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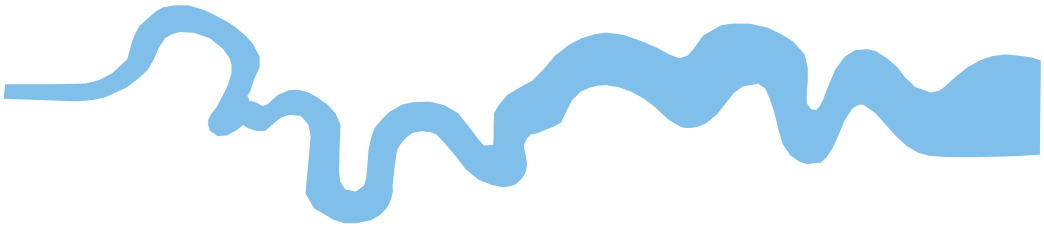

NORTH MIDLANDS

Land at Bonehill Road, Tamworth, Staffordshire

Geophysical Survey

by Kyle Beaverstock

Site Code BHT 19/146

(SK 2037 0357)

Land at Bonehill Road, Tamworth, Staffordshire

Geophysical Survey (Magnetic) Report

For Rockford Estate

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code BHT 19/146

September 2019

Summary

Site name: Land at Bonehill Road, Tamworth, Staffordshire

Grid reference: SK 2037 0357

Site activity: Magnetometer survey

Date and duration of project: 27th of September 2019

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: BHT 19/146

Area of site: 0.2ha

Summary of results: Other than an area of magnetic debris, no features of an archaeological nature were identified by the geophysical survey.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by: Tim Dawson✓ 1.10.19

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Land at Bonehill Road, Tamworth, Staffordshire
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 19/146

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Bonehill Road, Tamworth, Staffordshire (SK 2037 0357) (Fig. 1). The work was commissioned by Helen Martin-Bacon of Avalon Heritage Ltd on behalf of Rockford Estates Ltd.

Planning permission (Application No: 0443/2016) was submitted to Tamworth Borough Council and is subject to a condition relating to archaeology. A programme of archaeological works including a geophysical survey has been commissioned to be undertaken prior to construction commencing. This is in accordance with the Ministry of Housing, Communities and Local Government's *National Planning Policy Framework* (NPPF 2019), and the Borough's policies on archaeology. The field investigation was carried out to a specification approved by the Staffordshire County Council Heritage Environment Team. The fieldwork was undertaken by Kyle Beaverstock and Sophie Peng on the 27th of September 2019 and the site code is BHT 19/146.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located to south-west of central Tamworth (Fig. 1), 190m from the southern and western banks of the river Tame, to the south-west of a bend in the river at the junction between the rivers Tame and Anker and c.380m south-west of Tamworth Castle. It is bounded by Bonehill Road to the south, commercial buildings to the east and an embankment to the north and west. This sub-rectangular parcel of land sits at a height of c.58m above Ordinance Datum and is currently not being utilised. The underlying geology is stated as either Alluvium to the north or First Terrace River Gravel to the south (BGS 1970).

Site history and archaeological background

A full description of the historical background can be found in the desk-based assessment (Wardle *et al* 2015). To summarise, the site lies to the c.500m south of the historic centre of Tamworth at the confluence between the rivers Tame and Anker. Tamworth was a significant Saxon trading centre and by the 8th century was capital of

Mercia. Following the Norman conquest in 1066, the town was reordered and a castle constructed (c.380m to the northeast of the site). Historical records show that a mill was built nearby although not within the site boundaries in 1166 with the area of the site part of the 'Bitterscote Pool'. Following this the site appears to have been largely empty marshland with only a flood defence embankment constructed in the 20th century along the northern boundary the only recorded activity.

Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating northwest to southeast zig-zag orientation across the survey area. Although the majority of the site was unobstructed, there was significant overgrowth along the southern and eastern boundaries that prevented these areas from being surveyed.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 2014).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for the fast yet detailed surveying of an area.

The detailed magnetometry survey was carried out using two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches can be seen from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyor software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -24.66 to 27.29 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

The greyscale plot of the processed data is exported from TerraSurveyor in a georeferenced portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is combined with grid and site plans in QGIS 2.18.15 and exported again in .PNG format in order to present them in figure templates in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised, they are exported in .PDF format for inclusion within the finished report.

Results

In the north-western part of the site most of the area returned a scattering of strong dipolar responses indicating an area of significant buried magnetic debris. This is characterised by a spread of dipolar magnetic responses with a high amplitude. On the eastern boundary there is an area of magnetic disturbance, this was likely caused by the boundary fence which was comprised of ferrous materials.

Conclusion

Much of the results appear to show an extensive area of magnetic debris in the north-western area of the site while there was some interference in the south-eastern area of the site from the boundary fence. This relatively small survey area did not reveal any distinct features of an archaeological nature.

References

BGS, 1970, *British Geological Survey*, 1:63,360, Sheet 154, Solid Edition, Keyworth

CI*f*A, 2014, 'Standard and Guidance for archaeological geophysical survey', Reading

EAC, 2015, *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*, EAC Guidelines 2, Namur

IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading

NPPF, 2019, *National Planning Policy Framework (revised)*, Ministry for Housing, Communities and Local Government, London

Wardle, P, Lacey, C, Papworth, H, 2015, Land adjacent to co-op garage site: desk-based assessment, Goring

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Filename: tamworth RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 420341.259975515, 303598.380783379 m
Southeast corner: 420407.559975515, 303555.610783379 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 1
Dummy Value: 32702

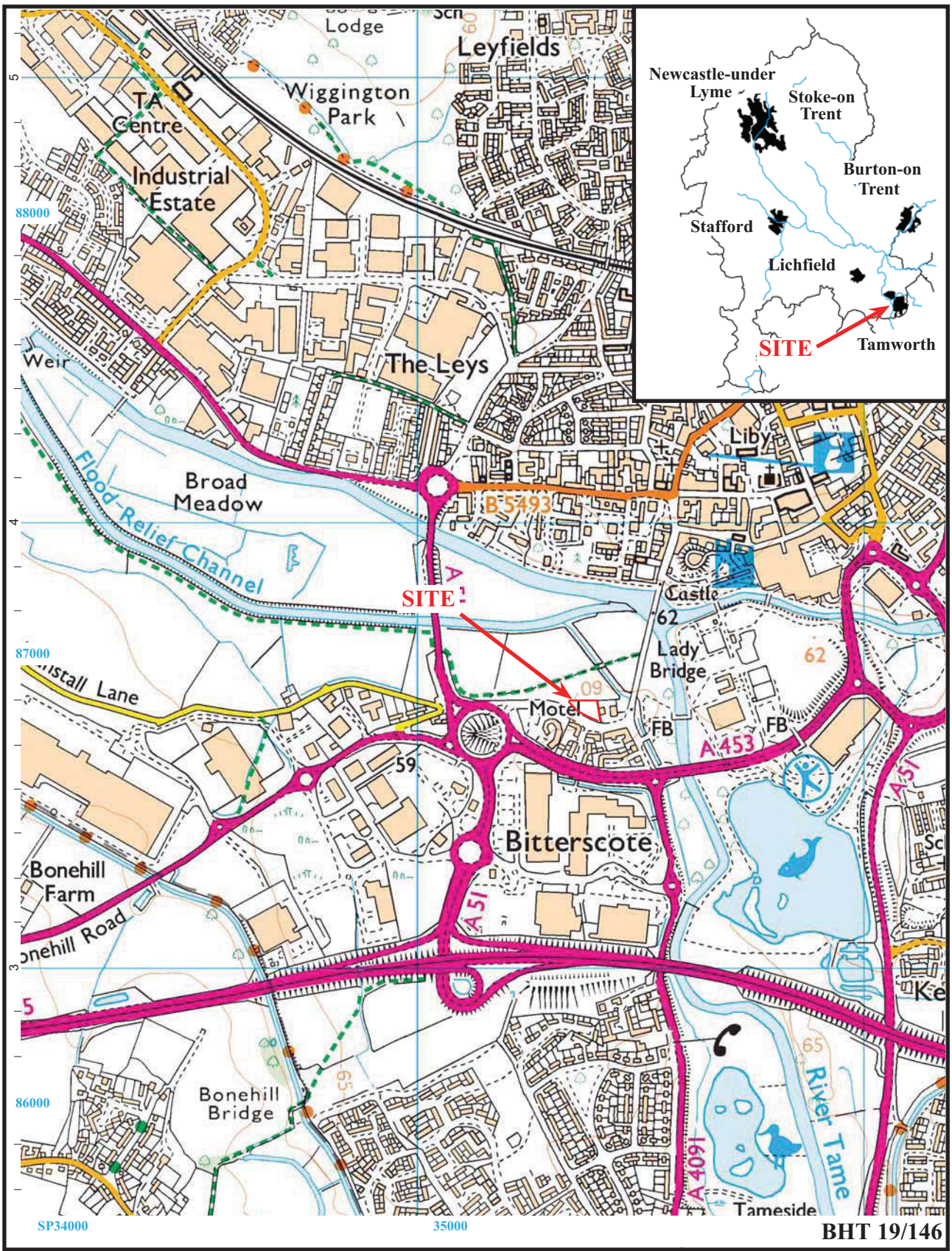
Dimensions
Survey Size (meters): 66.3 m x 42.8 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 6079, Recorded: 6079

Stats
Max: 107.02
Min: -109.02
Std Dev: 25.00
Mean: 0.61
Median: -1.01
Composite Area: 0.28357 ha
Surveyed Area: 0.14717 ha

Processed data
Filename: tamworth.xcp

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Despike Threshold: 1 Window dia: 3
5 Clip at 1.00 SD

Stats
Max: 27.29
Min: -24.66
Std Dev: 10.92
Mean: 0.54
Median: 0.02
Composite Area: 0.28357 ha
Surveyed Area: 0.14717 ha



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Land at Bonehill Road, Tamworth
Staffordshire, 2019
Geophysical Survey

Figure 1. Location of site within Tamworth and Staffordshire.

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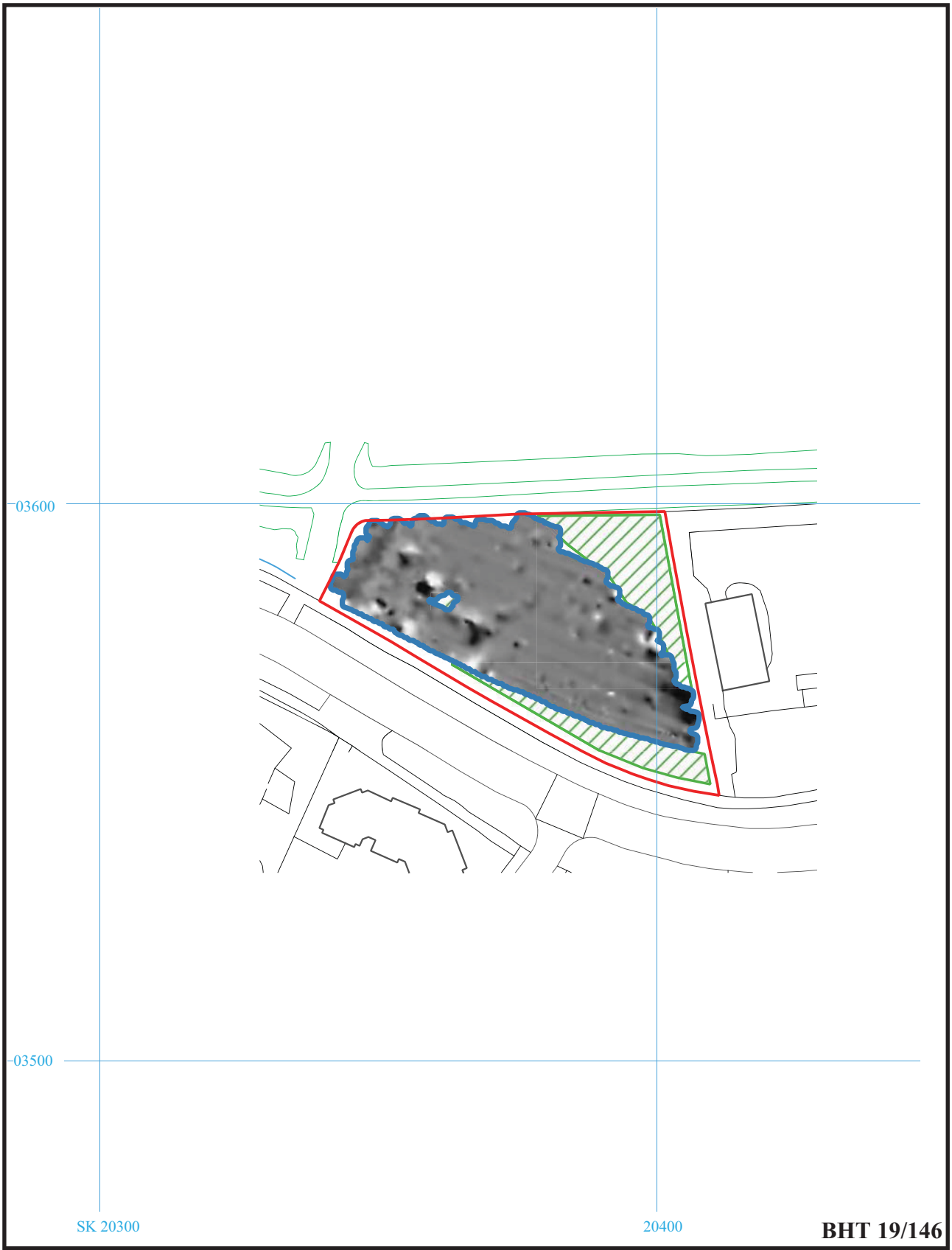

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Land at Bonehill Road, Tamworth, Staffordshire, 2019
Geophysical Survey (Magnetic)
Figure 2. Plot of raw gradiometer data.

0m 50m

+100
nT
-100

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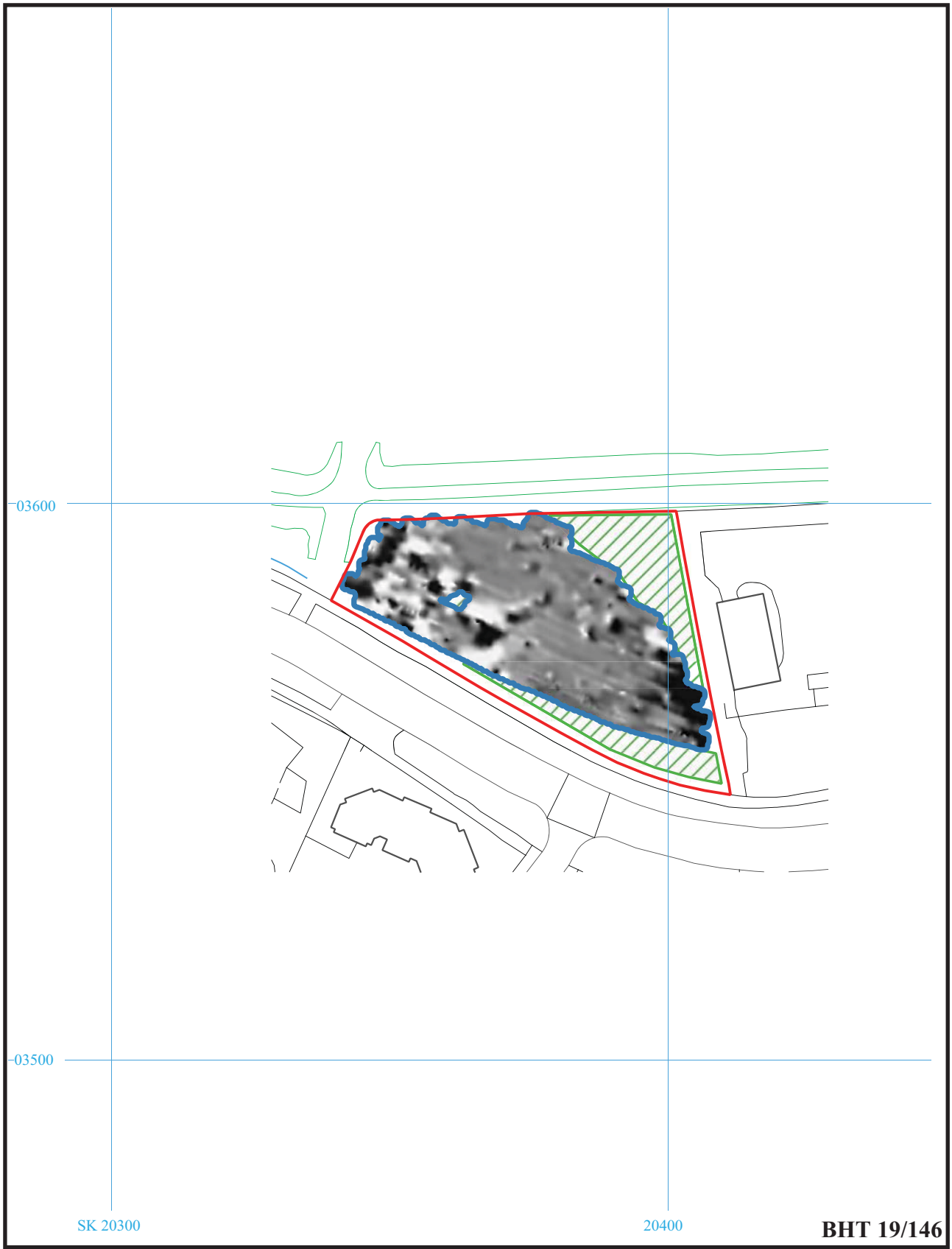
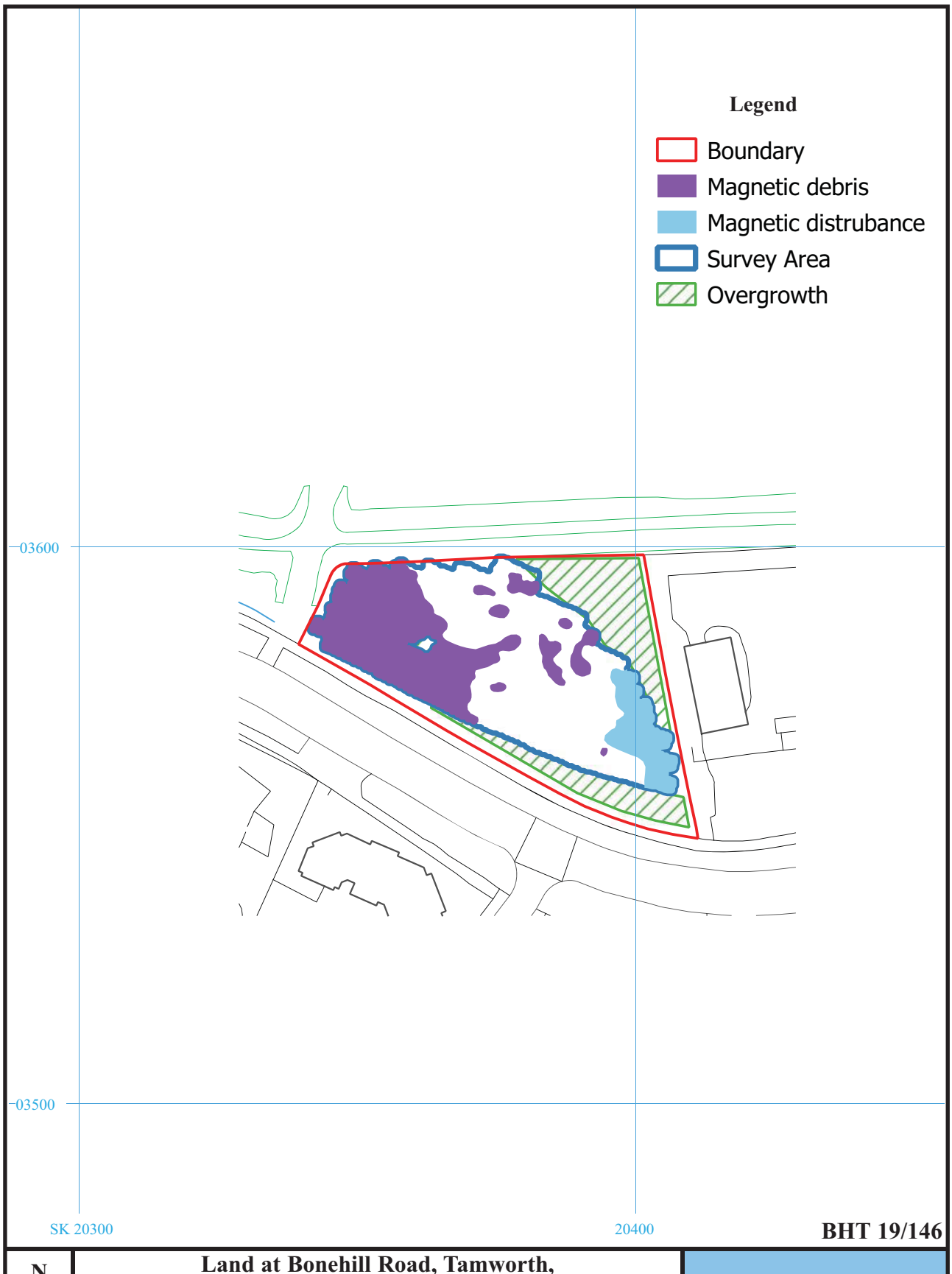


Land at Bonehill Road, Tamworth, Staffordshire, 2019
Geophysical Survey (Magnetic)
Figure 3. Plot of processed gradiometer data.



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Land at Bonehill Road, Tamworth, Staffordshire, 2019
Geophysical Survey (Magnetic)
Figure 4. Interpretation plot.

0m 50m

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Plate 1. Survey area looking southeast.

Plate 2. Tamworth Castle from survey area looking northeast.

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Land at Bonehill Road, Tamworth,
Staffordshire, 2019
Geophysical Survey (Magnetic)
Plates 1 and 2.

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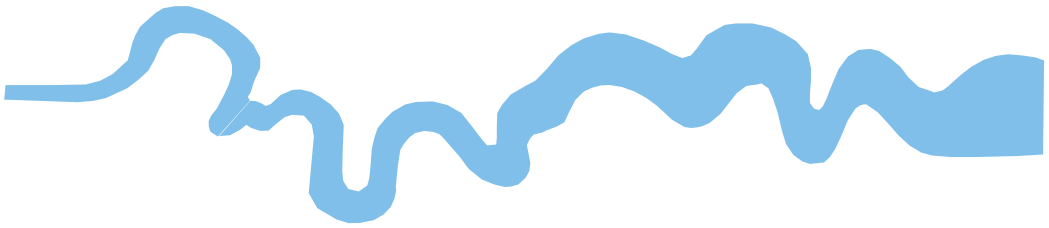
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
	AD 0 BC
Iron Age	750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC



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