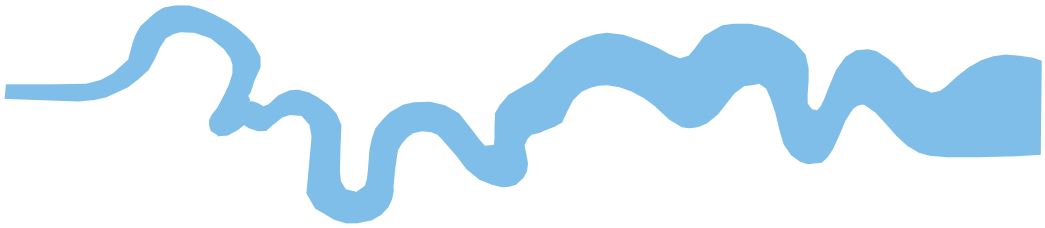
T V A S



EAST MIDLANDS

Land at Medina Farm, Dennises, South Ockendon, Essex

Geophysical Survey (magnetic)

by Kyle Beaverstock

Site Code MFE 17/170

(TQ 5750 8384)

Land at Medina Farm, Dennises Lane, South Ockendon, Essex

Geophysical Survey (Magnetic) Report

For Ingrebourne Valley Ltd

by Kyle Beaverstock

TVAS East Midlands

Site Code MFE 17/170

May 2022

Summary

Site name: Land at Medina Farm, Dennises Lane, South Ockendon, Essex

Grid reference: TQ 5750 8384

Site activity: Magnetometer survey

Date and duration of project: 18th of May 2022

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: MFE17/170

Area of site: *c.* 6.5ha

Summary of results: A few weak positive linear magnetic anomalies were detected by the geophysical survey which may suggest the presence of archaeological deposits.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by:	Steve Ford✓ 01.06.22
	Tim Dawson✓ 01.06.22

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Tel. (0118) 926 0552; email tvas@tvas.co.uk; website: www.tvas.co.uk

Land at Medina Farm, Dennises Lane, South Ockendon, Essex
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 17/170b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Medina Farm, Dennises Lane, South Ockendon, Essex (TQ 5750 8384) (Fig. 1). The work was commissioned by Amy McDonagh on behalf of Ingrebourne Valley Ltd. Cecil House, Foster Street, Harlow Common, Essex, CM17 9HY.

Planning permission (19/01799/FUL) has been gained from Thurrock Council to extract gravel from part of the site and restore to agriculture both it and old workings. The consent is subject to conditions (14-17) relating to archaeology. This is in accordance with the *National Planning Policy Framework* (NPPF 2012), and the Borough's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock on the 18th of May 2022 and the site code is MFE 17/170.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located c. 2km north-west of South Ockendon and c. 3km south-east of Upminster (Fig. 1). The site is bounded by Dennises Lane to the north, Baldwins Farm Lane to the east, industrial units to the south and pastoral land to the east. This rectangular parcel of land sits at a height of *c*. 18m above Ordinance Datum and is currently being utilised as pastoral land. The underlying geology is stated as Lynch Hill Gravel (BGS 1996).

Site history and archaeological background

The archaeological background has been highlighted in detail by the desk-based assessment (Baljikas 2017). In summary although there are no heritage assets within the proposed area the site lies in the lower Thames Valley which is rich in archaeological deposits. In particular, there is a possibility for Palaeolithic deposits in the gravel layers.

Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating zig-zag pattern along a north-west to south-east orientation across the survey area. No significant obstructions were encountered other than some overgrowth along the western boundary. Conditions were dry and bright.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. This enables readings to be taken of both the general background magnetic field

and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -4.40 to 4.42 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.18.15 and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised, they are exported in .PDF format for inclusion within the finished report.

Results

The geophysical survey identified a small number of magnetic anomalies across the site area (Figs. 2 and 3). In the north of the site is a large area of magnetic disturbance. This is represented by two parallel bipolar linear anomalies **[Fig. 4: 1]** with high positive and negative responses and most likely represents buried services. In the south, is another area of magnetic disturbance which is most likely caused by the presence of structures outside the site boundary to the south. In the centre of the survey area is a weak positive linear anomaly **[2]**, it measures 35m long and is orientated north-west to the south-east. In the south are two parallel weak positive linear anomalies **[4]** running east to west for 18m and 32m. To the west of these is another weak positive linear anomaly **[3]** orientated north-west to the south-east and running for 27m. These weak positive anomalies may represent short, linear features such as ditches, however they are irregular and have a low amplitude so may represent perturbations in the natural geology.

Conclusion

The geophysical survey was successfully completed and was able to identify a small number of magnetic anomalies. A few positive linear anomalies were detected which may be caused by perturbations in the geology or they buried linear features such as ditches and as such are of archaeological interest. No other features of archaeological interest were identified although the strong magnetic disturbance recorded in the north and south of the field may be obscuring weaker magnetic variations caused by buried features.

References

Baljikas, G, 2017, 'Medina Farm, South Ockendon, Essex; an archaeological desk-based assessment' unpub. report **17/170**, Reading

BGS, 1996, *British Geological Survey*, 1:50,000, Sheet 257, Solid and Drift Edition, Keyworth

CI*f*A, 2014, 'Standard and Guidance for archaeological geophysical survey', Reading

EAC, 2015, *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*, EAC Guidelines 2, Namur

IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading

NPPF, 2012, *National Planning Policy Framework*, Dept Communities and Local Govt, London

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

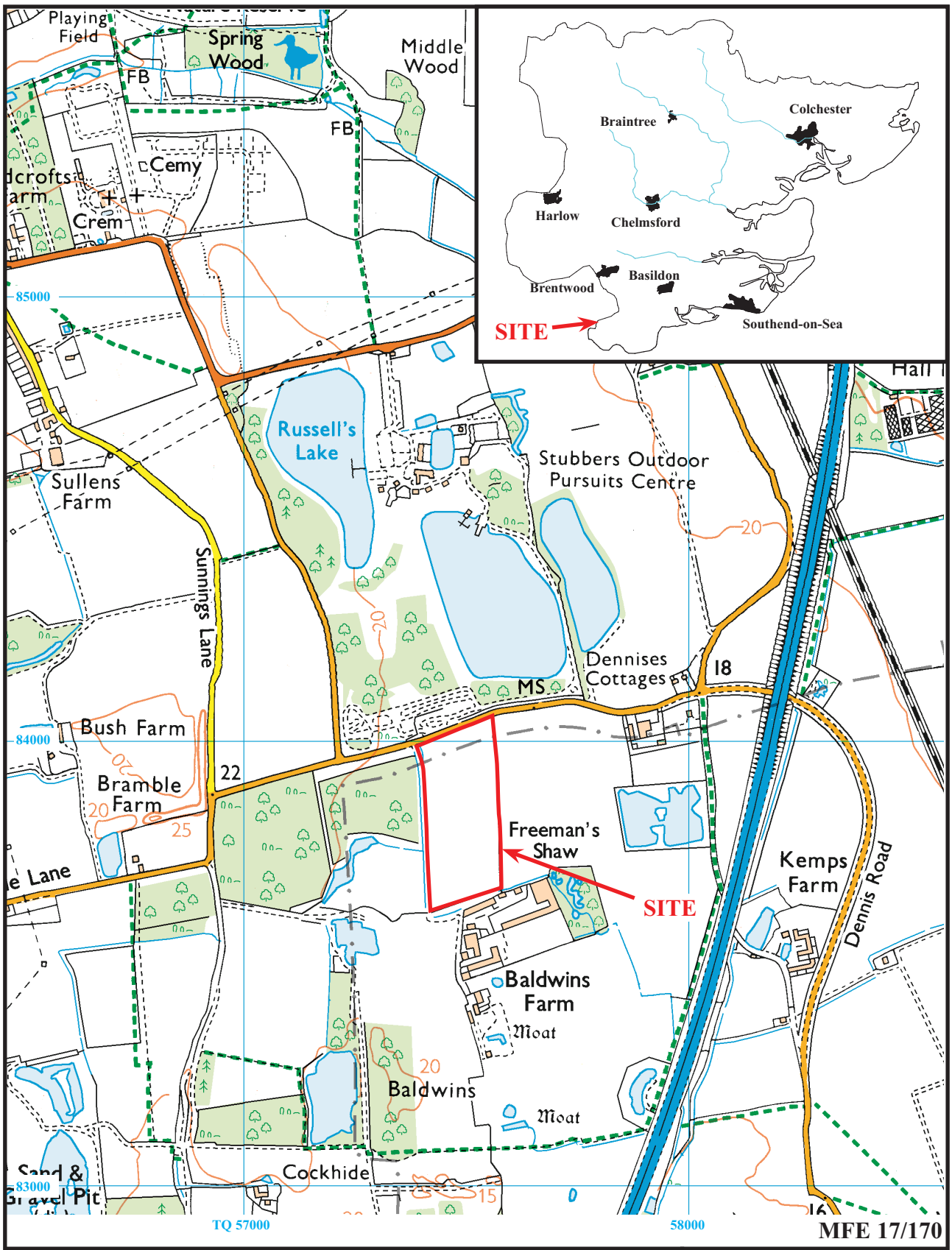
Raw data
Filename: Medina Farm RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 557415.200144345, 184046.941135763 m
Southeast corner: 557575.490144345, 183629.511135763 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions
Survey Size (meters): 160 m x 417 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 148199, Recorded: 148199

Stats
Max: 107.55
Min: -109.76
Std Dev: 21.56
Mean: 0.02
Median: 1.81
Composite Area: 6.691 ha
Surveyed Area: 5.0168 ha

Processed data
Filename: Medina Farm.xcp
Stats
Max: 4.42
Min: -4.40
Std Dev: 1.82
Mean: 0.01
Median: 0.04
Composite Area: 6.691 ha
Surveyed Area: 5.0095 ha

GPS based Proce6
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip at 1.00 SD
5 Clip from -4.00 to 4.00
6 DeStagger by: 50.00cm, Shift Positions



Land at Medina Farm, Dennises Lane, South Ockendon, Essex, 2022
Geophysical Survey (Magnetic)
Figure 1. Location of site within Essex.

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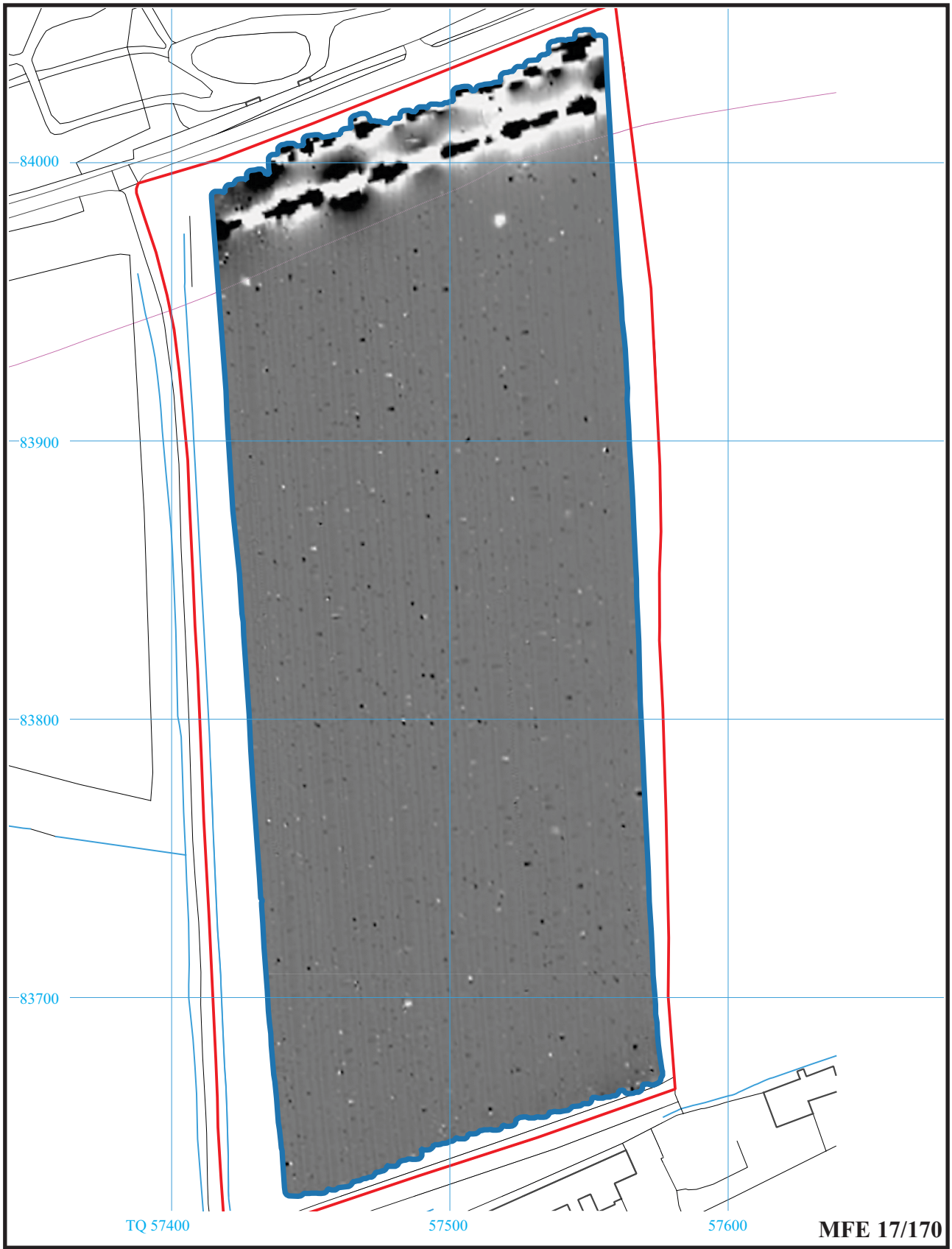

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Land at Medina Farm, Dennises Lane, South Ockendon, Essex, 2022
Geophysical Survey (Magnetic)
Figure 2. Plot of raw gradiometer data.

0m 100m

+100
nT
-100

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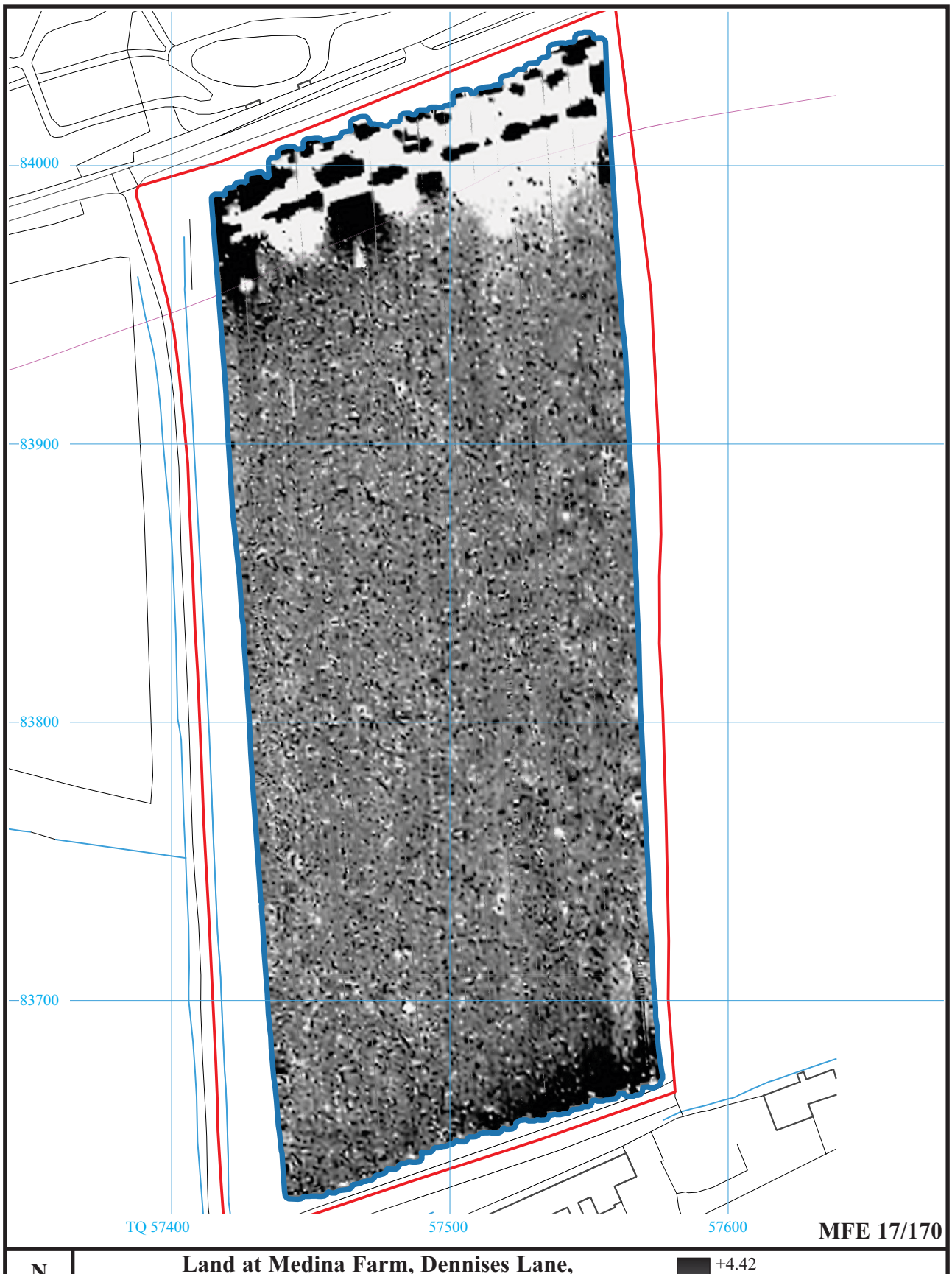
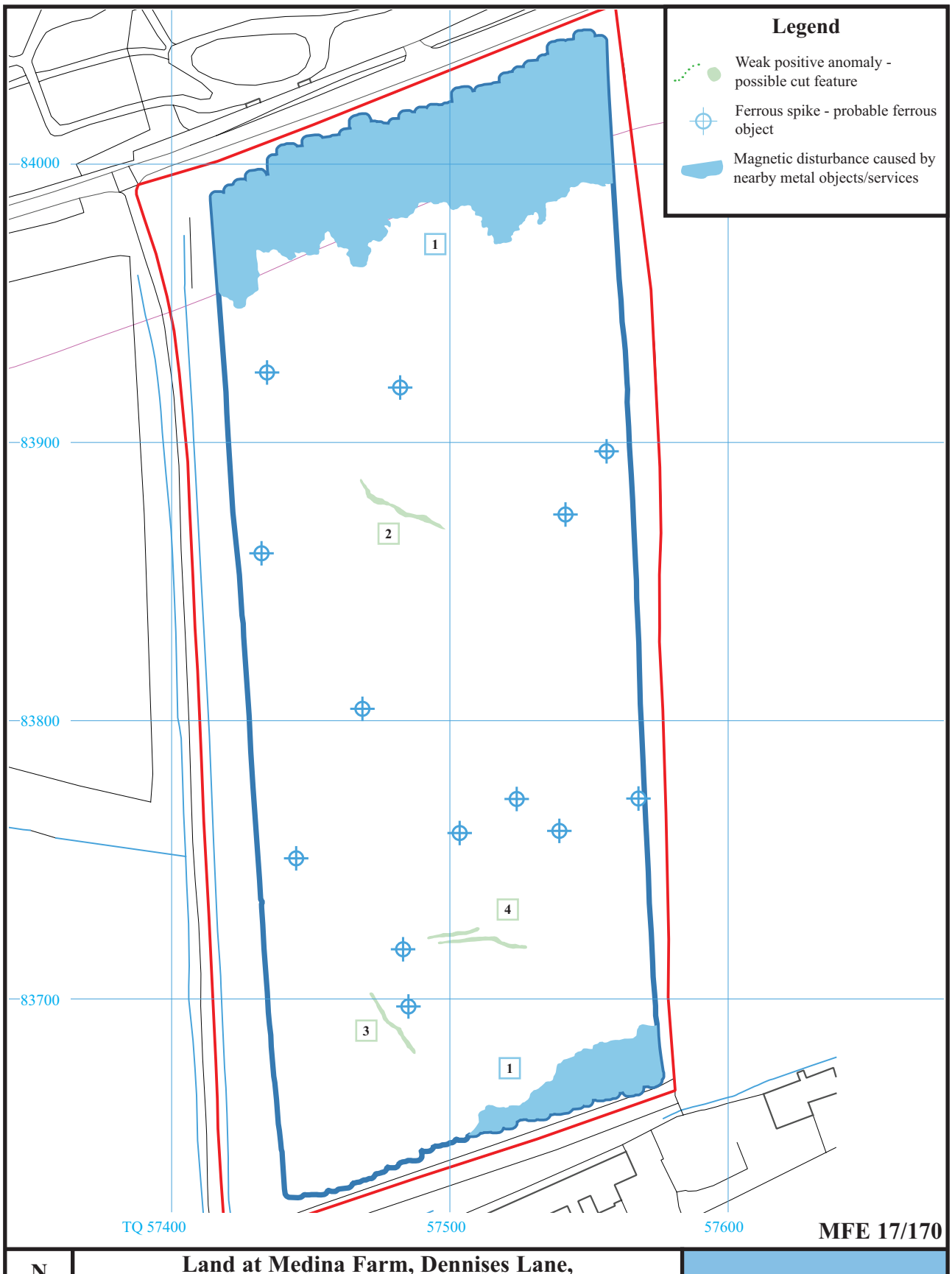


Land at Medina Farm, Dennises Lane,
South Ockendon, Essex, 2022
Geophysical Survey (Magnetic)

Figure 3. Plot of processed gradiometer data.



Land at Medina Farm, Dennises Lane, South Ockendon, Essex, 2022
Geophysical Survey (Magnetic)
Figure 4. Interpretation plot.

N

0m 100m

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Plate 1. Eastern boundary of survey area looking south

Plate 2. Western boundary of survey area looking south

MFE 17/170

Land at Medina Farm, Dennises Lane,
South Ockendon, Essex, 2022
Geophysical Survey (Magnetic)
Plates 1 and 2.

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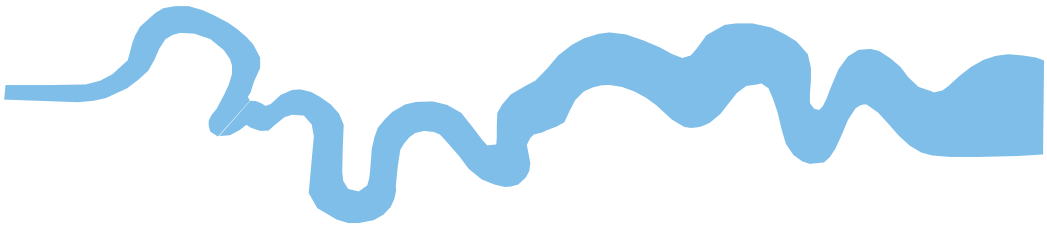
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
	AD 0 BC
Iron Age	750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC



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