

**Detailed Magnetometer Survey  
Land south of Crawley, West Sussex**

**NGR: 525830 133424  
(TQ 25830 33424)**

**ASE Project No: 7443  
ASE Report No. 2015099**

**By John Cook BSc (Hons) ACIFA**



**April 2015**

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<b>Date of Issue:</b>	April 2015		
<b>Revision:</b>			

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## **Abstract**

*Archaeology South-East was commissioned by Crawley Borough Council to conduct a magnetometer survey on a site totalling approximately c.1 hectare of land at South of Crawley, West Sussex. The work was undertaken on Tuesday 31st March 2015. The site consists of an area of woodland and grassland currently used as a campsite for the Guide Association.*

*Limited evidence for possible cut archaeological features (such as pits and ditches) was represented by discrete and linear positive anomalies. It is possible that a number of these anomalies may also relate to in filled natural features or more modern activity. Anomalies noted as thermoremnant and areas of magnetic debris may correspond to former industrial activity such as iron working. However, as noted previously, thermoremnant anomalies are permanently magnetic and therefore represented by dipolar anomalies in the same way as ferrous objects. The interpretation of possible industrial activity relies on the proximity of the site to known iron working sites as well as the relative weakness of the anomalies (50-500nT) compared to ferrous material (1000nT or more). Some of the features identified may be the result of more recent agricultural activity, infilling of natural features or combination of these factors.*

## **Statement of Indemnity**

*Geophysical survey is the collection of data that relate to subtle variations in the form and nature of soil and which relies on there being a measurable difference between buried archaeological features and the natural geology. Geophysical techniques do not specifically target archaeological features and anomalies noted in the interpretation do not necessarily relate to buried archaeological features. As a result, magnetic and earth resistance detail survey may not always detect sub-surface archaeological features. This is particularly true when considering earlier periods of human activity, for example those periods that are not characterised by sedentary social activity.*

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## **1.0 INTRODUCTION**

### **1.1 Site background**

1.1.1 Archaeology South-East was commissioned by Crawley Borough Council to conduct a magnetometer survey on a site totalling approximately c.1 hectare of land at South of Crawley, West Sussex (NGR. 525830 133424; Figure 1).

### **1.2 Geology and topography**

1.2.1 According to the British Geological Survey (BGS 2015a) the bedrock geology of the site predominately comprises Upper Tunbridge Wells sand - sandstone and mudstone. No superficial drift deposits are recorded at the site. No boreholes are recorded on the BGS Borehole Viewer (BGS 2015b) on or in the immediate vicinity of the site.

1.2.2 The site consists of an area of woodland and grassland currently used as a campsite for the Guide Association.

### **1.3 Aims of geophysical investigation**

1.3.1 The purpose of the geophysical survey was to detect any buried archaeological anomalies that might provide a measurable magnetic response.

### **1.4 Scope of report**

1.4.1 The scope of this report is to report on the findings of the survey. The project was conducted by John Cook with the assistance of Ed Blinkhorn. The project was managed by Darryl Palmer (fieldwork) and Jim Stevenson (post fieldwork).

## **2.0 ARCHAEOLOGICAL BACKGROUND**

The site lies to the south of the presently known wide zone of ancient iron working sites in Crawley (from just pre-Roman times to the 17th century). Ancient archaeological sites in and around the southernmost part of the Borough, recorded on the County Council's Historic Environment Record database, comprises a few concentrations of prehistoric flint tools and tool manufacturing waste, noticed on the surfaces of ploughed fields. (John Mills pers comm).

### **3.0 SURVEY METHODOLOGY**

#### **3.1 Geophysical survey**

3.1.1 A fluxgate gradiometer (magnetometry) survey was undertaken across two enclosures, as depicted on Figure 2 (NGR 525830 133424). The work was undertaken on Tuesday 31st March 2015 during cold, dry weather, and strong winds.

#### **3.2 Applied geophysical instrumentation**

3.2.1 The Fluxgate Gradiometer employed was the Bartington Instrumentation Grad 601-2. The Grad 601-2 has an internal memory and a data logger that store the survey data. This data is downloaded into a PC and is then processed in a suitable software package.

3.2.2 30m x 30m grids were set out using a GPS (see below). Each grid was surveyed with 1m traverses; samples were taken every 0.25m.

3.2.3 Data was collected along north-south traverses in a zigzag pattern beginning in the south west corner of each grid.

#### **3.3 Instrumentation used for setting out the survey grid**

3.3.1 The survey grid for the site was geo-referenced using a Leica Viva Smartrover. The GPS receiver collects satellite data to determine its position and uses the mobile phone networks to receive corrections, transmitting them to the RTK Rover via Bluetooth to provide a sub centimetre Ordnance Survey position and height. Each surveyed grid point has an Ordnance Survey position; therefore the geophysical survey can be directly referenced to the Ordnance Survey National Grid.

#### **3.4 Data processing**

3.4.1 All of the geophysical data processing was carried out using TerraSurveyor published by DW Consulting. Minimally processed data was produced using the following schedule of processing. Due to the very high positive readings of some of the magnetic disturbance, the values were replaced with a dummy value so as to avoid detrimentally affecting the dataset when further processed. The first process carried out upon the data was to apply a DESPIKE to the data set which removes the random 'iron spikes' that occur within fluxgate gradiometer survey data. A ZERO MEDIAN TRAVERSE was then applied to survey data. This removes stripe effects within grids and ensures that the survey grid edges match.

#### **3.5 Data presentation**

3.5.1 Data is presented using images exported from TerraSurveyor into Autocad software and inserted into the geo-referenced site grid. Data is presented as raw data, processed data, and interpolated data greyscale plot.

## **4.0 GEOPHYSICAL SURVEY RESULTS**

### **4.1 Description of site**

- 4.1.1 The survey area consisted of approximately c.1 hectare of an area of woodland and grassland currently used as a campsite for the Guide Association.

### **4.2 Survey limitations**

- 4.2.1 Physical obstructions encountered on site included trees, corrugated iron sheds and buildings (Figure 7a). Obstructions for each area are noted in the results. In addition, the effectiveness of magnetometer surveys depends on a contrast between the absolute magnetic susceptibility of the topsoil to the underlying subsoil (Clark 1996). Features may also be difficult to detect where there has been significant primary silting and development of significant overburden. Areas where physical obstructions form a barrier to survey, or a health and safety issue, have been omitted. The site lies over mudstone geology. An average response to magnetometer is possible, although results may be variable (English Heritage 2008).

### **4.3 Introduction to results**

- 4.3.1 The results should be read in conjunction with the figures at the end of this report (Figures 3, 4, 5, 6 and 7). The types of features likely to be identified are discussed below.
- 4.3.2 Positive Magnetic Anomalies  
Positive anomalies generally represent cut features that have been in-filled with magnetically enhanced material.
- 4.3.3 Negative Magnetic anomalies  
Negative anomalies generally represent buried features such as banks or compacted ground that have a lower magnetic signature in comparison to the background geology.
- 4.3.4 Magnetic Disturbance  
Magnetic disturbance is generally associated with interference caused by modern ferrous features such as fences and service pipes or cables.
- 4.3.5 Magnetic Debris  
Low amplitude magnetic debris consists of a number of dipolar responses spread over an area and is indicative of ground disturbance.
- 4.3.6 Dipolar Anomalies  
Dipolar anomalies are positive anomalies with an associated negative response. These anomalies are usually associated with discreet ferrous objects or may represent buried kilns or ovens.
- 4.3.7 Bipolar Anomalies  
Bipolar anomalies consist of alternating responses of positive and negative



magnetic signatures. Interpretation will depend on the strength of these responses; modern pipelines and cables typically produce strong bipolar responses.

#### 4.3.8 Thermoremanence

Thermoremanence is most commonly encountered through the magnetizing of clay through the firing process although stones and soils can also acquire thermoremanence.

4.3.9 Magnetism from ferromagnetic materials (iron) and from thermoremanence are forms of permanent magnetism and in most cases a magnetometer will not enable the separation of anomalies into the two categories. The interpretation of these anomalies into either category relies on field strength within an area. Magnetic anomalies due to iron normally rise and fall rapidly, forming a 'spike' in the data.

### 4.4 Interpretation of fluxgate gradiometer results

4.4.1 The interpretation of fluxgate gradiometer results should be read in conjunction with the figures at the end of the report. Specific examples of anomaly types are numbered in the figures and text but not all anomalies are numbered.

4.4.2 Evidence of possible cut features of archaeological origin was, in general, sparse and included the following described anomalies. Linear moderate positive anomalies, noted as A1, and likely to be due to cut features such as gullies. Several discrete moderate positive anomalies (A2) may represent cut features such as pits. However, these anomalies may also relate to in filled natural features.

4.4.3 Possible thermoremanant anomalies (A3) are noted within the survey data indicating areas of intense heating such as that resulting from a kiln or furnace. However, these anomalies may also relate to ferrous objects.

4.4.4 Areas of magnetic debris (A4) may relate to a scattering of near surface ferrous material, ground disturbance or made ground. These areas may relate to the thermoremanant anomalies noted.

4.4.5 Dipolar anomalies (A5, A6) are observed across the area. These anomalies may relate to thermoremanent material such as that due to kilns and furnaces (A5) but in most cases are probably related to near surface ferrous objects (A6).

4.4.6 Magnetic disturbance (A7) is noted in the south of the survey area and is likely to relate to nearby buildings.

## **5.0 CONCLUSIONS**

### **5.1 Discussion**

- 5.1.1 Limited evidence for possible cut archaeological features (such as pits and ditches) was represented by discrete and linear positive anomalies. It is possible that a number of these anomalies may also relate to in filled natural features or more modern activity.
- 5.1.2 Anomalies noted as thermoremnant and areas of magnetic debris may correspond to former industrial activity such as iron working. However, as noted previously, thermoremnant anomalies are permanently magnetic and therefore represented by dipolar anomalies in the same way as ferrous objects. The interpretation of possible industrial activity relies on the proximity of the site to known iron working sites as well as the relative weakness of the anomalies (50-500nT) compared to ferrous material (1000nT or more).
- 5.1.3 Some of the features identified may be the result of more recent agricultural activity, infilling of natural features or combination of these factors.

## **Bibliography**

BGS 2015a. *Geology of Britain Viewer*

<http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html?src=topNav>

Accessed 1<sup>st</sup> April 2015

BGS 2015b. British Geological Survey, *Borehole Scans*

<http://www.bgs.ac.uk/data/boreholescans/home.html>

Accessed 1<sup>st</sup> April 2015

Clark, A. 1996. *Seeing Beneath the Soil*. (2<sup>nd</sup> edition). London: Routledge.

English Heritage 2008 *Geophysical Survey in Archaeological Field Evaluation 2<sup>nd</sup> Edition* Swindon: English Heritage

## **Acknowledgements**

Archaeology South-East would like to thank Crawley Borough Council for commissioning the survey.

## HER Summary

Identification Name and Address	Detailed Magnetometer Survey Land south of Crawley, West Sussex				
County, District &/or Borough	West Sussex				
OS Grid Refs.	525830 133424				
Geology	Upper Tunbridge Wells sand - sandstone and mudstone				
Arch. South-East Project Number	7443				
Type of Fieldwork					<b>Survey</b>
Type of Site	<b>Green Field</b>				
Dates of Fieldwork					31 <sup>st</sup> April 2015
Sponsor/Client	Crawley Borough Council				
Project Manager	Darryl Palmer				
Project Supervisor	John Cook				
Period Summary					
<p>Summary</p> <p><i>Archaeology South-East was commissioned by Crawley Borough Council to conduct a magnetometer survey on a site totalling approximately c.1 hectare of land at South of Crawley, West Sussex. The work was undertaken on Tuesday 31st March 2015. The site consists of an area of woodland and grassland currently used as a campsite for the Guide Association.</i></p> <p><i>Limited evidence for possible cut archaeological features (such as pits and ditches) was represented by discrete and linear positive anomalies. It is possible that a number of these anomalies may also relate to in filled natural features or more modern activity. Anomalies noted as thermoremnant and areas of magnetic debris may correspond to former industrial activity such as iron working. However, as noted previously, thermoremnant anomalies are permanently magnetic and therefore represented by dipolar anomalies in the same way as ferrous objects. The interpretation of possible industrial activity relies on the proximity of the site to known iron working sites as well as the relative weakness of the anomalies (50-500nT) compared to ferrous material (1000nT or more). Some of the features identified may be the result of more recent agricultural activity, infilling of natural features or combination of these factors.</i></p>					

## OASIS Form

**OASIS ID: archaeo16-207922**

### Project details

Project name	Detailed Magnetometer Survey Land south of Crawley, West Sussex
Short description of the project	Archaeology South-East was commissioned by Crawley Borough Council to conduct a magnetometer survey on a site totalling approximately c.1 hectare of land at South of Crawley, West Sussex. The work was undertaken on Tuesday 31st March 2015. The site consists of an area of woodland and grassland currently used as a campsite for the Guide Association. Limited evidence for possible cut archaeological features (such as pits and ditches) was represented by discrete and linear positive anomalies. It is possible that a number of these anomalies may also relate to in filled natural features or more modern activity. Anomalies noted as thermoremnant and areas of magnetic debris may correspond to former industrial activity such as iron working. However, as noted previously, thermoremnant anomalies are permanently magnetic and therefore represented by dipolar anomalies in the same way as ferrous objects. The interpretation of possible industrial activity relies on the proximity of the site to known iron working sites as well as the relative weakness of the anomalies (50-500nT) compared to ferrous material (1000nT or more). Some of the features identified may be the result of more recent agricultural activity, infilling of natural features or combination of these factors.
Project dates	Start: 31-03-2015 End: 31-03-2015
Previous/future work	Not known / Not known
Any associated project reference codes	7443 - Contracting Unit No.
Type of project	Field evaluation
Current Land use	Grassland Heathland 5 - Character undetermined
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Cemetery
Prompt	Planning condition
Position in the	Not known / Not recorded

planning process

Solid geology (other)	Upper Tunbridge Wells sand - sandstone and mudstone
Drift geology (other)	None
Techniques	Magnetometry

#### Project location

Country	England
Site location	WEST SUSSEX CRAWLEY CRAWLEY Land south of Crawley, West Sussex
Postcode	RH11 9TQ
Study area	1.00 Hectares
Site coordinates	TQ 25830 33424 51.0857700423 -0.203223891613 51 05 08 N 000 12 11 W Point

#### Project creators

Name of Organisation	Archaeology South-East
Project brief originator	west sussex county council
Project design originator	Archaeology South-East
Project director/manager	Darryl Palmer/Jim Stevenson
Project supervisor	John Cook
Type of sponsor/funding body	Crawley Borough Council
Name of sponsor/funding body	Crawley Borough Council

#### Project archives

Digital Archive recipient	n/a
Digital Contents	"Survey"
Digital Media available	"Geophysics","Images raster / digital photography","Survey","Text"

Paper Archive recipient	n/a
Paper Contents	"Survey"
Paper Media available	"Miscellaneous Material", "Photograph", "Plan", "Report", "Survey", "Unpublished Text"

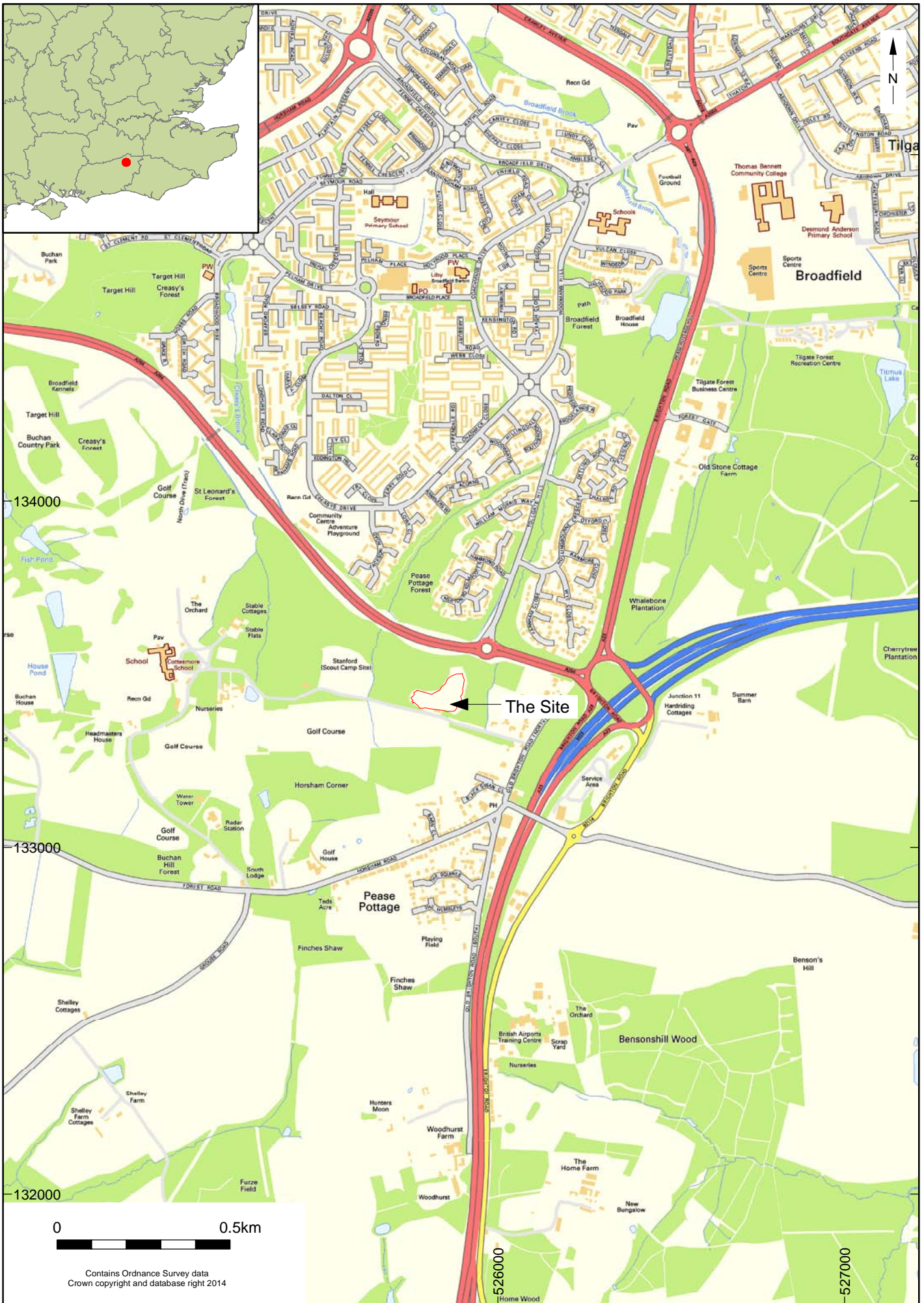
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**Project bibliography 1**

Publication type	Grey literature (unpublished document/manuscript)
Title	Detailed Magnetometer Survey Land south of Crawley, West Sussex
Author(s)/Editor(s)	Cook, J.
Other bibliographic details	2015099
Date	2015
Issuer or publisher	ASE
Place of issue or publication	Portslade

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Entered on	1 April 2015

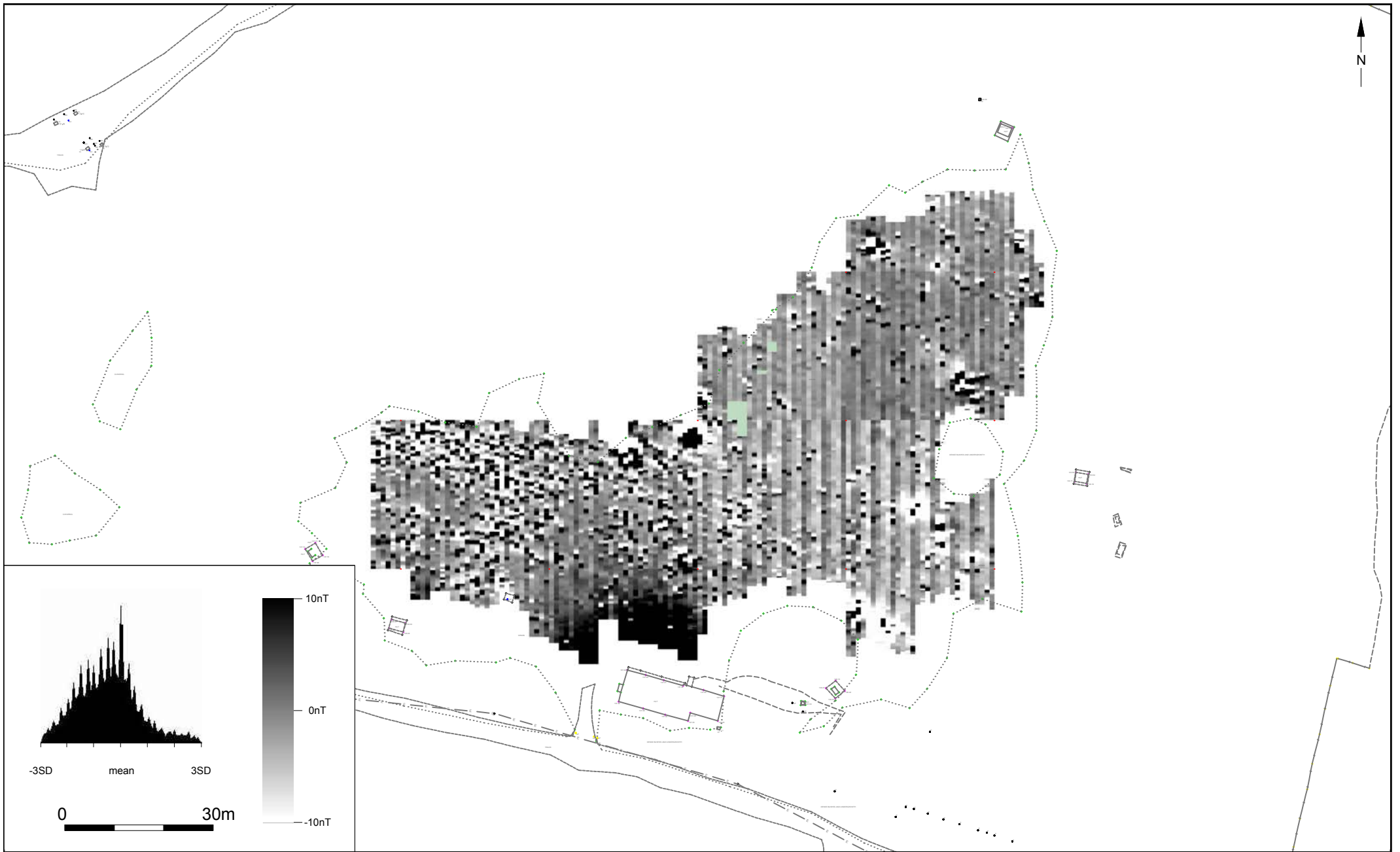


© Archaeology South-East		Land south of Crawley, West Sussex	Fig. 1
Project Ref: 7443	Mar 2015	Site location	
Report Ref: 2015099	Drawn by: JC		

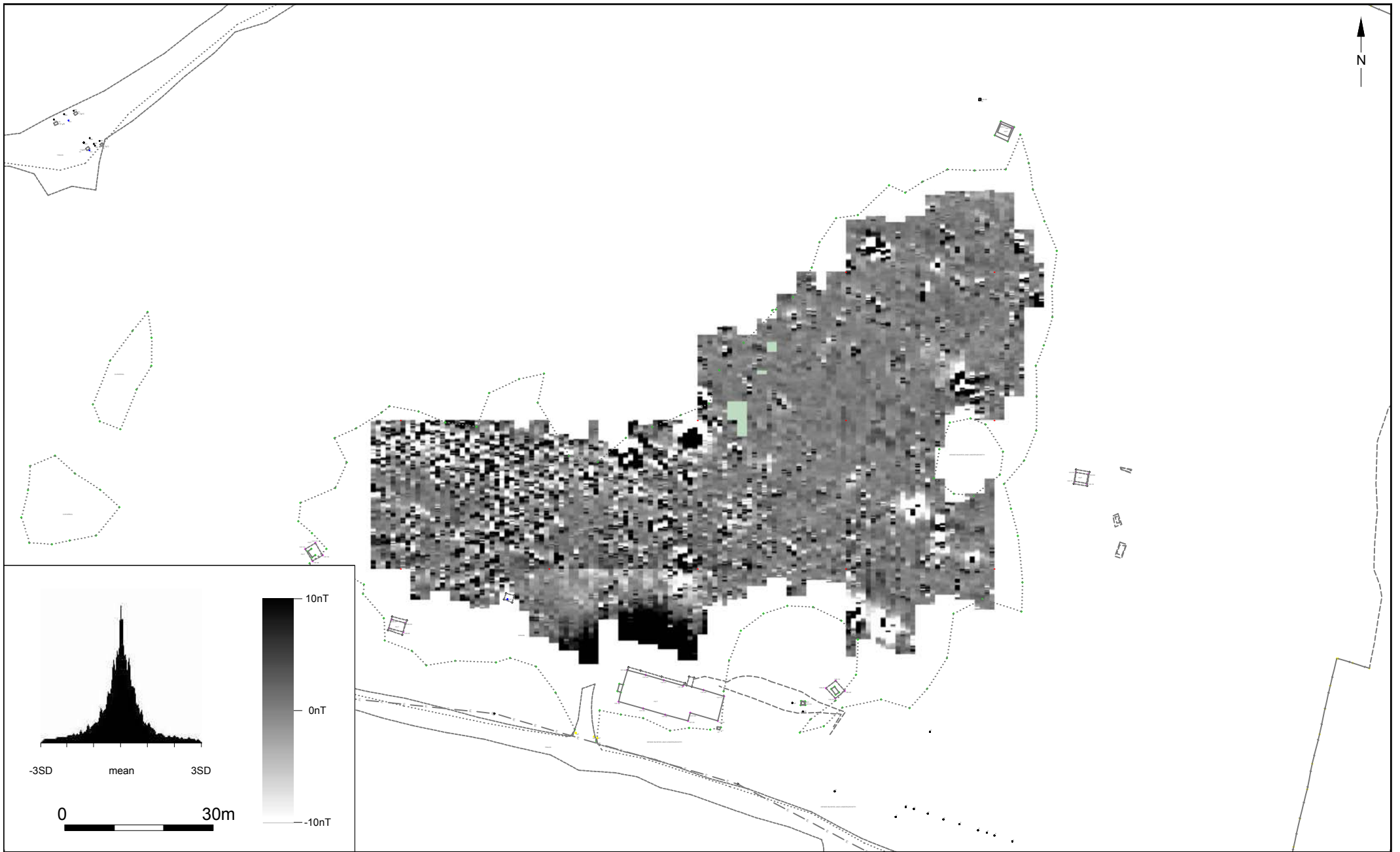




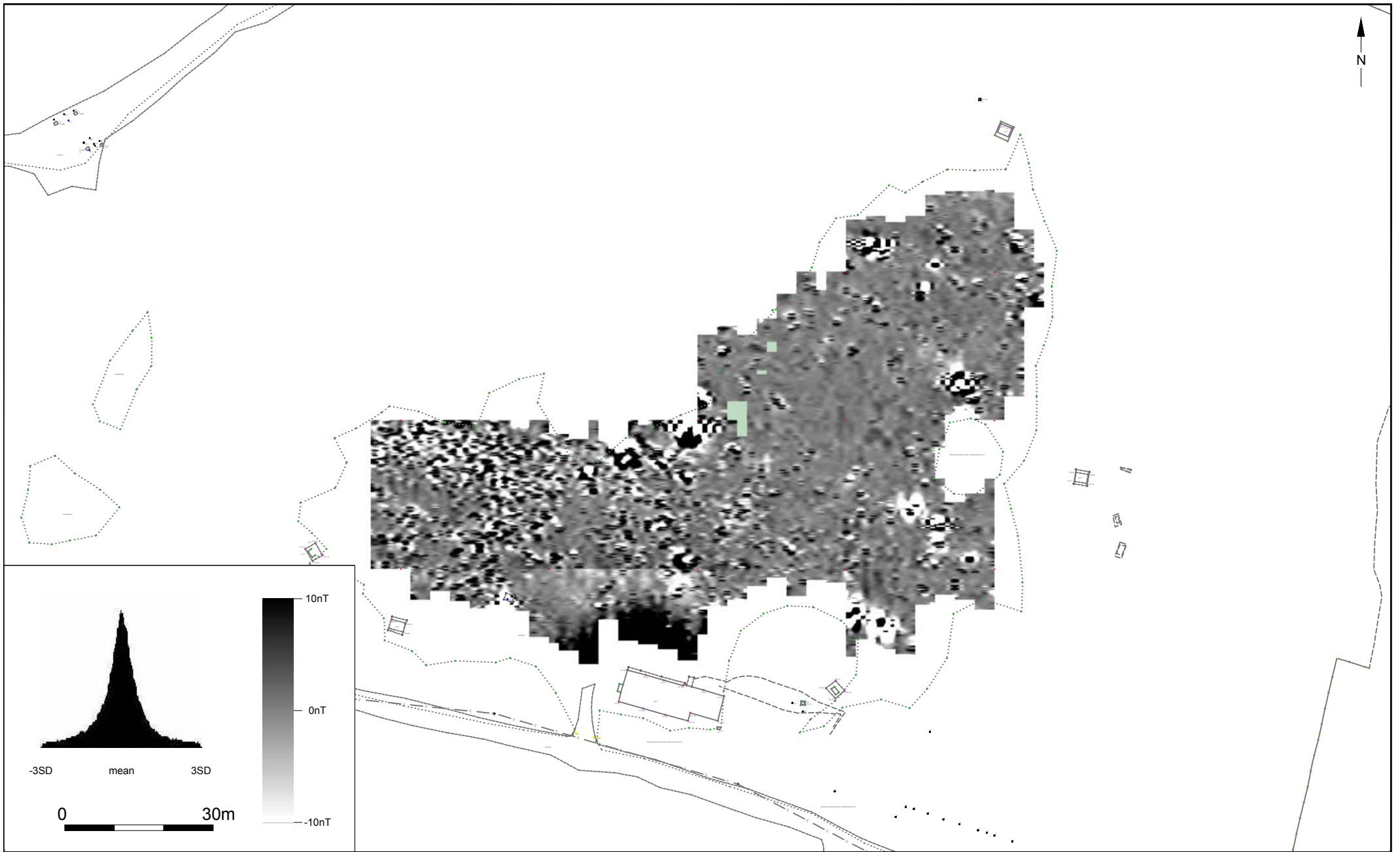
© Archaeology South-East		Land south of Crawley, West Sussex	Fig.2
Project Ref: 7443	Apr 2015	Location of geophysics survey	
Report Ref: 2015099	Drawn by: JC		



© Archaeology South-East		Land south of Crawley, West Sussex	Fig.3
Project Ref: 7443	Apr 2015	Raw data	
Report Ref: 2015099	Drawn by: JC		



© Archaeology South-East		Land south of Crawley, West Sussex	Fig.4
Project Ref: 7443	Apr 2015	Processed data	
Report Ref: 2015099	Drawn by: JC		



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Land south of Crawley, West Sussex

Project Ref: 7443

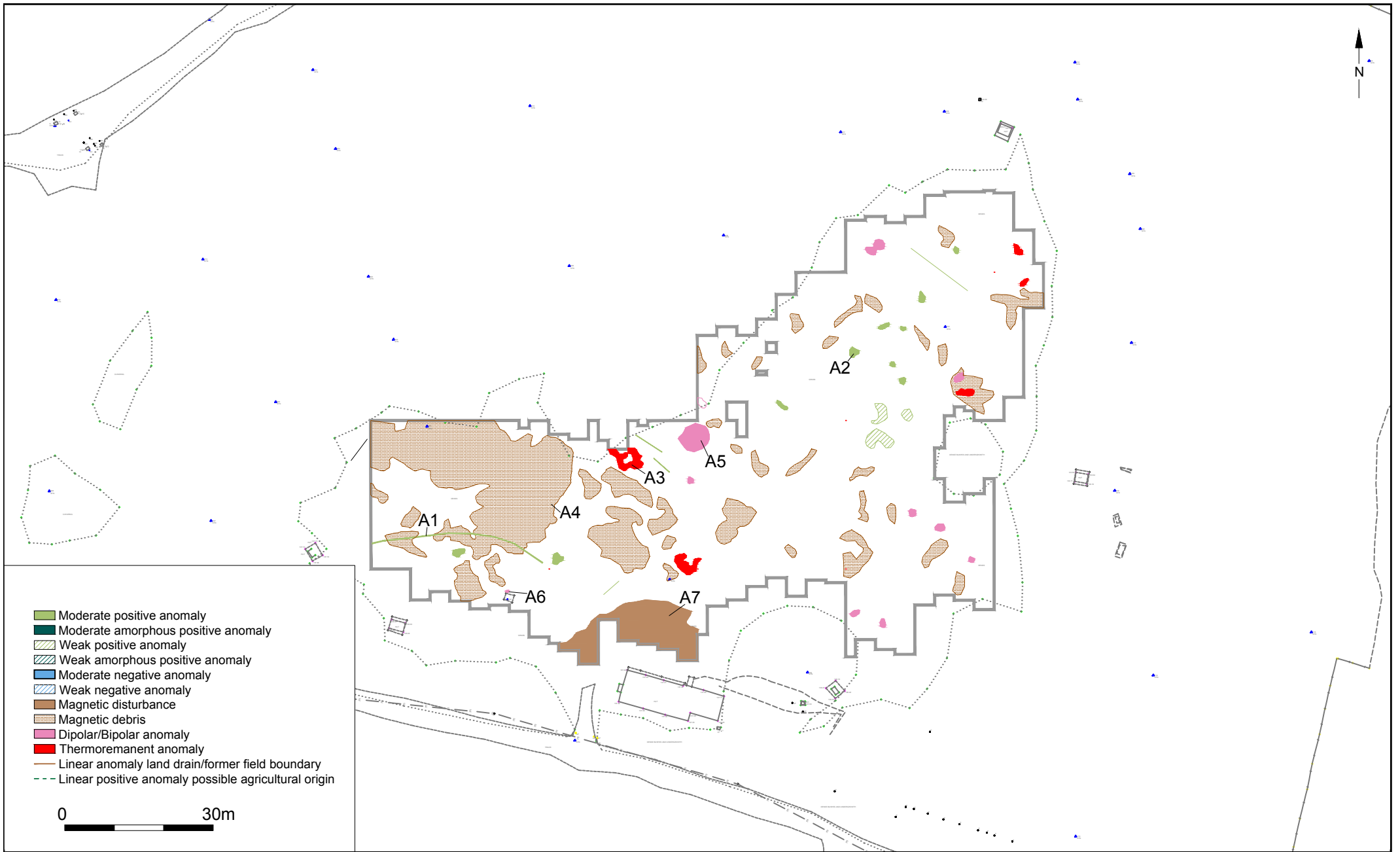
Apr 2015

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Interpolated data

Fig.5



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Project Ref: 7443	Apr 2015	Interpretation		
Report Ref: 2015099	Drawn by: JC			



Fig. 7a Obstructions



Fig. 7b Site shot facing south east. Buildings



Fig. 7c corrugated iron sheds

<b>© Archaeology South-East</b>		Land south of Crawley, West Sussex	Fig. 7
Project Ref: 7443	Apr 2015	Site photographs	
Report Ref: 2015099	Drawn by: JC		

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