

**Detailed Magnetometer Survey Report
Land off Rectory Road
Swanton Morley, Norfolk**

NGR: TG 01750 17260

**ASE Project No: 8101
OASIS ID: archaeol6-165844**

ASE Report No: 2013318

By Catherine Douglas

December 2013

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Abstract

Archaeology South-East was commissioned by Hopkins Homes Ltd to undertake a detailed fluxgate gradiometer survey on land off Rectory Road, Swanton Morley, Norfolk.

The survey took place between the 25th and the 28th of November 2013. The survey area covered approximately 3 hectares and comprised a crop field bounded by hedgerows. Possible archaeological features were represented by discrete and linear positive anomalies. Three areas of burning were also identified.

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 (ASE) was commissioned by Hopkins Homes Ltd to conduct a Magnetometer survey over land off Rectory Road, Swanton Morley, Norfolk, hitherto referred to as 'the survey area' (NGR TG 01750 17260; Figure 1).

1.2.2 The survey was undertaken as a pre-planning prospection exercise, the results of which may be used to inform a decision to purchase the site and the design of any subsequent planning application that may be submitted.

1.2.3 A WSI was prepared by ASE and submitted to and approved by Norfolk County Council (NCC) in advance of fieldwork.

1.2 Geology and topography

1.2.1 Swanton Morley is a small village located in Breckland District, approximately three miles north-east of Dereham and four miles east of Gressenhall.

1.2.2 According to the British Geological Survey (BGS 2012) the site straddles a boundary in the superficial geology, which in the eastern part of the site, extending towards the village, comprises glacio-fluvial deposits (sand and gravel) of Mid-Pleistocene date, while the remainder of the site lies on glacial till (diamicton). The underlying bedrock comprises undifferentiated chalk of the Lewes Nodular Chalk Formation and Seaford Chalk Formation.

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 fieldwork was conducted by John Cook and Catherine Douglas; and project managed by Neil Griffin (fieldwork) and Dan Swift (post fieldwork).

2.0 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 The following archaeological background information is taken from the Written Scheme of Investigation for the geophysical survey (WSI; ASE 2013a).

2.1.2 There are no known sites of archaeological interest within the site itself, although this may well be a reflection of a lack of any detailed archaeological fieldwork in the immediate area, rather than a genuine absence of any remains. Finds of Mesolithic and Neolithic flint tools have been made from gravel quarries in the area, suggesting that the gravel terraces of the River Wensum were attractive to early settlers, while a number of crop mark ring-ditches, suggestive of plough-levelled Bronze Age round barrows have been recorded to the east of the village. Finds of high-status Iron Age metalwork have been made in the parish, suggesting that a significant settlement may lie nearby, while an early Roman fort/ temporary camp is located overlooking the River Wensum and was probably in use at the time of the Boudican uprising of AD60/ 61.

2.3.2 The Church of All Saints, a Grade 1 Listed designated heritage asset (UID 220784), lies to the east of the survey area. Begun before 1379 and with 15th century additions, the church lies to the north of an area of earthworks that have been interpreted as a possible medieval manorial centre.

3.0 SURVEY METHODOLOGY

3.1 Geophysical survey

3.1.1 A fluxgate gradiometer (magnetometry) survey was undertaken in the area depicted in Figures 1 and 2 (NGR TG 01750 17260).

3.1.2 The field work was undertaken between November 25th-28th 2013 when the weather was mainly cold and dry and damp and foggy on the 27th.

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 using Virtual Reference Stations (VRS). 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 Norfolk Historic Environment Service Requirements

3.4.1 The following is taken from the Norfolk County Council Generic Brief for Archaeological Evaluation by Magnetometer Survey:

“Each day on site, the survey team must survey one grid twice, to demonstrate the repeatability of the results. The grid should not be surveyed twice in quick succession, but should be repeated at a later point in the day. The results of both surveys of the grids must be presented as an appendix to the site report as raw data.” (Hamilton, 2012)

In order to comply with this requirement Grids A8 and A20 were repeated 6 hours after they were surveyed. Grid R1 (initially A21) was the repeat of grid A8, and grid R2 (initially B3) was the repeat of grid A20.

3.5 Data processing

3.5.1 All of the geophysical data processing was carried out using Geoplot V3 published by Geoscan Research. 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. Data was clipped with parameters of -10 to +10. A ZERO MEAN TRAVERSE was then applied to survey data. This removes stripe effects within grids and ensures that the survey grid edges match. Each grid square was processed individually. The grids affected by magnetic disturbance on the South-east edge of the excavation area were given a zero mean traverse threshold of 10 to -10, and the remaining grid squares were given a 5 to -5 threshold. Figure 4 displays the processed survey data.

3.6 Data presentation

3.6.1 Data is presented using images exported from Geoplot into AutoCAD software and inserted into the geo-referenced site grid. Data is presented as raw data (Figure 3), processed data greyscale plot (Figure 4) and interpretation (Figure 5).

4.0 GEOPHYSICAL SURVEY RESULTS (Figures 4 and 5)

4.1 Description of site

4.1.1 The survey area consisted of part of a single field of approximately three hectares currently under a crop of sugar beet. The field is bounded to the north by Rectory Road and agricultural land beyond this, the village to the east, agricultural land and residential development to the west, and paddocks/ pasture to the south.

4.2 Survey limitations

4.2.1 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.

4.3 Introduction to results

4.3.1 The results should be read in conjunction with the figures at the end of this report. 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 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.

4.4 Interpretation of fluxgate gradiometer results (Figure 5)

Magnetometry results

4.4.1 Evidence of archaeological features included a linear moderate positive anomaly (1) which may indicate a ditch and a scattering of surrounding discrete moderate positive anomalies (2) which may indicate cut features such as pits.

4.4.2 Four linear moderate positive anomalies (3) are likely to represent axial field boundary ditches perpendicular and parallel to Rectory Road. A similar arrangement of long fields stretching between Rectory Road and Harkers Lane to the south is evident at least as early as the 1st edition Ordnance Survey (<http://digimap.edina.ac.uk/digimap/home> accessed 9th December 2013, not reproduced) to the west and the anomalies detected may therefore represent a former, more easterly continuation of this arrangement.

4.4.3 A linear positive moderate anomaly (4) probably also indicates a ditch. It lines up with an boundary depicted on Ordnance Survey mapping from at least 1880, but gone by the 1970s (*ibid.*).

4.4.4 Two parallel linear weak positive anomalies (5) may indicate in filled features such as plough marks.

4.4.5 A linear discrete moderate positive anomaly (6) reflects the magnetic change between the ploughed field and the unploughed field margin.

4.4.6 A scattering of dipolar anomalies across the site probably indicate discreet ferrous objects on the surface, probably relating to agricultural activity. However, three roughly equally spaced dipolar anomalies arranged in a line (7) have a different magnetic signature than the obviously ferrous metal features, which may indicate thermoremanent features such as buried kilns or hearths.

4.4.7 An area of magnetic disturbance (8) may mask underlying features with a weaker magnetic signature in the southern end of the field. This probably related to the paddocks and workshops south of the field. Magnetic disturbance along the southeast edge of the field related to the south-east hedgerow and road.

4.4.8 A small area of magnetic debris (9) probably related to a cluster of small ferrous objects on the surface of the ground possibly resulting from modern agricultural activity.

5.0 DISCUSSION AND CONCLUSIONS

- 5.1 Evidence of archaeological features was successfully detected throughout the magnetic survey. Possible archaeological features were mostly represented by discrete and linear positive anomalies representative of cut features such as ditches and pits, whilst three discrete areas of burning were also identified. Possible plough marks were indicated by linear weak positive anomalies.
- 5.2 Other anomalies identified consisted of magnetic disturbance relating to the surrounding hedgerows and buildings, and the area where the edge of the crop field met grass.
- 5.3 With the exception of linear moderate positive anomaly (1), the linear anomalies identified within the survey are probably ephemeral. This may be due to the features themselves being short-lived, overburden between the magnetometer and the feature, the result of more recent agricultural activity, infilling of natural features or a combination of these. For this reason the geophysics results would ideally need to be tested by invasive techniques (e.g. targeted trial trenching) in order to assess the nature of the anomalies effectively.

Bibliography

ASE 2013 *Written Scheme of Investigation for Geophysical Survey at Land off Rectory Road Swanton Morley Norfolk*

ASE 2013b *Archaeological Watching Brief Report for Land off Rectory Road, Swanton Morley, Norfolk*, unpublished document

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Hamilton K. Norfolk County Council 2012 *Generic Brief for Archaeological Evaluation by Magnetometer Survey* NCC Historic Environment Service

Acknowledgements

Archaeology South-East would like to thank Hopkins Homes Ltd for commissioning the survey and James Albone, Norfolk Historic Environment Service monitoring officer for his guidance throughout the project. Justin Russell produced the figures for this report.

HER Summary Form

Site Code	-					
Identification Name and Address	Land off Rectory Road, Swanton Morley, Norfolk					
County, District &/or Borough	Norfolk					
OS Grid Refs.	01750 17260					
Geology	Glacio-fluvial Deposits (sand and gravel) of mid-Pleistocene date, and glacial Till (diamicton) overlying Lewes Nodular Chalk Formation and Seaford Chalk Formation.					
Arch. South-East Project Number	8101					
Type of Fieldwork					Survey	
Type of Site	Green Field					
Dates of Fieldwork				26 th -28 th November 2013		
Sponsor/Client	Hopkins Homes Ltd					
Project Manager	Neil Griffin					
Project Supervisor	John Cook					
Period Summary						
<p>Summary</p> <p>Archaeology South-East was commissioned by Hopkins Homes Ltd to undertake a detailed fluxgate gradiometer survey on land off Rectory Road, Swanton Morley, Norfolk. The survey took place between the 25th and the 28th of November 2013. The survey area covered approximately 3 hectares and comprised a crop field bounded by hedgerows. Possible archaeological features were represented by discrete and linear positive anomalies. Three areas of burning were also identified.</p>						

OASIS form

OASIS ID: archaeol6-165844

Project details

Project name	Detailed Magnetometer Survey at Land off Rectory Road Swanton Morley, Norfolk
Short description of the project	Archaeology South-East was commissioned by Hopkins Homes Ltd to undertake a detailed fluxgate gradiometer survey on land off Rectory Road, Swanton Morley, Norfolk. The survey took place between the 25th and the 28th of November 2013. The survey area covered approximately 3 hectares and comprised a crop field bounded by hedgerows. Possible archaeological features were represented by discrete and linear positive anomalies. Three areas of burning were also identified.
Project dates	Start: 25-11-2013 End: 28-11-2013
Previous/future work	No / No
Type of project	Recording project
Site status	None
Current Land use	Cultivated Land 2 - Operations to a depth less than 0.25m
Investigation type	"Geophysical Survey"
Prompt	Research
Solid geology (other)	Lewes nodular chalk formation and Seaford chalk formation.
Drift geology	GLACIAL SAND AND GRAVEL
Techniques	Magnetometry

Project location

Country	England
Site location	NORFOLK BRECKLAND SWANTON MORLEY Land off Rectory Rad, Swanton Morley
Study area	3.00 Hectares
Site coordinates	TG 01750 17260 52 0 52 42 53 N 000 59 14 E Point

Project creators

Name of Organisation	Archaeology South-East
Project brief originator	Archaeology South-East
Project design originator	Archaeology South-East

Project director/manager Neil Griffin
Project supervisor John Cook
Name of sponsor/funding body Hopkins Homes Ltd

Project archives

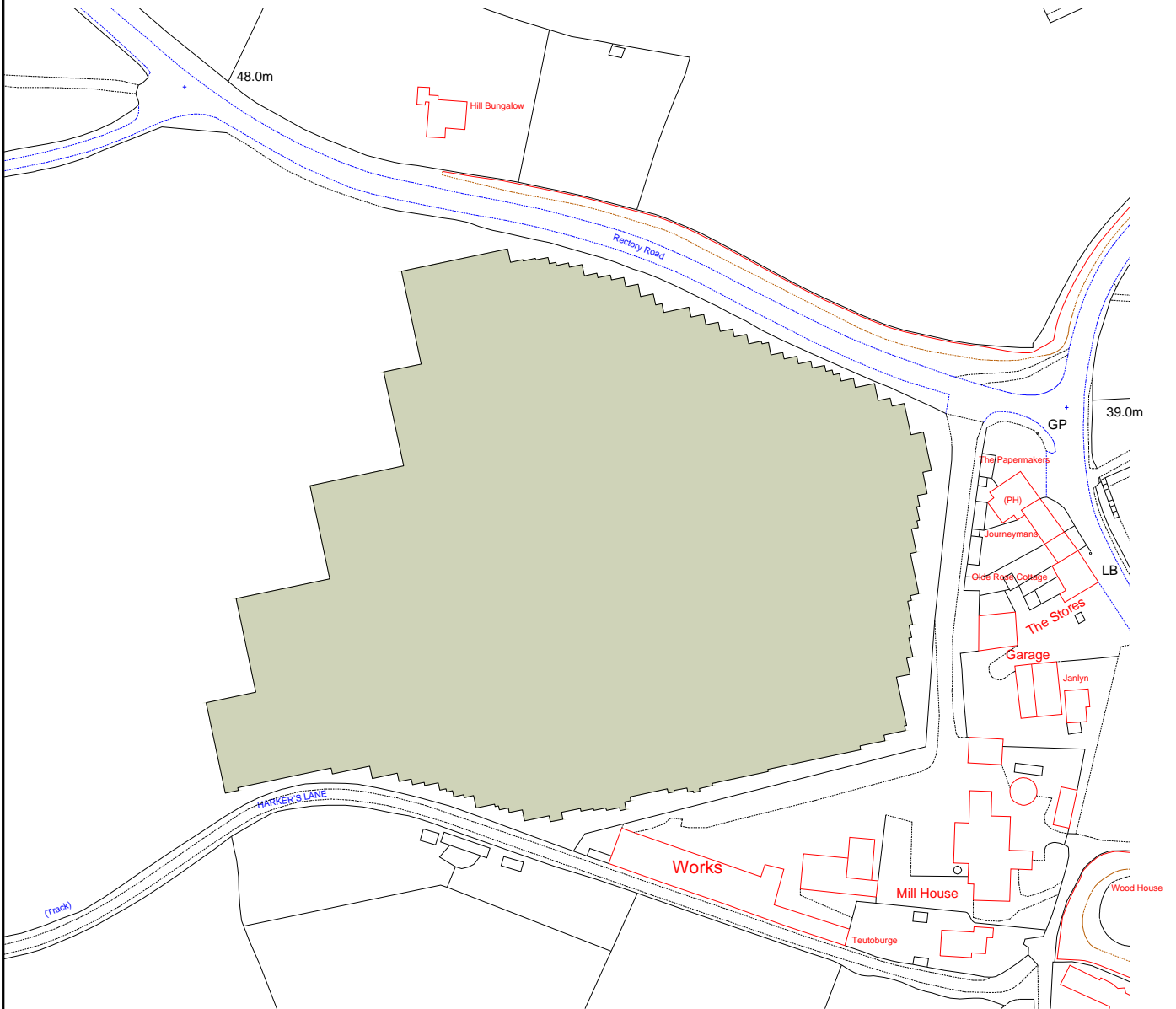
Digital Archive recipient Norfolk Museum Services
Digital Contents "Survey"
Digital Media available "Geophysics", "Images raster / digital photography"
Paper Archive recipient Norfolk Museum Services
Paper Media available "Report"

Entered by Catherine Douglas (catherine.douglas@ucl.ac.uk)
Entered on 2 December 2013



© Archaeology South-East		Swanton Morley	Fig. 1
Project Ref: 8101	Dec 2013	Site location	
Report Ref: 2013318	Drawn by: JLR		

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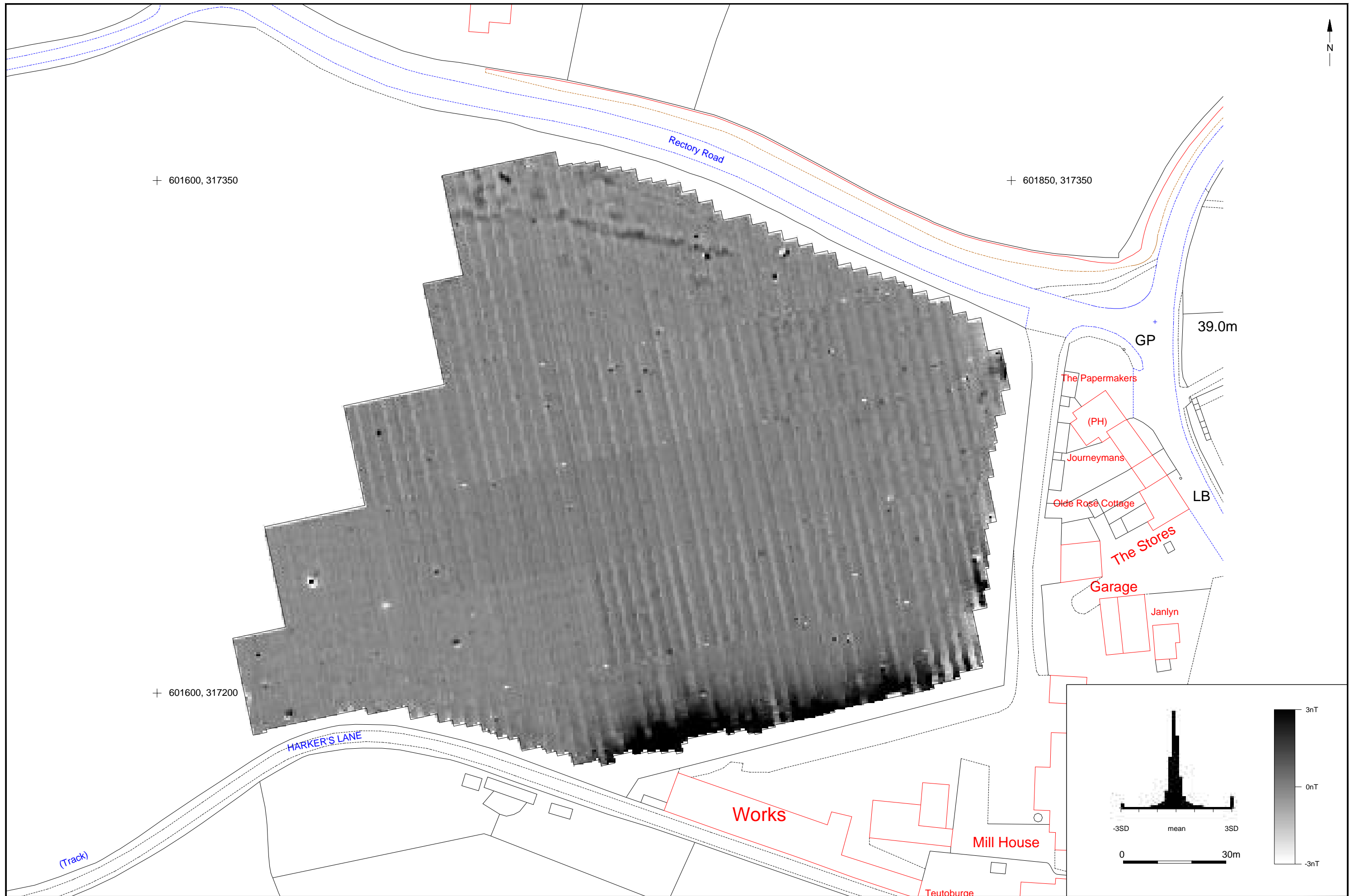


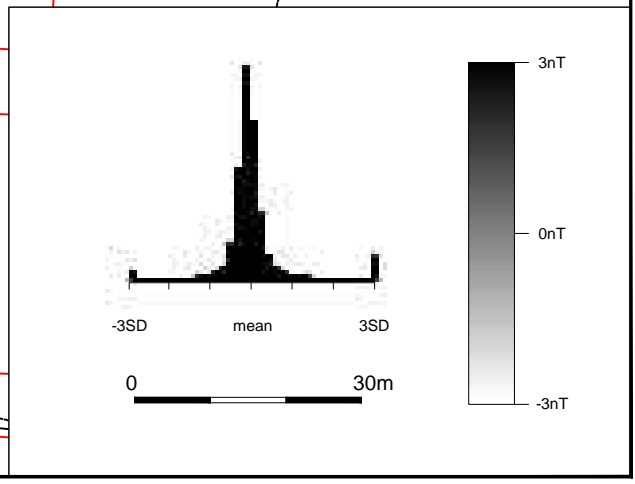
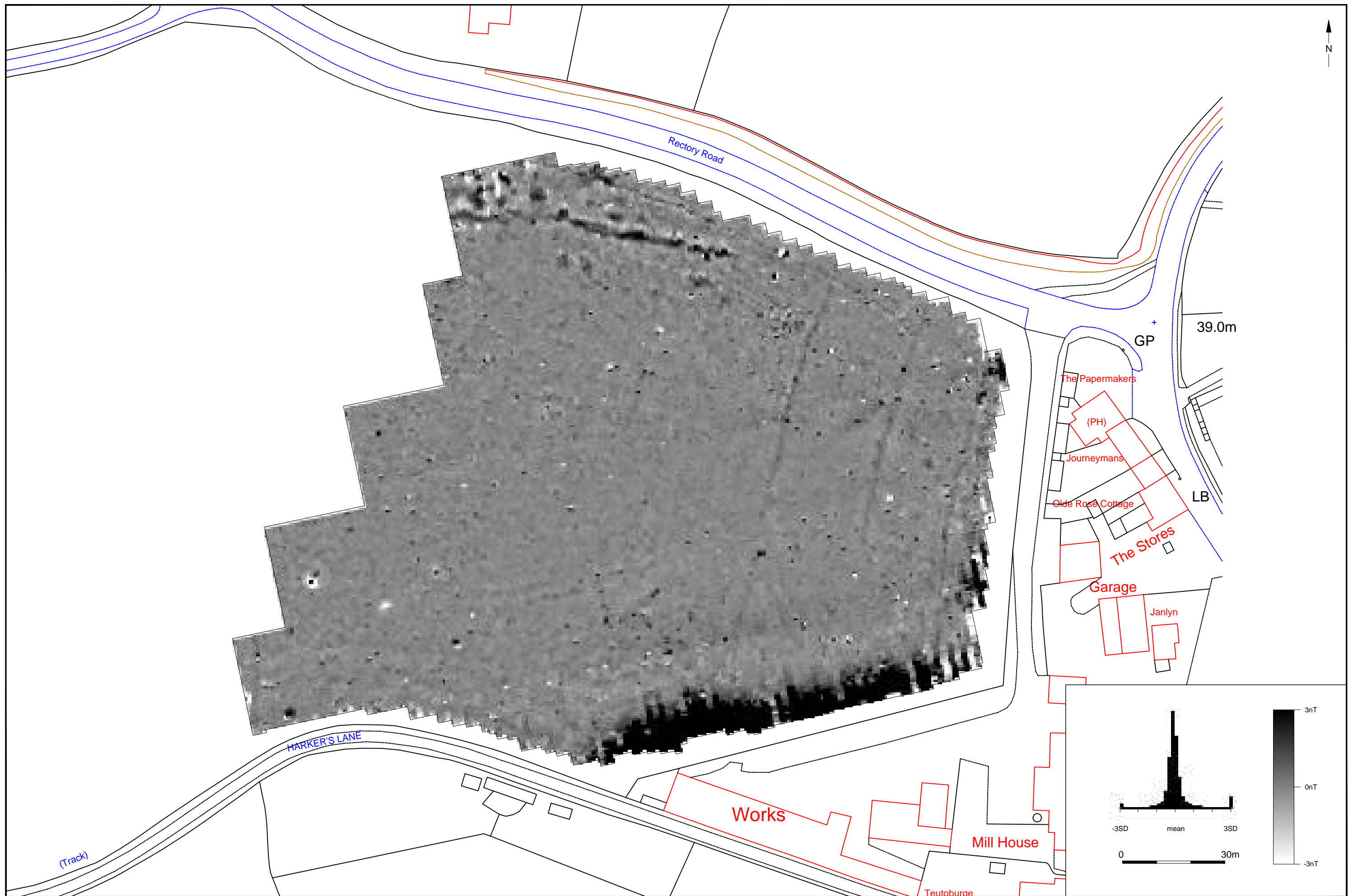
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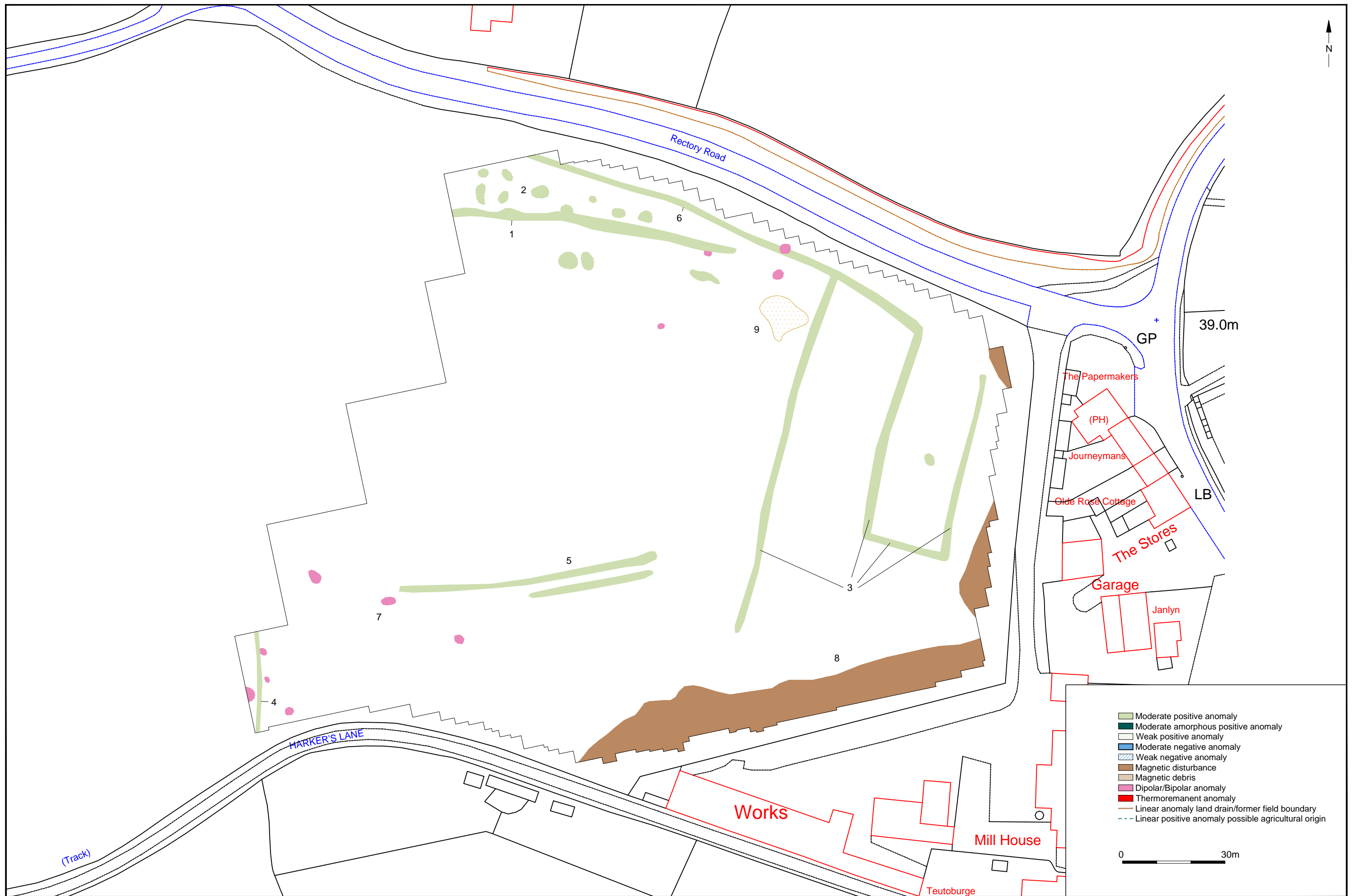
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© Archaeology South-East		Swanton Morley	Fig. 2
Project Ref: 8101	Dec 2013	Location of geophysics survey	
Report Ref: 2013318	Drawn by: JLR		





© Archaeology South-East		Swanton Morley	Fig. 4
Project Ref: 8101	Dec 2013	Processed data	
Report Ref: 2013318	Drawn by: JLR		



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