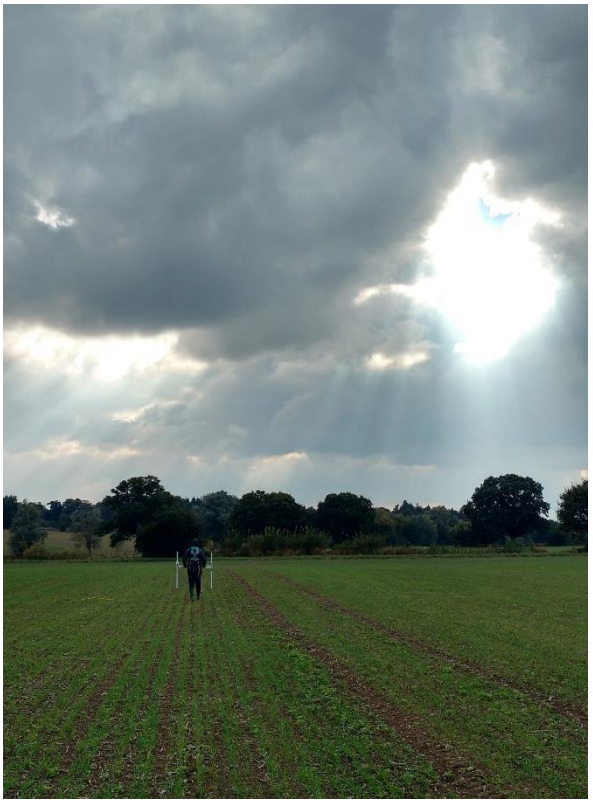
LAND EAST OF THE CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DETAILED MAGNETOMETER SURVEY



Report Number: 1145 October 2016

LAND EAST OF THE CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DETAILED MAGNETOMETER SURVEY

Prepared for: Colchester
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October 2016

Site Code	EBG056	**NGR**	TM 083 352
Event Number	ESF24728		
Planning Ref.	B/16/01092/OUT	**OASIS**	britanni1-263239
Approved By:		**Date**	October 2016

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ABSTRACT

In October 2016 Britannia Archaeology Ltd (BA) undertook a detailed magnetometer survey on Land East of the Constable Medical Centre, Heath Road, East Bergholt, (NGR TM 083 352).

*The geophysical survey has identified several anomalies that could be archaeological in origin. The features present within the survey are identified as low amplitude positive anomalies, which could be infilled ditch type features (**1000 – 1002** and **1004**), with anomalies **1001** and **1002** possibly representing an enclosure. A series of low amplitude anomalies (**1003)** on the northern boundary of the site have been identified as ploughing activity, of an unknown date. A discrete high amplitude anomaly (**1006)** was identified of unknown origin, it is possible that the source of the anomaly is archaeological in origin.*

1.0 INTRODUCTION

In October 2016 Britannia Archaeology Ltd (BA) undertook a detailed magnetometer survey on Land East of the Constable Medical Centre, Heath Road, East Bergholt, (NGR TM 083 352), over 9.2 ha of land for proposed development.

2.0 SITE DESCRIPTION

The site was located in two agricultural fields to the south of Heath Road in East Bergholt, Suffolk. The fields were bound to the east by Mill Road and agricultural fields, to the south by agricultural fields and to the west by residential properties.

The bedrock geology is Thames Group – Clay, Silty. This sedimentary bedrock was formed approximately 34 to 56 million years ago in the Palaeogene period when the local environment was previously dominated by deep seas (BSG 2016).

Superficial deposits are described as Lowestoft Formation – Sand and Gravel. These superficial deposits were formed up to 2 million years ago in the Quaternary Period when the local environment was previously dominated by ice age conditions (BSG 2016).

3.0 ARCHAEOLOGICAL BACKGROUND

An archaeological desk-based assessment has been undertaken (Parmenter 2016) in summary:

It appears that the proposed development site has never been subject to direct settlement or development of any kind. Historic maps point to the long-term use of the proposed development site being pasture/arable farmland.

There are no Heritage Assets within, or in close proximity to the proposed development site but there are a number within the Search Area, and though none of these will be affected by the proposed development, they may give an indication as to the archaeological potential for the development site.

There is very little evidence for any activity in the search area until the medieval period. However, evidence for the medieval occupation of East Bergholt is fairly limited.

Almost all the Heritage Assets returned by the Suffolk HER were post-medieval in date. The village clearly saw significant growth at this time, with nearly 40 listed buildings being added to the village over the post-medieval period.

4.0 PROJECT AIMS

A non-intrusive geophysical survey was required of the development; this is likely to lead to a programme of trial trenching, subject to a separate WSI, to enable the archaeological resource, both in quality and extent, to be accurately quantified. However, any decision about the need for, and extent of, trial trenching will be taken following the geophysical survey (Brief Section 3.1).

5.0 METHODOLOGY

The survey grid was be set out to the Ordnance Survey OSGB36 datum to an accuracy of ±0.01m using a Leica Viva Glonnass Smart Rover GS08.

A Bartington Dual Grad 601-2 fluxgate gradiometer was used to undertake the survey, because of its high sensitivity and rapid ground coverage. The soils and underlying geology are receptive to magnetometer survey, but good results are heavily dependent on the contrast between the fills of a feature (with humic and charcoal rich deposits providing the best results) and the relative weakness of the local magnetic background field.

Only minimal processing of the datasets has been undertaken, data processing allows for the correction of errors introduced during the survey and instrument errors. The survey data has been processed using TerraSurveyor software V 3.0.29.3, where the following data processes were applied:

Destripe: Removes striping effects from the raw data caused by discrepancies between different sensors and walking directions caused by alternate zig-zag traverses.

Destagger: Corrects the displacement of anomalies caused by alternate zig-zag traverse.

Clip: The range of the data can be set to specified maximum and minimum values in order to improve the contrast of weaker anomalies within the data.

Compress: Weak anomalies were further enhanced by applying an arctangent weighing to the data.

Grad. Shade: The overall appearance of the data was improved

Two processed greyscale plots have been produced the first processed greyscale shows minimal processing of the data, the second shows further enhancement of weak anomalies present in the data by applying an arctangent compression to the data. The raw and two processed greyscale plots have been produced for comparison. An XY trace plot consisting of the processed data will be used in combination with raw and processed greyscale data. An interpretation plan characterising the anomalies has been produced based on the evidence collated from the greyscales and XY trace plots.

6.0 RESULTS (Figs. 3-7)

The geophysical survey has revealed a few anomalies of possible archaeological origin. The following numbered anomalies refer to the numerical labels of the interpretation plot.

6.1 Gradiometer Results

In the north-western corner of the survey area the data revealed a low amplitude positive linear anomaly (**1000)**. This linear anomaly has a NW – SE orientation and is visible in the data for *c.*39m. This anomaly is regular in appearance, however, is of varying signal strength, which is suggestive of the anomaly being disturbed at source. Anomaly **1000**

has a similar alignment to cropmarks recorded in the field immediately to the north west of the survey area SHER 12290.

The central area of the survey has revealed a weak positive linear anomaly (**1001)**, that has a NE – SW orientation for *c.*29m before turning east on a NW – SE orientation for *c.*24m, to then finally turn to a SW – NE orientation for *c.*15m before disappearing out of the data. It is possible that this is representing an enclosure *c.*20m in width. Located to the north-west of anomaly **1001** is positive linear anomaly **1002**. This anomaly is irregular in appearance and can be seen running for *c.*21m with a N – S orientation. It is unknown if anomalies **1001** and **1002** are related.

On the northern boundary of the site are a series of low amplitude positive linear anomalies (**1003)**, these anomalies run parallel *c.*3 – 5m apart from one another with NW – SE orientations, visible in the data for *c.*31m before being masked by magnetic disturbance **1010** from the road on the northern boundary of the site. These anomalies most likely represent previous ploughing activity within the field, their irregular and intermittent appearance is suggestive of the source of the anomalies are disturbed.
Positive anomaly **1004** has been identified in the south-east corner of the survey area. This anomaly measures *c.*4m in width, the length of this anomaly is unknown as it is only partially present within the survey. The anomaly appears to be regular in appearance and the response given is consistent with those resulting from an infilled feature of archaeological origin. Immediately to the north-west of anomaly **1004** is a low amplitude irregular anomaly (**1005)**, this anomaly has a NW – SE orientation and is *c.*20m ending with an irregular positive response *c.*5m in width. These anomalies are most likely natural in origin.

High amplitude anomaly
In the south-east of the survey area, north-west of anomalies **1004** and **1005** is a high amplitude positive sub-rectangular anomaly with associated negative response **1006**. The anomaly measures *c.*14m x *c.*4m, with a NW – SE orientation. The interpretation of this anomaly is uncertain. The high amplitude anomaly could be a result of *in situ* burning causing the remnant magnetic material. Therefore this anomaly could be of archaeological origin.

Geological anomalies

Several geomorphological features have been identified in the data (**1007)**, these features have a broadly NE – SW orientation, with various associated channels. These anomalies are characterised as low amplitude positive spreads, the signal of which has derived from slightly higher magnetic material being deposited by glacial melt waters.

Modern disturbance

The data has displayed several strong magnetic responses which are described below. A strong positive response with associated negative response located on the western edge with a NE – SW orientation has been produced by modern service **1008**.

A series of strong bipolar responses can be seen running along the western and northern boundaries of the site (**1009** and **1010**). These have resulted from the boundaries of the properties adjacent to the survey area (**1009)**, and from close proximity of a road and passing vehicles (**1010)**, which have all produced a distortion to the local magnetic field. It is probable that the halo effect produced by these responses could be masking the presence of archaeological anomalies in these areas.

The survey has revealed numerous high amplitude magnetic spikes (**1011)**. Each of these discrete magnetic spikes consists of a well-defined dipolar response. Their high amplitudes suggest the presence of ferrous debris in the ploughsoil.

7.0 CONCLUSION

The geophysical survey has identified several anomalies that could be archaeological in origin. The features present within the survey are identified as low amplitude positive anomalies, which could be infilled ditch type features (**1000 – 1002** and **1004**), with anomalies **1001** and **1002** possibly representing an enclosure. A series of low amplitude anomalies **1003** on the northern boundary of the site have been identified as ploughing activity, of an unknown date. A discrete high amplitude anomaly (**1006)** was identified of unknown origin, it is possible that the source of the anomaly is archaeological in origin.

The overall signal strength of the features is reduced, this could be due to the reduced natural magnetic enhancement of topsoils developing over the Thames group clay formations, leading to the reduced feature contrasts.

8.0 PROJECT ARCHIVE AND DEPOSITION

A full archive will be prepared for all the work undertaken in accordance with the *Selection, Retention and Dispersion of Archaeological Collections,* Archaeological Society for Museum Archaeologists 1993. Arrangements will be made for the archive to be deposited with the relevant museum/HER office.

9.0 ACKNOWLEDGEMENTS

Britannia Archaeology Ltd would like to thank Mr Chris Lister of the Colchester Archaeological Trust for commissioning the project.

We would also like to thank Rachael Abrahams at the Suffolk County Council Archaeology Service / Conservation Team (SCCAS/CT) for her input and advice.

The survey was undertaken by Matthew J. Baker and Adam Leigh of Britannia Archaeology Ltd

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APPENDIX 1 – OASIS FORM

OASIS DATA COLLECTION FORM: England

OASIS ID: britanni1-263239

Project details

Project name	Land East of the Constable Medical Centre, Heath Road, East Bergholt, Suffolk
Short description of the project	Geophysical Survey: In October 2016 Britannia Archaeology Ltd (BA) undertook a detailed magnetometer survey on Land East of the Constable Medical Centre, Heath Road, East Bergholt, (NGR TM 083 352). The geophysical survey has identified several anomalies that could be archaeological in origin. The features present within the survey are identified as low amplitude positive anomalies, which could be infilled ditch type features (1000 - 1002 and 1004), with anomalies 1001 and 1002 possibly representing an enclosure. A series of low amplitude anomalies (1003) on the northern boundary of the site have been identified as ploughing activity, of an unknown date. A discrete high amplitude anomaly (1006) was identified of unknown origin, it is possible that the source of the anomaly is archaeological in origin.
Project dates	Start: 21-09-2016 End: 07-10-2016
Previous/future work	No / Yes
Any associated project reference codes	EBG056 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	After full determination (eg. As a condition)
Solid geology	LONDON CLAY
Drift geology	GLACIAL SAND AND GRAVEL
Techniques	Magnetometry

Project location

Country	England
Site location	SUFFOLK BABERGH EAST BERGHOLT Land East of the Constable Medical Centre, Heath Road, East Bergholt, Suffolk
Postcode	CO7 6RT

Study area	9.2 Hectares
Site coordinates	TM 608300 235200 51.848528679863 1.78766168867 51 50 54 N 001 47 15 E Point
Height OD / Depth	Min: 0m Max: 0m

Project creators

Name of Organisation	Britannia Archaeology Ltd
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Matthew Baker
Project director/manager	Martin Brook
Project supervisor	Matt Baker
Type of sponsor/funding body	Archaeological Contractor
Name of sponsor/funding body	Colchest Archaeological Trust

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Suffolk HER
Digital Archive ID	EBG056
Digital Contents	"none"
Digital Media available	"GIS","Geophysics","Images raster / digital photography","Survey","Text"
Paper Archive recipient	Suffolk HER
Paper Archive ID	EBG056
Paper Contents	"none"
Paper Media available	"Map","Photograph","Report","Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	LAND EAST OF THE CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT: DETAILED MAGNETOMETER SURVEY
Author(s)/Editor(s)	Baker, M. J.
Other bibliographic details	Report Number 1145
Date	2016
Issuer or publisher	Britannia Archaeology Ltd
Place of issue or publication	Bury St Edmunds

Description	A4 Report with A3 pullout figures
URL	http://www.britannia-archaeology.com/
Entered by	Matthew Baker (m.baker@brit-arch.com)
Entered on	12 May 2017

OASIS:

Please e-mail Historic England for OASIS help and advice

APPENDIX 2 – WRITTEN SCHEME OF INVESTIGATION

LAND EAST OF THE CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

WRITTEN SCHEME OF INVESTIGATION
DETAILED MAGNETOMETER SURVEY

Project Number: 1160 September 2016

LAND EAST OF THE CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

Written Scheme of Investigation
Detailed Magnetometer Survey

Prepared for: Colchester
Archaeological Trust Roman
Circus House
Circular Road North
Colchester Essex
CO2 7GZ

By:
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Site Code	EBG056	**NGR**	TM 083 352
Event Number	ESF24728		
Planning Ref.	B/16/01092/OUT	**OASIS**	britanni1-263239
Approved By:	Dan McConnell	**Date**	September 2016

CONTENTS

1.0 INTRODUCTION

This Written Scheme of Investigation (WSI) has been prepared by Britannia Archaeology Ltd (BA) on behalf of the Colchester Archaeological Trust, Roman Circus House, Circular Road North, Colchester, Essex in response to a brief (Abraham, R. 12th September 2016) for a geophysical survey over land for proposed development (9.2 ha) on Land East of the Constable Medical Centre, Heath Road, East Bergholt (NGR TM 083 352).

2.0 SITE DESCRIPTION

The site is located in two agricultural fields to the south of Heath Road in East Bergholt, Suffolk. The fields are bound to the east by Mill Road and agricultural fields, to the south by agricultural fields and to the west by residential properties.

The bedrock geology is Thames Group – Clay, Silty. This sedimentary bedrock was formed approximately 34 to 56 million years ago in the Palaeogene period when the local environment was previously dominated by deep seas (BSG 2016).

Superficial deposits are described as Lowestoft Formation – Sand and Gravel. These superficial deposits were formed up to 2 million years ago in the Quaternary Period when the local environment was previously dominated by ice age conditions (BSG 2016).

3.0 PLANNING POLICIES

The archaeological investigation is to be carried out on the recommendation of the local planning authority, following guidance laid down by the National Planning and Policy Framework (NPPF, DCLD 2012) which replaces Planning Policy Statement 5: Planning for the Historic Environment (PPS5, DCLG 2010). The relevant local planning policy is the *Mid Suffolk Local Plan; (1998)*.

4.0 ARCHAEOLOGICAL BACKGROUND

An archaeological desk-based assessment has been undertaken (Parmenter 2016) in summary:

It appears that the proposed development site has never been subject to direct settlement or development of any kind. Historic maps point to the long-term use of the proposed development site being pasture/arable farmland.

There are no Heritage Assets within, or in close proximity to the proposed development site but there are a number within the Search Area, and though none of these will be affected by the proposed development, they may give an indication as to the archaeological potential for the development site.

There is very little evidence for any activity in the search area until the medieval period. However, evidence for the medieval occupation of East Bergholt is fairly limited.

Almost all the Heritage Assets returned by the Suffolk HER were post-medieval in date. The village clearly saw significant growth at this time, with nearly 40 listed buildings being added to the village over the post-medieval period.

5.0 PROJECT AIMS

A non-intrusive geophysical survey is required of the development; this is likely to lead to a programme of trial trenching, subject to a separate WSI, to enable the archaeological resource, both in quality and extent, to be accurately quantified. However, any decision about the need for, and extent of, trial trenching will be taken following the geophysical survey (Brief Section 3.1).

6.0 METHODOLOGY

6.1 Fieldwork

A detailed fluxgate gradiometer survey is required over *c.*9.2 Hectares, scheduled to be undertaken in September 2016.

6.2 Instrument Type Justification

Britannia Archaeology Ltd will employ a Bartington Dual Grad 601-2 fluxgate gradiometer to undertake the survey, because of its high sensitivity and rapid ground coverage. The soils and underlying geology are receptive to magnetometer survey, but good results are heavily dependent on the contrast between the fills of a feature (with humic and charcoal rich deposits providing the best results) and the relative weakness of the local magnetic background field.

6.3 Instrument Calibration

The Magnetometer will be left on for a minimum of 20 minutes in the morning for the sensors to settle before any recorded survey takes place. Sensor heights will be measured and equalised at the start of the first day so that a consistent height above the ground is maintained during the survey. Each sensor shall be positioned on the same side of the instrument throughout the survey. A calibration point will be located with a magnetic variation no greater than 1 nano tesla (nT) within a 6m^2 area. This area of low magnetic susceptibility will be used to calibrate the instruments sensors during the survey. Sensor calibration will be undertaken after every 6 full grids, however, sudden changes in weather or knocking the sensors will require recalibration.

6.4 Sampling Interval and Grid Size

The sampling interval shall be 0.25m along 1m traverse intervals, within 30 x 30m grids. Where a 30m grid cannot be recorded in full, as much of the partial grid will be recorded as possible.

6.5 Survey Grid Location

The survey grid shall be set out to the Ordnance Survey OSGB36 datum to an accuracy of ±0.01m employing a Leica Viva Glonnass Smart Rover GS08. Data will be converted to the National Grid Transformation OSTN02, and the instrument will be regularly tested using stations with known ETRS89 coordinates. The grid will be located parallel to the long axis of the proposed development to allow for ease of survey.

6.6 Data Capture

The grid order will be recorded on a BA pro-forma so that the composite plan can be inputted at the close of the day. Instrument readings will be recorded on an internal data logger, downloaded to a laptop at midday and in the evening. Data will be filed in job specific folders and backed up onto an external storage device and finally a remote server.

6.7 Data Presentation and Processing

Only minimal processing of the datasets shall be undertaken, data processing allows for the correction of errors introduced during the survey and instrument errors. The survey data will be processed using TerraSurveyor software v3.0.29.3. These processes will be entirely dependent on the data collected from the survey.

The raw and processed greyscale plots will be produced for comparison. An XY trace plot consisting of the processed data will be used in combination with raw and processed greyscale data. An interpretation plan characterising the anomalies will be produced based on the evidence collated from the greyscale and XY trace plots.

6.8 Software

The software used to process the data and produce the composites will be DW Consulting's Terrasurveyor v3.0.29.3. Datasets will be exported into AutoCAD and placed onto their corresponding grid positions. An interpretation plot will then be produced using AutoCAD.

7.0 PRESENTATION OF RESULTS

The prepared client/archive report will be commensurate with the results of the fieldwork, and will be consistent with the principles of the *Management of Research Projects in the Historic Environment* (*MoRPHE*), English Heritage, Edmund Lee, 2006 (minor revisions 2009), *Geophysical Survey In Field Evaluation,* English Heritage, Andrew David *et al*, 2008,

and the *Standard and Guidance for Archaeological Geophysical Survey*, Institute for Archaeologists, 2011, containing the following:

- *Summary.* A concise summary of the work undertaken and the results.
- *Introduction*. Introduction to the project including the reasons for work, funding, planning background.
- *Background*. The history, layout and development of the site.
- *Aims and Objectives.*
- *Methodology.* Survey strategy and techniques used.
- *Results*. Detailed description of findings outlining the nature, location and extent of the anomalies.
- *Discussion and Conclusions.* A synopsis interpreting the anomalies, impact assessment, site potential, possible locations of subsequent trial trenches.
- *Bibliography.*
- *Appendices.* Technical Details, Geo-referencing Information, Metadata Sheet, HER/OASIS Summary Sheet.
- *Illustrative Material.* Raw Data Plots, Processed Data Plots, XY Trace Plots, Interpretation Plots, Photographs.

Prior to the release of the final report, a draft report will be submitted for comment and approval to the Suffolk Historic Environment Record. On approval digital copies will be supplied to the client and both a the digital version and hard copy of the final report will be submitted to the Suffolk Historic Environment Record in due course (including a vector plan and AutoCAD .dxf file) and the National Monuments Record (NMR). A .pdf version will be uploaded to the ADS website and an OASIS form will be completed online and sent to the HER.

8.0 PROJECT ARCHIVE AND DEPOSITION

A full archive will be prepared for all work undertaken in accordance with guidance from the *Selection, Retention and Dispersion of Archaeological Collections,* Archaeological Society for Museum Archaeologists, 1993. Arrangements will be made for the archive to be deposited with the relevant museum/HER Office, in this case will be the Suffolk County Council HER Store.

9.0 HEALTH AND SAFETY

BA operates a comprehensive Health and Safety Policy in accordance with the Health and Safety Executive. BA operates under the Federation of Archaeological Managers and Employers (FAME) *Health and Safety Field Manual*, which is regularly updated by supplements.

BA are covered by employer's liability, public liability and professional indemnity insurance arranged through Towergate Insurance (see Appendix 2).

9.1 Code of Practice, Risk Assessment and Site Induction

BA's Code of Practice covers all aspects of survey work and ensures all risks are adequately controlled. A site visit will be undertaken and an assessment of the potential risks highlighted, a full site risk assessment will be produced based on this information. The assessment of risk is continually monitored and this document can be updated if any change in risk occurs. A copy of the Risk Assessment is kept on site, read and countersigned by all staff and visitors during the BA site induction.

BA will liaise with the contractor or client on arrival and will follow any additional Health and Safety instructions given.

A qualified First Aider will be present on every site.

All BA staff members are CSCS registered.

10.0 RESOURCES

All archaeological projects are undertaken by a team of professional qualified archaeologists, a synopsis can be found at Appendix 3. Full CV's are available on request.

All site work will be undertaken by a Project Officer with a qualified member of staff in close communication with a Project Manager. This project officer will also be responsible for post-survey publication.

11.0 TIMETABLE AND PROGRAMME OF WORK

The geophysical survey is scheduled to be undertaken in late September 2016 and report production will commence thereafter. Preliminary greyscale and interpretation plots shall be issued at the end of the survey. It is understood that the client is aware of the working methods and provision has been made to allow access to undertake the survey as required.

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APPENDIX 1 TECHNICAL DETAILS

MAGNETOMETER

The magnetometer differs from the 'active' magnetic susceptibility meter by being a 'passive' instrument. Rather than injecting a signal into the ground it detects slight variations in the Earth's magnetic field caused by cultural and natural disturbance (Clark).

Thermoremanent magnetism is produced when a material containing iron oxides is strongly heated. Clay for example has a high iron oxide content that in a natural state is weakly magnetic, when heated these weakly magnetic compounds become highly magnetic oxides that a magnetometer can detect.

The demagnetisation of iron oxides occurs above a temperature known as the Curie point; for example haematite has a Curie point of 675 Celsius and magnetite 565C. At the time of cooling the iron oxides become permanently re-magnetised with their magnetic properties re-aligned in the direction of the Earth's magnetic field (Gaffney and Gater). The direction of the Earth's magnetic field shifts over time and these subtle alignment differences can be recorded. Kilns, hearths, baked clay and ovens can reach Curie point temperatures, and are the strongest responses apart from large iron objects that can be detected. Other cultural anomalies that can be prospected include occupation areas, pits, ditches, furnaces, sunken feature buildings, ridge and furrow field systems and ritual activity (David, 2011). Commonly recorded anomalies include modern ferrous service pipes, field drainage pipes, removed field boundaries, perimeter fences and field boundaries.

Fluxgate Gradiometers

Fluxgate gradiometers are sensitive instruments that utilise two sensors placed in a vertical plane, spaced 1 metre apart. The sensor above reads the Earth's magnetic (background) response while the sensor below records the local magnetic field. Both sensors are carefully adjusted to read zero before survey commences at a 'zeroing' point, selected for its relatively 'quiet' magnetic background reading. When differences in the magnetic field strength occur between the two sensors a positive or negative reading is logged. Positive anomalies have a positive magnetic value and conversely negative anomalies have a negative magnetic value relative to the site's magnetic background. Examples of positive magnetic anomalies include hearths, kilns, baked clay, areas of burning, ferrous material, ditches, sunken feature buildings, furrows, ferrous service pipes, perimeter fences and field boundaries. Negative magnetic anomalies include earthwork embankments, plastic water pipes and geological features.

The instruments are usually held approximately 0.30m to 0.50m above the ground surface and can detect to a depth of between 1-2metres. Best practice dictates that the optimal direction of traverse in Britain is east to west.

Magnetic Anomalies

Linear trends

Linear trends can be both positive and negative magnetic responses. If they are broad, relatively weak or negative in nature they may be of agricultural or geological origin, for example periglacial channels, land drains or ploughing furrows. If the responses are strong positive trends they are more likely to be of archaeological origin. Archaeological settlement ditches tend to be rich in highly magnetic iron oxides that accumulate in them via anthropogenic activity and humic backfills. Conversely surviving banks will be negative in nature, the material is derived from subsoil deposits that is less likely to be positively magnetic. Curvilinear trends can also be recorded and are indicative of archaeological structures such as drip-gullies.

Discrete anomalies

Discrete anomalies appear as increased positive responses present within a localised area. They are caused by a general increase in the amount of magnetic iron oxides present within the humic back-fill of for example a rubbish pit.

'Iron spike' anomalies

These strong isolated dipolar responses are usually caused by ferrous material present in the topsoil horizon. They can have an archaeological origin but are usually introduced into the topsoil during manuring.

Areas of magnetic disturbance

An area of magnetic disturbance is usually associated with material that has been fired. For example areas of burning, demolition (brick) rubble or slag waste spreads. They can also be caused by ferrous material, e.g. close proximity to barbwire or metal fences and field boundaries, buried services, pylons and modern rubbish deposits.

APPENDIX 2 INSURANCE DETAILS

	Employers Liability Insurance	**Public Liability**	**Professional Indemnity**
Insurer	Towergate Insurance	Towergate Insurance	Towergate Insurance
Extent of Cover	£10,000,000	£5,000,000	£5,000,000
Policy Number	000436	000436	201101352/1236

APPENDIX 3 STAFF

The following members of staff have the skills and experience necessary to undertake the supervision of archaeological work as required in the brief. All have a wide range of experience on a variety of site types.

Archaeologist **Adam Leigh BA (Hons)**

Qualifications: University of Reading, BA (Hons) History (2008-2011)

Experience: Adam joined Britannia Archaeology in early 2015 as an Archaeologist and has four years experience within commercial archaeology. After graduating from Reading with First Class Honours, Adam began his career in archaeology processing finds recovered from sites across East Anglia. In 2012 he became responsible for supervising the processing of finds and working with specialists to produce post excavation assessments. Adam has also worked closely with archivists and has experience in preparing archives for deposition across the region. In his time within commercial archaeology he has learned a wide range of fieldwork skills on numerous sites within and beyond the East Anglia. Adam's main research interests lie in the archaeology and history of the medieval period that stemmed from his higher education studies.

Project Officer **Matthew Baker MA, BA (Hons)**

Qualifications: *Cardiff University, MA Archaeology (2011–2013)*
Cardiff University, BA (Hons) Archaeology (2008–2011)

Experience: Matthew joined Britannia Archaeology in 2016 as a Project Officer and has 3 years commercial archaeological experience. Matthew has been involved with numerous projects across the United Kingdom, including assisting in geophysical surveys for the Exmoor Mire Project, and the Damerham Archaeological Project. Since 2013 Matthew has been working in East Anglia where he has developed his skills in both Archaeological excavation and geophysics, undertaking numerous small to large scale projects; including monitoring, trial trenching, full excavation and gradiometer surveys across East Anglia and beyond. Matthews's research interests involve metal production technology with a focus on the Late Bronze Age – Early Iron Age transition.

Director **Dan McConnell BSc (Hons)**

Qualifications: University of Bournemouth, BSc (Hons) Archaeology (1995-1998)

Experience: Dan is a Director at Britannia Archaeology and has seventeen years commercial archaeological experience. He took part in several archaeological projects in the north of England from the late 1980's onwards, including the Wharram Percy Research Project and Mount Grace Priory excavations. Within commercial archaeology he has been involved with many small to large scale archaeological projects in the United Kingdom and

Ireland including major infrastructure schemes. Since relocating to East Anglia in 2004 he has carried out and managed several small to large scale excavations across the south and east of England. In 2008 Dan became a County Archaeologist for the Cambridgeshire County Council Historic Environment Team before joining Britannia in 2014. His main research interests focus on the early pre-historic period (in particular the Neolithic) of the British-Isles and late post-medieval archaeology.

Director **Martin Brook BA (Hons) PCIfA**

Qualifications: University of Leicester, BA (Hons) Archaeology (2003 – 2006)

Experience: Martin is a Director at Britannia Archaeology and has ten years commercial archaeological experience. He specialises in logistical project management, archiving and fieldwork. He has carried out numerous excavations and evaluations throughout East Anglia and the Midlands, and works closely with local and national museums when archiving sites. His research interests are focused on the British Iron age specifically funerary traditions in the south of England and in East Yorkshire. Martin specialises in metalwork finds from the period, specifically those associated with grave goods and personal adornment.

Director **Matthew Adams BA (Hons) ACIfA**

Qualifications: University of Durham, BA (Hons) Classical Studies (1997- 2000)

Experience: Matt is a Director of Britannia Archaeology and has ten years commercial archaeology experience. He was involved in several archaeological projects in the midlands from the mid 1990's onwards and in the North East of England as an undergraduate. Since 2007 he has been based in East Anglia where he has specialised in all areas of practical field work, running numerous projects both large and small. He is also an experienced surveyor, GIS and AutoCAD operator. Matt was an occasional contributor to the popular TV series Time Team and is experienced at presenting talks and seminars to interested organisations. His main research interests focus on transitional periods and include the late Iron Age and early Romano-British period, and the late Roman and early Anglo-Saxon period in Britain and the late Aegean Bronze Age in Crete.

APPENDIX 4 - SPECIALISTS

Prehistoric Pottery:	Ms Sarah Percival
Roman Pottery:	Ms Cathy Tester
Saxon and Medieval Pottery:	Ms Richenda Goffin
Post Medieval Pottery:	Ms Richenda Goffin
Flint:	Miss Justine Biddle
Animal Bone:	Dr Jim Morris and Dr Julia Cussans
Human Bone:	Dr Steph Leach
Environmental:	Ms Anne West
Pollen and Seeds:	Dr Steve Boreham
Charcoal and Wood:	Dr Roderick Bale
Soil Micromorphology:	Dr Steve Boreham
Carbon-14 Dating:	Archaeological Research Services Ltd
Conservation:	University of Leicester Archaeological Services (ULAS)
Metalwork and Leather:	University of Leicester Archaeological Services (ULAS)
Glass:	University of Leicester Archaeological Services (ULAS)
Small Finds:	University of Leicester Archaeological Services (ULAS)
Illustration:	Mr Dave Watt, Miss Charlotte Davies
Slag:	Ms Jane Cowgill
Geophysical Surveyors:	Dr Dave Bescoby
Air Photographic Assessments:	Alison Deegan (BSc)
Topographic Survey:	Mr Matt Adams (BA)
CAD:	Mr Dan McConnell & Mr Matt Adams (BA)
Coins & Medals:	British Museum, Department of Coins & Medals or Norfolk Museum Identification and Recording Service for Archaeological Finds

1:5000 0 300m

N

Site Boundary

NGR:	608300 235200
REF:	P1160
PROJECT:	LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT
DESCRIPTION:	GENERAL LOCATION PLAN
CLIENT:	COLCHESTER ARCHAEOLOGICAL TRUST

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W: www.britannia-archaeology.com

DATE:	OCT 2016	PLOT: A3	VERSION: 3
AUTHOR:	MJB	FIGURE:	1
APPROVED:	DPM		

N

Site Boundary

NGR: 608300 235200

REF: P1160

PROJECT: LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DESCRIPTION: GRID PLAN

CLIENT: COLCHESTER ARCHAEOLOGICAL TRUST

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DATE: OCT 2016

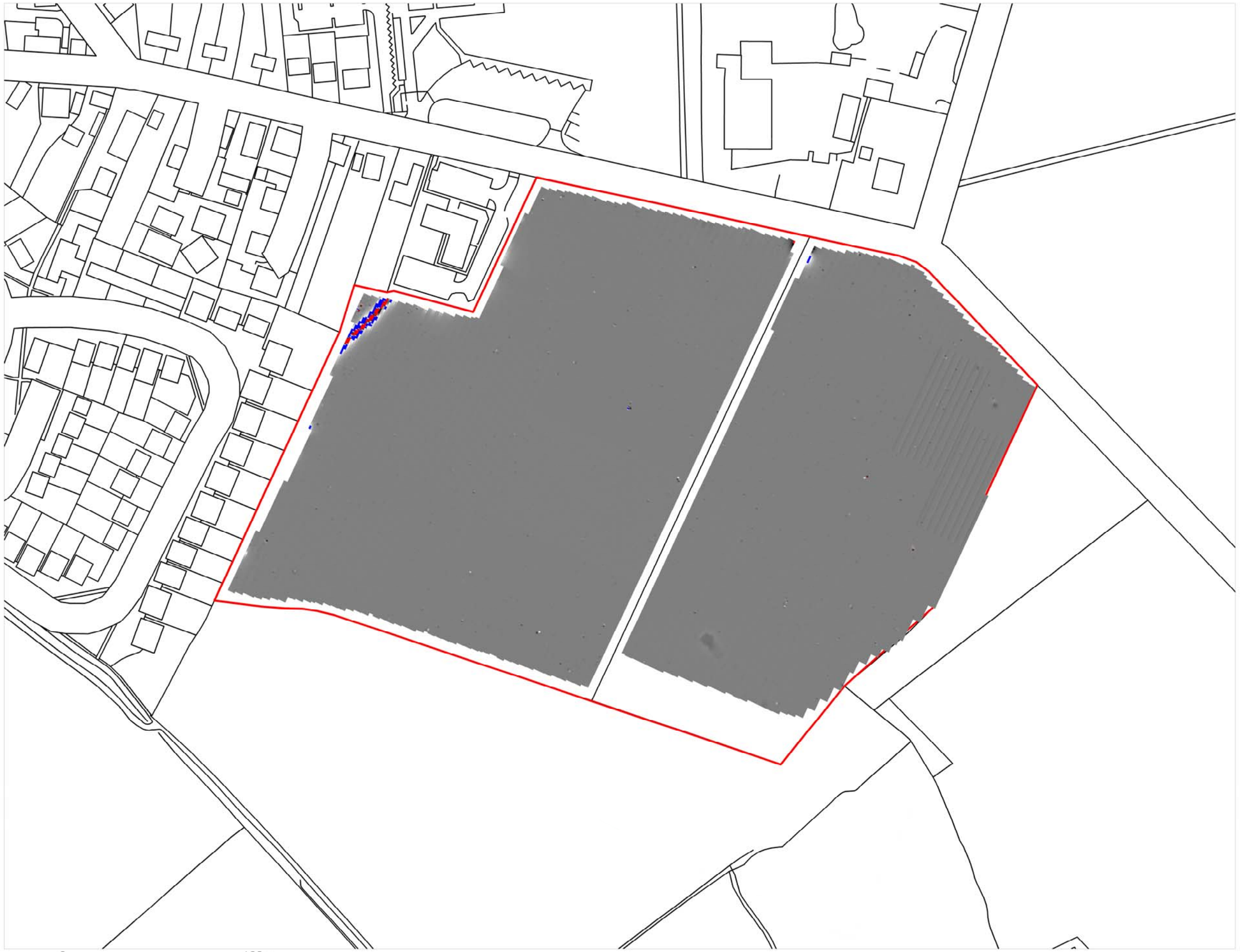
PLOT: A3

VERSION: 3

AUTHOR: MJB

APPROVED: DPM

FIGURE: 2



N

+100nT

-100nT

Site Boundary

NGR: 608300 235200

REF: P1160

PROJECT: LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DESCRIPTION: NON-PROCESSED DATA PLAN

CLIENT: COLCHESTER ARCHAEOLOGICAL TRUST

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DATE: OCT 2016

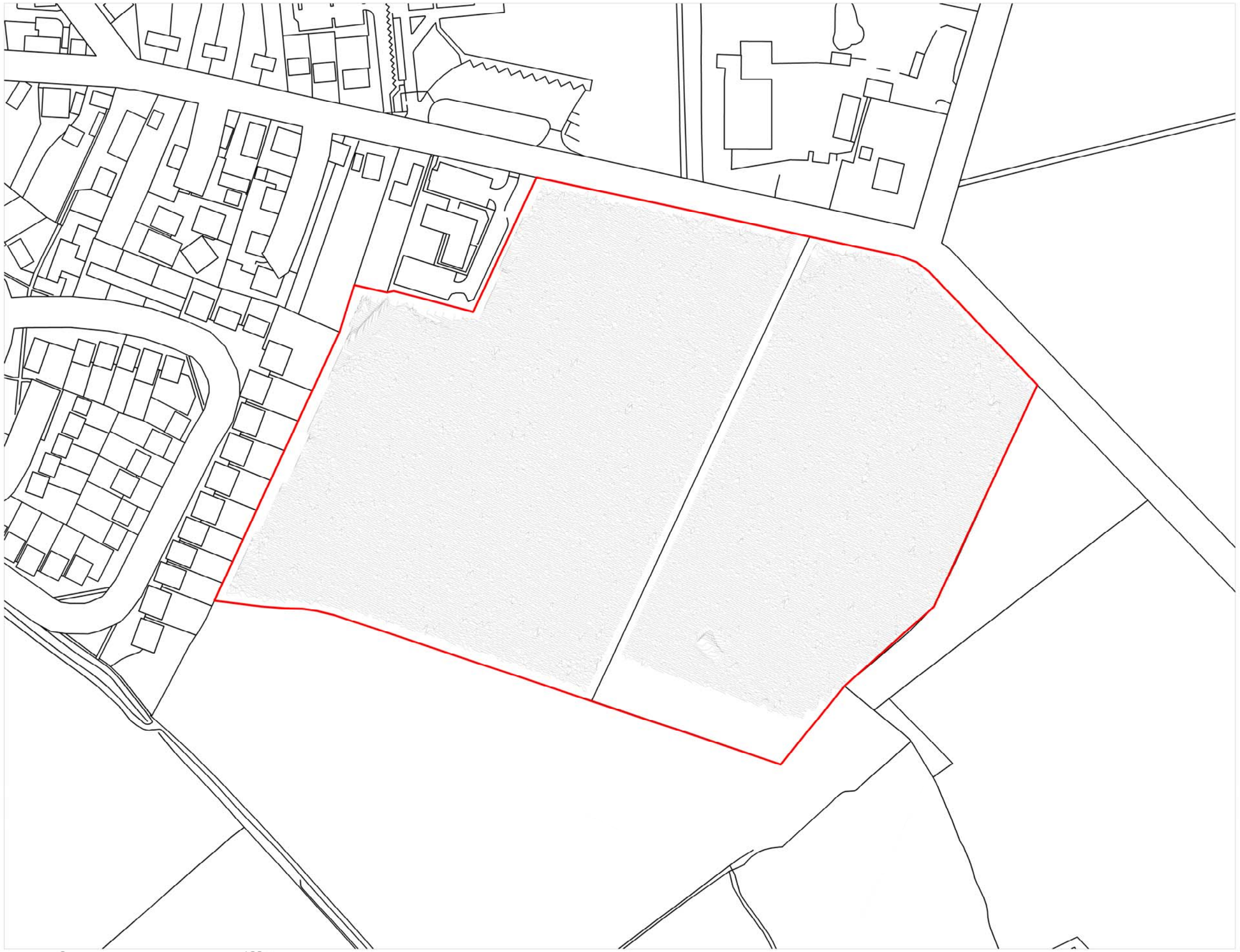
PLOT: A3

VERSION: 2

AUTHOR: MJB

APPROVED: DPM

FIGURE: 3



N

5 nT

0 nT

10nT/cm Scale Interval

Site Boundary

NGR: 608300 235200 | REF: P1160

PROJECT: LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DESCRIPTION: XY DATA PLOT

CLIENT: COLCHESTER ARCHAEOLOGICAL TRUST

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DATE: OCT 2016 | PLOT: A3 | VERSION: 2

AUTHOR: MJB

APPROVED: DPM

FIGURE: 4

N

+5nT

-5nT

Site Boundary

NGR: 608300 235200

REF: P1160

PROJECT: LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DESCRIPTION: MINIMAL PROCESSED DATA PLAN

CLIENT: COLCHESTER ARCHAEOLOGICAL TRUST

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DATE: OCT 2016

PLOT: A3

VERSION: 1

AUTHOR: MJB

APPROVED: DPM

FIGURE: 5

N

+1.56nT

-1.56nT

Site Boundary

NGR: 608300 235200

REF: P1160

PROJECT: LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DESCRIPTION: COMPRESSED DATA PLAN

CLIENT: COLCHESTER ARCHAEOLOGICAL TRUST

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DATE: OCT 2016

PLOT: A3

VERSION: 2

AUTHOR: MJB

APPROVED: DPM

FIGURE: 6

0 100m

1:2000

N

- Positive Anomaly Possible Archaeology
- Low Amplitude Positive Linear Ploughing
- Low Amplitude Magnetic Spread Geological Anomaly
- Increased Magnetic Distortion
- Increased Magnetic Response Possible Archaeology
- Increased Magnetic Response Modern Service
- Discrete Magnetic Dipolar Response
- Site Boundary

NGR: 608300 235200 | REF: P1160

PROJECT: LAND EAST OF CONSTABLE MEDICAL CENTRE, HEATH ROAD, EAST BERGHOLT

DESCRIPTION: INTERPRETATION

CLIENT: COLCHESTER ARCHAEOLOGICAL TRUST

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DATE: OCT 2016 | PLOT: A3 | VERSION: 2

AUTHOR: MJB | APPROVED: DPM

FIGURE: 7