ARCHAEOLOGICAL EVALUATION REPORT:

GEOPHYSICAL SURVEY BY MAGNETOMETRY ON LAND AT ABBEY FIELD, HERRING LANE, PINCHBECK, LINCOLNSHIRE

NGR: TF 23314 26245
AAL Site Code: PIAF 13

Report prepared for Mr John Lyon

By
Allen Archaeology Limited
Report Number 2013105

August 2013

Allenarchaeology

Contents

List of Figures

Document Control

Element	Name	Date
Report prepared by:	Robert Evershed BSc (Hons) and Chris Clay MA	29/08/2013
Illustrations prepared by:	Robert Evershed BSc (Hons) and Chris Clay MA	29/08/2013
Report edited by:	Mark Allen MIfA BSc (Hons)	30/08/2013
Report produced by:	AAL2013105	30/08/2013

Cover image: General shot of site, looking north

Executive Summary

- Allen Archaeology Limited was commissioned by Mr John Lyon to undertake a geophysical survey by magnetometry on land at Abbey Field off Herring Lane, Pinchbeck, Lincolnshire as part of the ongoing archaeological investigation work into the history and archaeology of the parish.

- Approximately five hectares of land were surveyed over a period of two days. In the northern part of the site were a number of possible drainage and boundary features, as well as possible palaeochannels.

- Immediately to the south of this anomaly group was an L-shaped anomaly reflecting a former drain shown on historic mapping until the later 20th century. South of this was an area of varied magnetic response of potential archaeological interest, comprising probable pit-like anomalies and possible structural remains.

- In the southern part of the site was another area of varied magnetic response, interpreted as former courses of the River Welland, the canalised course of which passes c.75m south of the site.

- Scattered randomly throughout the site are a number of strong and weak dipolar responses. The characteristic dipole response of pairs of positive and negative 'spikes' suggests near-surface ferrous metal or other highly fired material.

1.0 Introduction

1.1 Allen Archaeology Limited was commissioned by Mr John Lyon to undertake a geophysical survey by magnetometry on land at Abbey Field off Herring Lane, Pinchbeck, Lincolnshire as part of the ongoing archaeological investigation work into the history and archaeology of the parish.

1.2 The site works and reporting conform to current national guidelines, as set out in '*Geophysical Survey in Archaeological Field Evaluation*' (English Heritage 2008), '*The Use of Geophysical Techniques in Archaeological Evaluations*' (IFA Paper 6) and the Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (IfA 2011).

1.3 The site is archaeologically sensitive, lying in an area of archaeological interest and potential.

2.0 Site Location and Description (Figures 1 and 2)

2.1 Pinchbeck is located in the administrative district of South Holland and is situated approximately 3.4km south-southeast of central Spalding, and 15.5km east-northeast of the centre of Bourne (Figure 1). The site comprises Abbey Field, north of North Gate and west of Herring Lane (Figure 2). The site centres on NGR TF 23314 26245.

2.2 The site lies at a height of approximately 3m above Ordnance Datum in a fenland environment characterised by the Terrington Beds; younger marine alluvium; salt marsh, tidal creek and river deposits (sandy silt, sand and clay). The underlying geology is Middle and Upper Jurassic Oxford Clay (British Geological Survey 1992). The geology map depicts the probable Anglo-Saxon coastline approximately 1km to the east of the site.

3.0 Planning Background

3.1 This project lies outside the planning process and is an entirely private commission to investigate the archaeological remains within Abbey Field. Prior to Allen Archaeology's first involvement in 2009, the area had been regularly metal-detected, producing a large quantity of metal finds.

3.2 Mr John Lyon has personally financed a number of investigations on sites around Pinchbeck, including geophysical surveys, ground penetrating radar, excavations and specialist reports. The current programme of work represents a continuation of this programme of investigations.

4.0 Archaeological and Historical Background

4.1 Investigations associated with the Fenland Management Project that took place in the early 1990s showed that there was activity in the Pinchbeck parish fens from the later Mesolithic, later Neolithic/early Bronze Age and middle Bronze Age periods (Crowson *et. al*. 2000). This activity was shown to lie upon a former sandy island, where pits and hollows were investigated beneath alluvial cover (Coles and Hall 1998).

4.2 Iron Age exploitation of the fens in the parish of Pinchbeck is recognized by a number of sites that were found along the raised levees of a silted creek, although these are located at some distance from the current site (Crowson *et. al.* 2000).

4.3 The Fenland Management Project suggested that the sealing of the local Bronze Age creek system by later silts was probably caused by a late Iron Age/early Roman accumulation of silts reflecting a period of rising sea levels (*ibid*.).

4.4 The earliest physical evidence of activity from Pinchbeck was the discovery of a Roman coin of Commodus (180-192 AD) that was found in 1742 within the gardens of Pinchbeck Hall (Lincolnshire Historic Environment Record (hereafter LHER) Reference 22418). The recovery of a single coin of this date does not indicate sustained activity however, only the probable chance discard or loss of a single object.

4.5 Anglo-Saxon exploitation of the Pinchbeck fens is evidenced by the discovery of a settlement site at Leaves Lake Drove, *c.*5km to the west-southwest of the site (Crowson *et. al.* 2000). Contemporary metalwork has recently been found to the east of Manor Farm, *c.*600m north-east of the site (Peter Lorimer *pers. comm.* 2009).

4.6 Pinchbeck is mentioned in the Domesday Survey of 1086 AD as *Pincebec*, indicating it is at least of late Saxon origin (Cameron 1998). The place name comes from the Old English *pinc* and the Old Norse *bekkr*, possibly meaning 'the minnow stream' (*ibid*). At the time of the survey, there were two major landowners; Ivo Tallboys and Guy of Craon (Morgan and Thorn 1986). Ivo Tallboys had 10 carucates of land taxable, with land for ten ploughs, whilst Guy of Craon had 2 carucates of land taxable with land for two ploughs (*ibid*).

4.7 Excavations for a pit in 1964 revealed Saxo-Norman and medieval pottery and animal bone at a depth of c.8ft below the existing ground surface, c.200m northeast of the site (LHER Reference 22426).

4.8 Previous investigations have been undertaken for Mr Lyon at Healeys Field; c.350m east of the current site (AAL 2012), initially based on a section of stone wall observed protruding from the side of a dyke. Subsequent excavation revealed a sequence of features and deposits of medieval to post-medieval date. In the medieval period, a moated enclosure had been created by forming a channel extending from the adjacent River Glen, with wooden stakes from the channel radiocarbon dated to the 13th to 15th century. Finds from the site, including painted window glass indicate the presence of a high status medieval structure in the moated enclosure.

4.9 Significant quantities of architectural stonework were recovered from the site, likely to have been collected from Spalding Priory following Dissolution, and re-used on the site, to construct structures associated with a probable wharf on the channel, as well as a rectangular building interpreted as a possible cottage for a bailiff monitoring craft using the wharf. A

series of large stone steps were also recorded on the edge of the channel, possibly to allow pedestrian access in and out of river vessels. The channel appeared to have silted up during the medieval period, and was backfilled with quantities of post-medieval domestic waste. Large quantities of 18th century finds were recovered from the site, indicating high status domestic activity on the site until abandonment of the site in the 18th century.

5.0 Methodology

5.0.1 The geophysical survey consisted of a detailed gradiometer survey of as much of Abbey Field as was possible within the two days allowed, totalling approximately 5 hectares.

5.0.2 The fieldwork was carried out by a team of two experienced geophysicists from AAL over a period of two working days, Thursday 15th and Friday 16th August 2013. The site was divided into 30m by 30m grids, established on site with reference to local fixed boundaries and accurately tied into the National Grid with Ordnance Survey base mapping using a Leica GS08 Netrover receiving RTK corrections.

5.0.3 The survey was undertaken using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an onboard automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the onboard data logger.

5.0.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.

5.1 Summary of Survey Parameters

5.1.1 Fluxgate Magnetometer

Instrument:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	Terrasurveyor 3.0.22.1
Surface conditions:	Recently harvested crops
Area surveyed:	5 ha
Date surveyed:	Thursday 15th and Friday 16th August 2013
Surveyor:	Robert Evershed
Survey assistants:	Edward Oakley
Data interpretation:	Robert Evershed

5.2 Data Collection and Processing

5.2.1 The grids were marked out using tapes from the south-western corner of the site. The collection of magnetic data using a north – south traverse pattern is preferable for a magnetic survey, as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north – south direction (Breiner 1999). On this occasion magnetic data was collect close to the preferred alignment due to the orientation of the survey grids. Data was collected by making successive parallel traverses across each grid in a zigzag pattern. Several key points of the survey grids were accurately tied into the National Grid with Ordnance Survey base mapping.

5.2.2 The data collected from the survey has been analysed using the current version of Terrasurveyor 3.0.22.1. The resulting data set plots are presented with positive nT/m values and high resistance as black and negative nT/m values and low resistance as white.

The data sets have been subjected to processing using the following filters:

- De-stripe (also known as Zero Mean Traverse or ZMT)
- Clipping

5.2.3 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments, instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. The de-stripe process is used with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.2.4 The clipping process is used to remove extreme data point values which can mask fine detail in the data set. Excluding these values allows the details to show through.

5.2.5 Plots of the data are presented in processed linear greyscale (smoothed) with any corrections to the measured values or filtering processes noted, and as separate simplified graphical interpretations of the main anomalies detected.

6.0 Magnetometer Survey Results (Figures 3 – 6)

6.1 For the purposes of interpreting the anomalies, the survey data has been processed to the values of -3 to 3 nT/m (Figure 3). This enhances faint anomalies that may otherwise not be noted in the data; however it also includes all ferrous and other magnetically enhanced material within the study area, making the resulting greyscale image particularly 'noisy'. The survey results revealed a number of anomalies across the data set, and these are discussed in turn and noted as two-digit numbers in square brackets.

6.2 Immediately noticeable in the data set is a large L-shaped anomaly, [01] running north from the southern boundary of the site for approximately 450m then turning east and continuing to the eastern site boundary. The north – south aligned component of the feature was a dipolar anomaly producing readings of -100 to +100 nT/m; at the north end of this is a pair of large dipolar spikes producing readings of -3000 to +3000 nT/m. The eastern end of the feature comprises a pair of parallel linear positive anomalies producing readings of +20 to +60

nT/m; [3], surrounded by a halo of 'negative' responses. Despite the differing signatures this is clearly all part of a single buried service/pipeline.

6.3 Positive magnetic anomalies [02] – [08] are all likely to represent infilled drainage and/or boundary features. [02] is a curvilinear positive anomaly producing readings of +2 to +4 nT/m running west from the eastern site boundary and then turning to head south-southwest. The south-southwest alignment is continued by anomaly [03], producing readings of +3 to +6 nT/m which then appears to turn broadly eastwards, [04]. [05] is a reverse 'L-shape' anomaly producing readings of +2 to +4 nT/m and is located within the area enclosed by anomalies [02] and [04]. Within the inner angle of this anomaly is a small sub-circular positive anomaly, producing readings of +10 to +20 nT/m which may represent an infilled pond, pit or soil filled hollow, with two further similar anomalies immediately to its south [06].

6.4 To the west of [02], anomaly [07] is a sinuous curvilinear positive anomaly producing readings of +1 to +5 nT/m and may relate to a field boundary, drain or ditch, possibly used for funnelling livestock.

6.5 Feature [08] and [09] is a slightly amorphous linear positive anomaly producing readings of +2 to +8 nT/m. This could represent a ditch, boundary or track, however the extent of the magnetic response is perhaps more likely to represent a palaeochannel.

6.6 A number of narrow linear positive anomalies [10] – [13] were recorded, orientated east-southeast to west-northwest throughout the site. These produced readings of +1 to +2 nT/m and may relate to ceramic field drains.

6.7 Close to the south-eastern corner of the site is a pair of parallel positive linear anomalies orientated north-northeast to south-southwest, [14]. These produced readings of +2 to +4 nT/m, and are likely to reflect former drainage/boundary features running along the adjacent road.

6.8 Towards the south-eastern quadrant of the survey area was an area producing a varied magnetic response, including a large number of small amorphous positive anomalies, and a small number of linear negative anomalies. These produced readings of +2 to +10 nT/m and -1 to -4 nT/m respectively. The features are likely to be of archaeological interest, and can be broadly split into an area of possible pit-like anomalies in the northern part of the area, [15], with further possible pits and potential structural remains in the southern part of the area, [16]. Overall the area of noise may be evidence of human activity and potentially demolished structures.

6.9 In the southern part of the site is another area of magnetic noise, [17], among which there are a number of irregular broadly linear positive anomalies producing readings of +10 to +20 nT/m, e.g. [18] and [19]. The magnetic signature of these features and their irregular sinuous appearance suggests these may be a series of palaeochannels.

6.10 On the eastern border of the site there is an area of dipolar spikes, producing readings of -20 to +20 nT/m, [20]. This is related to the house and surrounding fence within the area not surveyed on the eastern border.

6.11 A number of dipolar responses were detected across the survey area, with some examples highlighted as yellow circles on the interpretative plot (Figure 4). These are likely to be associated with ferrous waste or highly fired material within the ploughsoil.

7.0 Discussion and Conclusions

7.1 The site conditions proved particularly receptive to geophysical surveying, and significant evidence for archaeological activity was identified.

7.2 The large L-shaped group of anomalies in the southern half of the site is of recent date, as it closely follows the alignment of a drain shown on Ordnance Survey mapping from at least the later 19th century. The feature was present on historic mapping in to the second half of the 20th century, and the northern component was present as a boundary feature into the 1970s. The pair of parallel linear anomalies [14] also relates to a recent drain, shown running parallel to Herring Lane on maps from 1888 to 1969.

7.3 The northern part of the site was characterised by a series of linear positive anomalies. Some of these may be natural palaeochannels and some may be of archaeological interest, although it should be noted that [02] continues the alignment of an extant field drain immediately to the east of the adjacent road, Herring Lane, and as such may denote an earlier continuation of this boundary. Historic map evidence indicates that it had been infilled by at least the later 19th century.

7.4 Perhaps the area of greatest archaeological interest is in the south-eastern part of the site, where an extensive area of magnetic 'noise' was recorded. This contained a number of amorphous pit-like anomalies as well as anomalies of a more linear appearance, suggestive of possible structural remains. Part of this response may be due to demolition rubble and detritus associated with the extant farm buildings to the north and the former farm buildings to the west, but there is undoubtedly archaeological activity present within this area of the site.

7.5 The southern part of the site also contained an area of varying magnetic response, but of a different character to the area to its north. The most likely explanation for theses responses is the presence of former palaeochannels, and this hypothesis is given more credibility by the presence of the canalised course of the River Welland, c.75m to the south.

8.0 Effectiveness of Methodology

8.1 The non-intrusive evaluation methodology employed was particularly appropriate to the scale and nature of the site to be surveyed. Magnetometry surveying was the prospection technique best suited to the identification of archaeological remains on the site. Other techniques would have required justification and may have proved too time consuming or cost-prohibitive.

9.0 Acknowledgements

9.1 Allen Archaeology would like to thank Mr John Lyon for funding this project and for his wealth of enthusiasm.

10.0 References

AAL, 2012, *Pinchbeck's Lost Manor: Archaeological Investigations at Healey's Field, Pinchbeck, Lincolnshire, Allen Archaeology Monograph no. 1*, Allen Archaeology Limited, Branston

Bartington, G. and Chapman, C.E., 2004, *A High-stability Fluxgate Magnetic Gradiometer for Shallow Geophysical Survey Applications. Archaeological Prospection* 11 (1) 19-34

BGS, 1992, *Spalding. England and Wales Sheet 144. Solid and Drift Geology. 1:50,000 Provisional Series*. Keyworth, Nottingham: British Geological Survey

Breiner, S., 1999, *Applications Manual for Portable Magnetometers*, Geometrics, California

Cameron, K., 1998, *A Dictionary of Lincolnshire place-names*, English Place-Name Society, University of Nottingham, Nottingham

Coles, J. and Hall, D., 1998, *Changing Landscapes: The Ancient Fenland.* Wetland Archaeology Research Project. Cambridgeshire County Council

Crowson, A., Lane, T., and Reeve, J., 2000, *Fenland Management Project Excavations 1991-1995.* Lincolnshire Archaeology and Heritage Report Series

English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

Gaffney, C., Gater, J., and Ovenden, S., 2002, *The Use of Geophysical Techniques in Archaeological Evaluations. IFA Paper No.6.* The Institute for Archaeologists

IfA, 2011, S*tandard and guidance for archaeological geophysical survey*, Institute for Archaeologists, Reading

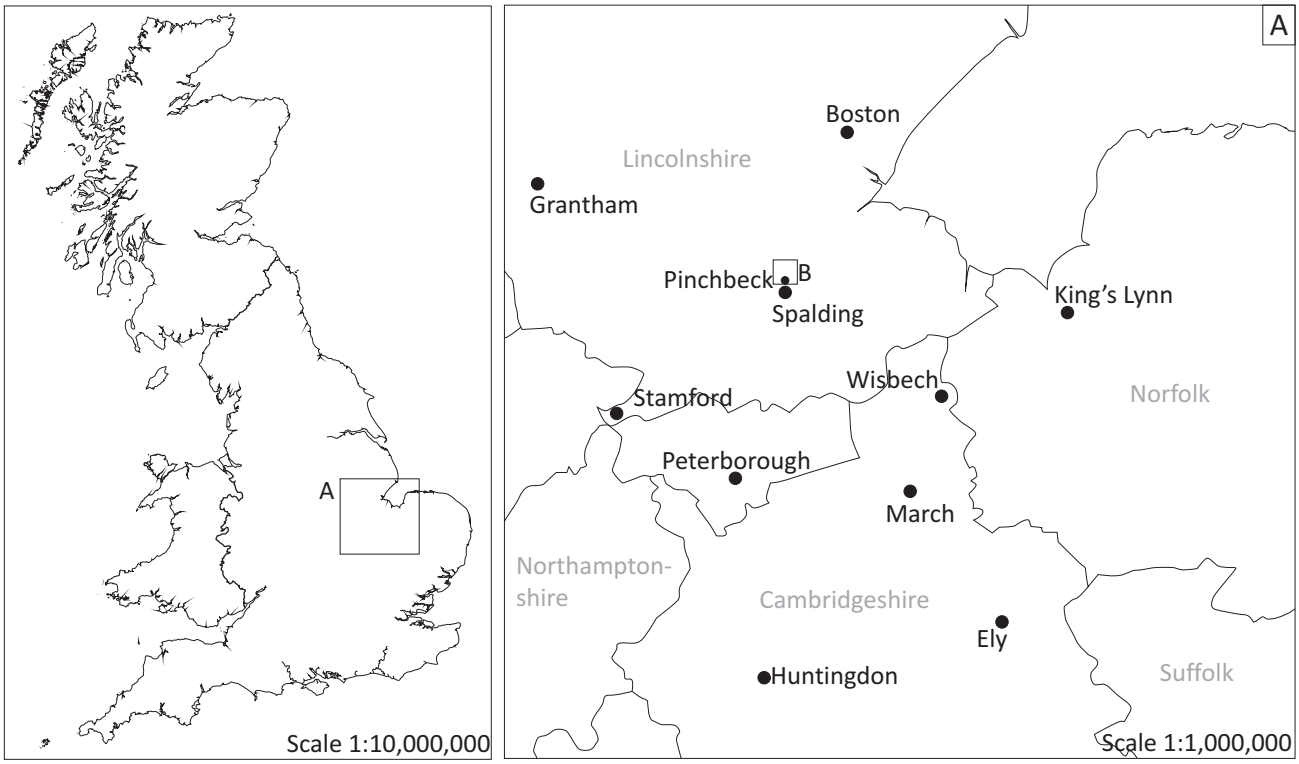
LCC, 2012, *Lincolnshire Archaeological Handbook: a manual of archaeological practice*. Lincoln, Lincolnshire County Council, Built Environment Dept.

Morgan P. and Thorn, C. (eds.), 1986, *Domesday Book: vol.31: Lincolnshire*, Phillimore & Co. Ltd, Chichester

Owen, D.M., 1990, *Church and Society in Medieval Lincolnshire*, History of Lincolnshire volume V, History of Lincolnshire Committee, Lincoln

Scollar, I., Tabbagh, A., Hesse, A. and Herzog, I. (eds.), 1990, *Archaeological Prospecting and Remote Sensing.* Cambridge University Press

Wilbourn, D., 2013, Terrasurveyor Program version 3.0.22 User Manual. DW Consulting



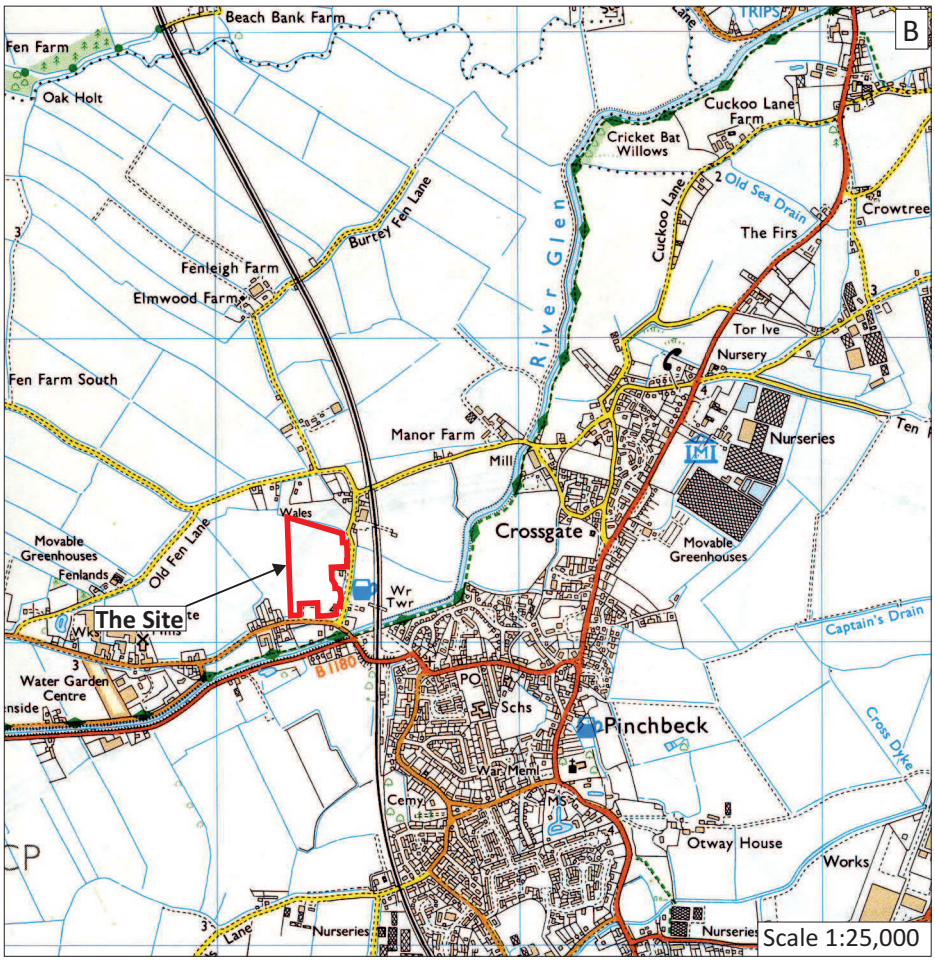


Figure 1: Site location outlined in red

Site Code:	PIAF 13
Scales:	1:10,000,000 1:1,000,000 1:25,000 @ A4
Drawn by:	R Evershed
Date:	28/08/13

Allenarchaeology
Lincoln
Birmingham
Cambridge
Southampton
www.allenarchaeology.co.uk

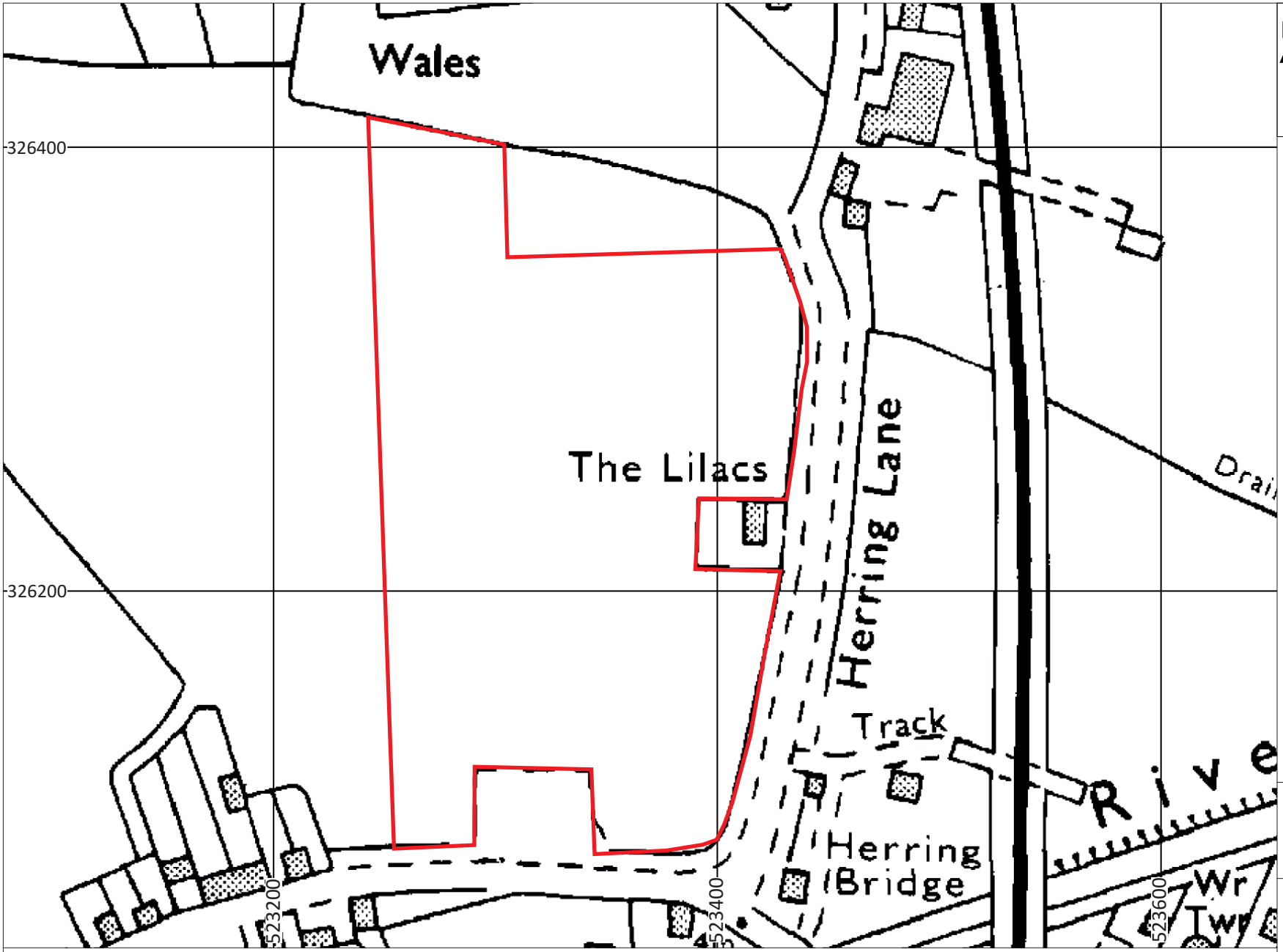


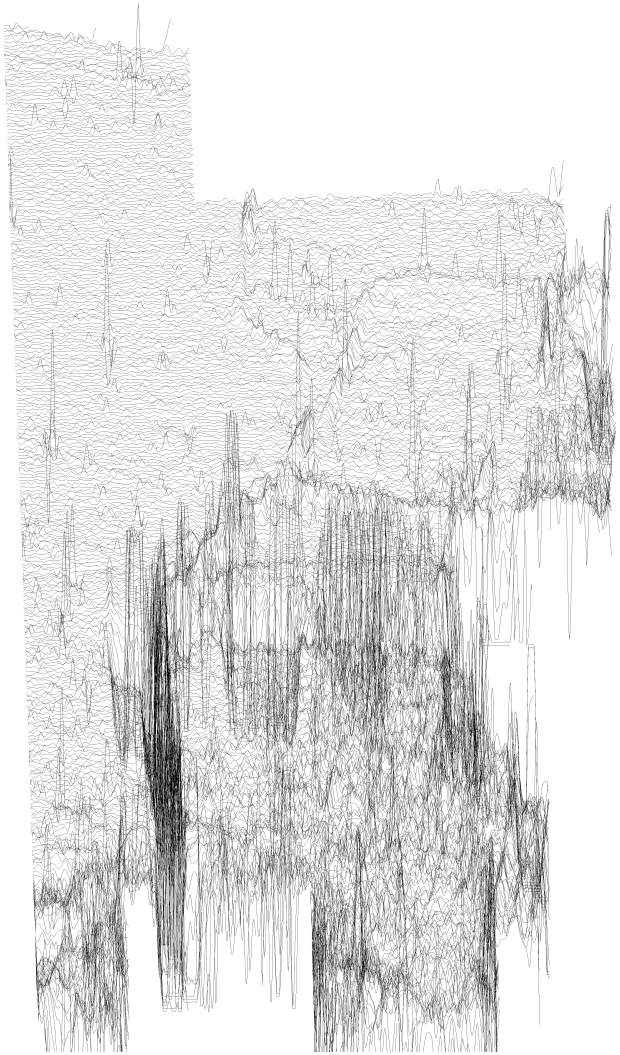
Figure 2: Site location, with survey area outlined in red

Site Code	PIAF 13
Scale	1:2500 @ A4
Drawn by	C Clay
Date	28/08/13

Allenarchaeology
Lincoln
Birmingham
Cambridge
Southampton
www.allenarchaeology.co.uk

Raw data (clipped to +/- 40 nT)

Trace Plot (ZMT and clipped to +/- 25nT)



N

40

nT

-40

Raw Data

25nT

Trace Plot

Site Code	PIAF 13
Scale	1:2500 @ A4
Drawn by	C Clay
Date	28/08/13

Allenarchaeology

Lincoln

Birmingham

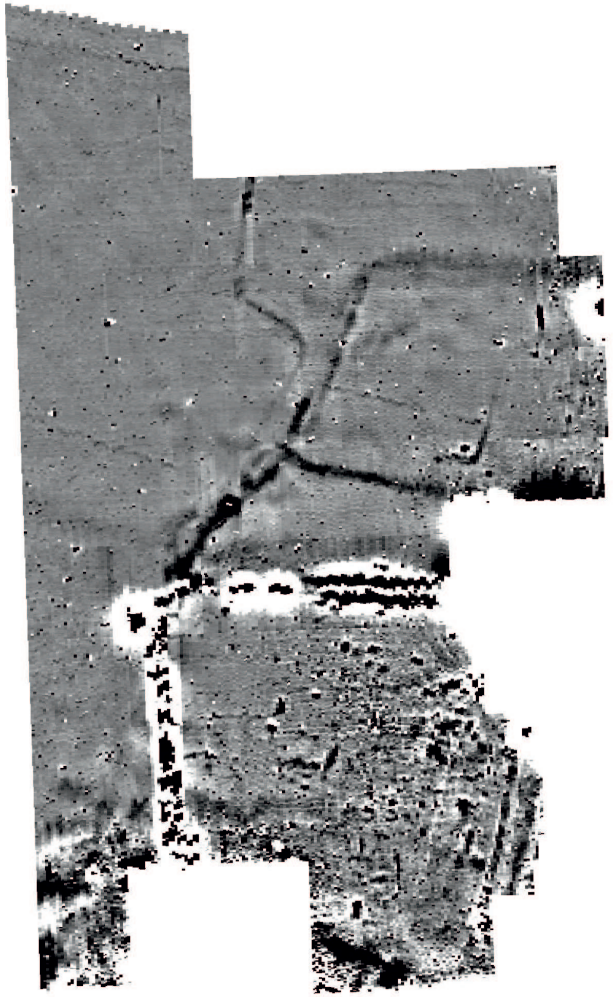
Cambridge

Southampton

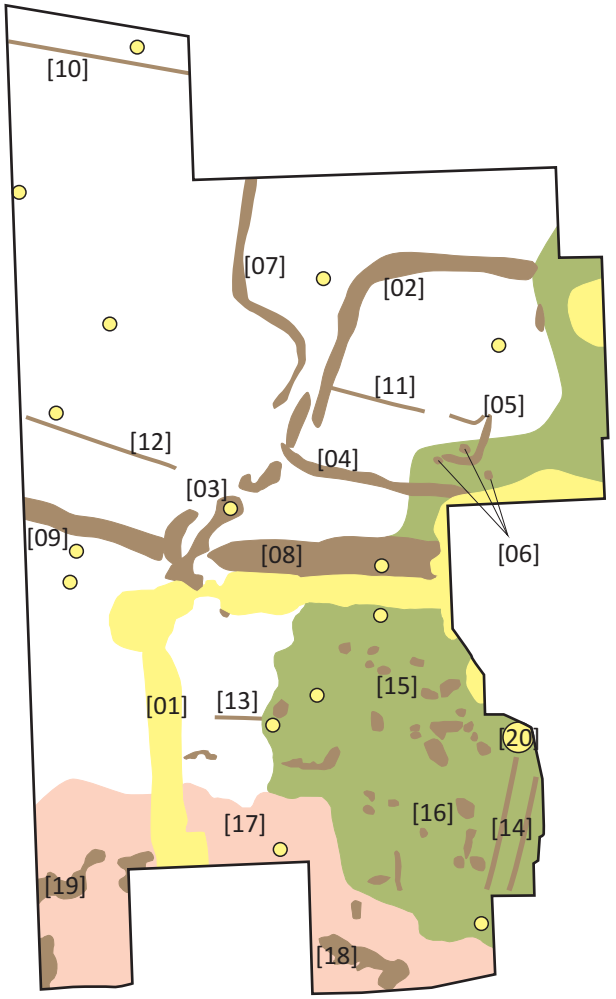
www.allenarchaeology.co.uk

Figure 3: Greyscale raw data and processed trace plot

Processed (ZMT and clipped to +/- 3 nT)



Interpretation of Survey Results



N

3
nT
-3

Interpretation Key

- Positive magnetic anomaly
- Dipolar linear anomaly
- Area of magnetic noise (palaeochannels?)
- Area of magnetic interference
- Examples* of individual dipolar responses indicative of ferrous or highly fired material

*smaller responses omitted for clarity

Site Code	PIAF 13
Scale	1:2500 @ A4
Drawn by	C Clay
Date	28/08/13

Allenarchaeology
Lincoln
Birmingham
Cambridge
Southampton
www.allenarchaeology.co.uk

Figure 4: Processed greyscale plot of survey area with interpretation outlined in black

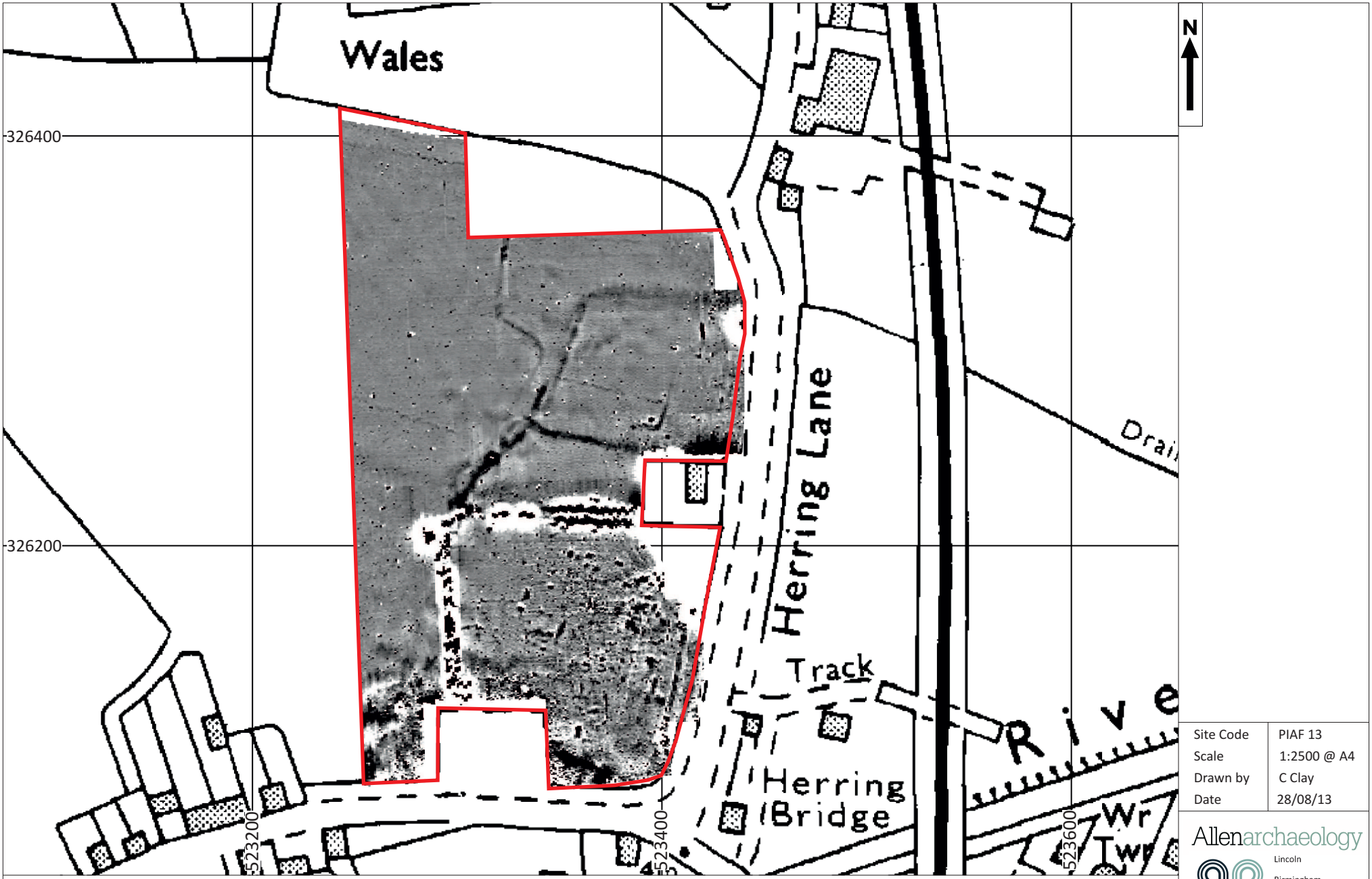
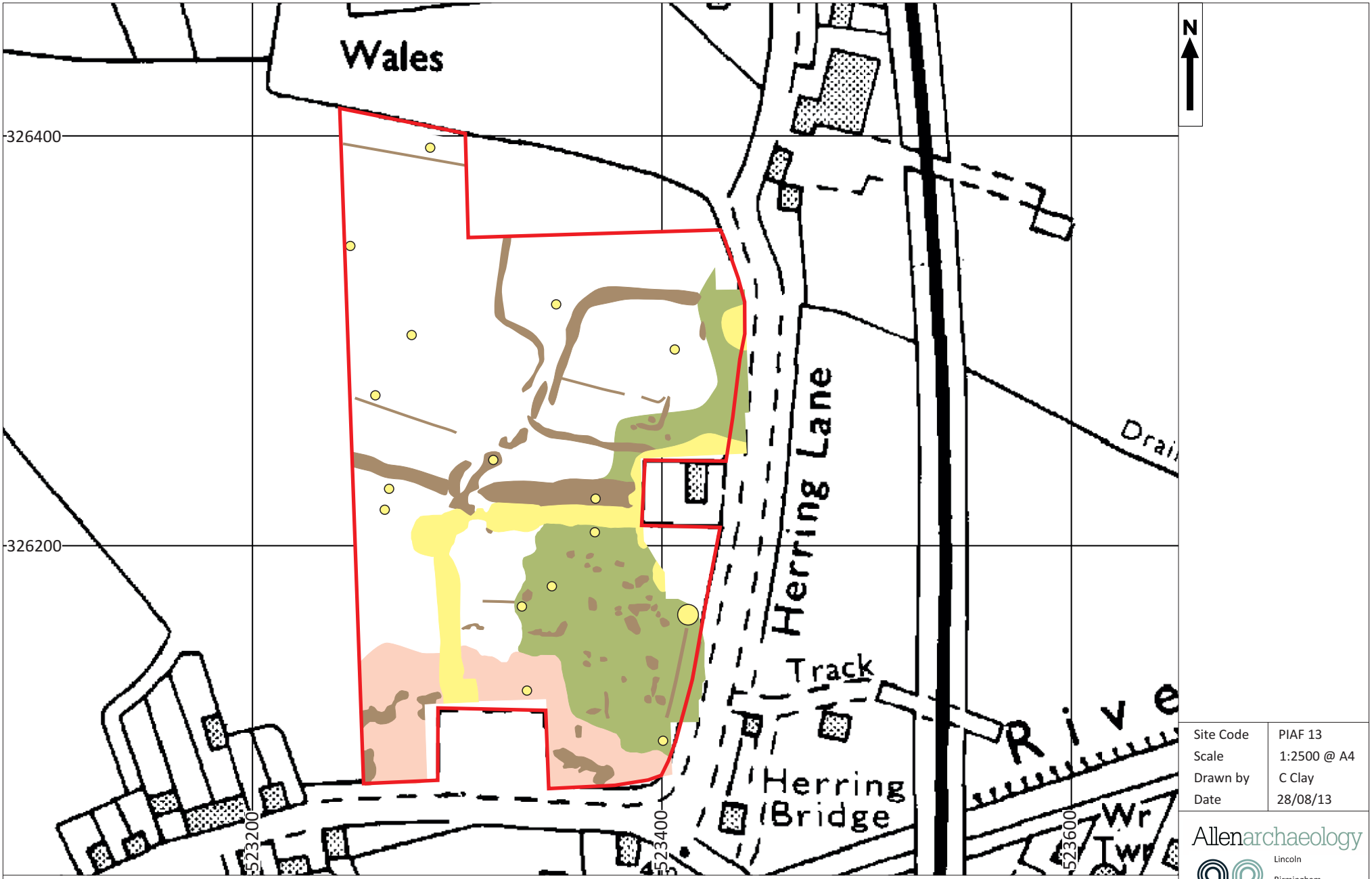


Figure 5: Processed greyscale plot in real space, with site outlined in red



Site Code	PIAF 13
Scale	1:2500 @ A4
Drawn by	C Clay
Date	28/08/13

Allenarchaeology
Lincoln
Birmingham
Cambridge
Southampton
www.allenarchaeology.co.uk

Figure 6: Interpretative plot in real space, with site outlined in red

Allen Archaeology Limited
Website: www.allenarchaeology.co.uk

Company Registered in England and Wales No: 6935529

Lincoln
Unit 1C
Branston Business Park
Lincoln Road
Branston
Lincolnshire LN4 1NT

Tel/Fax: +44 (0) 1522 794400
Email: info@allenarchaeology.co.uk

Birmingham
Arion Business Centre
Harriet House
118 High Street
Birmingham
B23 6BG

Tel/Fax: +44 (0) 800 610 2545
Email: birmingham@allenarchaeology.co.uk

Cambridge
Wellington House
East Road
Cambridge
CB1 1BH

Tel/Fax: +44 (0) 800 610 2550
Email: cambridge@allenarchaeology.co.uk

Southampton
International House
Southampton International Business Park
George Curl Way
Southampton
SO18 2RZ

Tel: +44 (0) 800 610 2555
Email: southampton@allenarchaeology.co.uk