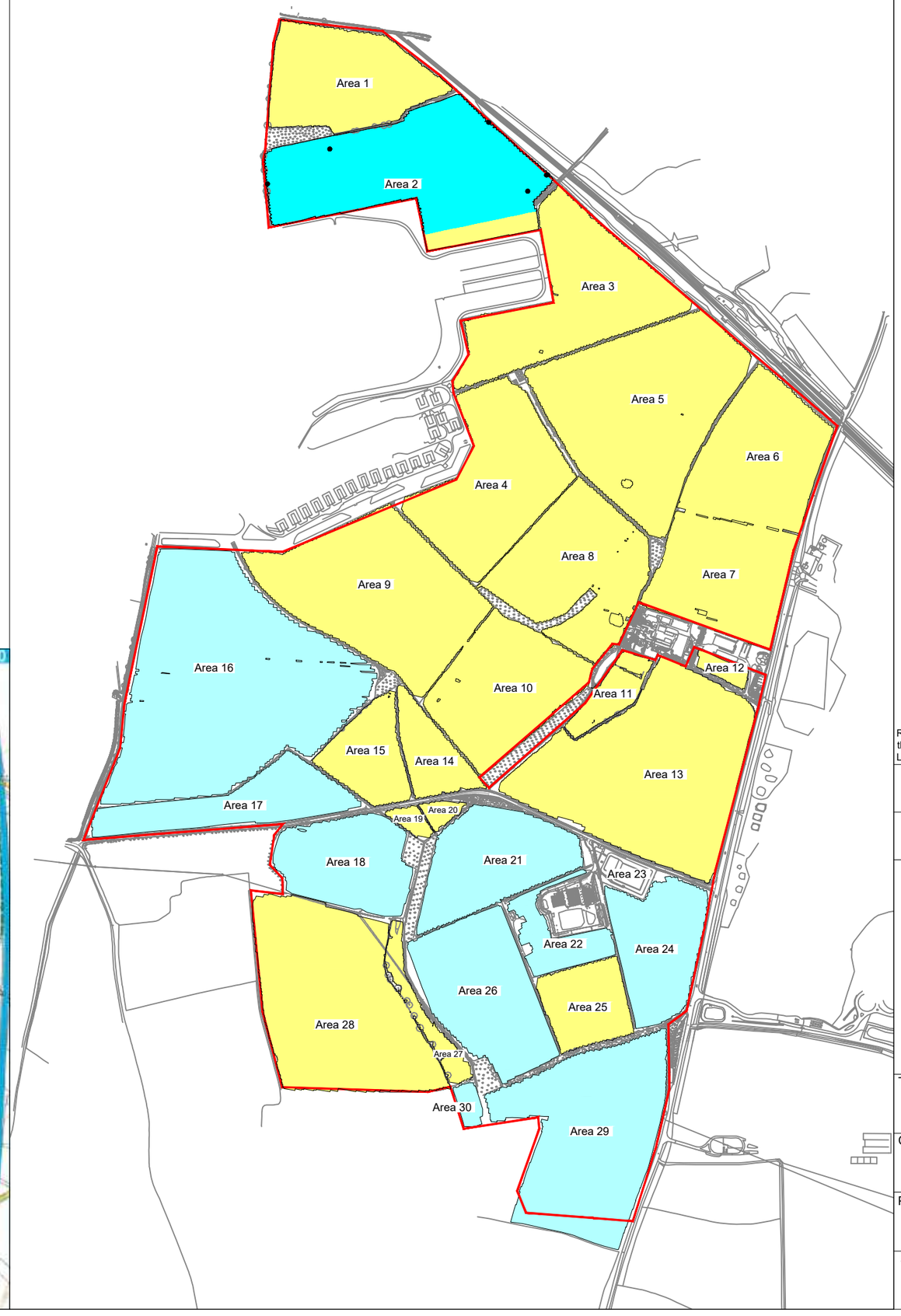
Gerard *et al* 2015 *Green Waste and Archaeological Geophysics.,* Gerrard, J., Caldwell, L., and Kennedy., A. Journal of Archaeological Prospection, 22, 139-142 (Wiley).

OHER 2021 Oxfordshire Historic Environment Record [accessed 14/10/2021] *website:* www.heritagegateway.org.uk

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	Survey Areas - hand-held data
	Survey Areas - cart data

N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Site Location

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
NOT TO SCALE

Fig No:
01



N

+2nT

-1nT

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GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

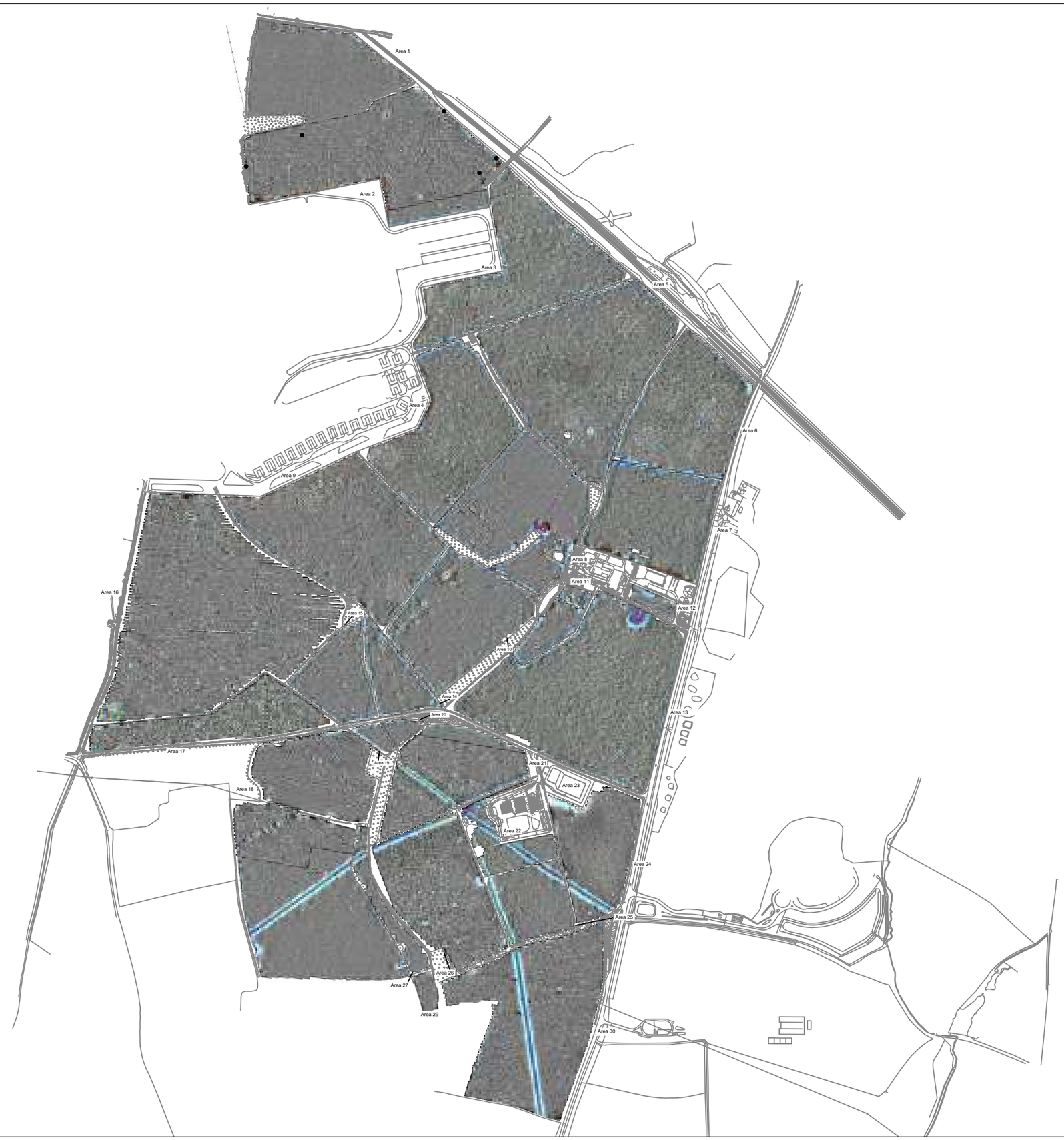
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Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
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1:11,500 @ A3

Fig No:
02



N

+100nT

-100nT

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GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

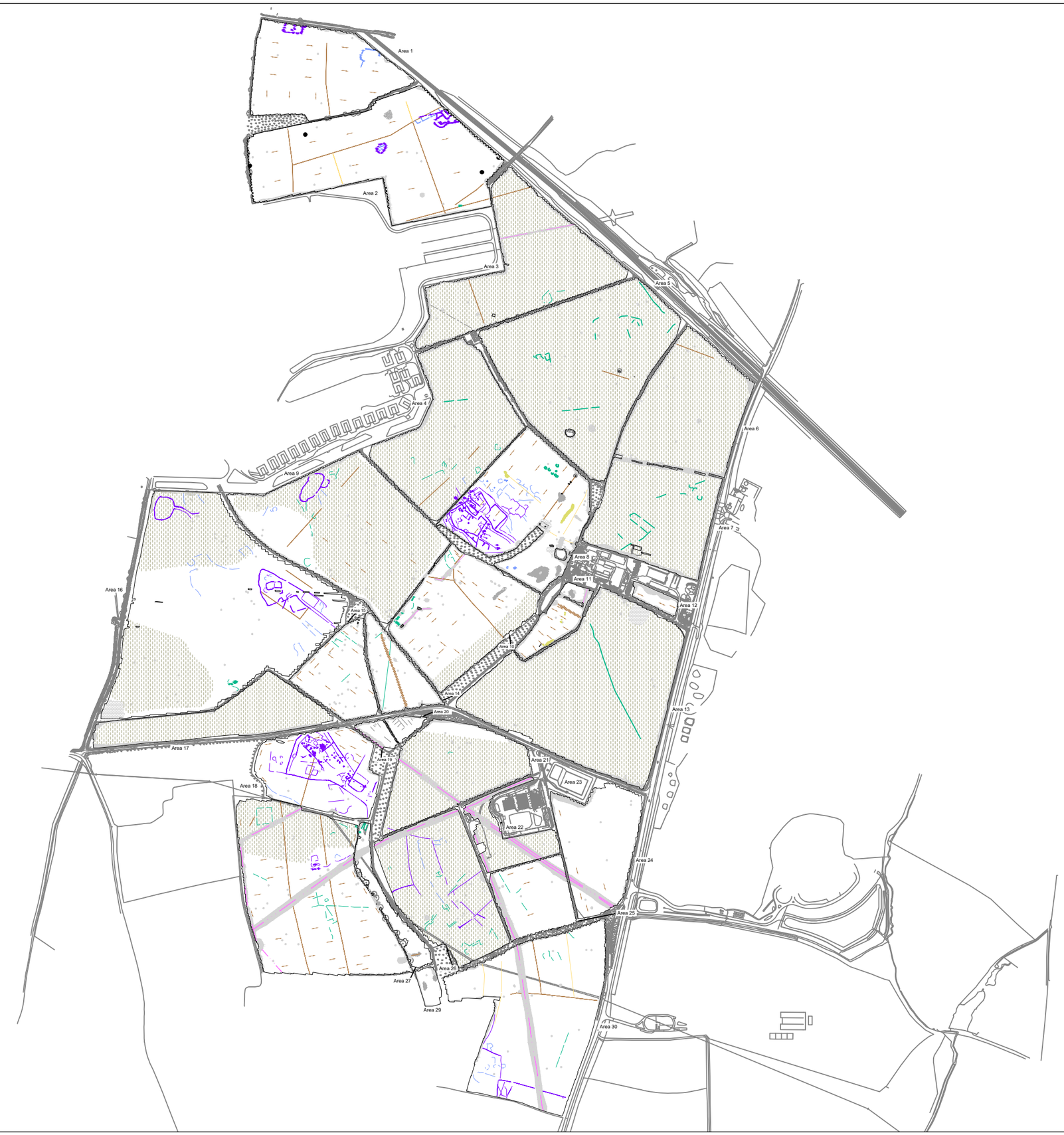
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Client:
RPS Consulting Services

Project:
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Fig No:
03



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

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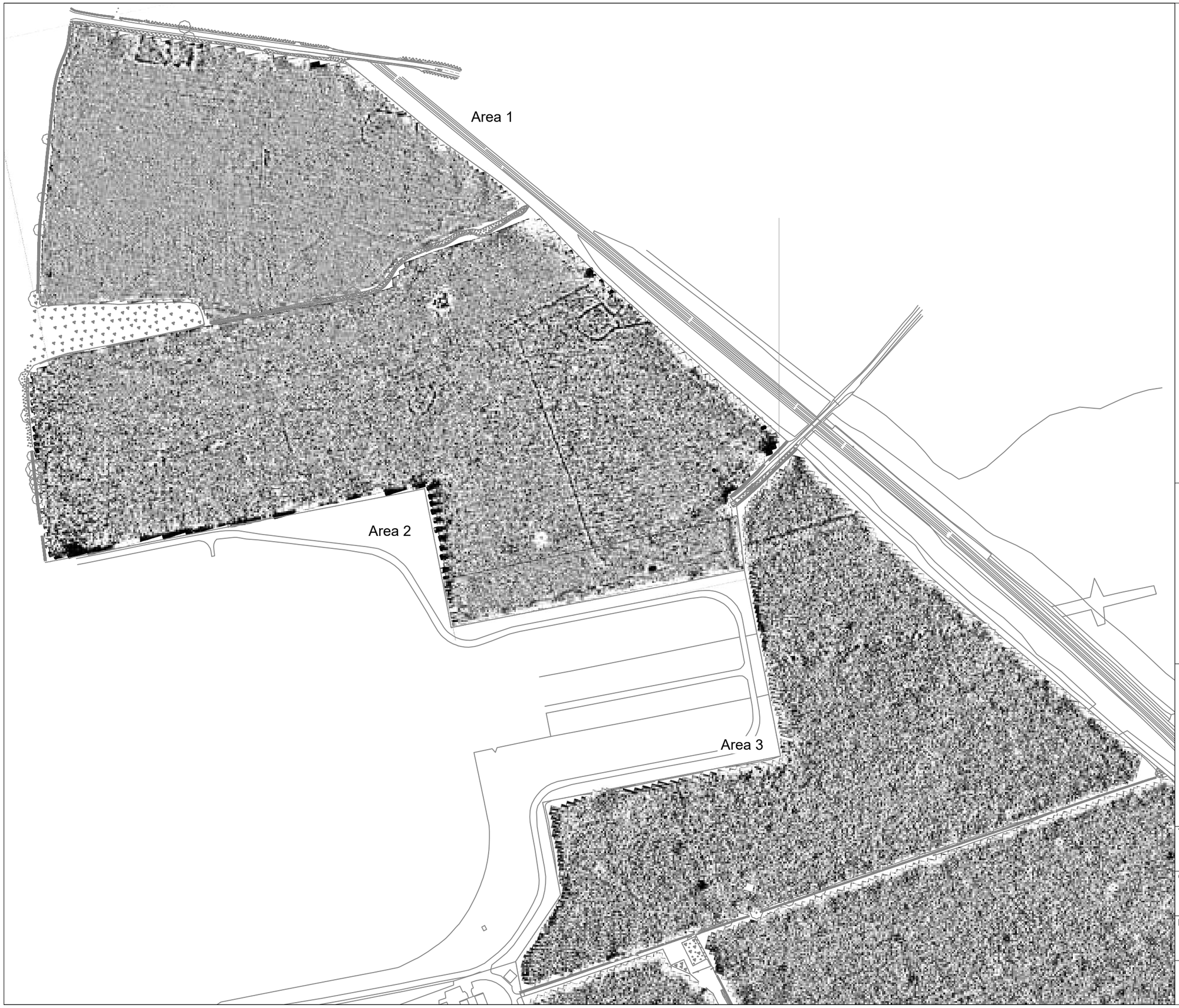
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Client:
RPS Consulting Services

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Scale:
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1:11,500 @ A3

Fig No:
04



N

+2nT

-1nT

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GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

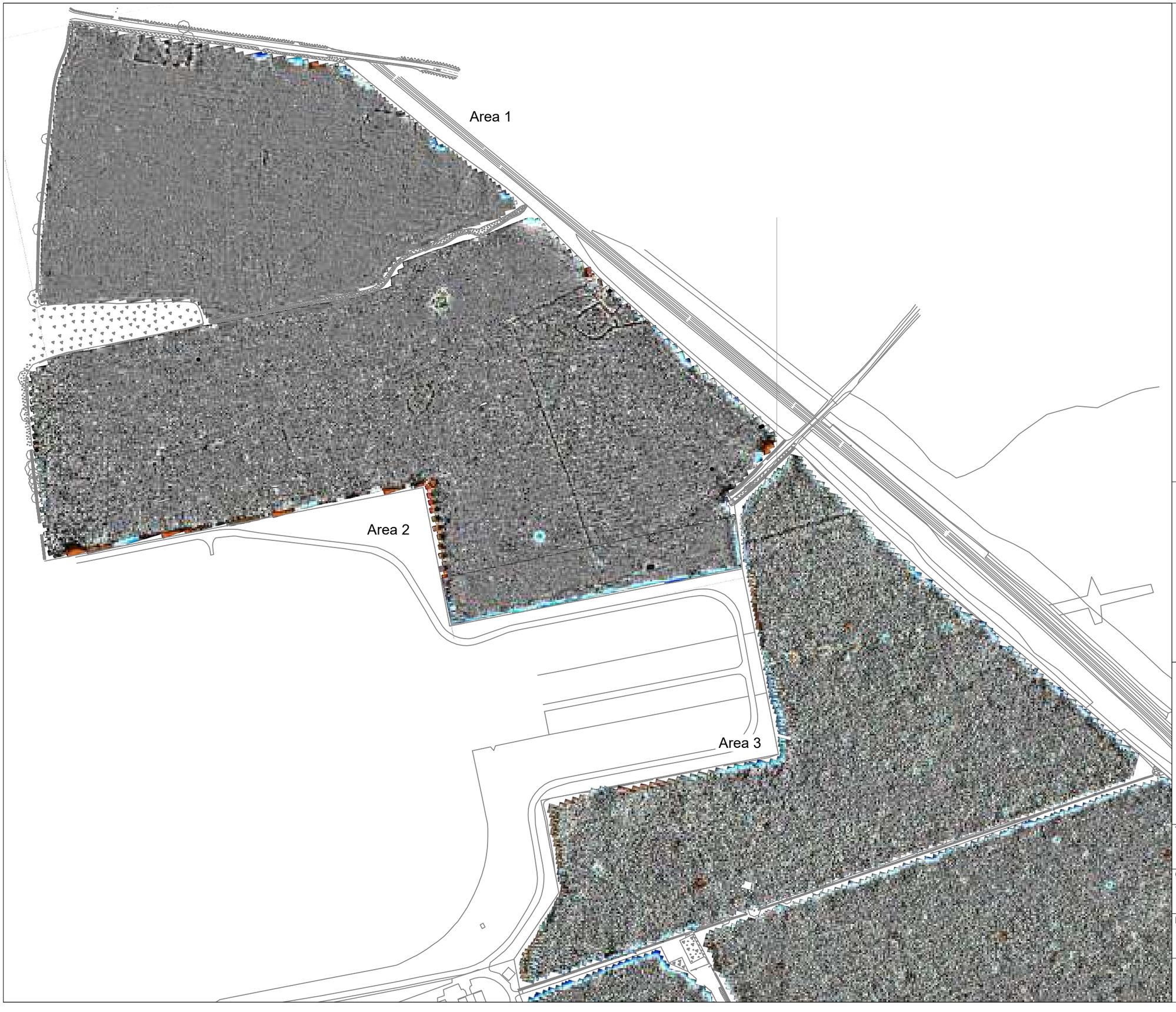
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Magnetometer Survey - Greyscale Plots - Areas 1, 2 and 3

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Project:
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Scale:
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1:3500 @ A3

Fig No:
05



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

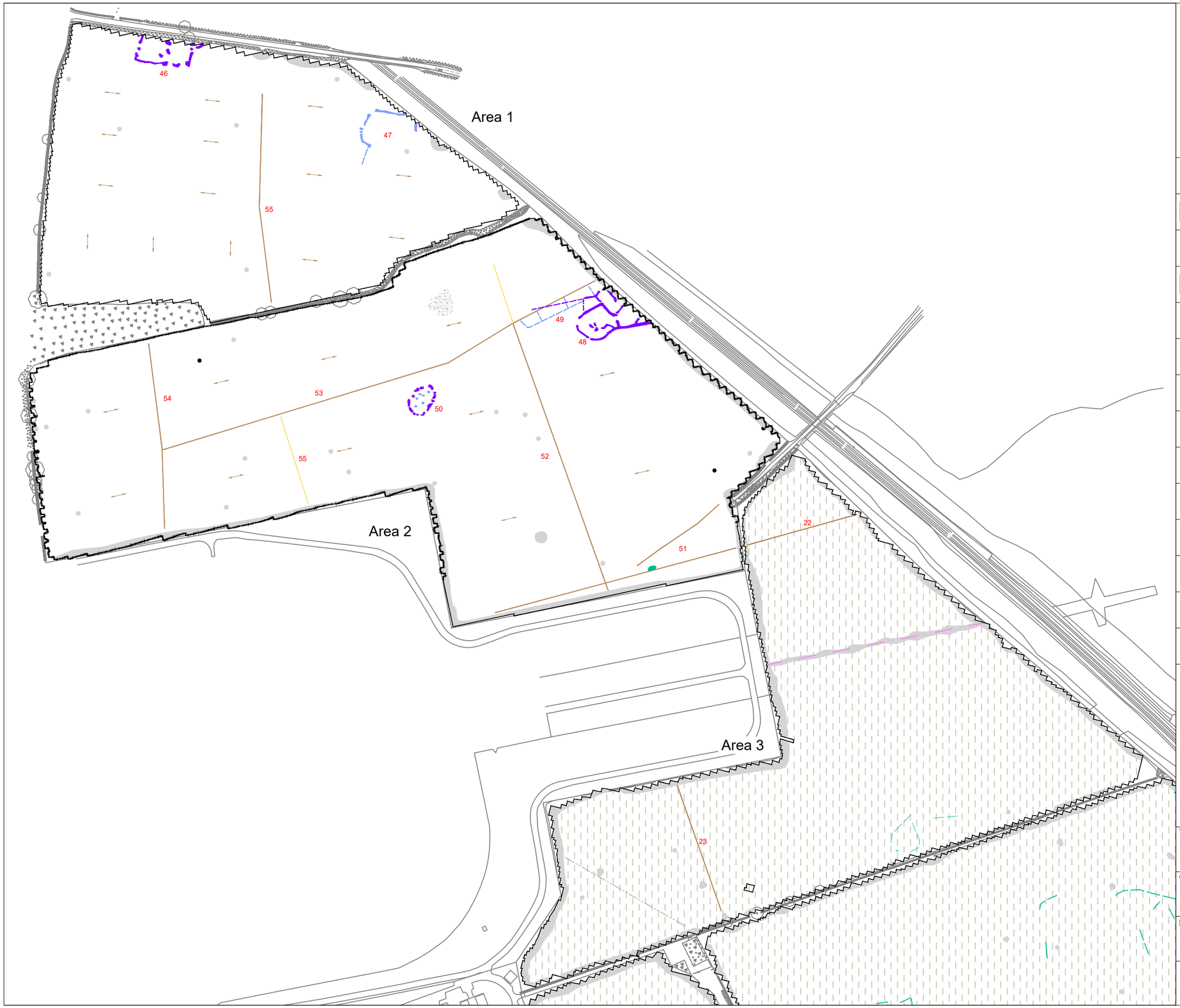
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Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
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Fig No:
06



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

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GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Areas 1, 2 and 3

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 175
1:3500 @ A3

Fig No:
07



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Area 4

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
08



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

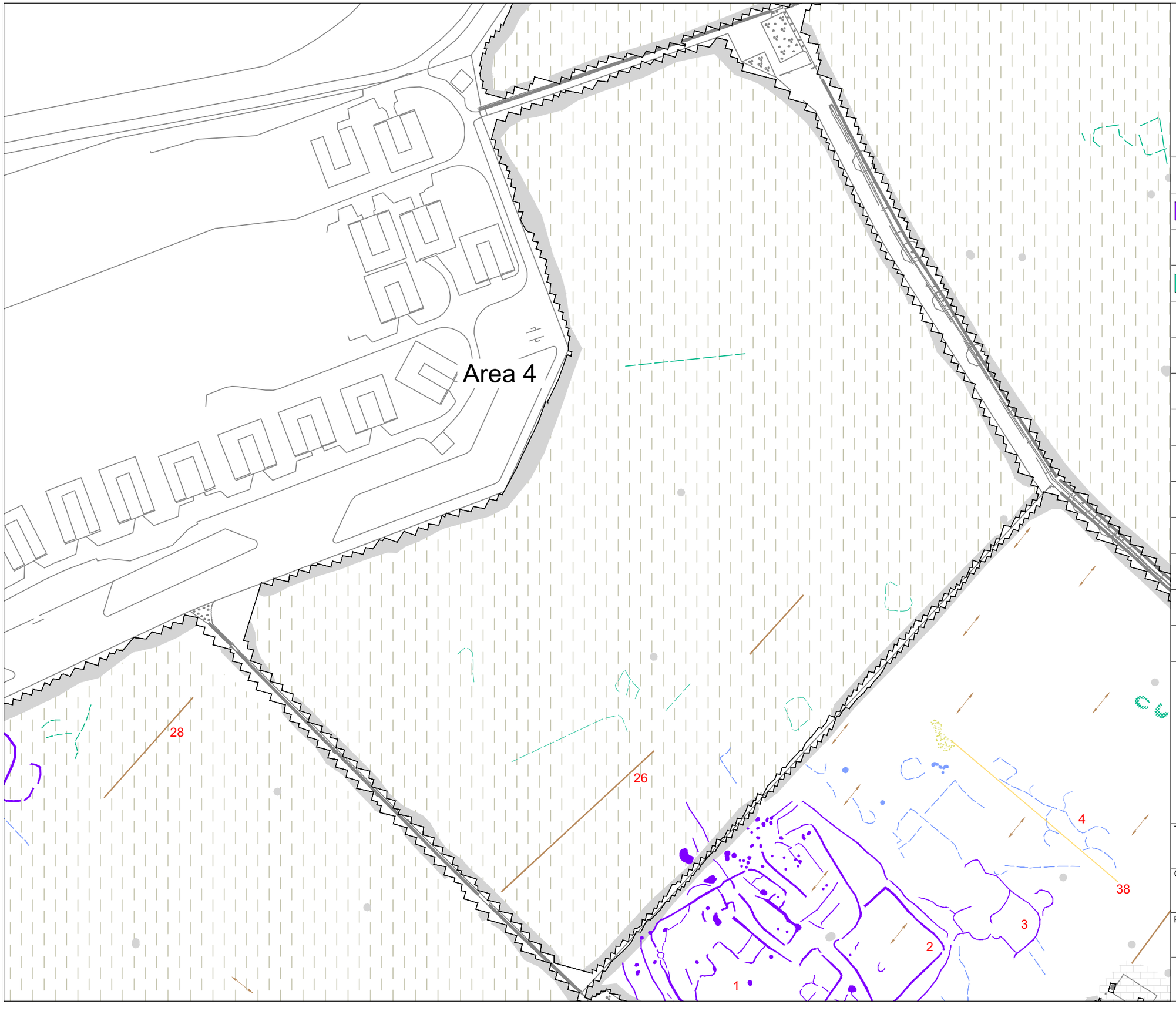
Title:
Magnetometer Survey - Colour Plots - Area 4

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
09



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

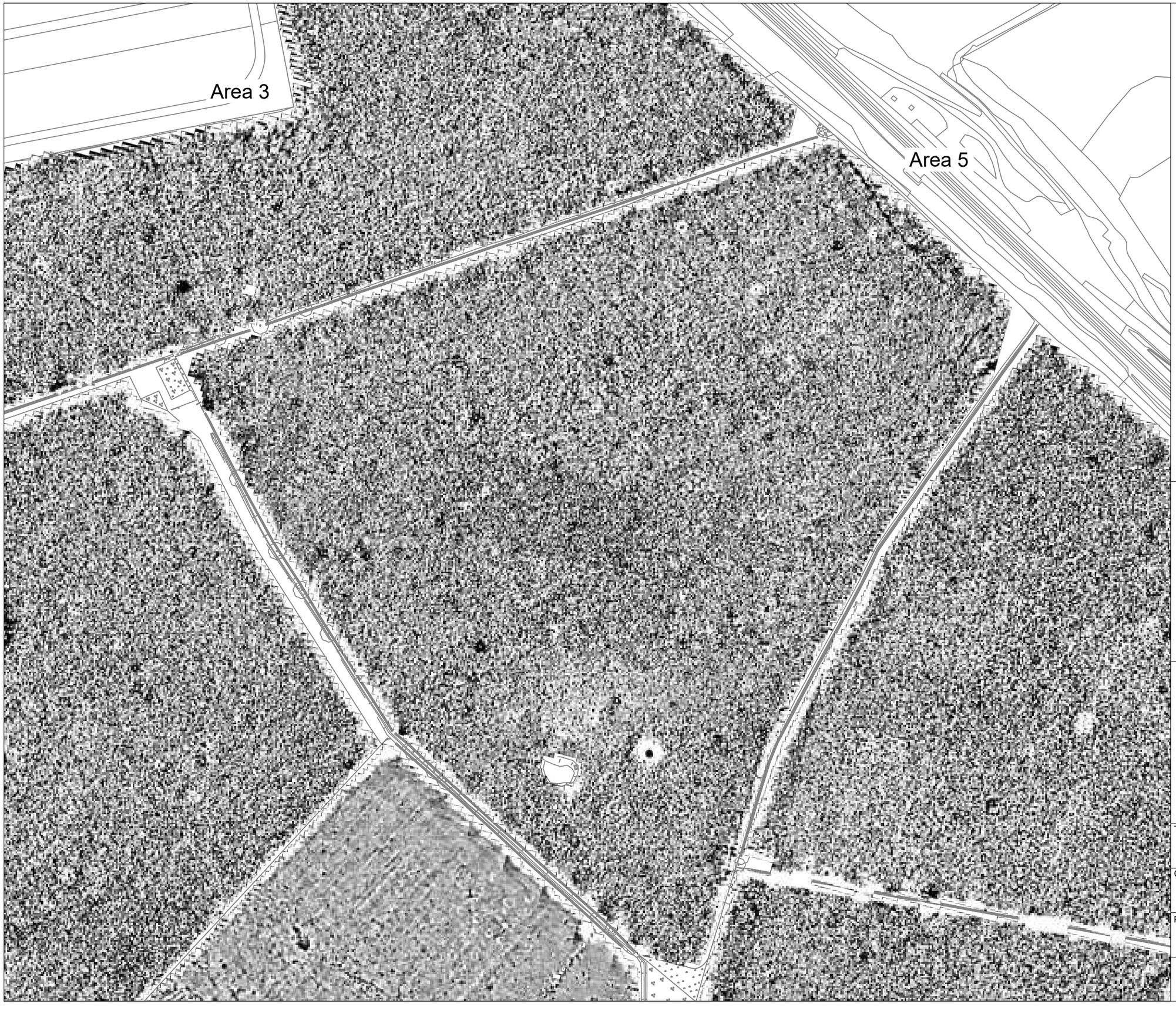
Title:
Magnetometer Survey - Interpretation - Area 4

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
10



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Area 5

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
11

Area 3

Area 5

N

+100nT

-100nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots - Area 5

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
12



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Area 5

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
13



N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Area 6

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
14



N

+100nT

-100nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

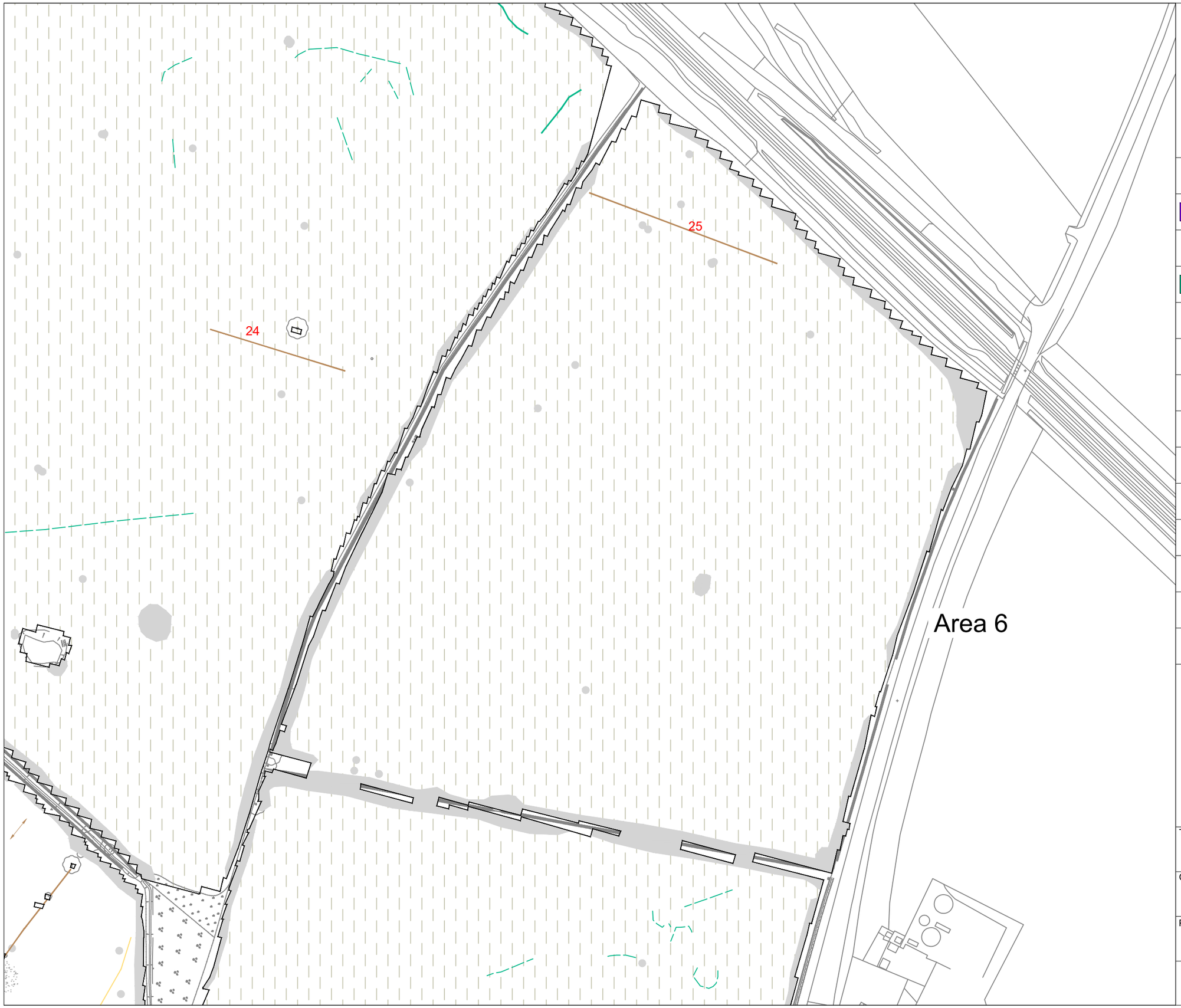
Title:
Magnetometer Survey - Colour Plots - Area 6

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
15



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Area 6

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
16



N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Area 7

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
17



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

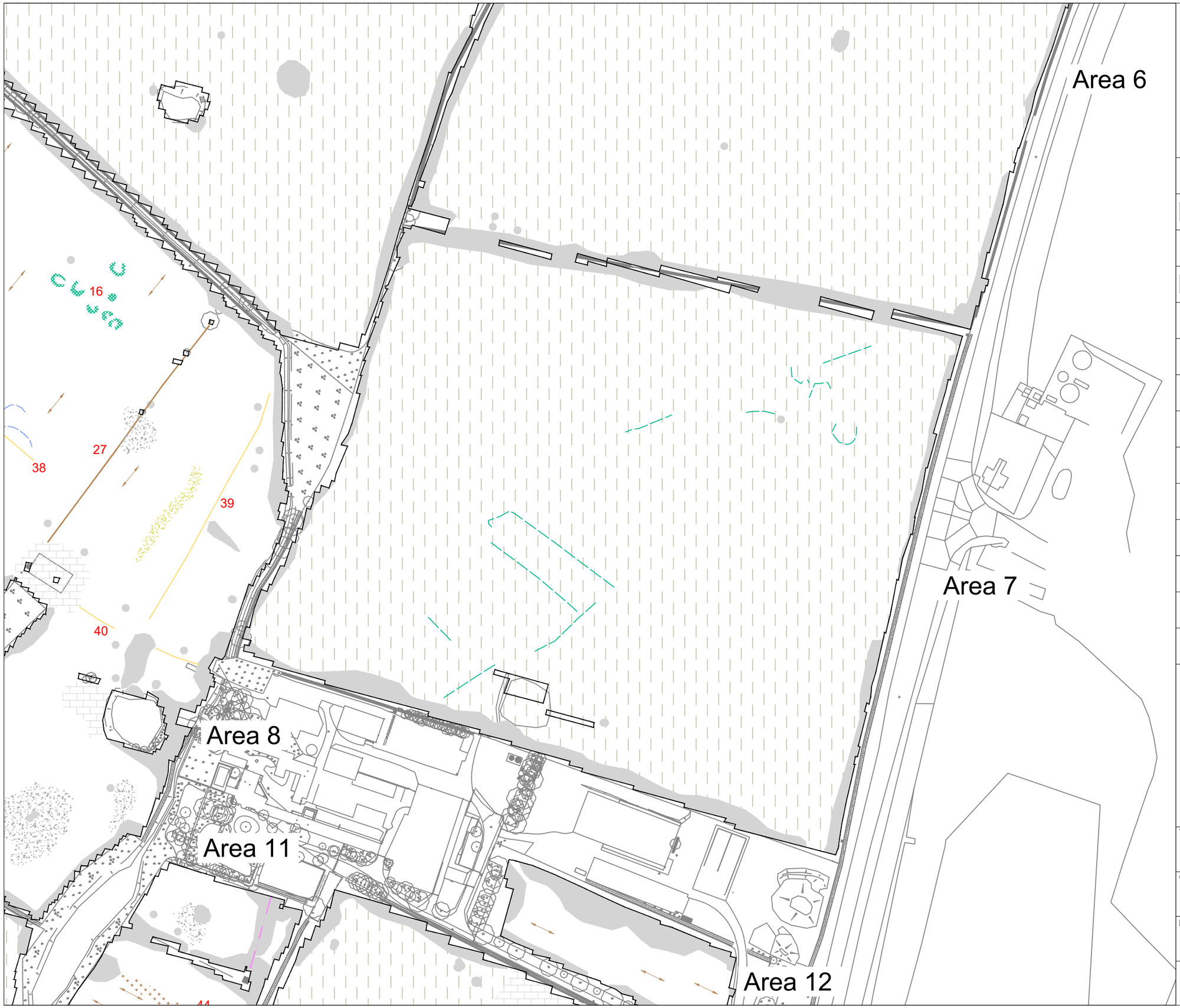
Title:
Magnetometer Survey - Colour Plots - Area 7

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
18



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

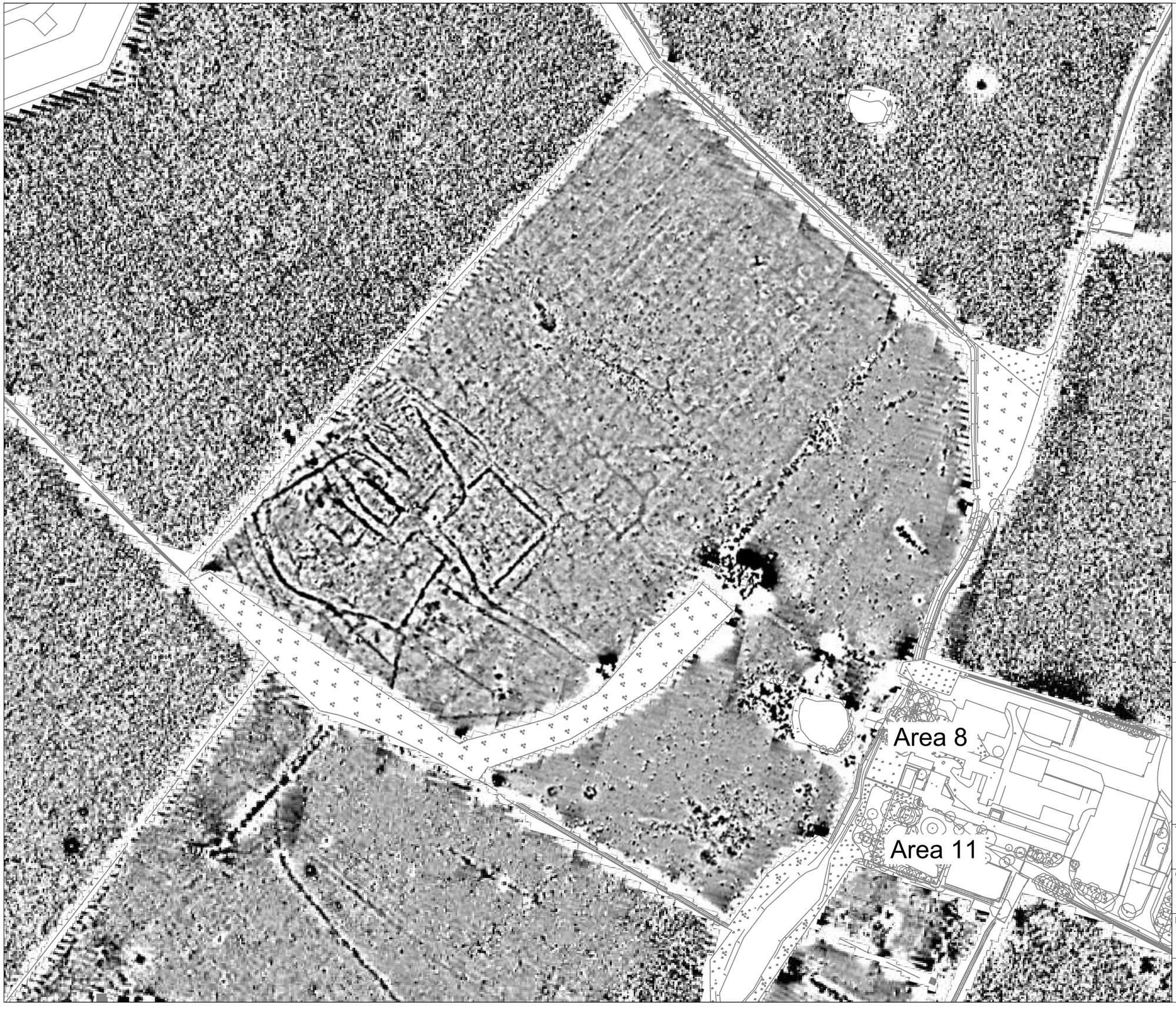
Title:
Magnetometer Survey - Interpretation - Area 7

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
19



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

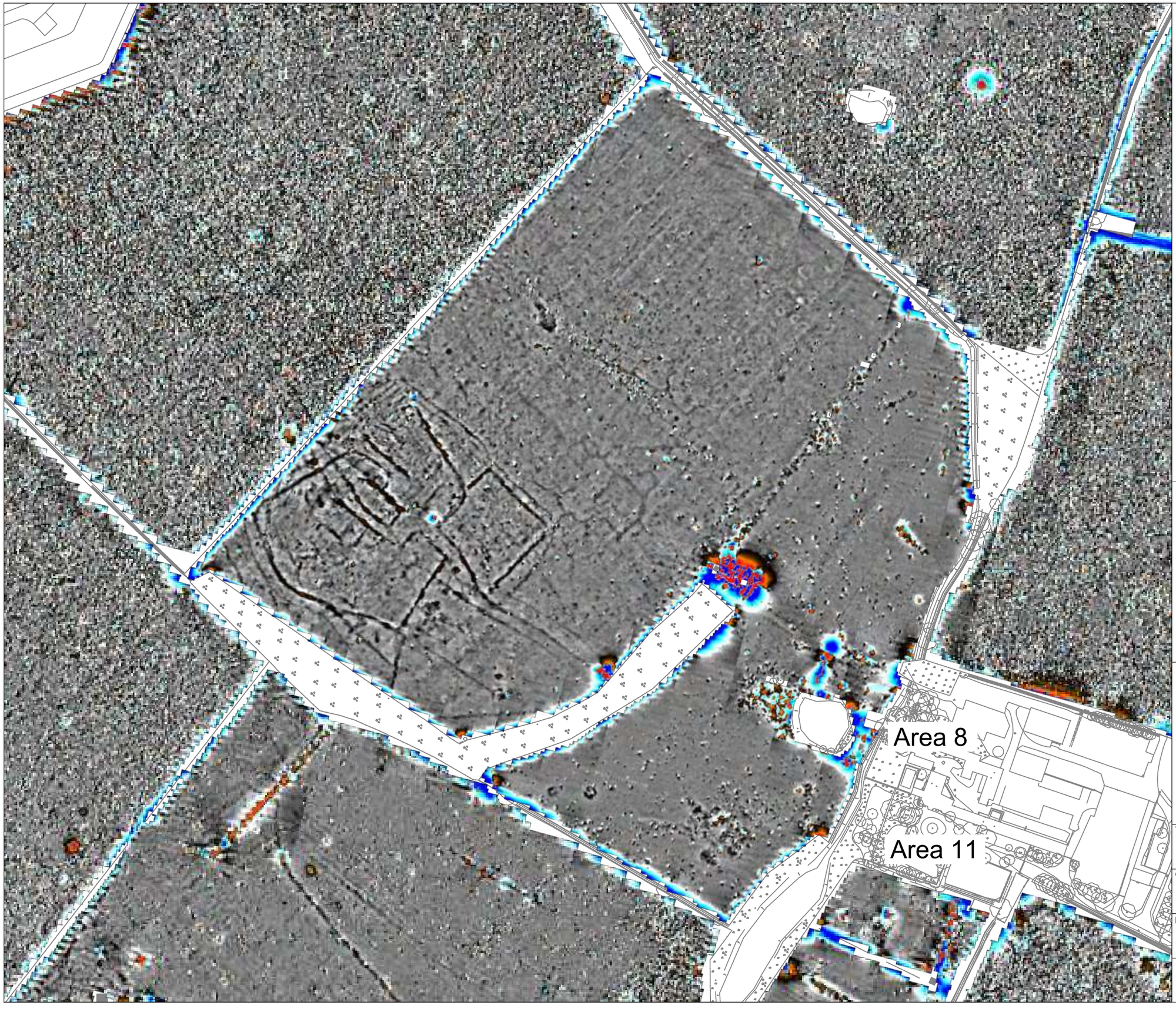
Title:
Magnetometer Survey - Greyscale Plots - Area 8

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
20



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

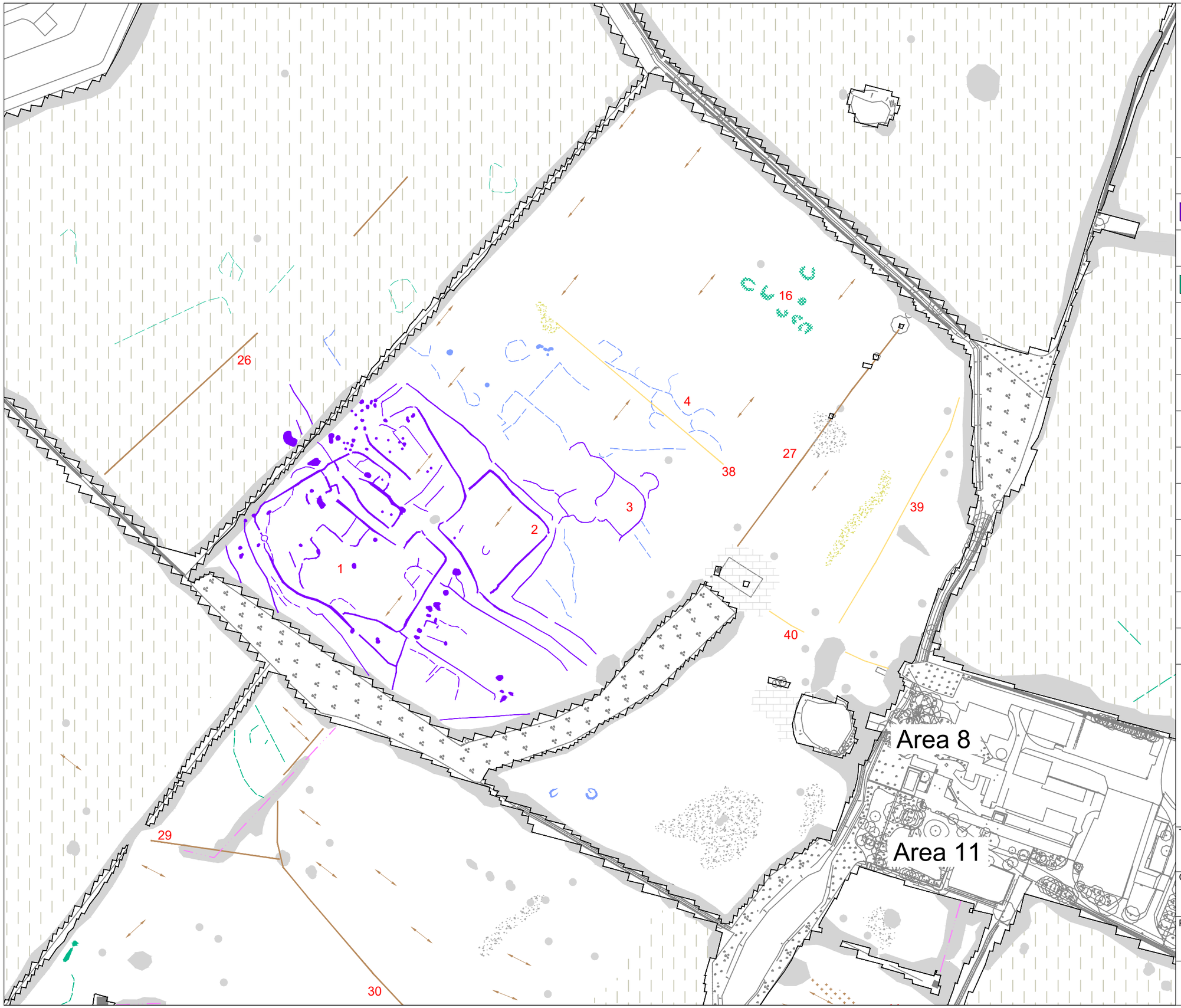
Title:
Magnetometer Survey - Colour Plots - Area 8

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
21



KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

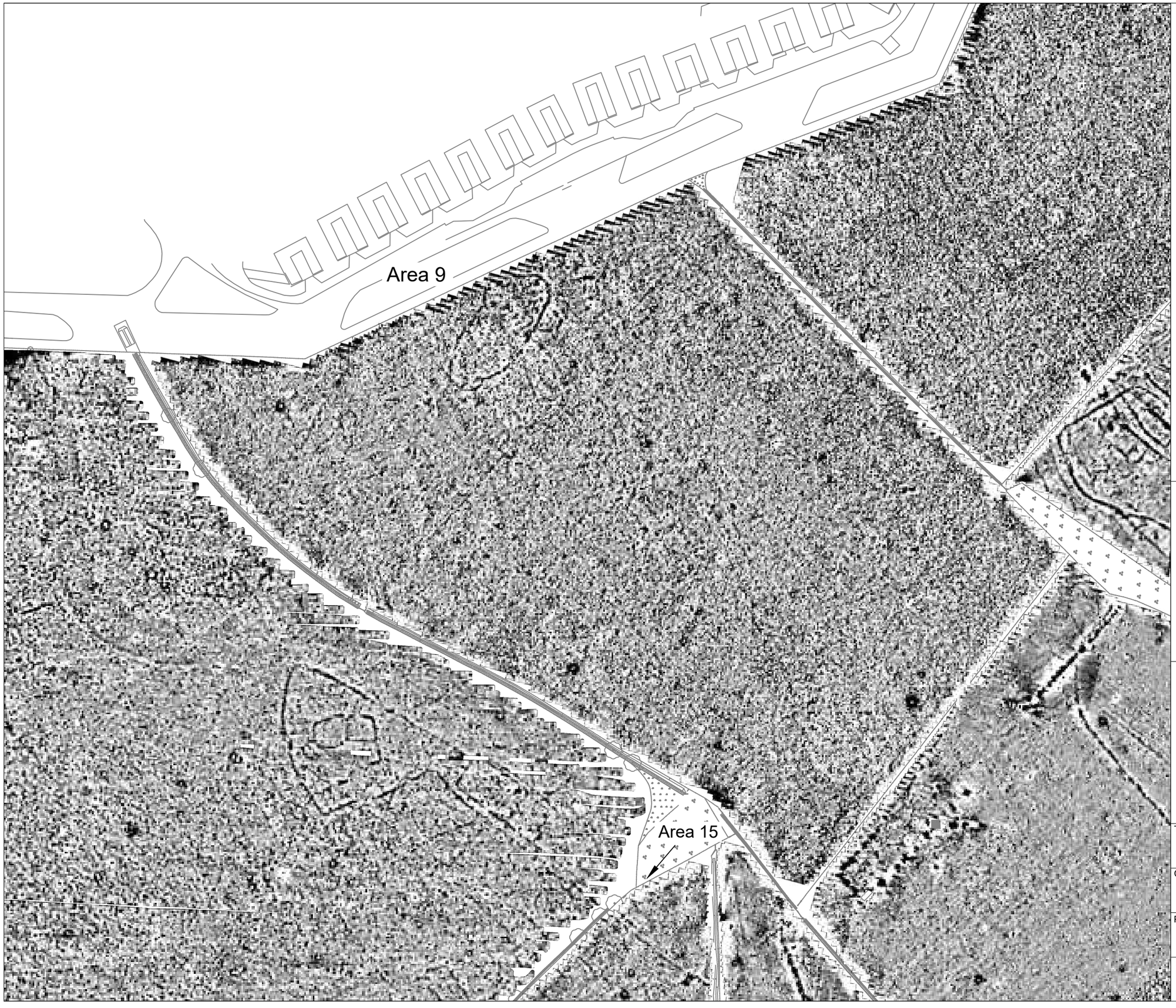
Title:
Magnetometer Survey - Interpretation - Area 8

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
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1:2000 @ A3

Fig No:
22



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

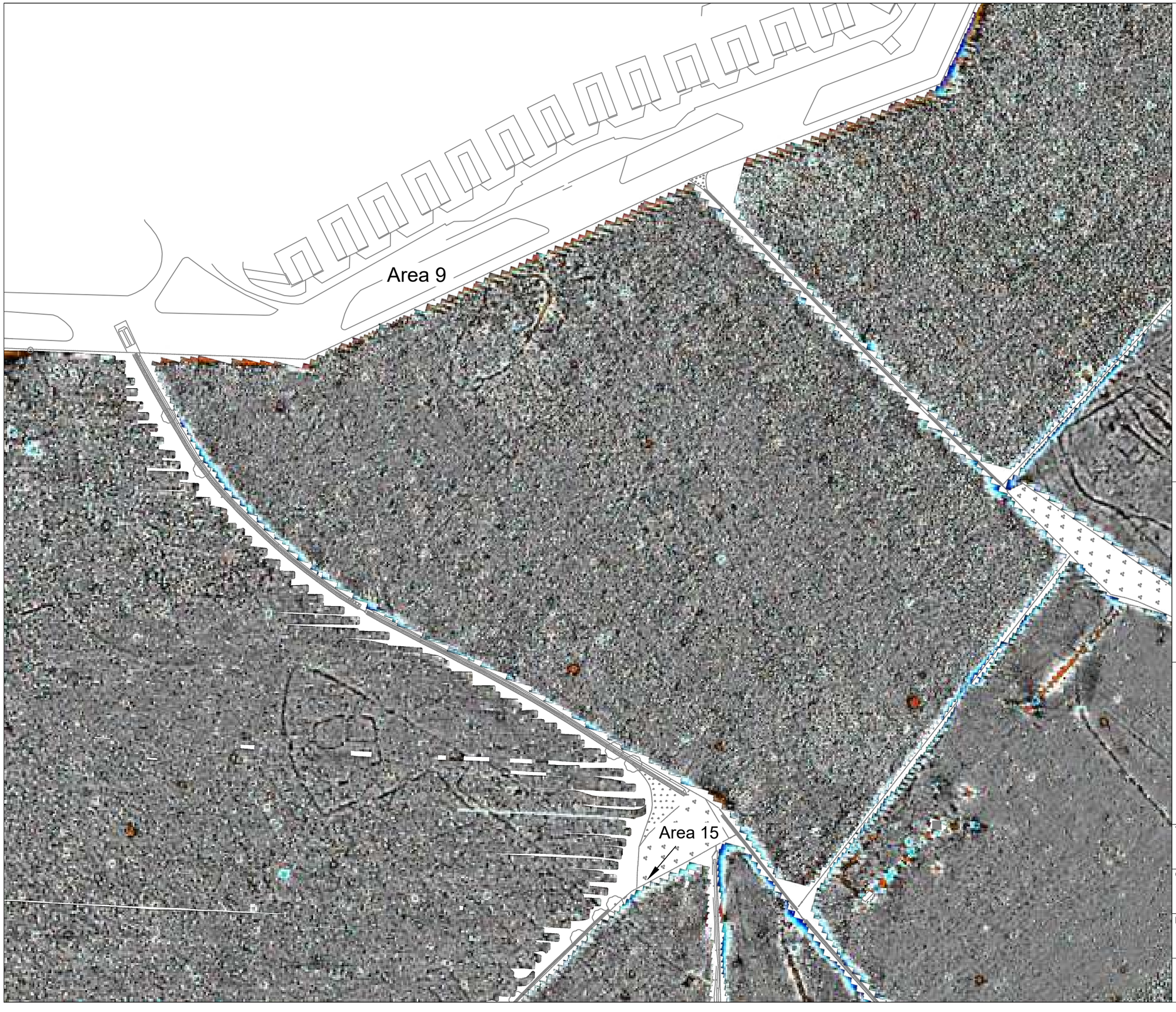
Title:
Magnetometer Survey - Greyscale Plots - Area 9

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
23



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots - Area 9

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
24

Area 9

Area 15

5

28

26

1

28

12

7

6

8

31

29

30

19

N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

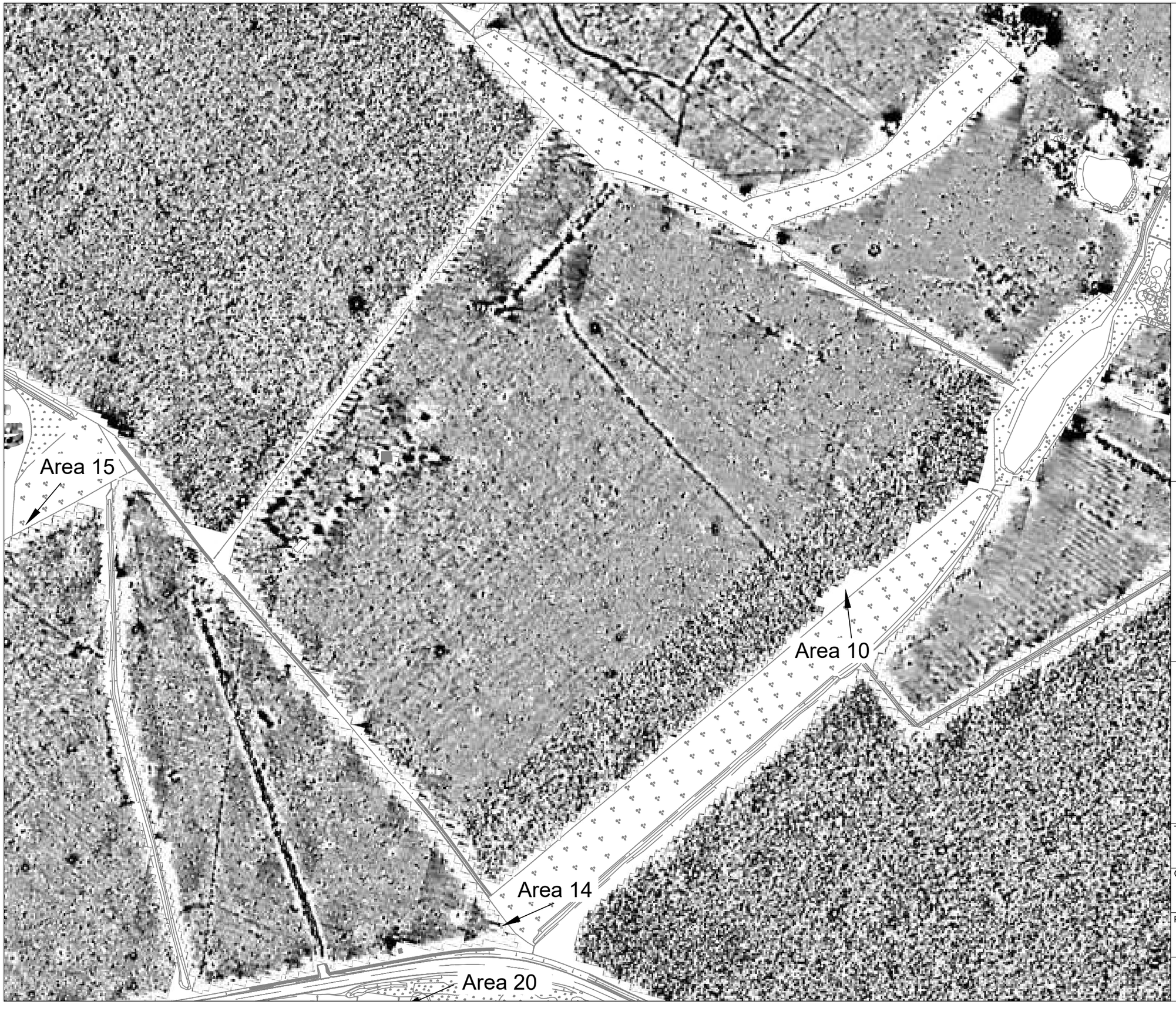
Title:
Magnetometer Survey - Interpretation - Area 9

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
25



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

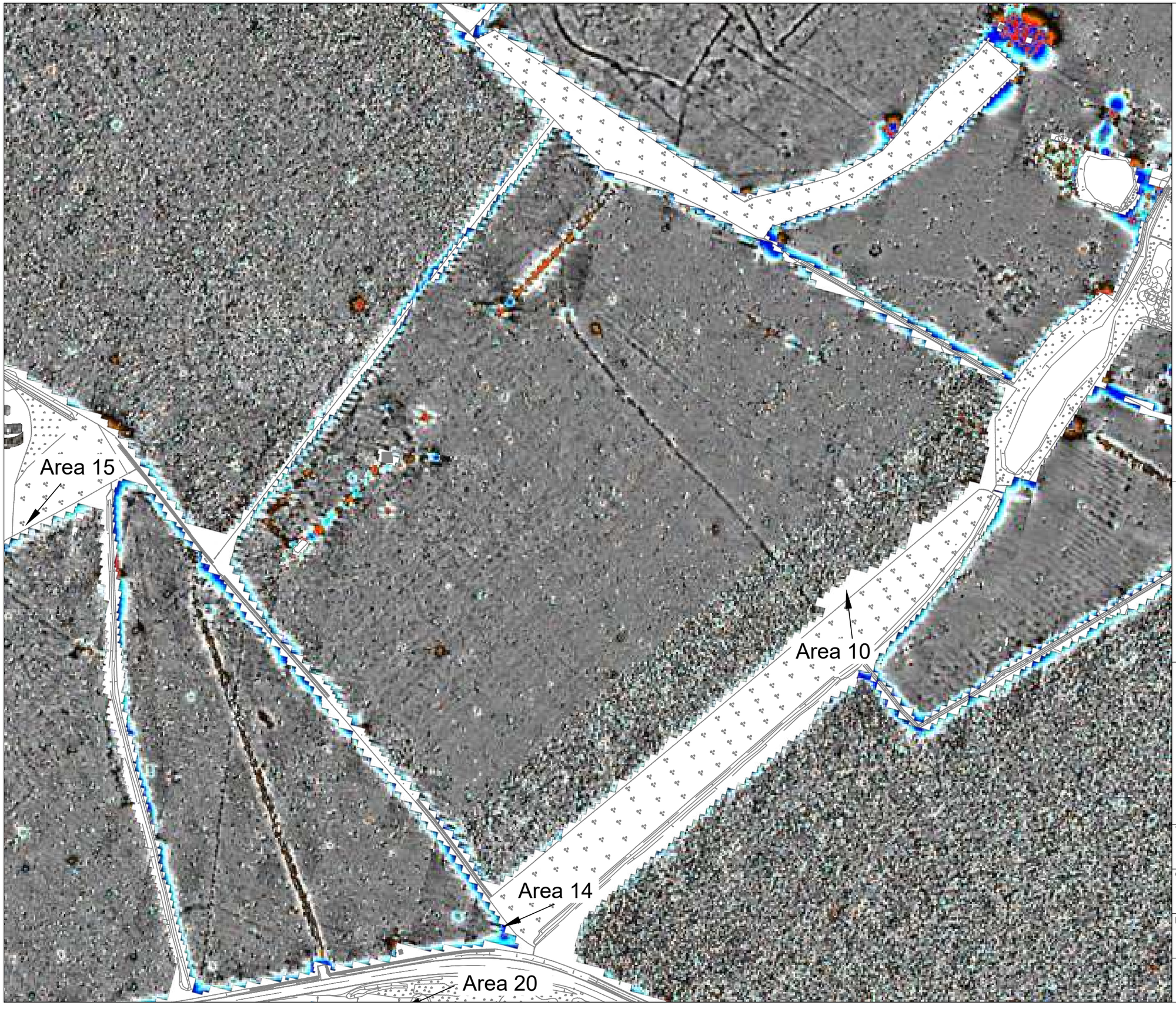
Title:
Magnetometer Survey - Greyscale Plots - Area 10

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
26



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

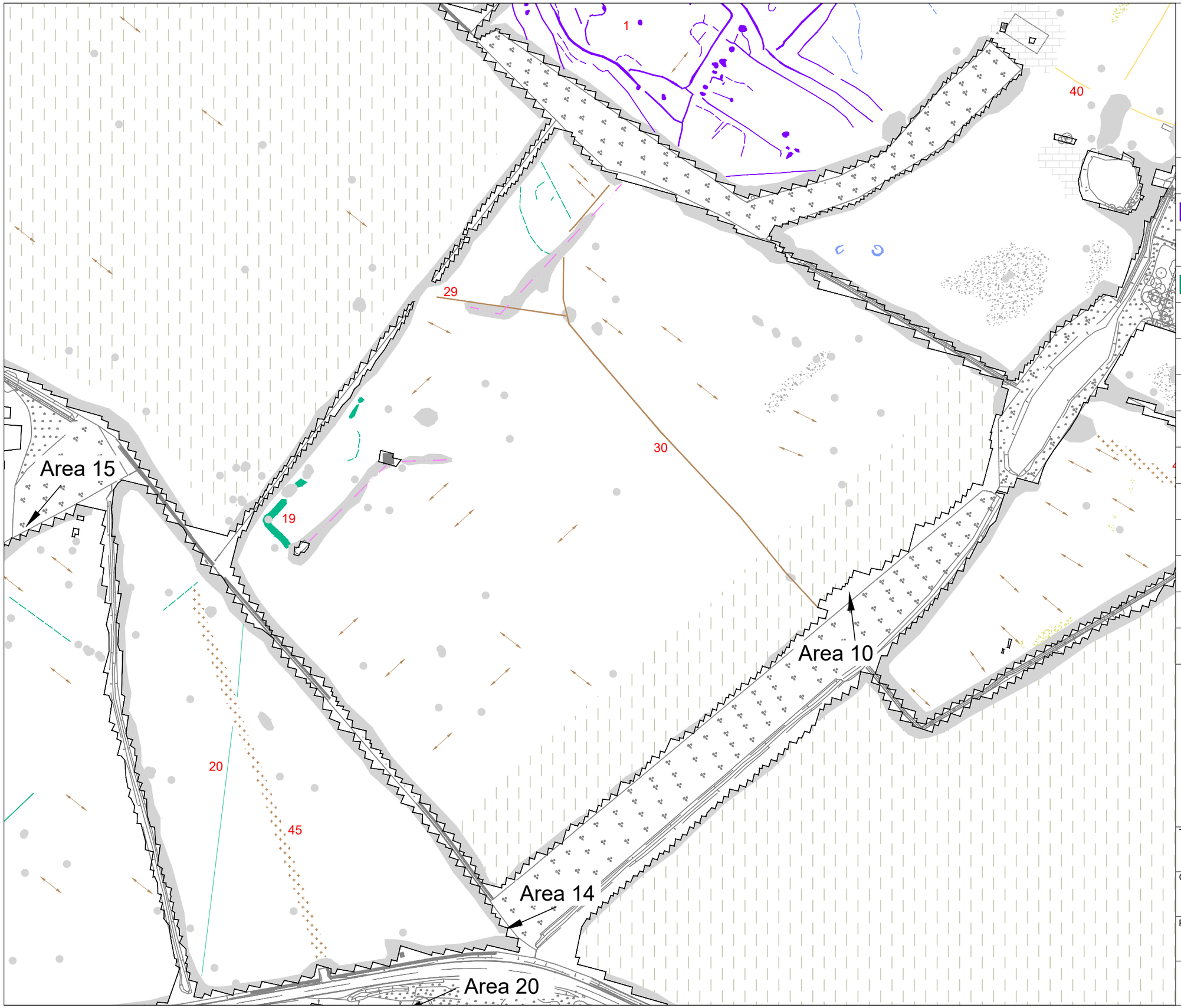
Title:
Magnetometer Survey - Colour Plots - Area 10

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
27



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Area 10

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
28



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

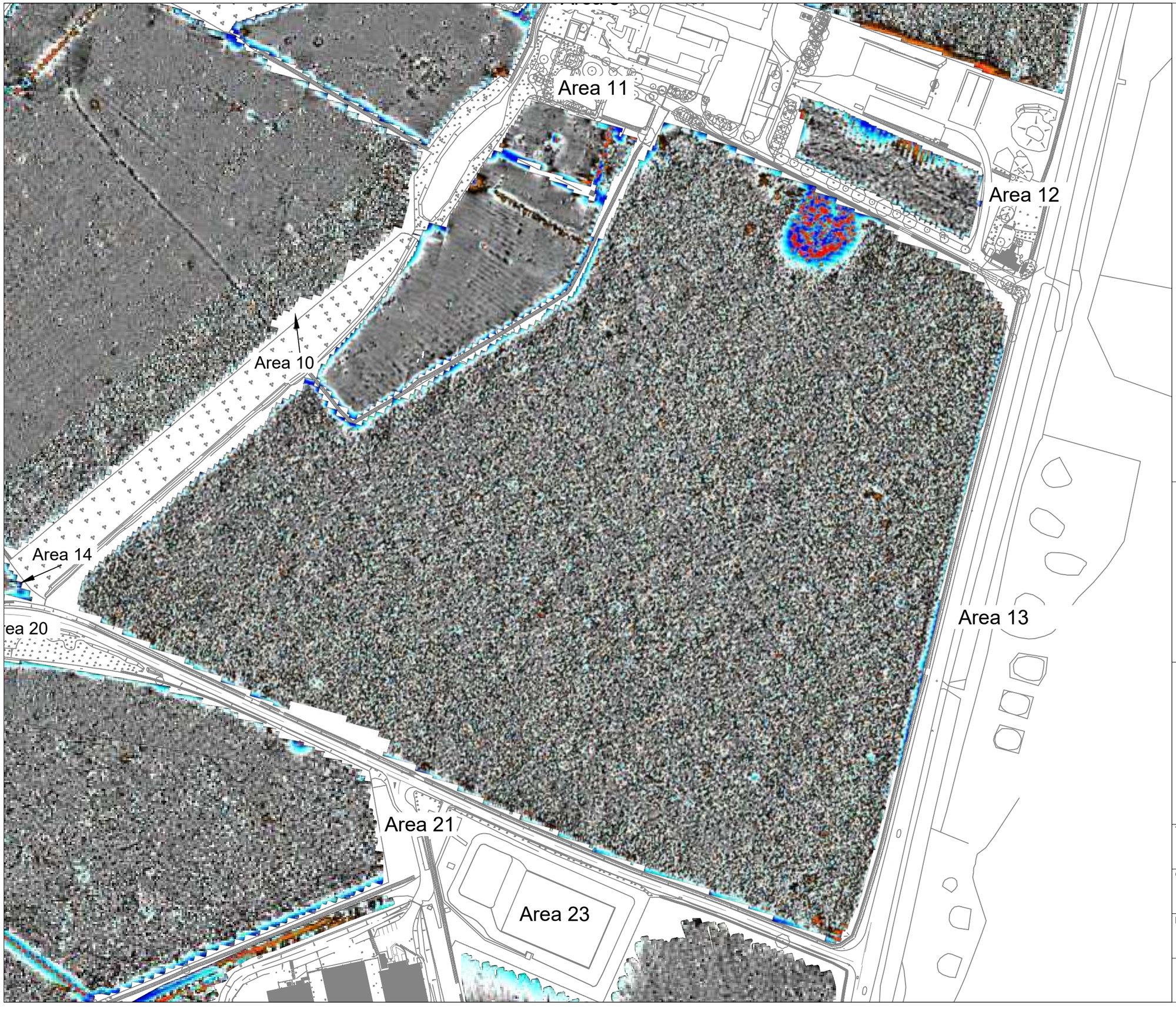
Title:
Magnetometer Survey - Greyscale Plots - Areas 11, 12 and 13

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
29



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

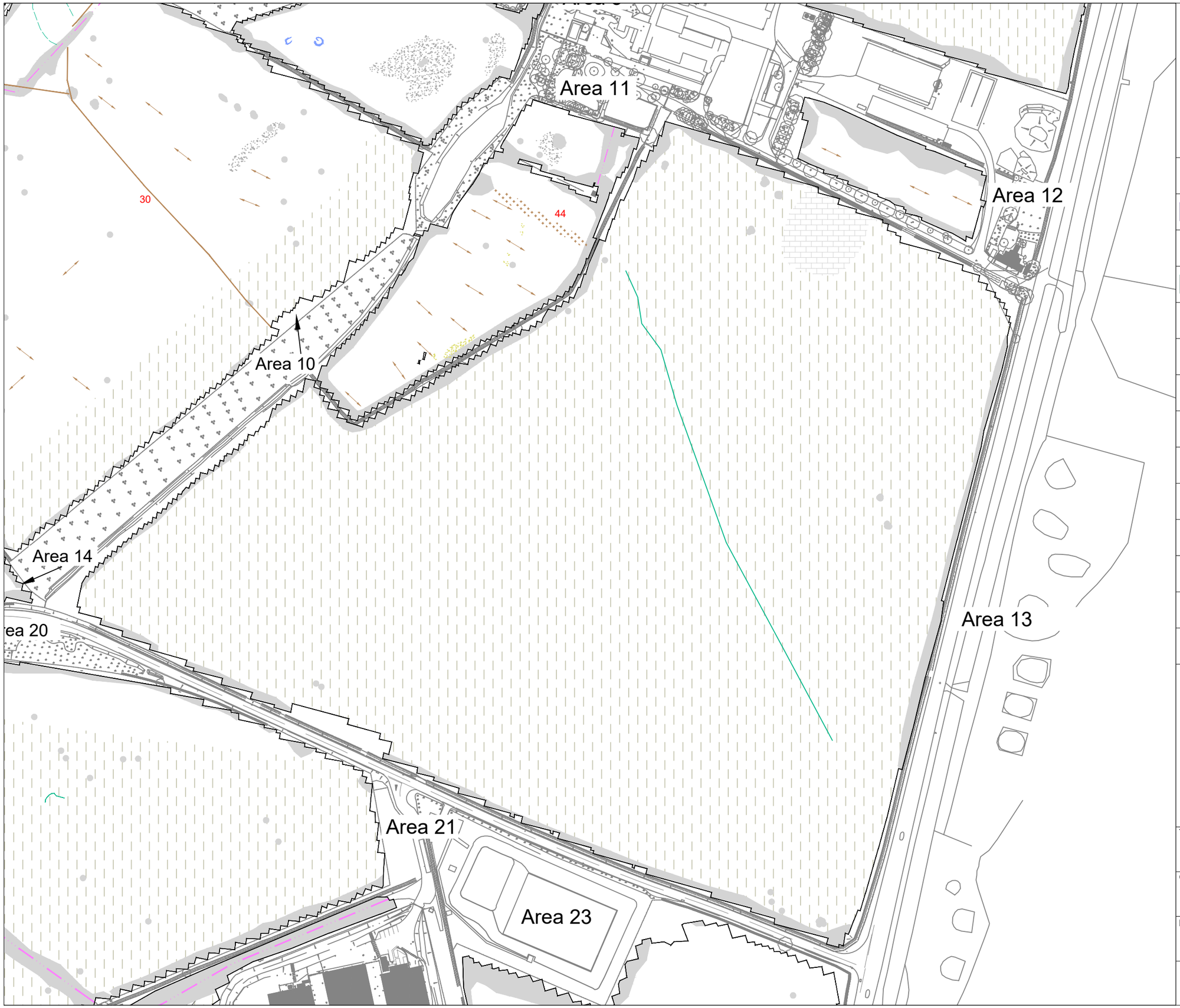
Title:
Magnetometer Survey - Colour Plots - Areas 11, 12 and 13

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
30



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

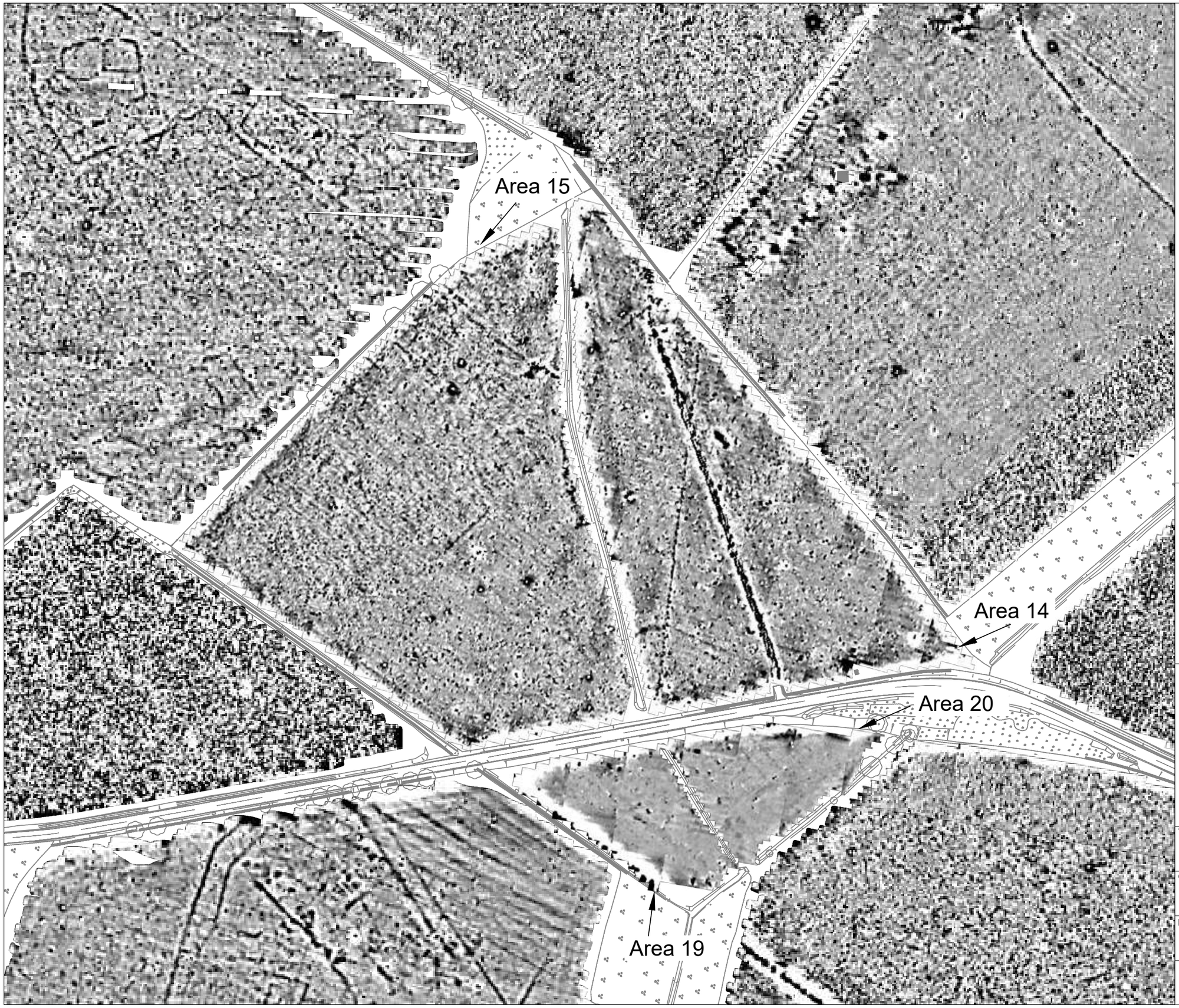
Title:
Magnetometer Survey - Interpretation - Areas 11, 12 and 13

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
31



N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

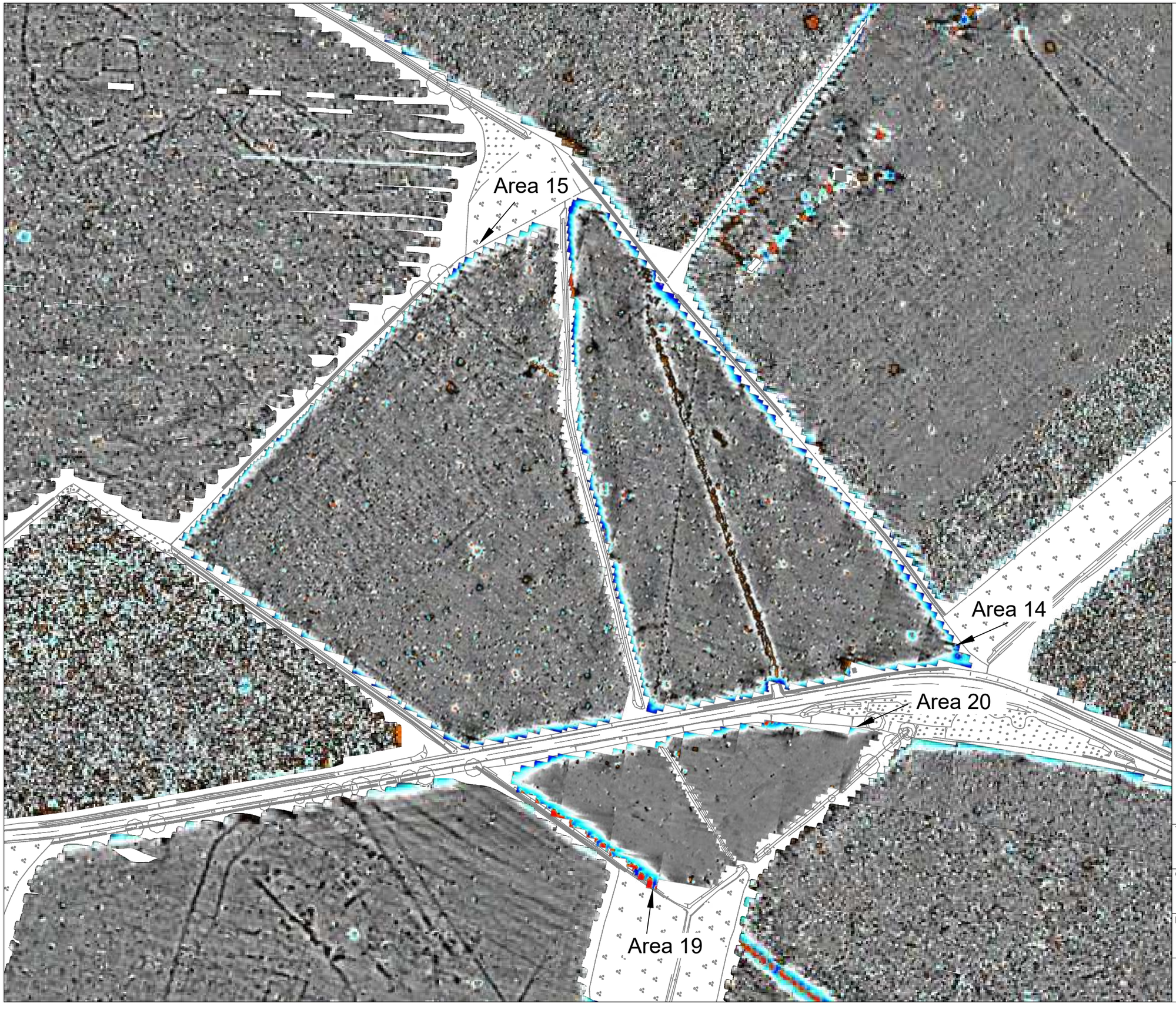
Title:
Magnetometer Survey - Greyscale Plots - Areas 14, 15

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
32



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

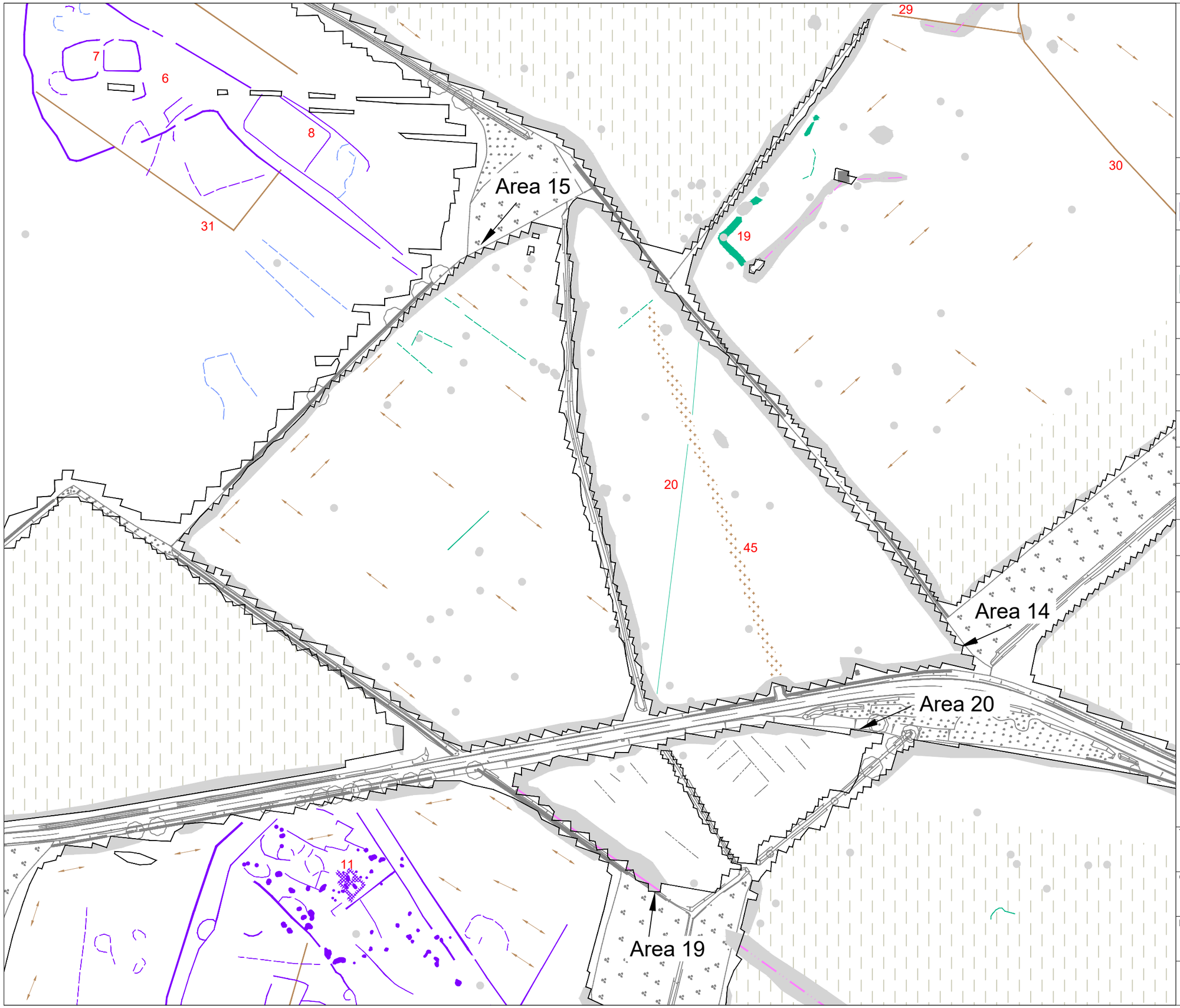
Title:
Magnetometer Survey - Colour Plots - Areas 14, 15

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
33



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

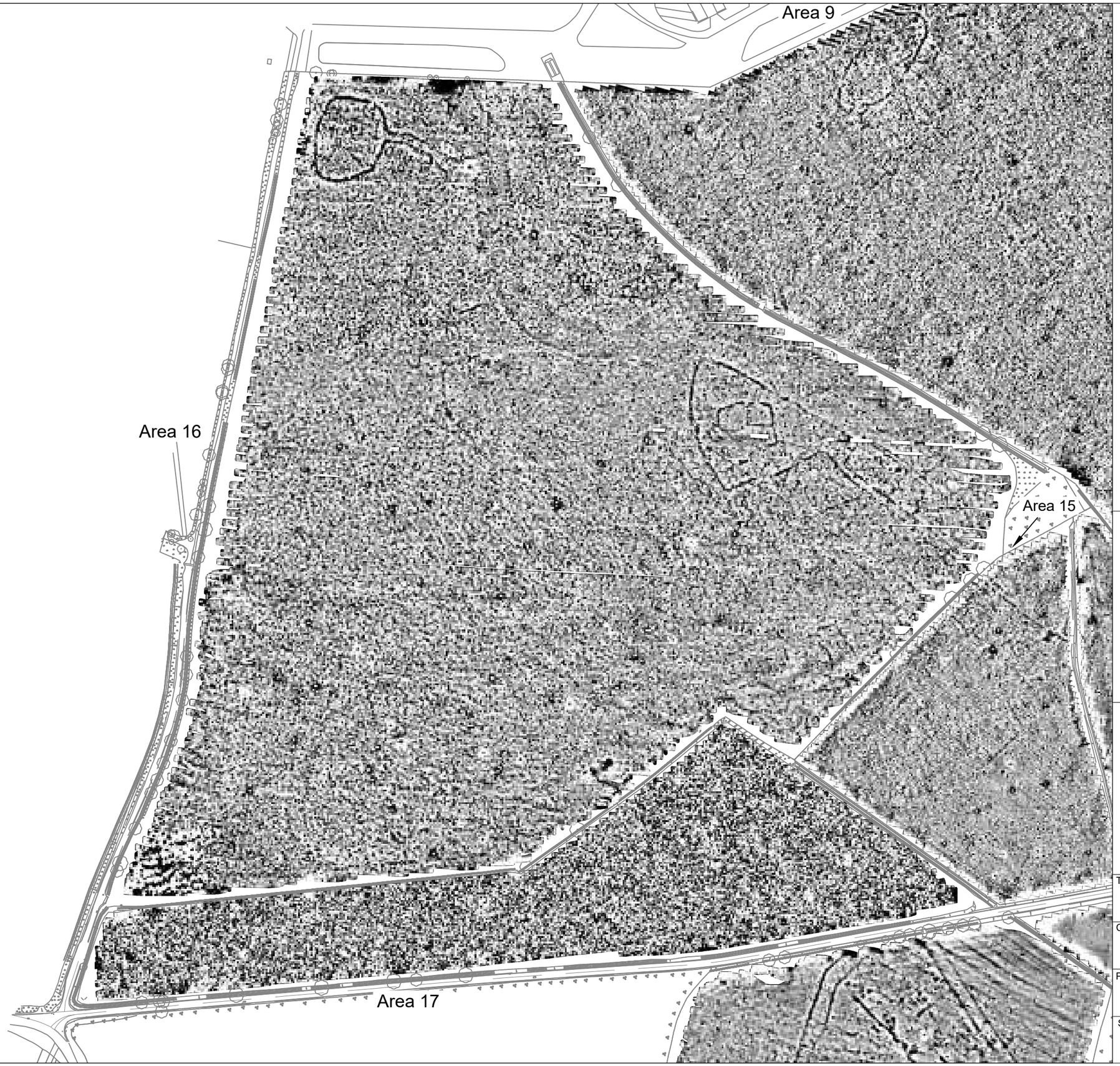
Title: Magnetometer Survey - Interpretation - Areas 14, 15

Client: RPS Consulting Services

Project: 02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale: 0 metres 100
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Fig No: 34



N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

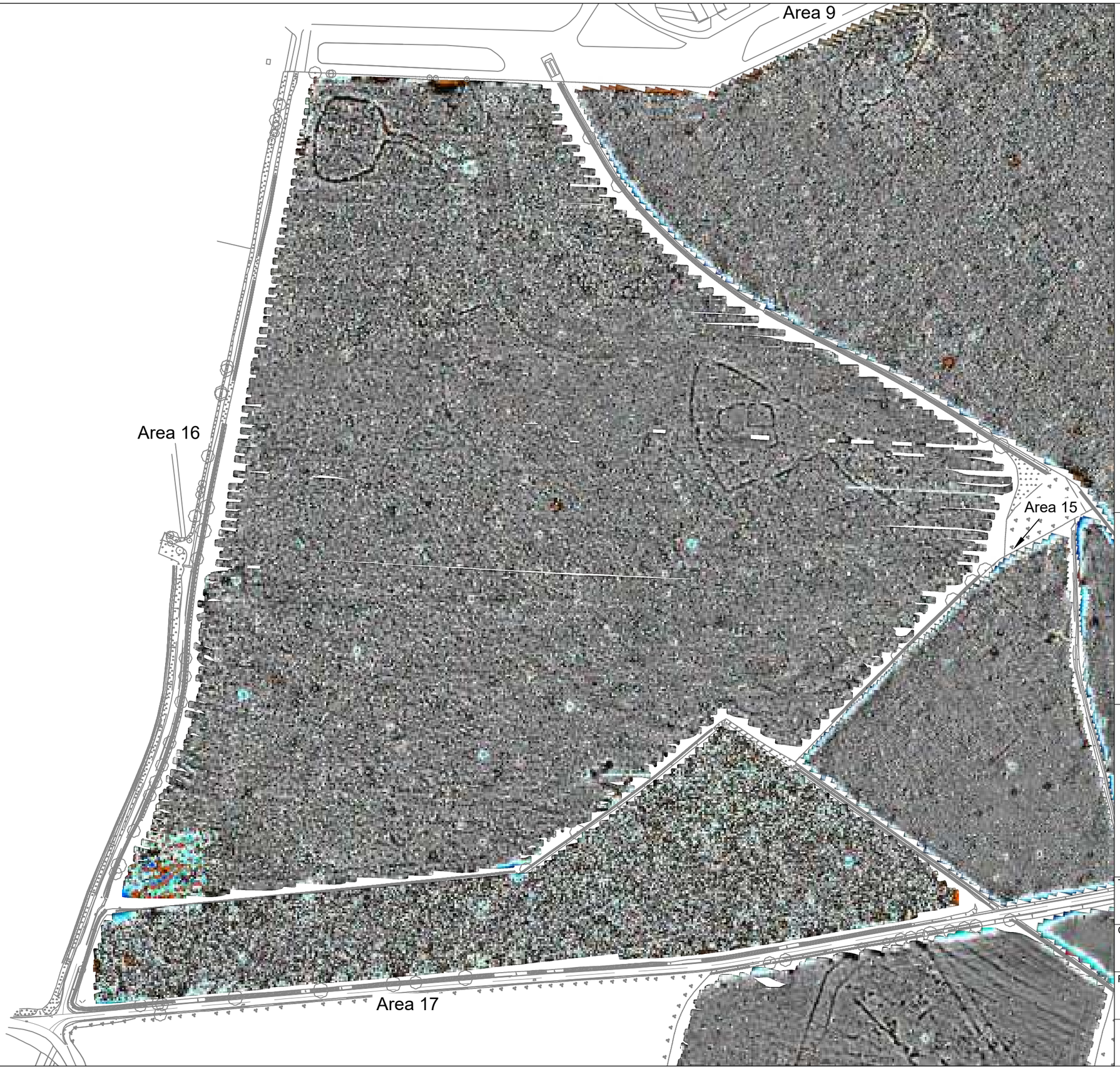
Title:
Magnetometer Survey - Greyscale Plots - Areas 16 and 17

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 150
1:3000 @ A3

Fig No:
35



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots - Areas 16 and 17

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 150
1:3000 @ A3

Fig No:
36



KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Areas 16 and 17

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 150
1:3000 @ A3

Fig No:
37



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Area 18

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
38



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

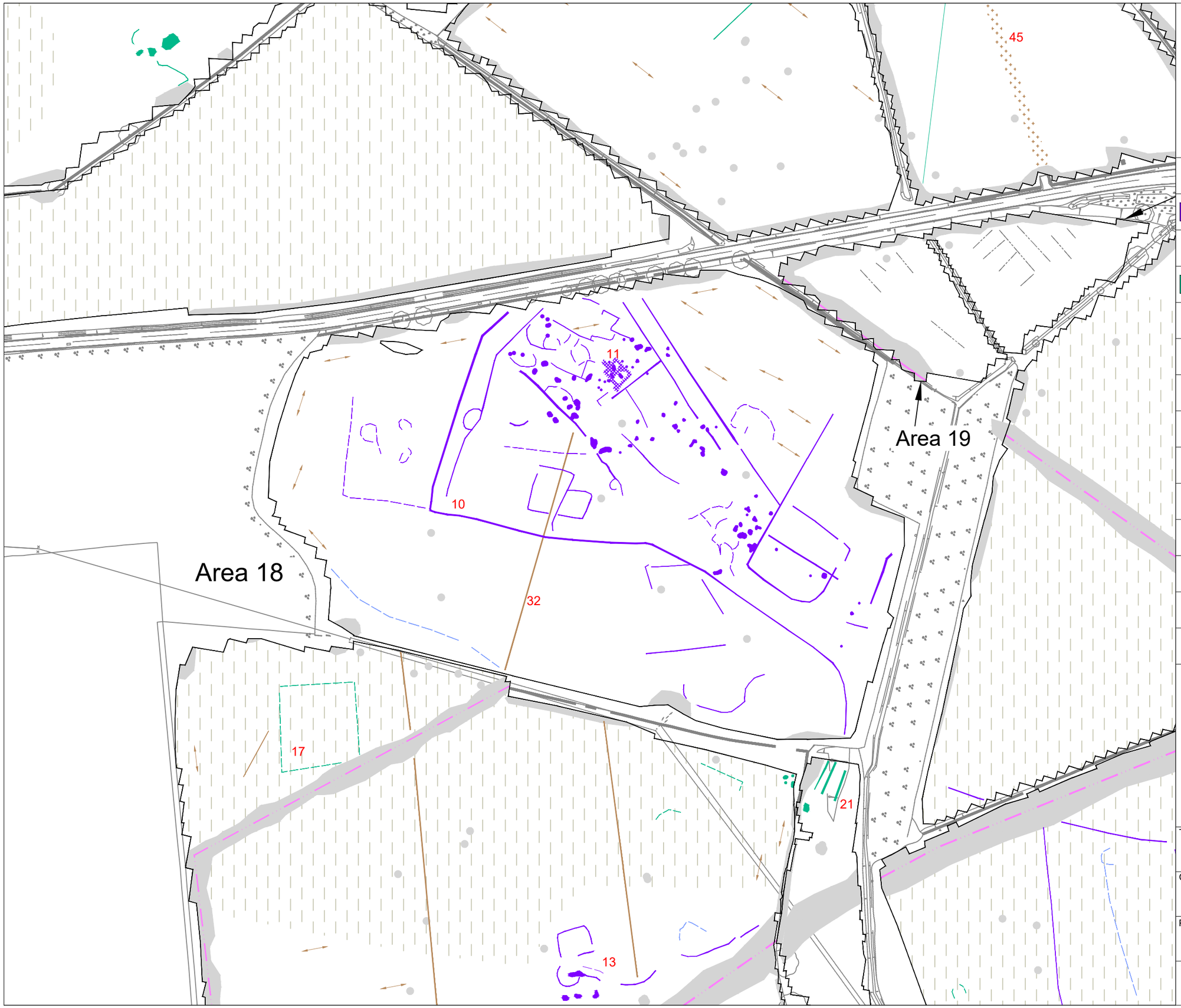
Title:
Magnetometer Survey - Colour Plots - Area 18

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
39



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Area 18

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
40



N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

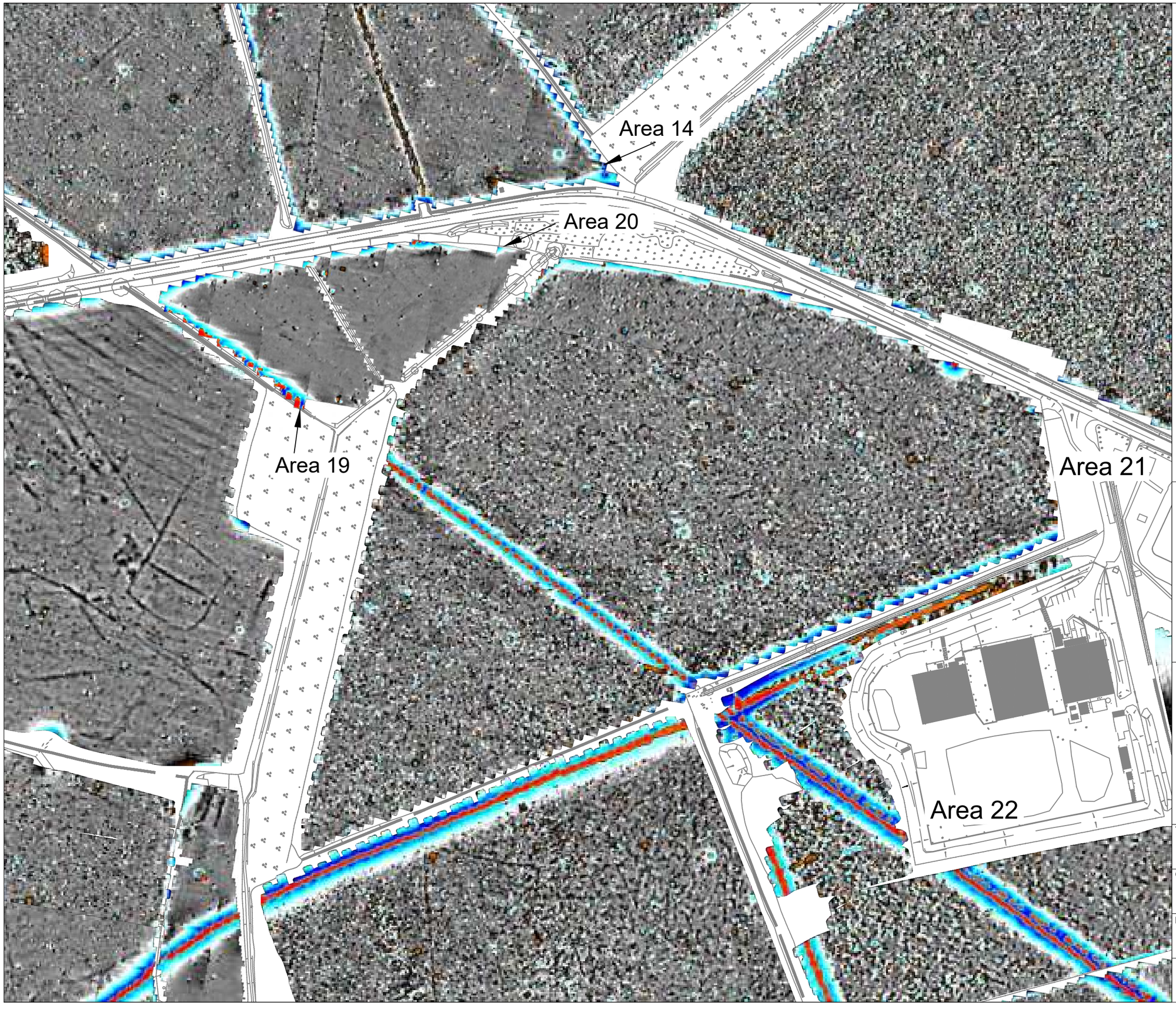
Title:
Magnetometer Survey - Greyscale Plots - Areas 19, 20 and 21

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
41



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

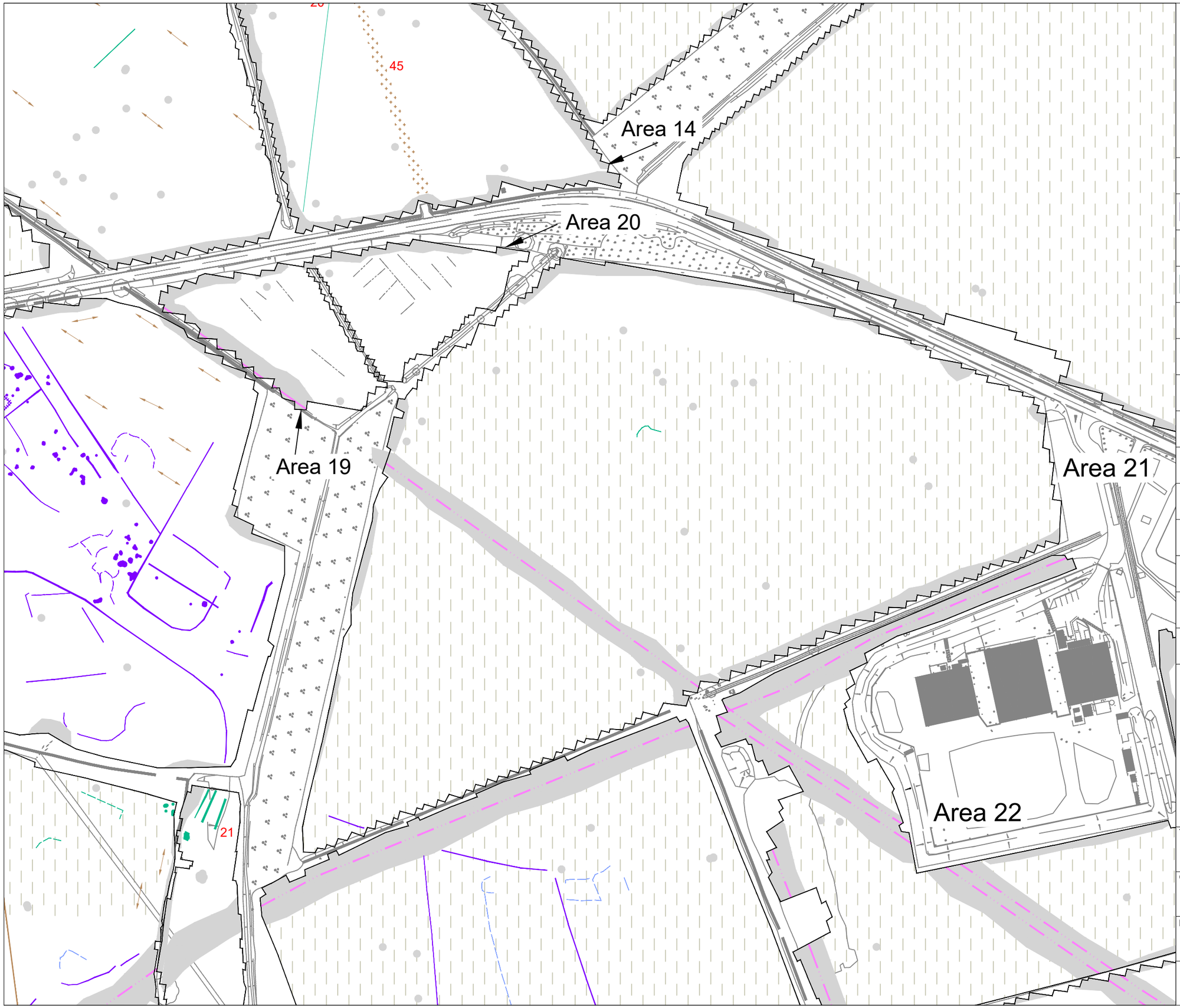
Title:
Magnetometer Survey - Colour Plots - Areas 19, 20 and 21

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
42



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

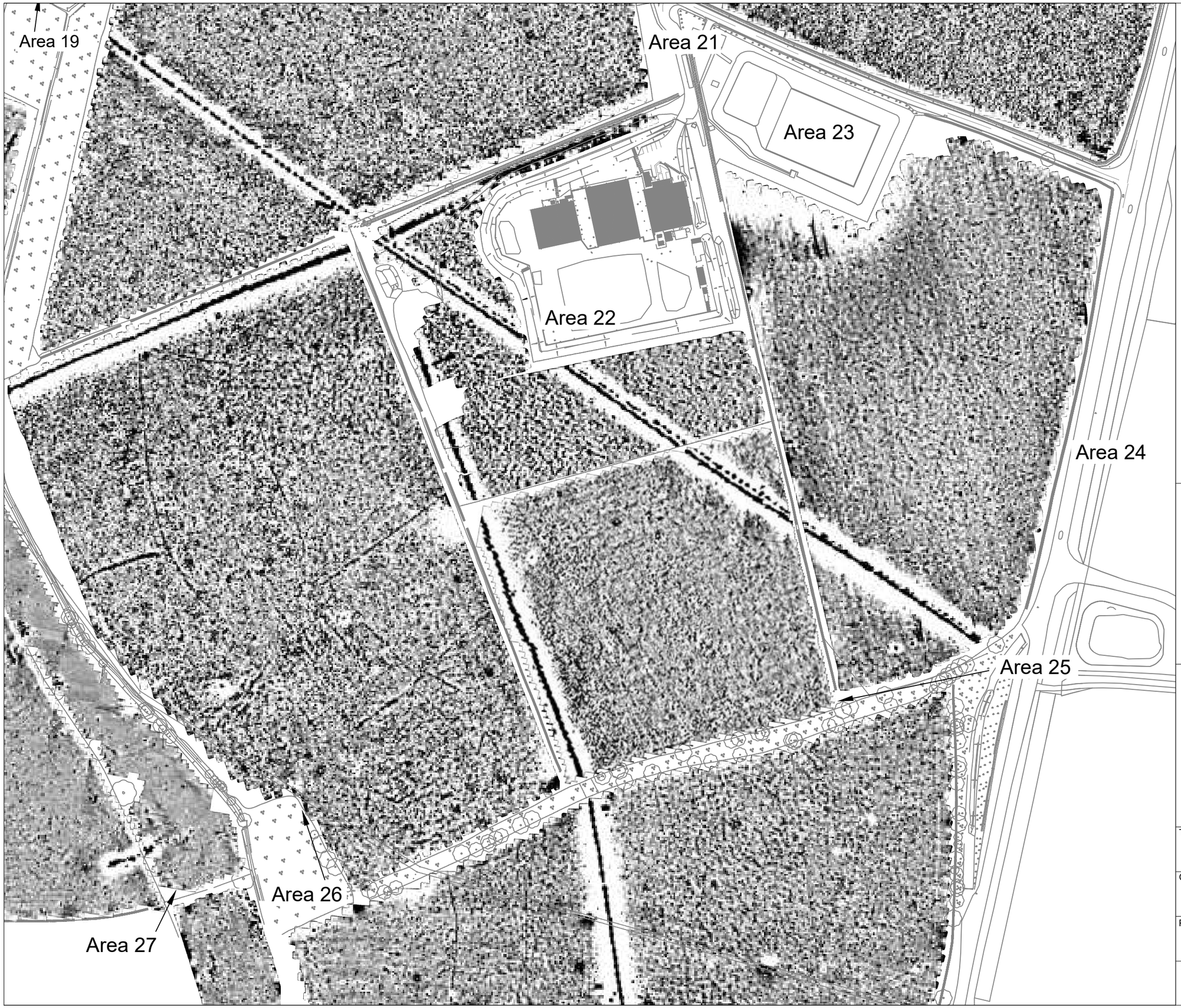
Title:
Magnetometer Survey - Interpretation - Areas 19, 20 and 21

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
43



N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Areas 22, 24, 25 and 26

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
44



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Colour Plots - Areas 22, 24, 25 and 26

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
45

Area 19

Area 21

Area 23

Area 22

Area 24

Area 25

Area 26

Area 27

12

12

35

36

41

42

43

37

N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Areas 22, 24, 25 and 26

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
46

Area 18

Area 26

Area 27

Area 29

N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Areas 27, 28 and 29

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
47



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

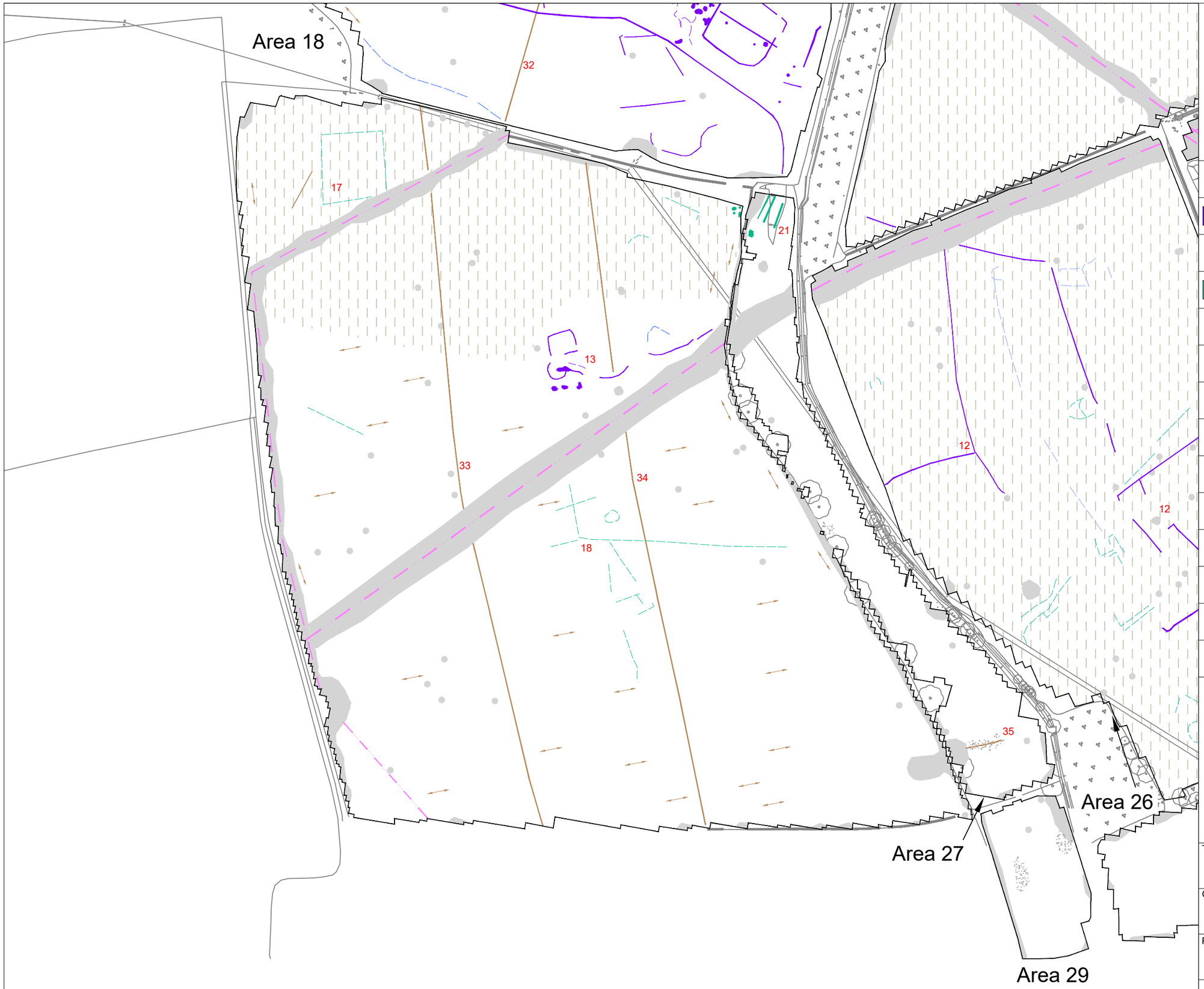
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Magnetometer Survey - Colour Plots - Areas 27, 28 and 29

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
48



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: Magnetometer Survey - Interpretation - Areas 27, 28 and 29

Client: RPS Consulting Services

Project: 02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale: 0 metres 125
1:2500 @ A3

Fig No: 49



N

+2nT

-1nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Greyscale Plots - Area 30

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
50



N

+100nT

-100nT

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

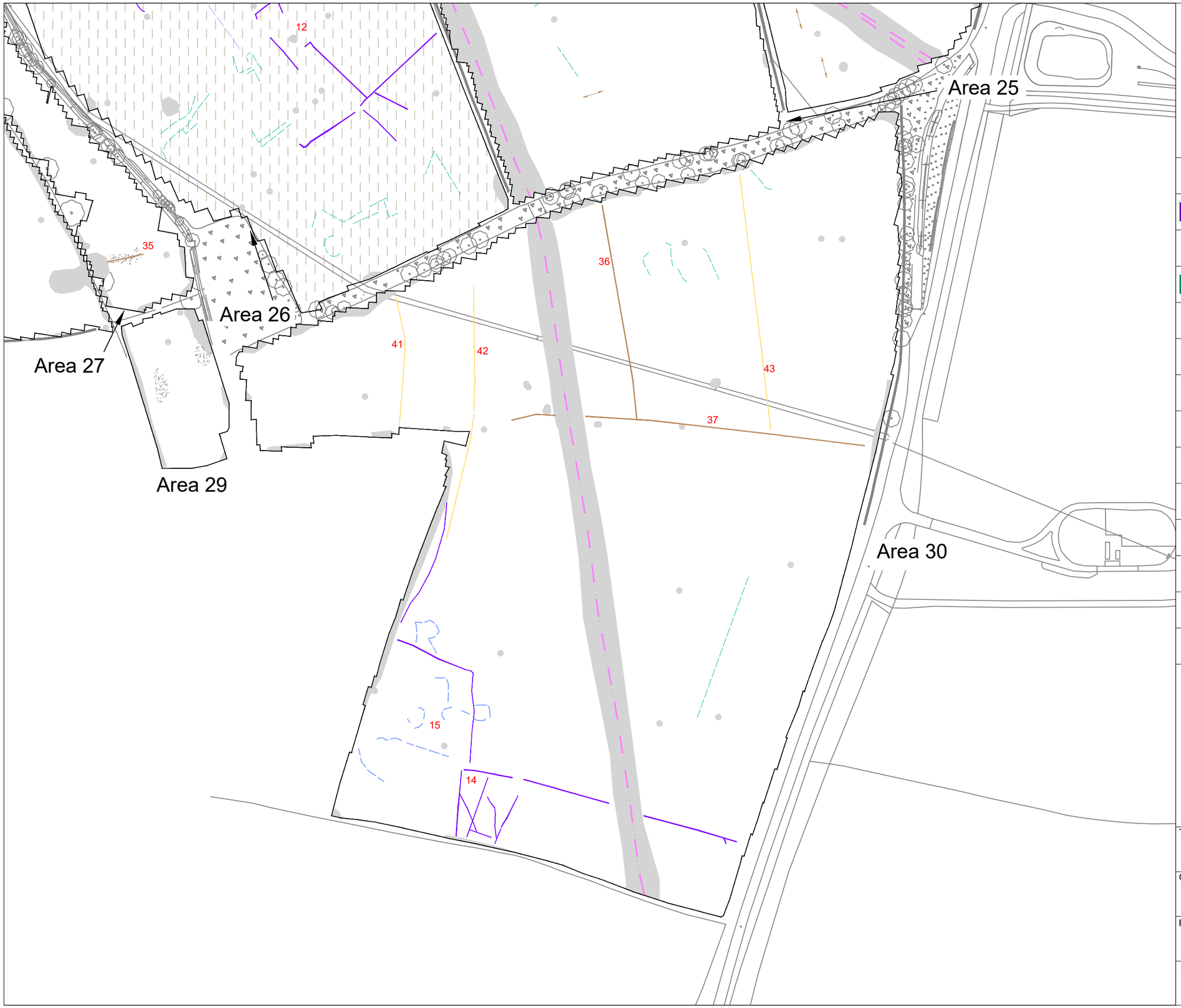
Title:
Magnetometer Survey - Colour Plots - Area 30

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
51



N

KEY

	Probable archaeology (discrete anomaly / trend / negative)
	Possible archaeology (discrete anomaly / trend)
	Uncertain Origin (discrete anomaly / trend / negative)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Agriculture (plough / ridge and furrow)
	Track (corroborated)
	Land drain
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Green waste
	Service
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Magnetometer Survey - Interpretation - Area 30

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
52



N

KEY

Old field boundary detected by survey

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
1839 Ardley Tithe Map and 1841 Middleton Tithe Map

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
NTS

Fig No:
53



N

+10nT

-10nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Minimally Processed Data - Greyscale Plots - Overview

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 575
1:11,500 @ A3

Fig No:
54



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Overview

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 575
1:11,500 @ A3

Fig No:
55



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

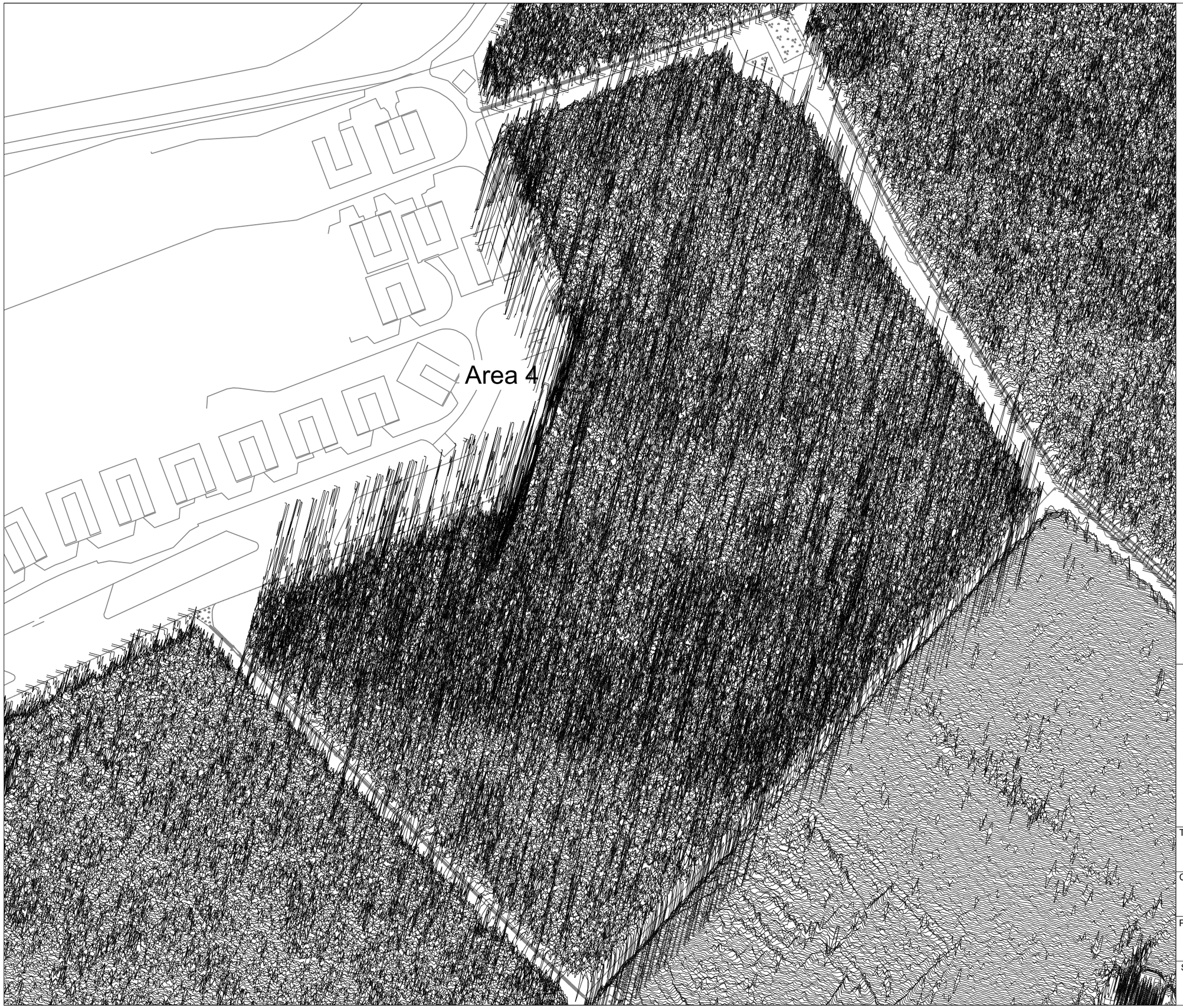
Title:
XY Trace Plots (clipped at +/-15nT) - Areas 1, 2 and 3

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
56



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 4

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
57



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 5

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
58



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 6

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
59

Area 6

Area 7

Area 8

Area 11

Area 12

N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 7

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
60



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

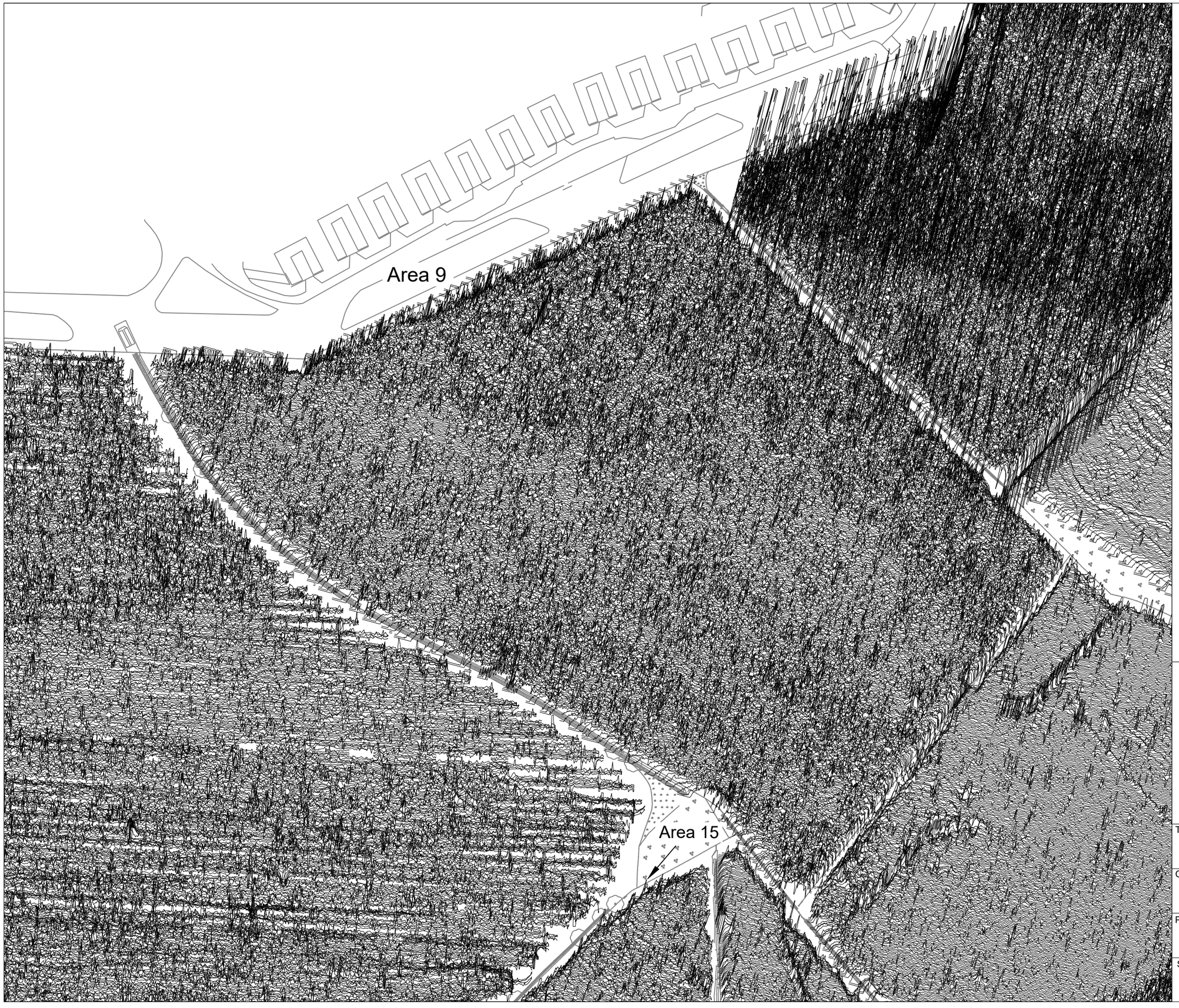
Title:
XY Trace Plots (clipped at +/-15nT) - Area 8

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
61



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 9

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
62



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 10

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
63



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

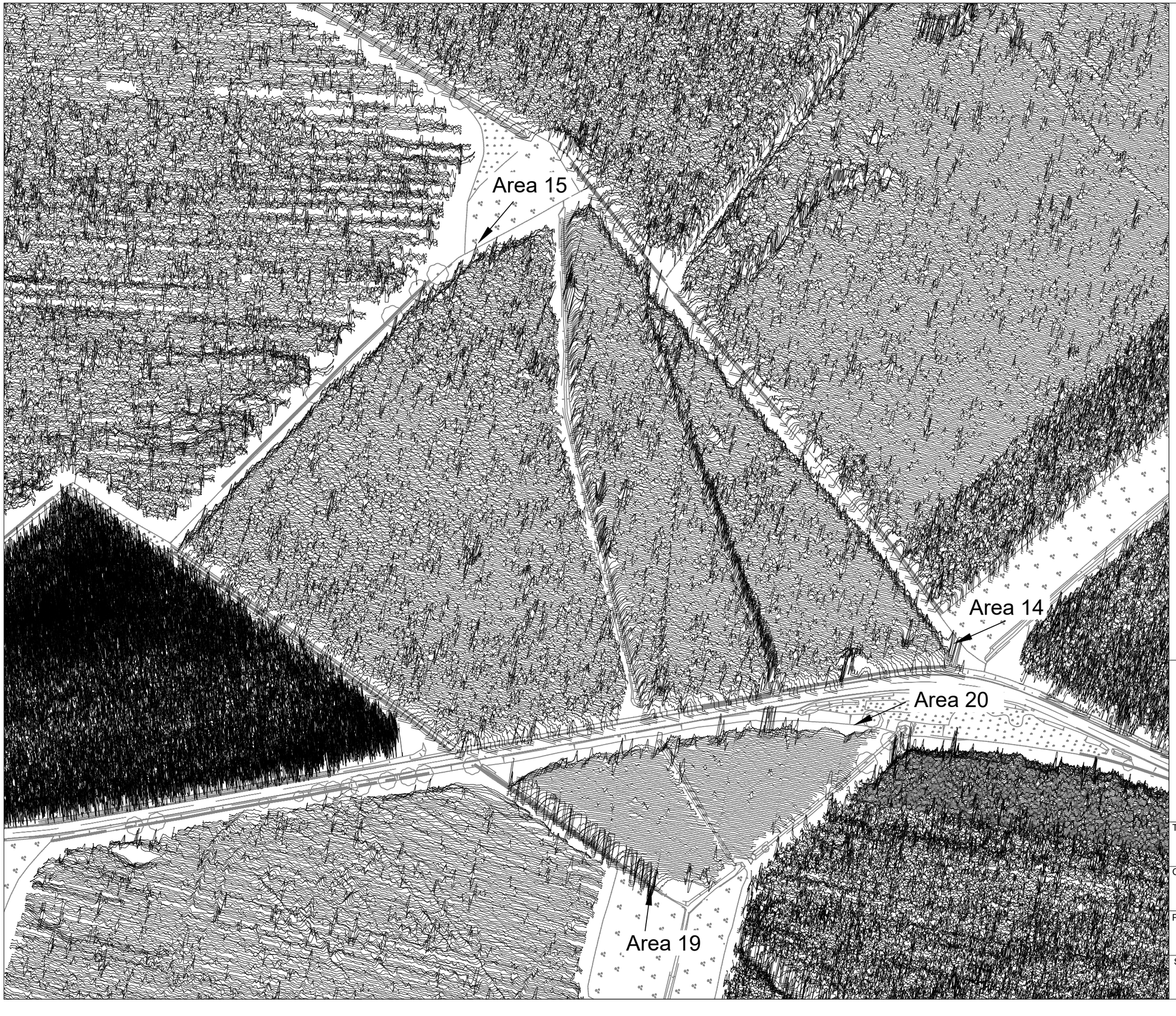
Title:
XY Trace Plots (clipped at +/-15nT) -
Areas 11, 12 and 13

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
64



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) -
Areas 14 and 15

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
65



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Areas 16 and 17

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 150
1:3000 @ A3

Fig No:
66



sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 18

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
67



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) -
Areas 19, 20 and 21

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
68



sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) -
Areas 22, 24, 25 and 26

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
69

Area 18

N

Area 26

Area 27

Area 29

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title: XY Trace Plots (clipped at +/-15nT) - Areas 27, 28 and 29

Client: RPS Consulting Services

Project: 02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale: 0 metres 125

1:2500 @ A3

Fig No: 70



sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
XY Trace Plots (clipped at +/-15nT) - Area 30

Client:
RPS Consulting Services

Project:
02545 - Oxfordshire Strategic Rail Freight Interchange, Ardley, Oxfordshire

Scale:
0 metres 125
1:2500 @ A3

Fig No:
71

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.

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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.

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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).

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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.

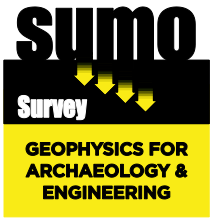
Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and 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.

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- Geophysical
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- Measured Building
- Topographic
- Utility Mapping

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