Appendix I2

Geophysical Survey Report

ECBU24

EAST CLAYDON GREENER GRID PARK

GEOPHYSICAL SURVEY REPORT

commissioned by Lichfields
on behalf of Statkraft UK LTD

April 2025

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

EAST CLAYDON GREENER GRID PARK

GEOPHYSICAL SURVEY REPORT

commissioned by Lichfields
on behalf of Statkraft UK LTD

April 2025

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **ECBU24** / HA Report No **2025-45** / NGR **SP 474773 226506** / Parish **The Claydons** / Local Authority **Buckinghamshire Council** / Fieldwork Date **13/01/2025 – 16/01/2025** / OASIS Ref. **headland1-532475**

PROJECT TEAM:

Project Manager **Sam Harrison** / Author **Ross Bishop** / Fieldwork **Findlay Young, Ross Bishop** / Graphics **Joseph Van Miert, Leia Carter, Ross Bishop**

Approved by **Sam Harrison** .....

Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road | Cleckheaton BD19 4EZ
t 0127 493 8019
e yorkshireandnorth@headlandarchaeology.com
w www.headlandarchaeology.com

HEADLAND ARCHAEOLOGY
an RSK company

REGISTERED ORGANISATION CIfA

PROJECT SUMMARY

Headland Archaeology (UK) Ltd was commissioned by Lichfields (the Consultant) on behalf of Statkraft UK Ltd (the Client), to undertake a geophysical (magnetometer) survey on land north-east of East Claydon, Buckinghamshire where the new Greener Gid Park comprising energy storage, grid balancing equipment, and associated infrastructure including access, drainage, landscaping and other incidental works, is proposed. This geophysical survey report will be submitted in support of any future planning application for the development. The results may also inform future archaeological strategy, if required.

Survey was successfully undertaken across all suitable parts of the geophysical survey area (GSA) and the data has recorded a wide range of magnetic anomalies considered predominantly agricultural in nature but also of modern, natural, uncertain and archaeological origin. A small area of archaeological activity defined by a series of ditches forming rectangular enclosures and a ring ditch was identified in the north-east corner of the GSA.

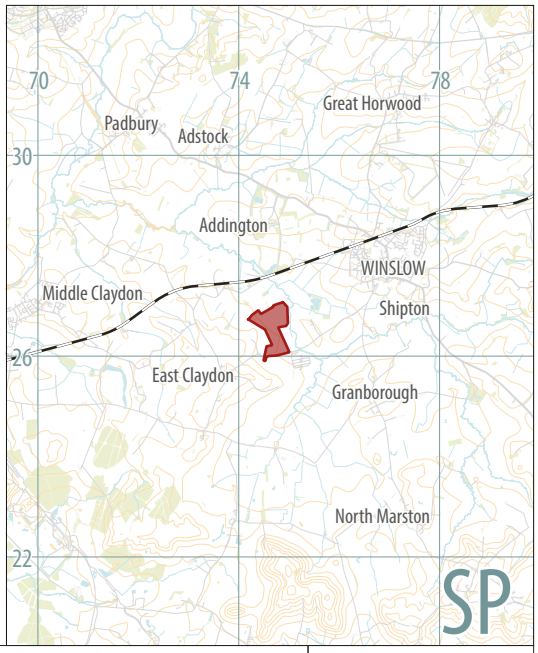
Elsewhere the survey findings were limited to faint linear trends and a loose cluster of enhanced discrete responses of uncertain origin in the south of the GSA, linear and curvilinear trends recording traces of ridge and furrow cultivation and sections of former field boundaries and natural/geological variations mapping changes in overlying superficial deposits. Two buried services and a linear spread of interference from overhead powerlines have also been recorded.

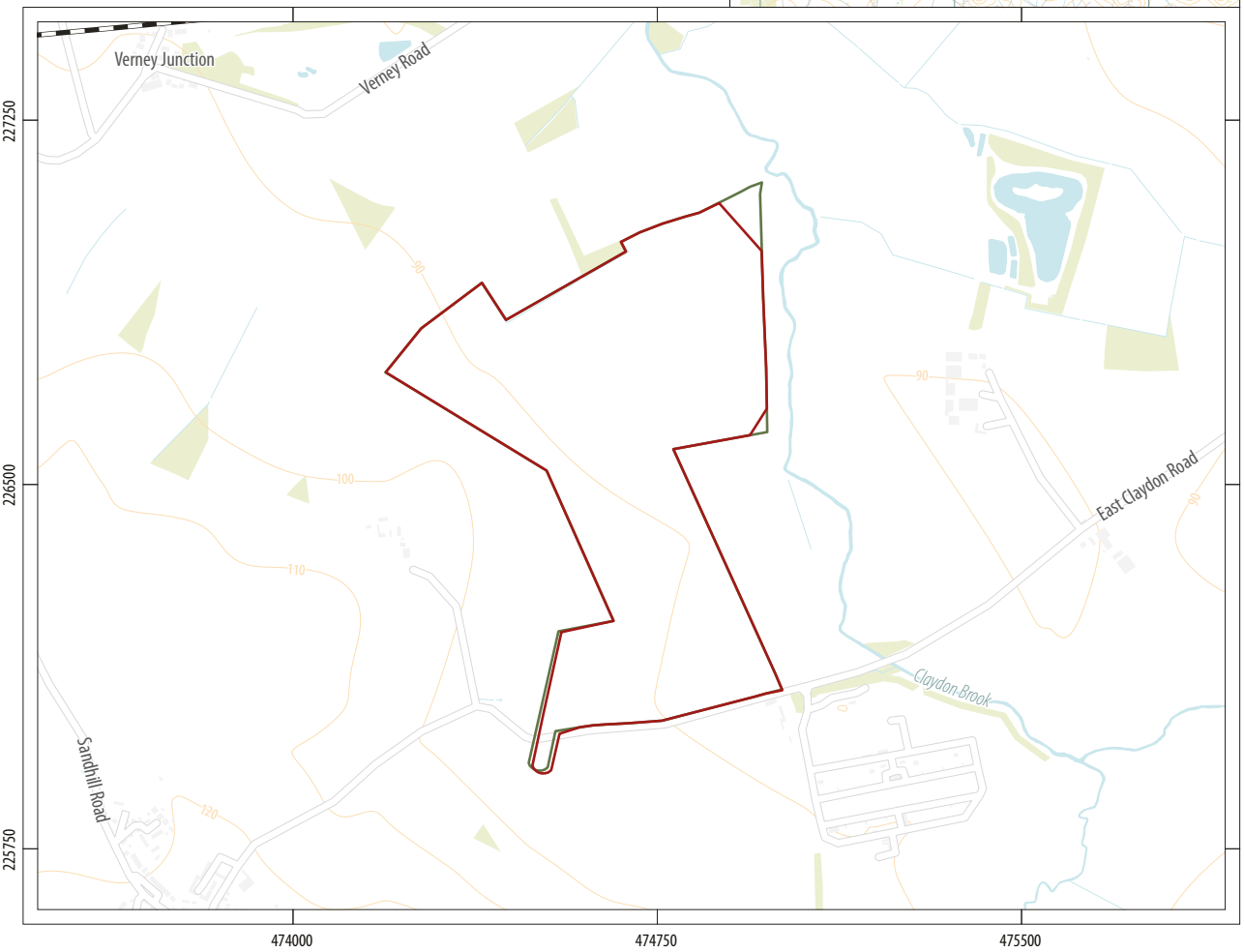
No anomalies of note were identified in the location of a purported Roman road crossing the eastern part of the GSA or in the location of two metal detecting find spots in the north-west part of the GSA. Based on the results of the survey the archaeological potential of the GSA is widely assessed as low, except for the north-east corner of the GSA which is regarded as locally high.

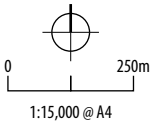
CONTENTS

LIST OF ILLUSTRATIONS

East Claydon Road
East Claydon
Buckinghamshire







East Claydon Greener Grid Park Site
geophysical survey area (GSA)

HEADLAND ARCHAEOLOGY
Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road | Cleckheaton BD19 4EZ
t 0127 493 8019
e yorkshireandnorth@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location

EAST CLAYDON GREENER GRID PARK

GEOPHYSICAL SURVEY REPORT

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Lichfields (the consultant) on behalf of Statkraft UK Ltd (the Client), to undertake a geophysical (magnetometer) survey on land north-east of East Claydon, Buckinghamshire where the new Greener Gid Park comprising energy storage, grid balancing equipment, and associated infrastructure including access, drainage, landscaping and other incidental works, is proposed (Illus 1). This geophysical survey report will be submitted in support of any future planning application for the development. The results will inform future archaeological strategy, if required.

The scheme of work was undertaken in accordance with the requirements of the National Planning Policy Framework (Ministry of Housing, Communities & Local Government, MHCLG 2024) and with the Written Scheme of Investigation for Geophysical Survey (WSI) (TigerGeo 2024).

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) and the Chartered Institute for Archaeologists' (CIfA) Standard and Guidance for Archaeological Geophysical Survey (CIfA 2020) and the survey was carried out in line with the same best practice guidelines.

The survey was carried out between January 13th and January 16th, 2025

1.1 GEOPHYSICAL SURVEY AREA LOCATION, TOPOGRAPHY AND LAND-USE

The survey was conducted over an area measuring approximately 45.4 hectares and which is referred to as 'GSA' (Illus 1) throughout this text and in the related illustrations. The area of the proposed development is slightly smaller in extent and is referred to as 'East Claydon Greener Grid Park Site' (Illus 1). The GSA is located 650m north-east of East Claydon Village, centred at NGR SP 474773 226506 and it comprises a single block of mixed arable (F3, F4, F5, and F6) and pastural land (F1 and F2) (Illus 2 to Illus 5 inclusive), with East Claydon Road bounding it to the south. The line of the former Aylesbury to Buckingham Railway splits the GSA roughly in half along a north-west/south-east axis. East Claydon substation lies immediately south-east of the GSA.

Topographically, the land within the GSA gently undulates between 85m Above Ordnance Datum (AOD) in the north-east corner, and 96m AOD in the south-east corner.

1.2 GEOLOGY AND SOILS

The solid bedrock geology is underlain by mudstone of the Stewartby Member and Weymouth Member formations, a sedimentary bedrock formed between 166.1 and 163.5 and 163.5 and157.3 million years ago respectively, during the Jurassic period. No superficial deposits are recorded over the majority of the GSA however two spreads of river terrace deposits are recorded at the north-east corner (F1) and eastern boundary of the GSA (F4). A small spread of alluvium (clay, silt, sand and gravel) encroaches at the northern boundary of the GSA but is otherwise concentrated outside the GSA boundary in the location of Claydon Brook watercourse which lies to the east (Illus 7 and NERC 2024).

ILLUS 2 F1, looking north-east

The overlying soils of the GSA are classified predominantly as slowly permeable acidic but base-rich loams and clays with impeded drainage in Soilscape 18 Association. Naturally wet floodplain loams and clays classified in Soilscape 20 Association follow the course of Claydon Brook and possibly encroach on the easternmost parts of the GSA (Cranfield University 2024).

2 ARCHAEOLOGICAL BACKGROUND

A recent Desk Based Assessment (Headland Archaeology 2024) concluded:

> *'There are no designated heritage assets within the GSA. Three non-designated heritage assets are recorded in the Buckinghamshire HER within the GSA. These relate to four findspots, (two coins from the Medieval and Post Medieval periods, an ingot from the Bronze Age (MBC40909), and a harness pendant from the Romano-British period (MBC39969). The purported route of the Roman Road between Akeman Street at Fleet Marston and Thornborough (MBC6013 / 0203400000), Margary Road 162, runs approximately north-south through the centre of the GSA, and has a possible extension to the Alchester to Towcester Road, while the former Aylesbury to Buckingham Railway runs northwest-southeast through the centre of the GSA (MBC14921/0578800000).*
>
> *There is assessed to be a medium to high potential for Romano-British activity to be located within the GSA boundary, as a Romano-British harness pendant and the purported course of the Roman Road between Akeman Street at Fleet Marston and Thornborough, Margary 162, runs through the centre of the GSA.*
>
> *Possible above ground earthworks have been identified in the LiDAR data that could represent regimes of ridge and furrow cultivation that could range in date from the Medieval to Post-Medieval period. A large number of above ground earthworks are visible within the 1km Study Area and have been recorded by Buckinghamshire HER as ridge and furrow cultivation. Therefore, it has been assessed that there is a high potential for further such Medieval to Post-Medieval agricultural activity to be within the GSA.*

Further non-designated assets recorded within the vicinity of the GSA include several findspots of Roman coins (MBC39854, MBC39855, MBC39856, and MBC46504), a Roman brooch (MBC46495), and a post medieval metal object (MBC40400), located approximately 350m west of the GSA, clustered around a farm.

Roughly 270m east of the GSA, a findspot of a medieval or post medieval cloth seal is also recorded (MBC45978).

Analysis of historical maps, aerial photography and LiDAR data has identified possible ridge and furrow cultivation (possibly no longer extant), a former 19th century field system and footpath.

ILLUS 3 F2, looking north-east

3 AIMS, METHODOLOGY & PRESENTATION

3.1 AIMS AND OBJECTIVES

The principal objectives of the geophysical survey were to gather information to establish the presence/absence, character, and extent of any archaeological remains within the GSA, and thereby support any forthcoming planning application and inform any further investigation strategies.

The aims of the 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, or other geophysical anomalies, and provide an interpretation; and,
- to produce a comprehensive GSA archive and report.

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 or burial grounds. However, magnetometry is by far the single most useful technique and was assessed as the best non-intrusive evaluation methodology for this GSA.

The survey was undertaken using a hand carried five sensor array deploying Sensys FGM650/10 sensors mounted at 1m intervals (1m traverse interval) onto a rigid frame. The system was programmed to take readings at a frequency of 100Hz (allowing for a 1–2cm sample interval) on roaming traverses (swaths) 5m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Leica GS18 Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for

ILLUS 4 F3, looking north-west

each data point. MonMX (Sensys Ltd) software was used to collect and export the data.

Anomaly GeoSurvey v1.12.3 (Lichenstone Geoscience) and QGIS v.3.34.6 software was used to process and present the data respectively.

3.3 DATA PRESENTATION AND TECHNICAL DETAIL

A location plan of the GSA is shown in Illus 1 at a scale of 1:15,000. Illus 2 to Illus 5 inclusive are GSA condition photographs. Illus 6 shows the location and direction of the GSA condition photographs, areas unsuitable for survey, and HER assets at a scale of 1:5,000. Illus 7 shows the GSA location with superficial geology data at a scale of 1:5,000. Illus 8 and Illus 9 present overviews of the processed greyscale data and interpretation of the data, also at 1:5,000. Illus 10 to Illus 18 inclusive show the fully processed (greyscale) data, minimally processed (XY trace plot) data and interpretative plans, by Sector at a scale of 1:2,500, with smaller scale plots covering an Area of Archaeological Activity (AAA), at a scale of 1:1,000 in Illus 19 to Illus 21.

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 GSA archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Tigergeo 2024), and guidelines outlined by Europae Archaeologia Consilium (EAC 2016) and by the Chartered Institute for Archaeologists (CIfA 2020).

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 Archaeology management and reporting staff.

4 RESULTS & DISCUSSION

4.1 GEOPHYSICAL SURVEY AREA CONDITIONS

Magnetometer survey is generally recommended over any sedimentary geology, but results can be variable over mudstone bedrock geologies

ILLUS 5 F4, looking north-west

particularly in the presence of any overlying quaternary deposits as is partly the case here (English Heritage 2008; Table 4).

The magnetic background appears relatively homogeneous across the GSA except for areas likely covered by overlying river terrace superficial deposits, such as in the north-east corner (F1 and F2; Illus 7) where the magnetic background exhibits more variation.

Against this magnetic background, anomalies of predominantly agricultural, modern, geological and uncertain origin have been recorded in addition to a cluster of ditch-like anomalies that likely identify an area of archaeological activity in the north-east corner of the GSA (see below).

The detection of a range of anomalies, including those of archaeological origin, indicates that there was likely sufficient magnetic contrast, for the detection of sub-surface archaeological features, if present, notwithstanding the limitations of magnetometer survey to identify the types, sizes and period of archaeological features as described in Section 3.2 and acknowledging the prevailing geological conditions. The results of the survey are therefore considered to provide a good indication of the archaeological potential of the GSA.

Surface conditions were generally very good (Illus 2 to Illus 5) and consequently data quality was also good with only minimal post-processing required. No problems were encountered during the survey.

The anomalies recorded by the survey are discussed below according to their interpreted origin.

4.2 ANOMALIES OF FERROUS AND MODERN ORIGIN

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 of the 'spike' responses, so these anomalies are likely to be indicative of a random distribution of modern ferrous debris in the plough-soil.

Two very high magnitude linear dipolar anomalies (Illus 18–SP1 and SP2) record the location of buried service pipes. Both share a similar north-west/south-east alignment crossing F5 but SP1 also cuts across the south-west corner of F4.

A broad linear spread of magnetic disturbance recorded across F4 (Illus 18) is caused by the presence of low-slung powerlines between high-voltage pylons.

4.3 ANOMALIES OF AGRICULTURAL ORIGIN

The majority of anomalies recorded by the survey are considered agricultural in origin. Most are due to either modern ploughing, or reflect older, medieval to post-medieval ridge and furrow cultivation which presents as a series of parallel linear and curvilinear trend anomalies that are evident to varying degrees within each field of the GSA. These results are in keeping with the findings of the DBA which acknowledges the GSA is sited within a landscape of known medieval to post medieval cultivation.

Two low magnitude linear anomalies recorded at the south-east corner of F1 (Illus 15–FB1) and at the southern boundary of F5 (Illus 18–FB1) record the location of former field boundaries evident on the 1830–1880 Six Inch OS map.

Elsewhere, several characteristic linear trends indicate the presence of land drains in F5, F1 and F4.

4.4 ANOMALIES OF GEOLOGICAL ORIGIN

As discussed previously, there is a good correlation between mapped superficial river terrace deposits and a broad spread of low magnitude magnetic variation recorded by the survey across the north-eastern part of the GSA (F1 and F2). Similar areas of low-level magnetic variation identified within F3, F4, and towards the centre of F5, likely map further previously unrecorded river terrace deposits.

4.5 ANOMALIES OF POSSIBLE OR PROBABLE ARCHAEOLOGICAL ORIGIN

A weakly magnetically enhanced series of perpendicular ditch-like anomalies likely identify an enclosure and/or series of appending rectilinear enclosures oriented roughly north-east/south-west in the north-east corner of F1 (E1–Illus 15 and Illus 21) centred at NGR SP 474880 227010.

The only other anomalies of note outside of the general plan of the enclosure ditches, include a ring ditch measuring approximately 11m in diameter (RD1–Illus 21) located at the eastern end of the enclosures close to the field boundary and a strongly enhanced discrete response indicative of burning, located towards the centre of the westernmost enclosure (B?1–Illus 21). This cluster of activity lies approximately 100m from the purported line of the Roman Road between Akeman Street at Fleet Marston and Thornborough (MBC6013, Margary Road 162) however no direct link is established from the survey data.

It remains unclear whether the weak and fragmentary nature of the responses are indicative of the preservation of features, likely denuded by historic and modern cultivation and/or a result of the prevailing geological conditions with mudstone overlain by river terrace deposits mapped in this location.

Linear trend anomalies (L1–Illus 15) recorded south of E1 but still within F1 are considered of possible archaeological origin. The anomalies appear more coherent than weaker agricultural trends and could identify further ditch-like anomalies associated with E1.

4.6 ANOMALIES OF UNCERTAIN ORIGIN

A faint linear trend anomaly spanning the boundary between F1 and F2 (L2–Illus 15) shares an alignment with the purported route of the Roman Road between Akeman Street at Fleet Marston and Thornborough (MBC6013, Margary Road 162) but lies approximately 40m to the east. The very weak anomaly response precludes a more confident interpretation, and it remains the anomaly could equally represent an agricultural trend of no archaeological concern.

A strongly magnetically enhanced discrete anomaly of uncertain origin is recorded at the northern boundary of F1 (ME1–Illus 21). The anomaly lies adjacent to the archaeological activity at E1 and RD1 but is considered of uncertain origin given its position so close to the field boundary.

Two very low magnitude linear trends (L3 and L4–Illus 18) and a loose cluster of magnetically enhanced discrete responses (ME2–Illus 18) located in F5 are interpreted as of uncertain origin on the basis that cannot be confidently interpreted in any other category. The anomalies have a distinct magnetic signature suggestive of an anthropogenic cause however do not correspond with any mapped or obvious landscape feature and do not share an alignment with current and/or former field boundaries.

5 CONCLUSION

Survey was successfully undertaken across all suitable parts of the GSA and the data has recorded a wide range of magnetic anomalies predominantly agricultural in nature but also of modern, natural, uncertain and archaeological origin. The detection of a range of anomalies, including those of archaeological origin, indicates that there was likely sufficient magnetic contrast, for the detection of sub-surface archaeological features and the results of the survey are therefore considered to provide a good indication of the archaeological potential of the GSA.

A small area of archaeological activity defined by a series of weakly magnetically enhanced ditches forming rectangular enclosures and a ring ditch has been identified in the north-east corner of the GSA. No link is established with the purported route of the Roman Road between Akeman Street at Fleet Marston and Thornborough (MBC6013, Margary Road 162) which lies approximately 100m to the west and which has not been detected as an anomaly in the data. A faint linear trend anomaly which shares an alignment with the purported road is identified however lies approximately 40m to the east and could represent an agricultural trend of no archaeological consequence.

Elsewhere the survey findings are limited to faint linear trends and a loose cluster of enhanced discrete responses of uncertain origin in the south of the GSA, linear and curvilinear trends recording traces of ridge and furrow cultivation and sections of former field boundaries and natural/geological variations mapping changes in overlying superficial deposits.

Two high magnitude linear anomalies identifying buried services and a linear spread of interference from overhead powerlines has also been recorded.

No anomalies of note are identified in the location of two non-designated heritage assets recording the location of metal detecting find spots in the north-west part of the GSA.

Based on the results of the survey the archaeological potential of the GSA is widely assessed as low, except for the north-east corner of the GSA where ditches forming rectangular enclosures and a ring ditch have been mapped and is therefore regarded as locally high.

6 REFERENCES

Chartered Institute for Archaeologists (ClfA) 2020 ***Standard and guidance for archaeological geophysical survey*** (Reading) https://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_3.pdf accessed 22nd January 2025

Cranfield University (2024) ***Cranfield Soil and Agrifood Institute Soilscapes*** http://www.landis.org.uk/soilscapes/ accessed 22nd January 2025

English Heritage (2008) ***Geophysical Survey in Archaeological Field Evaluation***

Europae Archaeologia Consillium (EAC) 2016 ***EAC Guidelines for the Use of Geophysics in Archaeology: Question to Ask and Points to Consider*** (Namur, Belgium) https://www.europae-archaeologiae-consilium.org/eac-guidlines accessed 22nd January 2025

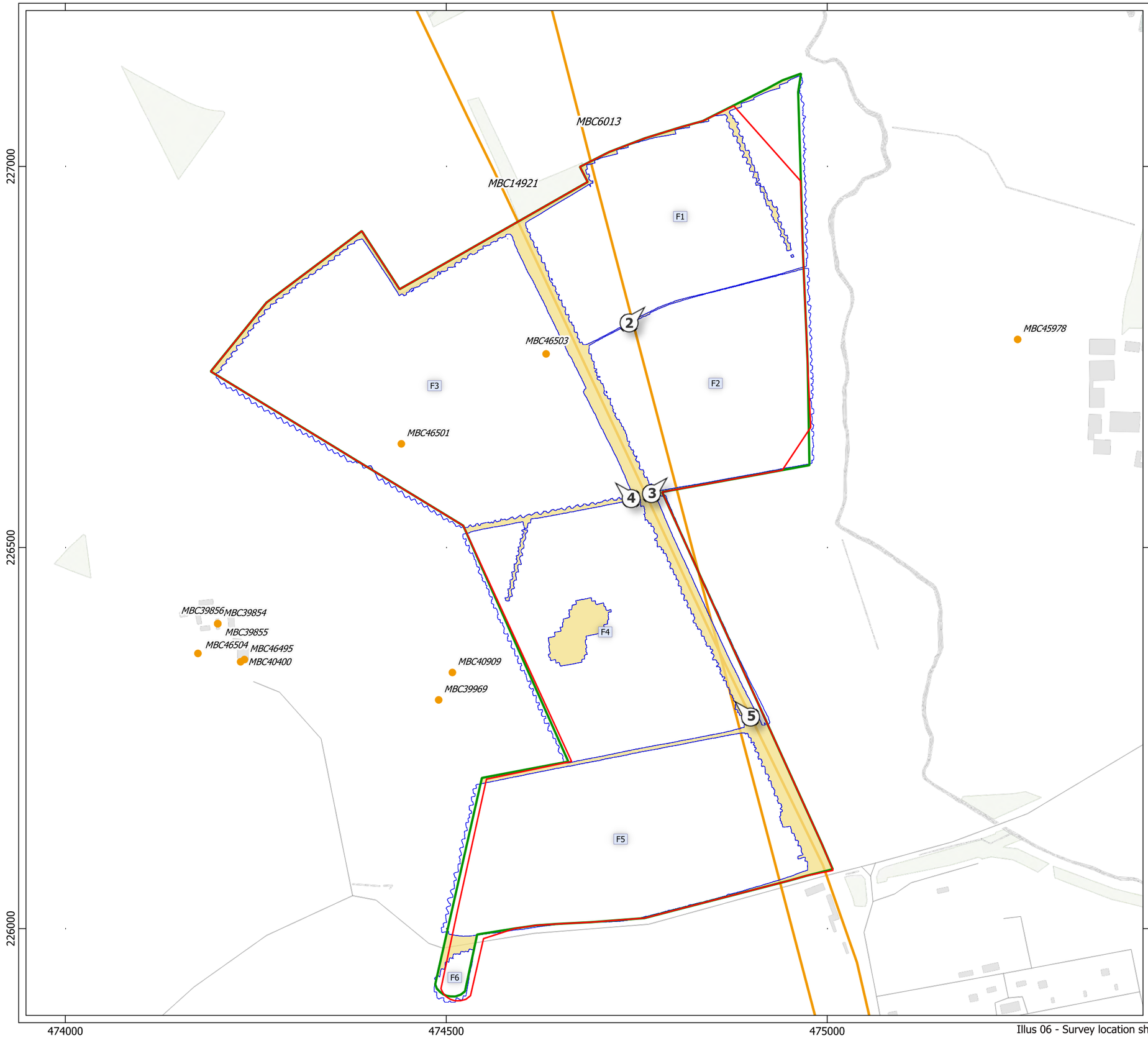
Gaffney C & Gater J (2003) ***Revealing the Buried Past: Geophysics for Archaeologists*** Stroud

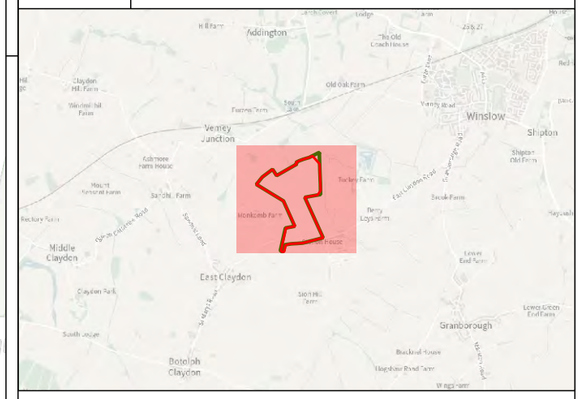
Headland Archaeology (2024) ***East Claydon Greener Grid Park Desk Based Assessment*** Ref: P24–110

Ministry of Housing, Communities & Local Government (MHCLG) 2024 ***The National Planning Policy Framework*** https://assets.publishing.service.gov.uk/media/675abd214cbda57cacd3476e/NPPF-December-2024.pdf accessed 22nd January 2025

Natural Environment Research Council (NERC) 2024 ***British Geological Survey*** http://www.bgs.ac.uk/ accessed 22nd January 2025

Tigergeo (2024) ***land at East Claydon, Buckinghamshire specification for Geophysical Survey*** (WSI) [Internal Ref ECB241]





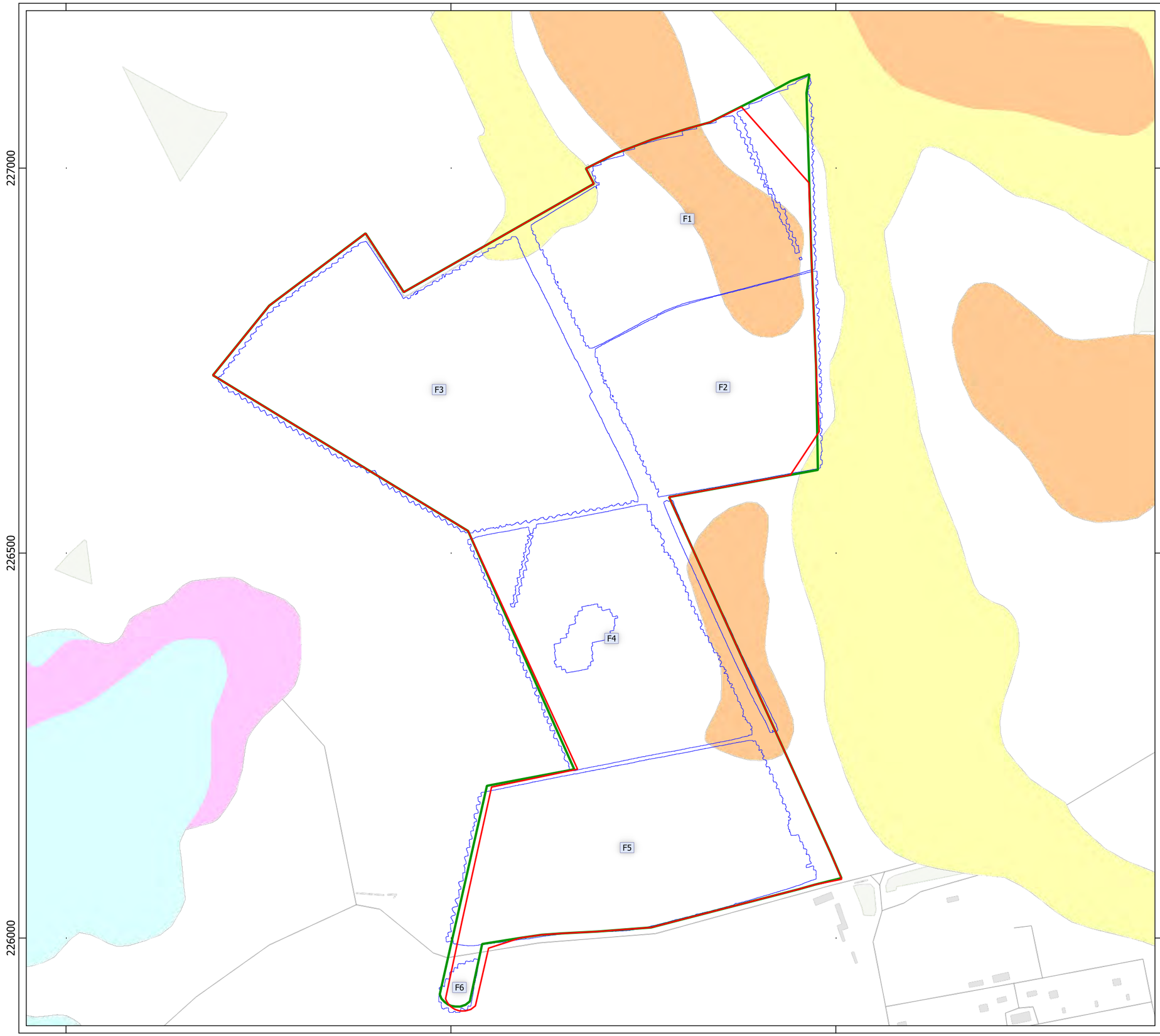
Key

- East Claydon Greener Grid Park Site
- Geophysical Survey Area (GSA)
- Survey Extent
- Location and Direction for Illus 02 to 05
- Unsuitable Survey Area
- Monuments
- Monuments

0 100 200 m

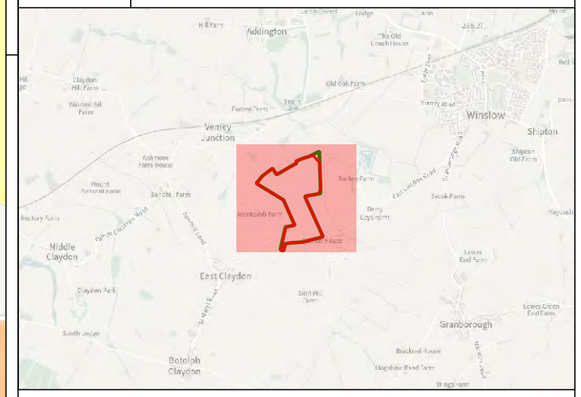
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:5,000 @ A3

Illus 06 - Survey location showing photograph locations, areas unsuitable for survey, and HER assets



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

- East Claydon Greener Grid Park Site
- Geophysical Survey Area (GSA)
- Survey Extent

BGS Superficial Key

- Alluvium - Clay, silt, sand and gravel.
- River Terrace Deposits - Sand and gravel.
- Till, Mid Pleistocene - Diamicton.
- Glaciofluvial Deposits, Mid Pleistocene - Sand and gravel.

0 100 200 m

Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:5,000 @ A3

Illus 07 - Survey Location showing BGS Superficial Geology

Sector 1
See Illus 10 - 12

Sector 2
See Illus 13 - 15

AAA 1
See Illus 19 - 21

Sector 3
See Illus 16 - 18

F1

F2

F3

F4

F5

F6

227000

226500

226000

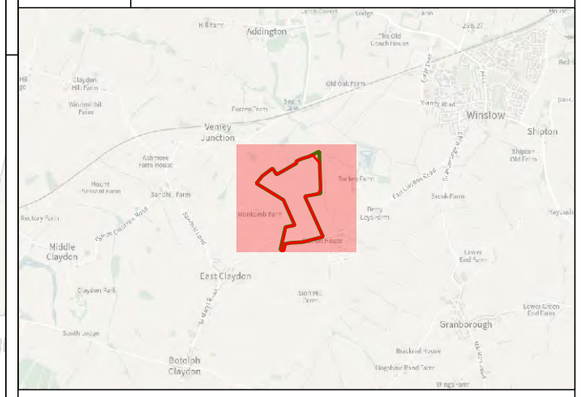
474000

474500

475000

N

HEADLAND ARCHAEOLOGY
an RSK company



Key

- East Claydon Greener Grid Park Site
- Geophysical Survey Area (GSA)
- Survey Extent
- Area for Illus 10 to 18
- Area for Illus 19 to 21

+2nT

-1nT

0 100 200 m

Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:5,000 @ A3

Illus 08 - Overall greyscale plot of processed magnetometer data

Sector 1
See Illus 10 - 12

Sector 2
See Illus 13 - 15

AAA 1
See Illus 19 - 21

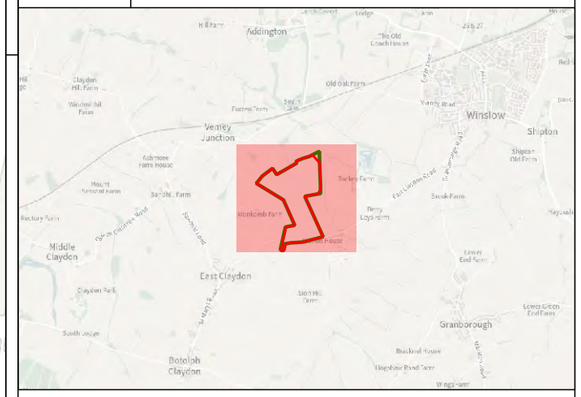
Sector 3
See Illus 16 - 18

E1
ME1
B?1
RD1
L1
FB1
L2
F1
F2
F3
F4
F5
F6
SP1
SP2
L3
L4
ME2
FB2

227000
226500
226000
474000
474500
475000

N

HEADLAND ARCHAEOLOGY
an RSK company



Key

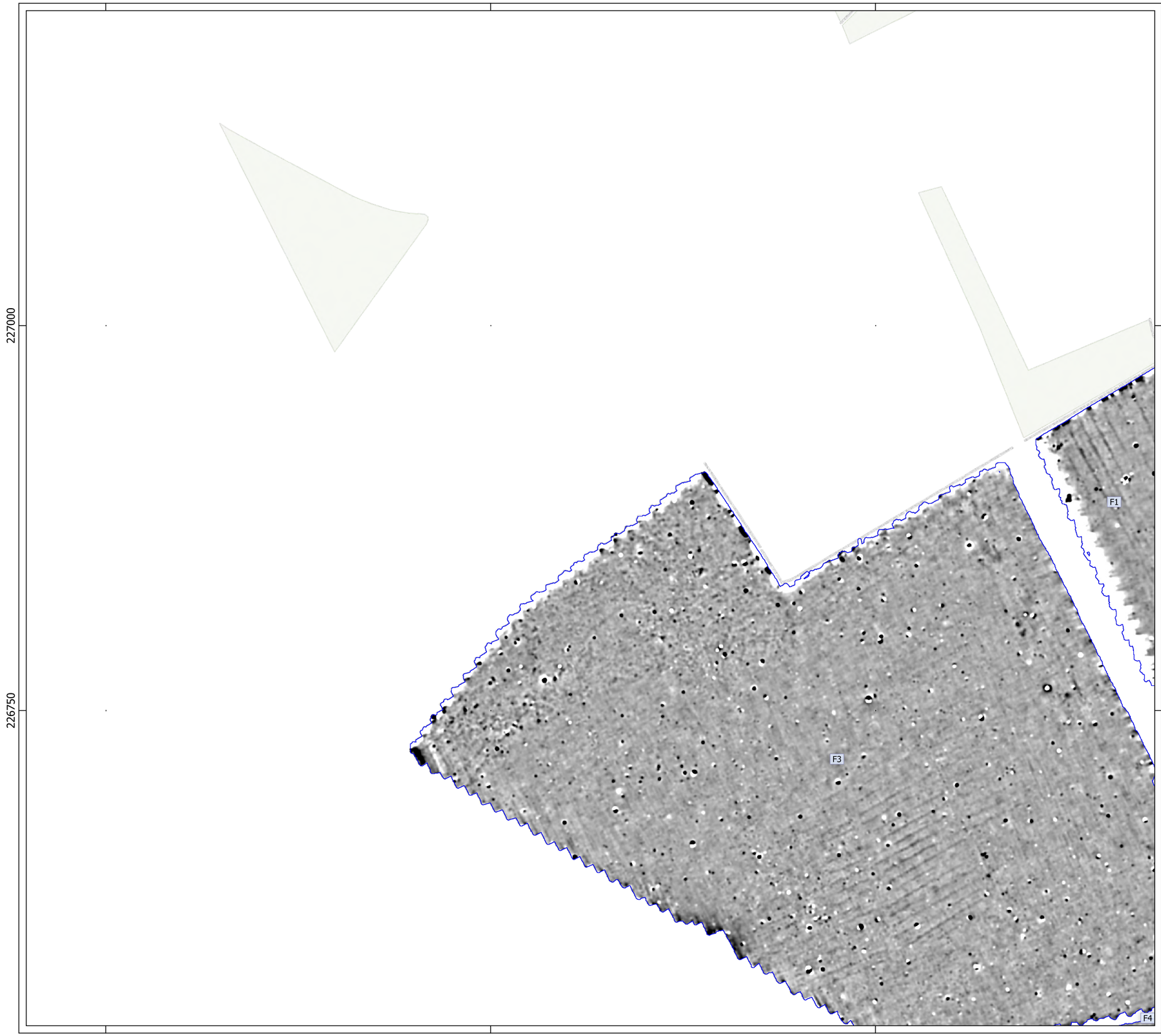
- East Claydon Greener Grid Park Site
- Geophysical Survey Area (GSA)
- Survey Extent
- Area for Illus 10 to 18
- Area for Illus 19 to 21
- Ferrous Objects
- Agriculture
- Field Boundary
- Field Drain
- Natural
- Service
- Ridge and Furrow
- Archaeology
- Magnetic Disturbance (Above Ground)
- Magnetic Disturbance (Below Ground)
- Natural
- Overhead Cable
- Possible Archaeology
- Uncertain
- Burning?

	Abbreviation
B?	Burning?
E	Enclosure
FB	Former Boundary
L	Linear Trend
ME	Magnetic Enhancement
RD	Ring Ditch
SP	Service Pipe

0 100 200 m

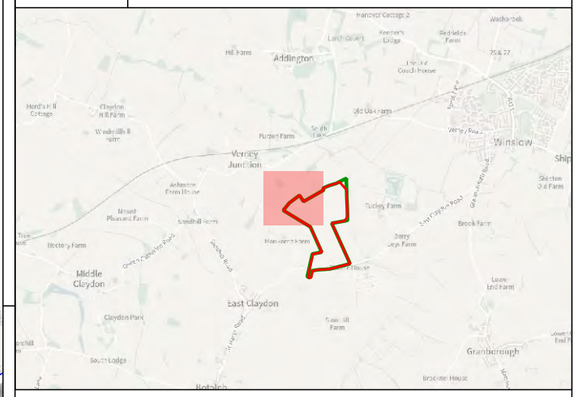
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:5,000 @ A3

Illus 09 - Overall interpretation of magnetometer data



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

Survey Extent

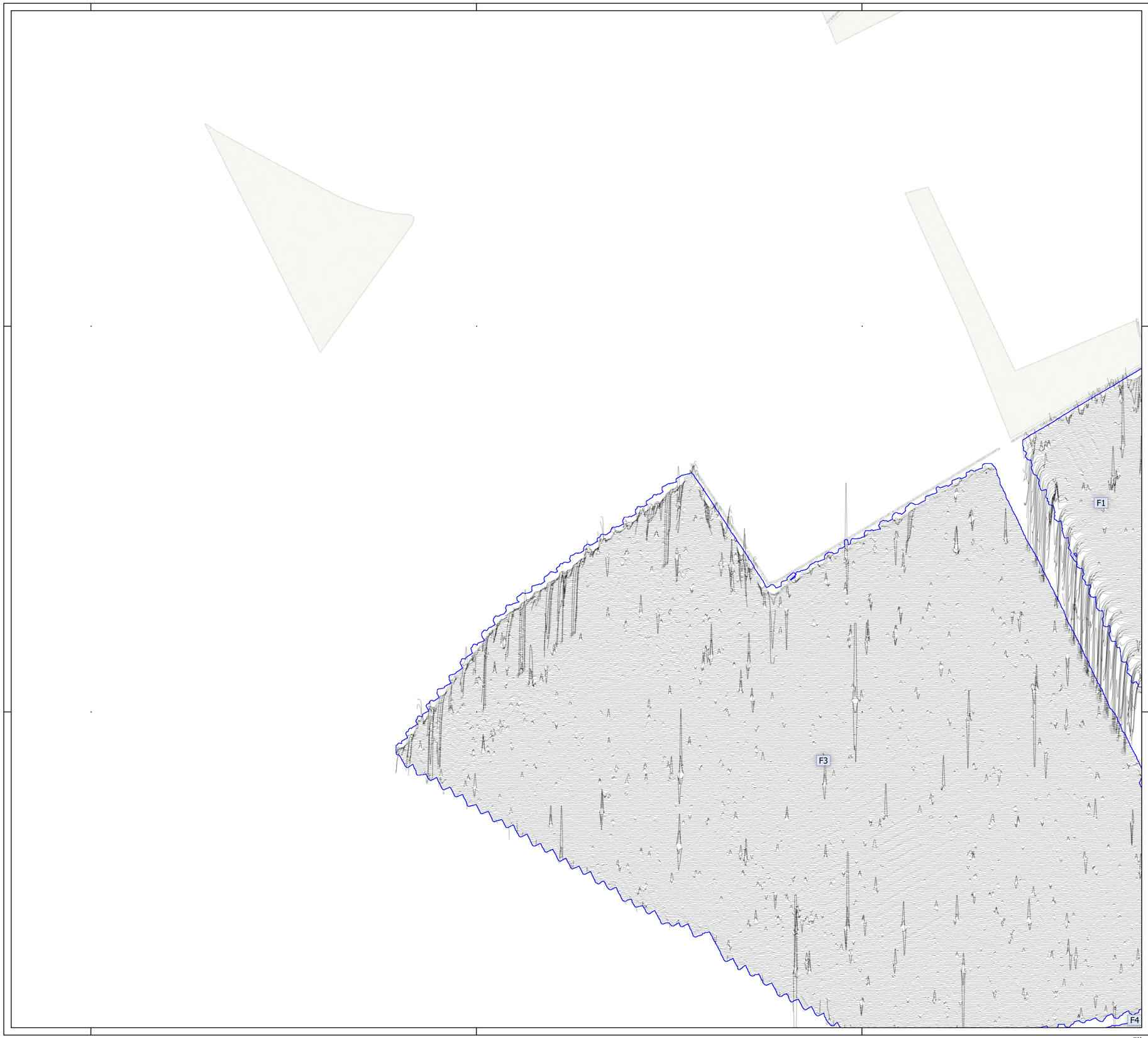
+2nT

-1nT

0 50 100 m

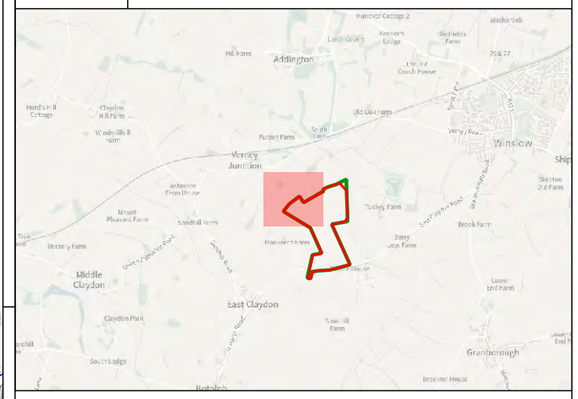
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 10 Processed greyscale magnetometer data; Sector 1



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

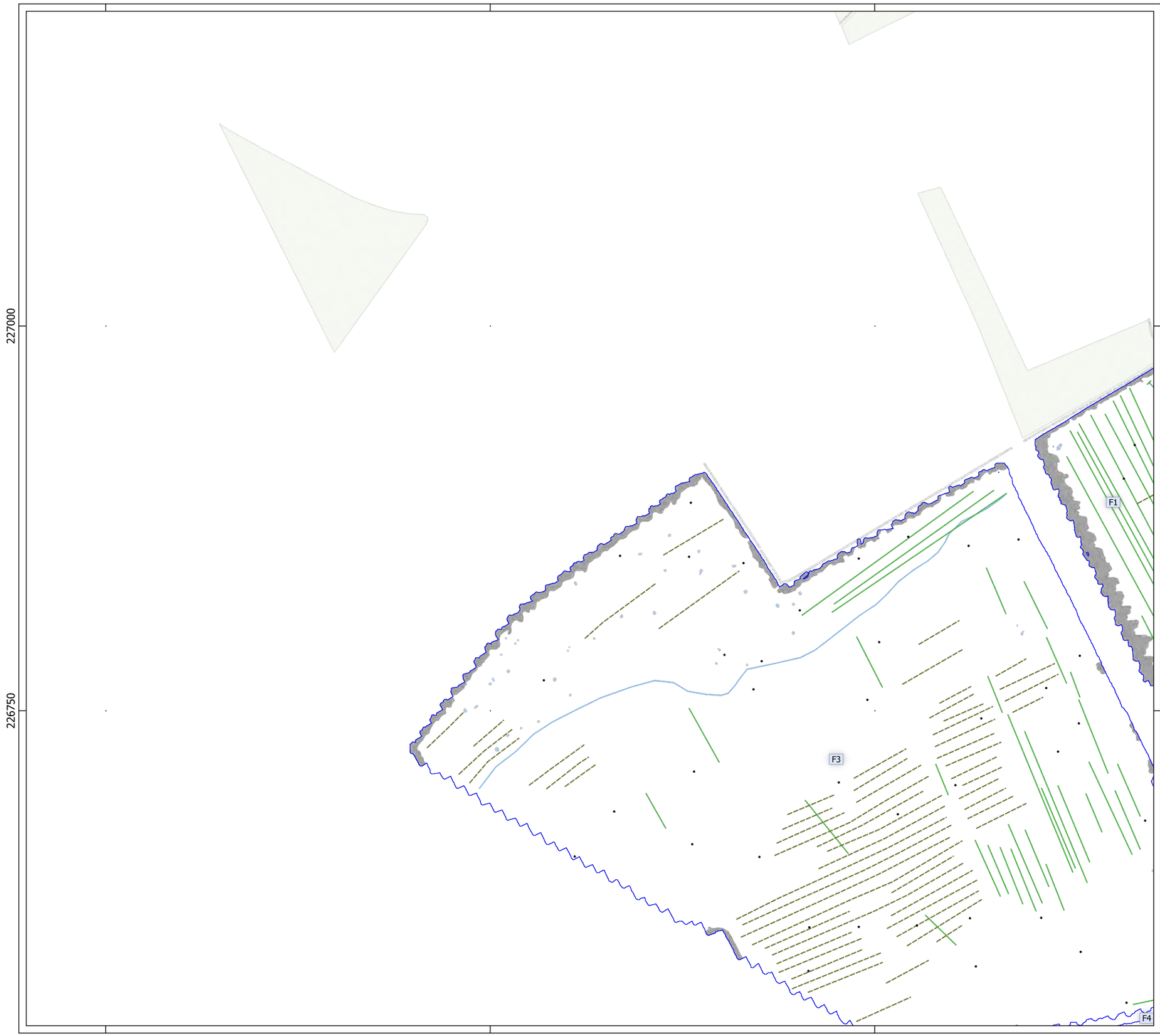
Survey Extent

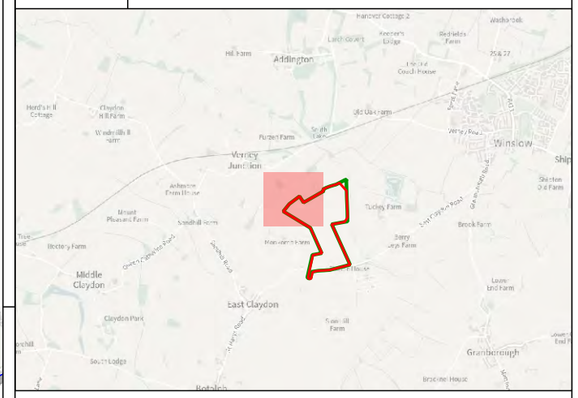
XY Trace (25nT/cm)

0 50 100 m

Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 11 XY trace plot of minimally processed magnetometer data; Sector 1





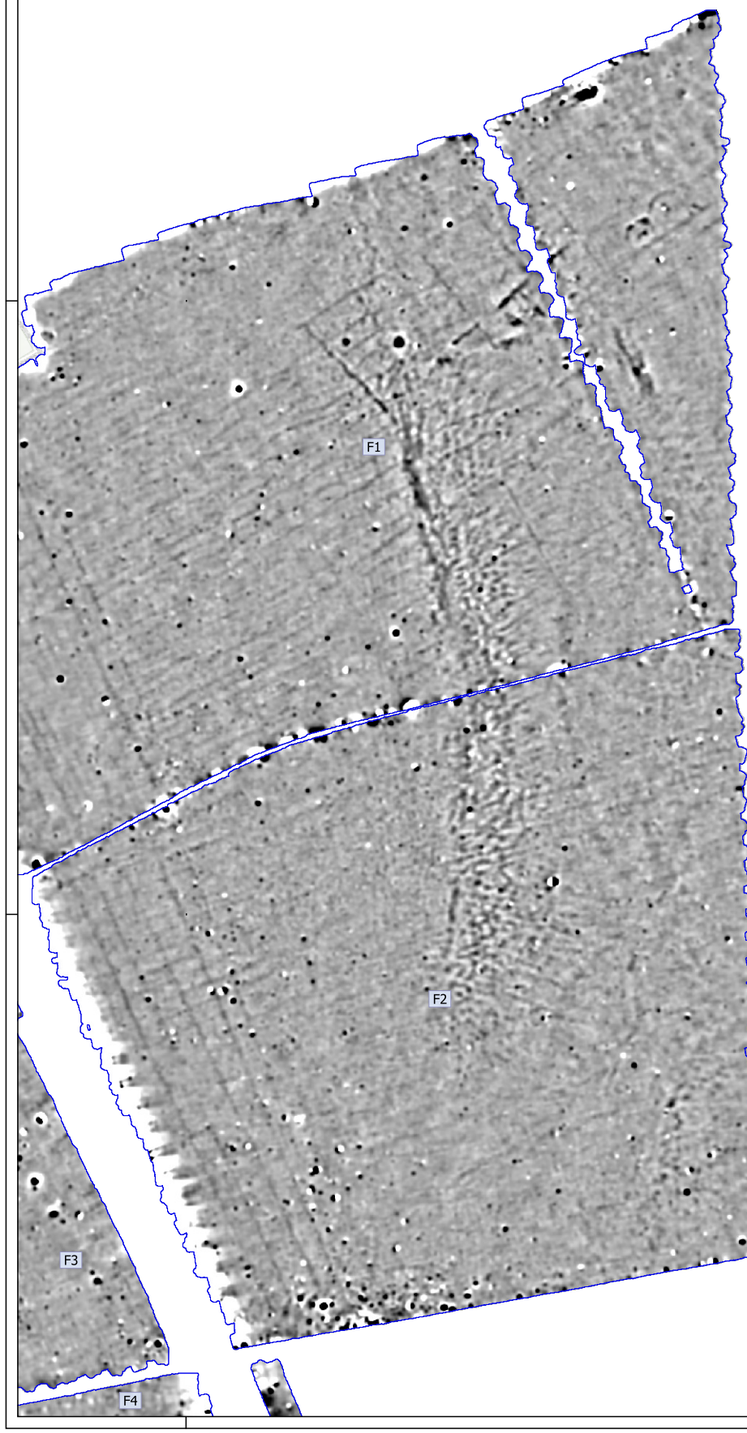
Key

- Survey Extent
- Ferrous Objects
- Agriculture
- Field Drain
- Natural
- Ridge and Furrow
- Magnetic Disturbance (Above Ground)
- Natural

0 50 100 m

Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

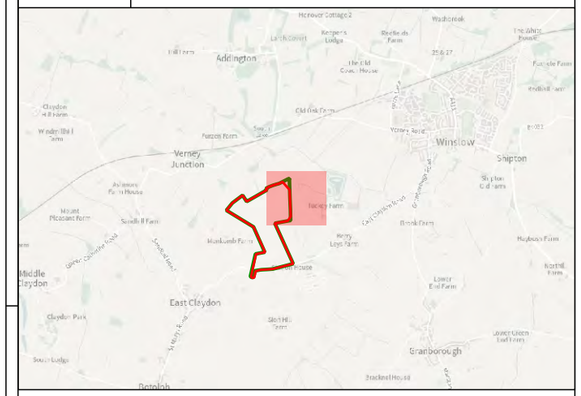
Illus - 12 Interpretation of magnetometer data; Sector 1



227000
226750
474750
475000
475250

N

HEADLAND ARCHAEOLOGY
an RSK company



Key

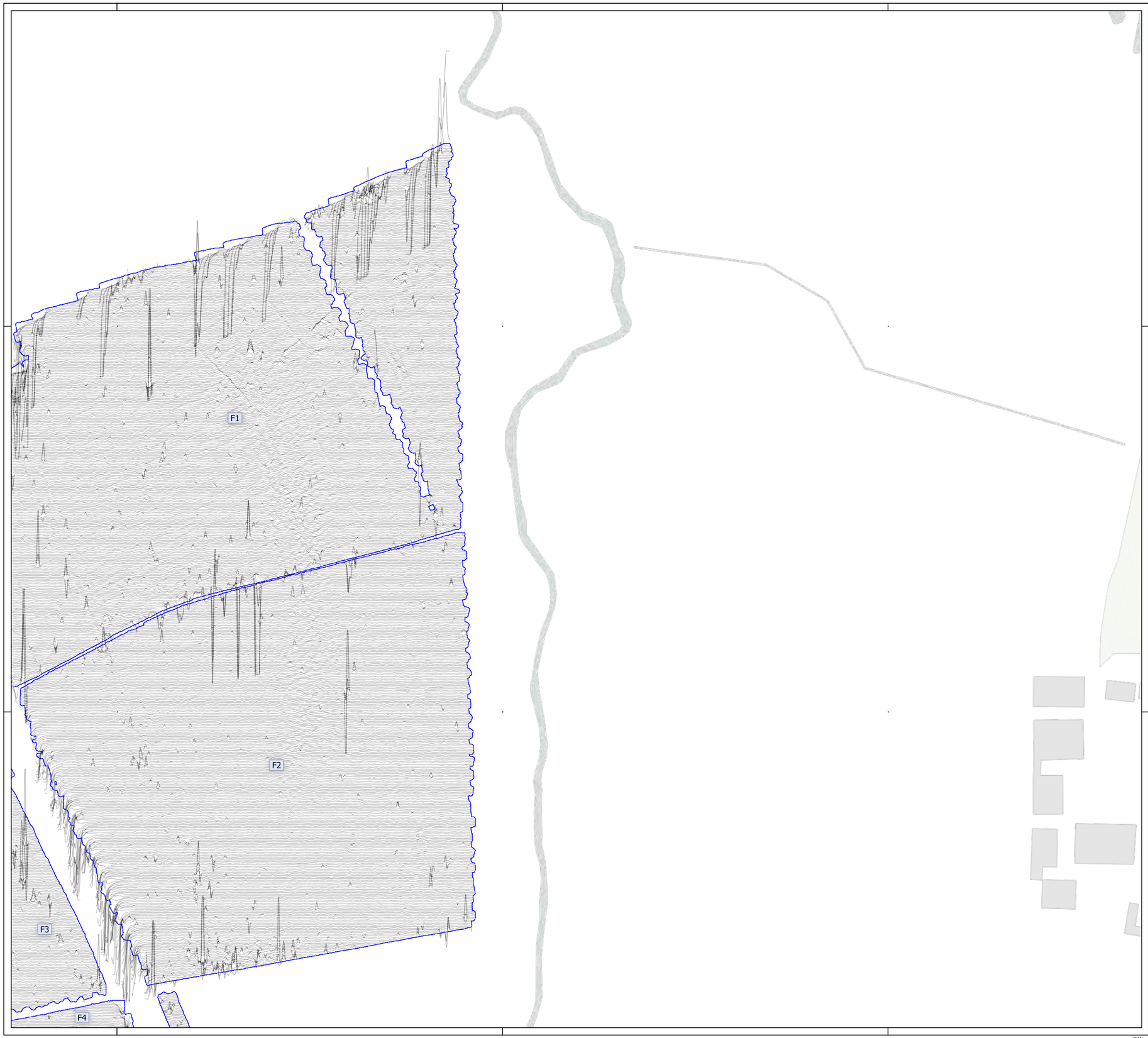
Survey Extent

+2nT
-1nT

0 50 100 m

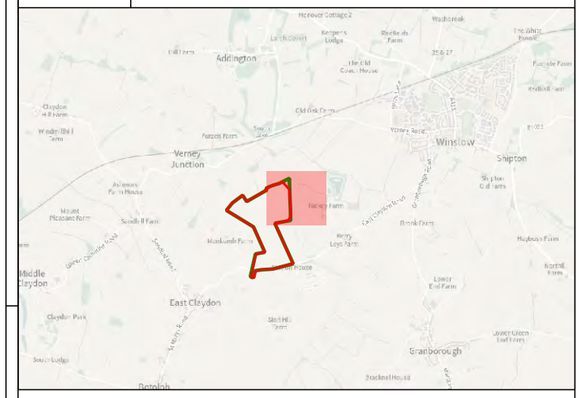
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 13 Processed greyscale magnetometer data; Sector 2



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

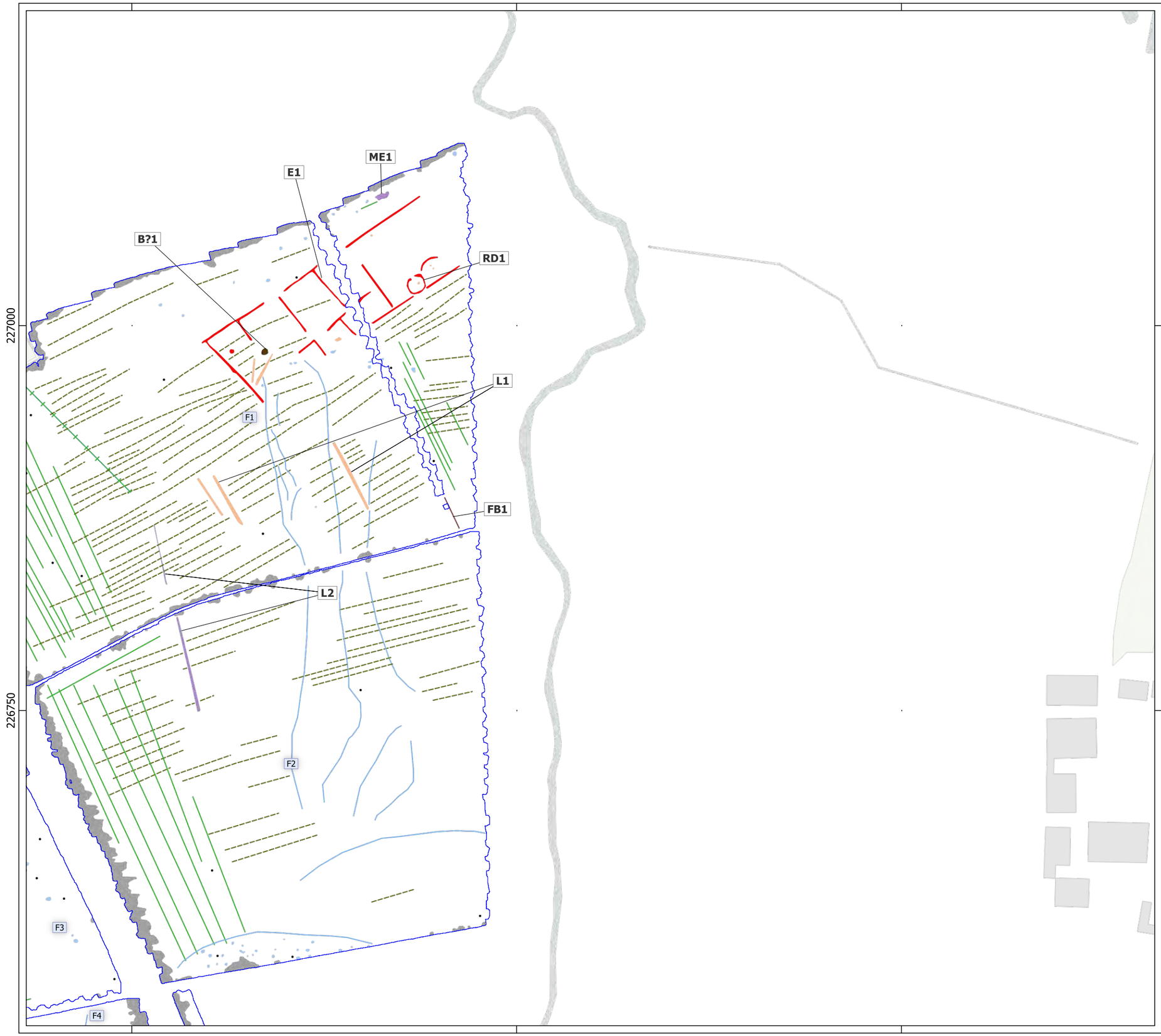
Survey Extent

XY Trace (25nT/cm)

0 50 100 m

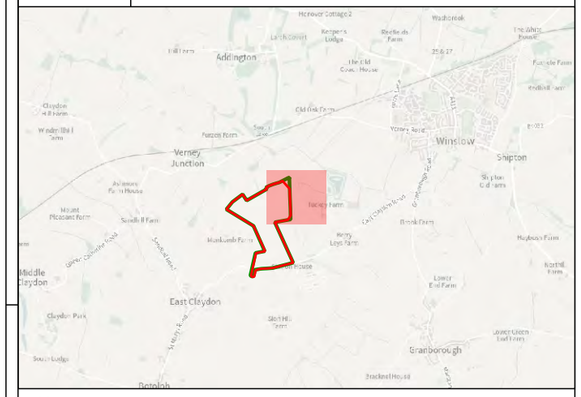
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 14 XY trace plot of minimally processed magnetometer data; Sector 2



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

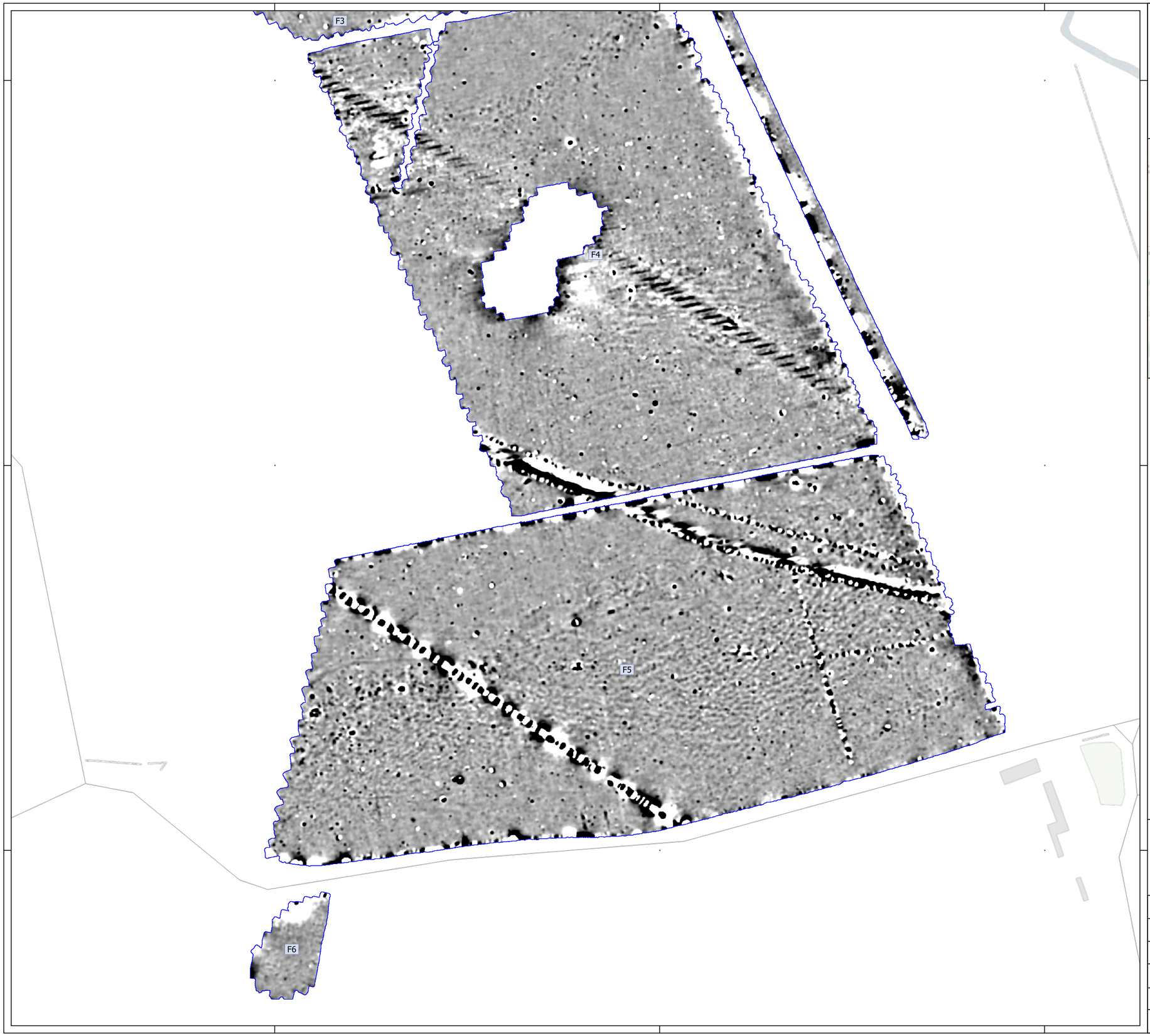
- Survey Extent
- Ferrous Objects
- Agriculture
- Field Boundary
- Field Drain
- Natural
- Ridge and Furrow
- Archaeology
- Magnetic Disturbance (Above Ground)
- Natural
- Possible Archaeology
- Uncertain
- Burning?

	Abbreviation
B?	Burning?
E	Enclosure
FB	Former Boundary
L	Linear Trend
ME	Magnetic Enhancement
RD	Ring Ditch

0 50 100 m

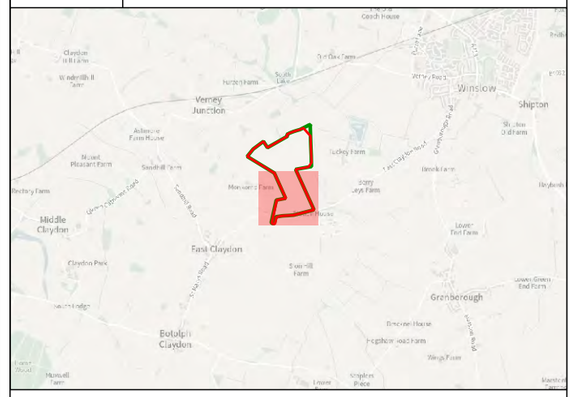
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 15 Interpretation of magnetometer data; Sector 2



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

Survey Extent

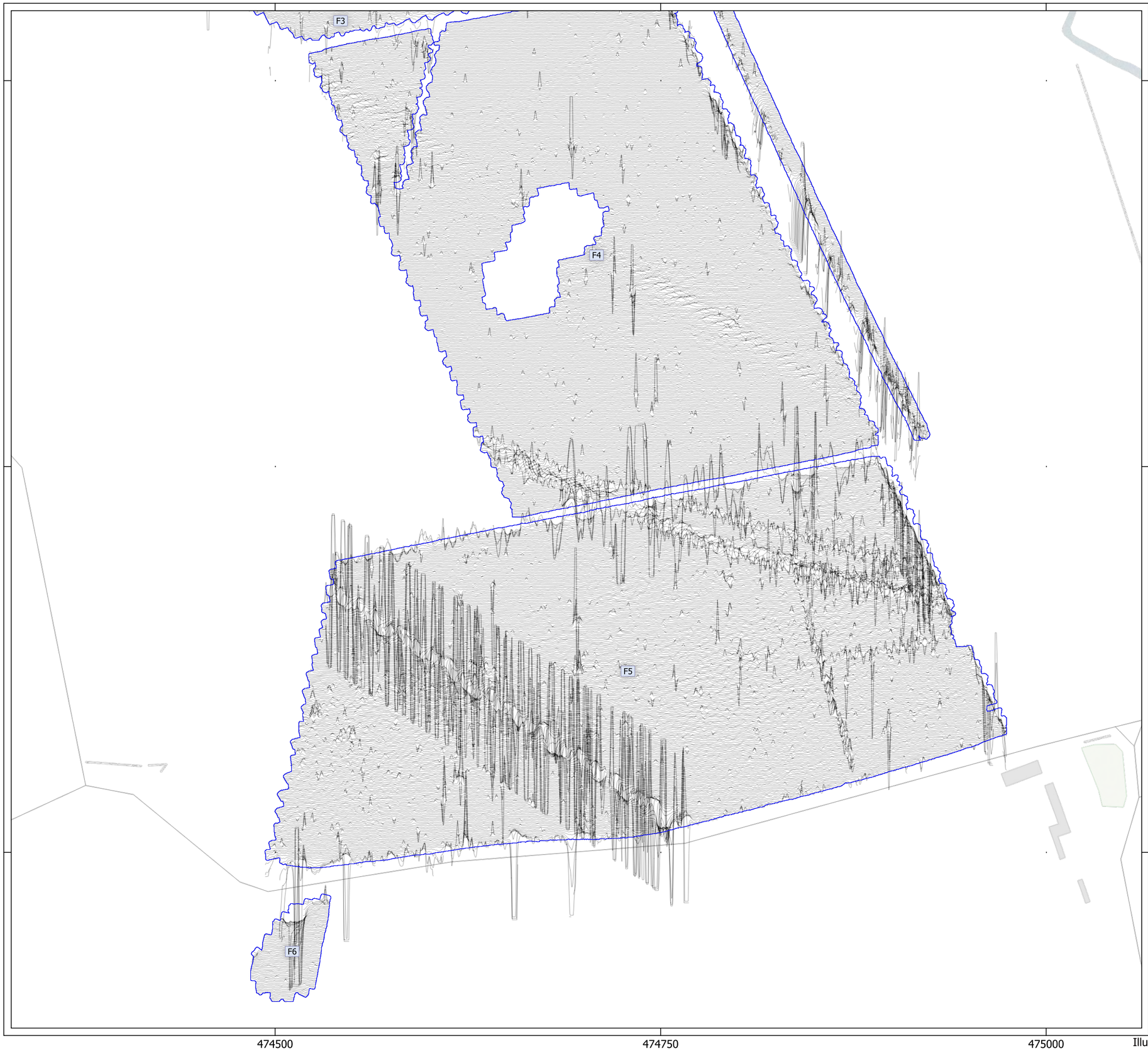
+2nT

-1nT

0 50 100 m

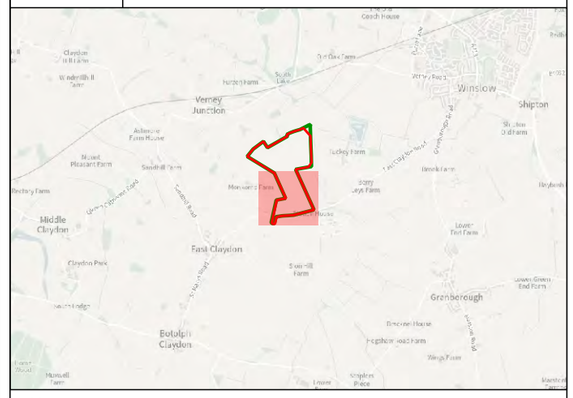
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 16 Processed greyscale magnetometer data; Sector 3



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

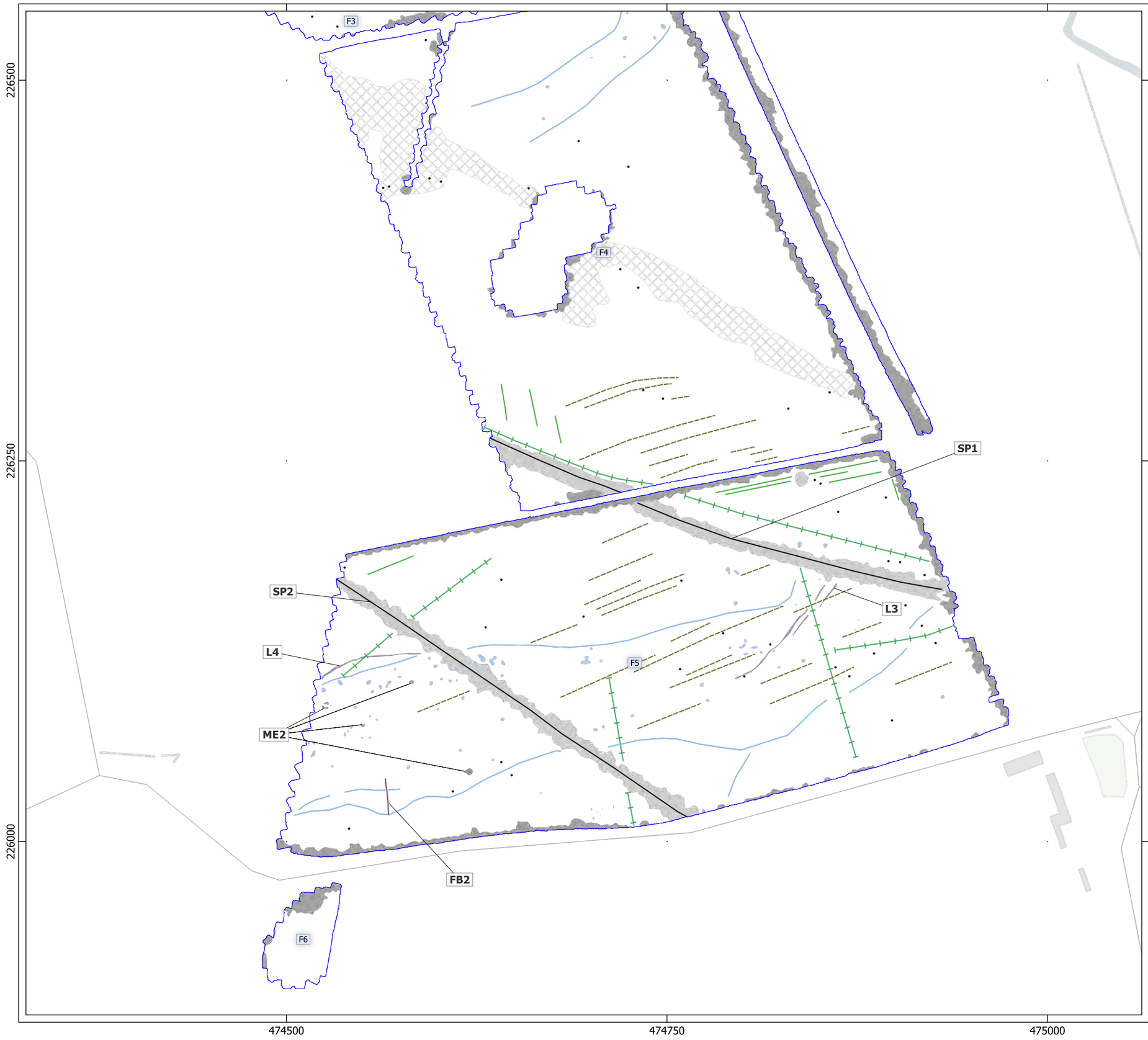
Survey Extent

XY Trace (25nT/cm)

0 50 100 m

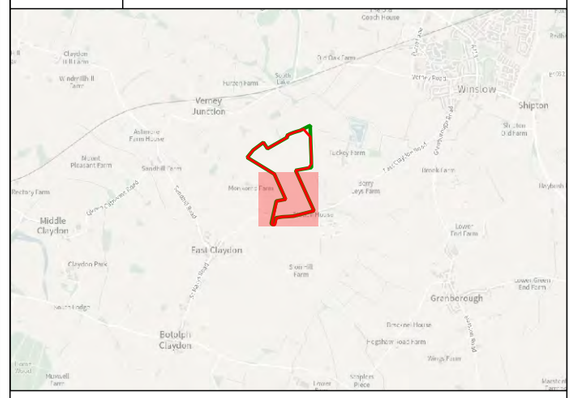
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 17 XY trace plot of minimally processed magnetometer data; Sector 3



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

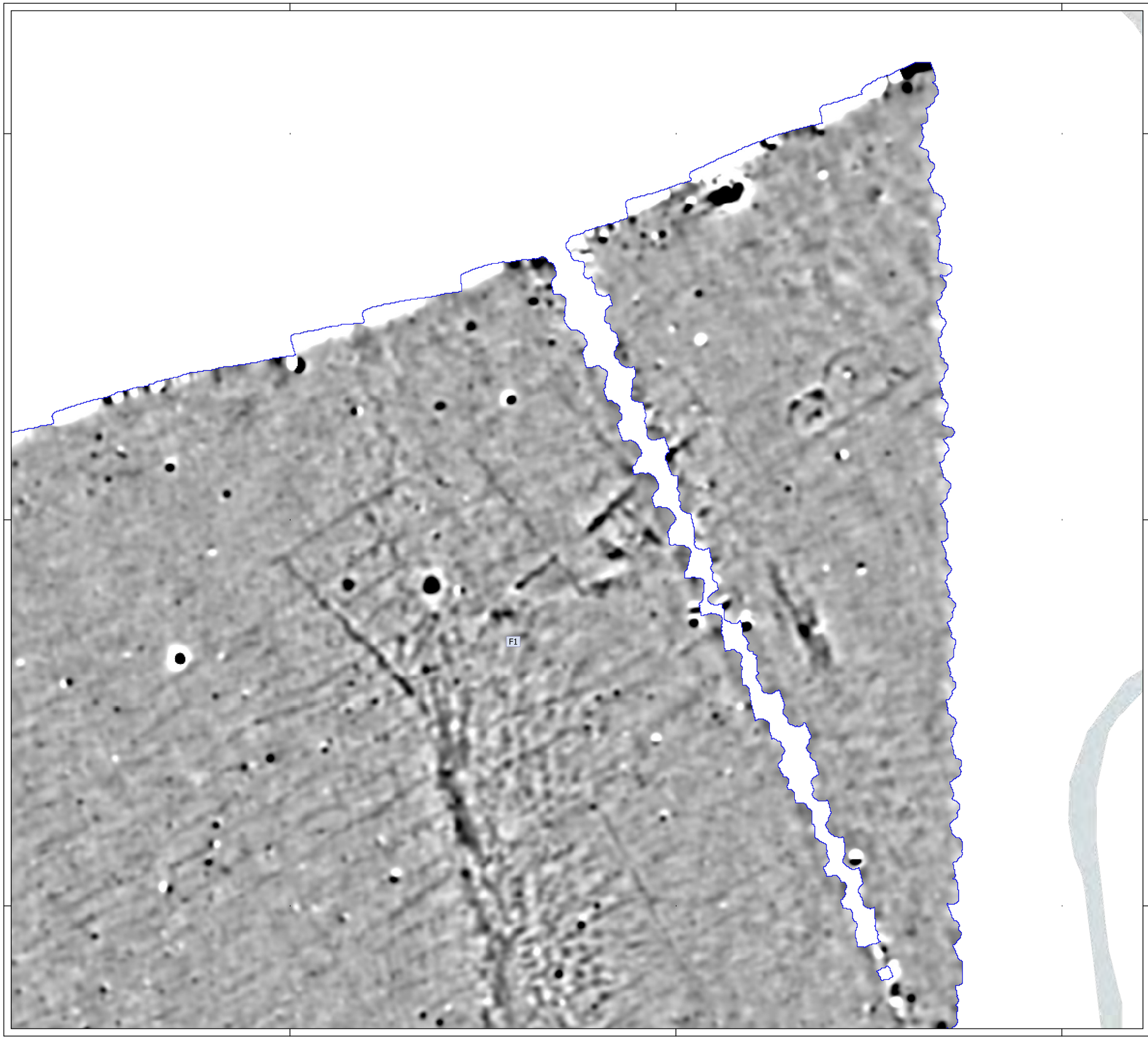
- Survey Extent
- Ferrous Objects
- Agriculture
- Field Boundary
- Field Drain
- Natural
- Service
- Ridge and Furrow
- Magnetic Disturbance (Above Ground)
- Magnetic Disturbance (Below Ground)
- Natural
- Overhead Cable
- Uncertain

	Abbreviation
FB	Former Boundary
L	Linear Trend
ME	Magnetic Enhancement
SP	Service Pipe

0 50 100 m

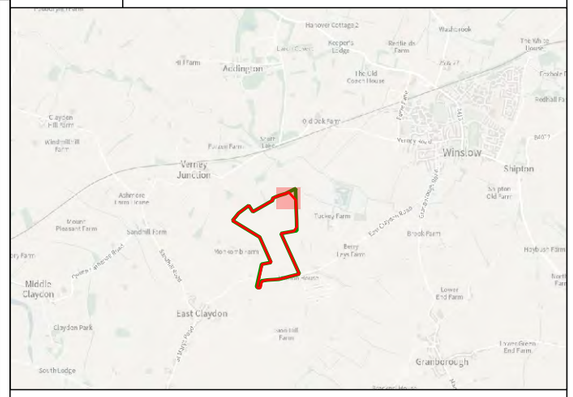
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:2,500 @ A3

Illus - 18 Interpretation of magnetometer data; Sector 3



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

Survey Extent

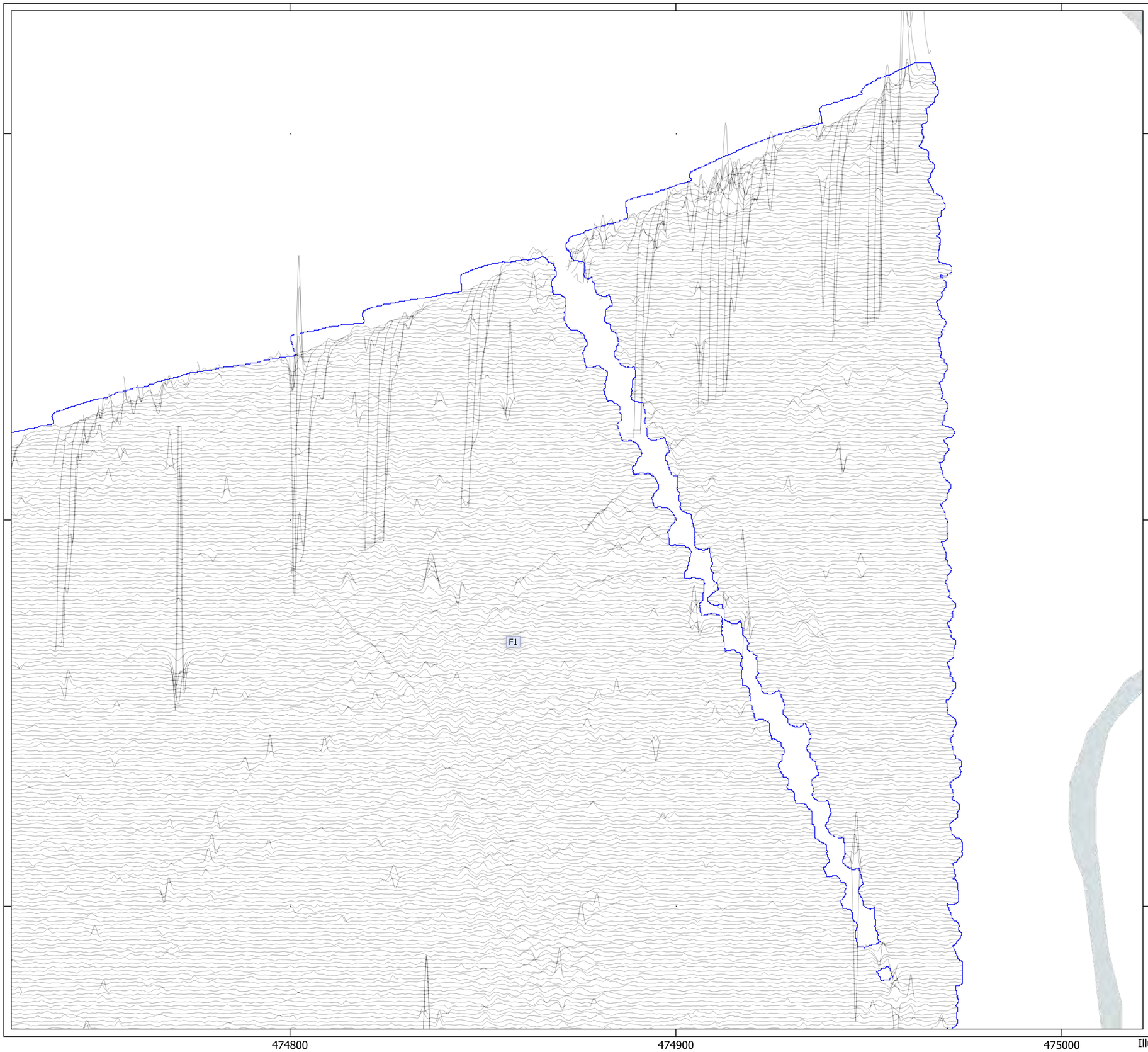
+2nT

-1nT

0 20 40 m

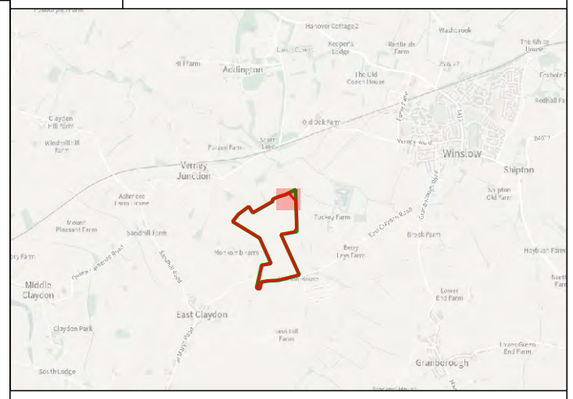
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:1,000 @ A3

Illus - 19 Processed greyscale magnetometer data; AAA 1



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

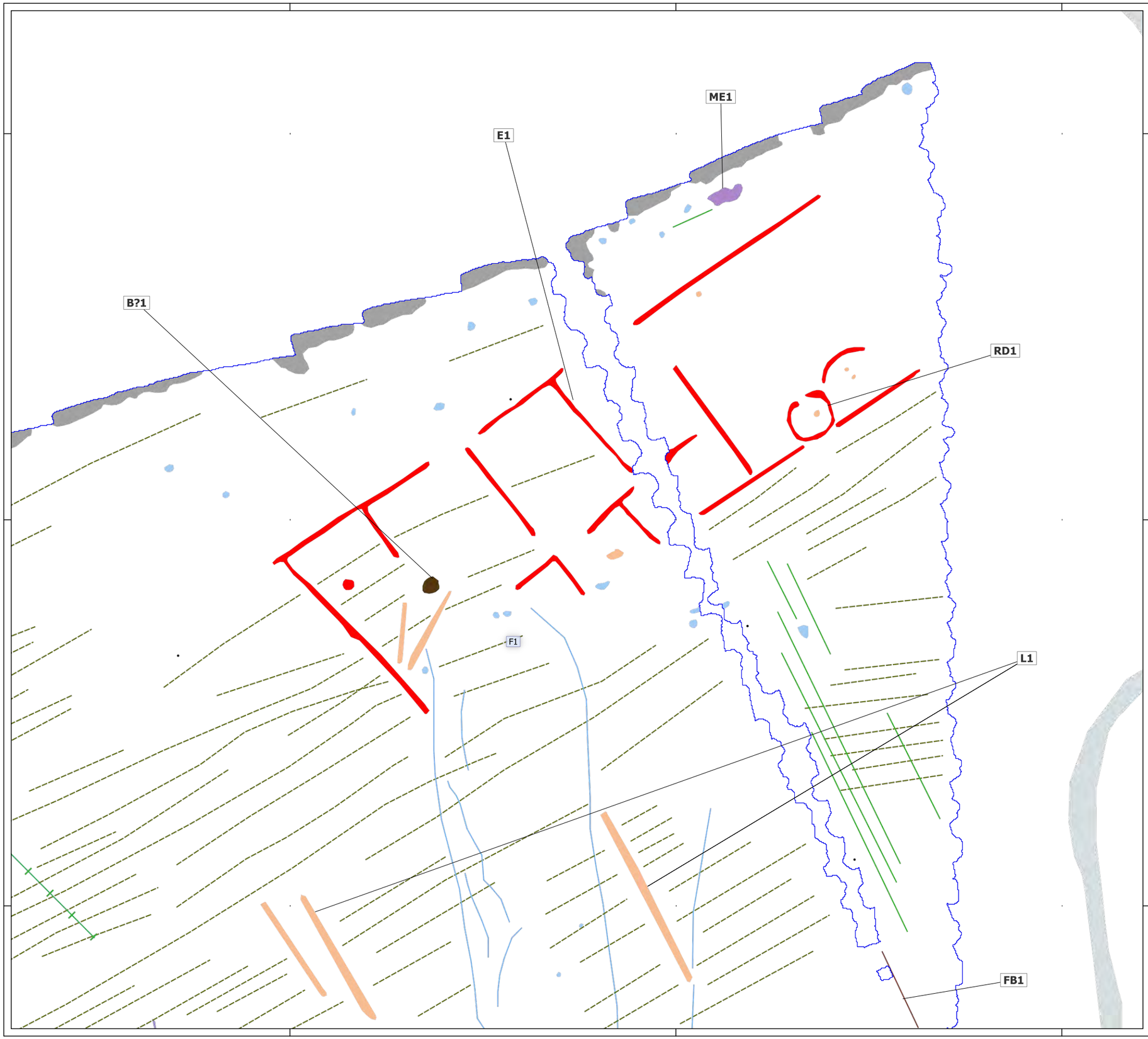
Survey Extent

XY Trace (25nT/cm)

0 20 40 m

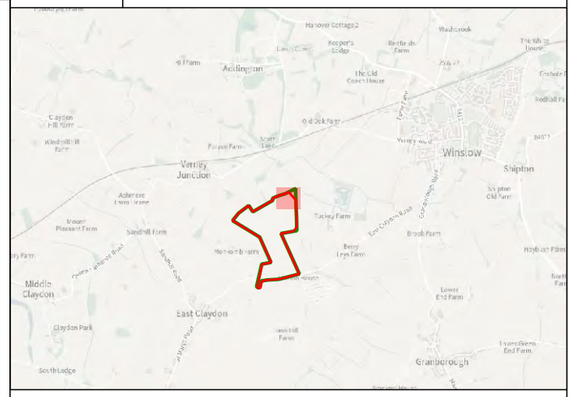
Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:1,000 @ A3

Illus - 20 XY trace plot of minimally processed magnetometer data; AAA 1



N

HEADLAND ARCHAEOLOGY
an RSK company



Key

- Survey Extent
- Ferrous Objects
- Agriculture
- Field Boundary
- Field Drain
- Natural
- Ridge and Furrow
- Archaeology
- Magnetic Disturbance (Above Ground)
- Natural
- Possible Archaeology
- Uncertain
- Burning?

	Abbreviation
B?	Burning?
E	Enclosure
FB	Former Boundary
L	Linear Trend
ME	Magnetic Enhancement
RD	Ring Ditch

0 20 40 m

Site:	ECBU24
Created by:	LD
Checked by:	KM
Version:	v5.0
Date:	17/04/2025
Scale:	1:1,000 @ A3

Illus - 21 Interpretation of magnetometer data; AAA 1

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of the topsoil, subsoil, and rock, into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns, or areas of burning.

Types of magnetic anomaly

In most instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However, some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes) These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being introduced into the topsoil during manuring.

Areas of magnetic disturbance These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Lightning-induced remnant magnetisation (LIRM) LIRM anomalies are thought to be caused in the near surface soil horizons by the flow of an electrical current associated with lightning strikes. These observed anomalies have a strong bipolar signal which decreases with distance from the spike point and often appear as linear or radial in shape.

Linear trend This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

APPENDIX 2 SURVEY LOCATION INFORMATION

The magnetometer data was collected and is geo-located based on survey grade Real Time Kinetic (RTK) differential Global Positioning System (dGPS) used on both hand-carried and towed systems. The accuracy of this dGPS equipment is better than 0.01m. The GPS systems output in NMEA mode in real time, with a visual guide of survey tracks and any survey area boundaries displayed on a tablet device in view of the survey operator to ensure full coverage. Any survey area boundaries are uploaded as a string of co-ordinates or shapefile to the tablet prior to the commencement of survey.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report.

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift, heading errors and any other artificial data.

The XY data has been clipped to remove extreme values and to improve the interpretability of the data.

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID (UID): headland1-532475

Project Name:	Geophysical Survey, Magnetometry Survey at East Claydon Greener Grid Park
Activity type:	Geophysical Survey, Magnetometry Survey, MAGNETOMETRY SURVEY
Sitecode(s):	ECBU24
Project Identifier(s):	P24-111
Planning Id:	[no data]
Reason for Investigation:	Planning: Pre application
Organisation Responsible for work:	Headland Archaeology (UK) Ltd
Project Dates:	13-Jan-2025–16-Jan-2025
HER:	National Trust HBSMR
HER:	Historic England review
HER:	Buckinghamshire HER
HER Identifiers:	[no data]
Project Methodology:	The survey was undertaken using a hand carried five sensor array deploying Sensys FGM650/10 sensors mounted at 1m intervals (1m traverse interval) onto a rigid frame. The system was programmed to take readings at a frequency of 100Hz (allowing for a 1–2cm sample interval) on roaming traverses (swaths) 5m apart. These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Leica GS18 Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point. MonMX (Sensys Ltd) software was used to collect and export the data. Anomaly GeoSurvey v1.12.3 (Lichenstone Geoscience) and QGIS v.3.34.6 software was used to process and present the data respectively.
Project Results:	Survey was successfully undertaken across all suitable parts of the site and the data has recorded a wide range of magnetic anomalies considered predominantly agricultural in nature but also of modern, natural, uncertain and archaeological origin. A small area of archaeological activity defined by a series of ditches forming rectangular enclosures and a ring ditch was identified in the north-east corner of the site. Elsewhere the survey findings were limited to faint linear trends and a loose cluster of enhanced discrete responses of uncertain origin in the south of the site, linear and curvilinear trends recording traces of ridge and furrow cultivation and sections of former field boundaries and natural/geological variations mapping changes in overlying superficial deposits. Two buried services and a linear spread of interference from overhead powerlines has also been recorded. No anomalies of note were identified in the location of a purported Roman road crossing the eastern part of the site or in the location of two metal detecting find spots in the north-west part of the site. Based on the results of the survey the archaeological potential of the site is widely assessed as low, except for the north-east corner of the site which is regarded as locally high.
Keywords:	[no data]
Archive:	[no data]

APPENDIX 6 WRITTEN SCHEME OF INVESTIGATION (TIGERGEO 2024)

Headland Archaeology Scotland
13 Jane Street
Edinburgh EH6 5HE
t 0131 467 7705
e scotland@headlandarchaeology.com

Headland Archaeology Yorkshire & North
Units 23–25 & 15 | Acorn Business Centre | Balme Road
Cleckheaton BD19 4EZ
t 0127 493 8019
e yorkshireandnorth@headlandarchaeology.com

Headland Archaeology South & East
Building 68C | Wrest Park | Silsoe
Bedfordshire MK45 4HS
t 01525 861 578
e southandeast@headlandarchaeology.com

Headland Archaeology Midlands & West
Unit 1 | Clearview Court | Twyford Rd
Hereford HR2 6JR
t 01432 364 901
e midlandsandwest@headlandarchaeology.com

Headland Archaeology North West
Fourways House | 57 Hilton Street
Manchester M1 2EJ
t 0161 236 2757
e northwest@headlandarchaeology.com

www.headlandarchaeology.com