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Gate Burton Energy Farm, Lincolnshire

Detailed Gradiometer Survey Report

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Contents

Summary	iii
Acknowledgements.....	iii
1 INTRODUCTION	1
1.1 Project background.....	1
1.2 Scope of document.....	1
1.3 The site.....	1
2 ARCHAEOLOGICAL BACKGROUND.....	2
3 METHODOLOGY	3
3.1 Introduction.....	3
3.2 Aims and objectives.....	3
3.3 Fieldwork methodology	3
3.4 Data processing.....	4
4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION	4
4.1 Introduction.....	4
4.2 Gradiometer survey results and interpretation	4
5 DISCUSSION	7
REFERENCES	8
Bibliography.....	8
Cartographic and documentary sources.....	8
Online resources.....	8
APPENDICES	9
Appendix 1: Survey Equipment and Data Processing.....	9
Appendix 2: Geophysical Interpretation	11
Appendix 3: OASIS form	12

List of Figures

Figure 1	Site location and survey extent
Figure 2	Detailed gradiometer survey results: greyscale plot (Fields 19 - 26)
Figure 3	Detailed gradiometer survey results: interpretation (Fields 19 - 26)
Figure 4	Detailed gradiometer survey results: greyscale plot (Fields 24 - 29)
Figure 5	Detailed gradiometer survey results: interpretation (Fields 24 - 29)
Figure 6	Detailed gradiometer survey results: greyscale plot (Field 1 - 7, 30 - 34)
Figure 7	Detailed gradiometer survey results: interpretation (Field 1 - 7, 30 - 34)
Figure 8	Detailed gradiometer survey results: greyscale plot (Field 8 - 15)
Figure 9	Detailed gradiometer survey results: interpretation (Field 8 - 15)
Figure 10	Detailed gradiometer survey results: greyscale plot (Field 12, 15 - 18)
Figure 11	Detailed gradiometer survey results: interpretation (Field 12, 15 - 18)
Figure 12	Detailed gradiometer survey results: greyscale plot (Field 1, 4, 5)
Figure 13	Detailed gradiometer survey results: interpretation (Field 1, 4, 5)
Figure 14	Detailed gradiometer survey results: greyscale plot (Field 2, 5)
Figure 15	Detailed gradiometer survey results: interpretation (Field 2, 5)
Figure 16	Detailed gradiometer survey results: greyscale plot (Field 3, 4, 6)
Figure 17	Detailed gradiometer survey results: interpretation (Field 3, 4, 6)
Figure 18	Detailed gradiometer survey results: greyscale plot (Field 7, 11)
Figure 19	Detailed gradiometer survey results: interpretation (Field 7, 11)
Figure 20	Detailed gradiometer survey results: greyscale plot (Field 8, 9, 10)
Figure 21	Detailed gradiometer survey results: interpretation (Field 8, 9, 10)
Figure 22	Detailed gradiometer survey results: greyscale plot (Field 12)



- Figure 23** Detailed gradiometer survey results: interpretation (Field 12)
Figure 24 Detailed gradiometer survey results: greyscale plot (Field 13)
Figure 25 Detailed gradiometer survey results: interpretation (Field 13)
Figure 26 Detailed gradiometer survey results: greyscale plot (Field 13, 14, 15)
Figure 27 Detailed gradiometer survey results: interpretation (Field 13, 14, 15)
Figure 28 Detailed gradiometer survey results: greyscale plot (Field 15)
Figure 29 Detailed gradiometer survey results: interpretation (Field 15)
Figure 30 Detailed gradiometer survey results: greyscale plot (Field 16)
Figure 31 Detailed gradiometer survey results: interpretation (Field 16)
Figure 32 Detailed gradiometer survey results: greyscale plot (Field 17, 18)
Figure 33 Detailed gradiometer survey results: interpretation (Field 17, 18)
Figure 34 Detailed gradiometer survey results: greyscale plot (Field 19, 20, 22)
Figure 35 Detailed gradiometer survey results: interpretation (Field 19, 20, 22)
Figure 36 Detailed gradiometer survey results: greyscale plot (Field 20, 21, 23)
Figure 37 Detailed gradiometer survey results: interpretation (Field 20, 21, 23)
Figure 38 Detailed gradiometer survey results: greyscale plot (Field 21, 23)
Figure 39 Detailed gradiometer survey results: interpretation (Field 21, 23)
Figure 40 Detailed gradiometer survey results: greyscale plot (Field 24, 25, 26)
Figure 41 Detailed gradiometer survey results: interpretation (Field 24, 25, 26)
Figure 42 Detailed gradiometer survey results: greyscale plot (Field 24, 25, 26)
Figure 43 Detailed gradiometer survey results: interpretation (Field 24, 25, 26)
Figure 44 Detailed gradiometer survey results: greyscale plot (Field 26)
Figure 45 Detailed gradiometer survey results: interpretation (Field 26)
Figure 46 Detailed gradiometer survey results: greyscale plot (Field 26)
Figure 47 Detailed gradiometer survey results: interpretation (Field 26)
Figure 48 Detailed gradiometer survey results: greyscale plot (Field 26)
Figure 49 Detailed gradiometer survey results: interpretation (Field 26)
Figure 50 Detailed gradiometer survey results: greyscale plot (Field 26)
Figure 51 Detailed gradiometer survey results: interpretation (Field 26)
Figure 52 Detailed gradiometer survey results: greyscale plot (Field 26, 29)
Figure 53 Detailed gradiometer survey results: interpretation (Field 26, 29)
Figure 54 Detailed gradiometer survey results: greyscale plot (Field 27, 28)
Figure 55 Detailed gradiometer survey results: interpretation (Field 27, 28)
Figure 56 Detailed gradiometer survey results: greyscale plot (Field 30, 32, 34)
Figure 57 Detailed gradiometer survey results: interpretation (Field 30, 32, 34)



Summary

A detailed gradiometer survey was conducted over land at Gate Burton Energy Park, Lincolnshire (centred on NGR 484748, 383644). The project was commissioned by Low Carbon Ltd to establish the presence, or otherwise, and nature of detectable archaeological features in support of a planning application for the development of the site as a photovoltaic solar park.

The site comprises arable fields in the county of Lincolnshire, adjacent to the east of the village of Gate Burton, 7.3 km south of Gainsborough and 17.3 km northwest of Lincoln, covering an area of 380 ha. The geophysical survey was undertaken between 31/01/2022 and 23/03/2022.

The detailed gradiometer survey has been successful in detecting clear anomalies of archaeological interest in the north-eastern and south-western parts of the site. These predominantly comprise rectilinear anomalies suggestive of Late Iron Age to Romano British enclosure(s), potentially incorporating multiple phases of activity. Within the north-eastern examples, there is also evidence for potential settlement activity and other pit-like features. Given the widespread evidence for activity dating to this period within the wider area, it is these form part of the Romano-British countryside. As the Roman town of Segelocum is located to the west of the site, these are likely related small-scale settlements within its agricultural hinterland.

A small number of oval and penannular features were also identified as possibly being of archaeological origin at the eastern part of the site. They could indicate a more isolated Late Iron Age or Romano-British roundhouse but given their weak nature could equally be natural in origin.

A large number of further linear ditch-like anomalies have been identified, which relate to former field boundaries visible on 1900 OS mapping of the area. In addition, several other features that are also recorded on historic mapping have also been detected as areas of increased magnetic response. This includes two locations of demolished structures, a former windpump to the north of the Clay Farm, annotated on the 1953 OS map, and the High Pasture Farm, known from the 1900 OS map.

Several areas of ridge and furrow were identified showing medieval or later agricultural activities. In addition, numerous modern drains throughout the site indicate more recent agricultural activity.

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The fieldwork was undertaken by Rok Plesnicar, Alistair Trace, Andrés Pérez Arana, Cameron Ray, Amy Dunn, Pamela Warne, Jake Bishop, Joanne Instone-Brewer, Davor Cakanic, and Steven Heer. Rok Plesnicar, Cameron Ray and Andrés Pérez Arana processed and interpreted the geophysical data. Rok Plesnicar and Andrés Pérez Arana wrote the report and prepared the illustrations. The geophysical work was quality controlled by Nicholas Crabb and the project was managed on behalf of Wessex Archaeology by Tom Richardson.



Gate Burton Energy Park, Lincolnshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology was commissioned by Low Carbon Ltd to carry out a geophysical survey at Gate Burton, Lincolnshire (centred on NGR 484748, 383644) (**Figure 1**). The survey forms part of an ongoing program of archaeological works being undertaken in support of a planning application for the development of the site as a photovoltaic solar farm.

1.2 Scope of document

- 1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The site

- 1.3.1 The site is located in the county of Lincolnshire, adjacent to the east of the village of Gate Burton, 7.3 km south of Gainsborough and 17.3 km north-west of Lincoln.
- 1.3.2 The survey comprises 380 ha of agricultural land spread across 34 fields, currently in use as arable land. For ease of reference, each field has been assigned an identification number (F1-F34), which is labelled on **Figures 2-11**. The site is bounded by open fields and woodland to the north and east, Willingham Road to the south, and further agricultural land and the villages of Gate Burton and Knaith to the west. In addition, within the site, areas of woodland at Long Nursery and Burton Wood also delimit the survey extent.
- 1.3.3 A set of overhead cables traverse the eastern part of the site, from north to south. The Lincoln to Gainsborough train line runs across the central part of the site from north to south.
- 1.3.4 The site is generally flat with a very gentle incline across the whole area, sloping from 30m above Ordnance Datum (aOD) at the western edge to 14m aOD at the eastern edge. However, there are a small number of more localised undulations that broadly correspond with variations in the underlying geological deposits.
- 1.3.5 The solid geology predominantly comprises interbedded Mudstone and Limestone from the Scunthorpe Mudstone Formation (BGS 2022). However, a band of Mudstone of the Penarth Group is located along the site's eastern edge, which is most extensive in the north-eastern corner of the site. There are also several parts of the site where overlying superficial geological deposits are present. In the northern fields (F1, F2, and F30-F34), sand and gravel glaciofluvial deposits are recorded. This is also present in the centre of the site, around F14 and F22, corresponding with a topographic high point. A similar spur is also present within F16 in the south-east of the site. Alluvium is also recorded within a slight depression around Clay Farm in the south of the site at F27 and F28.
- 1.3.6 The soils underlying the site are likely to consist of stagnogley soils of the 711f (Wickham 2) association and typical sandy gley soils of the 821b (Blackwood) along the northern edge of the survey area (SSEW SE Sheet 3 1983). Soils derived from such geological parent material have been shown to produce weak magnetic contrasts for the detection of archaeological remains through magnetometer surveys.



2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

- 2.1.1 A Written Scheme of Investigation (WSI) was prepared by AECOM for Gate Burton Energy Park, which examined the potential for the survival of buried archaeological remains within the development area and a 1 km study area (AECOM 2021). The following background is not exhaustive but is summarised from aspects of the WSI and other publicly available online and in-house resources that are considered relevant to the interpretation of the geophysical survey data.

2.2 Summary of the archaeological resource

- 2.2.1 There are no designated heritage assets recorded within the site, but there are three scheduled monuments within the study area. This includes the Roman town of Segelocum (NHLE 1003669) and a Roman fort south of Littleborough Lane (NHLE 1004935), which are located 1.5 km and 700 m to the east respectively. The 12th century earthworks of Heyninghs Priory (NHLE 1008685) are also located 800 m to the north of the site and were founded in 1135.
- 2.2.2 There are 18 listed buildings within the study area, including the Grade I listed Church of St. Margaret of Antioch (NHLE 1359484), which is located 740 m to the south of the site in the village of Marton. There are also three Grade II* listed buildings within the study area comprising the Church of St. Marry (NHLE 1064050), Gate Burton Hall (NHLE 1359458) and Burton Chateau (NHLE 1064085). The remaining 14 properties are Grade II listed buildings that predominately relate to post-medieval domestic and agricultural activity.
- 2.2.3 There are very few records pertaining to earlier prehistoric periods within the study area. Flint artefacts and a stone pounder found in a field close to Lea Grange represent the earliest evidence of human activity within the study area.
- 2.2.4 On the north-western corner of the survey area, possible prehistoric cropmarks have been identified, east of the village of Knaith, but it is unclear precisely what period these relate to.
- 2.2.5 Iron Age activity is only evidenced by individual recorded finds with no direct evidence of settlement or funerary practices recorded within the study area. However, there is significant evidence for the development of the area during the late Iron Age and Romano-British period.
- 2.2.6 A Roman Road linked Ermine Street north of Lincoln to a ford crossing the River Trent at Matron to Segelocum Roman town, the latter located on what today is Littleborough, 1.7 km west of the survey area. Within the wider landscape, there is also evidence of settlement, agricultural practices, and a military presence in the form of forts, as well as multiple individual finds dating to the Romano-British period.
- 2.2.7 The medieval period in the area represents an intense rural activity and many of the villages surrounding the site have origins in the medieval period. There is widespread evidence of ridge and furrow and the deserted village of Knaith and the extant village of Marton date to this period. Several of the churches, such as St Margaret's Church in Marton, are of medieval origin.
- 2.2.8 The deserted settlement of Gate Burton and the parkland associated with Gate Burton Hall (NHLE 1359458), likely extend into the site boundary. This is a classic example of population dispersal caused by "emparking" (the enclosing of land to create parkland) in the 18th century. Medieval ridge and furrow field systems are identified throughout the site. The Clay Farm building is located at the centre of the site with the associated wind pump, now

demolished. In addition, a location of the High Pasture Farm is known from OS map 1899, now demolished.

- 2.2.9 Archaeological evidence of post-medieval date is predominantly associated with industrial activity. This includes windmills, quarries, kilns, and brickyards, as well as the route of the railway and navigational improvements to the River Trent further to the west of the site.
- 2.2.10 Evidence of modern (1900 – present) date is largely limited to improvements to buildings and infrastructure.

3 METHODOLOGY

3.1 Introduction

- 3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 31 January and 23 March 2022. Field conditions were variable throughout the period of the survey. An overall coverage of 351 ha was achieved. Fields 31 and 33 were not surveyed due to the high vegetation. Additionally, ditched field boundaries, an abandoned building in Field 23, overgrown ground in Field 24, and the Lincoln – Gainsborough railway line prevented the total coverage of the site.
- 3.1.2 The methods and standards employed throughout the geophysical survey conform to that set out in the WSI (AECOM 2021), as well as to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

- 3.2.1 The aims of the survey comprise the following:
- To investigate the archaeological potential of the Site;
 - To assess the presence / absence of potential archaeological anomalies;
 - To determine the level of risk that the archaeological resource would present to the Scheme;
 - To inform the emerging design; and
 - To inform the scope of further evaluation.
- 3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:
- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
 - To clarify the presence/absence of anomalies of archaeological potential; and
 - Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

- 3.3.1 The cart-based gradiometer system used a Leica Captivate RTK GNSS instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey (OS) and Leica Geosystems. Such instruments allow positions to be determined with a

precision of 0.02 m in real-time and therefore exceed European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).

- 3.3.2 The detailed gradiometer survey was undertaken using four SenSys FGM650/3 magnetic gradiometers spaced at 1 m intervals and mounted on a non-magnetic cart and towed by an ATV vehicle. Data were collected with an effective sensitivity of 0.03 nT at a rate of 100 Hz, producing intervals of 0.05 m along transects spaced 4 m apart.

3.4 Data processing

- 3.4.1 Data from the survey were subjected to minimal correction processes. These comprise a background removal median function with an effective window of 60 m, applied to correct for any variation between the sensors, a discard overlaps function where transects have been collected too close together and an interpolation used to grid the data.
- 3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

- 4.1.1 The detailed gradiometer survey has identified magnetic anomalies across the site. Results are presented as a series of greyscale plots and archaeological interpretations at a scale of 1:5000 (**Figures 2 to 11**) and 1:2000 (**Figures 12 to 57**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale images.
- 4.1.2 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous responses, burnt or fired objects, and magnetic trends. These are presented on separate figures to the greyscale plots, with the detailed interpretation plans provided on the odd figure numbers. Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.
- 4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.
- 4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.
- 4.1.5 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

4.2 Gradiometer survey results and interpretation

- 4.2.1 The geophysical survey has identified several features that are likely to be associated with archaeological remains. The most prominent anomalies are located in the north-eastern (F16) and south-western part of the survey area (F21 and F23), where concentrations of rectilinear enclosures have been identified. The interpretation of many of these anomalies is hindered by the large number of drainage features that are dominant across the site. However, these are thought to be predominantly associated with Late Iron Age and Romano-British settlement activity based on their layout and form.
- 4.2.2 In the north-eastern part of the survey area, in F21 and F23, a dense concentration of anomalies has been recorded, which likely relates to multiple phases of enclosure(s)

(**Figure 37, 39**). This comprises a co-axial north – south / east – west arrangement of positive linear anomalies that are between 1 m and 1.5 m wide (**4000**). These are associated with ditch features occupying a total area of 220 m by 140 m and incorporates at least six segments, although numerous weaker linear trends may subdivide this further. This is thought to date to the Late Iron Age or Romano-British period and, although it is not possible to assign precise dates or functions to elements of these enclosures, it is possible to discern multiple aspects and phases of this, which are discussed below (**a – i**). Elsewhere within this area are several 1 – 2 m diameter pit-like anomalies, that may be associated with further settlement activity.

- 4.2.3 In the north-western corner of **4000**, an array of ditches form at least two rectilinear enclosures (**a**). The northern segment is open to the north and centrally subdivided but covers a narrow rectangle of 72 m by 16 m. The southern part forms a larger square-shaped element, covering an area of 62 m by 50 m. Within this, there is a large positive subcircular anomaly (**b**) that is 12 m in diameter and three oval anomalies (**c**) that are up to 7 m long by 5.5 m wide. These are thought to be associated with large pit-like features, possibly associated with storage pits, but given the large size could be sunken-feature buildings or other domestic structures.
- 4.2.4 A strong positive linear anomaly (**d**) divides **4000** from west to east and runs on the north-south alignment for 125 m. Within the centre of this, there is a notably stronger magnetic response, which may relate to variation in the composition of the fills within this part of the ditch, potentially containing more magnetically enhanced cultural material. However, it may equally relate to an alternative phase of construction. This also appears to form a junction of three further linear anomalies that extend eastwards from this location (**e**).
- 4.2.5 An array of ditches extend from **d** at the perpendicular angle to the east (**f**). These are up to 60 m long and form a rectangular enclosure that covers 81 m by 73 m. Within this are numerous weakly positive linear trends that may represent several further ditches, but these are extremely poorly defined. In addition, there is a small number of circular anomalies up to 2 – 3 m in diameter that are likely associated with pit-like features within this area.
- 4.2.6 The arrangement of enclosures at **4000** continues to the south after a 30 m gap, following the same alignment as **d**. These anomalies are of a much weaker magnitude, but a positive linear anomaly extends into F23, for 67 m (**g**) and at the southern end, turns towards the east, continuing for 30 m. This is likely subdivided by multiple ditches, but these are too poorly defined to discern a clear layout. However, at the southern part of **g**, a small enclosure of 33 m by 15 m is apparent, forming the south-western edge. About 15 m to the west of this, at **h**, there is an arrangement of weakly positive linear anomalies that encloses a 51 m by 32 m area.
- 4.2.7 Traversing F21 and F23 is a small oval enclosure, which is 28 m long and 20 m (**i**). This is visible at the southern edge of F21 but is notably weaker in F23. It is possible therefore that F23 has been subject to more intensive agricultural activity, resulting in many of the features being heavily ploughed down and only being detectable by a very weak magnetic signature. However, it is clear that this forms an additional aspect to the arrangement of enclosures within this part of the site, although it is not clear precisely what function it served.
- 4.2.8 The second cluster of recti-linear anomalies that are thought to be associated with Late Iron Age and Romano-British activity is located in the south-western part of the survey within F16 (**4001**). As with **4000**, there is roughly co-axial east-west / north-south alignment of linear positive anomalies and weakly positive trends (**Figure 31**). This covers a smaller total area of 105 m by 60 m and is generally very poorly defined, owing in part to the dense concentration of drainage features in this area. However, it is possible to identify a layout of ditch-like anomalies that are between 1 m and 2.5 m wide. This comprises a square-shaped enclosure on the western side (**j**) and a smaller rectangular area to the east (**k**). Within these

are numerous very weakly positive linear trends on the same alignment. These likely further subdivide the enclosure(s) but their magnetic response is too weak for more detailed interpretation.

- 4.2.9 In general, outside of the concentration of features at **4000 (a – i)** and **4001 (j, k)**, there are few anomalies of clear archaeological origin. However, there are a small number of more isolated, predominantly linear features that are interpreted as possible archaeology. In addition, there are multiple weakly positive circular and subcircular anomalies that may relate to pit-like features. These are only specifically referred to if they are arranged in a manner that is indicative of a more detailed interpretation.
- 4.2.10 A weakly positive linear anomaly is located in F11 at **4002 (Figure 19)**. This curves slightly from south-west to north-east and is 170 m long by 2 m wide. It indicates a ditch-like feature, probably relating to a former field boundary that predates the available historical mapping.
- 4.2.11 At the southern part of F24, there is a positive linear anomaly at **4003**, which is up to 1.5 m wide (**Figure 43**). At the western part, the ditch-like anomaly forms a rectangular enclosure that covers 22 m by 14 m and extends outside of the survey area to the west. From here, a ditch-like feature extends 60 m to the east. After 45 m it bifurcates towards the north for a further 27 m. This could relate to an unknown field boundary and enclosure.
- 4.2.12 A very weakly positive oval-shaped anomaly at **4004 (Figure 53)** is located in F29. It is a maximum of 19 m in diameter and up to 1 m wide. It indicates a ditch-like feature, potentially relating to a Late Iron Age to Romano-British roundhouse. However, the extremely weak magnitude of the anomaly may equally suggest that it is of modern or agricultural origin.
- 4.2.13 Two broad penannular anomalies are located at **4005 (Figure 55)**, in F27. They are up to 2.5 m wide and 16 m in diameter. They indicate ditch-like features that could also relate to Late Iron Age or Romano-British roundhouses. However, they could be caused by the natural undulation in the underlying geological deposits.
- 4.2.14 Across the entirety of the site are weakly positive linear anomalies that are associated with former field boundaries. These are up to 2.5 m in width and are of variable length (**4006 – 4034; Figures 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57**). The majority are positioned on parallel, or perpendicular to the existing layout of field divisions and can be identified on 1900 OS mapping.
- 4.2.15 Many of the fields detailed by this survey are covered by a series of weak positive linear anomalies. These are parallel with one another and separated by a distance of 6 m – 8 m. They are thought to be associated with ridge and furrow ploughing and can be most clearly visualised in F1 – F5, F8 – F11, F15, F18, and the eastern part of F26 (**Figures 17, 33, 49, 51**). The majority are aligned in respect to the existing layout of field divisions, but those within F18 are more askew, most likely respecting the local topography within this area. Such responses are typical of post-medieval ridge and furrow, which has been recorded more widely within the surrounding landscape.
- 4.2.16 An area of strong magnetic response at **4035** is located in the southern part of F24, to the north of Clay Farm (**Figure 43**). This covers an area of 49 m by 45 m and indicates the location of the now demolished windpump, known from 1953 OS mapping.
- 4.2.17 To the south of **4035** is another area of increased magnetic response at **4036 (Figure 43)**. This covers an area of 110m by 73 m and corresponds with ponds visible on 1900 OS mapping that have subsequently been backfilled.
- 4.2.18 200 m to the north of **4035** is a larger mound of building material visible on the ground. Surrounding it is an area of increased magnetic response at **4037** that indicates the further spread of the material on-site (**Figure 41**). It relates to the location of the now demolished High Pasture farm, which is also known from the 1900 OS map.

- 4.2.19 To the north of **4037** are several areas of increased magnetic response at **4038** that are located alongside the field boundaries at **4014** and **4015** (**Figure 41**). These likely indicate re-deposited material or made ground along the field boundaries.
- 4.2.20 On the southern side of the site, in F18, there is an area of an increased magnetic response of irregular shape at **4039** (**Figure 33**). Further to the south-west, in F17, is a similar anomaly at **4040**. These both indicate backfilled ponds, illustrated on the 1900 OS map.
- 4.2.21 Along the eastern edge of the survey, in F12, two areas of increased magnetic response at **4041** and **4042** are recorded that indicate made ground alongside the field boundaries (**Figures 21, 23**).
- 4.2.22 In addition to the specific anomalies outlined above, numerous further areas of increased magnetic responses have been identified along field boundaries across the site. They mostly relate to fencing and/or made ground at the edge of fields, or footpaths.
- 4.2.23 There are a very small number of anomalies that are interpreted as variations in the underlying superficial geology. These are predominantly located within F16 and are only identifiable as very weak clusters of irregular positive anomalies. This is probably associated with variation in the sand and gravel glaciofluvial spur, which is located within this area.
- 4.2.24 Numerous strongly positive and dipolar linear anomalies that run parallel to each other, forming a 'herringbone' pattern have been identified widely across the site. These are dominant within the results and are characteristic of a network of land drains.
- 4.2.25 A further strong dipolar linear anomaly at **4043** has been located traversing F18 and F27 (**Figures 33, 55**). This is indicative of a modern service such as a pipe or cable.

5 DISCUSSION

- 5.1.1 The gradiometer survey has been successful in detecting clear anomalies of archaeological interest in the north-eastern and south-western part of the site (within F16, F21, and F23). These predominantly comprise rectilinear anomalies suggestive of Late Iron Age to Romano British enclosure(s), potentially incorporating multiple phases of activity. Within the north-eastern examples, there is also evidence for potential settlement activity and other pit-like features. Given the widespread evidence for activity dating to this period within the wider area, it is thought that these form part of the Romano-British countryside. As the Roman town of Segelocum is located to the west of the site, these are likely related small scale settlements within its agricultural hinterland.
- 5.1.2 A small number of oval and penannular features have been identified as possible archaeology in the eastern part of the site. They could relate to a more isolated Late Iron Age or Romano-British roundhouse but given their weak nature could equally be natural in origin.
- 5.1.3 A large number of further linear ditch-like anomalies have been identified, which relate to former field boundaries visible on 1900 OS mapping of the area. In addition, several other features that are also recorded on historical mapping have also been detected as areas of increased magnetic response. This includes two locations of demolished structures, a former windpump to the north of the Clay Farm, annotated on the 1953 OS map, and the High Pasture Farm, known from the 1900 OS map.
- 5.1.4 Several areas of ridge and furrow were identified showing medieval or later agricultural activities. In addition, numerous modern drains throughout the site indicate more recent agricultural activity.



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[REDACTED]

Old Maps (accessed April 2022)

[REDACTED]

APPENDICES

Appendix 1: Survey Equipment and Data Processing

Survey methods and equipment

The magnetic data for this project were acquired using a non-magnetic cart fitted with four SenSys FGM650/3 magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 0.6 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of $\pm 8 \mu\text{T}$ over $\pm 1000 \text{ nT}$ range. All of the data are then relayed to a CS35 tablet, running the MONMX program, which is used to record the survey data from the array of FMG650/3 probes at a rate of 20 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Leica Captivate system with rover and base station. This receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.01 m intervals along traverses spaced up to 0.25m apart.

Post-processing

The magnetic data collected during the survey is downloaded from the system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

Typical data and image processing steps may include:

- GPS DeStripe – Determines the median of each transect and then subtracts that value from each datapoint in the transect within the defined window. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.
- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.
- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).

Typical displays of the data used during processing and analysis:



- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.
- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.

Appendix 2: Geophysical Interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.



Appendix 3: OASIS form

Project Details:

Project name	Gate Burton Energy Park, Lincolnshire				
Type of project	Detailed gradiometer survey (Field evaluation)				
Project description	<p>The detailed gradiometer survey has been successful in detecting clear anomalies of archaeological interest in the north-eastern and south-western parts of the site. These predominantly comprise rectilinear anomalies suggestive of Late Iron Age to Romano British enclosure(s), potentially incorporating multiple phases of activity. Within the north-eastern examples, there is also evidence for potential settlement activity and other pit-like features. Given the widespread evidence for activity dating to this period within the wider area, it is these form part of the Romano-British countryside. As the Roman town of Segelocum is located to the west of the site, these are likely related small-scale settlements within its agricultural hinterland.</p> <p>A small number of oval and penannular features were also identified as possibly being of archaeological origin at the eastern part of the site. They could indicate a more isolated Late Iron Age or Romano-British roundhouse but given their weak nature could equally be natural in origin.</p> <p>A large number of further linear ditch-like anomalies have been identified, which relate to former field boundaries visible on 1900 OS mapping of the area. In addition, several other features that are also recorded on historic mapping have also been detected as areas of increased magnetic response. This includes two locations of demolished structures, a former windpump to the north of the Clay Farm, annotated on the 1953 OS map, and the High Pasture Farm, known from the 1900 OS map.</p> <p>Several areas of ridge and furrow were identified showing medieval or later agricultural activities. In addition, numerous modern drains throughout the site indicate more recent agricultural activity.</p>				
Project dates	Start: 31-01-2022		End: 23-03-2022		
Previous work	WSI by AECOM 2021				
Future work	Not Known				
Project Code:	257660	HER event no.	N/A	OASIS form ID:	wessexar1-506327
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.	Not Known				
Site Status	None				
Land use	Arable Land				
Monument type	N/A	Period	Iron Age/Romano-British		

Project Location:

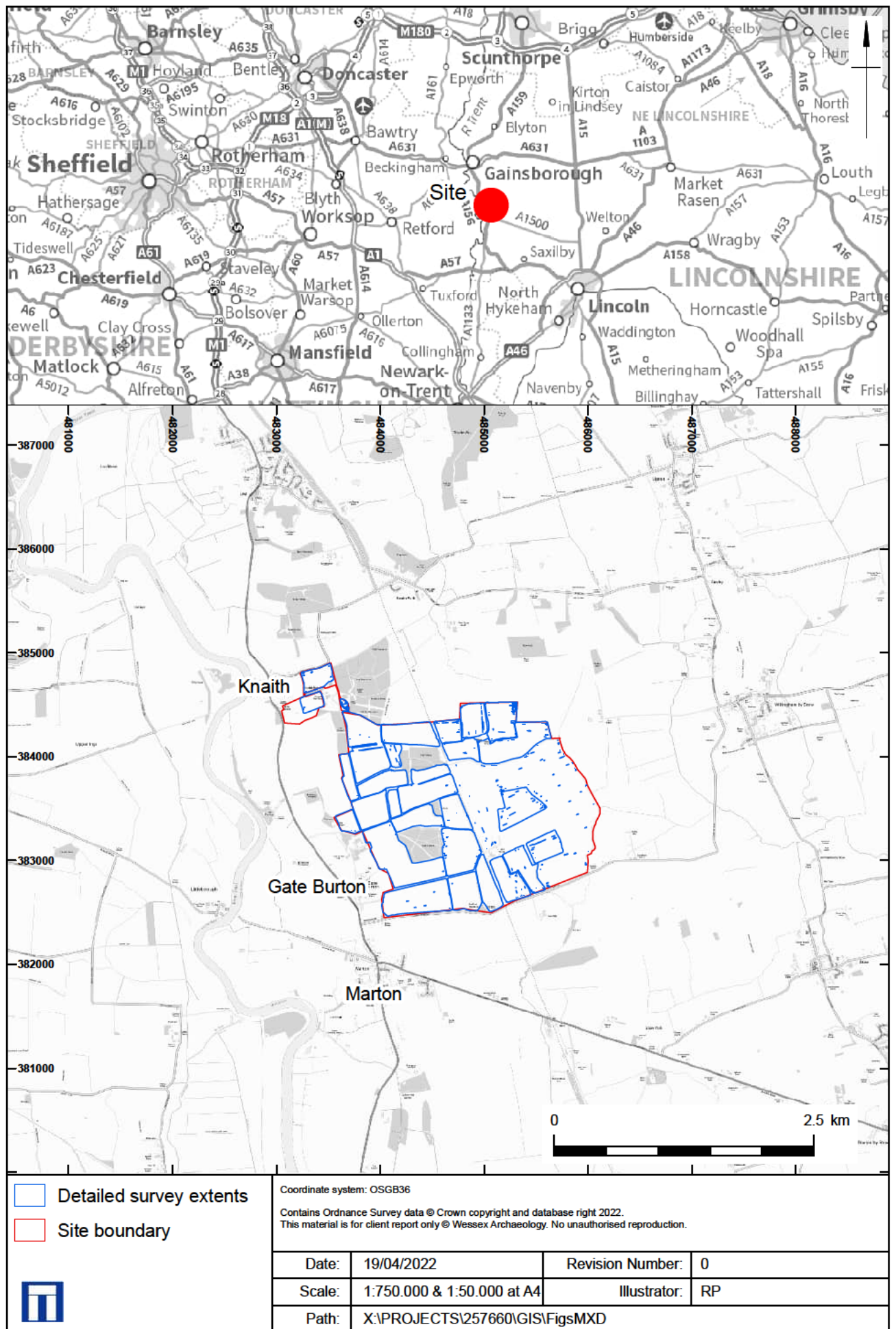
Site Address	Station Road, Knaith Park, Lincolnshire			Postcode	DN21 5EZ
County	Liccolnshire	District	West Lindsey	Parish	Gate Burton
Study Area	380 ha	Height OD	30 - 14 m aOD	NGR	484748 383644

Project Creators:

Name of Organisation	Wessex Archaeology		
Project brief originator	AECOM	Project design originator	Client
Project Manager	Tom Richardson	Project Supervisor	Rok Plesnicar
Sponsor or funding body	AECOM	Type of Sponsor	Client

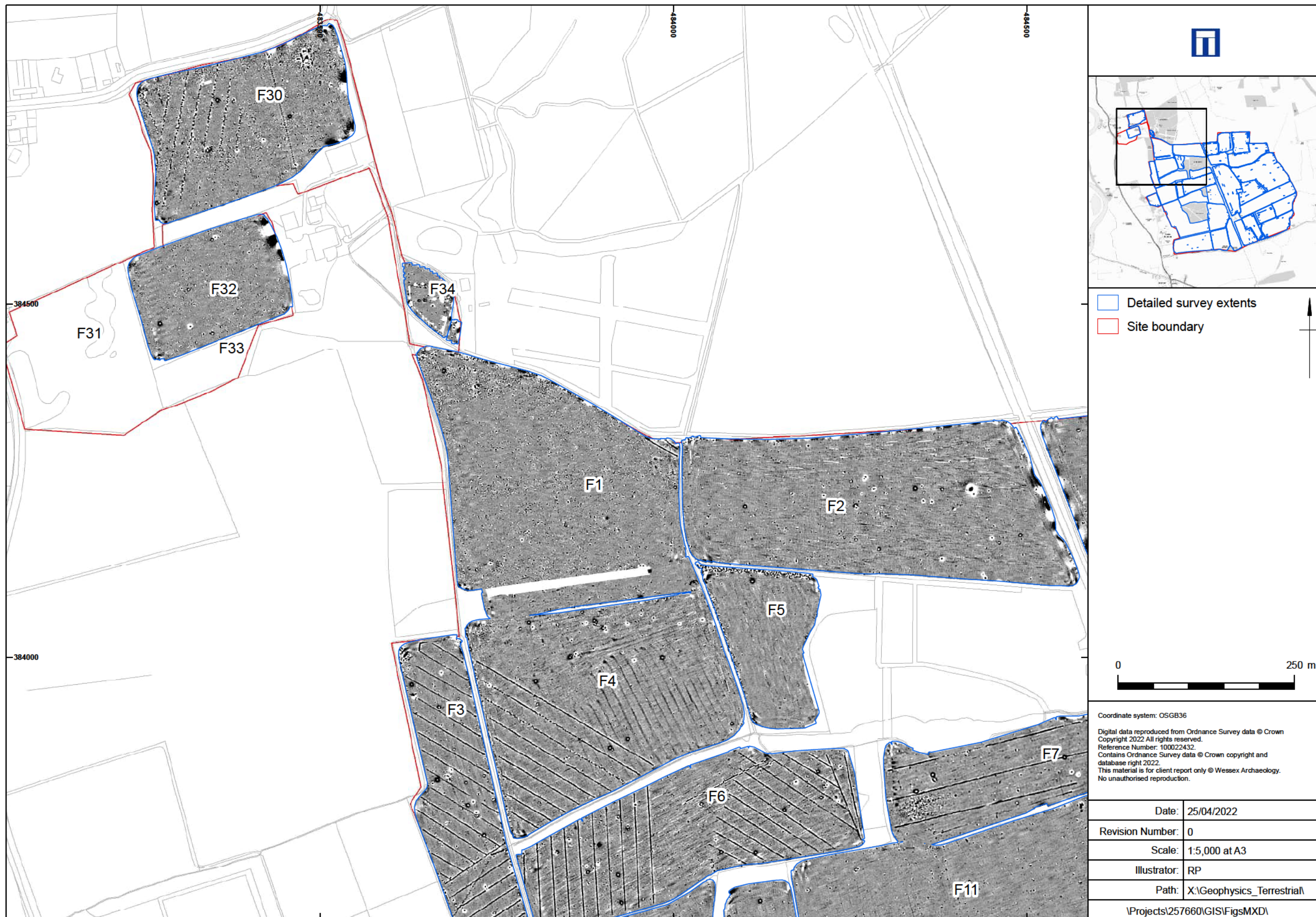
Project Archive and Bibliography:

Physical archive	N/A	Digital Archive	Geophysical survey and report	Paper Archive	N/A
Report title	Gate Burton Energy Park, Lincolnshire			Date	2022
Author	Wessex Archaeology	Description	Unpublished report	Report ref.	257660.03



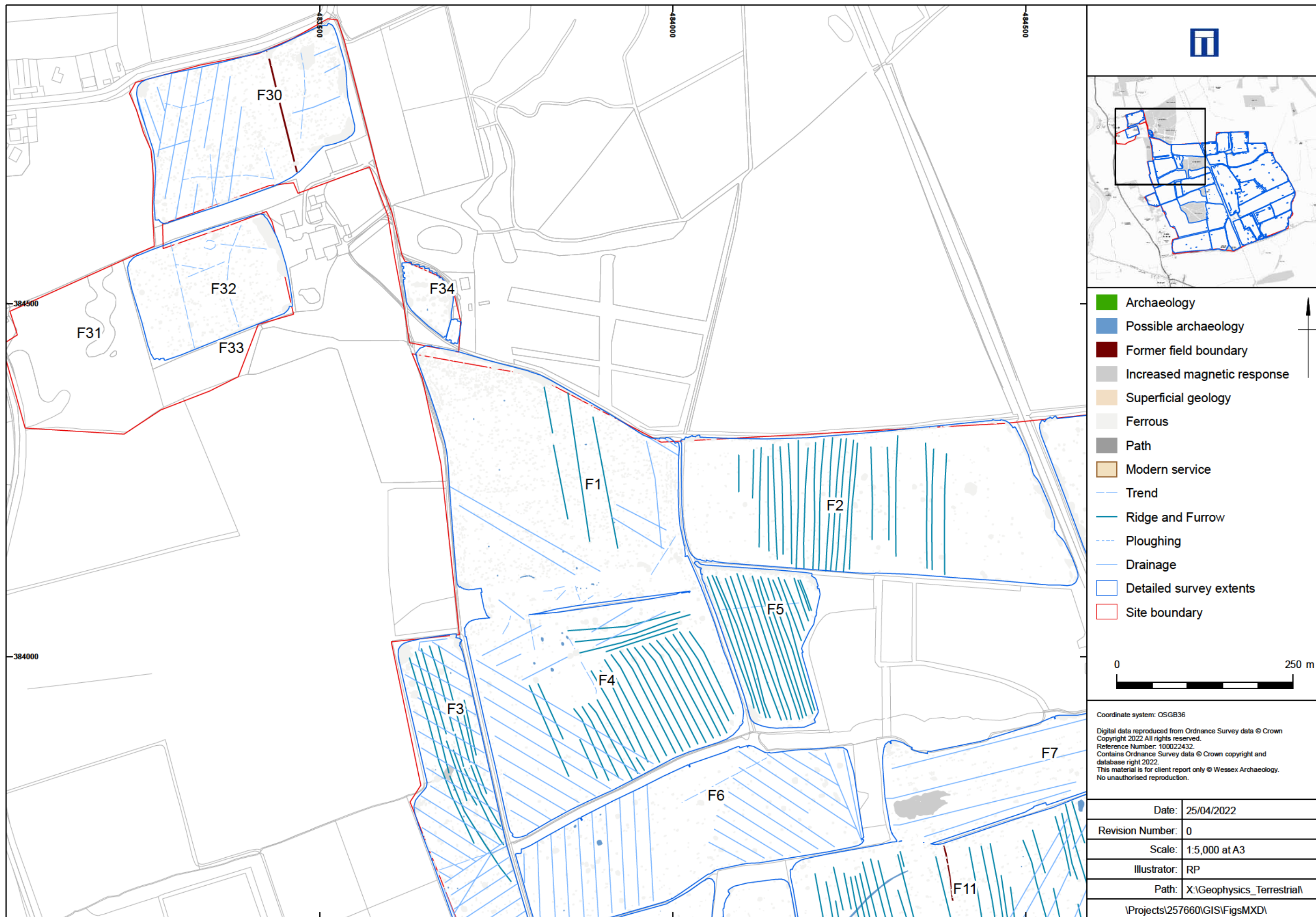
Site location and survey extent

Figure 1



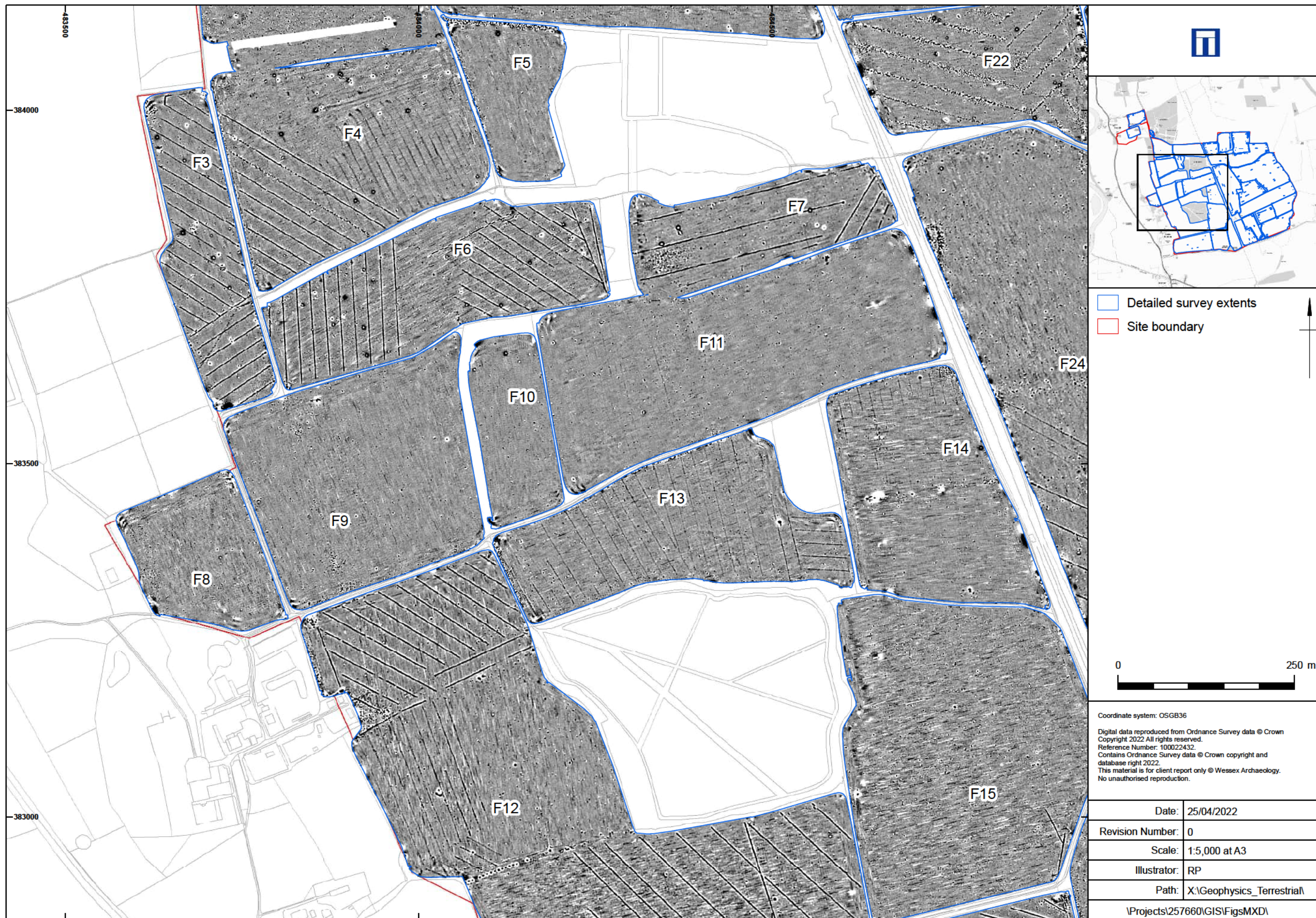
Detailed gradiometer survey results: greyscale plot (Field 1 - 7, 30 - 34)

Figure 2



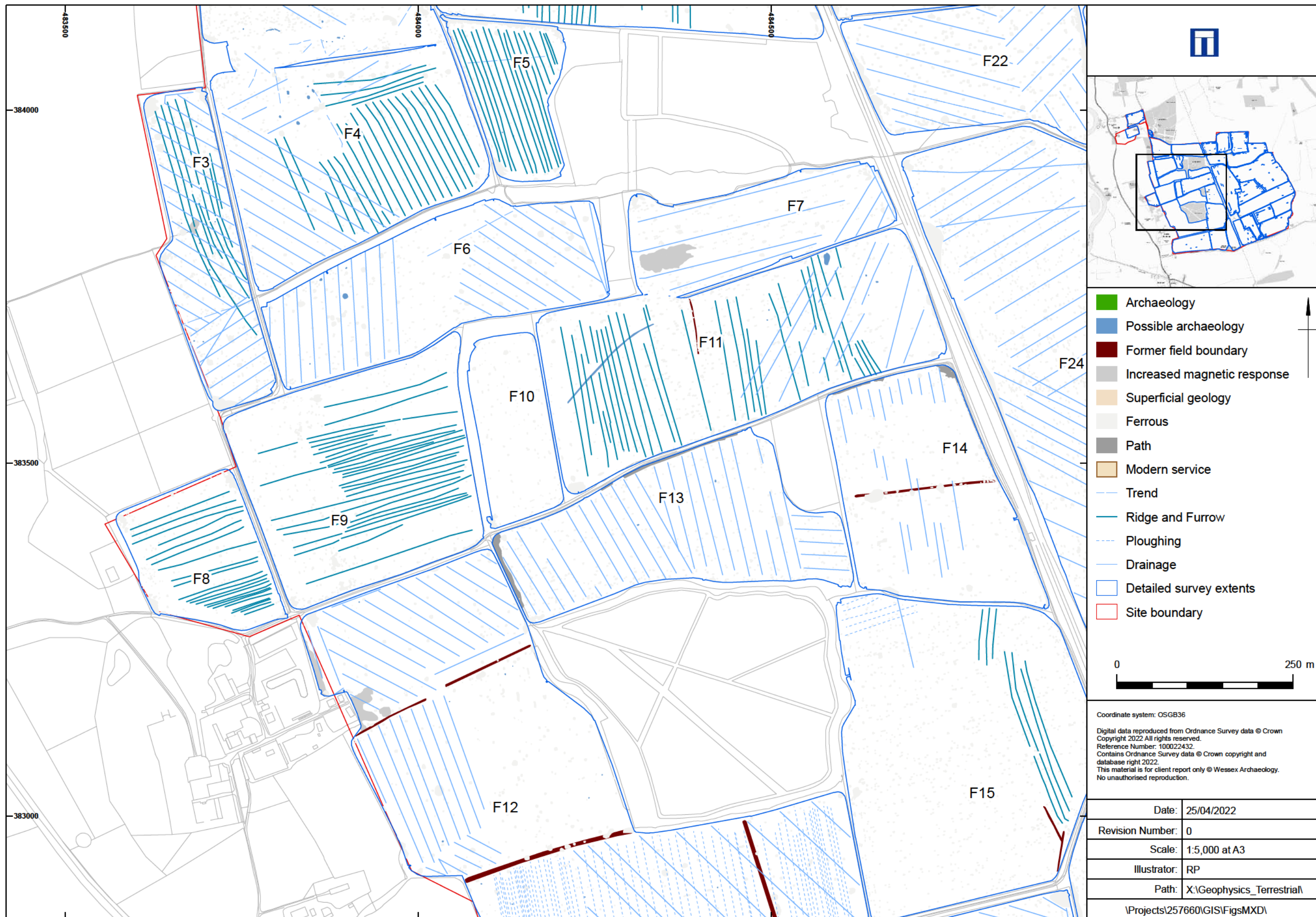
Detailed gradiometer survey results: interpretation (Field 1 - 7, 30 - 34)

Figure 3

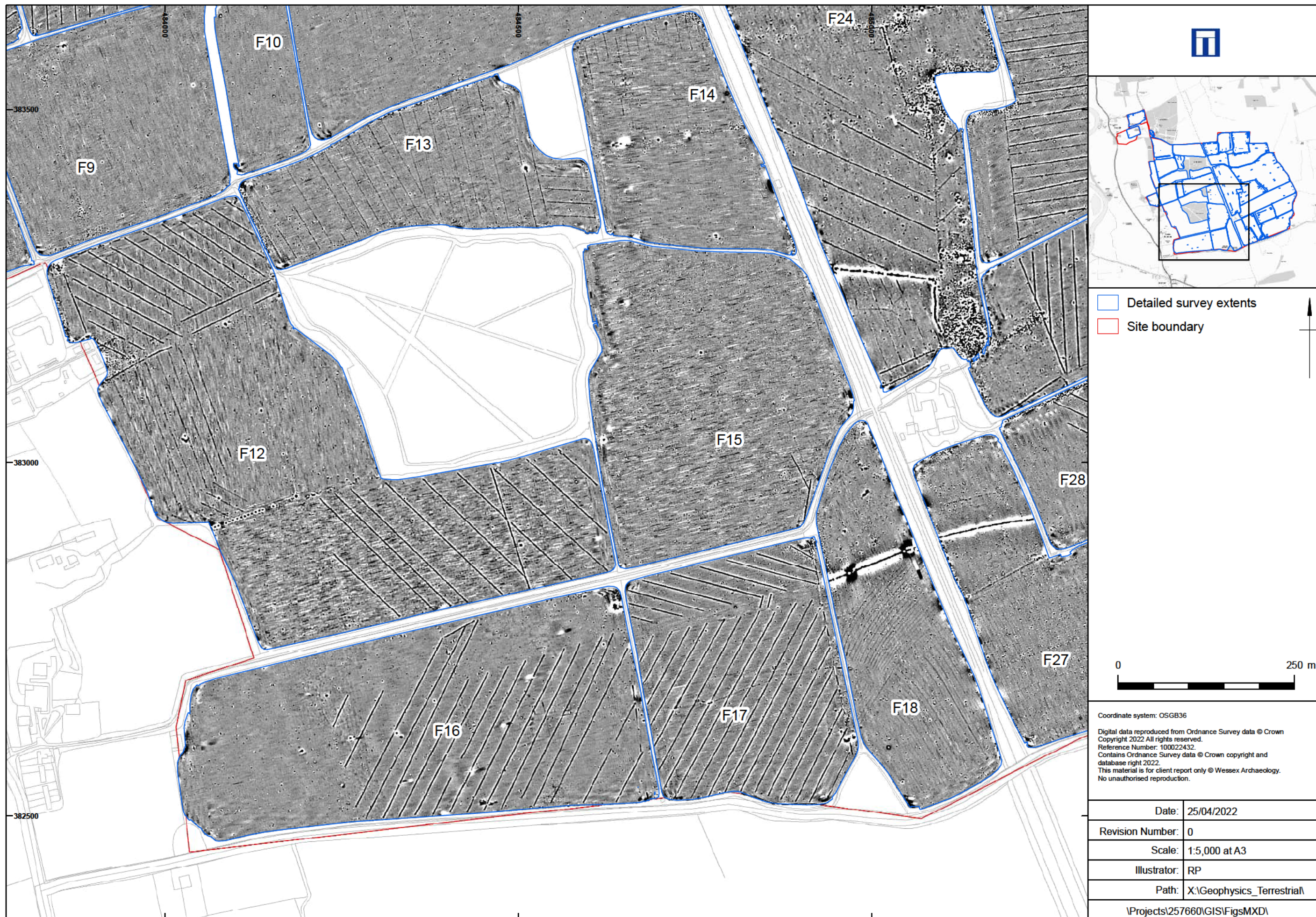


Detailed gradiometer survey results: greyscale plot (Field 8 - 15)

Figure 4

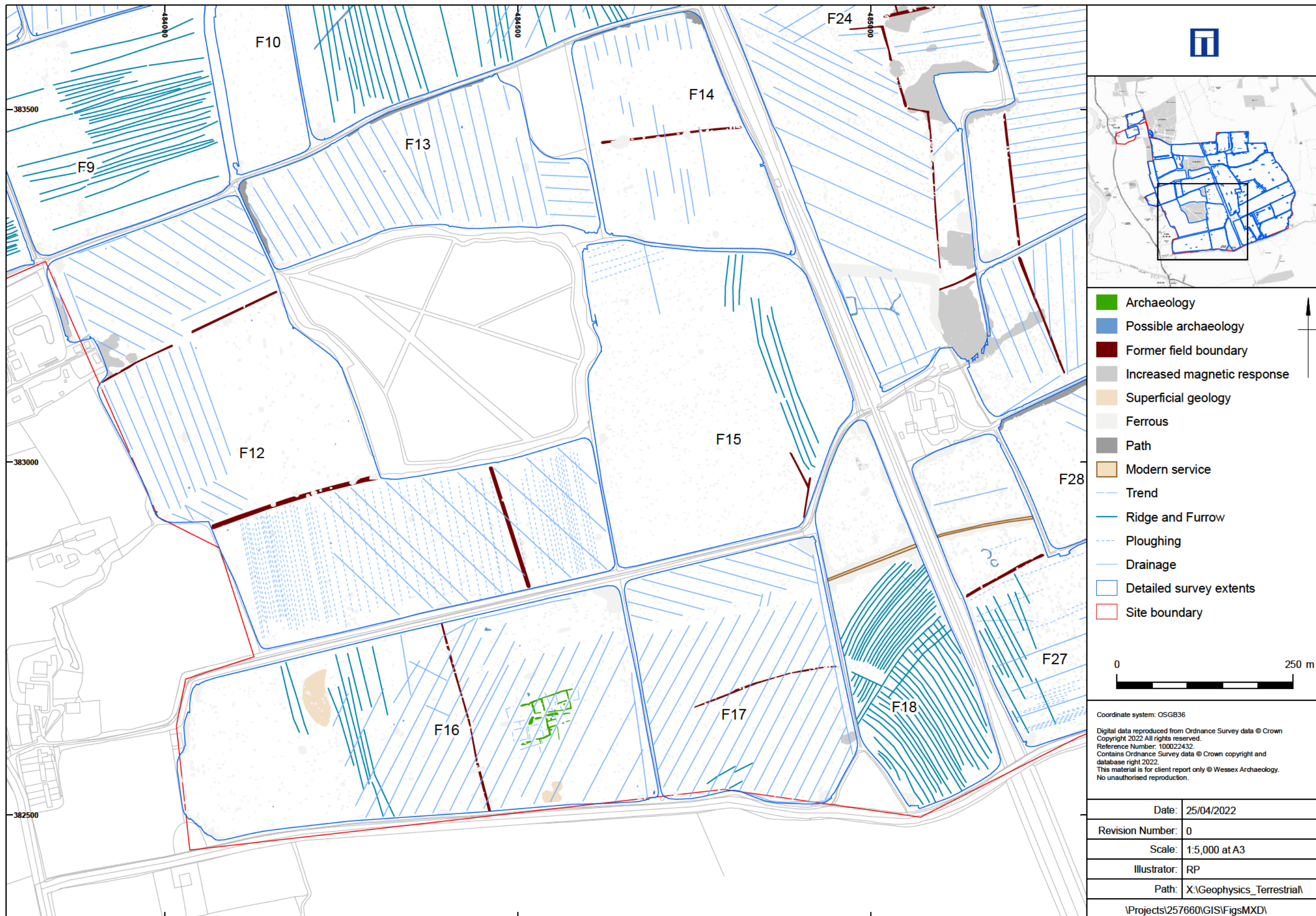


Detailed gradiometer survey results: interpretation (Field 8 - 15)

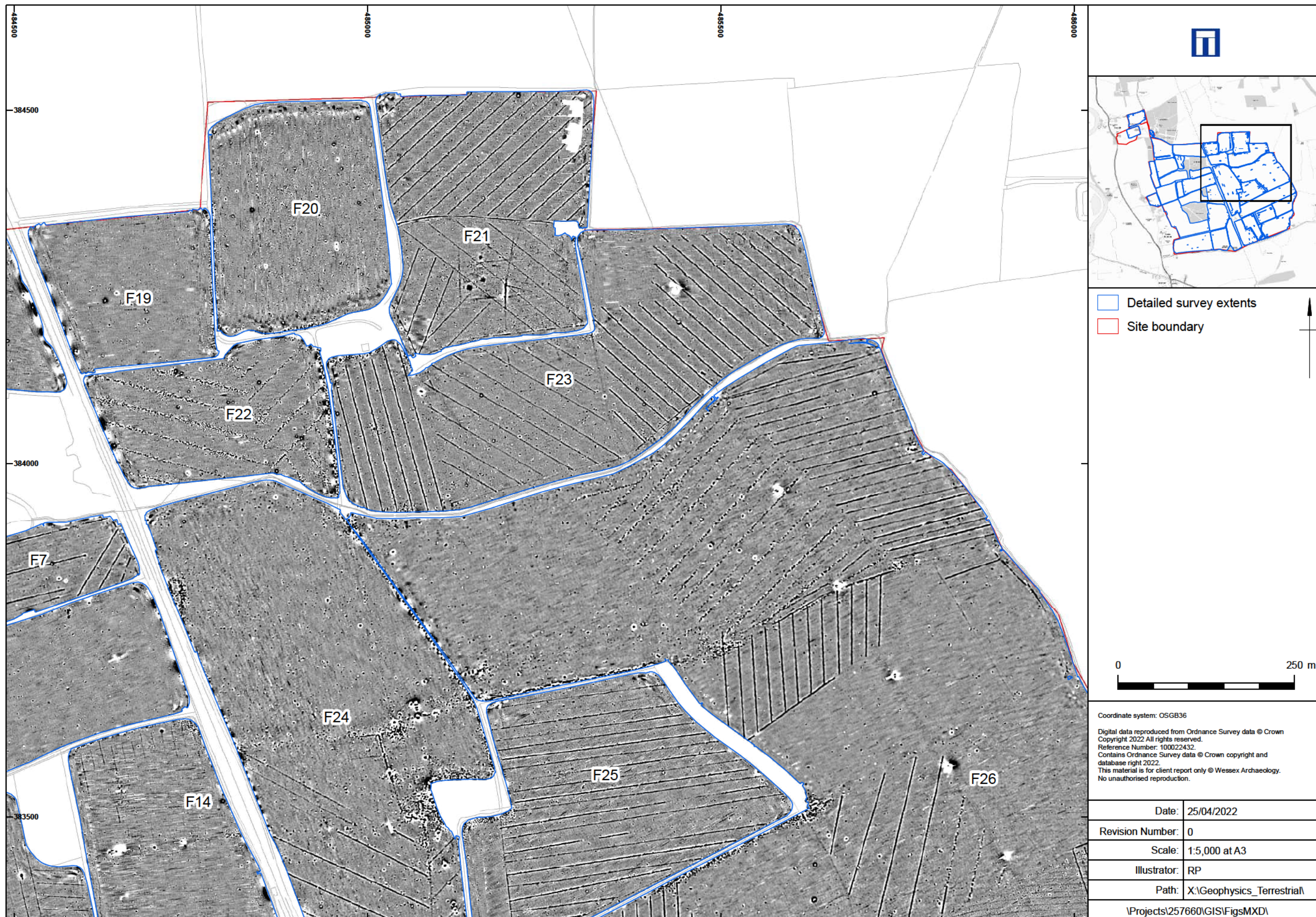


Detailed gradiometer survey results: greyscale plot (Field 12, 15 - 18)

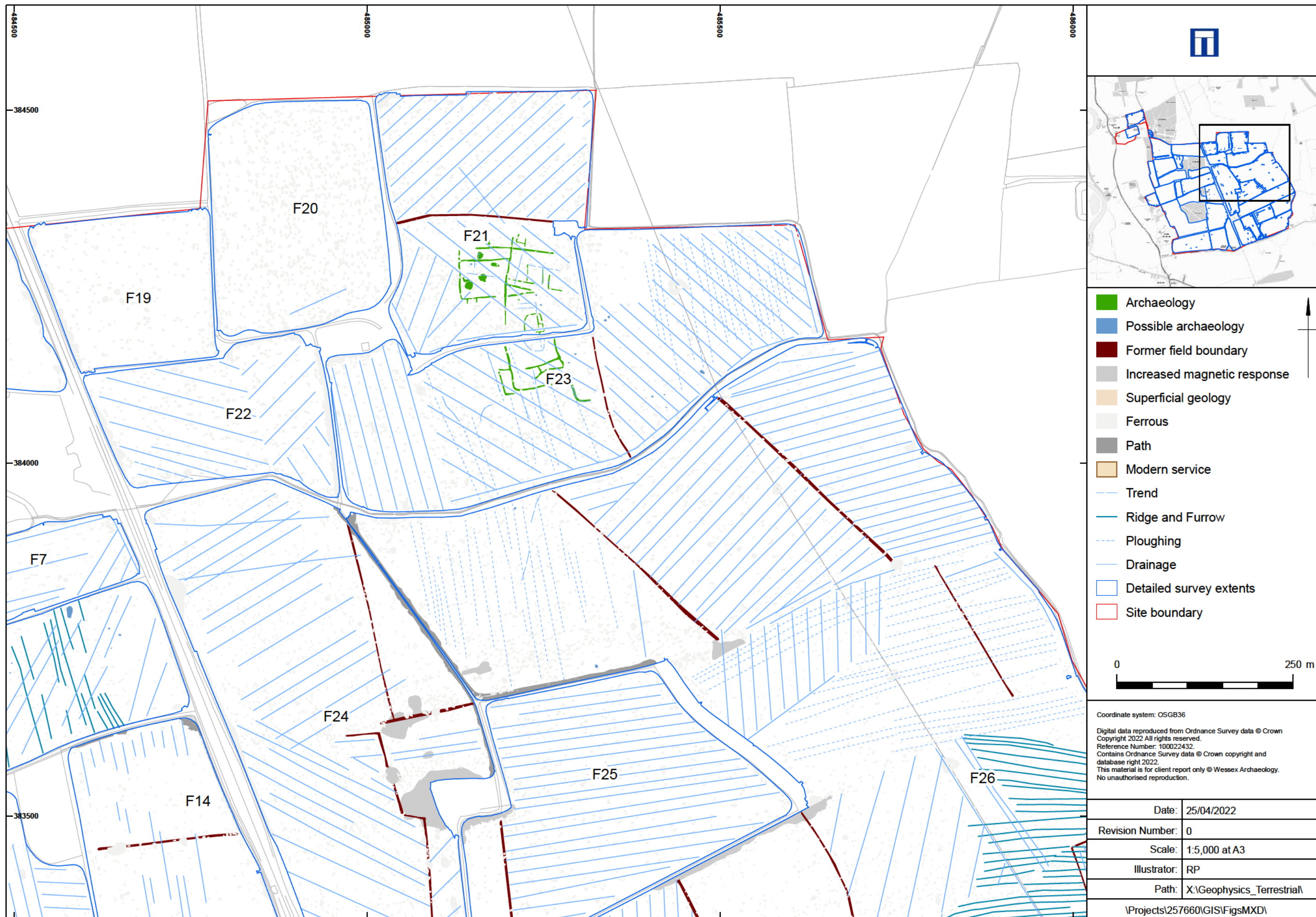
Figure 6



Detailed gradiometer survey results: interpretation (Field 12, 15 - 18)



Detailed gradiometer survey results: greyscale plot (Fields 19 - 26)

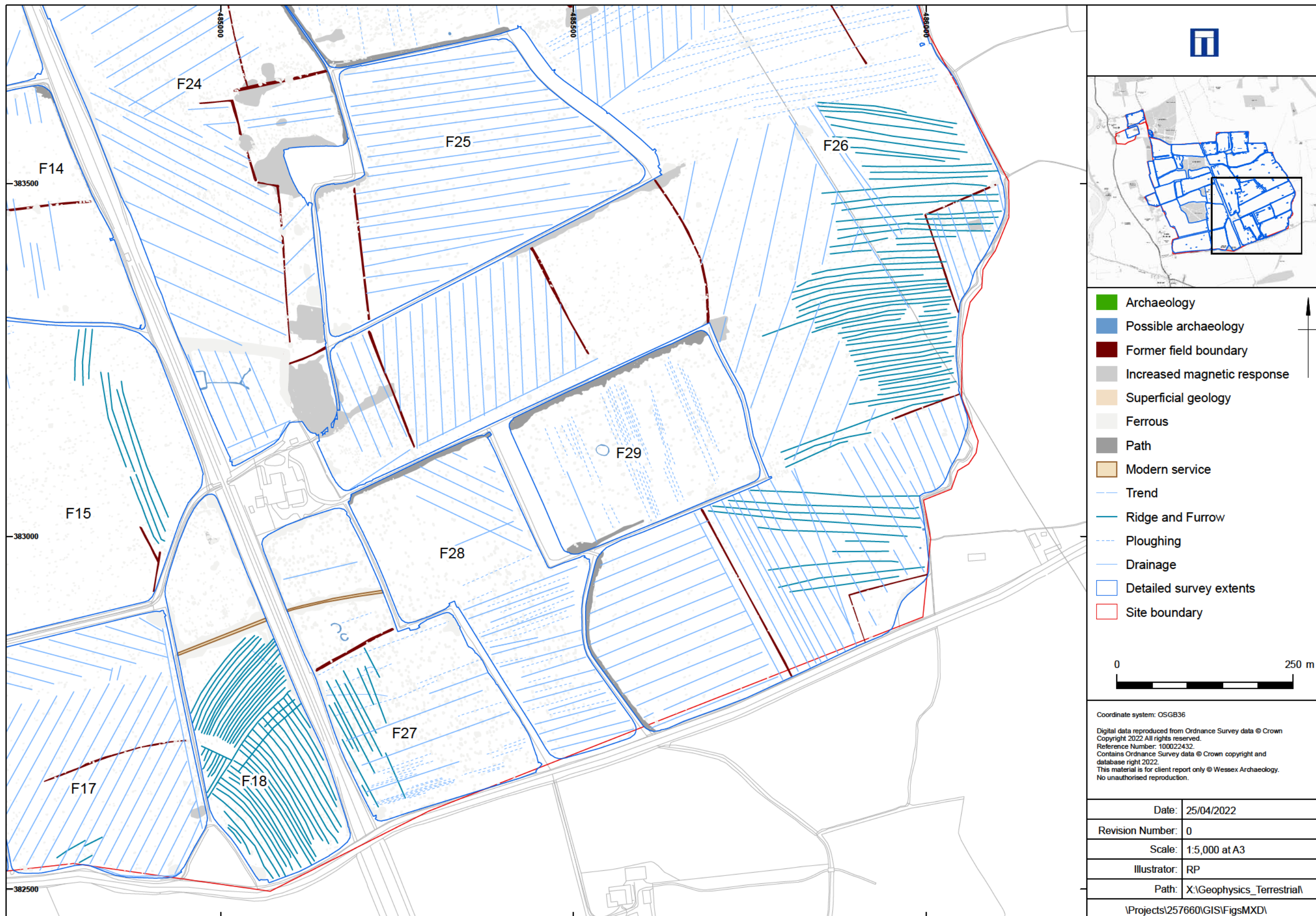


Detailed gradiometer survey results: interpretation (Fields 19 - 26)

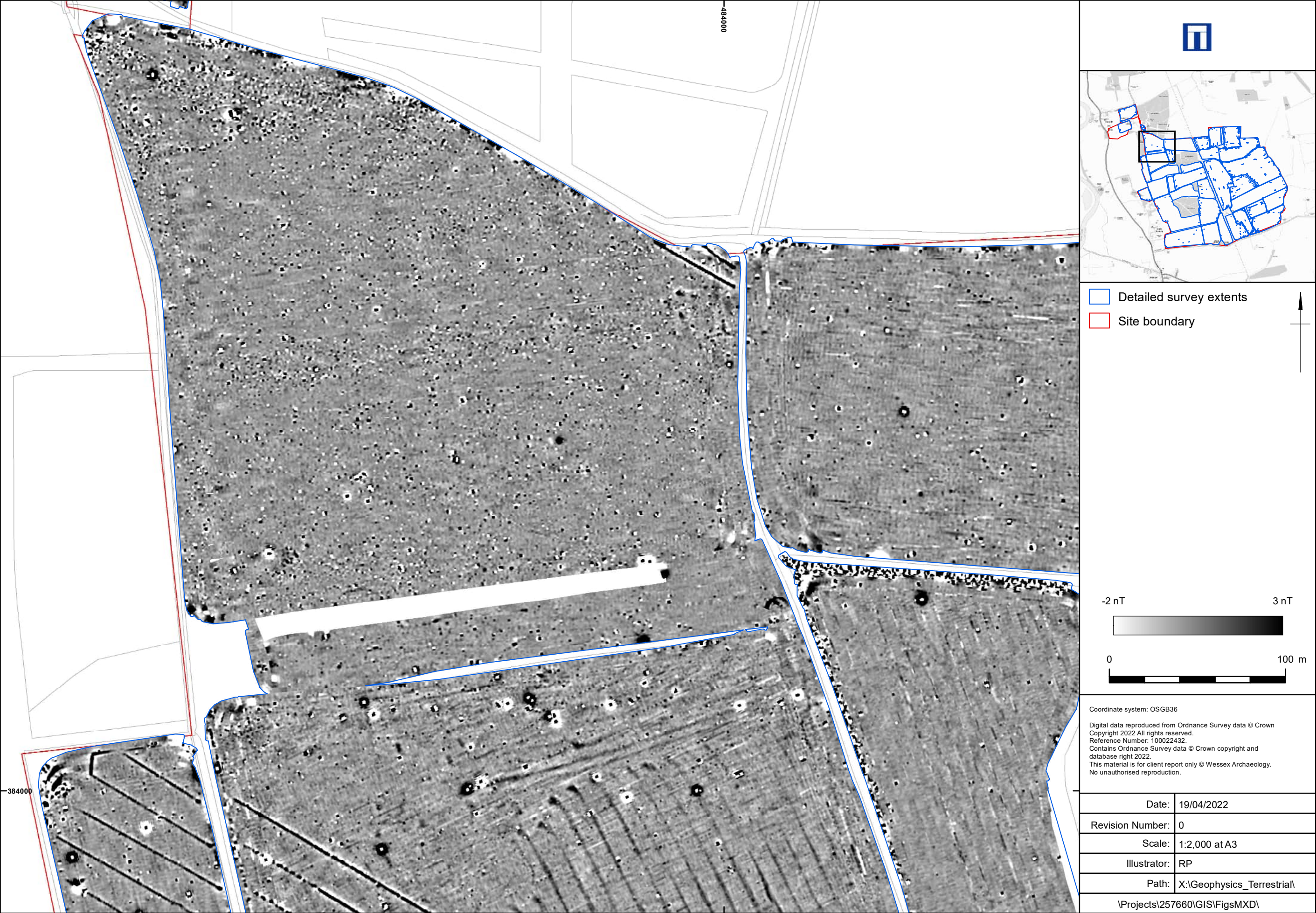
Figure 9



Detailed gradiometer survey results: greyscale plot (Fields 24 - 29)

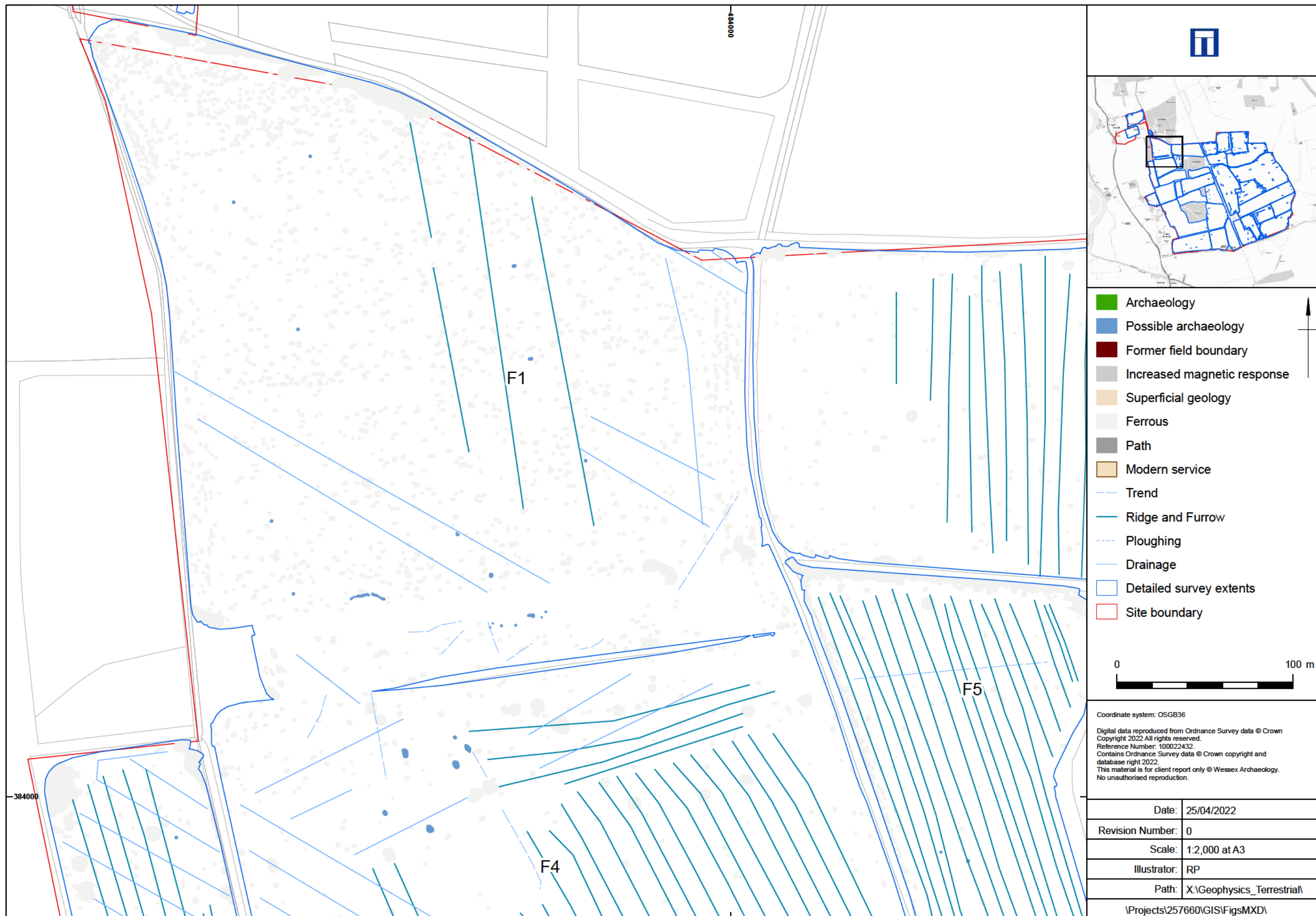


Detailed gradiometer survey results: interpretation (Fields 24 - 29)

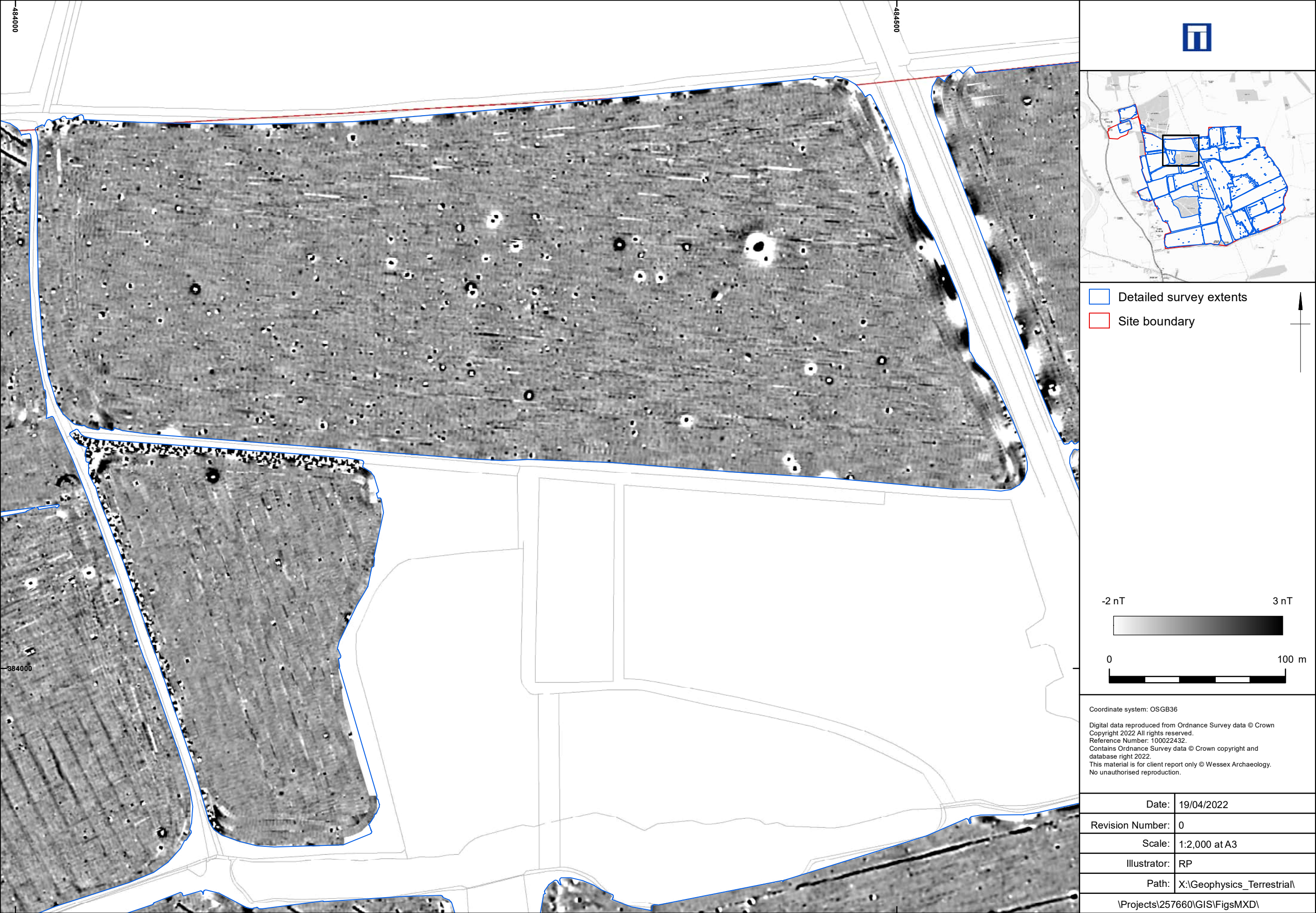


Detailed gradiometer survey results: greyscale plot (Field 1, 4, 5)

Figure 12

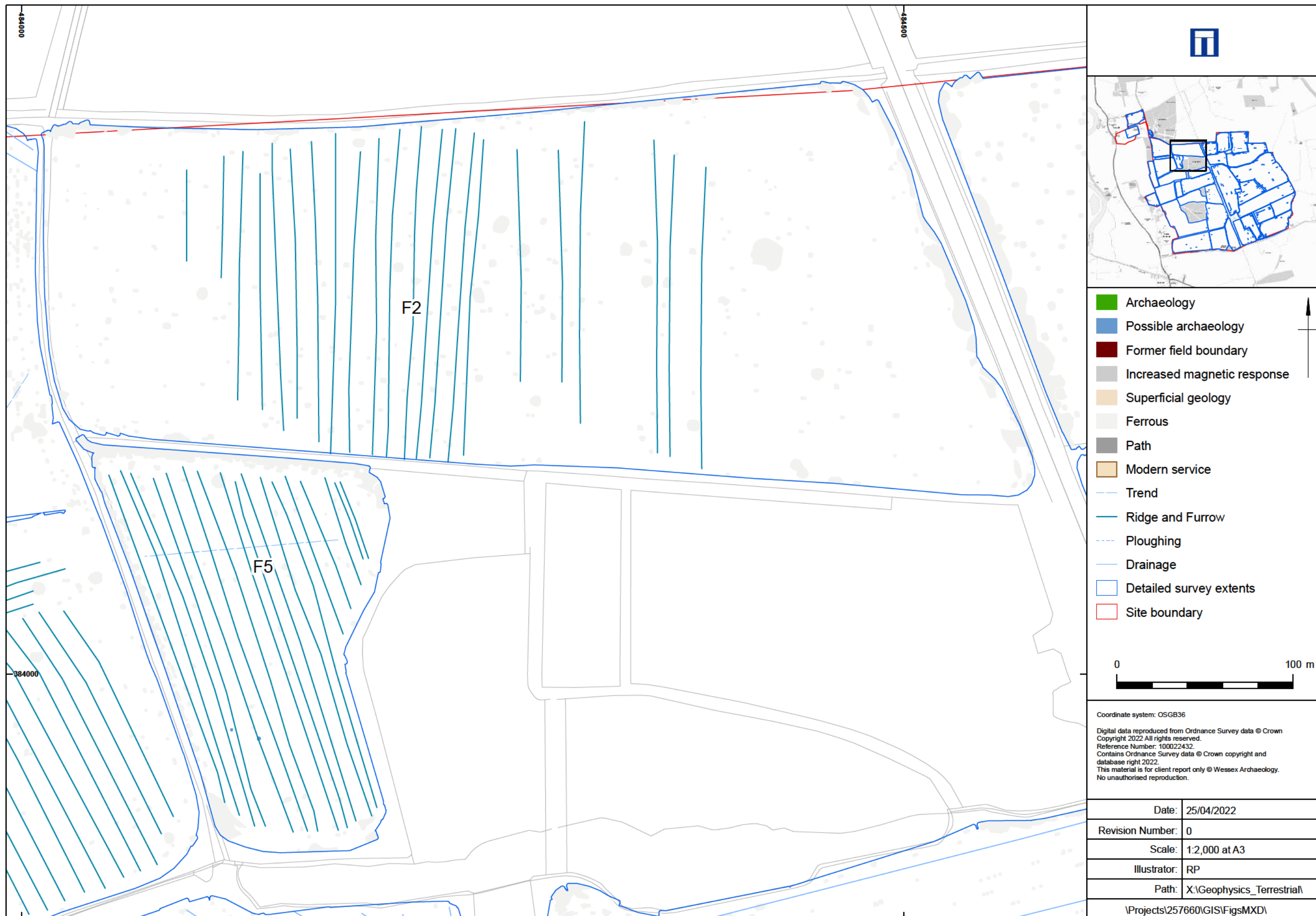


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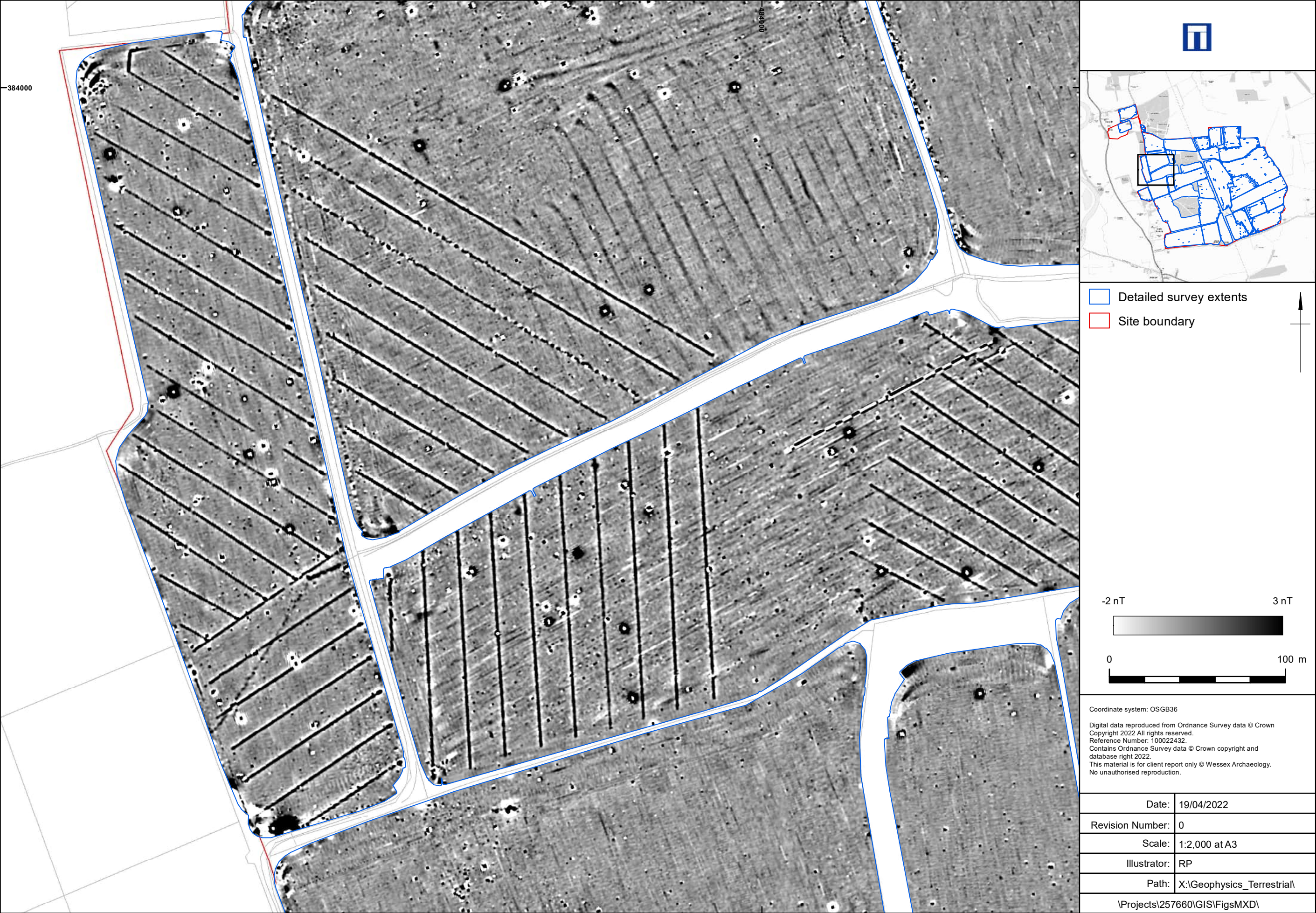


Detailed gradiometer survey results: greyscale plot (Field 2, 5)

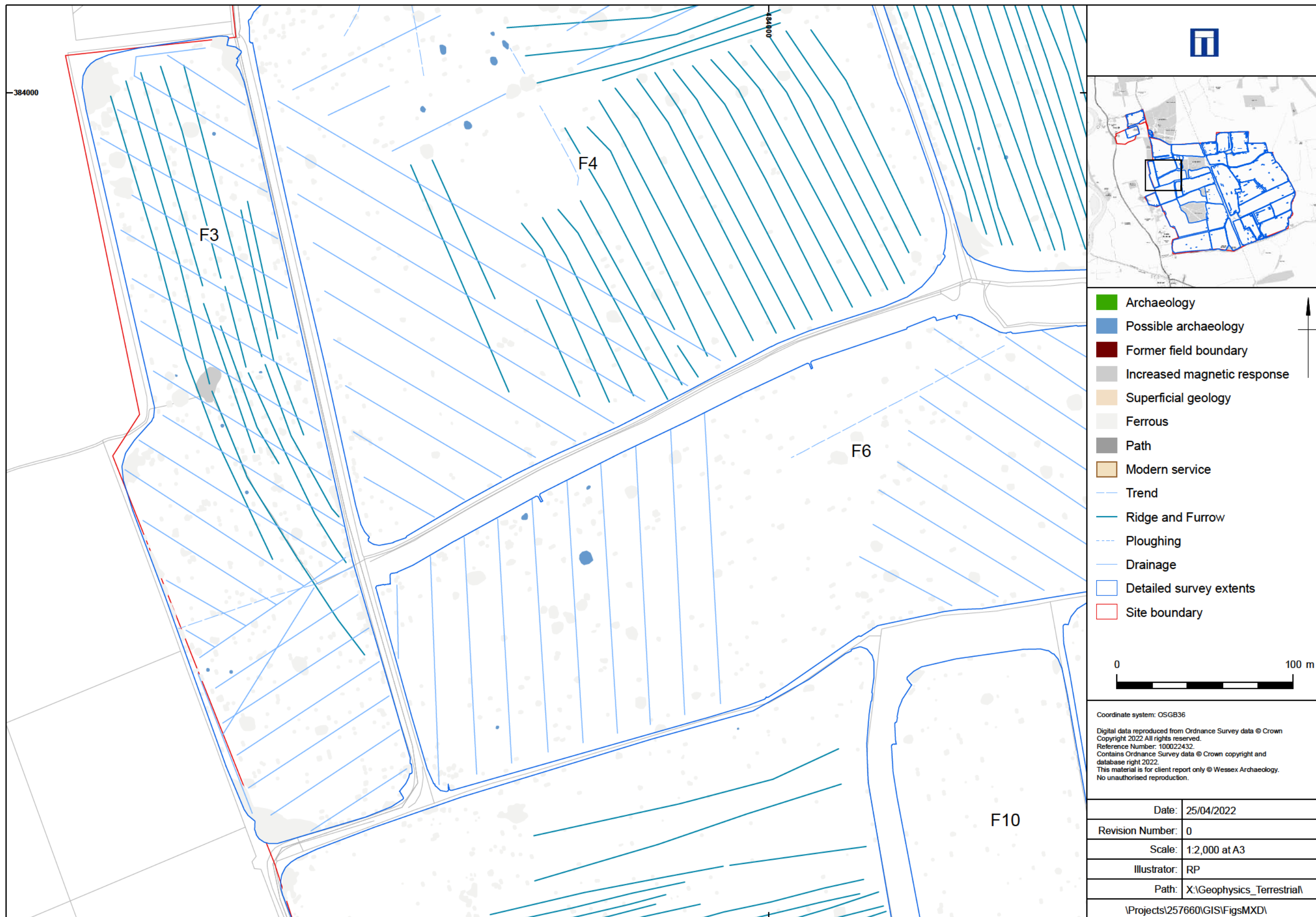
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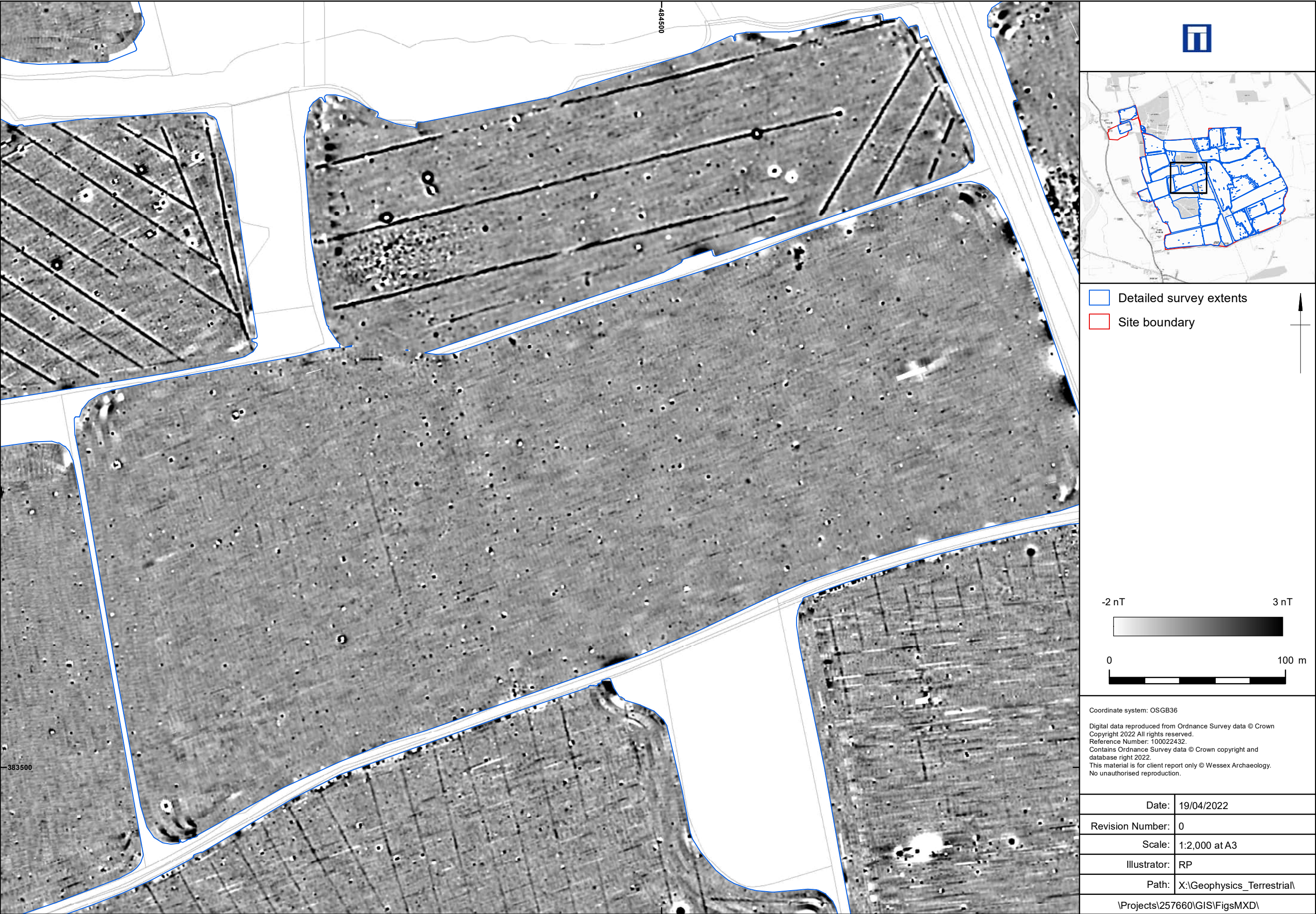
Detailed gradiometer survey results: interpretation (Field 2, 5)



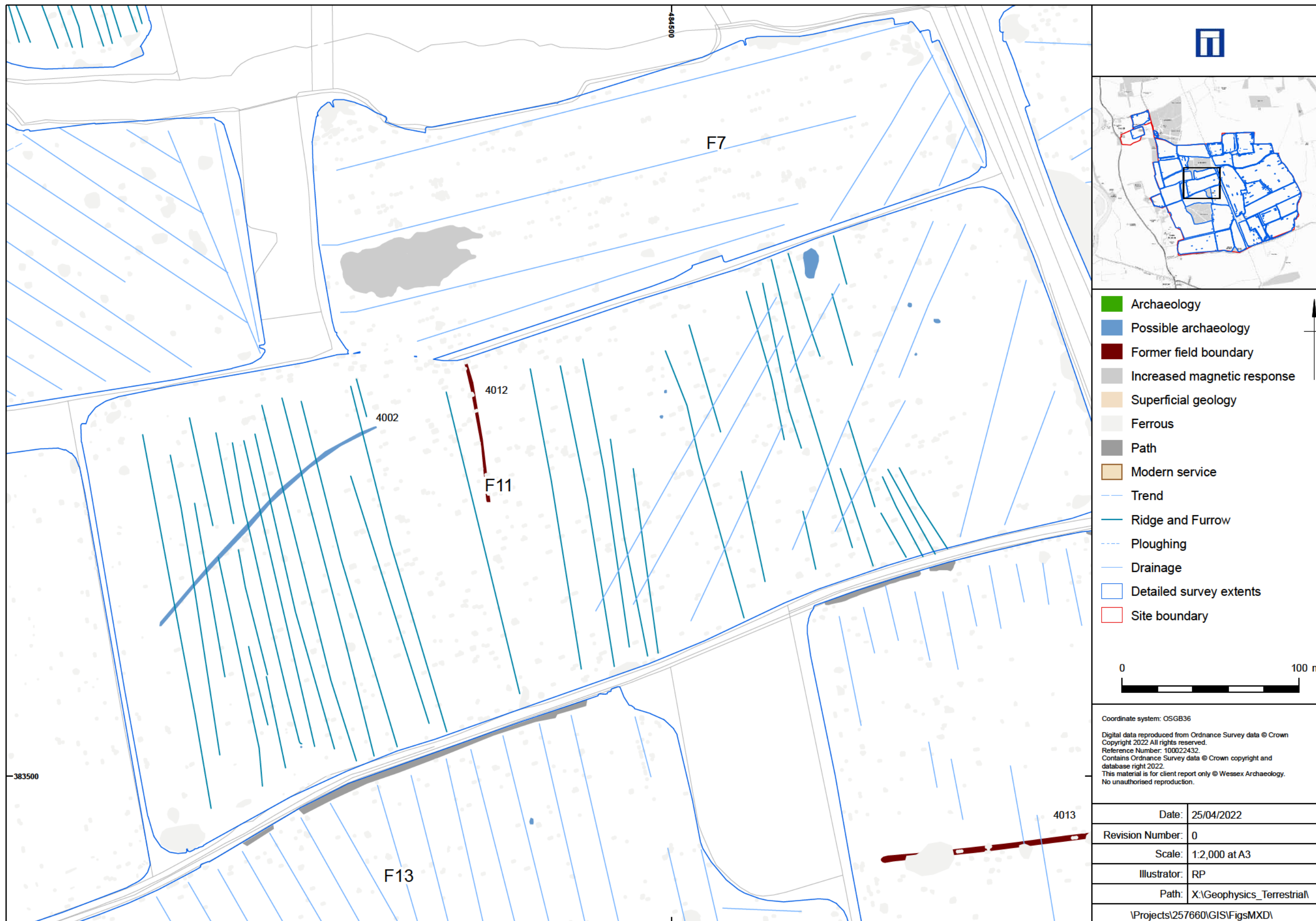
Detailed gradiometer survey results: greyscale plot (Field 3, 4, 6)



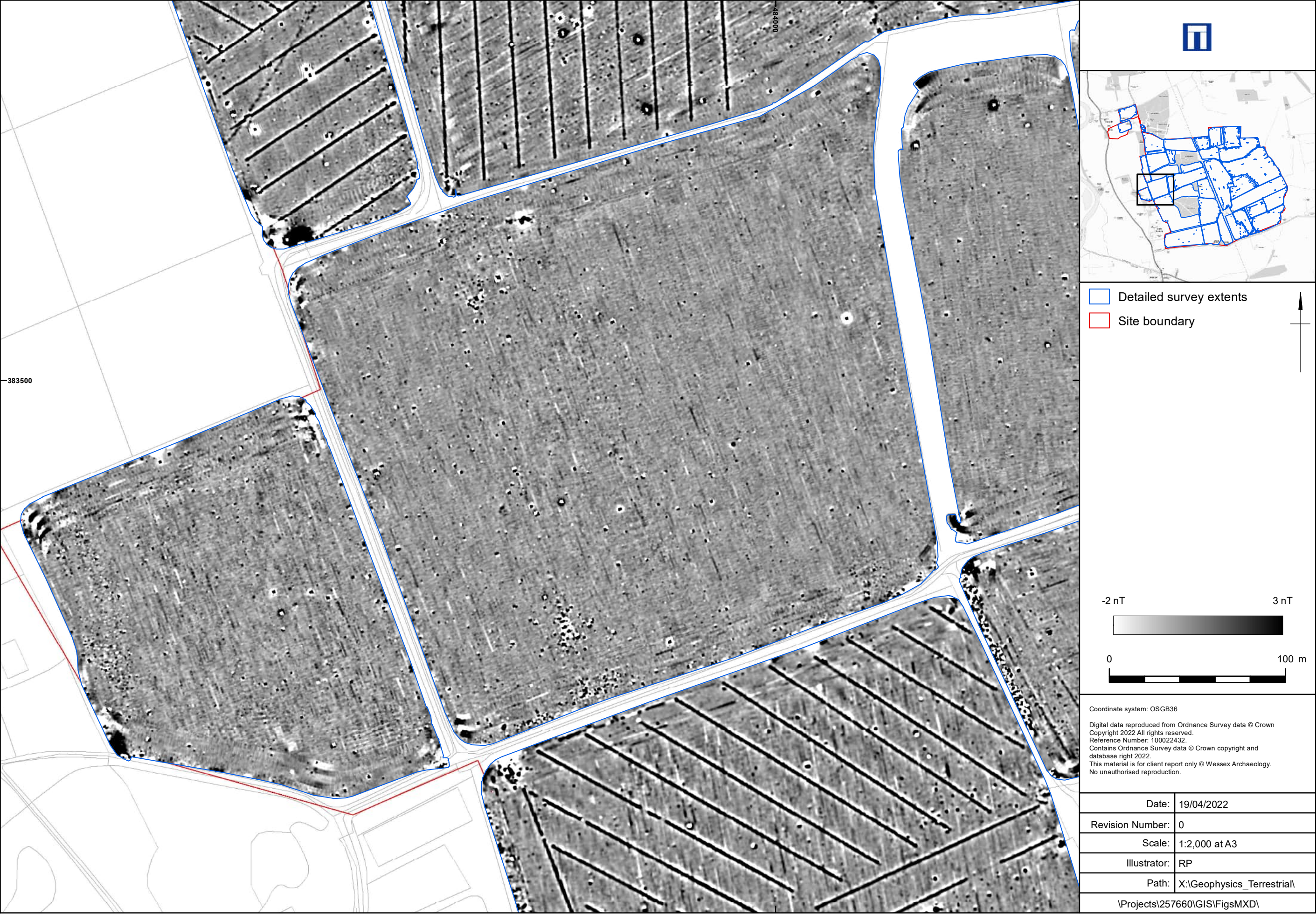
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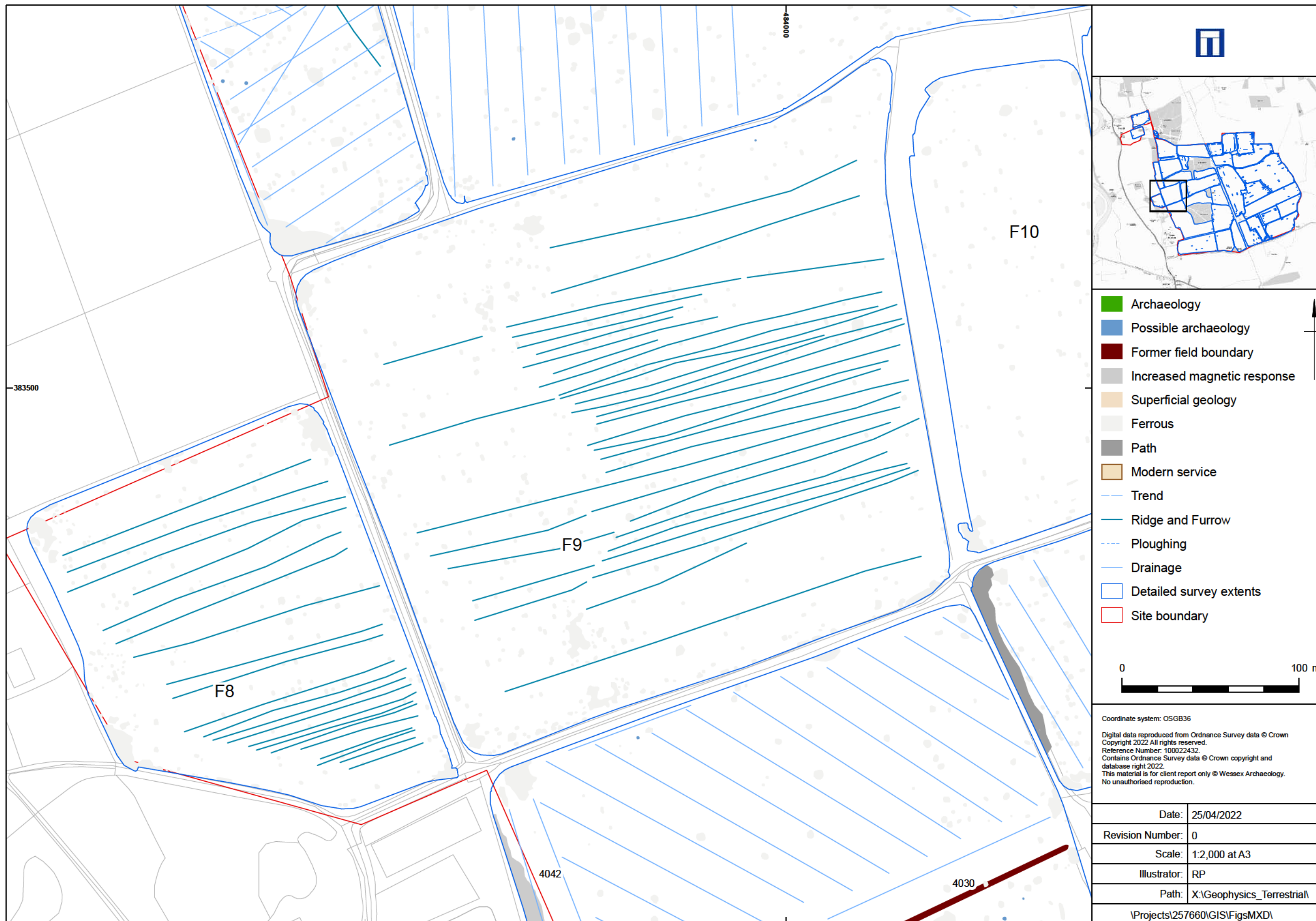
Detailed gradiometer survey results: greyscale plot (Field 7, 11)



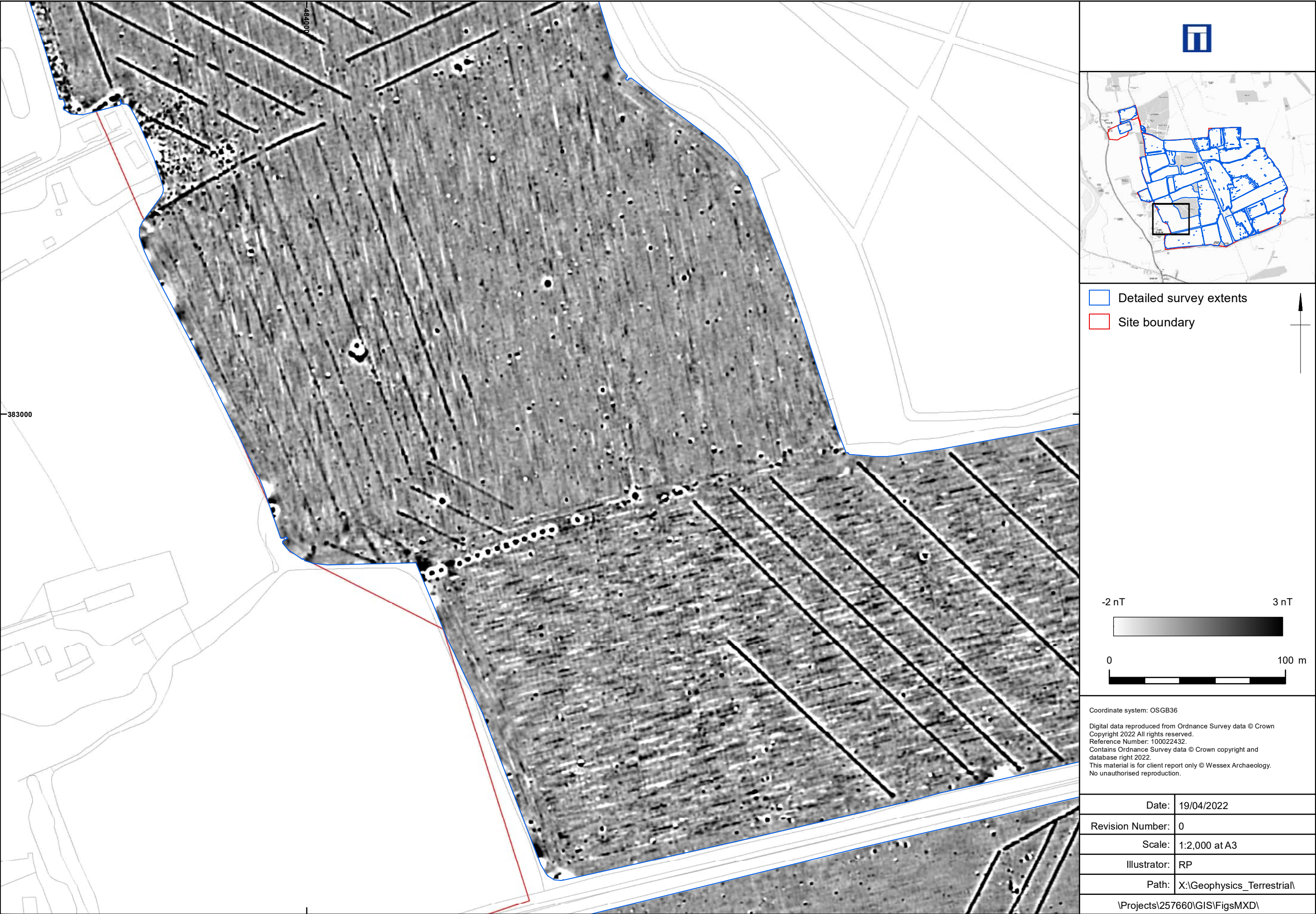
Detailed gradiometer survey results: interpretation (Field 7, 11)



Detailed gradiometer survey results: greyscale plot (Field 8, 9, 10)

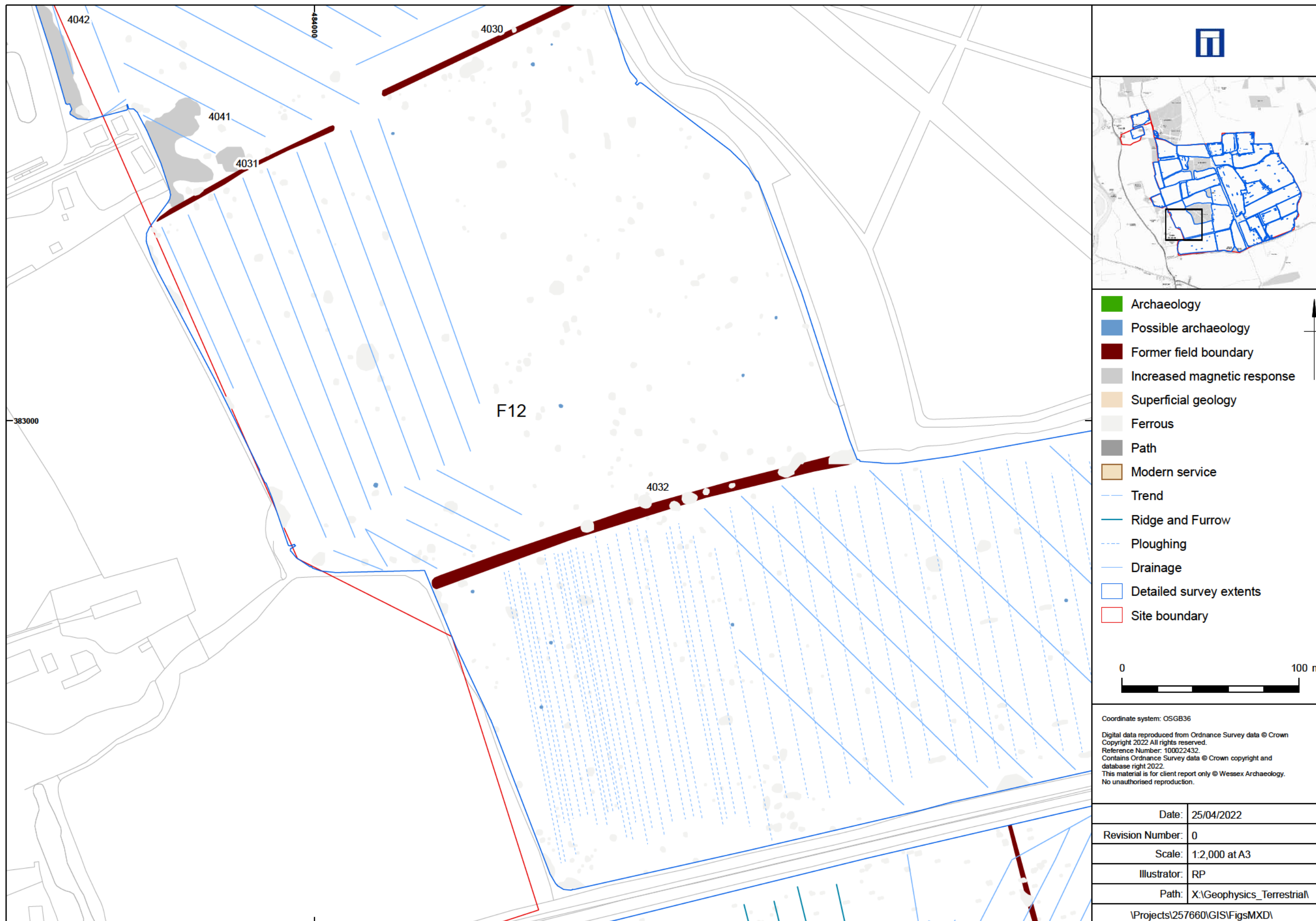


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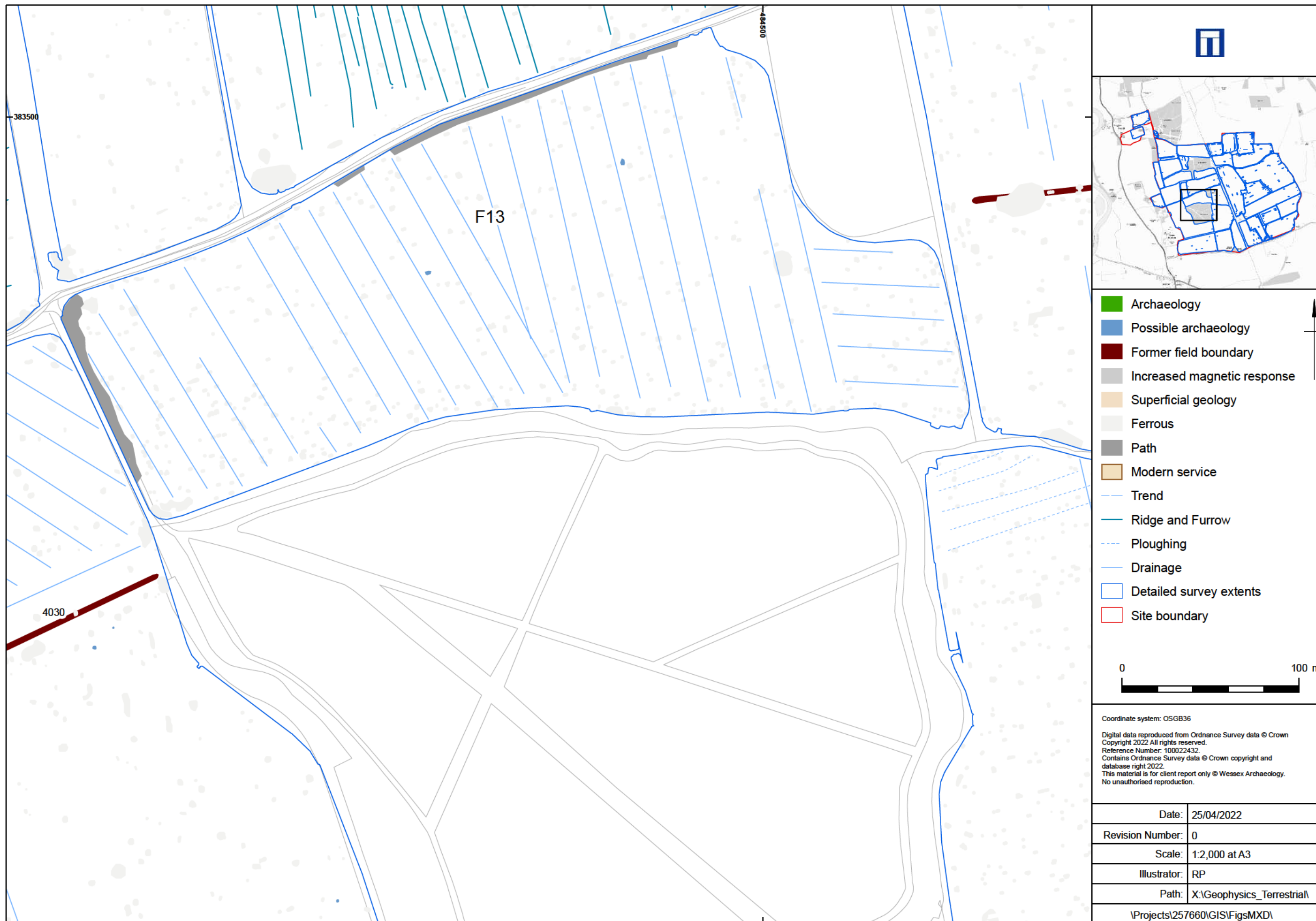


Detailed gradiometer survey results: greyscale plot (Field 12)

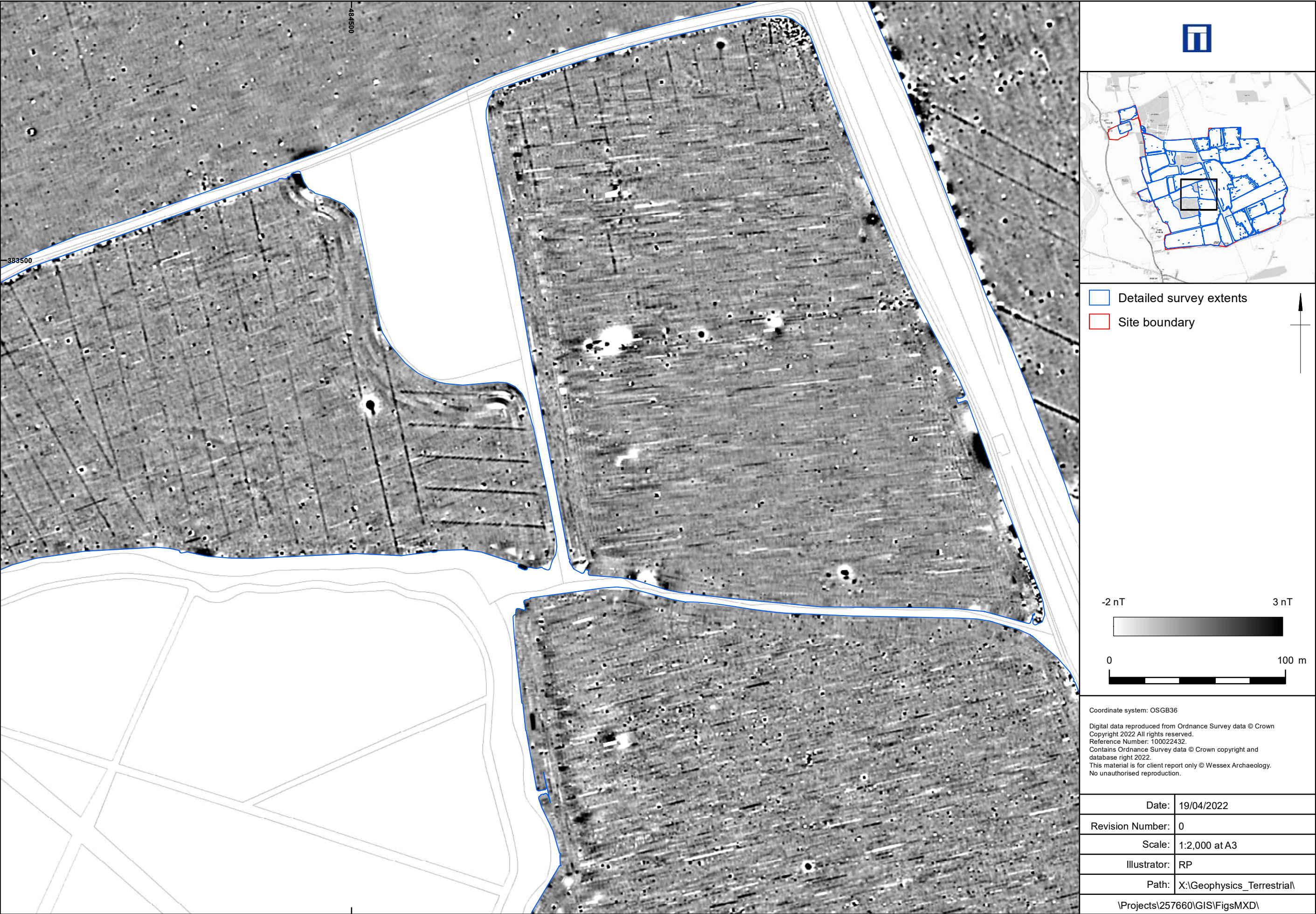
Figure 22



Detailed gradiometer survey results: interpretation (Field 12)

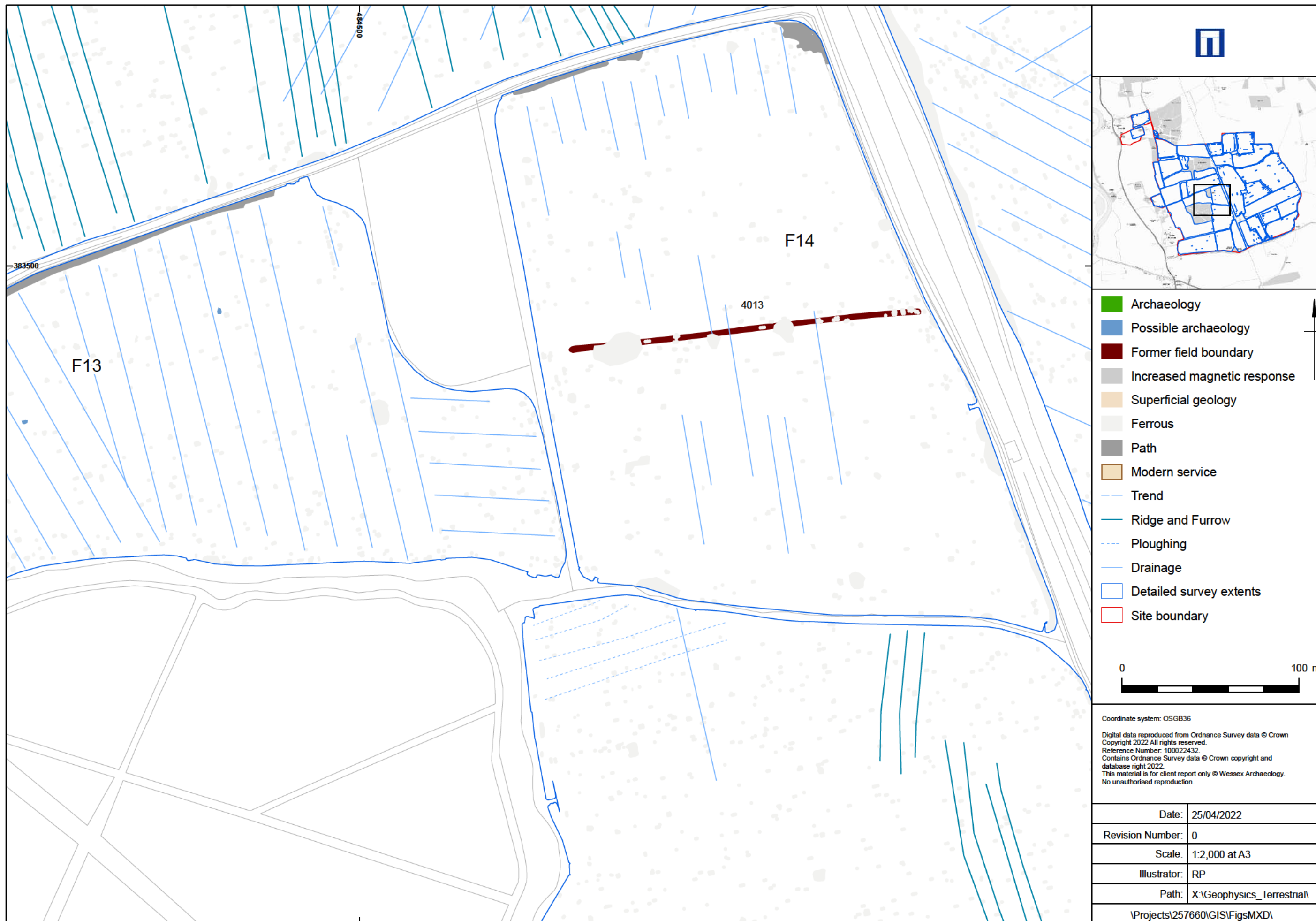


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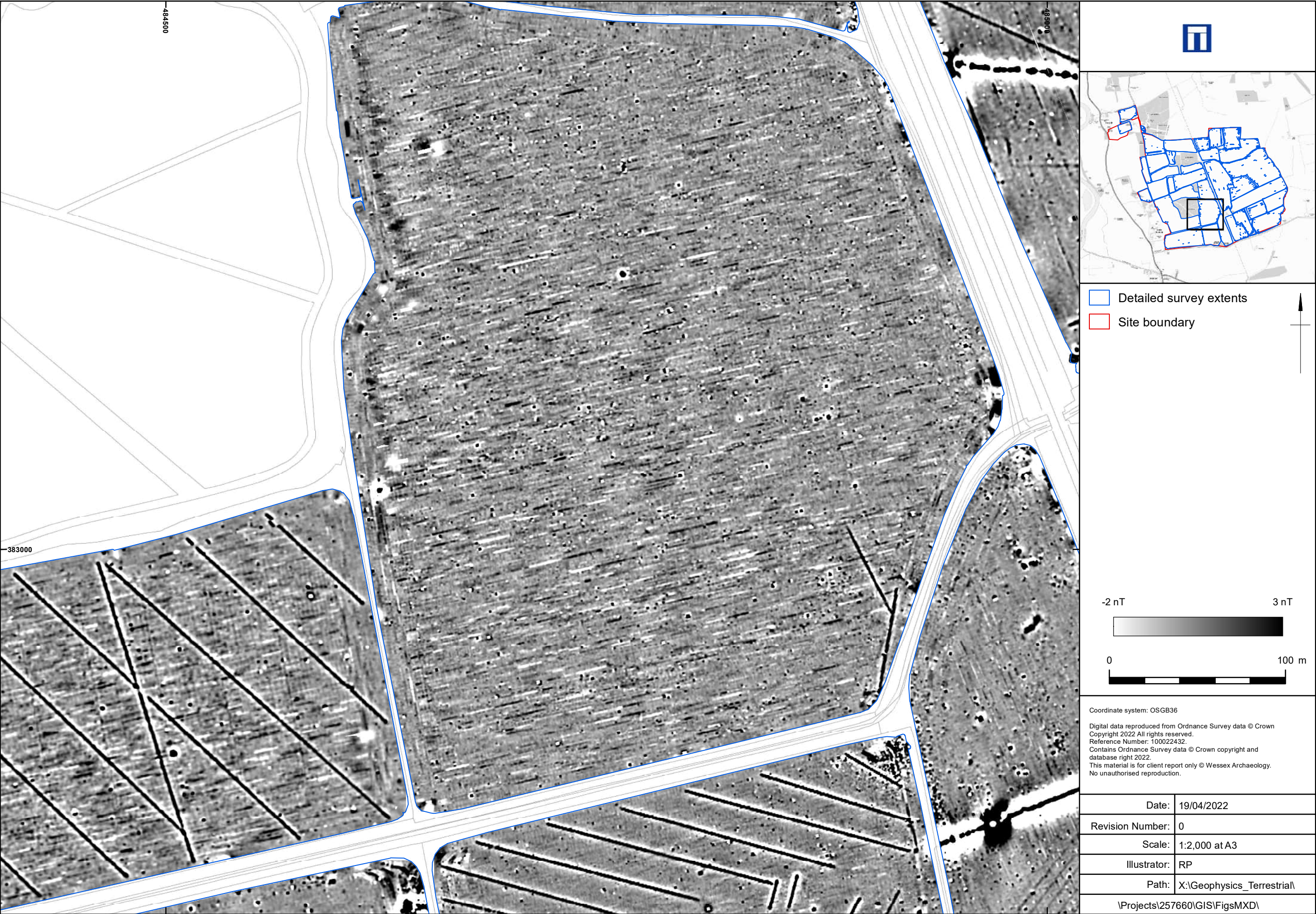


Detailed gradiometer survey results: greyscale plot (Field 13, 14, 15)

Figure 26

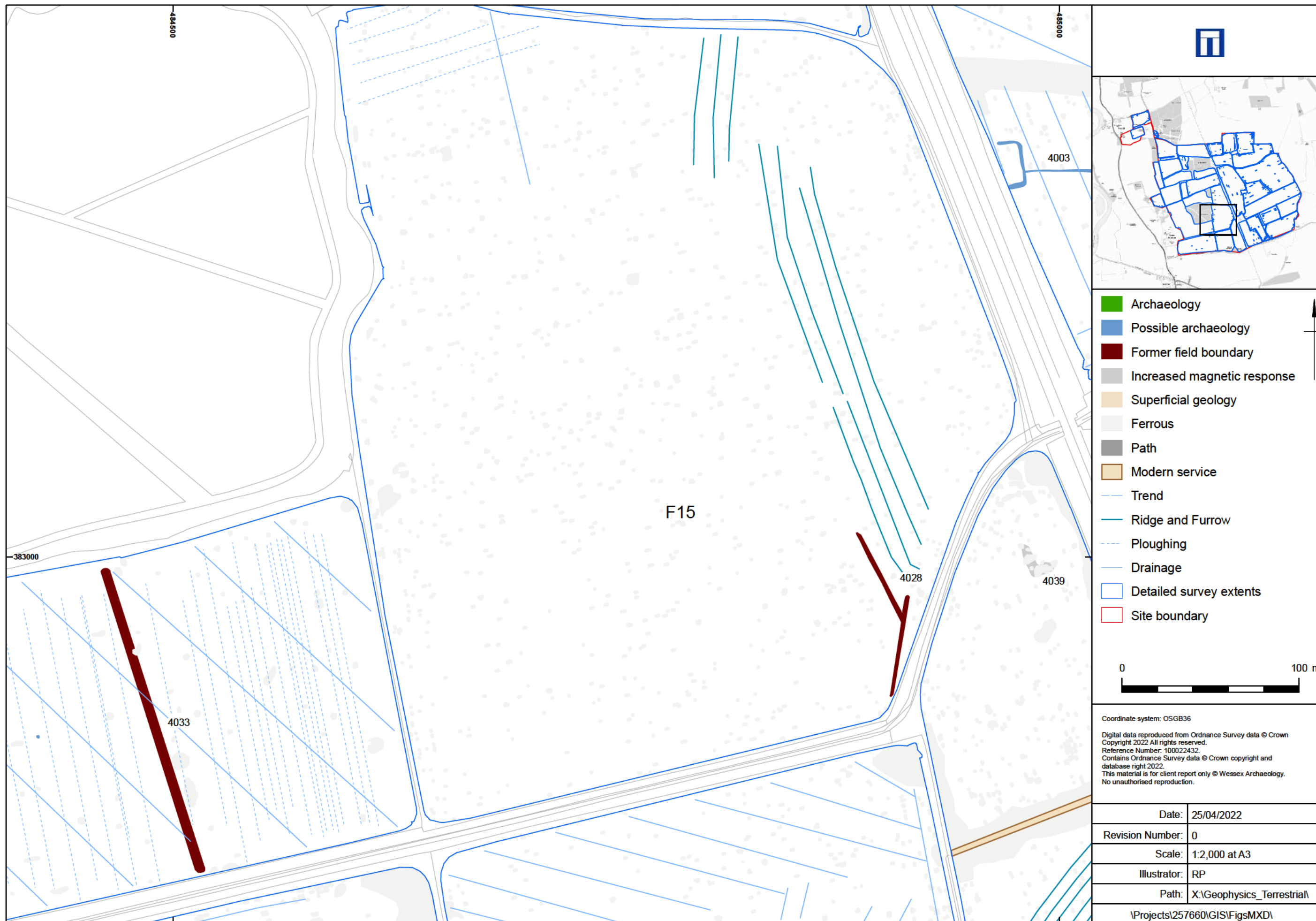


Detailed gradiometer survey results: interpretation (Field 13, 14, 15)

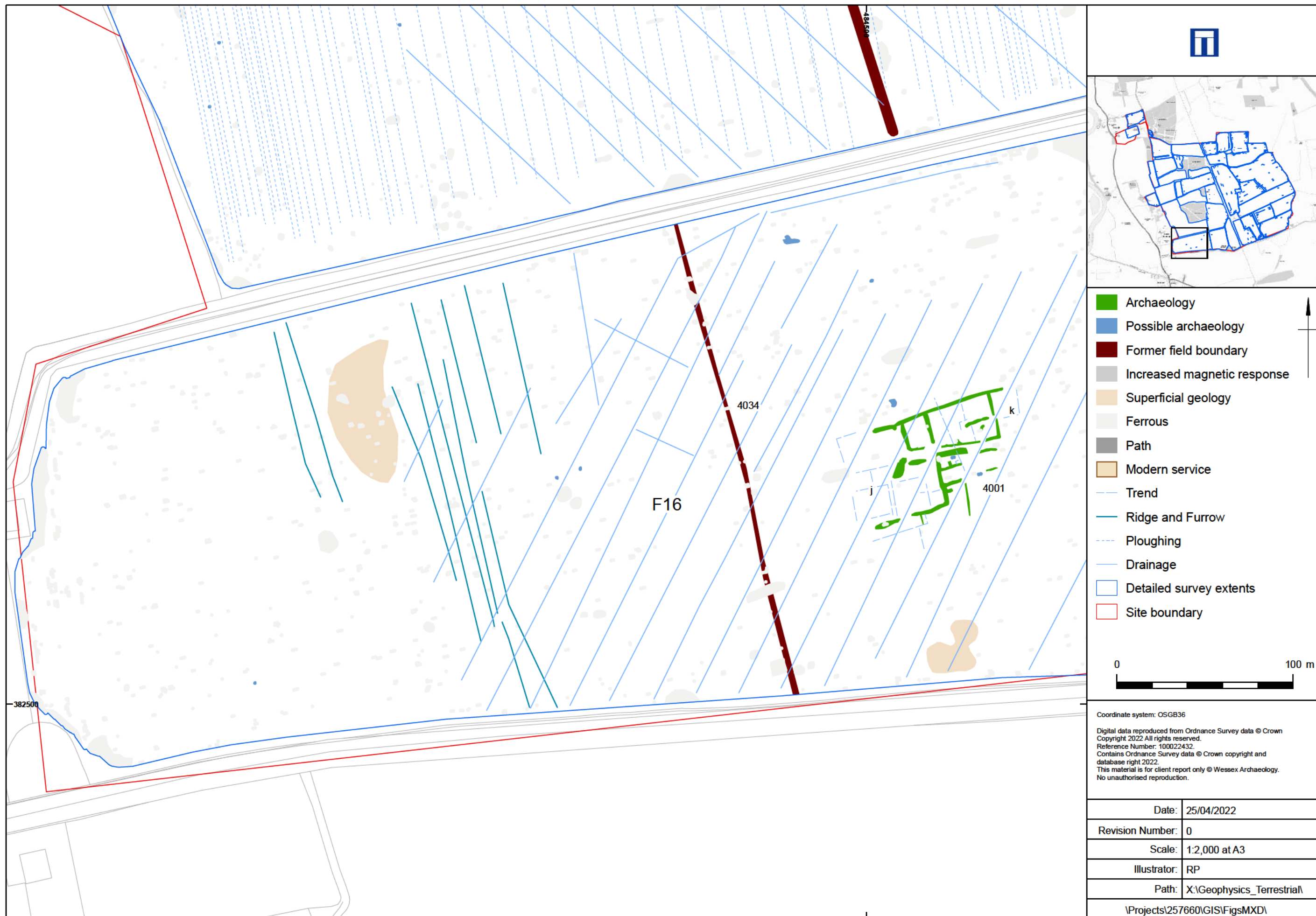


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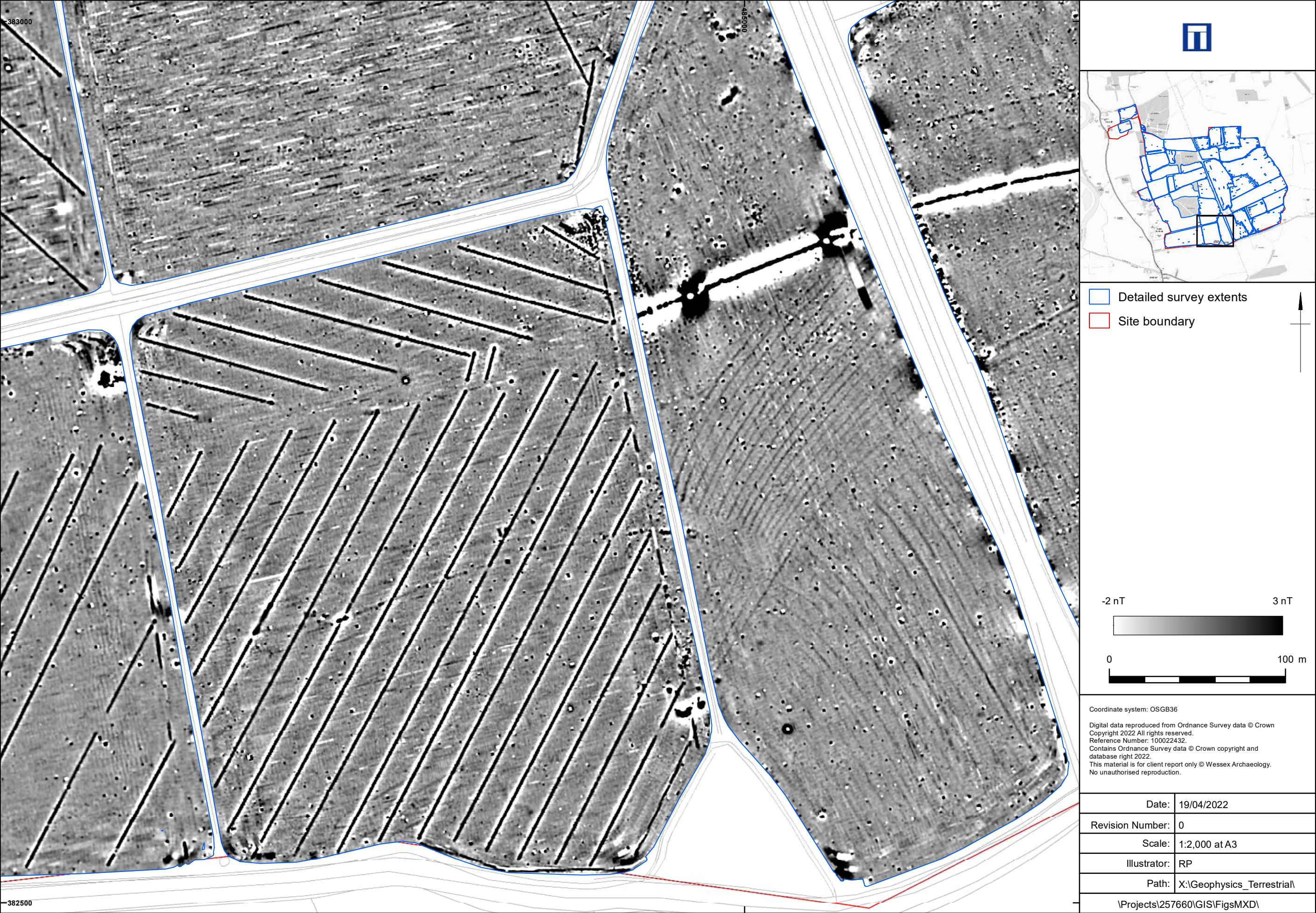
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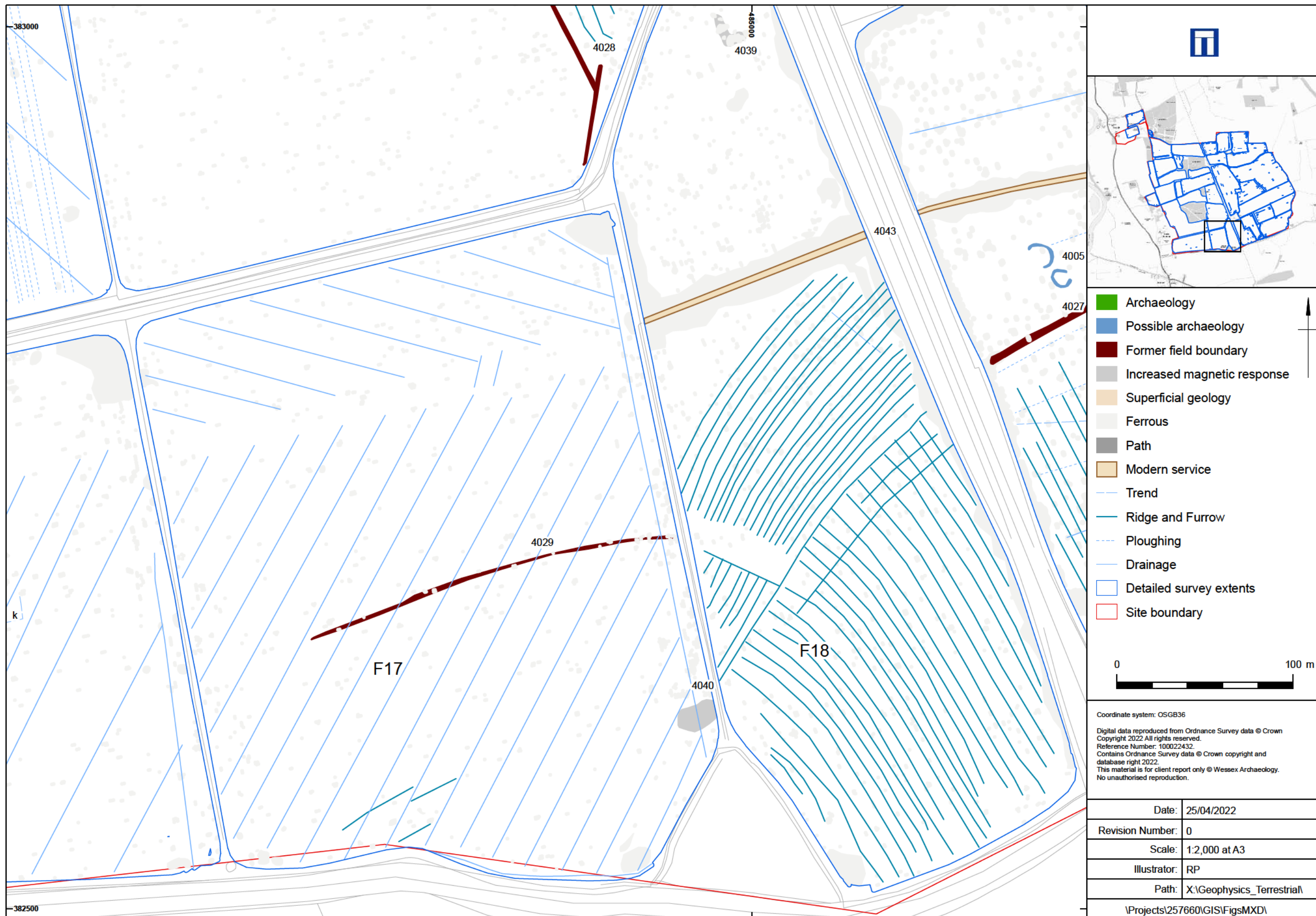


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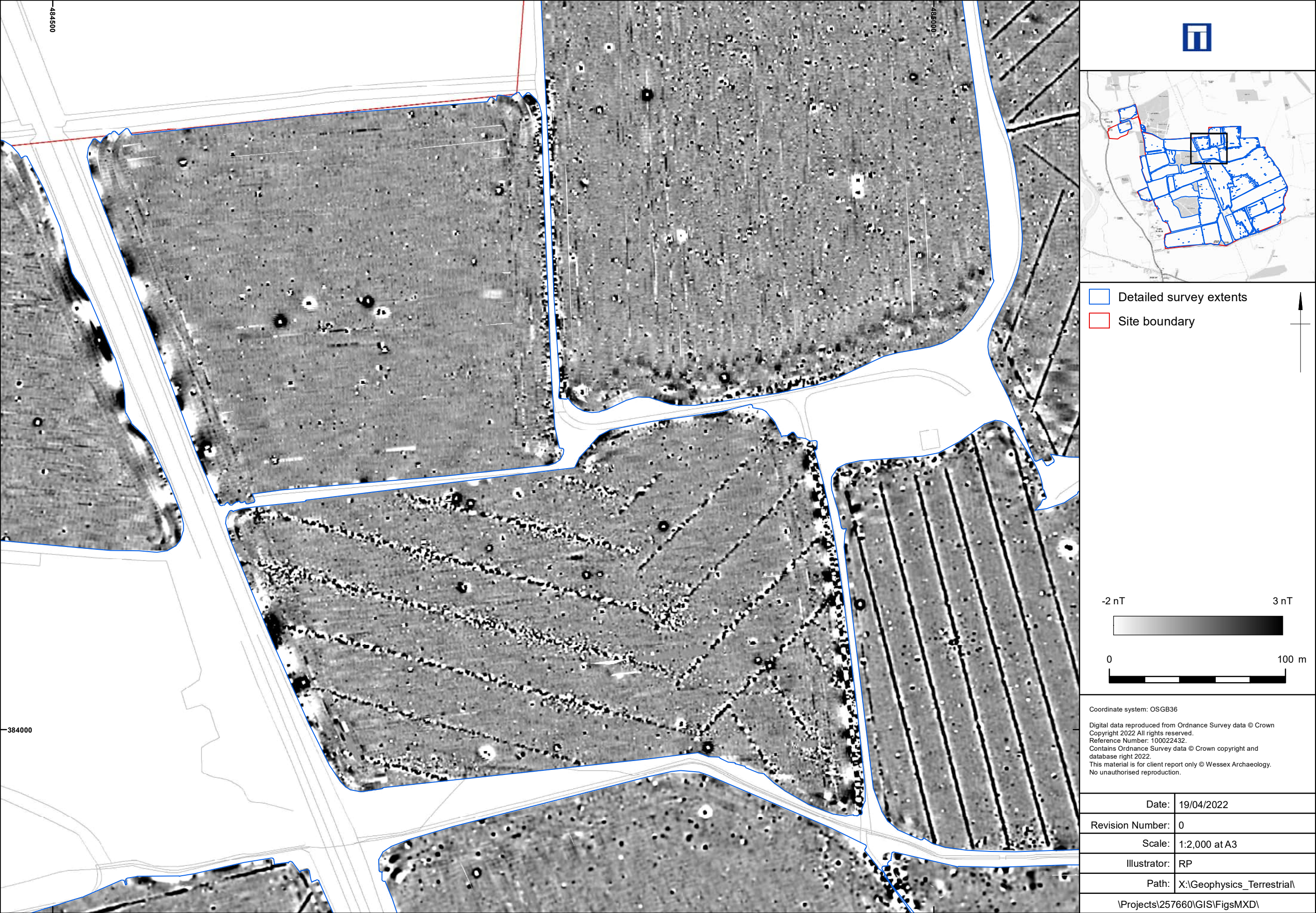


Detailed gradiometer survey results: greyscale plot (Field 17, 18)

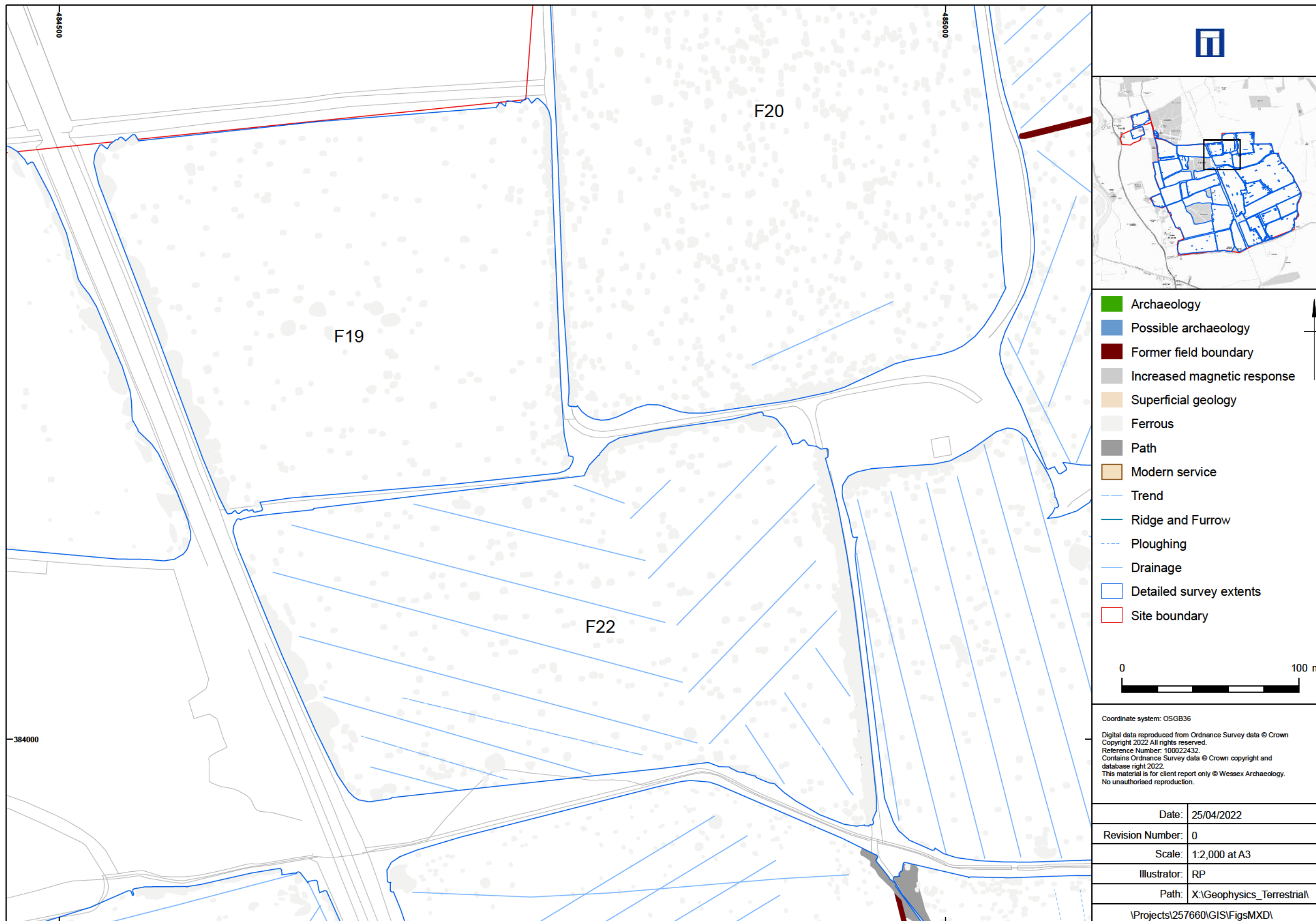
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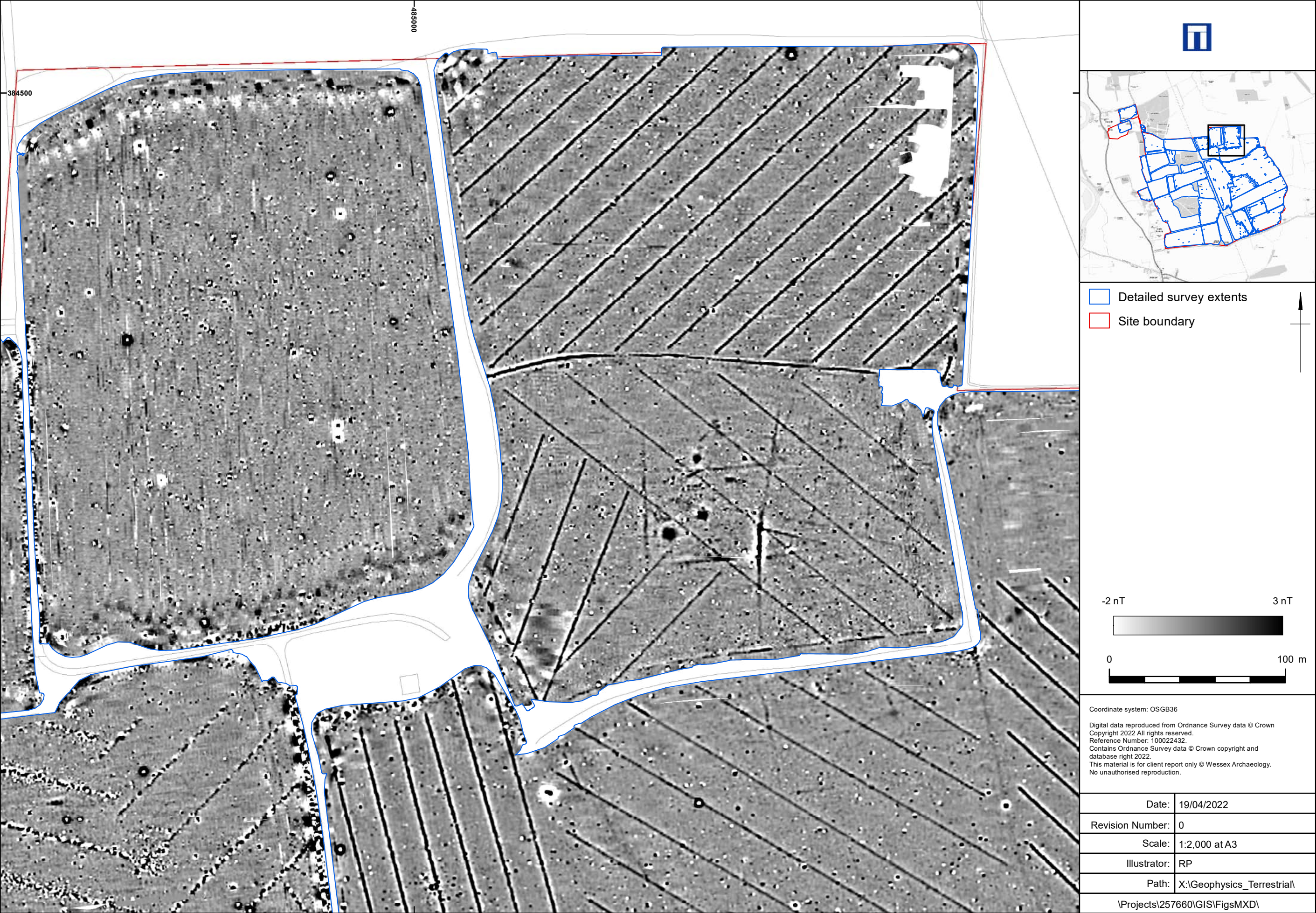
Detailed gradiometer survey results: interpretation (Field 17, 18)



Detailed gradiometer survey results: greyscale plot (Field 19, 20, 22)

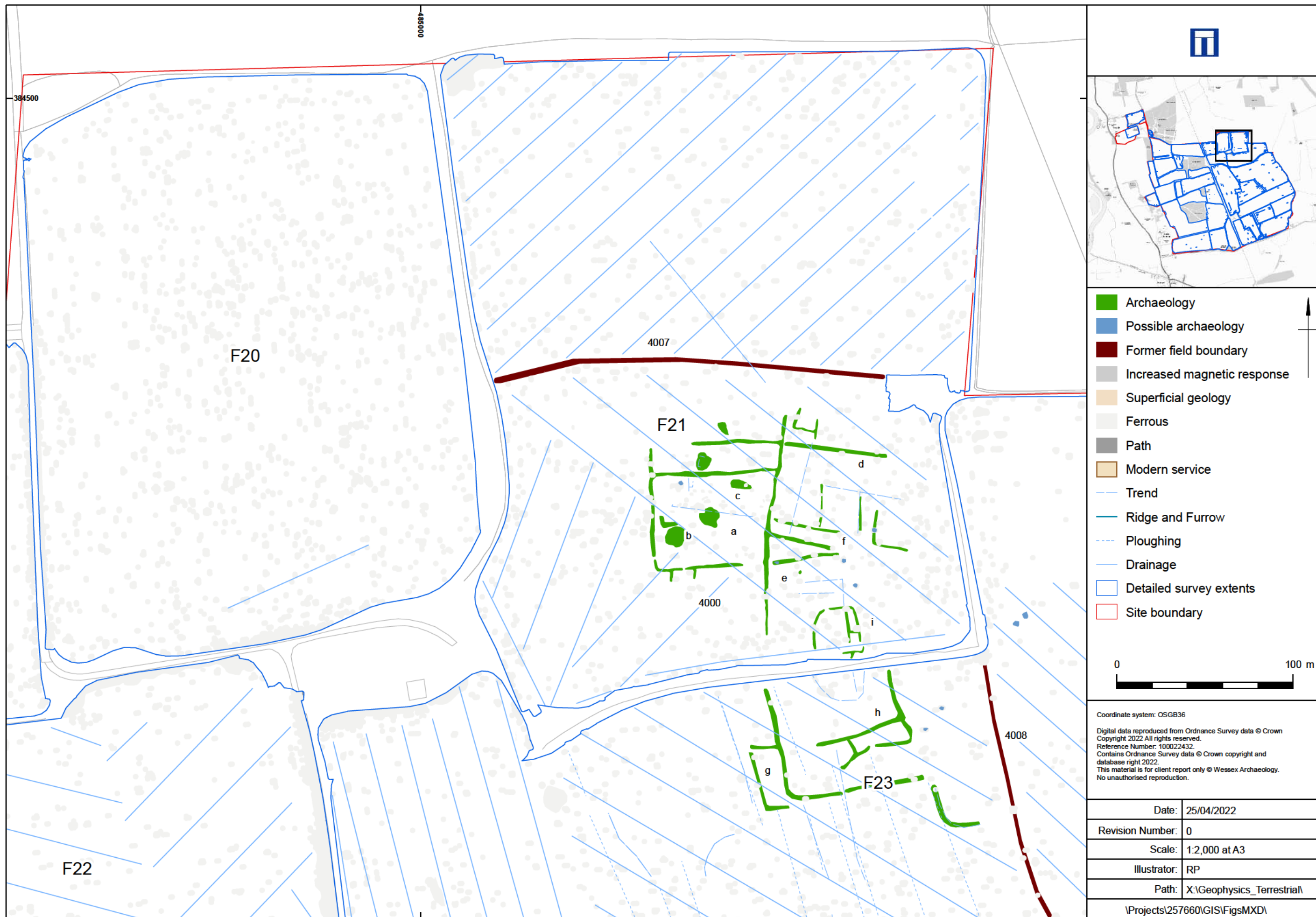


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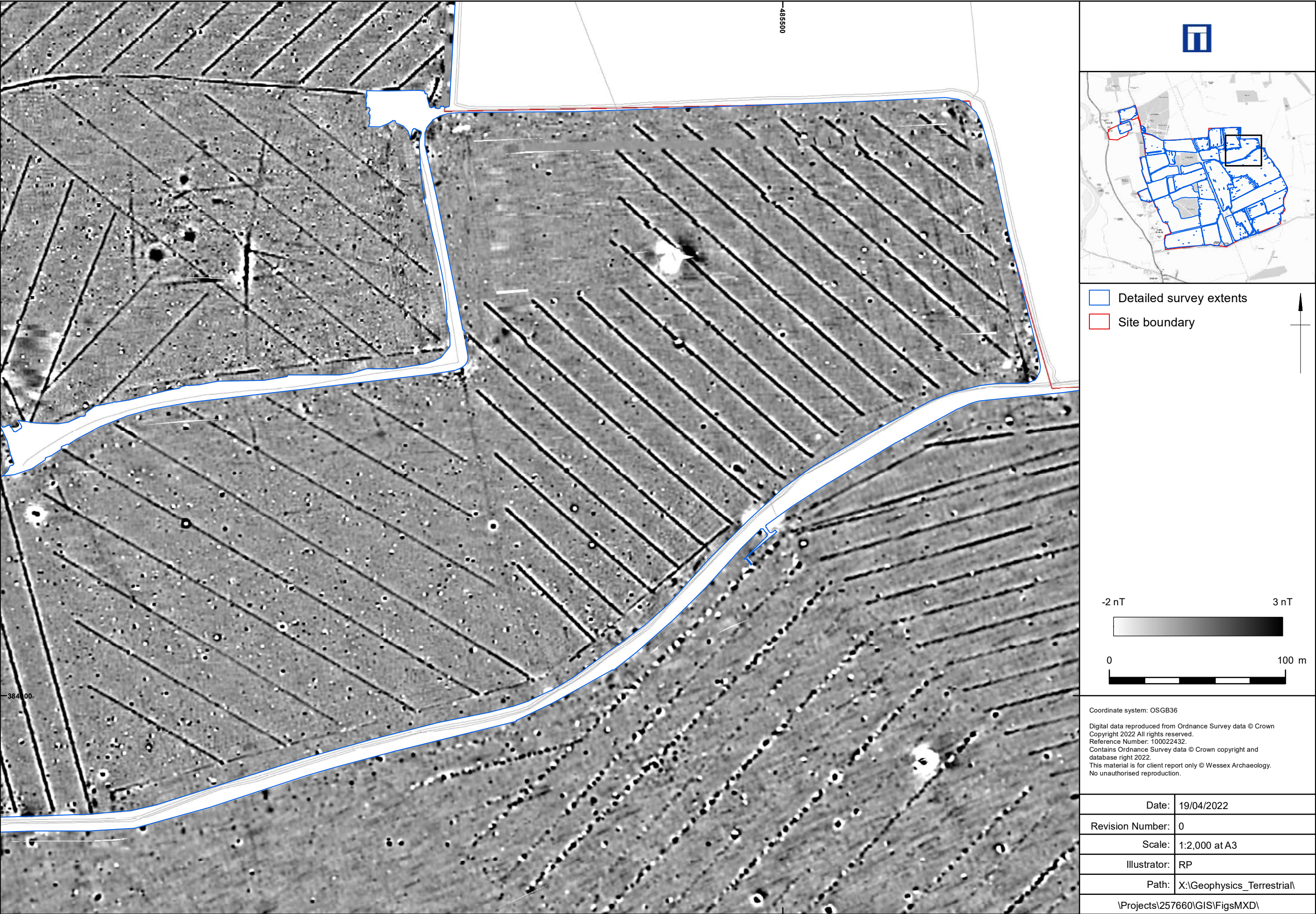


Detailed gradiometer survey results: greyscale plot (Field 20, 21, 23)

Figure 36

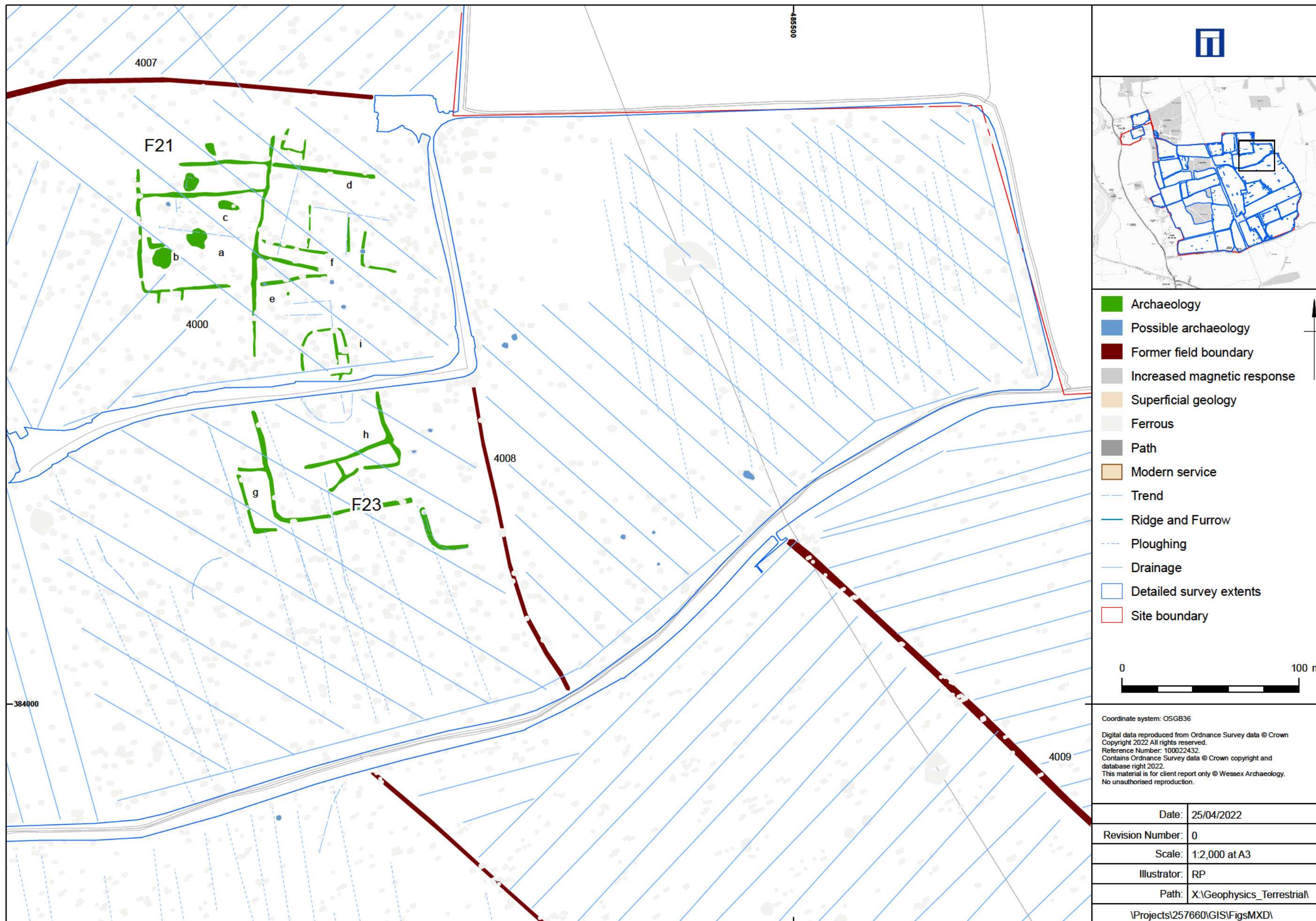


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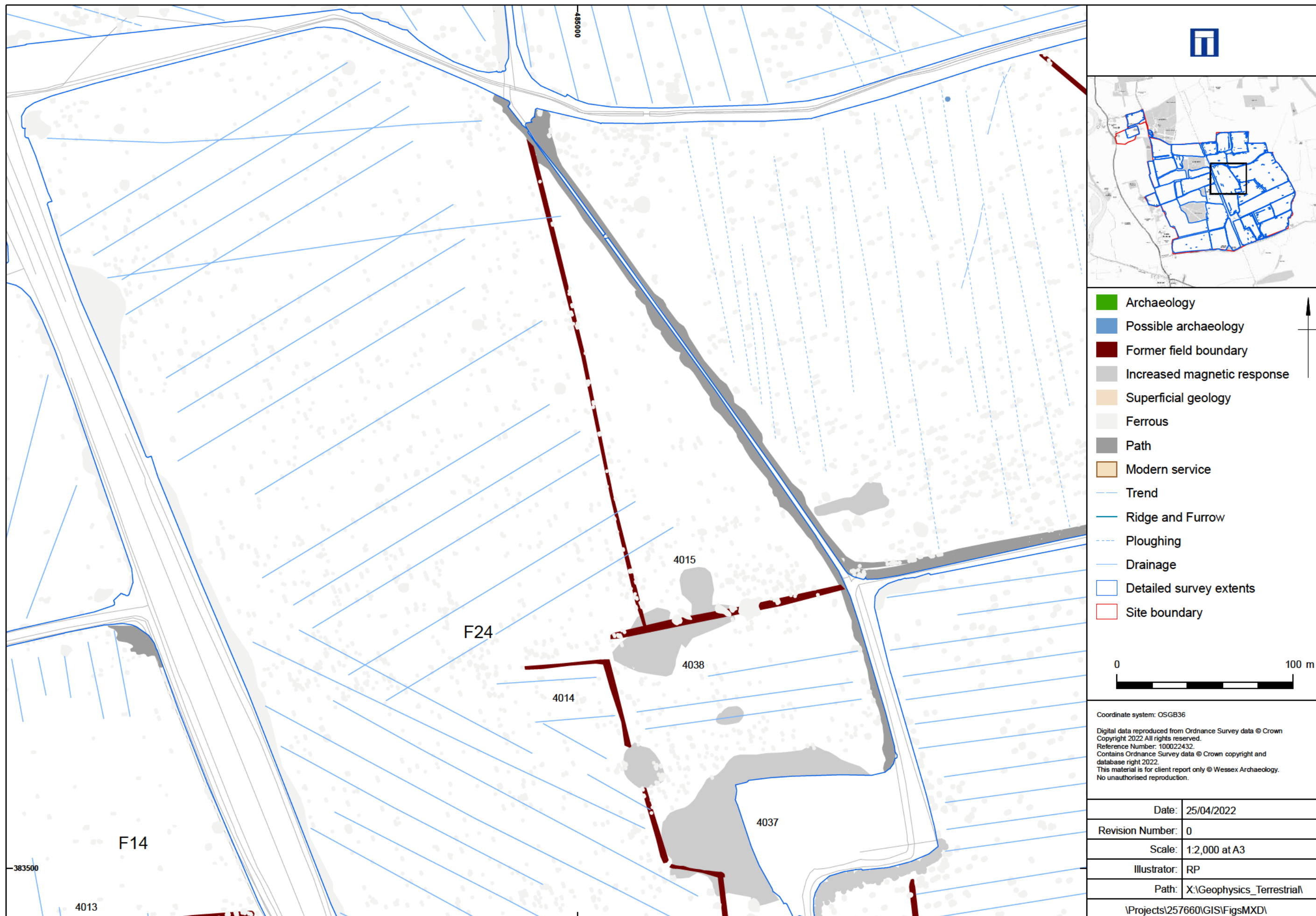


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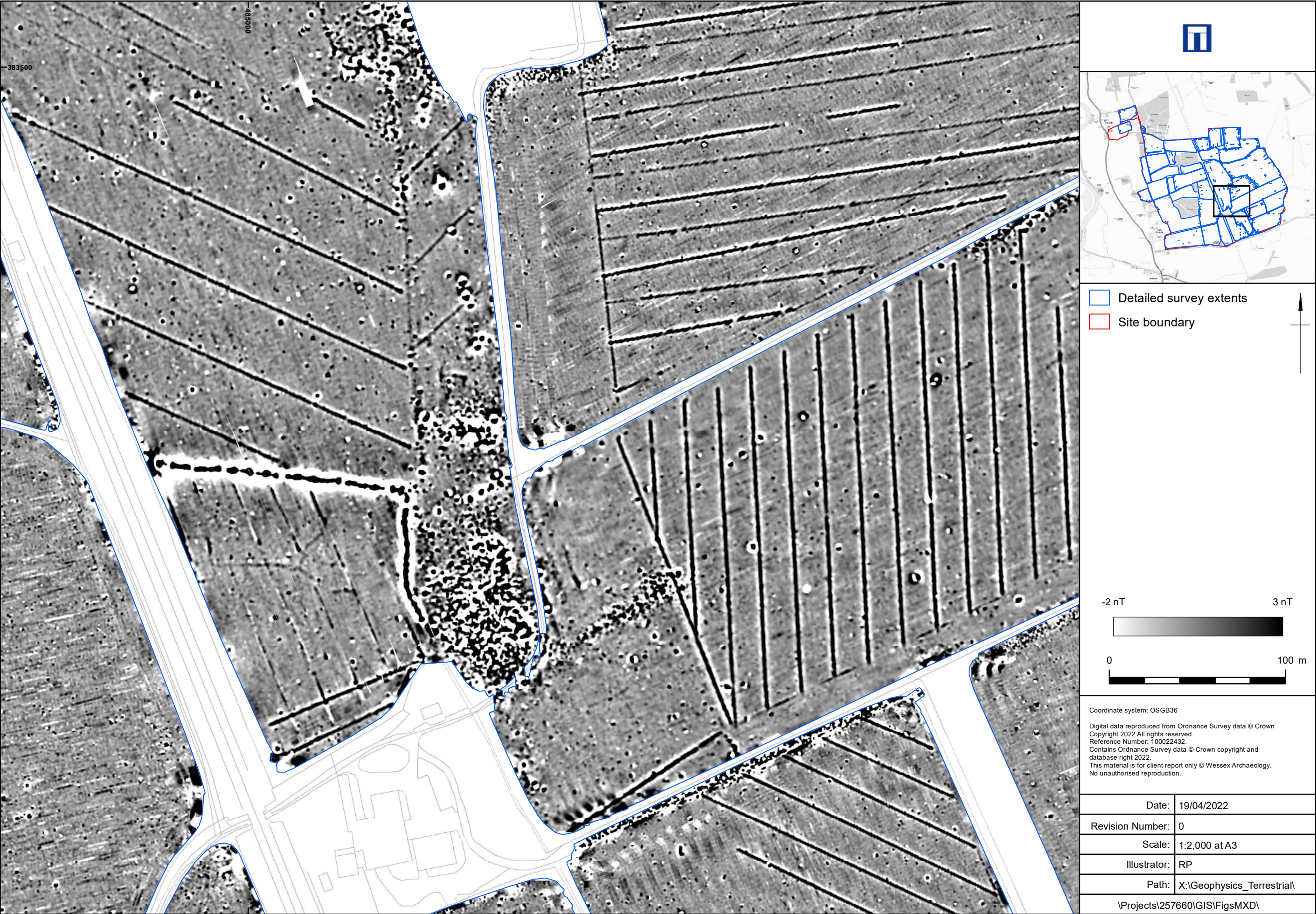
Figure 38



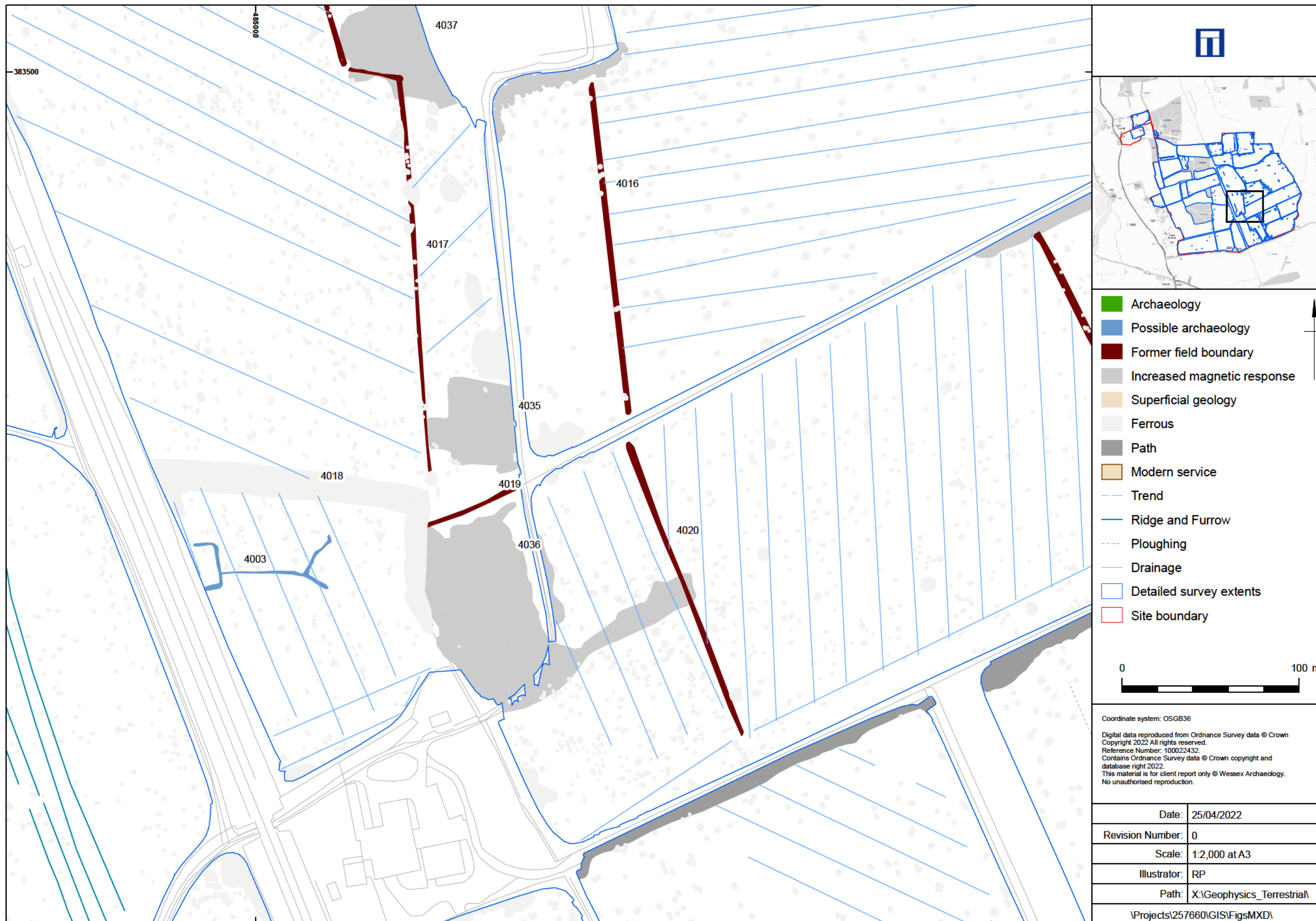
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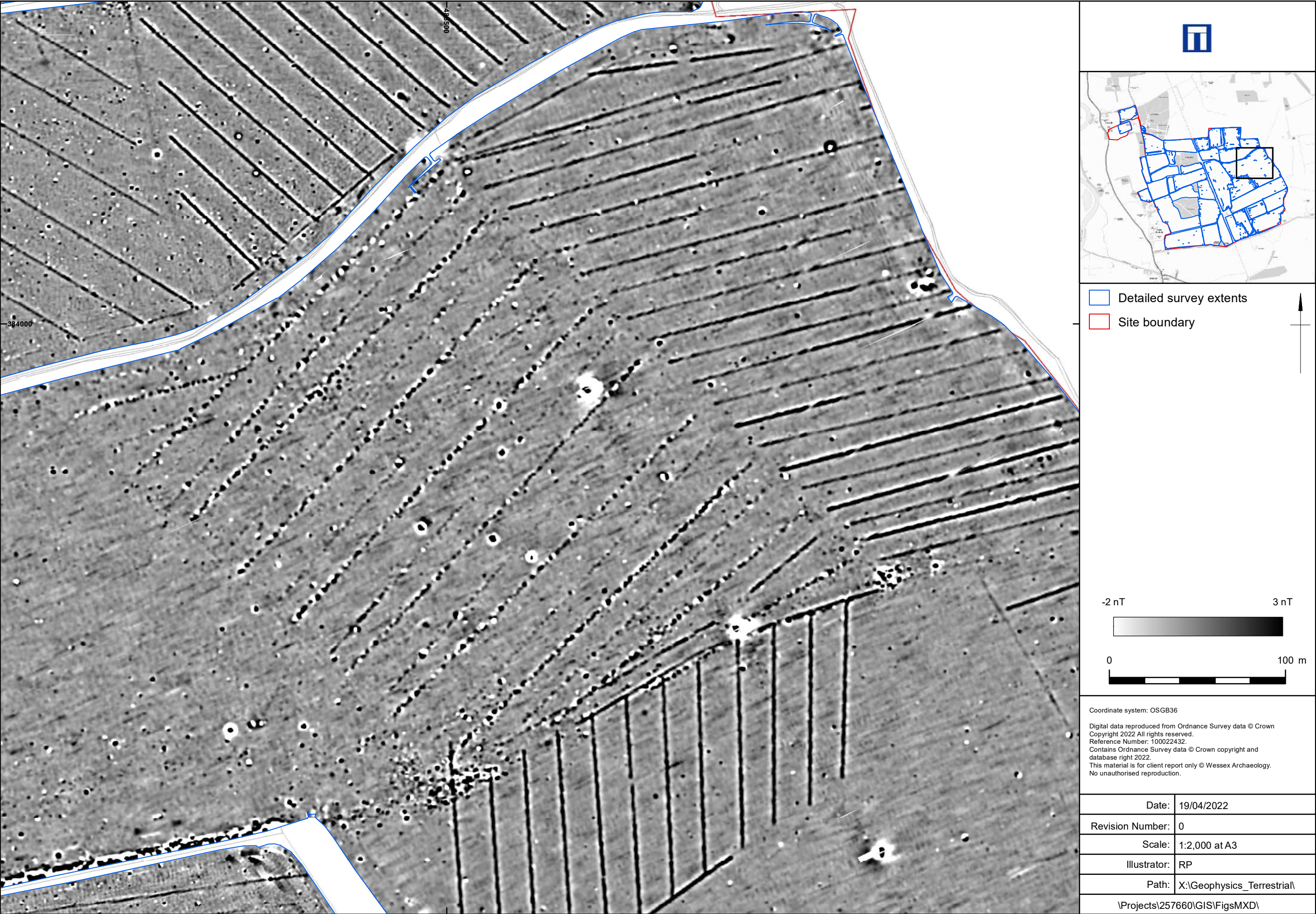
Detailed gradiometer survey results: interpretation (Field 24, 25, 26)



Detailed gradiometer survey results: greyscale plot (Field 24, 25, 26)

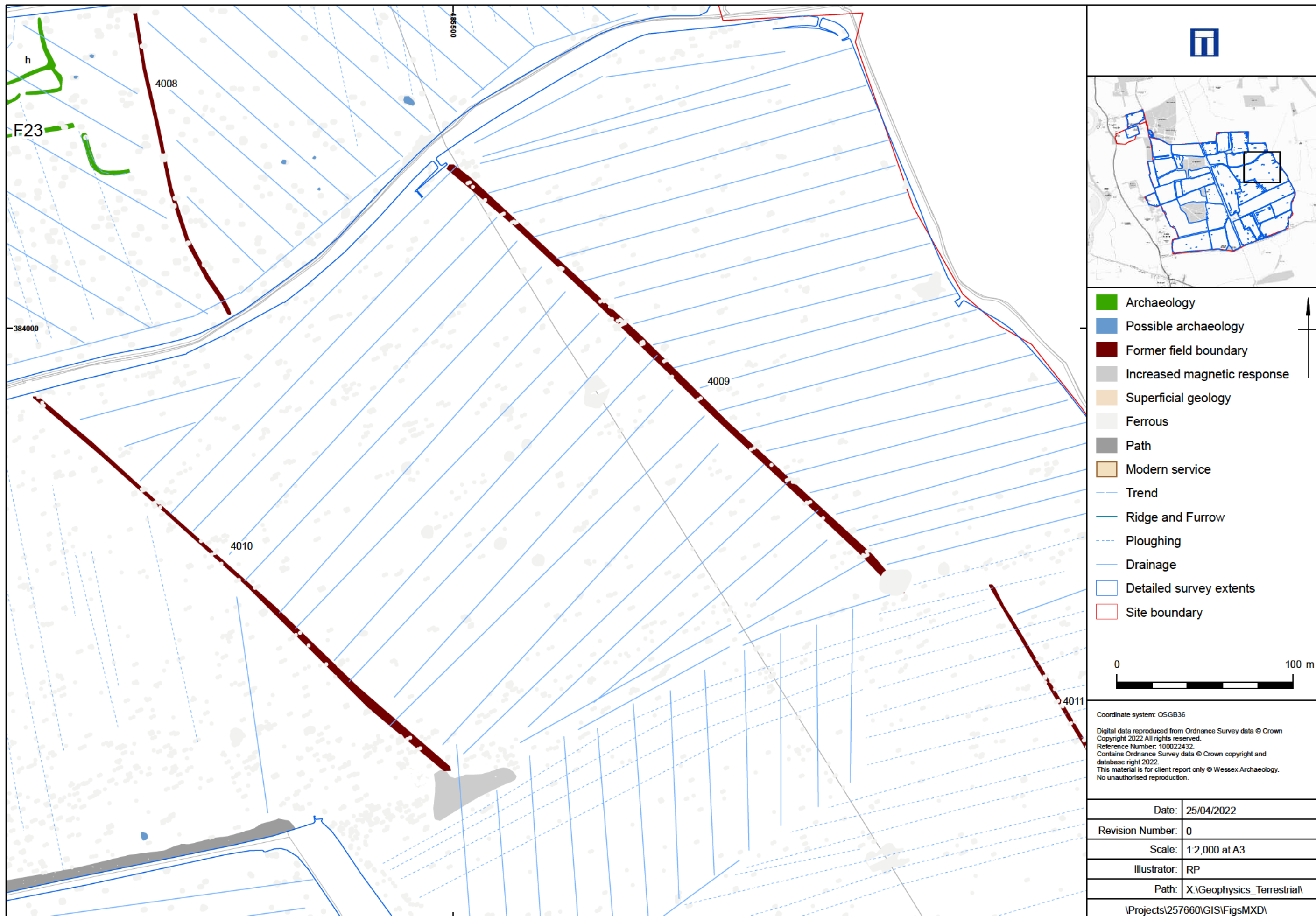


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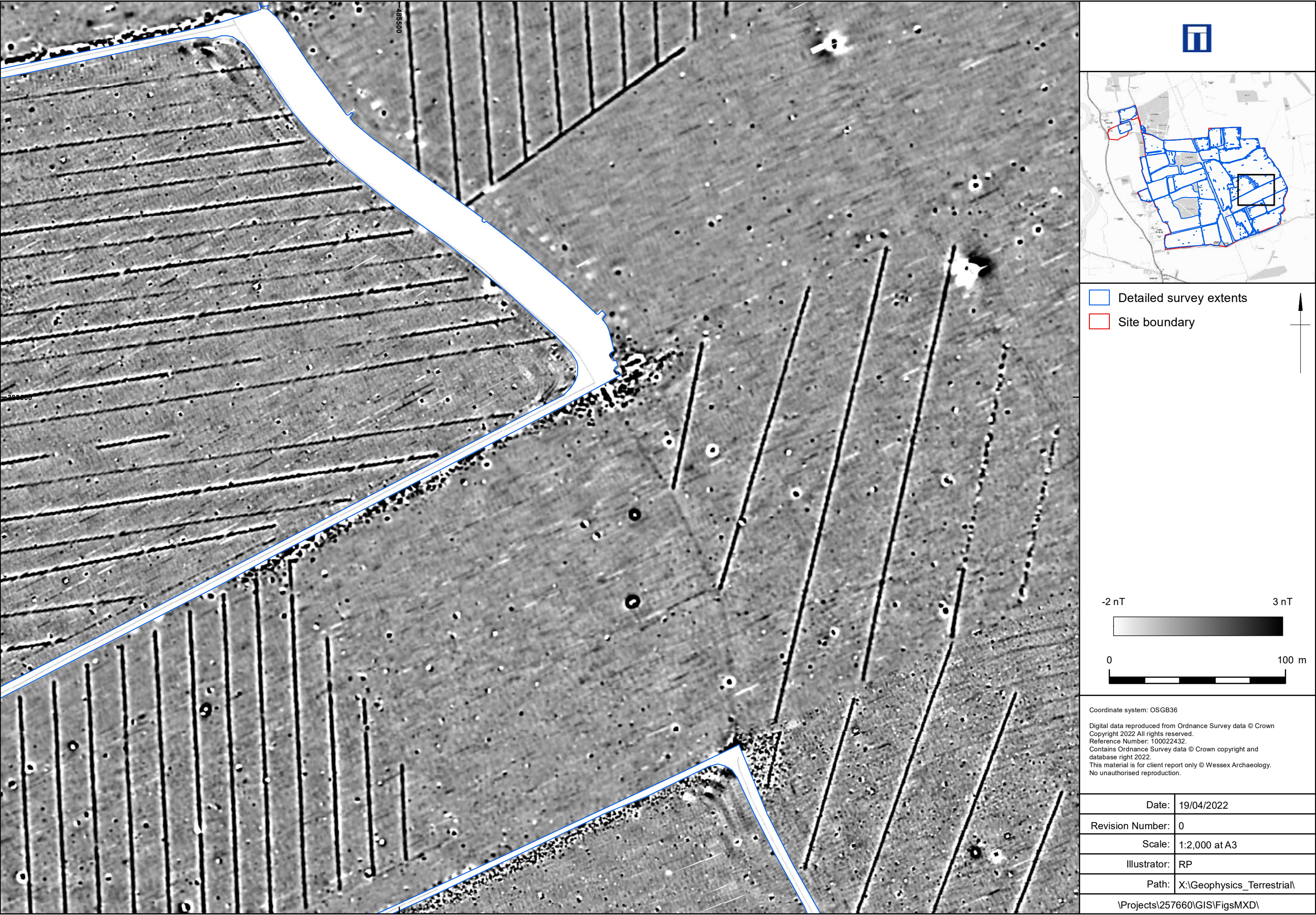


Detailed gradiometer survey results: greyscale plot (Field 26)

Figure 44

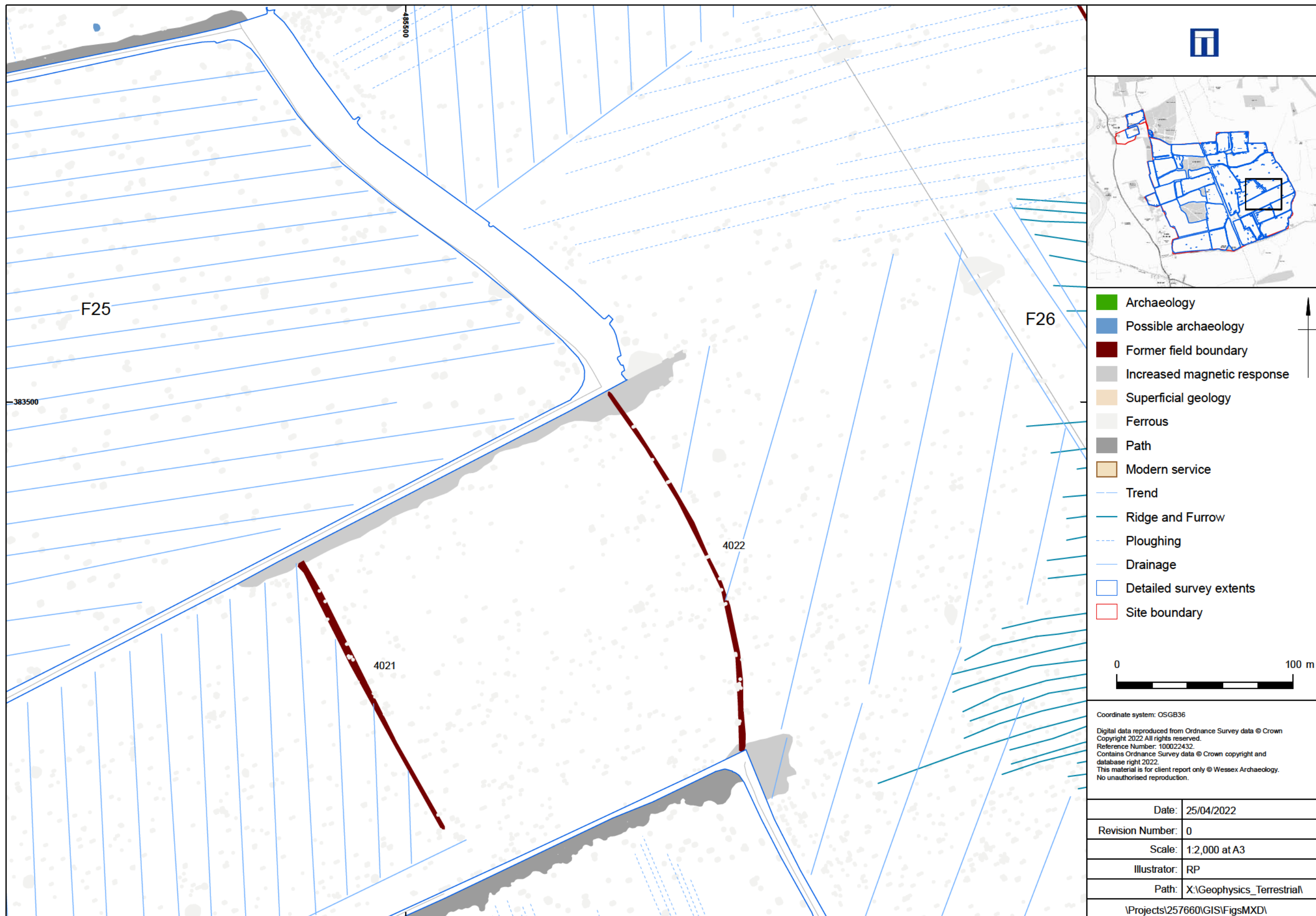


Detailed gradiometer survey results: interpretation (Field 26)



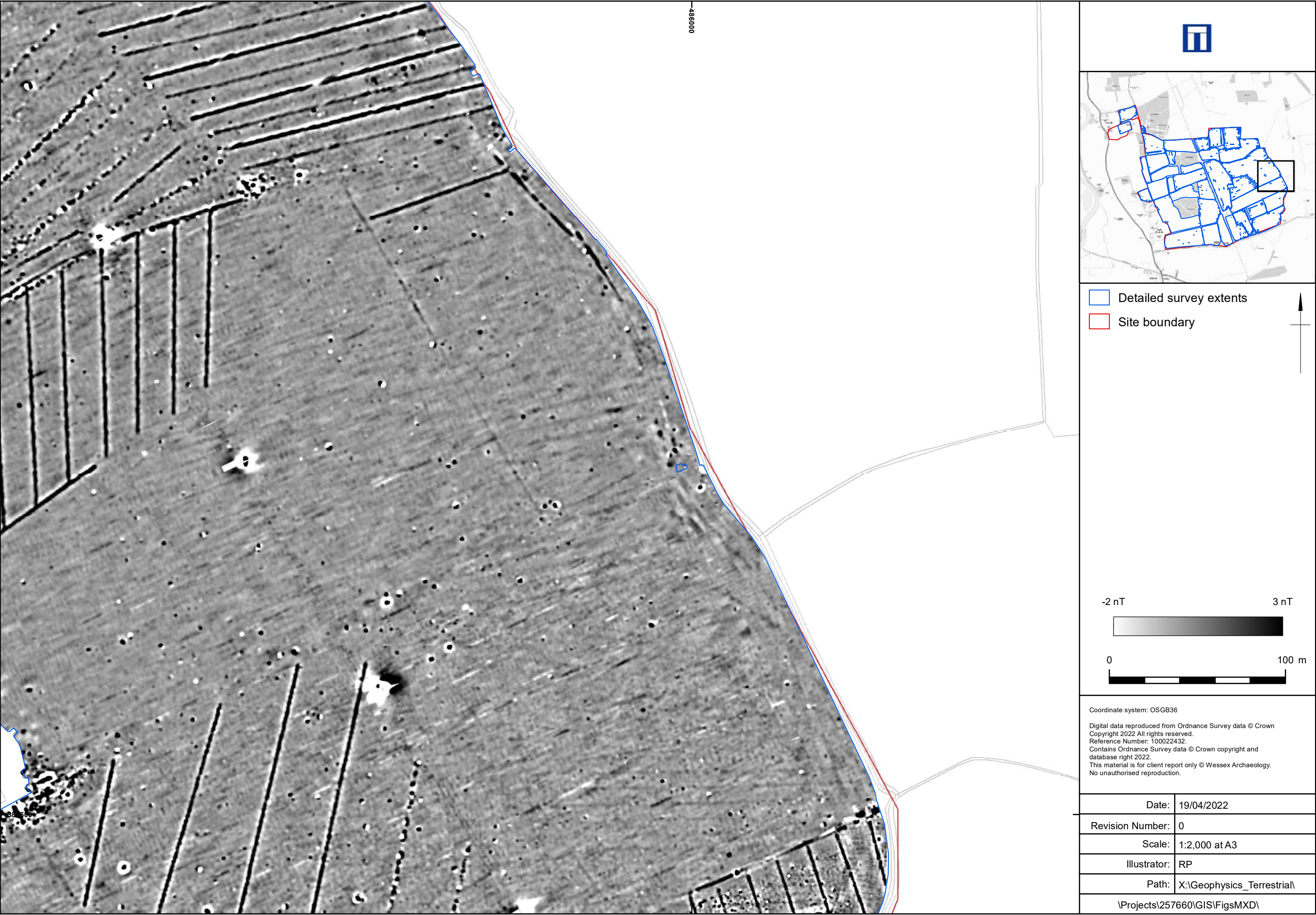
Detailed gradiometer survey results: greyscale plot (Field 26)

Figure 46




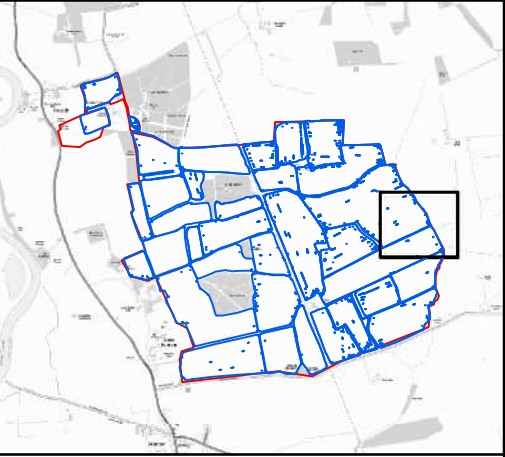
Detailed gradiometer survey results: interpretation (Field 26)

Figure 47




Detailed gradiometer survey results: greyscale plot (Field 26)






Detailed survey extents

Site boundary




-2 nT

3 nT



0

100 m

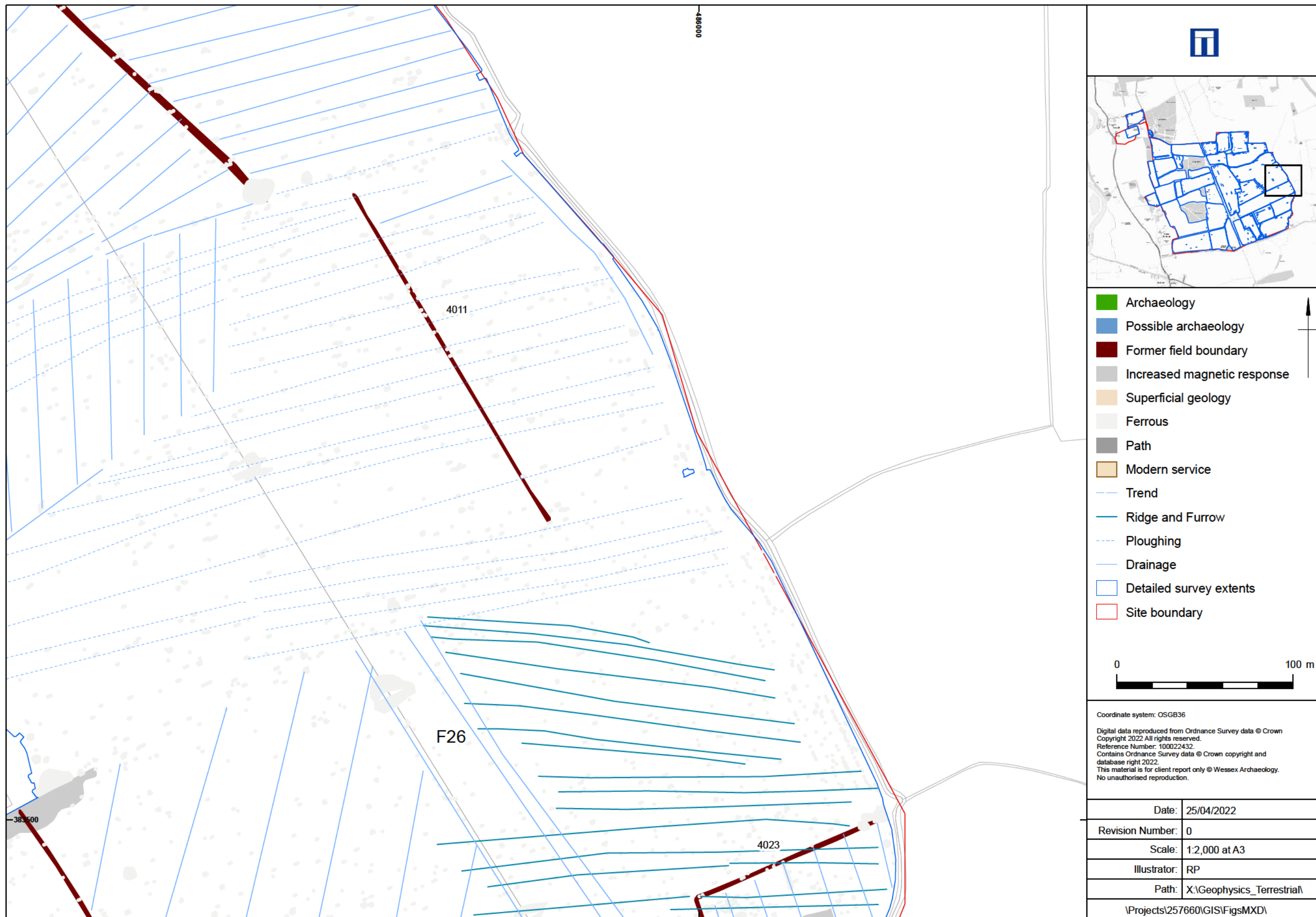


Coordinate system: OSGB36

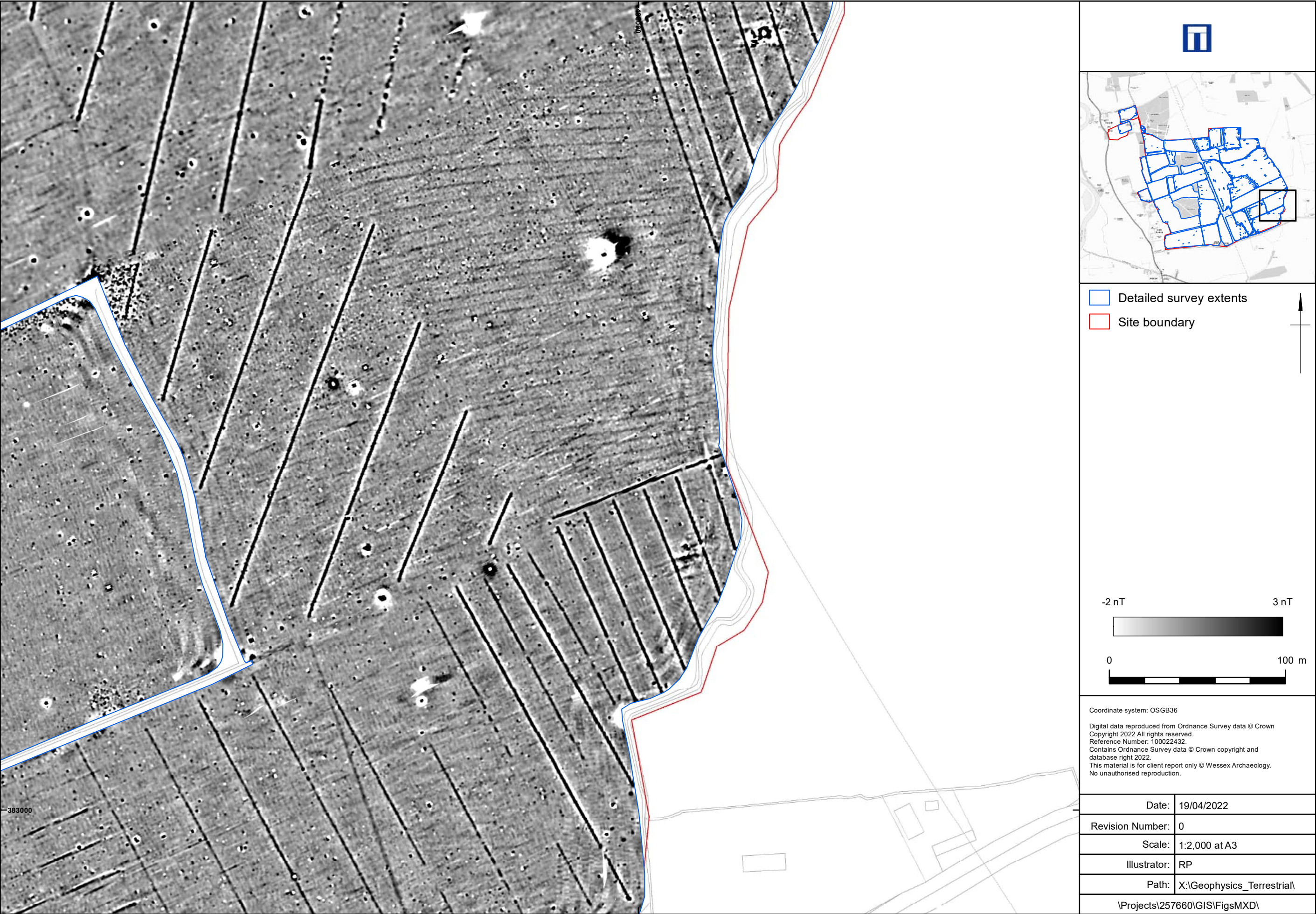
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Date:	19/04/2022
Revision Number:	0
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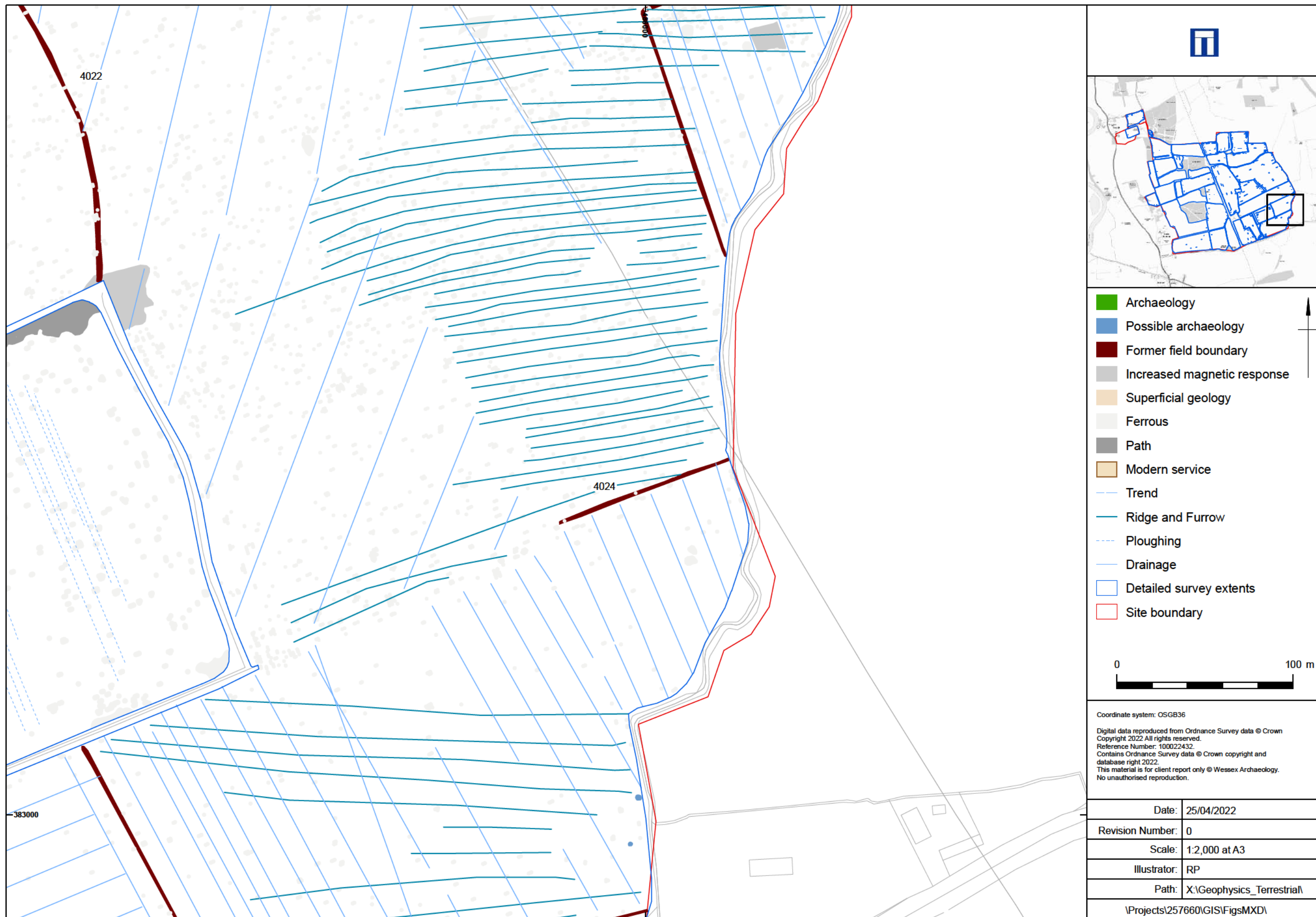
Figure 48



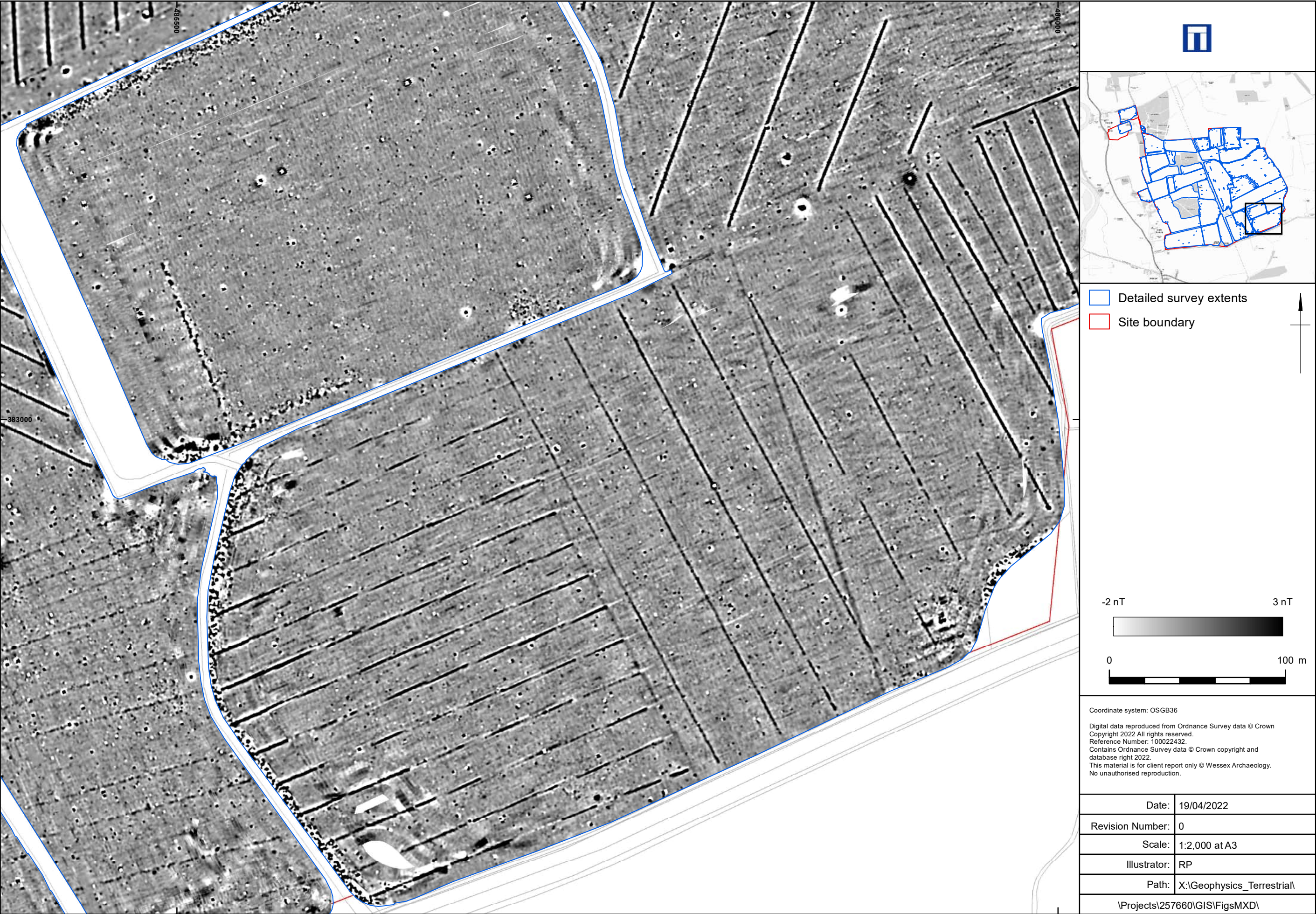
Detailed gradiometer survey results: interpretation (Field 26)



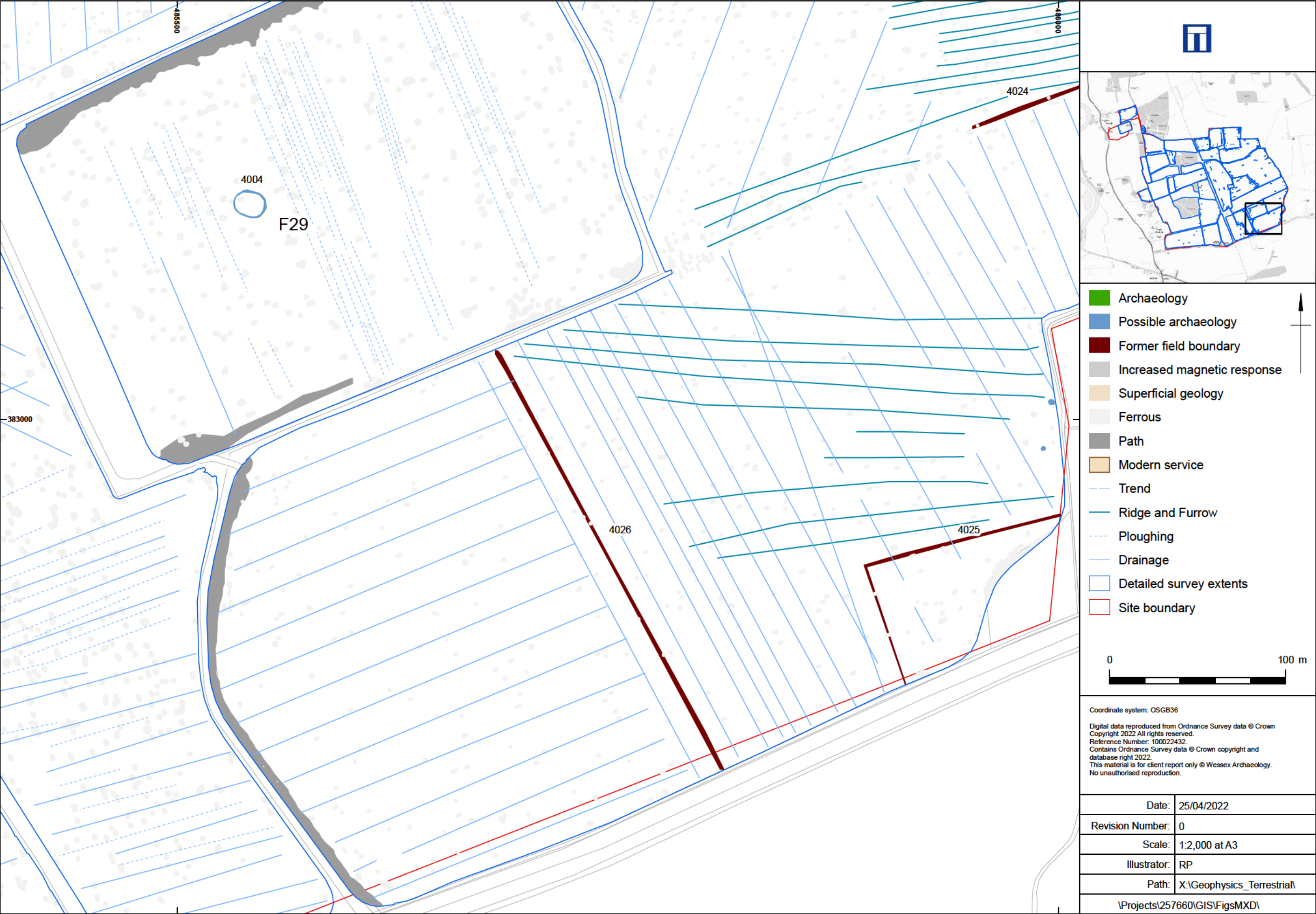
Detailed gradiometer survey results: greyscale plot (Field 26)



Detailed gradiometer survey results: interpretation (Field 26)

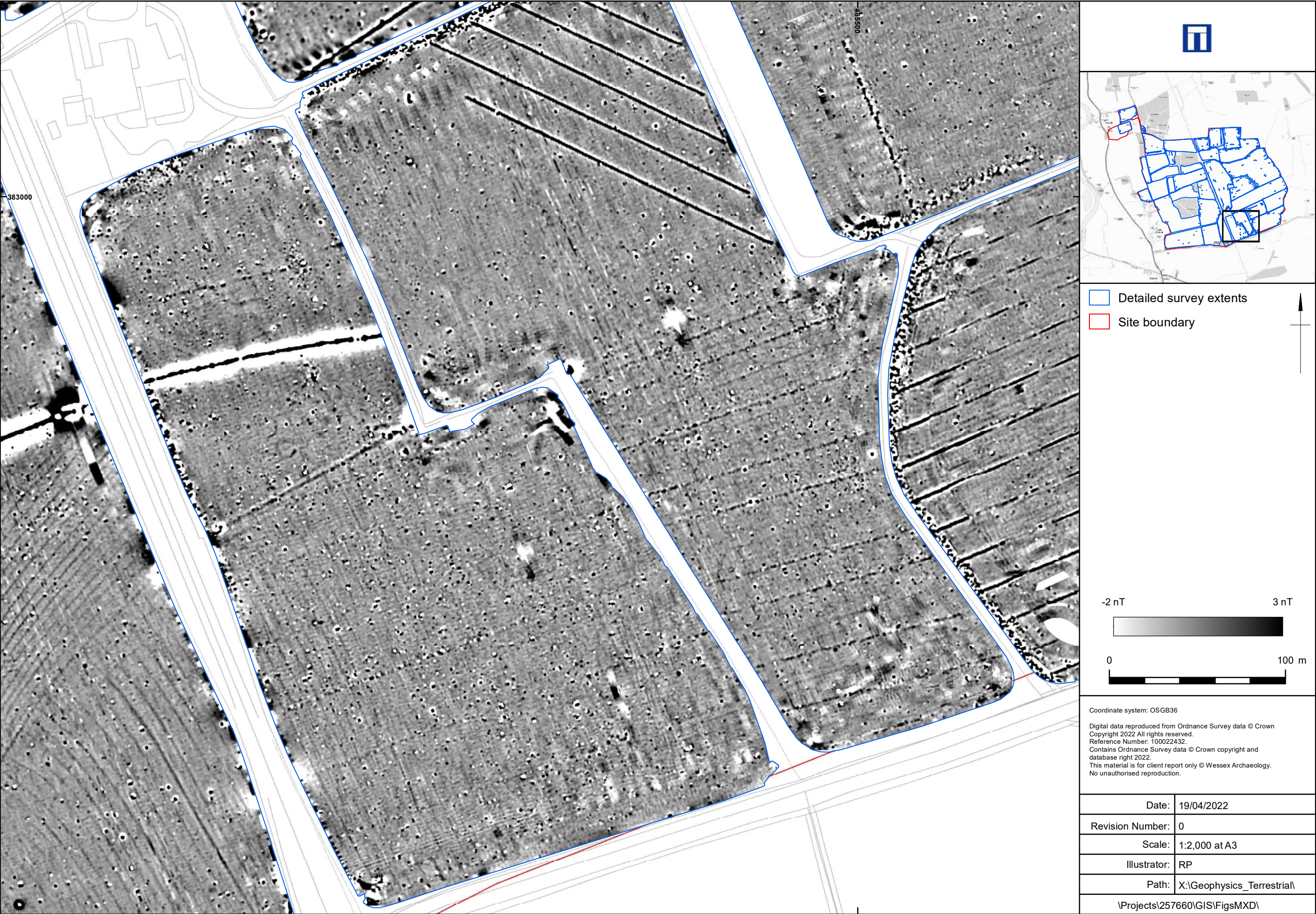


Detailed gradiometer survey results: greyscale plot (Field 26, 29)

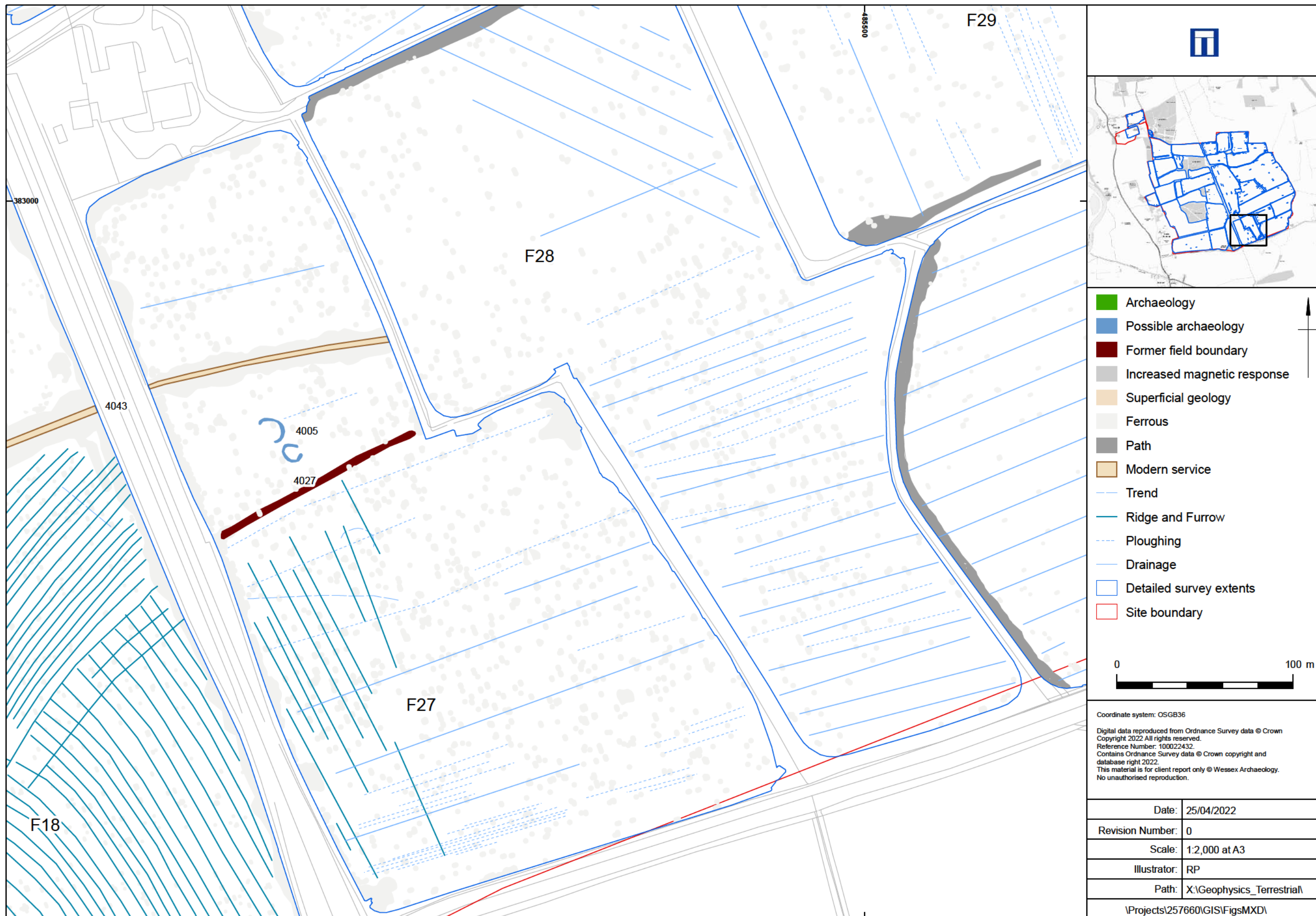


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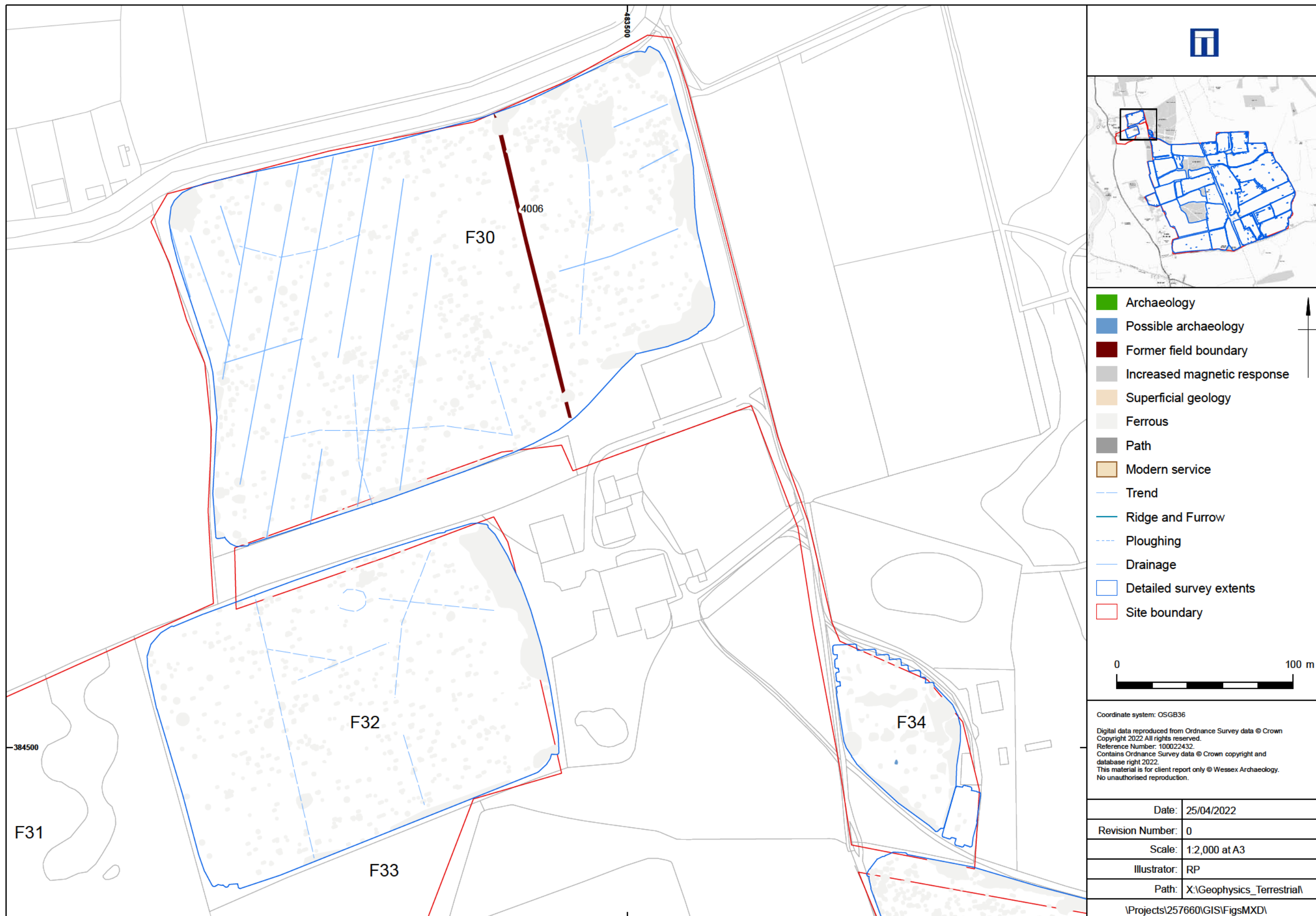
Figure 53



Detailed gradiometer survey results: greyscale plot (Field 27, 28)



Detailed gradiometer survey results: interpretation (Field 27, 28)



Detailed gradiometer survey results: interpretation (Field 30, 32, 34)

Figure 57



Wessex Archaeology Ltd registered office Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
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