

# Geophysical Survey of land east of St James Church, South Charlton, Northumberland



South facing view of land east of St James Church, South Charlton

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<b>Contents</b>	
	Page
<b>Executive Summary</b>	2
<b>1.0 Introduction</b>	3
1.1 Background	3
1.2 Location, Topography and Geology	3
<b>2.0 Archaeological Background</b>	3
<b>3.0 Methodology</b>	4
<b>4.0 Geophysical Survey Results</b>	5
4.1 Introduction	5
4.2 Anomalies	6
<b>5 Discussion and Conclusions</b>	7
<b>6 Archive deposition</b>	8
<b>7 Publicity, Confidentiality and Copyright</b>	8
<b>8 Statement of Indemnity</b>	8
<b>9 Acknowledgements</b>	9
<b>10 References</b>	9
<b>Appendix 1: Figures</b>	10

### **List of Figures**

Figure 1. Site location.

Figure 2. Location of survey grids.

Figure 3. Greyscale shade plot of processed gradiometer data.

Figure 4. Interpretative plan.

Figure 5. Trace plot of processed gradiometer data – fields 1 and 2.

Figure 6. Trace plot of processed gradiometer data – field 3.

**EXECUTIVE SUMMARY**

*This report presents the results of a geophysical survey undertaken on land to the east of St James Church, South Charlton in Northumberland on behalf of Northumberland Estates. The survey was commissioned to support a planning application for a proposed residential development including associated car parking, drainage and landscaping.*

*The geophysical survey results in the location of the proposed residential development indicate that the remains of field boundaries and ridge and furrow cultivation survive and the field has been disturbed by the installation of a modern water pipe. No further definite evidence of surviving sub-surface archaeological remains was detected yet, as the field is located adjacent to the historic core of medieval and post-medieval South Charlton, the presence of more significant archaeological remains should not be discounted until the results of the geophysical survey have been tested by trial trenching.*

*A geophysical survey was commissioned following the submission of a Heritage Impact Assessment. The assessment concluded that there is the low-moderate potential for the construction of the residential development and associated access and landscaping to impact upon any as yet unspecified below-ground truncated archaeological remains of medieval/post-medieval date. A geophysical survey of the field was carried out in March 2020 and the instrument chosen was a Bartington Grad 601 dual sensor fluxgate gradiometer.*

*In the field to the north of the main proposed development area the survey results suggest that no significant archaeological remains survive within the narrow drainage corridor and the extra area surveyed indicates that there are no significant archaeological features adjacent to or likely to pass through the narrow area of impact.*

*In the field to the north-east of the main proposed development area the survey results have revealed ridge and furrow cultivation on an alignment which is approximately perpendicular to the drainage corridor, probable land drainage and an area of probable modern tipping in the north. The extra area surveyed indicates that there are no other significant archaeological features adjacent to or likely to pass through the narrow area of impact. However, as in the proposed development area the presence of more significant archaeological remains should not be discounted until the results have been tested by trial trenching.*

*The ridge and furrow detected by the geophysical survey and which also survives as earthworks forms part of a wider landscape of surviving ridge and furrow remains of probable medieval or post-medieval date. Whilst these remains are likely to only be of local historical interest it should be noted that areas of ridge and furrow can mask earlier archaeological remains below and therefore testing below the ridge and furrow should be considered as well as targeted testing of the geophysical anomalies and any seemingly blank areas.*

1.1.2 This report presents the results of the geophysical survey. The objective of the

## **1.0 INTRODUCTION**

### **1.1 Background**

1.1.1 Archaeological Research Services Ltd was commissioned by Northumberland Estates to undertake a geophysical survey on land east of St James Church, South Charlton in Northumberland. The survey was commissioned to support a planning application for a proposed residential development including associated car parking, drainage and landscaping.

geophysical survey was to identify any anomalies of archaeological origin within the development area in order to identify and record the presence/absence, location, nature and extent of any surviving below-ground archaeological remains.

### **1.2 Location, Topography and Geology**

1.2.1 The 'red line boundary' of the proposed development area (hereafter 'PDA') is depicted by a red polygon on Figure 1, and is c.0.65ha in area. The PDA is located within the south-eastern extent of the village of South Charlton, centred at NU 16564 20267 and encompasses three fields or parts thereof (Figure 1). The PDA is bounded by the B6347 in the south-west and by fields and agricultural land on all other sides.

1.2.2 The underlying solid geology of the PDA comprises undifferentiated limestone, sandstone, siltstone and mudstone of the Tyne Limestone Formation and Alston Formation. This sedimentary bedrock was formed approximately 329 to 343 million years ago in the Carboniferous Period when the local environment was previously dominated by shallow carbonate seas. This is overlain by superficial deposits of Devensian Till, Diamicton and Devensian sand and gravel glaciofluvial deposits (BGS 2020).

1.2.3 The soils of the PDA are classified as belonging to the Brickfield 3 Soil Association (713g), which are cambic stagnogley soils (SSEW 1983). These soils form as drift from Palaeozoic sandstone and shale and are characterised as 'slowly permeable seasonally waterlogged fine loamy fine loamy over clayey and clayey soils' (CU 2019).

## **2.0 ARCHAEOLOGICAL BACKGROUND**

2.1 A full and detailed archaeological background is contained in the accompanying Heritage Impact Assessment of land east of St James Church, South Charlton, Northumberland (Burpoe 2019). The archaeological background is summarised below.

- 2.2 There is a paucity of information for prehistoric activity within South Charlton, with the Bronze Age providing the most substantial evidence for prehistoric remains within this area. A possible Bronze Age barrow (HER 5045) is recorded to the north-east of the PDA between Brockley Hall and Charlton Mires on the edge of a small ridge. A cist, projecting from the south side of this mound, was opened and emptied prior to the site being recorded in the 1950s. A second Bronze Age burial site (HER 5038) was excavated in the side of a sand pit adjacent Crag Hill c.1km to the west of the PDA.
- 2.3 There are no features of Iron Age/Romano-British date within the area or wider landscape, with South Charlton located well to the north of Hadrian's Wall, the north-west frontier of the Roman Empire.
- 2.4 The first reference to South Charlton comes from the 13th century, when South Charlton was included within the barony of Alnwick. Charleton del Suth is recorded in a 1242 entry in the Liber Feodorum or Book of Fees. The Northumberland HER records the former site of a medieval chapel and tower in the field to the north of the PDA. South Charlton chapel (HER 5040) is first mentioned in 1273 and is thought to have been built by a member of the Lucker family, who were prominent medieval landowners in Northumberland.
- 2.5 During this 17th century, many townships in Northumberland had adopted a 'three-field' arrangement of common fields, whilst South Charlton was one of only ten documented villages that had four common fields: North Field, East Field, Middle Field, and West Field. The site of the PDA is depicted on the 1624 maps to the east of the village centre within 'Midle Feilde', with the main part of the site possible incorporating part of a building, though this cannot be said with any certainty due to the difficulties in accurately referencing this plan. It is possible that this structure is related to the aforementioned medieval chapel and tower, which is documented as having fallen into a semi-ruinous condition by the 16<sup>th</sup>-17<sup>th</sup> century. The line of the proposed drainage area also possibly skirts the eastern boundary of this chapel and tower complex.
- 2.6 Documents note that during the mid-19<sup>th</sup> century South Charlton village was replanned, with the 1864 Ordnance Survey (OS) Plan showing the rapid redevelopment of the village during the decade. The area of the PDA has changed very little throughout the 20<sup>th</sup> and 21<sup>st</sup> centuries, with the most notable changes within the site being the removal of the pair of field boundaries running east-west through the site, the first by the time of the 1973 (OS) Plan and the second by the time of the 2003 OS Plan.

### **3.0 METHODOLOGY**

- 3.1 Magnetometry is a non-intrusive scientific prospecting technique that is the preferred geophysical technique used to determine the presence or absence of

buried archaeological features when site and geological conditions are favourable. It is an efficient and effective method for locating anomalies corresponding with archaeological features. The instrument chosen for this survey was a Bartington Grad 601 dual sensor fluxgate gradiometer which can detect weak changes in the Earth's magnetic field caused by buried features.

- 3.2 All fieldwork and reporting was undertaken following Historic England and Chartered Institute for Archaeologists (CIfA) standards and guidance (Gaffney *et al.* 2008; CIfA 2014a; 2014b).
- 3.3 The 30m by 30m survey grids were located to cover the PDA and aligned as shown in Figure 2. In total 15 survey grids (including partial grids) were set out and accurately positioned using a Leica Zeno 20 GNSS field controller with GS05 antenna cap which was connected to Leica Smartnet to receive corrections resulting in an accuracy of typically 0.5m or better. Each grid was then surveyed at 1m traverse intervals with the sampling at 0.25m (4 readings per metre) intervals. The survey was carried out in 'zigzag' mode with each alternate traverse walked in opposite directions. The range of the instrument was set at 100nT (0.01nT resolution).
- 3.4 The geophysical survey was carried out in March, in dry and windy weather conditions. At the time of the survey the PDA was under grass, the ground was firm, and the conditions were suitable for geophysical survey. For the purposes of the survey the PDA has been divided into three fields as shown on Figures 3 and 4.
- 3.5 Prior to commencing the survey the gradiometer was balanced and calibrated to the local conditions and this was repeated regularly throughout each day. At the end of each day the data was downloaded into a computer, checked and archived on the ARS Ltd server. The data was downloaded using Bartington Instruments' *Grad 601 Communication Application*.

## **4.0 GEOPHYSICAL SURVEY RESULTS**

### **4.1 Introduction**

- 4.1.1 The data was minimally processed using Geoplot software. The data was "clipped" (clipping parameters selected on the mean and standard deviation data values), "de-staggered" and the striping that can often appear in gradiometer data was removed by utilising the "zero mean traverse" function with thresholds applied. Finally, the data was interpolated. To enhance the visibility of subtle features the data was viewed under a number of different clip plotting parameters.
- 4.1.2 Occasionally processing the data to compensate for directional sensitivity or to remove iron spikes caused by miscellaneous ferrous objects can also inadvertently disguise anomalies that may be of archaeological origin, particularly long linear features in the direction of the traverses. To take account of this the data has been analysed in a number of different formats and at each stage of processing.

4.1.3 Not all anomalies have been included in the results and discussion or highlighted in Figure 4. Parts of the dataset were characterised by small discrete widely dispersed positive and dipolar anomalies that are common on most sites and almost certainly relate to natural variations in the soils and geology, modern agricultural disturbance and miscellaneous ferrous litter on the surface of the field. These particular anomalies have not been analysed further.

4.1.4 The data analysis is presented graphically in Figures 3 to 5. A greyscale shade plot of the processed gradiometer data is presented in Figure 3 and an interpretative plan in Figure 4. Trace plot of the processed gradiometer data are presented in Figures 5 and 6.

## **4.2 Anomalies**

### **4.2.1 Field 1**

4.2.1.1 The PDA encompasses the whole of field 1 which is bounded to the north and north-east by open fields (fields 2 and 3), to the south and west by the B6347 and to the north-west by Cherry Tree Cottage.

4.2.1.2 The majority of anomalies recorded in field 1 are weak, not clearly defined and almost indistinguishable in the western half of the field. The anomalies are aligned east-north-east to west-south-west and are of both positive and negative polarity. The anomalies are typical of ridge and furrow cultivation: the positive components indicating furrows and the negative components indicating ridges. A more notable linear anomaly which again contains both positive and negative components (1) is most likely to indicate the remains of a destroyed field boundary. Based on its location in relation to a boundary depicted on historic mapping (Burpoe, 2019) anomaly 2 may also indicate the remains of a field boundary but this is more speculative.

4.2.1.3 A moderate number of positive discrete anomalies, of varying size and form, were recorded. As the anomalies are randomly distributed across the field, there is no evidence to suggest a significant archaeological origin and they are most likely to be caused by agricultural disturbance or be natural in origin. However, an archaeological origin cannot be entirely discounted.

4.2.1.4 Weak positive and negative linear anomalies recorded on an alignment that respects the extant field boundaries (3 to 6) are most likely to be the result of modern agricultural activity. In the south of the field a modern water pipe was detected (7) on a north-west to south-east alignment.



#### **4.2.2 Field 2**

4.2.2.1 Only the south-east corner of field 2 is included in the PDA; the location of a narrow drainage corridor. A full 30m x 30m survey grid was surveyed to aid the interpretation of any anomalies within the narrow drainage corridor.

4.2.2.2 Most of the data within the drainage corridor is obscured by magnetic disturbance from the boundary. The only anomalies of possible note are positive discrete anomalies in the west and east which are most likely to be a result of spikes in the data caused by the close proximity of magnetic materials in the boundary but an archaeological origin cannot be discounted.

#### **4.2.3 Field 3**

4.2.3.1 Only a narrow drainage corridor adjacent to the south-western boundary of field 3 is included in the PDA. A series of 30m wide survey grids was surveyed along the south-western boundary to aid the interpretation of any anomalies within the narrow drainage corridor.

4.2.3.2 The majority of anomalies recorded in field 3 are aligned east-north-east to west-south-west and are of both positive and negative polarity. The anomalies are typical of ridge and furrow cultivation: the positive components indicating furrows and the negative components indicating ridges.

4.2.3.3 In the north-west where the drainage corridor expands to encompass the location of a proposed attenuation pond the data are more erratic. There is a clear area of magnetic disturbance (8) which most likely to be a result of modern tipping. An increased number of positive discrete anomalies in the north-west of the PDA are most likely to be associated with the more general magnetic disturbance or associated with agricultural disturbance; possibly the truncated remains of ridge and furrow cultivation.

4.2.3.4 In the south-east of field 3 a pair of linear anomalies is suggested of land drainage and if so one of the drains passes through the drainage corridor and is likely to be encountered during groundworks.

## **5.0 DISCUSSION AND CONCLUSIONS**

5.1.1 The geophysical survey results in the field 1, the location of the proposed residential development, indicate that the remains of field boundaries and ridge and furrow cultivation survive and the field has been disturbed by the installation of a modern water distribution pipe. No further definite evidence of surviving sub-surface archaeological remains was detected yet, as the field is located adjacent to the historic core of medieval and post-medieval South Charlton (Burpoe 2019), the presence of more significant

archaeological remains should not be discounted until the results of the geophysical survey have been tested by trial trenching.

- 5.1.2 In field 2 the survey results suggest that no significant archaeological remains survive within the narrow drainage corridor and the extra area surveyed indicates that there are no significant archaeological features adjacent to or likely to pass through the narrow area of impact.
- 5.1.3 In field 3 the survey results have revealed ridge and furrow cultivation on an alignment which is approximately perpendicular to the drainage corridor, probable land drainage and an area of probable modern tipping in the north. The extra area surveyed indicates that there are no other significant archaeological features adjacent to or likely to pass through the narrow area of impact. However, as in field 1 the presence of more significant archaeological remains should not be discounted until the results have been tested by trial trenching.
- 5.1.4 The ridge and furrow detected by the geophysical survey and which also survives as earthworks forms part of a wider landscape of surviving ridge and furrow remains of probable medieval or post-medieval date (Burpoe 2019). Whilst these remains are likely to only be of local historical interest it should be noted that areas of ridge and furrow can mask earlier archaeological remains below and therefore trial trenching below the ridge and furrow should be considered as well as targeted trial trenching of the geophysical anomalies and any seemingly blank areas.

## **6.0 ARCHIVE DEPOSITION**

- 6.1 One bound copy of the final report with an attached digital PDF/A copy on disc will be deposited with the Northumberland Historic Environment Record (HER). The disc will also include a digital archive, consisting of relevant ESRI shape files or CAD files, for use in updating the HER database.

## **7.0 PUBLICITY, CONFIDENTIALITY AND COPYRIGHT**

- 7.1 Any publicity will be handled by the client.
- 7.2 Archaeological Research Services Ltd will retain the copyright of all documentary and photographic material under the Copyright, Designs and Patent Act (1988).

## **8.0 STATEMENT OF INDEMNITY**

- 8.1 All statements and opinions contained within this report arising from the works undertaken are offered in good faith and compiled according to professional standards. No responsibility can be accepted by the author/s of the report for any errors of fact or opinion resulting from data supplied by any third party, or for loss or other consequence arising from decisions or actions made upon the basis of

facts or opinions expressed in any such report(s), howsoever such facts and opinions may have been derived.

## **9.0 ACKNOWLEDGEMENTS**

9.1 Archaeological Research Services Ltd would like to thank all those involved in the project for their help and assistance. In particular we would like to thank Barry Spall of Northumberland Estates for commissioning this work and the two tenant farmers for kindly providing access to carry out the surveys.

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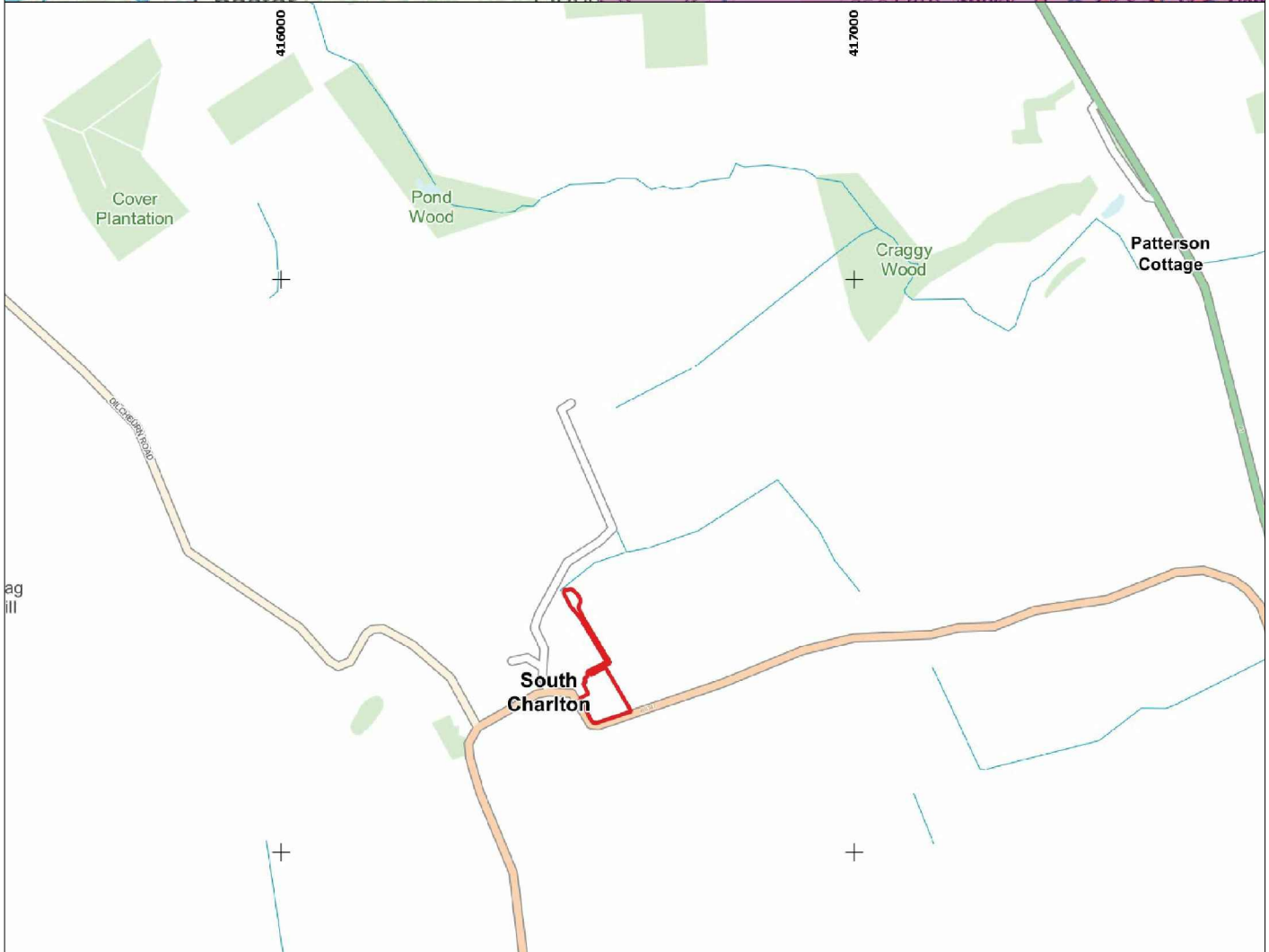
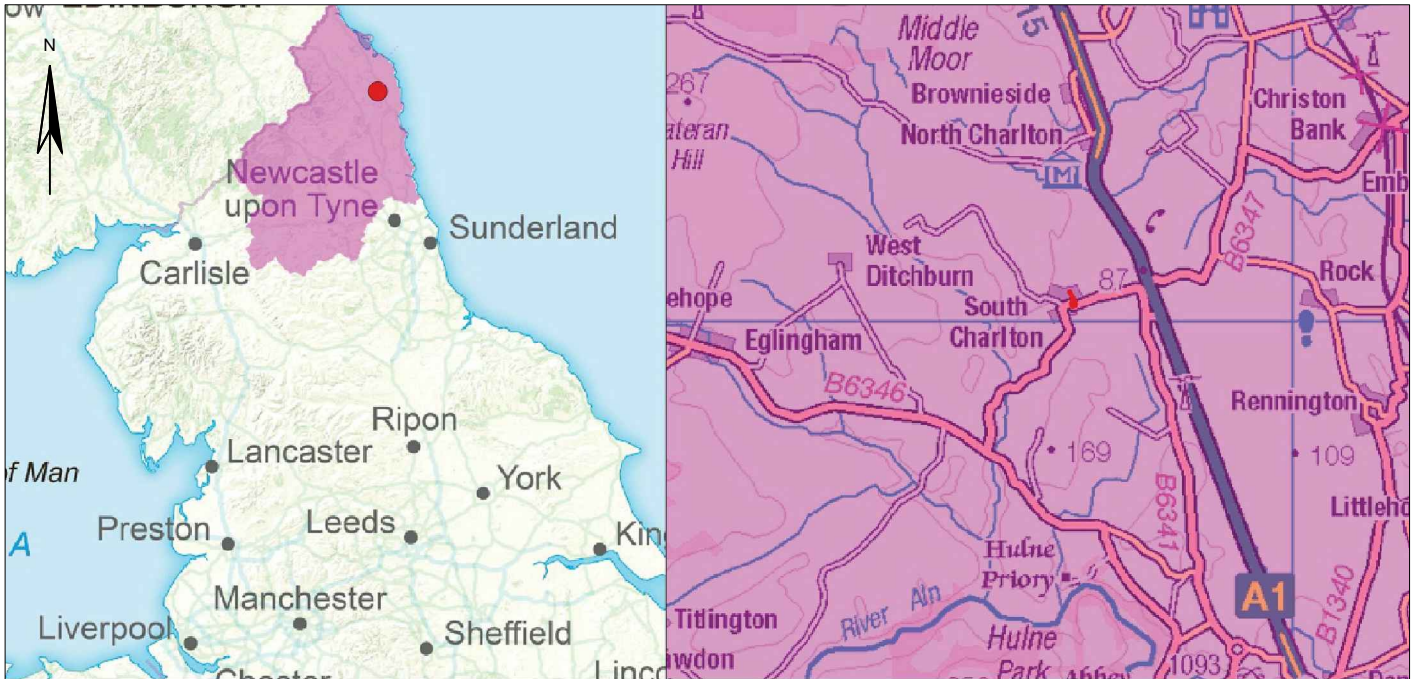
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**Appendix 1: Figures**



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 Date: March 2020  
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**Figure 1**  
 Site Location

**Key:**

- Proposed development area (PDA)
- Northumberland County Council
- Site location

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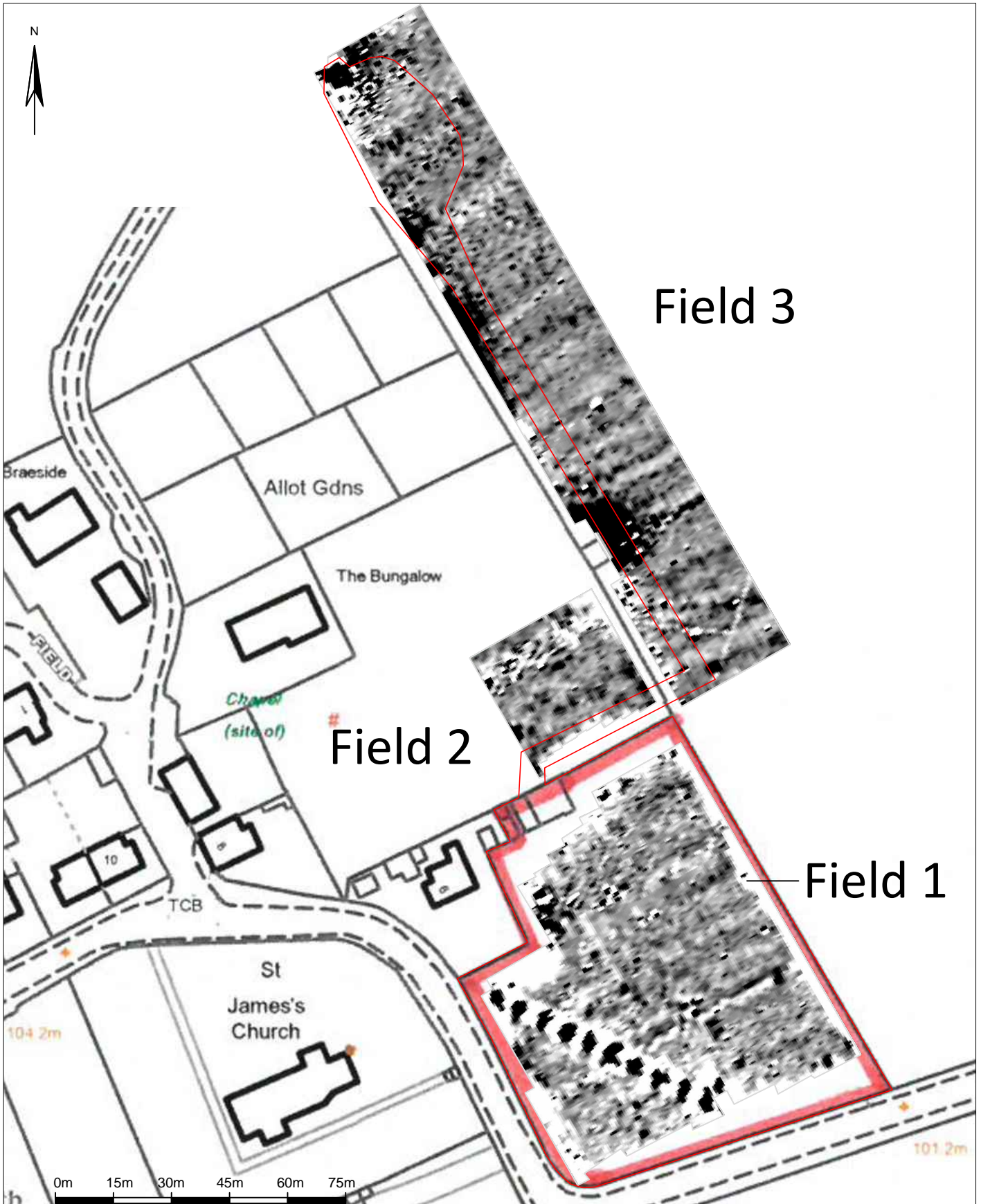
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**Figure 2**  
 Location of survey grids

Key:  Proposed development area (PDA)  
1 30m x 30m survey grid

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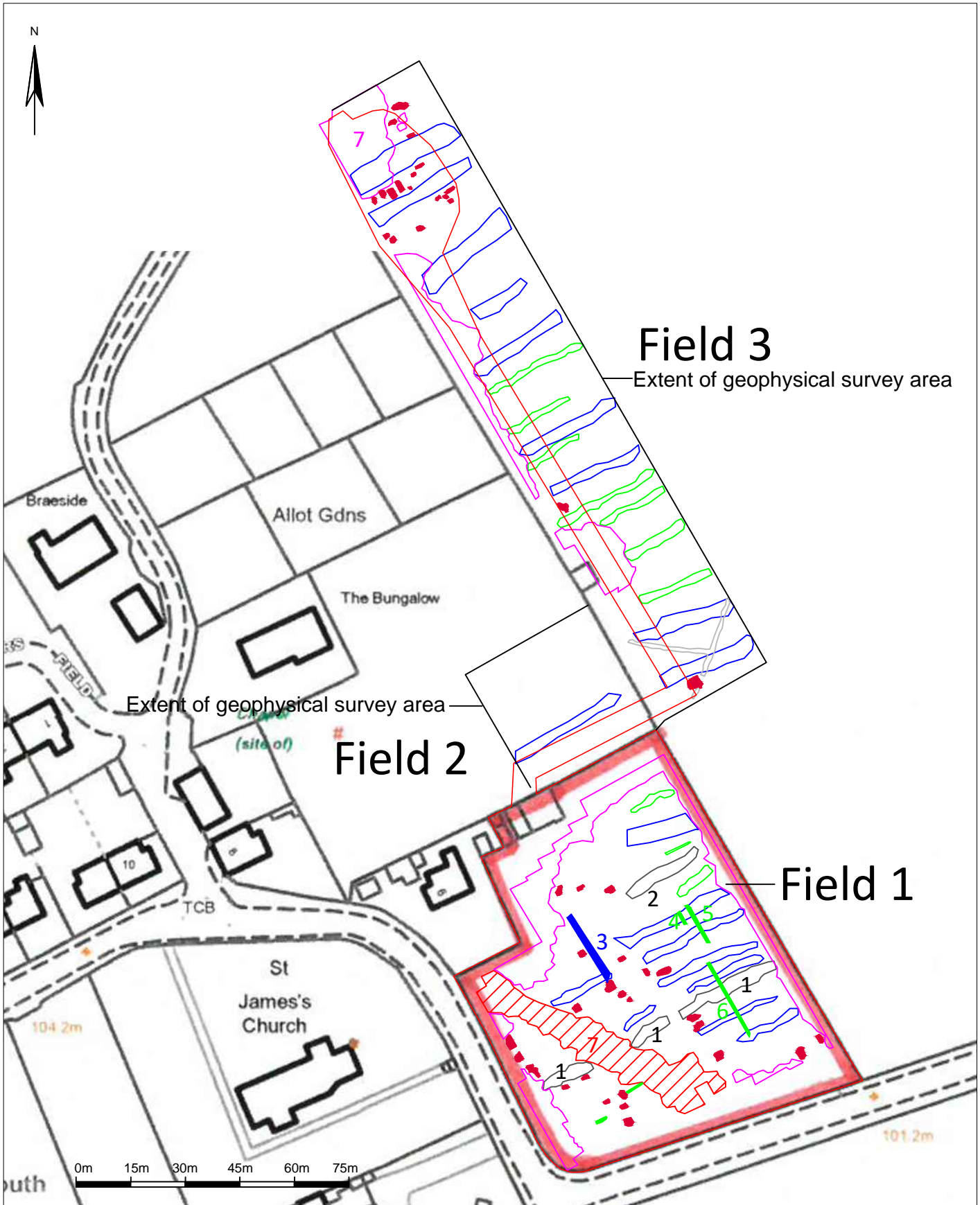
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**Figure 3**  
 Greyscale shade plot of processed gradiometer data

Key:  Proposed development area (PDA)

30m x 30m survey grid

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**Figure 4**  
Interpretative plan

Key:	Proposed development area (PDA)	Modern service
	Probable ridge (ridge and furrow)	Magnetic disturbance
	Probable furrow (ridge and furrow)	Probable modern cultivation
	Probable natural/ agricultural	Probable modern cultivation
	Probable field boundary	Probable land drainage

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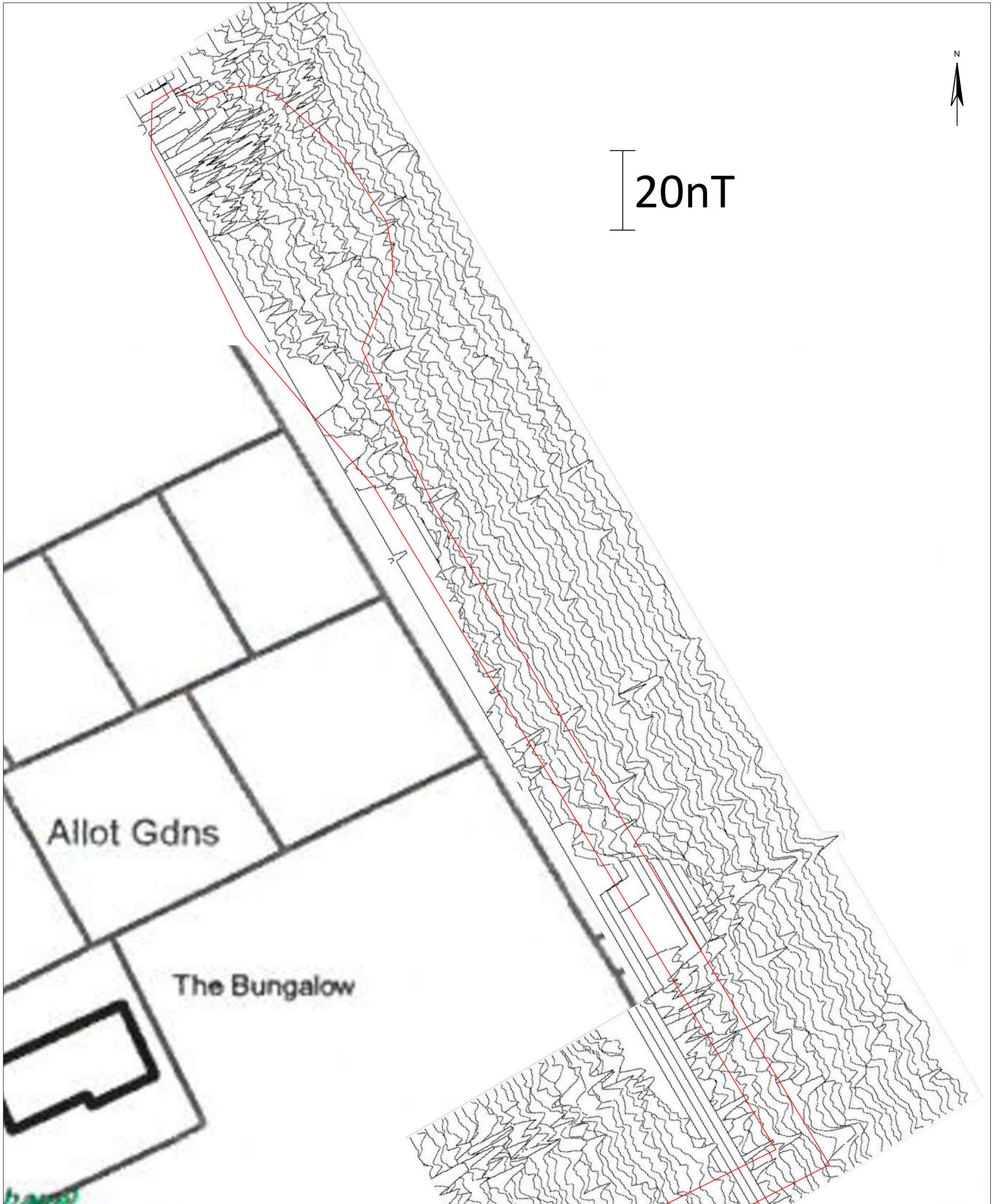
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### Trace Plot of Processed Gradiometer Data

Key:  Proposed development area

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### Trace Plot of Processed Gradiometer Data - field 3

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