

M5 Junction 10 Improvements Scheme

Environmental Statement
Appendix 11.5 Archaeological Geophysical Survey
of Land around J10 of M5
September-October 2024 First Interim Report
TR010063 – APP 9.89

Rules 8 (k)

Planning Act 2008

Infrastructure Planning (Examination Procedure) Rules 2010

Volume 9
November 2024

Infrastructure Planning Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

M5 Junction 10 Improvements Scheme Development Consent Order 202[x]

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Rule Number:	Rule 8 (k)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/9.89
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	November 2024	Deadline 9



Archaeological geophysical survey of land around Junction 10 of the M5 September to October 2024

Report No. 24/121



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NGR: SO 905 252

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Archaeological geophysical survey of land around Junction 10 of the M5 September to October 2024

ABSTRACT

MOLA was commissioned by Galliford Try Construction to undertake an archaeological geophysical survey (magnetometry) of land surrounding Junction 10 of the M5, north-west of Uckington, Gloucestershire. The first stage of survey, reported on here, covered c35ha and detected extensive networks of enclosure ditches, pits and other features, probably dating from the late Iron Age and Roman periods. These were focused in Area 2D, south-east of the motorway junction, but continued westwards beneath the motorway into Area 2E. A few doubtful archaeological features were detected elsewhere, particularly in the western parts of Area 5I at Uckington. Medieval to early post-medieval ridge and furrow was detected across most of the survey area.

1 INTRODUCTION

MOLA (Museum of London Archaeology) was commissioned by Galliford Try Construction Ltd to undertake an archaeological geophysical survey of circa 49ha of land surrounding Junction 10 of the M5, near Uckington, Gloucestershire (NGR: 390500, 225200) (Fig 1). This was done to de-risk planned works and provide sufficient information to inform the determination of the Development Consent Order.

Fiedlwork was undertaken between 30th September and 11th October 2024, covering Areas 1A, 1B, 2D, 2E, 4G and 5I which together accounted for approximately 35ha of the overall survey area. The remaining areas are intended to be surveyed when access becomes available, in mid-November 2024.

The survey methodology was set out in the written scheme of investigation for the project (MOLA 2024). This document was prepared in compliance with current best archaeological practice as defined in the Chartered Institute for Archaeologists and European Archaeological Council guidelines for geophysics (ClfA 2020 and Schmidt et al 2015).

2 BACKGROUND

2.1 Location, topography and geology

The survey took place across five non-contiguous areas in the vicinity of Uckington, Gloucestershire (Fig 1). These covered c35ha of land located immediately around the existing M5 Junction 10 (Areas 1A, 1B, 2D and 2E), eastwards along Tewkesbury Road / A4019 (Area 5I) and southwards to Old Gloucester Road / B4634 (Area 4G). Areas 1C, 3F and 4H were not surveyed in this phase of work due to the fields being variously waterlogged or under crop.

The survey areas occupy a broad, low-lying area in the valley of the River Chelt, roughly 5km east of its confluence with the River Severn. The north-western areas, nearest the motorway junction, lie on a very gentle north-west facing slope between 23 and 26m above Ordnance Datum (aOD) and the southern parcels are broadly level at 27m aOD. The eastern area, spanning a distance of 700m along the Tewkesbury Road, lies between 34 and 37m aOD.

The geology of the survey areas is recorded as mudstone of the Charmouth Mudstone Formation, concealed in places by superficial drift deposits. The latter comprise alluvium alongside the River Chelt and its tributary, the Leigh Brook, and broad swathes of Cheltenham Sands and Gravels flanking either side of the alluvium (BGS 2024; Crimp 2023).

2.2 Historical and archaeological background

An assessment of heritage assets affected by the junction improvement scheme was compiled by Atkins and included in the cultural heritage chapter of the Preliminary Environmental Information Report (PEIR) (Atkins 2021) and in the subsequent Environmental Statement (Atkins 2023). The most significant details from this assessment are summarised below with the relevant Gloucestershire Historic Environment Record (HER) numbers provided where available.

The HER records one non-designated historic environment asset within the geophysical survey areas. This is located in Area 2E, immediately south-west of Junction 10, and comprises cropmarks of a possible enclosure and other linear features of unknown date (48027).

A late prehistoric to Roman settlement is located in the field immediately east of Area 2D (8637), where a geophysical survey conducted by Magnitude Surveys detected a complex of multi-phased settlement enclosures and a smaller double-ditched enclosure (Beck and Ingénieur 2021). A trial-trench excavation by AOC Archaeology subsequently confirmed the character and date of these remains (AOC 2022).

A set of cropmarks (48029), located c700m east of Area 1C, is thought to represent a set of trackways and enclosures of late prehistoric or Roman date.

The remains of a Roman farmstead with several enclosures was found c500m north-east of Area 5I during archaeological evaluation works (44923). A further Roman site (5487) is located adjacent to area 5I on the north side of the Tewksbury Road; this was first identified from aerial photographs and confirmed by a later field visit which found Roman pottery, including black-burnished and colour-coated wares. Trial trench excavation immediately to the east of this identified ditches and pits which were mostly thought to date from the Roman period (27597).

A full archaeological excavation was carried out in advance of construction of the community fire station, south of Tewkesbury Road and adjacent to 5I. This found Iron Age, Roman and Saxon remains, including the remnants of timber structures preserved by waterlogging.

The scheduled monument of Moat House moated site (54132, Scheduled Monument No: 1016835) is located on the southern edge of Uckington, between survey areas 2D and 5I. It is thought that the moat was constructed between 1250 and 1350 when the manor of Uckington was held by the Abbey of St Denis in Paris. A second medieval moated site, Butler's Court (formerly Withy Bridge Manor), is located c600m south of area 2D (6473).

The site of the medieval Uckington Mill (6474), referred to in the Domesday Book, is located c350m west of area 3F. The post-medieval Withybridge Mill and adjoining barn (1305182) has since replaced it.

3 METHODOLOGY

3.1 Fieldwork

The magnetometer survey was undertaken with a Bartington magnetometer cart, a two-wheeled, lightweight sensor platform designed to be pushed by hand. It incorporates a bank of six vertically mounted Bartington Grad-01-1000L magnetic sensor tubes, spaced at 0.8m intervals along a bar aligned crossways to the direction of travel. These sensors were calibrated ('zeroed') at the start of each day's survey to minimise heading errors and offsets in their zero values.

The cart also incorporates a Leica Geosystems Viva GNSS antenna mounted on the central axis, 1.02m astern of the sensors. The magnetic sensors each output data at a rate of eight readings per second and the GNSS antenna outputs NMEA format data (GGA messages) at a rate of one position per second. These data streams are compiled into a single raw data file by MLGrad601 logging software.

The cart was propelled along straight and parallel traverses across each survey area, with data logging being toggled on and off at the start and end of each traverse to avoid the collection of spurious data whilst turning. Traverse ends were marked with ranging poles to aid even coverage, and the evenness of coverage was further checked by monitoring the positional trace plotted in real time by the logging software. The typical speed of coverage was under 1.8m/s, with a notional data resolution thus approximating to better than 0.225m x 0.80m. Narrow access in the eastern three small parcels of 5l forced a reconfiguration of the survey platform, with reduced sensor separation; in consequence the notional data resolution in that area was improved to 0.5m by 0.225m.

3.2 Data processing and presentation

The raw survey data was initially processed with MultiGrad601 software, which calculated a UTM co-ordinate for each data point by interpolating the GNSS readings and applying offset corrections based on the array geometry and calculated heading direction. This produced an output file in XYZ format which could be imported into TerraSurveyor software for data visualisation and further processing.

The raw XYZ data exhibited striping caused by slight mismatches in the calibration of the individual magnetic sensors. This was removed in TerraSurveyor by applying the median de-stripe function, with an appropriate threshold, to runs of data from each sensor.

The processed survey data is presented in this report as greyscale raster images, at a range of +/-4nT, which have been rotated and scaled to fit against topographic base mapping at a scale of 1:2500 (Figs 2-6). Interpretive diagrams (Figs 7-11) highlight notable anomalies for discussion but omit the least significant modern anomalies, including magnetic halos and the majority of small ferrous dipoles. Greyscale plots of the unprocessed survey data are presented for comparison with the processed results (Figs 12-16).

4 SURVEY RESULTS

4.1 Archaeology

Overall, the survey results indicate a substantial focus of archaeological remains in Area 2D, a lower density of remains in Area 2E and a few questionable features elsewhere, particularly in the western parts of Area 5I. Medieval to early post-medieval ridge and furrow is widespread.

Areas 1A and 1B

The survey has not identified any substantial archaeology in these fields. There may be a group of three pits in the north-eastern corner of Area 1B and a couple of lengths of ditch elsewhere, but the evidence for these is slight and not entirely persuasive.

Area 2D

This field contains a dense concentration of archaeological remains extending over at least six hectares. These comprise networks of enclosure ditches, pits and other features which evidently relate to several phases of settlement activity and given their overall appearance, seem likely to date from the late Iron Age and Roman periods. There is little evidence of structures, apart from two small C-shaped features which may relate to roundhouses. However, little weight should be placed on this observation as the remains of timber buildings are often difficult targets for geophysical survey to identify.

Although many of the individual features have produced strong magnetic anomalies, the edges of the site appear ragged and ill-defined. This is a reasonably common phenomenon, believed to arise from the 'habitation effect', whereby features at the core of a site are rich in magnetically-detectable debris, such as fired clay, hearth ash, iron slag and similar materials, but peripheral features are magnetically 'quiet' and harder to detect. It is therefore likely that the sites will extend at least a little further than the survey results suggest.

An intermittent set of magnetic anomalies follows a sinuous course across Area 2D, passing between and partially bounding the main concentrations of archaeology. This is likely to represent a former stream channel, perhaps of similar date to the archaeology itself.

Detailed interpretation of the archaeology is hindered by the medieval plough furrows which have cut through many of the ditches, giving them a confusingly segmented appearance. It is also hindered by the localised presence of alluvial sediments which may have buried and masked some features, particularly in the south of the field and alongside the putative stream channel.

Area 2E

The survey has detected some archaeological features near the eastern edge of this field which, given their character and alignment, seem likely to be a continuation of the settlement remains in Area 2D. Further west, there is evidence for an isolated square enclosure. Alluvial deposits were detected in the southern part of the field and, as in Area 2D, these have the potential to mask additional features of interest.

Area 4G

There are three slight positive linear anomalies in this area which, although not particularly diagnostic, might conceivably represent ditches of indeterminate date.

Area 5I (north-western part)

A 30m-wide strip of data from immediately west of the fire station, south of Tewkesbury Road, is marred by a large magnetic halo and by noise arising from a spread of modern debris. These intense magnetic anomalies will have unfortunately masked any continuation of the archaeological site that was discovered when the fire station was built. However, there are a few weak anomalies which could conceivably represent two pits and a short length of ditch further west in the same field

The field north of Tewksbury Road contains a broad shallow linear depression which is probably natural but might conceivably be the remains of a very large ditch. This feature is represented in the survey data by a broad, slightly curving, positive magnetic anomaly. It should be largely unaffected by the road construction, as it lies almost entirely outside the proposed construction area.

Area 5I (south-eastern part)

There may be one pit and one short length of ditch in these fields, but the evidence for these is slight and not entirely persuasive.

4.2 Ridge and furrow cultivation

The remains of medieval to post-medieval ridge and furrow has been detected across the great majority of the survey area. It is represented by sets of parallel linear anomalies that often follow gently curved courses as, for example, in Area 4G.

Whilst ridge and furrow would originally have existed as upstanding earthworks, it only survives in this form in the north of Area 1B. Elsewhere the earthworks have been flattened by later ploughing and it is only the bases of the furrows, surviving as bands of deeper ploughsoil, that have been detected.

4.3 Field boundaries and ponds

A weak linear anomaly in the south-west of Area 2D matches the position of a former field boundary depicted on the 1884 edition of the six-inch Ordnance Survey map and on subsequent historic mapping. A similar, although weaker, response in the north-west portion of Area 2E is suspected to represent another field boundary as it lies square to the nearby modern boundaries. However, there is no map evidence to confirm this, and it is thus only labelled as an 'inferred field boundary' on the interpretation figure (Fig 8).

Two strong positive anomalies in the north-eastern section of Area 1A and the northern section of Area 1B represent backfilled ponds which are depicted on historic Ordnance Survey maps. The northern of the two appears to have been a small pool connected to the adjacent stream rather than a free-standing pond.

4.4 Utilities

Several sections of modern metal pipes have been detected, in most cases represented by strong dipolar linear anomalies with broad magnetic halos. Examples are present in Areas 1B, 2D and 5I. A weaker dipolar linear anomaly in Area 4G, orientated approximately north to south, may represent a drain, a cable duct or another feature of broadly similar type.

The two closely spaced electricity pylons in the north-west of Area 4G are surrounded by a single strong magnetic halo that extends out for a distance of c20m around them. A smaller halo in the south of Area 1A likewise relates to a telegraph pole.

4.5 Other modern features

Field drains

One weak dipolar anomaly in Area 1A is diagnostic of a modern field drain. Some similar though less well resolved anomalies in the northern part of Area 1B may represent other drains interspersed with the ridge and furrow earthworks.

Farm track

An intense magnetic anomaly extending through the northern half of Area 1B can be attributed to the hardcore bed of a modern farm track. A comparable anomaly that branches eastwards from near its southern end is assumed to have a similar cause.

Archaeological trenches

Area 4G was investigated by archaeological trial trench excavation in 2021 (AOC 2022), and several of the backfilled trenches are apparent as weak, magnetically negative anomalies in the survey data.

Ferrous debris and magnetic halos

Many small magnetic dipoles are scattered throughout the datasets, largely representing small pieces of scrap metal buried in the ploughsoil. In a few areas, and particularly in parts of Area 5I, these anomalies are densely clustered, forming incoherent magnetic 'noise' which is often characteristic of recently disturbed ground containing hardcore, construction waste, domestic rubbish or similar modern material.

Magnetic halos occur sporadically around the edges of the survey areas due to the presence of adjacent fences, gates, buildings and other large iron or steel objects.

Agricultural marks

Various minor linear anomalies, such as those around the perimeter of Field 2D and some of those in the eastern part of 5I, can be attributed to wheel ruts and plough scars. These trivial features have been omitted from the interpretation figures to minimise unnecessary visual clutter.

4.6 Geology

The data from the southern parts of Areas 2D and 2E contains many irregular, blotchy magnetic anomalies. This type of magnetic response is often associated with alluvial sediments, with the individual anomalies representing pockets of naturally leached and re-deposited iron minerals. The distribution of these can be influenced, in part, by the presence of infilled channels, and this might explain the slight sinuous linear trends which are apparent in the south of Area 2E. The more persistent sinuous trend that extends north to south through Area 2D can similarly be interpreted as a former stream channel.

4.7 Uncertain

A few anomalies have been categorised as uncertain on the interpretation figures. These include a negative linear anomaly in 5I which might relate to a drain or a plough headland, and two noisy linear trends in Area 1B which might relate to utility trenches, trackways, field boundaries or other modern features.

5 CONCLUSION

The magnetometer survey has successfully detected an extensive network of enclosures spanning across much of Area 2D and continuing into the eastern portion of Area 2E. These features are comparable in appearance to the Iron Age and Roman remains previously investigated in the field to the east (Beck and Ingénieur 2021, AOC 2022) and very probably represent the remains of a long-lived and densely occupied settlement.

Outside of Areas 2D and 2E the evidence for archaeological remains is much more sparse, with only a few possible ditches and pits being detected. However, it should be noted that previous discoveries around 5I suggest that area to have a high archaeological potential and the lack of detected remains may be due in part to masking by modern features with strong and expansive magnetic signatures.

Medieval to post-medieval ridge and furrow has been detected across the survey area and serves as evidence of the medieval open field system.

In addition to the archaeology, the survey has detected some modern features, including several buried utilities which should be noted as obstacles to any future excavation works.

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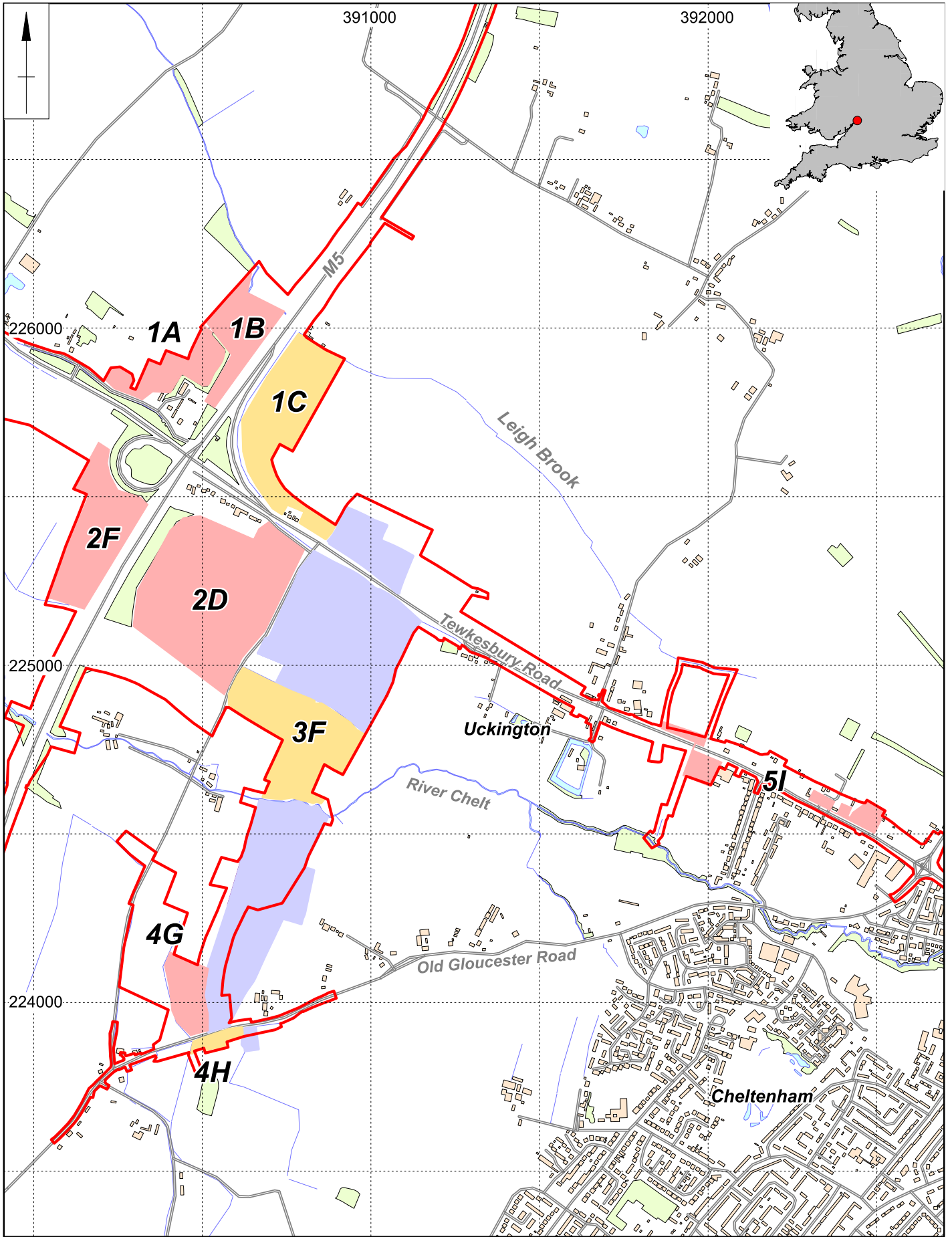
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- MOLA survey
- MOLA survey (pending)
- Magnitude survey 2021
- Scheme boundary

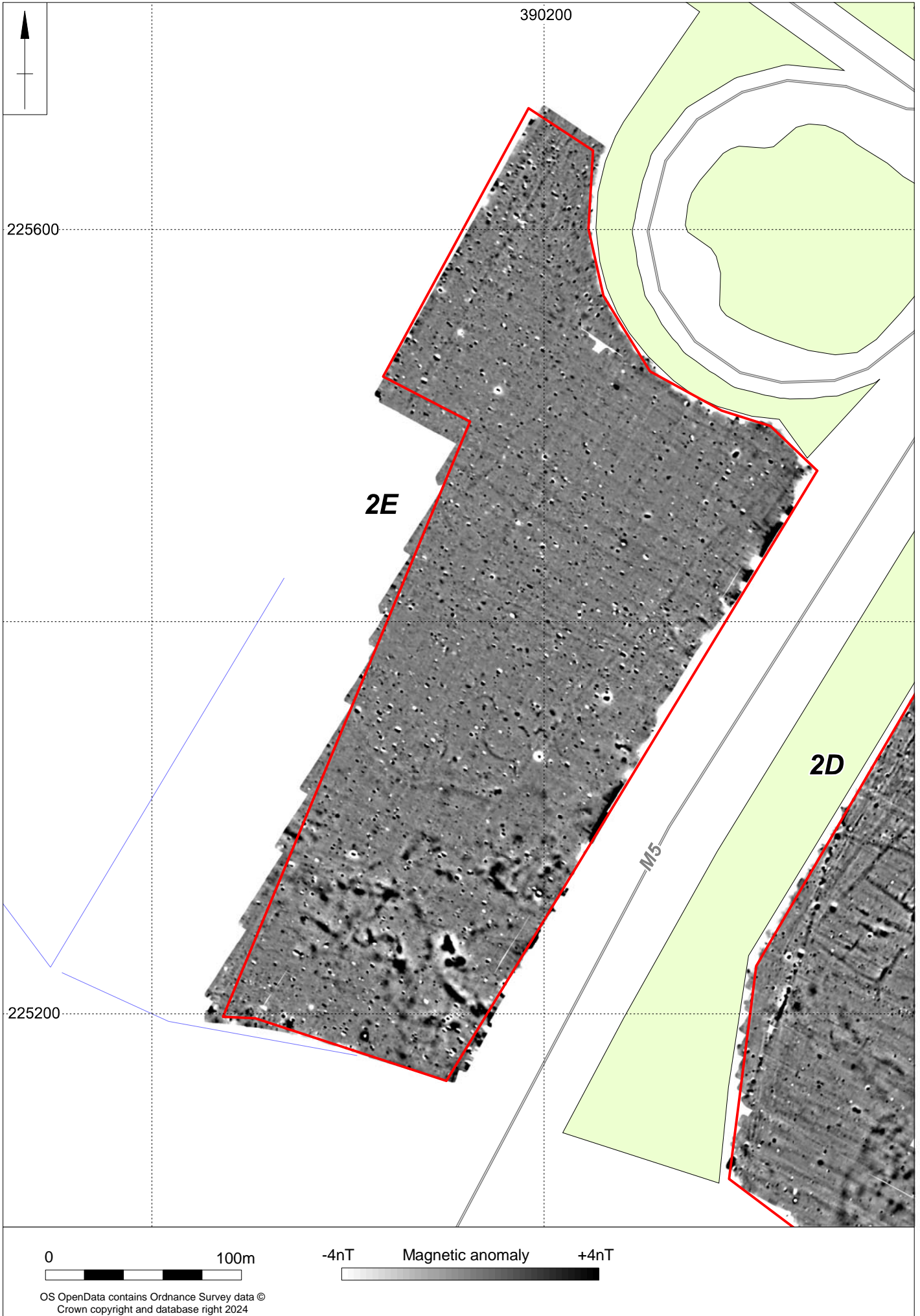
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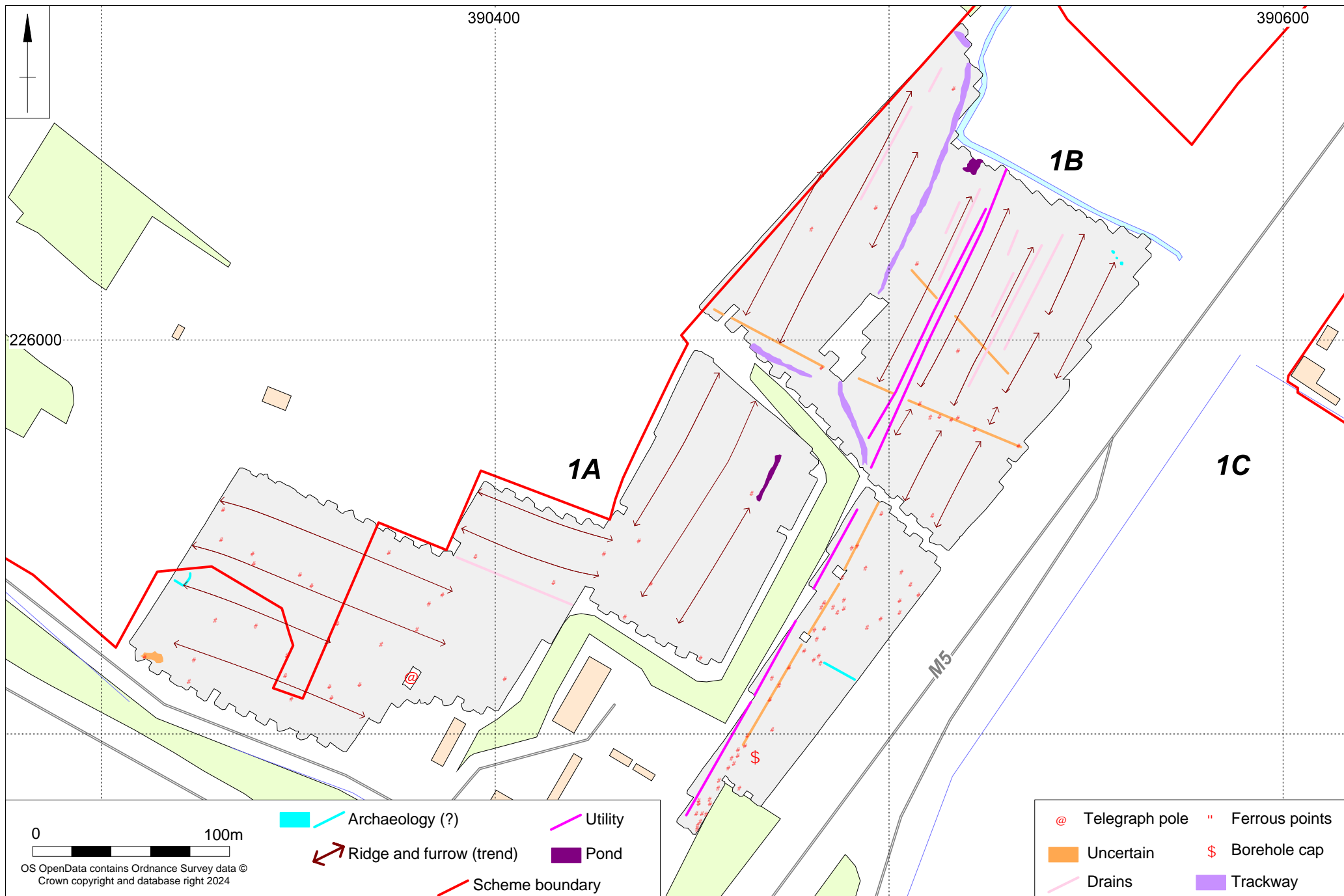
Magnetometer survey results (Areas 1A, 1B) Fig 2





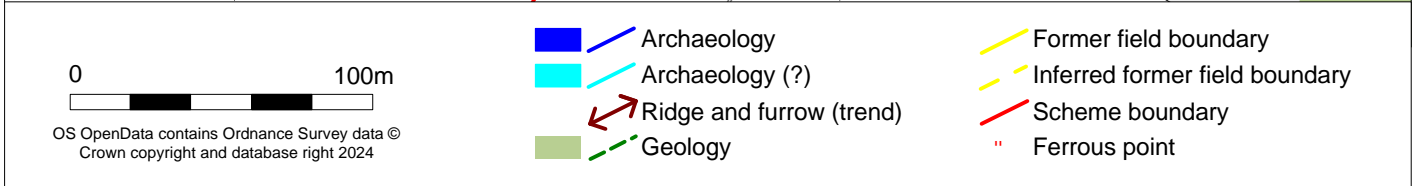
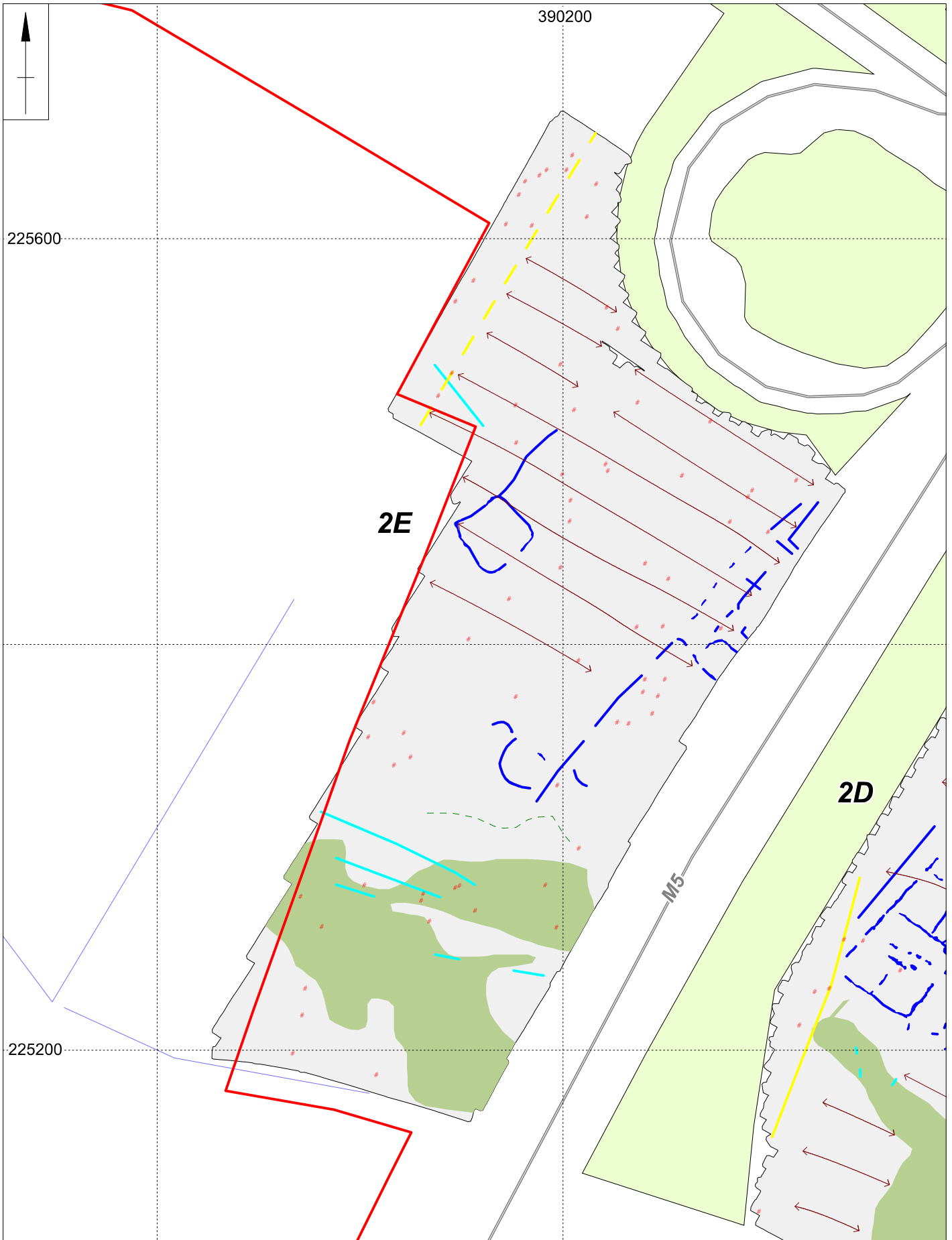






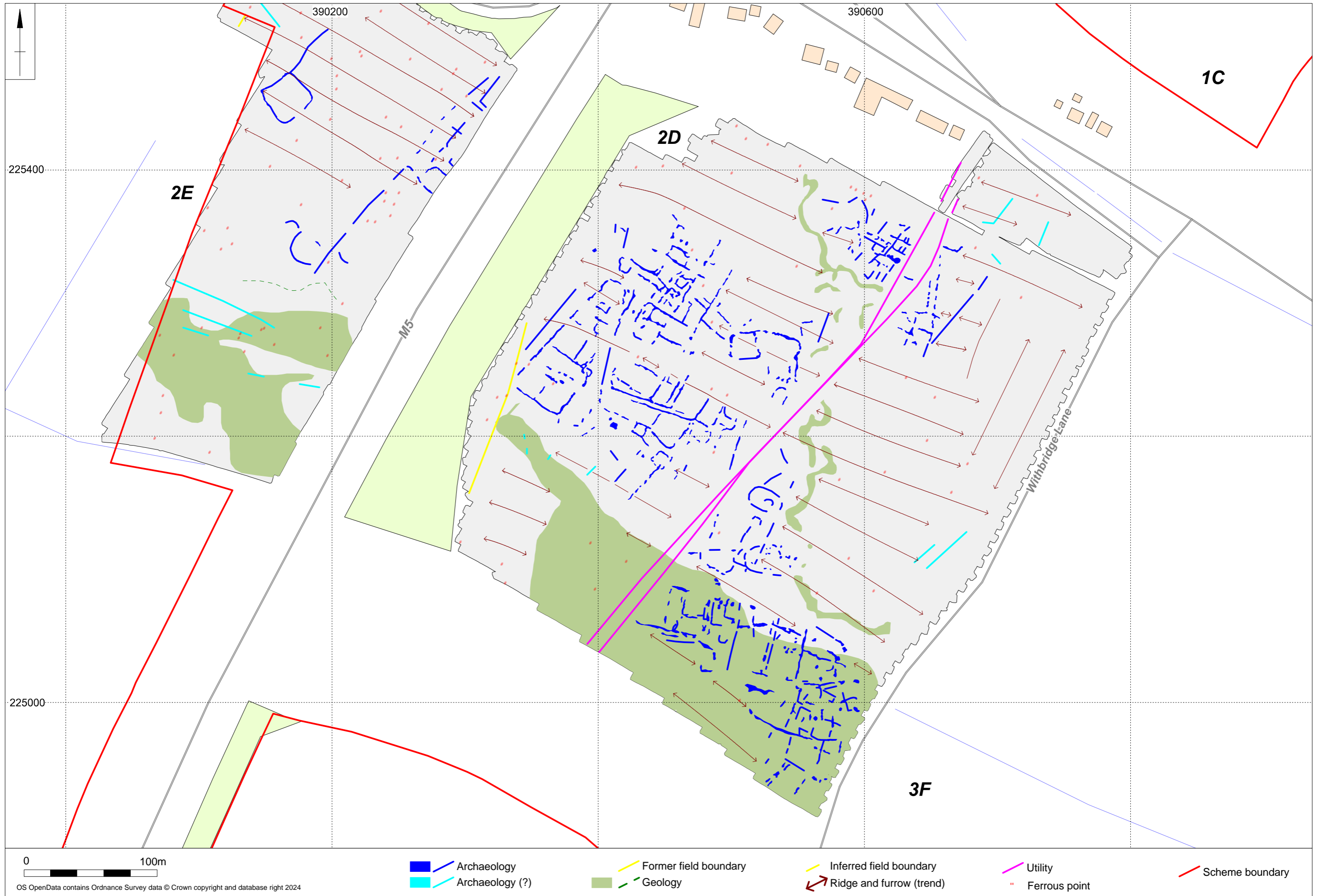
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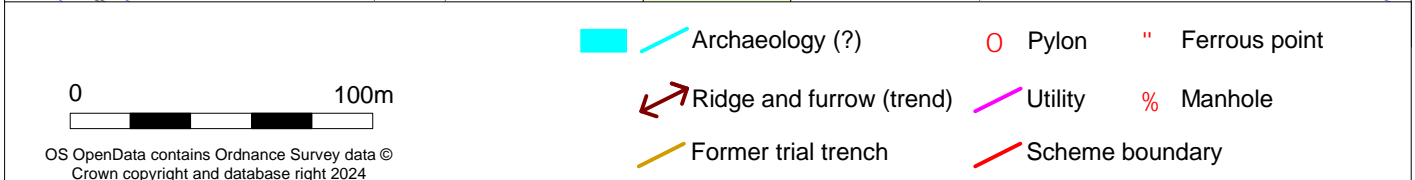
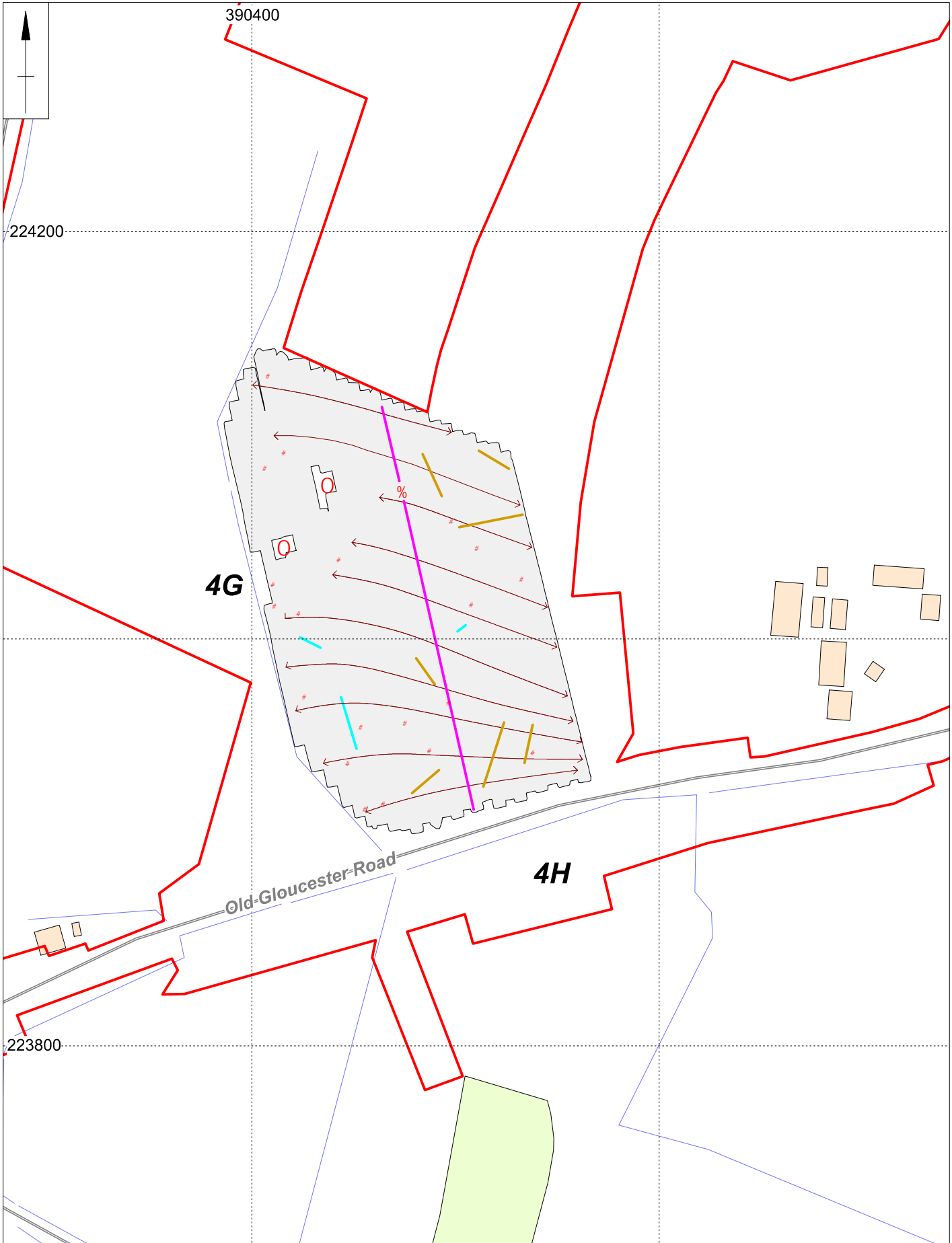
Magnetometer survey interpretation (Areas 1A, 1B) Fig 7



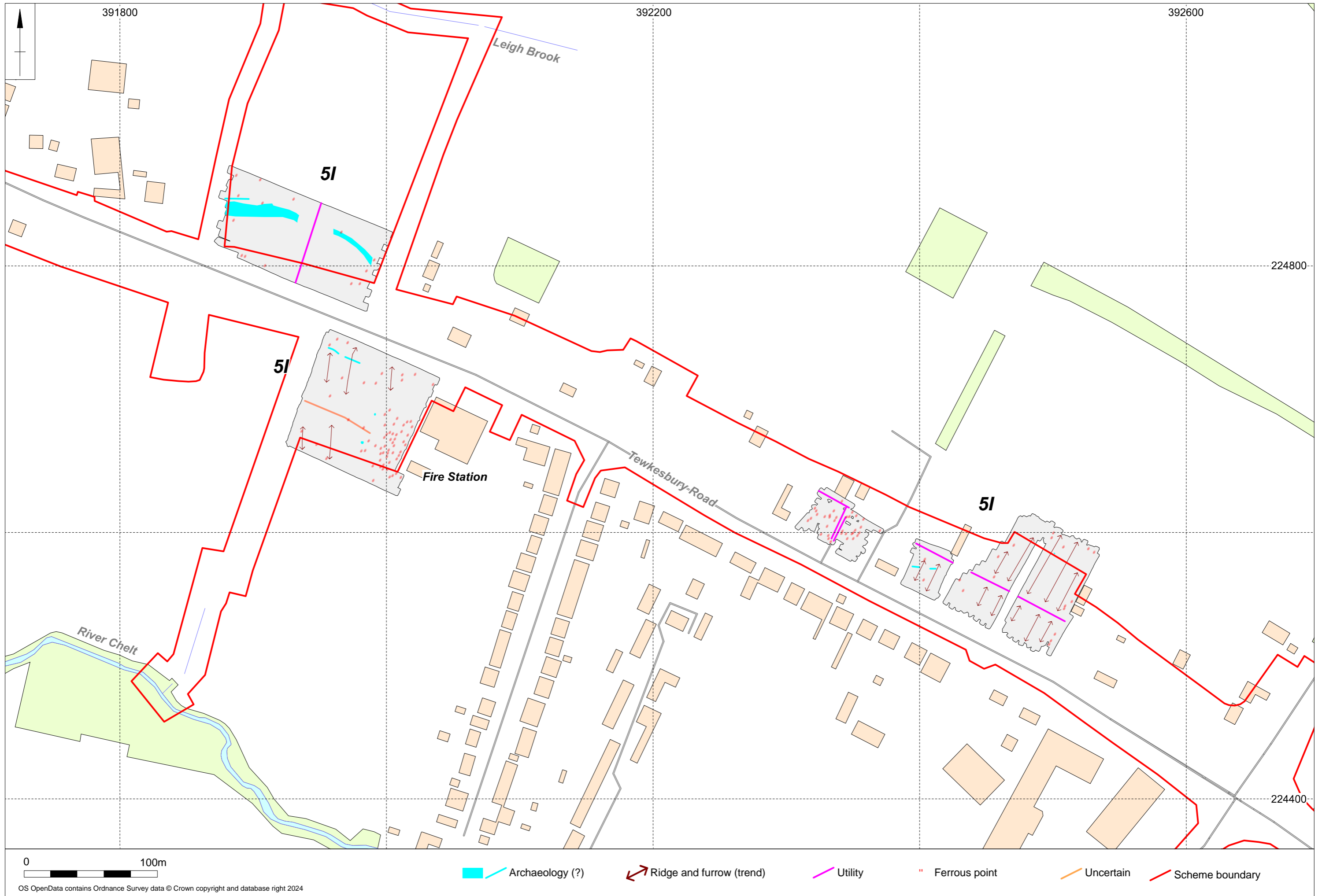
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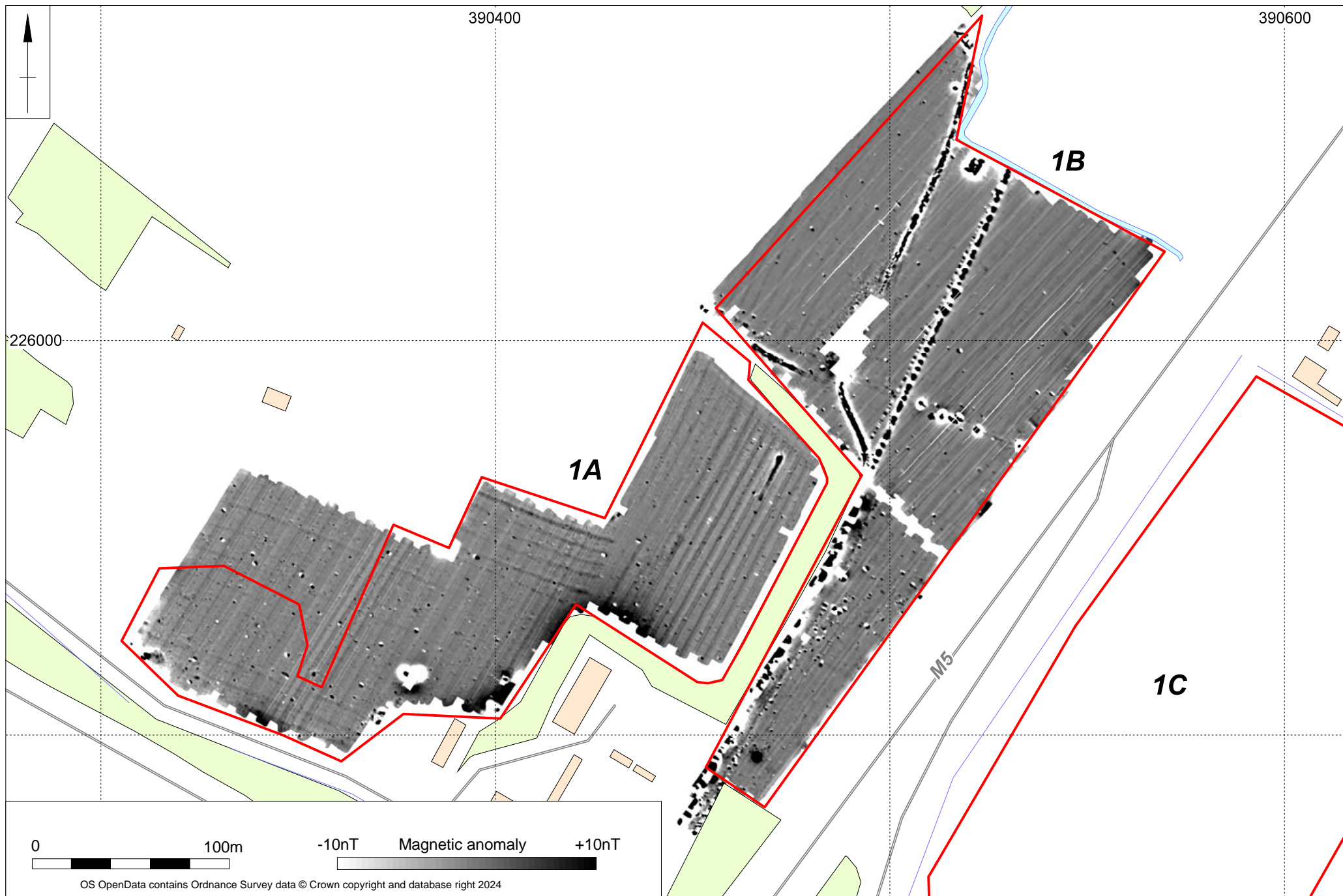
Magnetometer survey interpretation (Area 2E) Fig 8





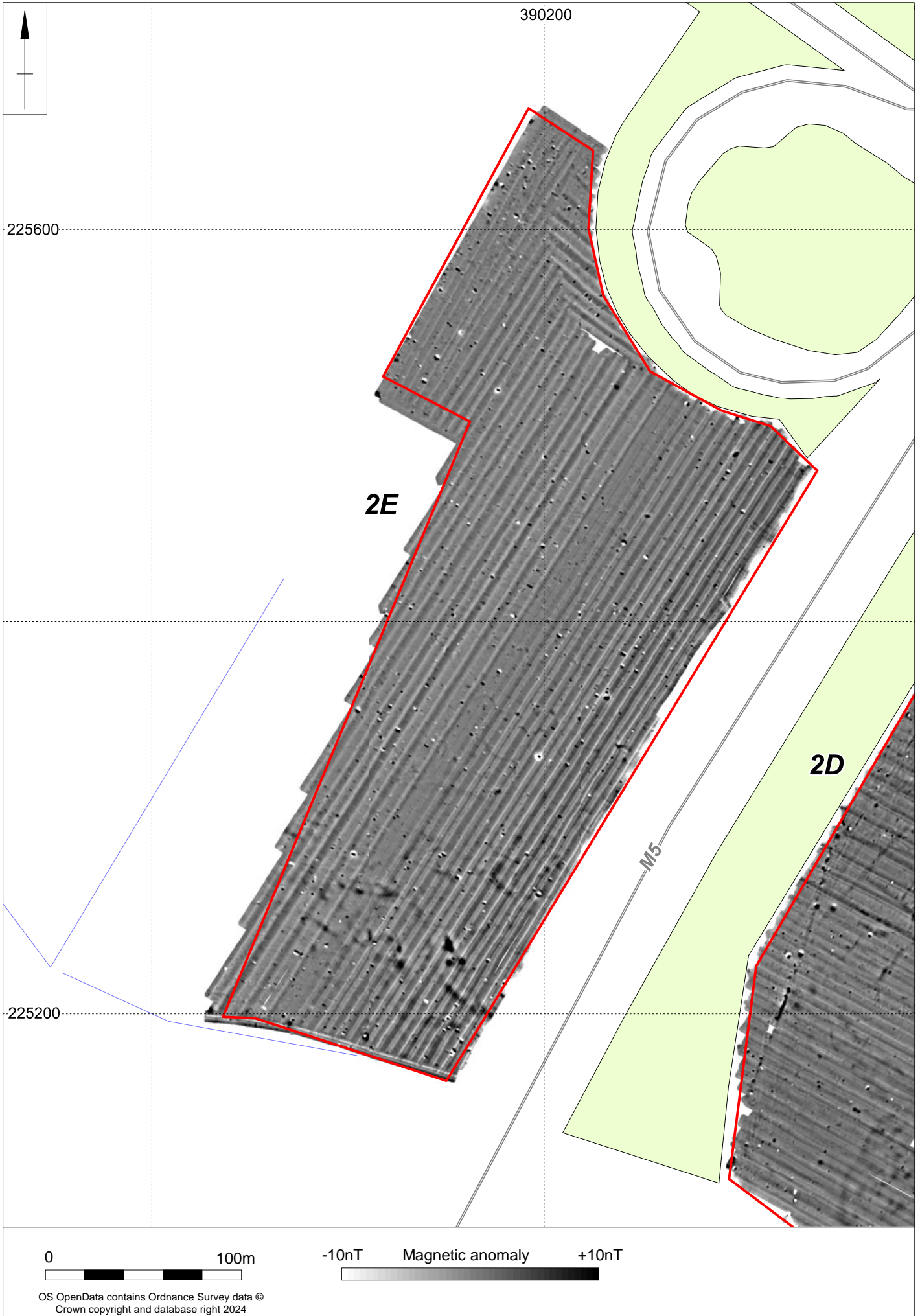
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Scale 1:2500 (A4)

Unprocessed magnetometer data (Areas 1A, 1B) Fig 12









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