Archaeological Services
University of Durham

Dallington Grange, Northamptonshire

geophysical survey

on behalf of
CgMs Consulting

Report 1463
June 2006

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1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted in advance of a proposed development at Dallington Grange, Northamptonshire.

1.2 The works were commissioned by CgMs Consulting and conducted by Archaeological Services in accordance with a project design provided by Archaeological Services.

Results

1.3 The survey detected a complex of rectilinear and curvilinear enclosures and ring-ditches across Area 1 and the southern part of Area 2 and provided further information regarding the extent of settlement and the likelihood of more than one phase of occupation.

1.4 Evidence of the causewayed enclosure and associated features discovered in the early 1990s were found in Area 2.

2. Project background

Location (Figure 1)

2.1 The study area is located at Dallington Grange, Northamptonshire (NGR: SP 7255 6350), 1 km northwest of Kings Heath on an area of relatively flat land associated with the Upper Nene basin. The survey area lies between two tributary streams of the River Nene and is approximately 29ha, bounded by Lodge Farm Industrial Estate to the southwest and Grange Farm to the northeast.

Development proposal

2.2 The survey has been carried out in advance of a residential and employment development proposal, with associated services and access roads.

Objective

2.3 The principal aim of the survey was to assess the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature, and scope of, any further scheme of archaeological works that may be required in advance of development.

Methods statement

2.4 The surveys have been undertaken in accordance with a Project Design prepared by Archaeological Services.

Dates

2.5 Fieldwork was undertaken between 15th and 26th May 2006. This report was prepared between 30th May and 7th June 2006.

Personnel

2.6 Fieldwork was conducted by Graeme Attwood, Bryan Atkinson and Edward Davies, and supervised by Lorne Elliott. This report was prepared by Lorne Elliott, with illustrations by David Graham. The Project Manager was Duncan Hale.

Archive/OASIS

2.7 The site code is **DGN06**, for **D**allington **G**range, **N**orthampton 20**06**. The project archive is currently held by Archaeological Services Durham University. Archaeological Services is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (OASIS). The OASIS ID number for this project is **archaeol3-15443**.

3. Archaeological and historical background

3.1 In 1994 The Royal Commission on the Historical Monuments of England (RCHME) carried out a 1:2500 scale level 3 survey in the vicinity of a possible Neolithic causewayed enclosure on Dallington Heath SP725635. The survey was undertaken as part of the Industry and Enclosure in the Neolithic Project. This was based primarily on ground survey and aerial photography of cropmarks. As a result of this survey one NMR record was updated (SP76SW 53) and six new monument records were created (SP 76SW 99, 100, 101, 102, 103, and 104). Limited fieldwalking in 1988 recovered prehistoric flints, and a geophysical survey and trial trenching in 1992 confirmed the presence of a causewayed enclosure (English Heritage 2006).

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised two fields of arable and rough grassland. The majority of the Areas 1 and 2 was rough grassland with cow parsley over 1.5m high in many places. Oil seed rape was growing to a height of more than 1m in the east of Area 2. A purpose-built scrambling track, which was in use most of the time was located in the central area of the survey. Tipping was apparent to the south of the site.

4.2 The survey area was predominantly level in the central area of the site at a mean elevation of *c.*100m OD. Away from this central area there is an incline of approximately 5m down to the west and east of the survey area.

4.3 The underlying solid geology of the area comprises Sandstone, Ironstone and Limestones of the Great Oolite and Upper Lias series, which are overlain by a sandy soil.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation* (David 1995); the Institute of Field Archaeologists Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2001).

Technique selection

5.2 Geophysical surveying enables the relatively rapid and non-invasive identification of potential archaeological features within landscapes and can involve a variety of complementary techniques such as magnetometry, electrical resistivity, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of site-specific factors including the nature of likely

targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

5.3 In this instance, based on aerial photographic cropmark evidence, it was considered likely that cut features, such as ditches and pits, would be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting each of the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record minute anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

5.5 The study area was divided into two separate areas for survey purposes (Figure 1).

5.6 A 30m grid was established across each survey area and tied-in to known, mapped Ordnance Survey points using a Leica GS50 global positioning system (GPS).

5.7 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 fluxgate gradiometers with automatic datalogging facilities. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 sample measurements per 30m grid unit.

5.8 Data were downloaded on-site into laptop computers for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.9 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 2-7; the trace plots are provided in Appendix I. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.10 The following basic processing functions have been applied to each dataset:
Clip – clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.

Zero mean traverse – sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities.

Destagger – corrects for displacement of anomalies caused by alternate zig-zag traverses.

Despike – locates and suppresses random iron spikes in gradiometer data.

Low pass filter – is useful for smoothing data or for enhancing larger weak features.

Interpolate – increases the number of data points in a survey to match sample and traverse intervals. In this instance the gradiometer data have been interpolated to 0.5 x 0.25m intervals.

Interpretation: anomaly types

5.11 Colour-coded geophysical interpretation plans are provided for both survey areas. Three types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.
negative magnetic	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids.
dipolar magnetic	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

Interpretation: features

5.12 For ease of presentation the survey was divided into two areas. Area 1 is the south part of the site and Area 2 is to the north (Figures 2 and 5). Colour-coded archaeological interpretation plans are provided for both survey areas.

Area 1 (Figs 2-4)

5.13 A complex of enclosures and other features have been detected throughout this area. In the west of the area a series of curvilinear positive magnetic anomalies reflect relative increases in high magnetic susceptibility materials and almost certainly represent the remains of soil-filled ring-ditches; these may be associated with round-houses.

5.14 In the centre of the survey area a group of rectilinear positive magnetic anomalies again most likely reflect a series of soil-filled ditched enclosures. One enclosure to the south of the survey area contains an area of intense

dipolar magnetic anomalies. This almost certainly corresponds to ferrous or fired material which may be of archaeological origin. This area is also shown more clearly on the trace plot (Appendix I).

5.15 Several rectilinear, curvilinear and linear positive magnetic anomalies continue in the north and east of the survey area. These appear to show further enclosures and ditch features. A strong curvilinear positive magnetic anomaly aligned northeast-southwest then northwest-southeast in the eastern part of Area 2 may reflect a much larger soil-filled feature. This appears to cut several features suggesting more than one phase for the site.

5.16 A series of parallel negative magnetic anomalies aligned northwest-southeast across the area correspond to open land drains.

5.17 A chain of intense dipolar magnetic anomalies traversing the area broadly north-south almost certainly represents a service pipe.

5.18 The only other anomalies detected here are small, discrete dipolar magnetic anomalies. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments. A sample of these is highlighted in the geophysical interpretation.

Area 2 **(**Figs 5-7)

5.19 A large discontinuous curvilinear positive magnetic anomaly approximately 270 by 240 metres was recorded in the centre of the survey area. These anomalies are stronger in the north and east of this feature. This oval shaped feature comprises a series of elongated pits or ditches forming a causewayed enclosure. The western part of the enclosure has a second discontinuous curvilinear positive magnetic anomaly possibly reflecting a double-ditch or re-alignment of the monument.

5.20 The northwest of this enclosure is cut by a strong rectilinear positive magnetic anomaly and two weak linear positive magnetic anomalies which almost certainly reflect soil-filled ditch features.

5.21 Both within and outside the southern part of the large enclosure are several curvilinear positive magnetic anomalies which may represent ring-ditches or small enclosures.

5.22 A series of sinuous parallel positive magnetic anomalies in the northern part of the survey with an approximate east-west alignment run perpendicular to the slope of the land. These may reflect some form of terracing no longer evident on the surface.

5.23 Two dipolar magnetic anomalies to the southeast of the area correspond to telegraph poles. A spread of dipolar magnetic anomalies is in evidence across the area. These most likely represent near-surface soil litter of fired and ferrous material. A sample of these is highlighted in the geophysical interpretation.

5.24 A chain of intense dipolar magnetic anomalies aligned broadly north-south in the southeast of the survey almost certainly represents a service pipe.

5.25 Dummy readings taken to the north and east of the large enclosure reflect two large oak trees on the site.

5.26 A banding effect in parts of the data was due to the height of the grass and cow parsley at the time of the survey. A compromise was taken during processing of the data to keep the banding rather than risk losing any archaeological features from the greyscale images.

6. Conclusions

6.1 Fluxgate gradiometer surveys have been undertaken on land at Dallington Grange, northwest of Northampton, in order to assess the potential survival of archaeological features prior to proposed residential and employment development.

6.2 The survey of Areas 1 and 2 shows that a large complex of rectilinear and curvilinear enclosures and ring-ditches has been detected.

6.3 Area 1 provided further information regarding the nature and extent of the settlement and the possibility of more than one phase of occupation. The form of the settlement is typical of the late prehistoric/Romano-British period

6.4 Area 2 highlighted the causewayed enclosure discovered in the early 1990s and detected possible associated features to the north and south.

7. Sources

David, A, 1995 *Geophysical survey in archaeological field evaluation,* Research and Professional Services Guideline **1**, English Heritage

English Heritage 2006 Pastscape database. *http://www.pastscape.org.uk/*

Gaffney, C, Gater, J & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*, Technical Paper **6**, Institute of Field Archaeologists

Schmidt, A, 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Arts and Humanities Data Service

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Figure 1

Geophysical surveys

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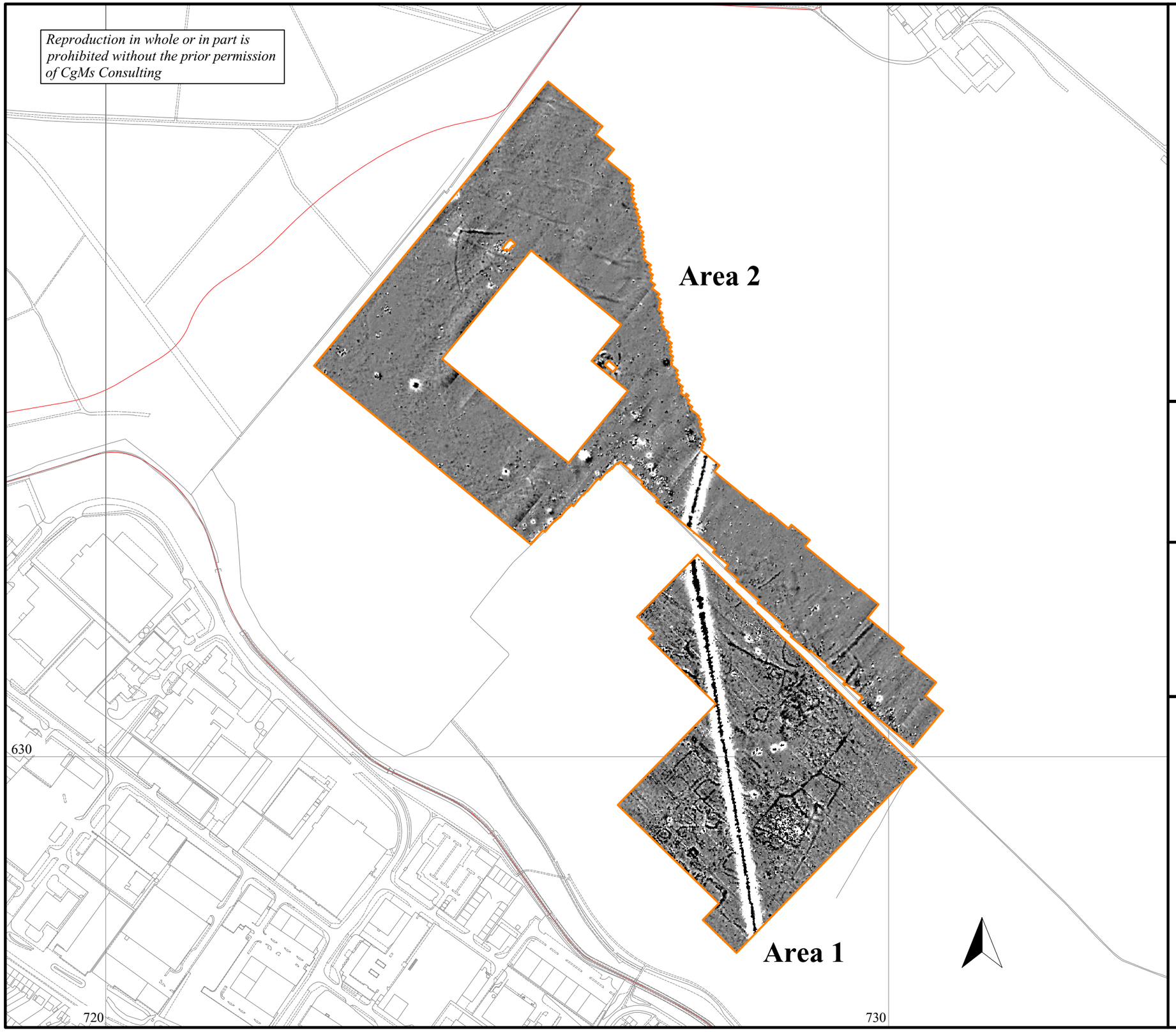

0 250m

scale 1:5000 - for A3 plot

outline of survey area

5.00
4.17
3.33
2.50
1.67
0.83
0.00
-0.83
-1.67
-2.50
-3.33
-4.17
-5.00 nT

631

630

728

Area 1

Area 2

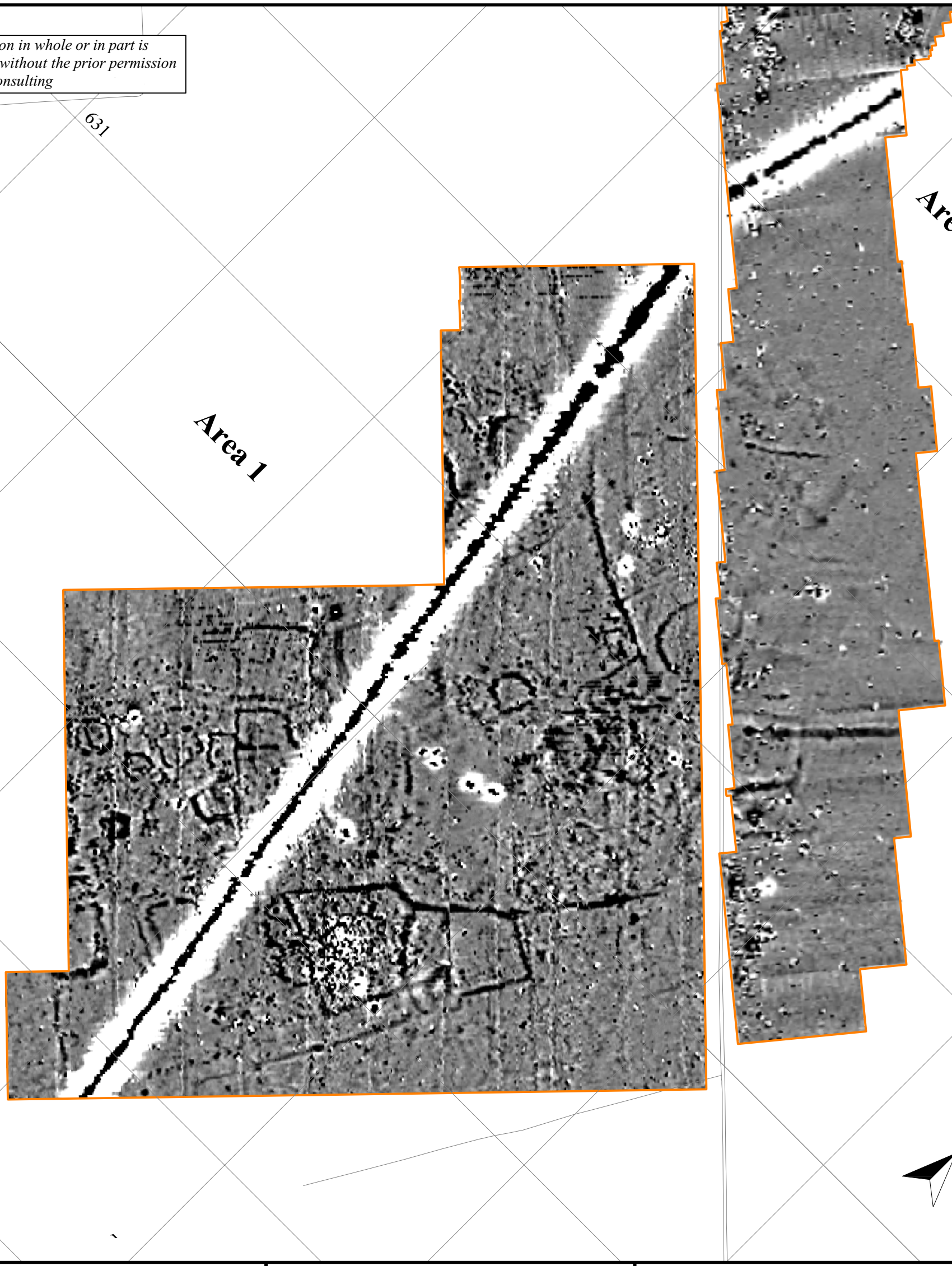

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Figure 2

Area 1, geophysical survey

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0 100m

scale 1:2000 - for A3 plot

outline of survey area

5.00
4.17
3.33
2.50
1.67
0.83
0.00
-0.83
-1.67
-2.50
-3.33
-4.17
-5.00 nT

631

630

728

Area 1

Area 2

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Figure 3

Area 1, geophysical interpretation

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0 100m

scale 1:2000 - for A3 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

631

630

728

Area 1

Area 2

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Figure 4

Area 1, archaeological interpretation

on behalf of
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0 100m

scale 1:2000 - for A3 plot

outline of survey area

soil-filled features

open land drains

service pipes

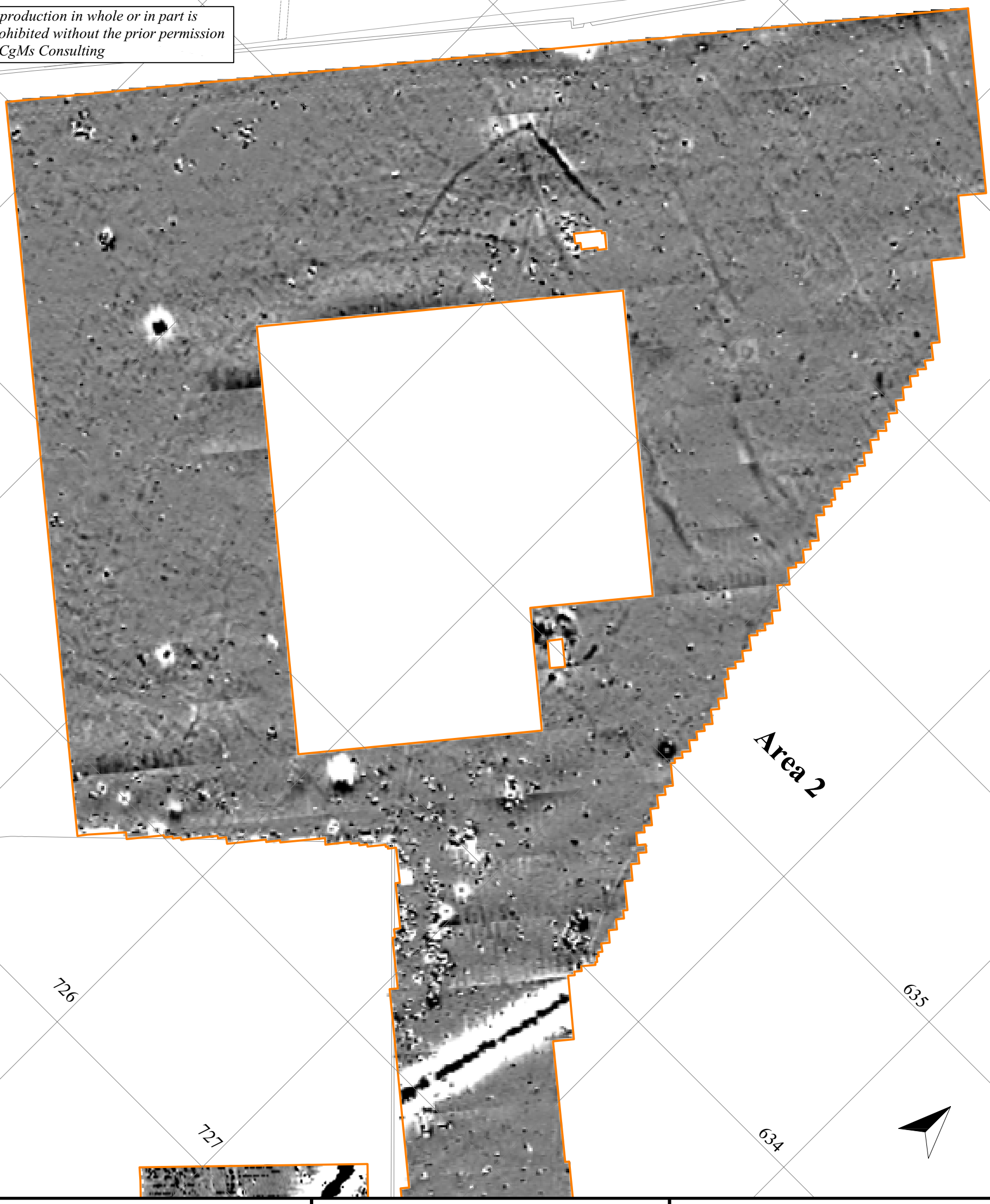

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Figure 5

Area 2, geophysical survey

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0 100m

scale 1:2000 - for A3 plot

outline of survey area

5.00
4.17
3.33
2.50
1.67
0.83
0.00
-0.83
-1.67
-2.50
-3.33
-4.17
-5.00 nT

Area 2

726

727

635

634

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Figure 6

Area 2, geophysical interpretation

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0 100m

scale 1:2000 - for A3 plot

outline of survey area

positive magnetic anomalies

negative magnetic anomalies

dipolar magnetic anomalies

Area 2

726

727

635

634

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Figure 7

Area 2, archaeological interpretation

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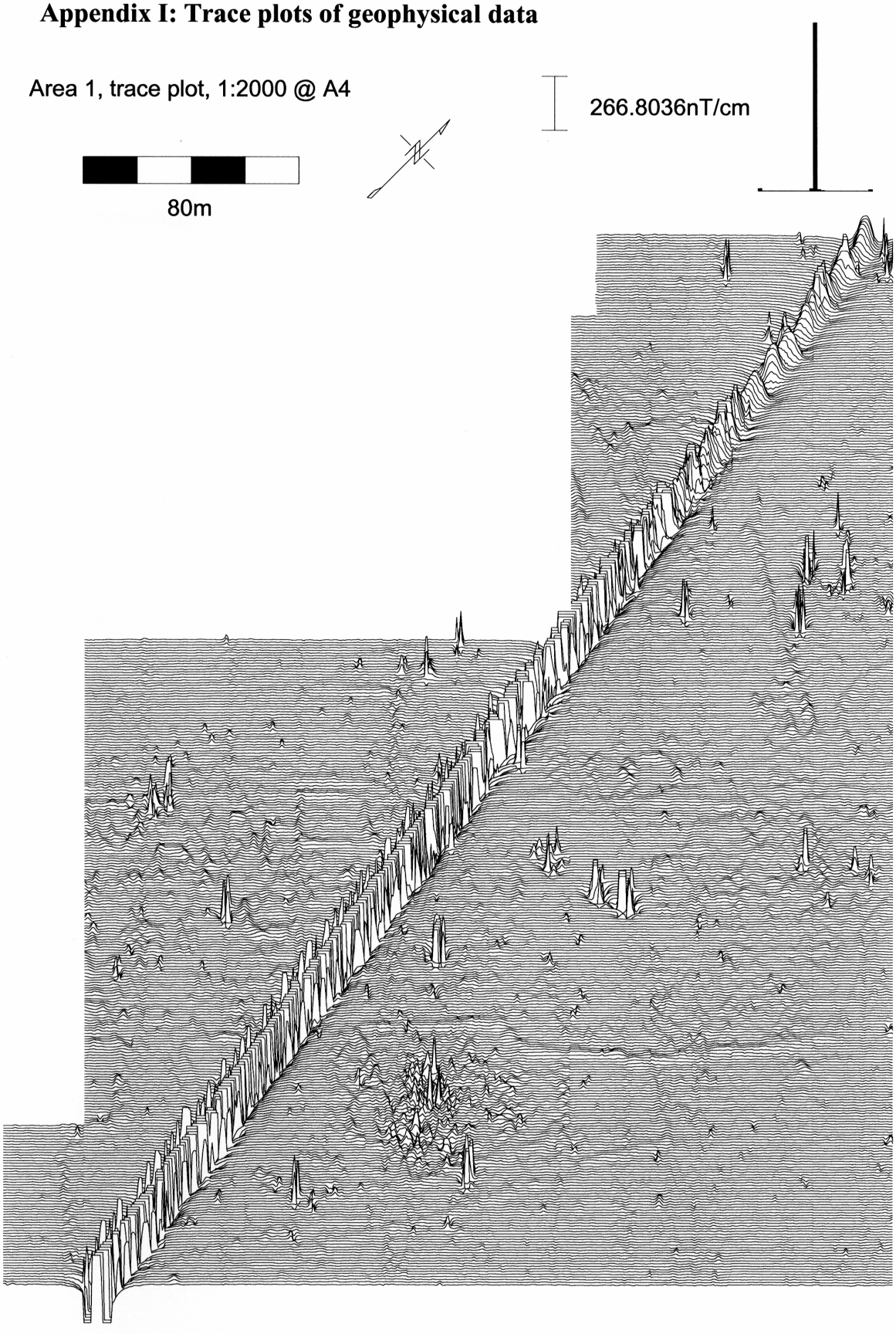
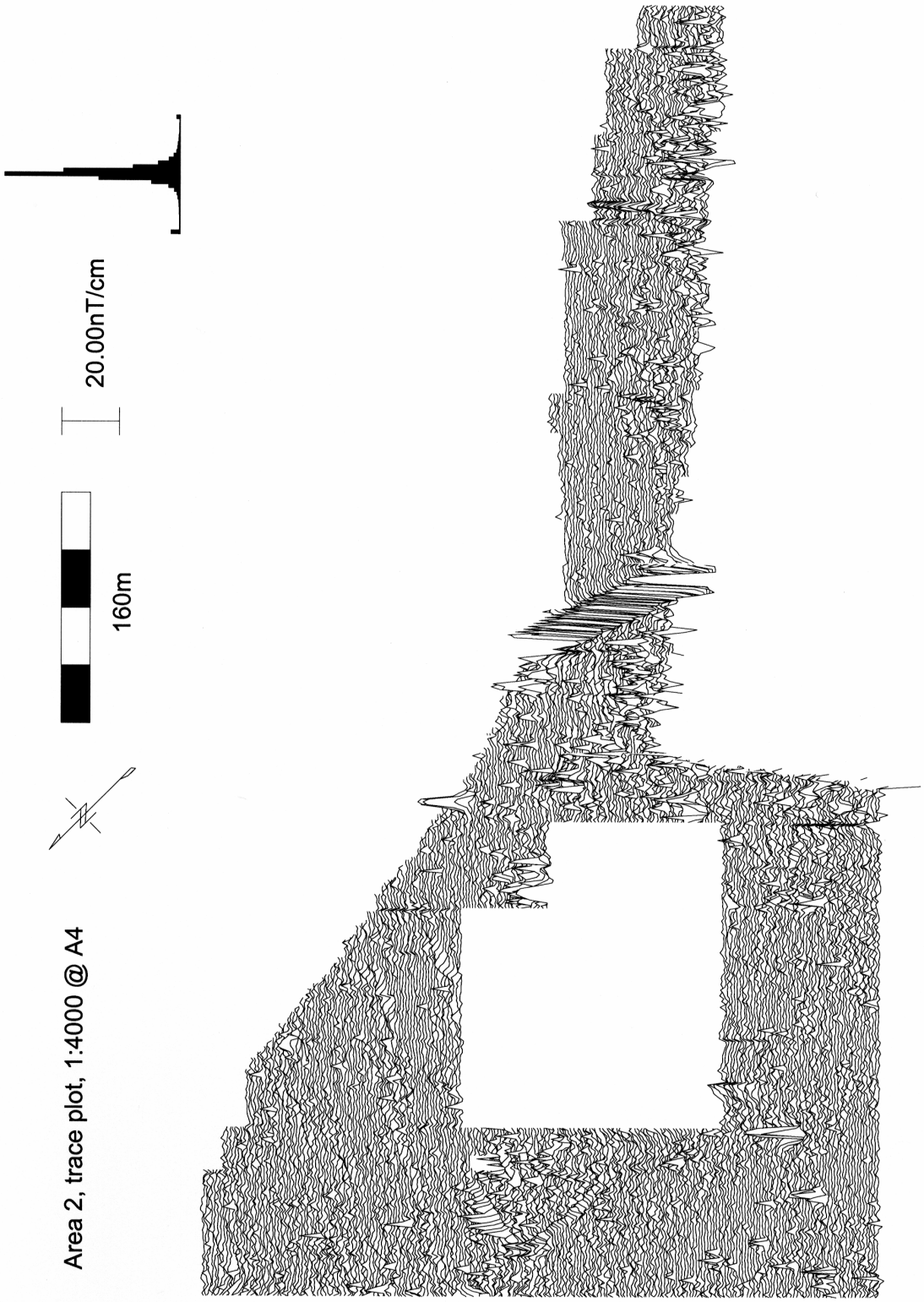
0 100m

scale 1:2000 - for A3 plot

- outline of survey area
- soil-filled features
- change in landuse
- telegraph pole
- tree
- service pipes

Appendix I: Trace plots of geophysical data




20.00nT/cm
160m
Area 2, trace plot, 1:4000 @ A4