LAND AT
ORBY ROAD,
BURGH LE MARSH,
LINCOLNSHIRE

GEOPHYSICAL SURVEY
(BLOR17)

Work undertaken for
Mr and Mrs DE Brooks

May 2017

Report produced by
Sean Parker BSc (Hons),

OASIS Ref: archaeol1-285270
National Grid Reference: TF 50177 65315

APS Report No: **27/17**

ARCHAEOLOGICAL
PROJECT
SERVICES

CONTENTS

List of Figures

1. SUMMARY

A detailed magnetic gradiometer survey was undertaken in advance of proposed residential development on land at Orby Road, Burgh Le Marsh, Lincolnshire. The survey area totalled c. 2.7ha.

The geophysical survey revealed several anomalies most of which are believed to be modern or geological in origin, some anomalies cannot be clearly identified and origins are uncertain.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (CIfA 2014a).

2.2 Project Background

Archaeological Project Services was commissioned by Neil Dowlman Architecture on behalf of Mr and Mrs DE Brooks to undertake a detailed magnetometer survey totalling some 2.7ha on land at Orby Road, Burgh Le Marsh, Lincolnshire. This was in advance of proposed development of the area. The work was undertaken in accordance with a specification prepared by APS and approved by the Planning Archaeologist, East Lindsey District Council. The survey was carried out on the 16th May 2017.

2.3 Topography and Geology

Burgh Le Marsh is situated 7.3km west of Skegness, 24km east of Horncastle in the administrative district of East Lindsey, Lincolnshire (Fig 1). The proposed development site is located 200m north of the centre of Burgh Le Marsh at National Grid Reference TF 50177 65315 (Fig 2).

The site is at a height of *c.*10m OD. The bedrock geology is Claxby Ironstone Formation with superficial deposits of clay and silt tidal flat deposits to the north and alluvial till to the south (BGS 2017).

2.4 Archaeological Setting

During the Roman period, Burgh le Marsh was probably an important settlement located at the terminus of a Roman road leading from Lincoln, through Horncastle to the town (Margary 1973, 238). It has also been suggested that Burgh was a military establishment, perhaps one of the Saxon shore forts. Pottery and coins of the period are recorded from the area of Cock Hill, to the southwest of the Site. To the west of the Site, scatters of Romano-British pottery

and coins have been recorded along Orby Road (Snee J, 2016)

3. GEOPHYSICAL SURVEY

3.1 Methods

A magnetic gradiometry survey was carried out with a Bartington Grad 601-2 fluxgate magnetometer. The fields were divided into grids and each grid was walked systematically in a zigzag pattern, taking readings every 0.25m at 1m traverses.

The layout of the survey area is shown in Figure 3. The northern field of the site was meadow and the southern field was pasture. On both sites overgrown bushes and trees covered most of the field boundaries.

The survey was undertaken in accordance with English Heritage (2008) and CIfA (2014b) guidelines and codes of conduct. Detailed methodology can be found in Appendix 1.

3.2 Results

The presentation of the data for the site involves a greyscale print-out of the minimally processed data (Fig 4; clipped for display but otherwise unprocessed) and the processed data (Fig 5). Magnetic anomalies have been identified and plotted on to an interpretative drawing (Fig 6). In the following text, the numbers in brackets refer to annotations on Figure 6

Positive Linear
The small positive linear that is present within the survey is small and has no pattern, neither does it appear to connect any other anomalies and so is considered to be a natural accumulation of magnetically enhanced material.

Dipolar linear
The dipolar linear running across the site (west to east) is believed to be a modern cable or utility route.

Agricultural activity
There are a series of linear features running northeast-southwest across the southern part of the site these are likely caused by ploughing or agricultural activity, for the purpose of clarity only a general indication of alignment has been shown (shown by green arrows).

Isolated positive
Within the area only one strong positive response (C) is clearly visible, with no other anomalies that clearly relate to archaeology on this site. This is believed to be a natural accumulation of enhanced material.

Isolated dipolar
There are several dipolar responses within the site. However, only one is of significantly high value, and probably relates to a modern feature or disturbance as no clear archaeological features are present.

Area of Positive disturbance

The area to the north, has areas of positive responses (D), these responses could be caused by ditches or geological changes. Due to the size of the survey area no pattern can be determined and are of unknown origin.

Area of Bipolar Responses
Within the site there are several areas of bipolar disturbance. Along the southern edge of the site there are some very strong responses which relate to the fencing and housing to the south. Anomaly (A) is a gathering of small bipolar responses that are likely to be modern in origin.

The area shown by anomaly (B) is caused by the utility or cable present within the area.

4. DISCUSSION

The majority of features seen in the survey are likely to be modern in date, or geological in origin. The only exception could be in the northern part of the site where strong positive features are present, however due to the survey area and size there is no clear pattern so these cannot be clearly identified.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Neil Dowlman Architecture who commissioned the project on behalf of Mr and Mrs DE Brooks. The work was coordinated by Paul Cope-Faulkner who also edited this report.

6. PERSONNEL

Project coordinator: Paul Cope-Faulkner
Geophysical Survey: Sean Parker
Survey processing and reporting: Sean Parker.

7. BIBLIOGRAPHY

BGS, 2016 *Geology of Britain Viewer.* Available at http://mapapps.bgs.ac.uk/geologyofbritain/home.html (accessed 04.03.2016)

CIfA, 2014a *Standard and Guidance for Field Evaluation.*

CIfA, 2014b *Standard and Guidance for Geophysical Survey.*

Snee J, 2016 *Heritage Statement, Proposed Development on the land at Orby Road, Burgh Le Marsh, Lincolnshire.*

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

Hodge, C A H, Burton, R G O, Corbett, W M , Evans, R and Seale, R S, 1984 *Soils and their use in Eastern England,* Soil Survey of England and Wales **13**

Margary, ID, 1973 *Roman Roads in Britain*

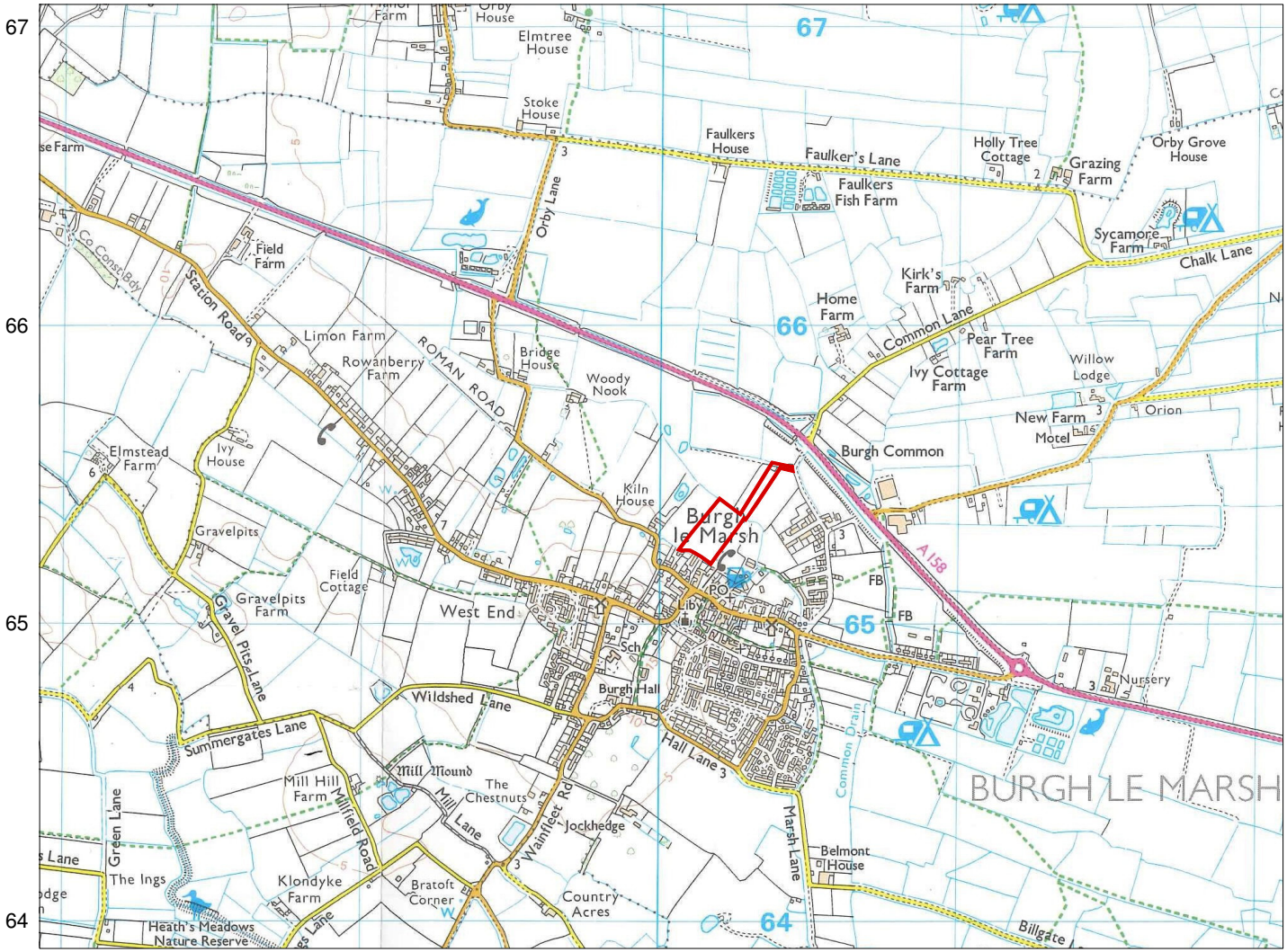
8. ABBREVIATIONS

APS Archaeological Project Services

BGS British Geological Survey

CIfA Chartered Institute for Archaeologists

Figure 1 - General location plan



Archaeological Project Services		
Project Name: Burgh Le Marsh, Orby Road		
Scale 1:500	Drawn by: SP	Report No: 22/17

Figure 2 Site location

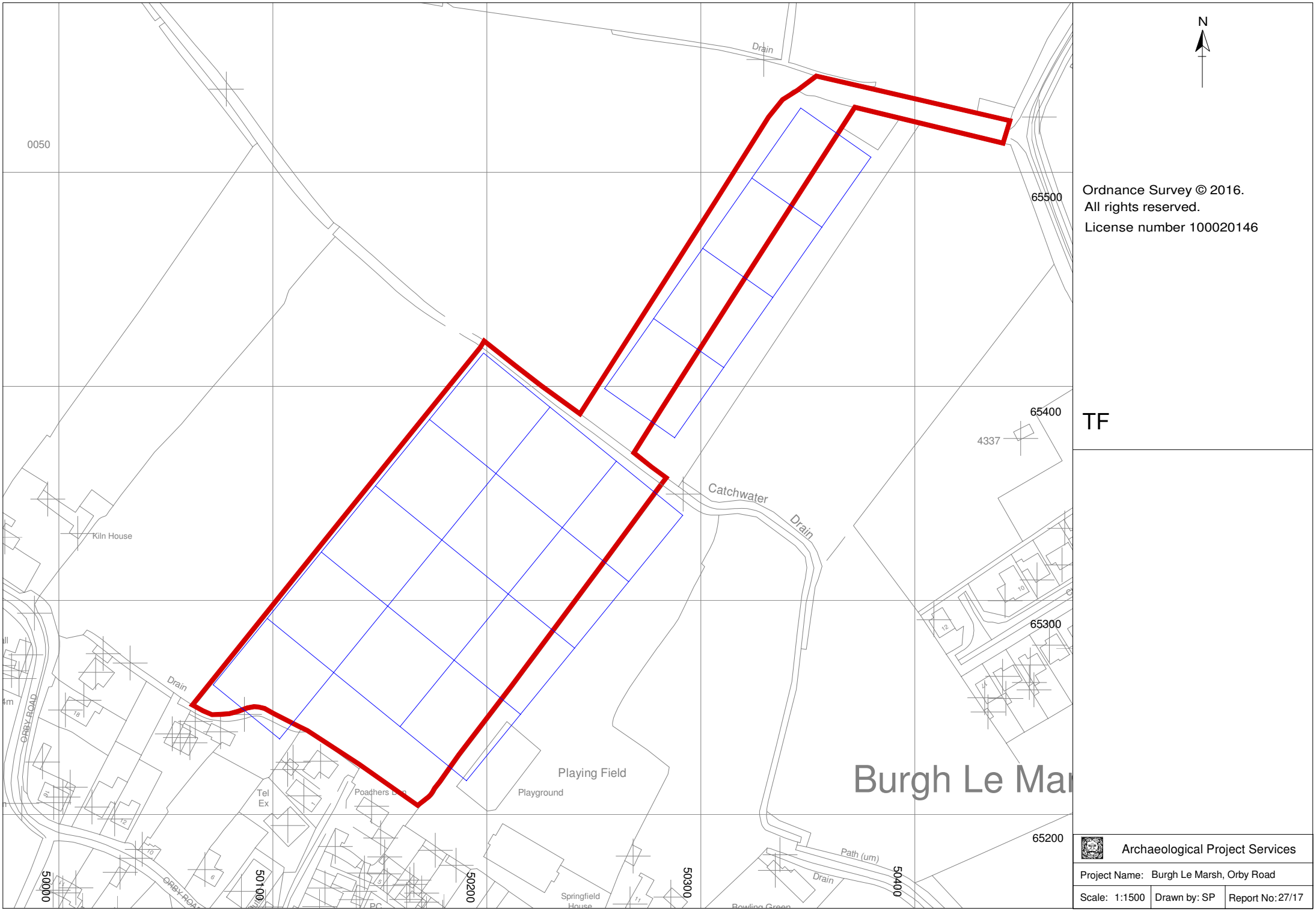


Figure 3: Site Layout

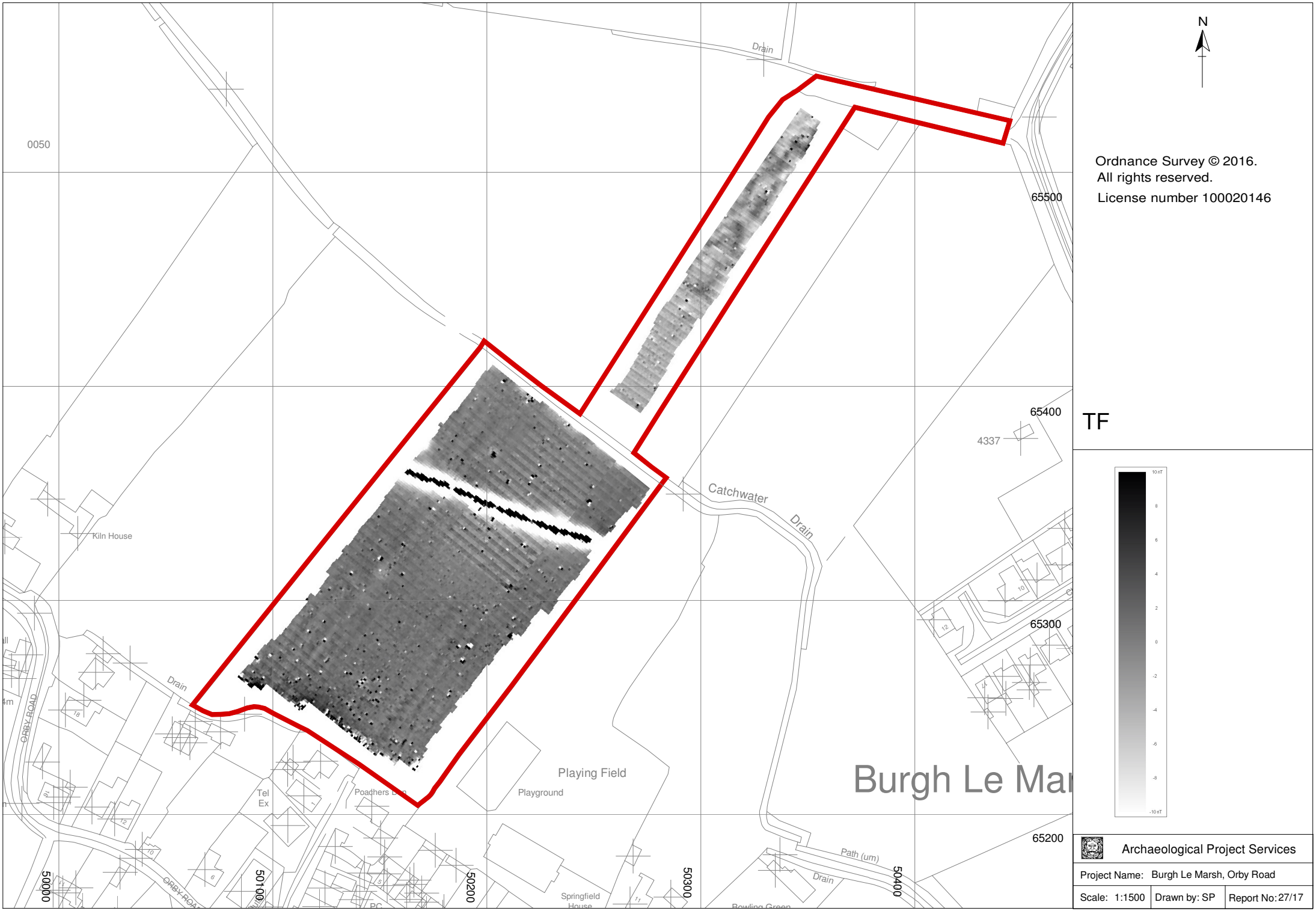


Figure 4: Raw Data Plot

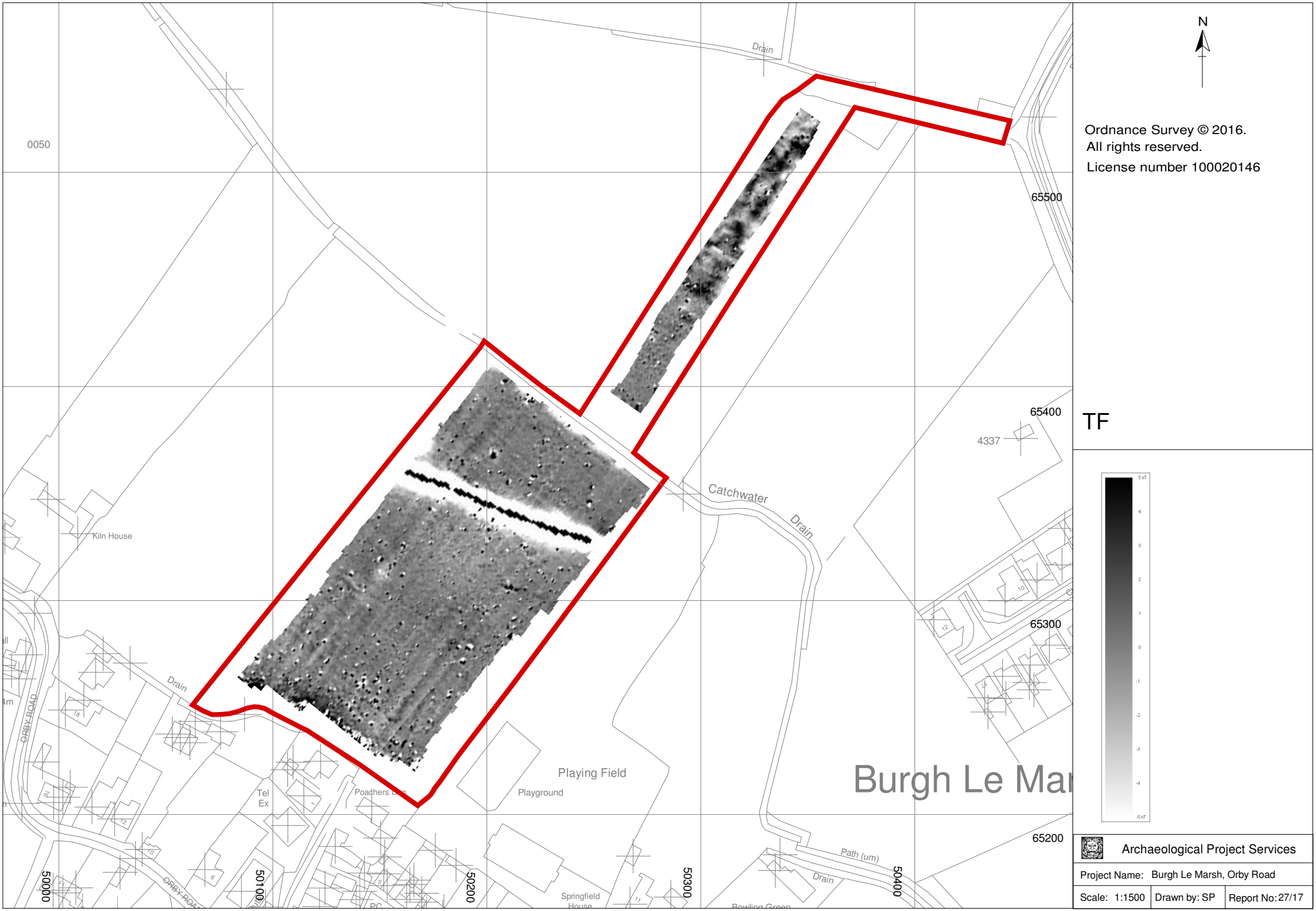


Figure 5: Processed Data

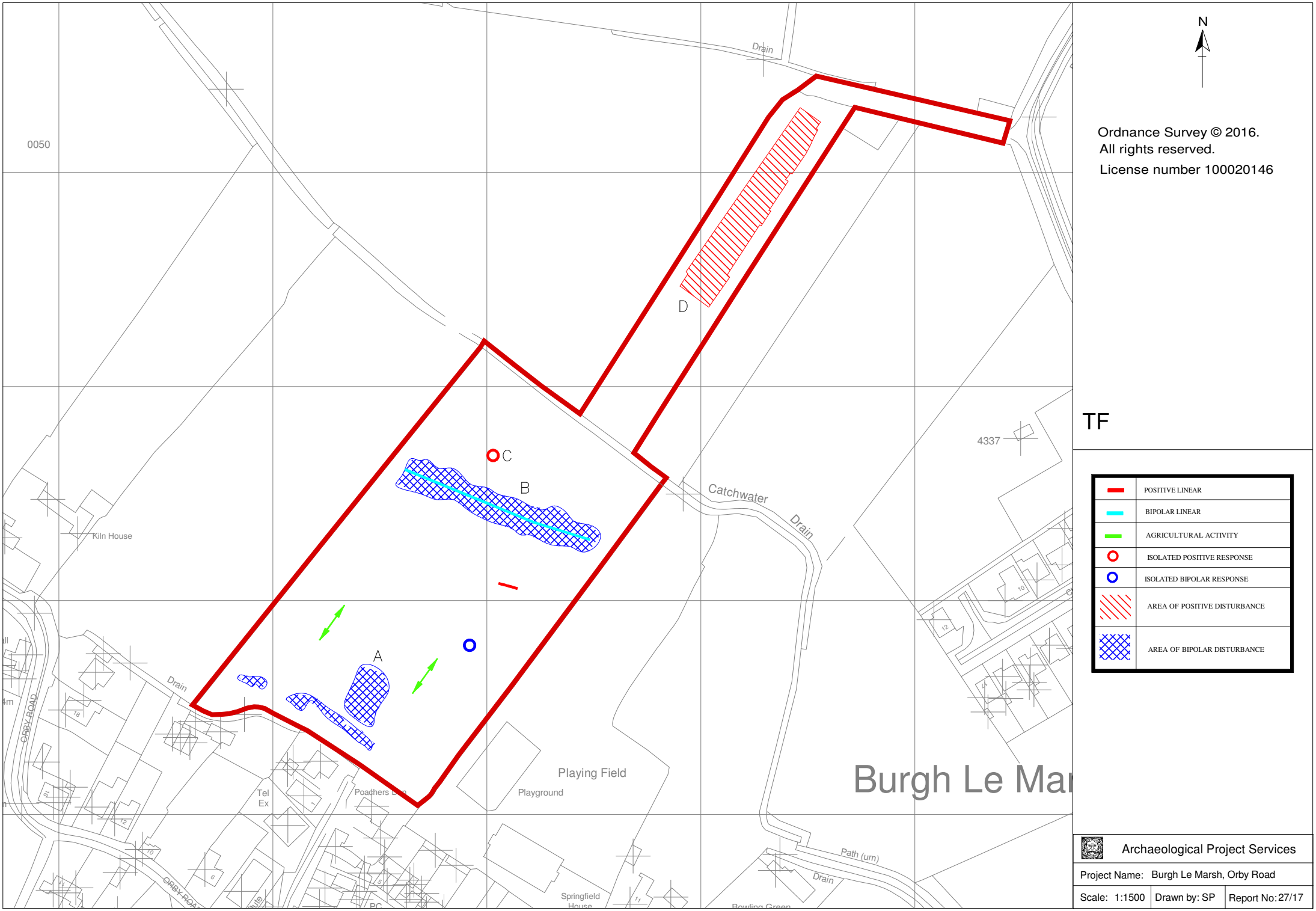


Figure 6: Interpretation

Appendix 1
TECHNICHAL INFORMATION

Principles of magnetometry
The basis for magnetic prospecting is the presence of weakly magnetised iron oxides in the soil. Depending on the state of iron oxides, the material will exhibit either a weak or a strong magnetisation (Gaffney and Gater 2003).

Human activities tend to enrich sediments with magnetic particles. Strong heat, such as that generated by fires, cause surrounding iron particles in the soil to become aligned with the earth's magnetic field and take on a magnetic charge. Where these particles accumulate, such as in cut features like ditches and pits, a weak positive magnetic anomaly is apparent. In cases where very strong heat has been applied, such as furnace and kiln bases, a bipolar magnetic anomaly will be apparent, with one area having a strong positive signature and one area having a strongly negative area. Where banks have been built up from natural geological material which excludes magnetically enriched sediments, or walls have been made of stone, this may result in a negative anomaly. Modern metallic items and fired bricks cause sharp bipolar spikes. Modern services have a tendency to alternate between positive and negative readings along their length.

It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features (Clark 1996).

Bartington Grad 601-2
A gradiometer uses two sensors separated by a fixed distance in order to measure the difference in strength between the earth's magnetic field and the soil. The Bartington Grad 601 uses two fluxgate sensors separated vertically by 1m to take these readings, which reduces variations associated with the Earth's magnetic field and deep geology. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity. The instrument has typical penetration of 0.5m-1m, although stronger anomalies can be detected at greater depths. The 601-2 model uses two pairs of sensors to take parallel readings 1m apart.

Methodology
The survey area is divided into grid squares of $30m^2$ or $40m^2$, depending on the terrain. The grids are set out using a survey grade GPS, accurate to 0.03m. The grids are systematically walked in a zig-zag pattern with the gradiometer taking readings every 0.25m along a traverse, and each traverse being separated by 1m. This equates to 3600 sampling points in a full 30m x 30m grid or 6400 in a 40m x 40m grid. Readings are automatically recorded on a datalogger which is downloaded at the end of each day. The gradiometer is 'zeroed' at the start of each day and at intervals throughout to ensure consistent results are achieved throughout the survey.

Data Processing
The data is downloaded and processed using TerraSurveyor software (version 3.0.25.1). The raw data is then adjusted to emphasise possible features. At each stage the data is examined as a greyscale image and as a trace plot.

Minimally Processed data
The data is clipped so that the mid-range of readings is most visible. This involves excluding all readings outside of the -20nT to 20nT range.

Processed Data
The following processes are applied to produce the processed greyscale image:

- Destripe: Each traverse is flattened with regard to surrounding traverses by setting the median value of the traverse to 0nT. This produces cleaner images, but may cause bleeding where particularly strong signals are present at one end of a traverse.
- Data Clip: The data is clipped to provide the most suitable contrast for seeing archaeological features. This excludes readings outside of the -5nT to 5nT range.

The following processes may also be applied to improve the clarity of the processed greyscale images:

- Despike: Isolated anomalous readings, such as those generated by tiny iron fragments, are removed from the data. This makes the images cleaner. The parameters used are: X radius = 2; Y radius = 2; Threshold = 3SD; Spike replacement = median.
- Destagger: Minor inconsistences in the way an operator walked grids can be corrected by shifting a traverse up to 0.5m to match edges with adjacent traverses.

Data is exported as a JPG image and georeferenced for use in scale plans of the site. Anomalies are then checked against historical maps, and where available, lidar contour data.

References

Clark, A., 1996 *Seeing Beneath the Soil*, London, 2nd edn.

Gaffney C. and Gater, J., 2006 *Revealing the Buried Past: Geophysics for Archaeologists,* The History Press

Appendix 2

THE ARCHIVE

The archive consists of:

1 Daily record sheets
1 Report text and illustrations
1 Digital data

File names	BLOR17a1.xyz, BLOR17b2.xyz
Explanation of codes used in file names	.xyz files allow whole composite to be generated and stored easily.
Description of file formats	All files are in xyz format where Z= nT reading
List of codes used in files	
Hardware, software and operating systems	TerraSurveyor 3.0.25.1 running under Windows 10
Date of last modification	18/05/17
Indications of known areas of weakness in data	
Survey Technique	Zigzag
Origin	Starts at 0
Grid size	40m x 40m
Interval	X=0.25, Y=1m
Dummy Value	32702
XYZ Separation	Comma

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Sleaford, Lincolnshire NG34 9RW

Final destination of the archive is:

The Collection
Art and Archaeology in Lincolnshire
Danes Terrace
Lincoln
LN2 1LP

OASIS code: archaeol1-285270

Site Code: BLOR17