

LEBA22



## Land East of J11, M40, Banbury

### GEOPHYSICAL SURVEY REPORT

Headland Archaeology Yorkshire & North  
Units 23–25 & 15 | Acorn Business Centre | Balme Road | Cleckheaton BD19 4EZ

for Greystoke CB

04/10/2022

## PROJECT INFORMATION:

PROJECT NAME	Land East of J11, M40, Banbury
TYPE OF WORK	Geophysical Survey
PLANNING REF.	n/a
PARISH NO.	n/a
CONSULTANT/AGENT	Pegasus Group
CLIENT	Greystoke CB
PROJECT CODE	LEBA22
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PARISH	Banbury civil parish
LOCAL AUTHORITY	Cherwell District Council
FIELDWORK DATES	22/08/2022 – 02/09/2022
OASIS REF.	Headland1-509847
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## PROJECT TEAM:

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GRAPHICS	Ross Bishop, Sam Harrison

## PROJECT SUMMARY

*Headland Archaeology (UK) Ltd was commissioned by Pegasus Group on behalf of Greystoke CB (the Client), to undertake a geophysical survey, covering approximately 66 hectares, on land east of Junction 11, M40, Banbury, where an outline planning application has been submitted for the construction of industrial units with ancillary offices, associated servicing and infrastructure, new site accesses, internal roads and footpaths, landscaping, drainage features and other associated works. The results may also inform future archaeological strategy, if required.*

*The survey has shown that 16 out of the 19 fields within the proposed development area (PDA) have had organic ('green') waste spread across them recently. The effects of this material are such that the usually weaker magnetic responses from archaeological features, if present, can potentially be masked by the higher magnitude readings from the green waste. Anomalies indicative of ridge and furrow cultivation are also recorded in all but the steepest, easternmost, fields within the site boundary. The combined effects of the soil improver and the ridge and furrow cultivation strips are potentially detrimental to resolving small and/or low magnitude (archaeological) anomalies, if present. However, it is not thought in this case that any extensive or 'significant' archaeological anomalies/features would be completely masked. The complete absence of any anomalies of possible or probable archaeological origin is therefore most likely an accurate indication of the archaeological potential of this site, although the possibility of features of archaeological origin cannot be completely dismissed.*

**TABLE OF CONTENTS**

1.	<u>INTRODUCTION</u>	1
	1.1. SITE LOCATION, TOPOGRAPHY AND LAND-USE	1
	1.2. GEOLOGY AND SOILS	1
2.	<u>ARCHAEOLOGICAL BACKGROUND</u>	2
3.	<u>AIMS, METHODOLOGY &amp; PRESENTATION</u>	3
	3.1. AIMS & OBJECTIVES	3
	3.2. METHODOLOGY	3
	3.3. DATA PRESENTATION & TECHNICAL DETAIL	3
4.	<u>RESULTS AND DISCUSSION</u>	4
	4.1. SITE CONDITIONS	4
	4.2. FERROUS AND MODERN ANOMALIES	4
	4.3. AGRICULTURAL ANOMALIES	5
	4.4. ANOMALIES OF UNCERTAIN ORIGIN	5
	4.5. ANOMALIES OF POSSIBLE ARCHAEOLOGICAL ORIGIN	5
5.	<u>CONCLUSION</u>	5
6.	<u>REFERENCES</u>	5
7.	<u>APPENDICES</u>	6
	APPENDIX 1 MAGNETOMETER SURVEY	6
	APPENDIX 2 SURVEY LOCATION INFORMATION	7
	APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE	7
	APPENDIX 4 DATA PROCESSING	7

## LIST OF ILLUSTRATIONS

Illus 1 Site location (1:12,000)

Illus 2 F16, looking west

Illus 3 F3, looking north-east

Illus 4 F19, looking north-northwest

Illus 5 F6, unsuitable area looking east-northeast

Illus 6 Geophysical survey area showing GPS swaths and photograph locations (1:5,000)

Illus 7 Overall greyscale plot of processed magnetometer data -1 to +2nT (1:5,000)

Illus 8 Overall greyscale plot of processed magnetometer data -8 to +8nT (1:5,000)

Illus 9 Overall interpretation of magnetometer data (1:5,000)

Illus 10 Processed greyscale magnetometer data; Sector 1 (1:2,500)

Illus 11 XY trace plot of minimally processed magnetometer data; Sector 1 (1:2,500)

Illus 12 Interpretation of magnetometer data; Sector 1 (1:2,500)

Illus 13 Processed greyscale magnetometer data; Sector 2 (1:2,500)

Illus 14 XY trace plot of minimally processed magnetometer data; Sector 2 (1:2,500)

Illus 15 Interpretation of magnetometer data; Sector 2 (1:2,500)

Illus 16 Processed greyscale magnetometer data; Sector 3 (1:2,500)

Illus 17 XY trace plot of minimally processed magnetometer data; Sector 3 (1:2,500)

Illus 18 Interpretation of magnetometer data; Sector 3 (1:2,500)

# LAND EAST OF J11, M40, BANBURY

## GEOPHYSICAL SURVEY REPORT

### 1. INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Pegasus Group on behalf of Greystoke CB (the Client), to undertake a geophysical survey on land close to Junction 11 on the M40, east of Banbury, Oxfordshire (Illus 1) where an outline planning application has been submitted for the construction of up to 140,000 sqm of employment floorspace (use class B8 with ancillary offices and facilities), and associated servicing and infrastructure including new site accesses, internal roads and footpaths, landscaping including earthworks to create development platforms and bunds, drainage features and other associated works. The results of the survey may also inform future archaeological strategy, if required.

The scheme of work was undertaken in accordance with the requirements of the National Planning Policy Framework (MHCLG 2021) and with the Written Scheme of Investigation for Geophysical Survey (WSI) (Headland Archaeology 2022), approved by Victoria Green, Planning Archaeologist at Oxfordshire County Archaeology Services,

The WSI was produced to the standards laid down in the European Archaeological Council's guideline publication EAC Guidelines for the Use of Geophysics in Archaeology (Europae Archaeologia Consilium 2016), the Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Archaeological Geophysical Survey (CIfA 2014). The survey was also carried out in line with the same best practice guidelines.

The survey was carried out between August 24th and September 2nd, 2022.

#### 1.1. SITE LOCATION, TOPOGRAPHY AND LAND-USE

The Proposed Development Area (PDA) covers approximately 66 hectares and is divided into 19 fields (F1 to F19) which are defined by mature hedgerows, trees, and agricultural fencing. All fields were grazed permanent pasture at the time of the survey (Illus 2 to Illus 5 inclusive).

Huscote Farmhouse, centred at NGR 447740, 242487, is located within the central northern part of the PDA; the associated disused farm buildings (located immediately north of the farmhouse) are excluded from the PDA. The boundaries of the PDA are defined by hedgerows, mature trees, and small pockets of woodland. The PDA is bounded by the A422 to the south, and the A361 to the west. More agricultural land lies to the north and east. Overthorpe Hall, now Carrdus School, lies approximately 250m south-east of the PDA, separated by fields and dense woodland. To the west of the A361 and opposite the PDA is the recently consented commercial development of Frontier Park, currently under construction.

The PDA slopes up from west to east being approximately 100m AOD in the west to approximately 150m AOD at its easternmost extent.

#### 1.2. GEOLOGY AND SOILS

Most of the PDA lies on a bedrock of Charmouth Mudstone Formation, whereas the easternmost extent lies on Dyrham Formation Siltstone and Mudstone. Both are sedimentary rocks formed approximately 183 to 199 million years ago in the Jurassic Period in a local environment previously dominated by shallow seas. No superficial geology is recorded (UKRI 2022).

Soils are described as slowly permeable, seasonally wet, slightly acid, but base-rich with a loamy and clayey texture and are classified in the Soilscape 18 Association (Cranfield University 2022).

## 2. ARCHAEOLOGICAL BACKGROUND

A detailed Heritage Desk-based Assessment for the PDA and surrounding area has been produced (Pegasus Group 2022) and the information in this section has been abstracted from this document.

The conjectured route of a prehistoric travel corridor ('the Jurassic Way') is plotted as intersecting the southernmost corner of the PDA (MNN160137). Another branch is plotted as passing close to the north-west corner of the site. These 'corridors' correspond with general evidence for movements between Yorkshire and Somerset from as early as the Neolithic and extending into the Iron Age. However, the plotted lines do not correspond with any clearly defined landscape features within or close to the PDA.

Evaluation of the area immediately to the west of the PDA revealed evidence of Romano-British agricultural activity dating from the 2nd, 3rd, and 4th centuries AD (EOX6925, EOX6926 & MOX27918) including ditches containing various remains and assemblages, including 2nd- to 4th-century pottery, a cremated human bone, charred cereal grains and wheat varieties consistent with Romano-British diets, and cattle bones. Together, these remains were taken as evidence of prolonged and intensive Romano-British cultivation activity, with a possible shift of focus from arable agriculture to husbandry in the 3rd/4th century.

No prehistoric or Romano-British remains have been recorded within the PDA although extensive evidence of prehistoric and Romano-British activity has also been recorded in the wider study area including:

- A possible Iron Age to Romano-British settlement, including rectilinear enclosures, a possible trackway, and round houses, 600m north-north-west of the PDA (MNN115433),
- Two conjectured routes of a Roman road ('Port Way') are plotted 600m south of the

PDA, although the existence of the road has not been verified,

- A possible late Prehistoric rectangular enclosure visible as cropmarks 710m west-north-west of the PDA (MOX4535),
- A possible Prehistoric to Romano-British multi-phase settlement revealed by a geophysical survey c. 800m north of the PDA (MNN115429),
- A scatter of Mesolithic flints found 900m south-south-west of the PDA (MOX4626),
- Late Neolithic pits and ditches excavated 900m west-south-west of the PDA in the vicinity of the later medieval settlement of Old Grimsbury (MOX4565),
- A possible Prehistoric or Romano-British settlement recorded as cropmarks 950m north-east of the PDA (MNN172276),
- Neolithic to Bronze Age flints and evidence of Romano-British settlement excavated 950m north-west of the PDA in the vicinity of the later medieval village of Hardwick (MOX4496); and
- Neolithic pits, ditches and associated finds, a possible Bronze Age bucket urn, and a late Iron Age to Romano-British farmstead or small settlement excavated 975m north-west of the PDA (MOX23786).

No medieval features are recorded within the HER datasets; however, eroded ridge and furrow earthworks are present within the PDA, although they are not recorded within the HER datasets being visible on aerial photographs and satellite imagery, in several fields. The ridge and furrow within the site and recorded early medieval and medieval remains in the wider vicinity suggest that the PDA formed part of the agricultural hinterland of the surrounding villages.

### 3. AIMS, METHODOLOGY & PRESENTATION

#### 3.1. AIMS & OBJECTIVES

The principal aim of the geophysical survey was to gather information to establish the presence/absence, character, and extent of any archaeological remains within the PDA. This will enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains, if present, and thereby inform any further investigation strategies, as appropriate.

The specific archaeological objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified,
- to therefore determine the likely presence/absence and extent of any buried archaeological features, and
- to prepare a report summarising the results of the survey.

#### 3.2. METHODOLOGY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

Magnetometry is the most widely used geophysical survey technique in archaeology as it can quickly evaluate large areas and, under favourable conditions, identify a wide range of archaeological features including infilled cut features such as large pits, gullies and ditches, hearths, and areas of burning and kilns and brick structures. It is therefore good at locating settlements of all periods, prehistoric field systems and enclosures and areas of industrial or modern activity, amongst others. It is less successful in identifying smaller features such as

post-holes and small pits (except when using a non-standard sampling interval), unenclosed (prehistoric) settlement sites and graves/burial grounds. However, magnetometry is by far the single most useful technique and was assessed as the best non-intrusive evaluation tool for this site.

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10-15cm sample interval) on roaming traverses (swaths) 4m apart (Illus 6). These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.37.0 (DWConsulting) software was used to process and present the data.

#### 3.3. DATA PRESENTATION & TECHNICAL DETAIL

A general site location plan is shown in Illus 1 at a scale of 1:12,000. Illus 2 to Illus 5 inclusive are site condition photographs. Illus 6 shows the GPS swaths, and the location and direction of the site condition photographs at 1:5,000. Fully processed (greyscale) data overviews of the whole PDA are presented, at two different ranges, -1 to +2nT and -8 to +8nT, in Illus 7 and Illus 8, to present the data to best effect and to ameliorate the effects of the 'green' waste which has been spread across most of the PDA (see below). These two illustrations are presented at a scale of 1:5,000, as is the interpretative overview (Illus 9). Fully processed (greyscale) data, minimally processed data (XY trace plot) data and interpretative plots are presented, by Sector, at a scale of 1:2,500, in Illus 10 to Illus 18 inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2022), guidelines outlined by Europae Archaeologia



Consilium (EAC 2016) and by the Chartered Institute for Archaeologists (CIfA 2014). All illustrations from Ordnance Survey (OS) mapping are reproduced with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' (minimally processed) and processed formats and over a range of different display levels. All illustrations are presented to display and interpret the data to best effect. The interpretations are based on the experience and knowledge of Headland management and reporting staff.

## 4. RESULTS AND DISCUSSION

### 4.1. SITE CONDITIONS

Magnetometer survey is generally recommended over any sedimentary bedrock (English Heritage 2008; Table 4) although the presence of overlying superficial deposits can lead to variability of results. No superficial deposits are recorded on this site. Magnetometry was therefore assessed as the most appropriate non-intrusive geophysical technique for evaluating the PDA, taking account of the limitations noted in Section 3.2 above.

Surface conditions were good across the PDA (all the fields were grazed pasture - Illus 2 to Illus 4) although steep in the easternmost fields. The land immediately surrounding the derelict farmhouse (Illus 5) and wooded areas in the east of F5 were unsuitable for survey.

As can be seen, whilst the data quality was good, the magnetic background was highly perturbed across 16 out of the 19 fields within the PDA; only F11, F18 and F19 were not affected by this extreme variation (Illus 7). This elevated and variable magnetic background is due to the spreading of organic ('green') waste to improve the fertility of the soil. This is a growing trend in modern agriculture but is unusual in this case as it is normally only spread on arable fields prior to ploughing whereas here it has been spread on permanent pasture; the non-organic components of the soil improver could be clearly seen in amongst the grass. The effects of this material are such that the usually weaker magnetic responses from archaeological features, if present, can potentially be masked by the higher magnitude readings from the green waste. As a means of bringing out greater resolution in the data it has

been displayed at two different ranges (Illus 7 and Illus 8). Whilst the effects of the soil improver are detrimental to resolving potentially small and/or low magnitude anomalies it is not thought in this case that any extensive or 'significant' archaeological anomalies/features would be completely masked by the green waste.

Against this magnetic background very few anomalies, primarily of modern and agricultural origin, have been recorded. Several anomalies of uncertain origin are also interpreted. Although an archaeological origin cannot be completely dismissed the absence of any anomalies interpreted as of possible or probable archaeological origin elsewhere within the PDA suggests a modern origin is perhaps most likely.

Overall, despite the presence of the 'green' waste it is assessed that the soils and geology are generally favourable for magnetometer survey and that the results therefore likely provide a good indication of the extent of sub-surface archaeological features within the PDA, notwithstanding the limitations of magnetometer survey to identify the types, sizes, and period of archaeological feature described in Section 3.2.

The anomalies are discussed in more detail below according to their interpreted origin.

### 4.2. FERROUS AND MODERN ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris is common on most sites, often being introduced into the topsoil during manuring or tipping/infilling. There is no obvious clustering to the ferrous anomalies across the PDA which might indicate an archaeological origin. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons.

Bands or small areas of magnetic disturbance are also recorded along or adjacent to many of the extant boundaries and field entrances. This disturbance is typically due to the accumulation of ferrous debris around field margins, or to barbed wire or mesh in the boundary itself, and to the tipping of material in gateways to improve access to/from fields.

Several sub-circular areas of disturbance such as those recorded in F5, F13, F17 and F19 (see Illus 4) are due to animal feed or water troughs.

Five linear dipolar anomalies (Illus 8 – SP1 to SP5) are caused by sub-surface pipes/services.

#### 4.3. AGRICULTURAL ANOMALIES

By far the most numerous recorded anomalies have an agricultural origin, and correspond with ridge and furrow cultivation. Parallel widely spaced linear anomalies are recorded in all fields except the five easternmost fields (F5, F13, F14, F15 and F16) where it was probably too steep to undertake this medieval and post-medieval method of ploughing. The direction of ploughing is generally parallel with the long axis of each field. Two different orientations of ploughing are recorded in F11 and F18.

#### 4.4. ANOMALIES OF UNCERTAIN ORIGIN

Five linear and curvilinear anomalies (Illus 9 - U1 to U5) and a few discrete anomalies of clustered magnetic enhancement are recorded across the PDA. These anomalies are interpreted as of uncertain origin on the basis that they cannot be confidently ascribed a modern, agricultural, geological, or archaeological origin. Given the lack of any anomalies of possible or probable archaeological origin anywhere within the PDA, non-archaeological causes are most likely; linear anomalies probably relate to agricultural or modern features and the discrete anomalies probably the result of green waste.

#### 4.5. ANOMALIES OF POSSIBLE ARCHAEOLOGICAL ORIGIN

No anomalies of possible or probable archaeological origin have been recorded by the survey.

### 5. CONCLUSION

The survey has shown that 16 out of the 19 fields within the PDA have had organic ('green') waste spread across them. The effects of this material are such that the usually weaker magnetic responses from archaeological features, if present, can potentially be masked by the higher magnitude readings from the green waste. Anomalies indicative of ridge and furrow cultivation are recorded in all but the steepest, easternmost, fields. The combined effects of the soil improver and the ridge and furrow

cultivation strips are potentially detrimental to resolving small and/or low magnitude anomalies, if present. However, it is not thought in this case that any extensive or 'significant' archaeological anomalies/features would be completely masked. The complete absence of any anomalies of possible or probable archaeological origin is therefore most likely an accurate indication of the archaeological potential of this site although the possibility of features of archaeological origin cannot be completely dismissed.

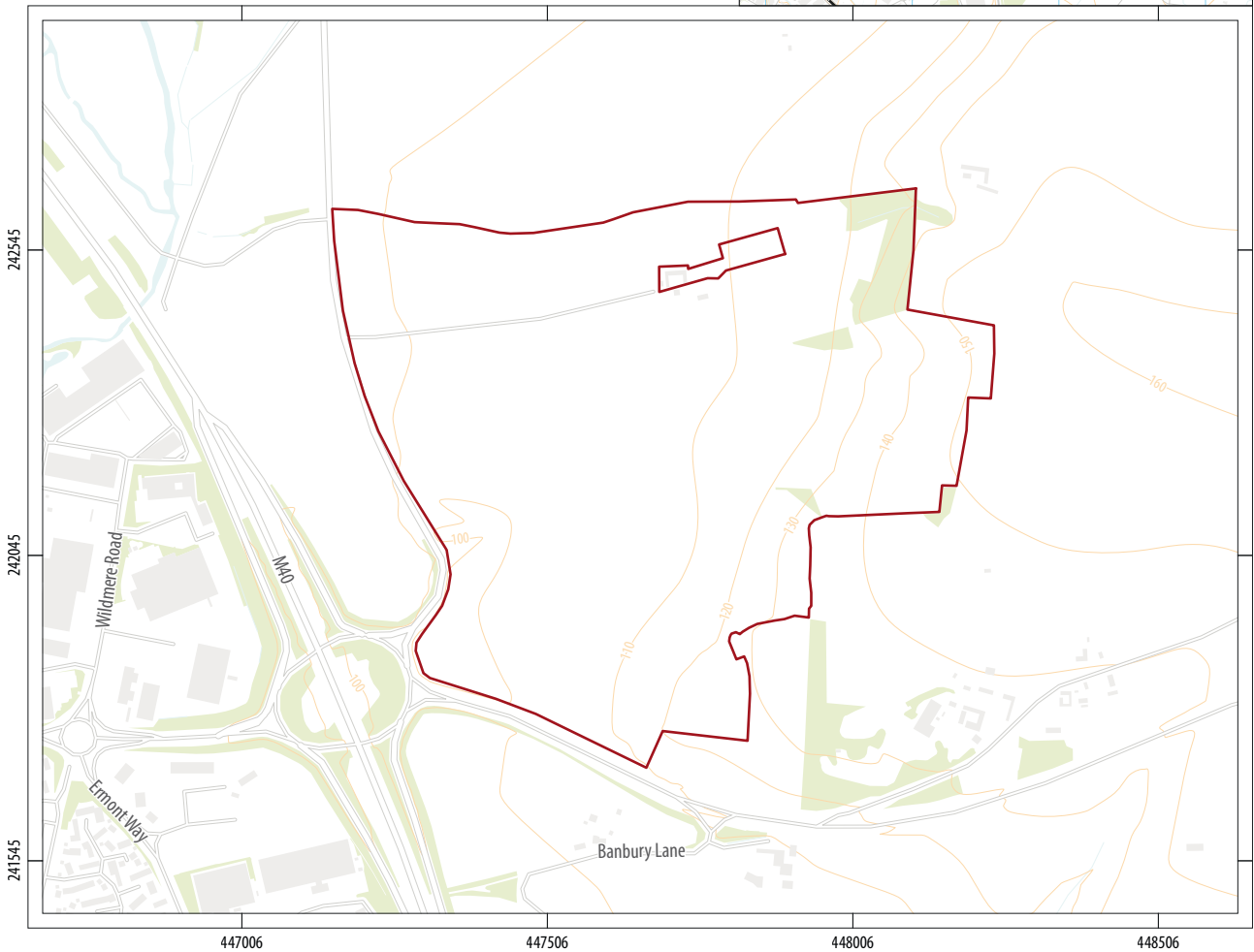
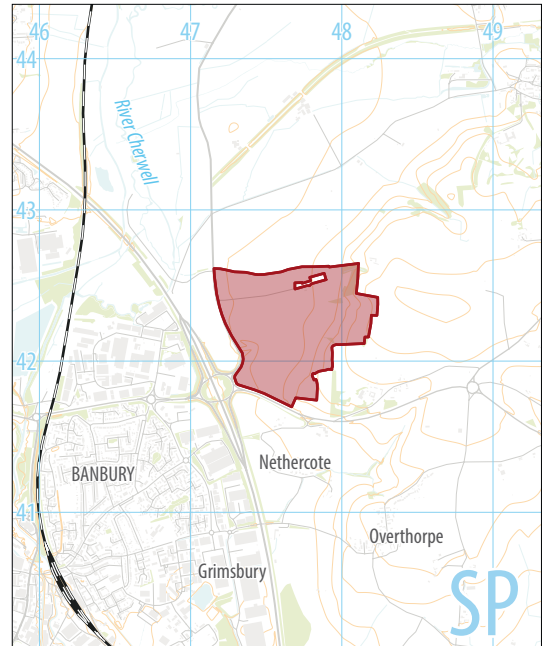
### 6. REFERENCES

- Chartered Institute for Archaeologists (CIfA) 2014 Standard and guidance for archaeological geophysical survey (Reading) [https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics\\_3.pdf](https://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics_3.pdf) accessed 25th September 2022
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- Gaffney, C & Gater, J 2003 Revealing the Buried Past: Geophysics for Archaeologists Stroud
- Headland Archaeology 2022 Land east of J11, M40, Banbury, Oxfordshire Written Scheme of Investigation for Geophysical Survey Unpublished Client Document Ref. LEBA22
- Natural Environment Research Council (UKRI) 2021 British Geological Survey <http://www.bgs.ac.uk/> accessed 25th September 2022
- Pegasus Group 2022 Land east of Junction 11, M40, Banbury Heritage Desk-Based Assessment P21-3302

Land east of J11  
M40  
Banbury  
Oxfordshire



0 200km  
1:12,500,000 @ A4



0 240m  
1:12,000 @ A4

 proposed development area

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Illus 2 F16, looking west



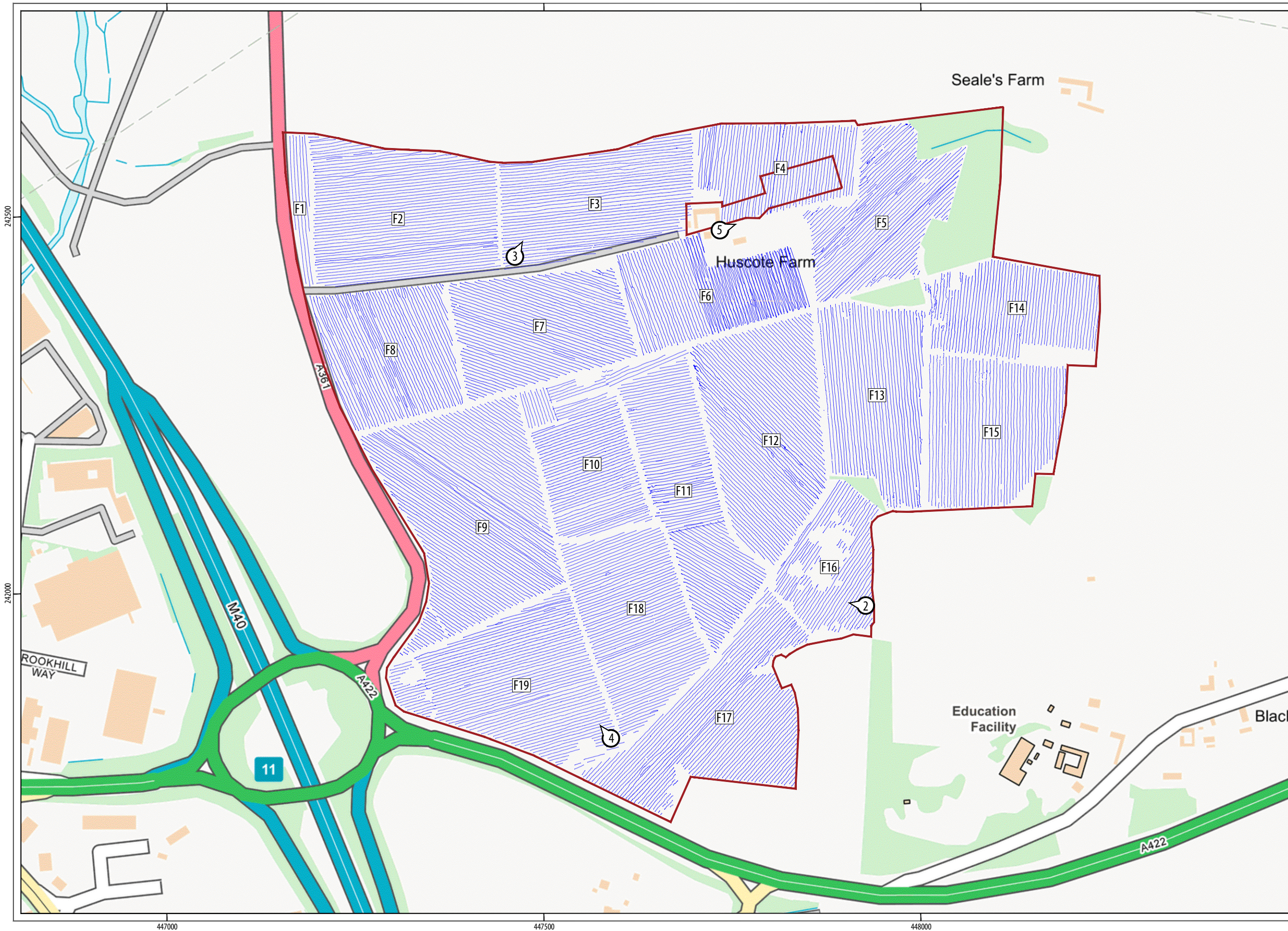
Illus 3 F3, looking north-east



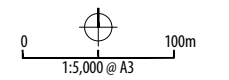
Illus 4 F19, looking north-northwest



Illus 5 F6, area unsuitable for geophysical survey, looking east-northeast



- geophysical survey area
- GPS swaths
- area unsuitable for survey
- location and direction of ILLUS 2-5



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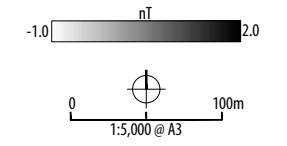


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ILLUS 6 Survey location showing GPS swaths and photograph locations



geophysical survey area



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ILLUS 7 Overall greyscale plot of processed magnetometer data



geophysical survey area

Seale's Farm

242500

242000

ROOKHILL WAY

M40

A192

A42

11

Hu...

Education Facility

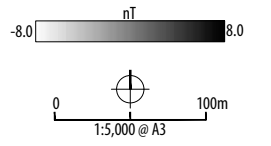
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A42

447000

447500

448000



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Oxfordshire

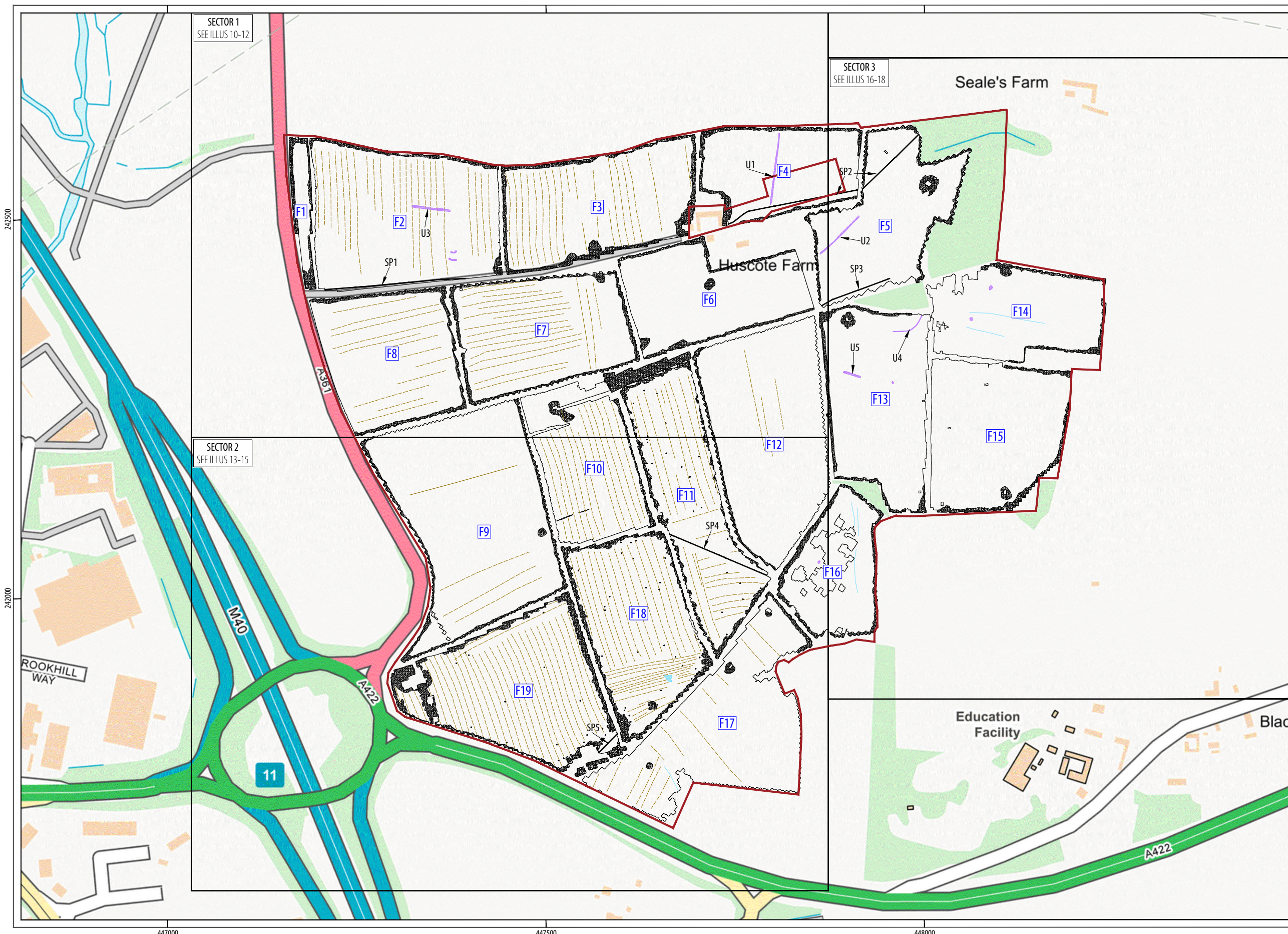
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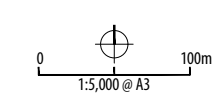
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ILLUS 8 Overall greyscale plot of processed magnetometer data





- geophysical survey area
- | TYPE OF ANOMALY        | INTERPRETATION       |
|------------------------|----------------------|
| ● dipolar isolated     | ferrous material     |
| ● magnetic disturbance | ferrous material     |
| — dipolar linear       | service pipe         |
| ⊕ magnetic enhancement | uncertain            |
| — linear trend         | ridge and furrow     |
| — linear trend         | geological variation |
- ABBREVIATIONS  
 SP - service pipe  
 U - uncertain



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ILLUS 9 Overall interpretation of magnetometer data