

ARCHAEOLOGICAL EVALUATION REPORT:
GEOPHYSICAL SURVEY BY MAGNETOMETRY ON LAND OFF NEWARK ROAD, NORTON DISNEY,
LINCOLNSHIRE

NGR: SK 861599
AAL Site Code: NDNR 20
OASIS Reference Number: allenarc1-402792



Report prepared for the Norton Disney History and Archaeology Group

By
Allen Archaeology Limited
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Allenarchaeology



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Cover image: View across the site, looking north

Executive Summary

- Norton Disney History and Archaeology Group commissioned Allen Archaeology Limited to undertake a geophysical survey using magnetometry on land off Newark Road, Norton Disney, Lincolnshire, to help provide information into the historic environment of the Norton Disney landscape.
- The site lies within an area of significant archaeological activity, with the site of a Roman villa lying in the field immediately to the north. Iron Age activity has also been identified by geophysical survey and trial trenching to the immediate west of the site.
- The survey has identified several potential archaeological features. A circular/sub-rectangular feature along with positive linear features were revealed, potentially suggesting settlement activity and boundary or enclosure features. These corresponded well with cropmarks seen within that part of the field, and potentially suggest that activity from the Roman villa settlement may extend into the north-eastern part of the field.
- Magnetic noise seen within the field corresponds with potential Iron Age iron slag seen on the surface, particularly towards the northeast corner of the site.
- The survey clearly identified several linear features which correspond with former field boundaries and drains which were still present on mapping dated to 1950.
- Negative linear and curvilinear features revealed towards the southern end of the site may correspond with cropmarks seen within that area and may form another component of the later prehistoric and Roman landscape.

1.0 Introduction

- 1.1 Norton Disney History and Archaeology Group commissioned Allen Archaeology Limited (AAL) to undertake a geophysical survey using magnetometry on land off Newark Road, Norton Disney, Lincolnshire, to provide information into the historic environment of the Norton Disney landscape and potentially inform the location of future seasons of excavation by the group.
- 1.2 The site works and reporting conform to current national guidelines, as set out in '*EAC Guidelines for the Use of Geophysics in Archaeology*' (EAC 2016), '*The Use of Geophysical Techniques in Archaeological Evaluations*' (Gaffney *et al.* 2002), and the Chartered Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (CIfA 2014).

2.0 Site Location and Description

- 2.1 Norton Disney is located approximately 15.2km to the southwest of Lincoln and 10.3km to the north-northeast of Newark. The area of investigation lies approximately 2.5km to the west-northwest of the centre of Norton Disney and comprises 11.2 hectares of farmland, bounded by Folly Lane to the west and Newark Road to the south, centred on NGR SK 861599 (Figure 1).
- 2.2 The local geology comprises a bedrock geology of Scunthorpe Mudstone Formation, with Eagle Moor Sand and Gravel Member superficial deposits recorded over much of the site (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>). Although the bedrock of mudstone can give a variable response to magnetometry, the superficial sand and gravels generally give a moderate to good response (English Heritage 2008).

3.0 Planning Background

- 3.1 This scheme of work is being undertaken to aid understanding of the historic environment of this part of Norton Disney within the wider archaeological landscape and to potentially inform future excavations for a community project, and therefore lies outside the planning system.

4.0 Archaeological and Historical Background

- 4.1 Immediately to the north of the site is a Roman villa, which survives solely as below-ground remains and is designated as a Scheduled Monument (No. 1005018, LHER No. 60745). Excavations undertaken between 1934 and 1937 identified a multiphase development of the villa site from the 1st century AD through to the middle of the 4th century AD. A geophysical survey (Bunn 2018) of the entire field containing the villa, using both magnetometry and resistivity techniques, revealed anomalies associated with the primary villa complex, as well as features potentially associated with prehistoric occupation of the site.
- 4.2 A geophysical survey (Bunn 2017) immediately to the west of Folly Lane (and to the east of the site) revealed potential pits and ditches. A follow up evaluation (Brocklehurst 2017) established these features as being Iron Age in origin, therefore pre-dating the villa.
- 4.3 At the northern end of the site, cropmarks recorded in the Lincolnshire Historic Environment Record (Monument No. 1067645) suggest the location of a probable prehistoric or Roman settlement consisting of enclosures and a possible hut circle. A geophysical survey (Jefferson 2019) on the northern part of the site identified a possible roundhouse and enclosures.

- 4.4 Within the southern part of the field cropmarks have been identified suggesting former boundaries and enclosures (HER No. 67050) of uncertain date and origin.

5.0 Methodology

- 5.1 The geophysical survey consisted of a detailed gradiometer survey totalling approximately 10.7 hectares. The survey was undertaken in a series of 30m grids across the site. It was not possible to survey a small area at the eastern end of the site as maize crop was present there.

Summary of Survey Parameters

5.2 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:	0.01nT
Processing Software:	3.0.36.0
Surface Conditions:	Stubble
Area Surveyed:	10.7 hectares
Date Surveyed:	Monday 24 th to Thursday 27 th August 2020
Surveyor:	Robert Evershed BSc (Hons)
Survey Assistant:	Dominika Czop
Data Interpretation:	Robert Evershed BSc (Hons)

Data Collection and Processing

- 5.3 The grids were marked using pre-programmed grids on the Leica GS08 Net rover. Magnetic data was collected close to a north to south alignment. A traverse pattern close to north-south is preferable as the fluxgate gradiometer is set up and balanced with respect to the cardinal points. Since the data is plotted as north-south traverses there is considerable merit sampling the north-south response of a magnetic anomaly with as many data points as is possible, this is accomplished as the density collected along the traverse line is greater than that between traverses (Aspinall *et al.* 2008). On this occasion the grids were aligned exactly north to south.
- 5.4 The data collected from the survey has been analysed using Terrasurveyor 3.0.36.0. 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-stripping
 - Clipping
 - De-staggering
- 5.5 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 as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

- 5.6 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.
- 5.7 The de-staggering process compensates for data correction errors caused by the operator commencing the recording of each traverse too soon or too late. It shifts each traverse either forward or backwards by a specified number of intervals.
- 5.8 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 Results

- 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, with a number of anomalies identified across the data set. These are discussed in turn and noted as single or double digit numbers in square brackets.
- 6.2 A small area at the eastern end of the site was covered in maize crop and therefore was not suitable for surveying.



Plate 1: Maize crop covering a small part of the site, looking northeast

- 6.3 There are a few areas of magnetic noise [1], [2] and [3], which produced magnetic readings of up to -100 to 100 nT/m, which correspond with metal gates at entrances to the site.



Plate 2: Metal gate at the south-eastern entrance to the field

- 6.4 Within the topsoil in the north-eastern part of the site a fair amount of slag was noticed during surveying. This appeared to correspond mainly with the area of magnetic noise [4], -4 to 4 nT/m with some much higher spikes of -60 to 60 nT/m. Along the northern edge of the site there were other areas of magnetic noise [5] and [6]. These produced readings of -3 to 2 nT/m and -5 to 5 nT/m, with both areas having some much higher spikes up to -50 to 50 nT/m. These areas could represent dumps of modern material, however with the slag seen within the topsoil it is possible that the debris from former iron working may be responsible for the readings. It is possible that the magnetic noise [6] could represent dumping associated with infilling of a small pond in this location shown on the 1950 OS map (Figure 6).
- 6.5 Running across the centre of the field, aligned northeast to southwest, and north to south, are several linear dipolar features [7]. These have produced readings of -10 to 10 nT/m, with some higher readings in places, and correspond with former field boundaries and large drains that can be seen on former OS maps (Figure 6). The linear dipolar feature [8], -2 to 3 nT/m, also appears to correspond with a former field boundary (Figure 6).
- 6.6 Within the north-western corner of the field there was a roughly sub-circular/sub-rectangular positive feature [9], 15 – 16m in diameter, 2 to 4 nT/m, which may represent a feature such as a potential barrow or a small enclosure. This feature was visible on aerial photographs and shown as part of the complex of cropmarks for this part of the field (Figure 7). Potentially associated with this are linear positive features [10], 2 to 6 nT/m, which appear to form part of an enclosure, possibly extending into the villa field immediately to the north.
- 6.7 On various alignments within the central part of the field are several potential linear positive features [11] and [12], 2 to 3 nT/m, which likely all represent different phases of land drainage.
- 6.8 The short positive linear feature [13], 1 nT/m, corresponds to a former field boundary, and a continuation of the linear dipolar feature [8] (Figure 6).
- 6.9 In the southern part of the site there are more potential linear positive features on different alignments [14] and [15], 1 nT/m, which are again likely to represent land drains.

- 6.10 Within the southern part of the site there are several connecting potential linear negative features [16], -1 nT/m. The regular appearance of these features may suggest they could represent former field boundaries or enclosure features and may tie in with cropmarks seen within this area of the field.
- 6.11 The curvilinear negative feature [17], -1 to -1.5 nT/m corresponds with a track along the edge of the field.
- 6.12 Towards the northern edge of the site there is another potential negative curvilinear feature [18], -1 nT/m, which could represent a former boundary feature.
- 6.13 Scattered randomly throughout the site are several weak and strong dipolar responses, examples of which are highlighted as [19]. The characteristic dipolar response of pairs of positive and negative 'spikes' suggest near-surface ferrous metal or other highly fired material in the topsoil, which could represent small pieces of metal such as nails, horseshoes or parts of a tractor.

7.0 Discussion and Conclusions

- 7.1 The geophysical survey has identified a number of features of archaeological interest. The most prominent of these is in the northwest corner of the site. A sub-circular/sub-rectangular positive feature along with other linear positive features corresponds well with cropmarks previously identified within that area. These may represent a structural feature, along with associated boundary or enclosure features. The cropmarks appear to extend into the field to the north, and this may suggest that they represent a continuation of activity associated with the Roman villa settlement in that field, however they may instead relate to the later prehistoric features recorded in the geophysics and trenching to the west of the site. The cropmarks appear more extensive than the features revealed by the survey, and this could suggest that ploughing within this area of the field has truncated some former features since the cropmarks were identified. The geophysical survey (Jefferson 2019), which covered the very northern part of the site, produced results which corresponded very well with the results of this survey.
- 7.2 Towards the northeast corner of the field, lumps of slag were seen during surveying. These do seem to correspond with areas of magnetic noise within the field, which may represent dumps of waste material from iron making activity potentially dating to the Iron Age.
- 7.3 Linear dipolar features revealed in the survey clearly represent former field boundaries and drains within the field, which were still present on mapping dated to 1950.
- 7.4 Many other potential positive linear features were identified, on various alignments within the field, and these likely represents different phases of recent land drainage.
- 7.5 A few potential negative linear features may correspond with cropmarks identified within the southern part of the field and may represent former boundary or enclosure features, again potentially of a later prehistoric or Roman date, given the findings from the surrounding landscape.

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 was the prospection technique best suited

to the identification of archaeological remains on the site. Other techniques would have required further justification and may have proved too time consuming or cost prohibitive.

9.0 Acknowledgements

- 9.1 Allen Archaeology Limited would like to thank Norton Disney History and Archaeology Group for this commission.

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Appendix 1: Figures

Figure 1: Site location outlined in red

Figure 2: Greyscale raw data and processed trace plot

Figure 3: Processed greyscale plot and interpretation

Figure 4: Processed greyscale location

Figure 5: Geophysical interpretation location

Figure 6: Site boundary and geophysics greyscale plot superimposed over 1950 OS map

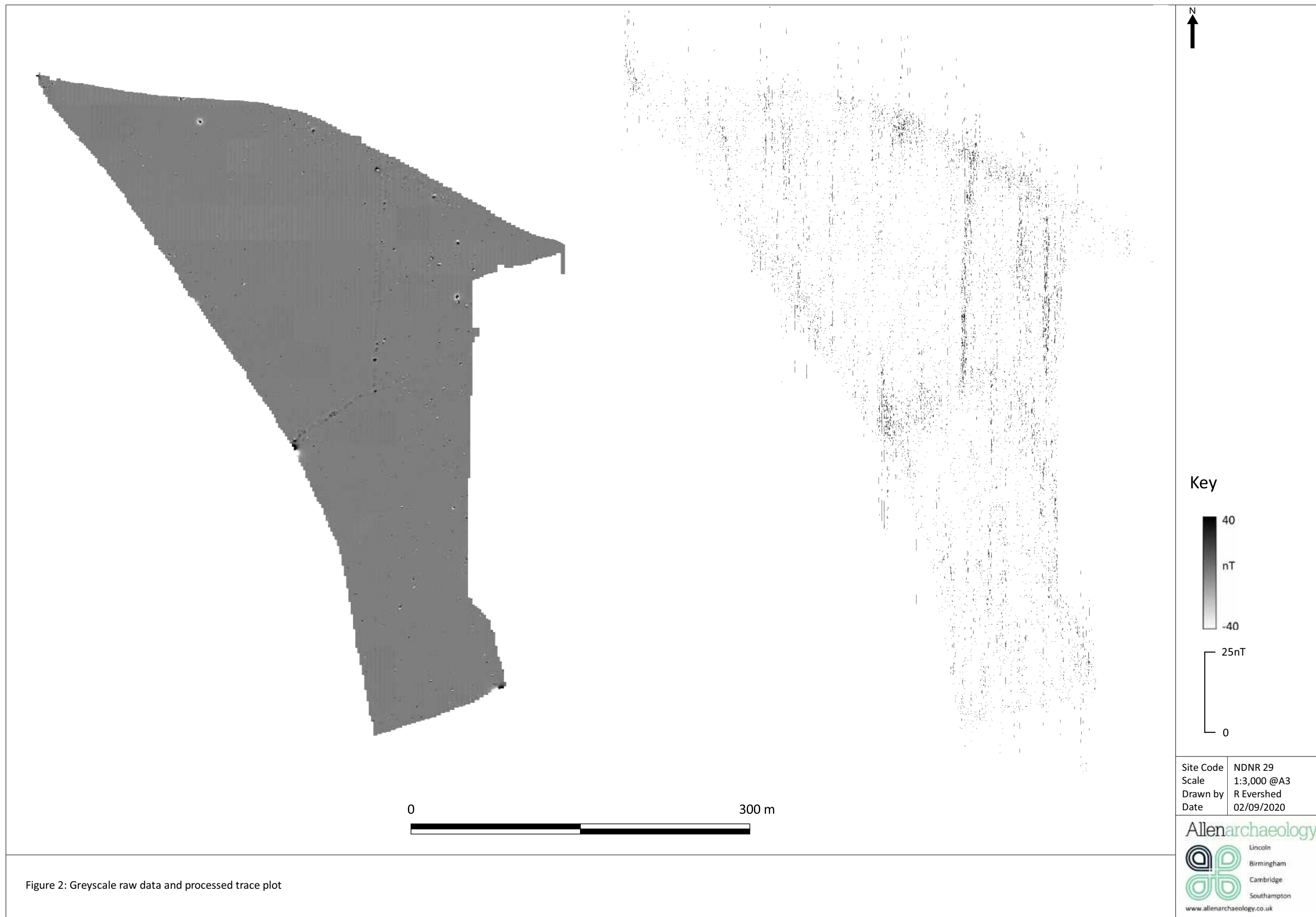
Figure 7: Site boundary superimposed over aerial photograph of the site, crop marks from the HER and geophysical greyscale plot within northwest corner of the site



Figure 1: Site location outlined in red

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Site Code	NDNR 20
Scale	1:10,000,000 1:1,000,000 1:25,000 @ A4
Drawn by	R Evershed
Date	04/09/2020



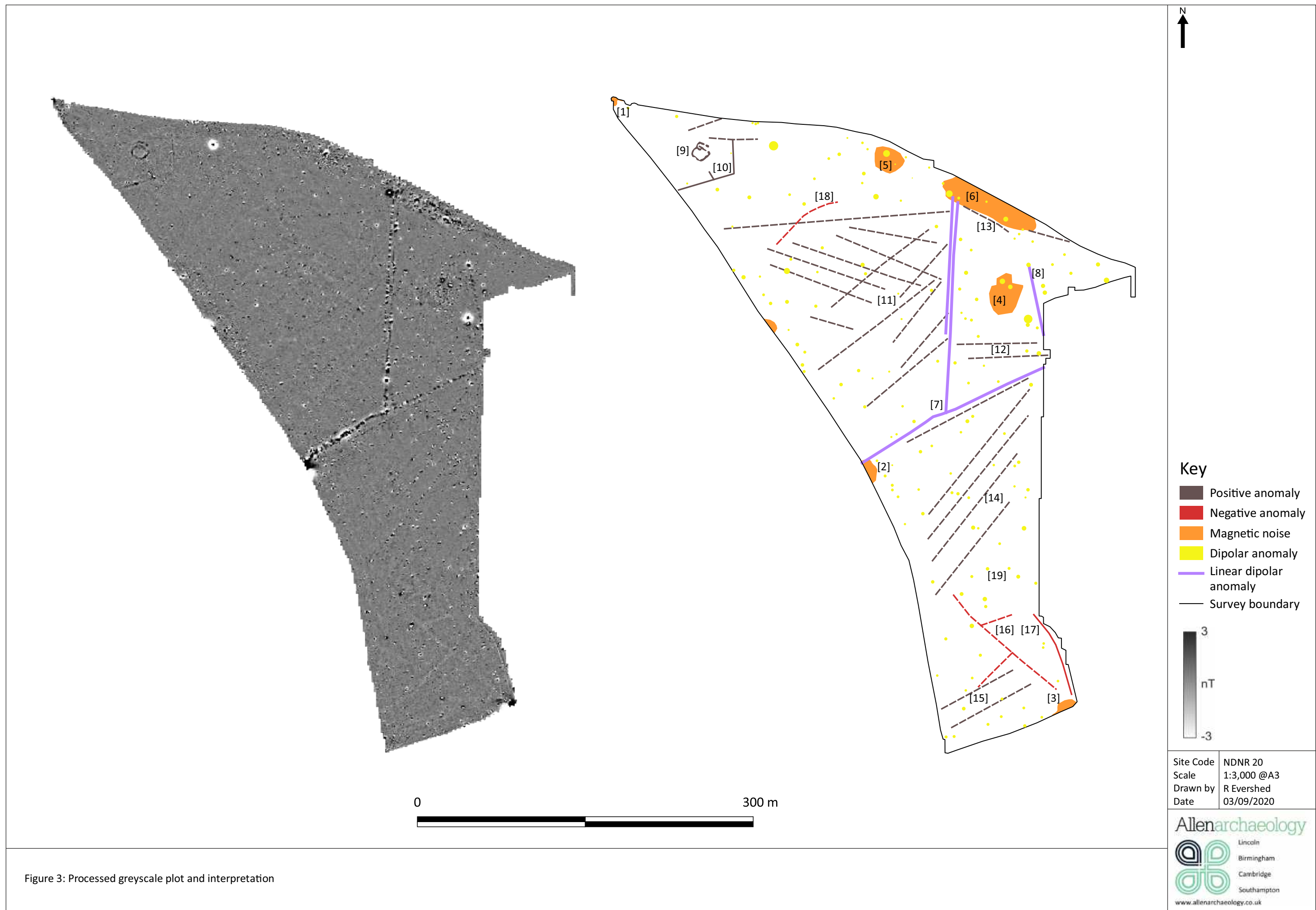




Figure 4: Processed greyscale location





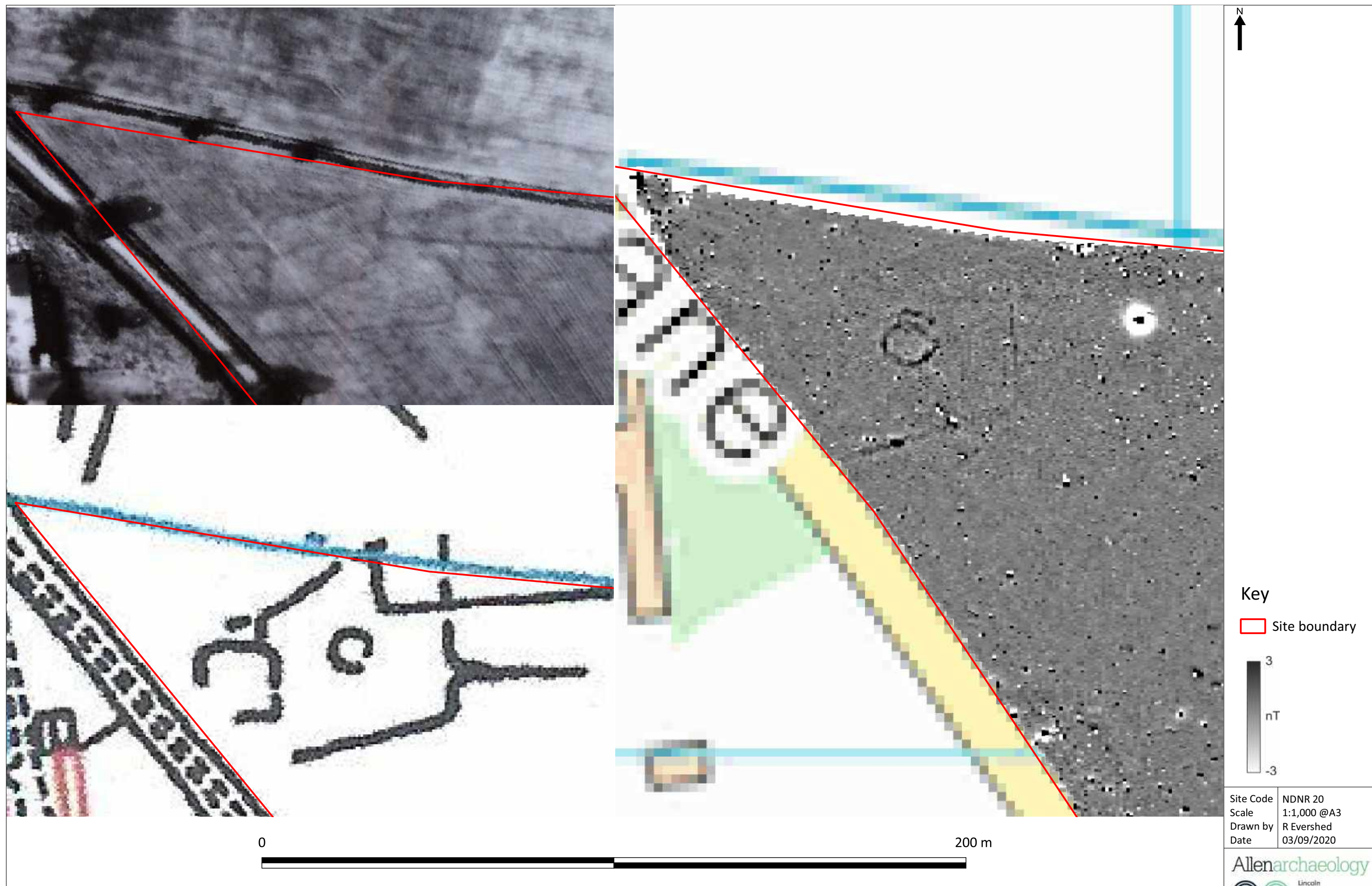


Figure 7: Site boundary superimposed over aerial photograph of site, crop marks from HER and geophysical greyscale plot within northwest corner of site



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