SURVEY REPORT

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Kingstand Farm, Leicester Forest East, Leicestershire

Client
CgMs Heritage (part of RPS)

Survey Report
12270

Date
February 2018

Incorporating

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and

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GEOPHYSICAL SURVEY REPORT

Project name:
Kingstand Farm,
Leicester Forest East, Leicestershire

SUMO Job reference:
12270

Client:
CgMs Heritage (part of RPS)

Survey date:
11 January 2018

Report date:
19 February 2018

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Report approved by:
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LIST OF FIGURES

DIGITAL CONTENT (Archive Data CD/DVD)

- Minimally Processed Greyscale Images and XY Trace Plots in DWG format
- Digital Copies of Report Text and Figures (both PDF and native formats)

1 SUMMARY OF RESULTS

A combined magnetometer and aerial photogrammetry survey was conducted on land at Kingstand Farm, Leicester Forest East. No archaeological remains have been identified. Linear responses of uncertain origin have been detected, though they are likely to be modern. Ridge and furrow is visible in both datasets, with features associated with the former golf course evident in the west.

2 INTRODUCTION

2.1 Background synopsis

SUMO Services Ltd were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by **CgMs Heritage (part of RPS)**.

2.2 Site details

NGR / Postcode	SK 519 022 / LE3 3PJ
Location	The site is located to the east of Leicester, in the suburb of Leicester Forest East. The site is bound to the north by the A47 (Hinckley Road), to the west by a former golf course and to the south by Kingstand Farm.
HER/SMR	Leicestershire
District	Blaby
Parish	Leicester Forest East CP
Topography	Largely level, some undulations
Current Land Use	Pasture
Weather	Magnetometer – overcast, dry Aerial – cold with some cloud
Geology	Solid: Edwalton Member - mudstone is recorded across the north of the site, with Arden Sandstone Formation - sandstone across the south. Superficial: Oadby Member - diamicton deposits are present across the whole site (BGS 2018).
Soils	Salop Association (711m), reddish fine loamy over clayey, fine loamy and clayey soils (SSEW 1983).
Archaeology	The archaeological and historical background to the site indicates low potential for the prehistoric, Roman, and medieval periods; and moderate to high potential for post-medieval remains relating to a former hunting stand and farm (PCA 2017).
Survey Methods	Magnetometer survey (fluxgate gradiometer) Aerial Photogrammetry
Study Area	Magnetometer - 5 ha; Aerial - 15 ha

2.3 Aims and Objectives

To locate and characterise magnetic anomalies of possible archaeological interest and to reveal otherwise unknown earthworks and features which may indicate the presence of archaeology within the study area.

3 METHODS, PROCESSING & PRESENTATION

3.1 Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (CIfA 2014) and the European Archaeological Council (EAC 2016).

3.2 Survey methods

Detailed magnetic survey and aerial photogrammetry were chosen as efficient and effective methods of locating archaeological anomalies and earthworks.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1.0m	0.25m
Photogrammetry	UAV with gimbal mounted camera	N/A	2.5cm/pix

More information regarding the magnetometry technique is included in Appendix A.

3.3 Data Processing

3.3.1 *Magnetometer*

The following basic processing steps have been carried out on the data used in this report:

De-stripe; de-stagger; interpolate

3.3.2 *Photogrammetry*

The data images are processed in photogrammetry software to generate point cloud, mesh and textured models of the ground surface.

The DEM files are processed further using relief visualisation tools or geographical information system software.

A detailed processing report with further technical information for this technique is included in Appendix C.

3.4 Presentation of results and interpretation

3.4.1 *Magnetometer*

The presentation of the results for each site involves a grey-scale plot of processed data. Magnetic anomalies are identified, interpreted and plotted onto the 'Interpretation' drawings. The minimally processed data are provided as a greyscale image in the Archive Data Folder with an XY trace plot in CAD format. A free viewer is available: https://viewer.autodesk.com

When interpreting the results, several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to other existing evidence, the anomalies will be given

specific categories, such as: *Abbey Wall* or *Roman Road*. Where the interpretation is based largely on the geophysical data, levels of confidence are implied, for example: *Probable*, or *Possible Archaeology*. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification *Possible*.

3.4.2 ***Photogrammetry***

Output files are generated in the form of georeferenced digital elevation models (Figure 05) and an orthophotograph (Figure 06).

4 RESULTS

4.1 Magnetometer

4.1.1 ***Probable / Possible Archaeology***

No magnetic responses have been recorded that could be interpreted as being of archaeological interest.

4.1.2 ***Uncertain***

A number of linear responses of uncertain origin have been detected across the site, though it is likely that they are of modern origin, i.e. related to the former golf course in the west, or other modern activity.

4.1.3 ***Agricultural – Ridge and Furrow***

Widely spaced, parallel linear responses are visible in the west of the site and are a result of ridge and furrow cultivation.

4.1.4 ***Ferrous / Magnetic Disturbance / Former Golf Course***

Large areas of magnetic disturbance are present across the site, with those in the west associated with landscaped features of the former Kingstand Golf Course, i.e. banks, bunkers and tee areas.

Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and their form is best illustrated in the XY trace plots. These responses are characteristic of small pieces of ferrous debris (or brick / tile) in the topsoil and are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

4.2 Photogrammetry

4.2.1 *Golf Course Features*

A number of banked features and mounds are visible across the west of the area. These are a result of landscaped features of the former golf course.

Several cut features are present across the area, predominantly in the western half of the site. A large number of these earthwork features are related to the former golf course, while the linear features are likely to be a result of agricultural activity.

4.2.2 *Ridge and Furrow*

Parallel, linear earthworks are present across the site, generally running east-west, and are most prominent around Kingstand Farm.

5 DATA APPRAISAL & CONFIDENCE ASSESSMENT

5.1 Historic England guidelines (EH 2008) Table 4 states that the average magnetic response over mudstones and sandstones can be variable. Though weak evidence of ridge and furrow has been detected, the large amount of magnetic disturbance across the site has the potential to mask weaker, more ephemeral, archaeological responses.

5.2 The conditions for the photogrammetry survey were adequate, with stable cold conditions but some cloud cover. Several earthworks have been detected, including ridge and furrow and former golf course features, demonstrating that the technique has been successful.

6 CONCLUSION

6.1 The magnetometer and aerial photogrammetry surveys at Kingstand Farm have not revealed any definite archaeological remains. Evidence of ridge and furrow is present in both the magnetic data and digital elevation model, with the remaining features associated with the former golf course to the west, or of other modern origin.

7 REFERENCES

BGS 2018 British Geological Survey, Geology of Britain viewer [Accessed 16/11/2017] *website*: (http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps)

CIfA 2014 *Standard and Guidance for Archaeological Geophysical Survey.* Amended 2016. CIfA Guidance note. Chartered Institute for Archaeologists, Reading http://www.archaeologists.net/sites/default/files/CIfAS%26GGeophysics_2.pdf

EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology,* European Archaeological Council, Guidelines 2.

EH 2008 *Geophysical Survey in Archaeological Field Evaluation.* English Heritage, Swindon https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/

PCA 2017 *Land at Kingstand Farm, off Hinckley Road, Leicester Forest East, Leicestershire - Historic Environment Desk-Based Assessment.* Pre-Construct Archaeology; unpublished report.

SSEW 1983 *Soils of England and Wales. Sheet 3, Midland and Western England*. Soil Survey of England and Wales, Harpenden.

Appendix A - Technical Information: Magnetometer Survey Method

Grid Positioning
For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: Bartington *Grad* 601-2
Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

Data Processing

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

Display

Greyscale/ Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly, all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Interpretation Categories

In certain circumstances (usually when there is corroborative evidence from desk-based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology / Probable Archaeology	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
Possible Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or form incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Former Field Boundary (probable & possible)	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases, the response may be the result of more recent agricultural activity.
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Land Drain	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.
Service	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
Ferrous	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.
Uncertain Origin	Anomalies which stand out from the background magnetic variation, yet whose form and lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology* / *Natural* or (in the case of linear responses) *Possible Archaeology* / *Agriculture*; occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

Appendix B - Technical Information: Magnetic Theory

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns; material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried feature. The difference between the two sensors will relate to the strength of a magnetic field created by this feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

Appendix C - Photogrammetry: Processing Report

LFE-DEM-rpt

Processing Report
15 January 2018

Survey Data

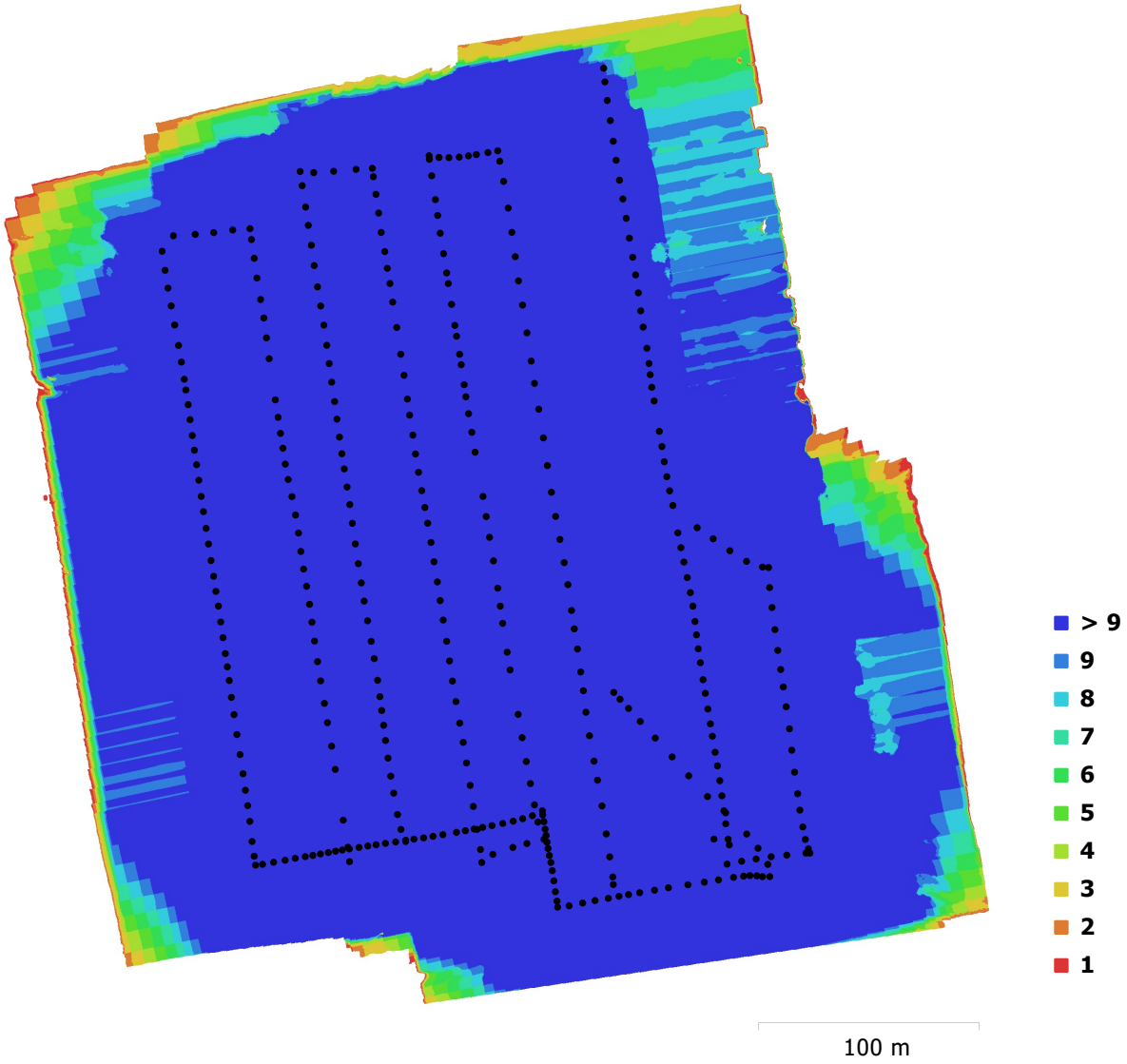


Fig. 1. Camera locations and image overlap.

Number of images:	382	Camera stations:	382
Flying altitude:	59.3 m	Tie points:	88,213
Ground resolution:	2.5 cm/pix	Projections:	1,094,233
Coverage area:	0.15 km²	Reprojection error:	1.4 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
FC6510 (8.8 mm)	5464 x 3070	8.8 mm	2.53 x 2.53 µm	No

Table 1. Cameras.

Camera Calibration

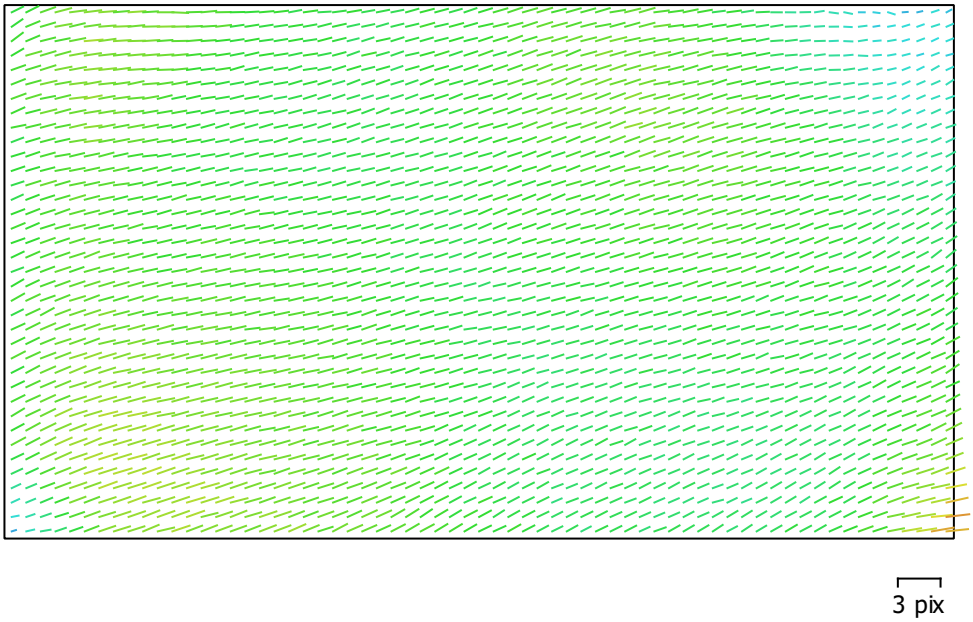


Fig. 2. Image residuals for FC6510 (8.8 mm).

FC6510 (8.8 mm)

382 images

Type	Resolution	Focal Length	Pixel Size
Frame	**5464 x 3070**	**8.8 mm**	**2.53 x 2.53 µm**

	Value	Error	F	B1	B2	K1	K2	K3	P1	P2
F	**1720.57**	5.9	1.00	-0.03	-0.16	-0.69	0.81	-0.76	-0.18	-0.82
B1	**-0.52914**	0.016		1.00	-0.02	0.03	-0.04	0.04	0.12	-0.06
B2	**-0.0908817**	0.016			1.00	0.10	-0.12	0.12	-0.07	0.10
K1	**-0.00133798**	1.9e-05				1.00	-0.93	0.91	0.11	0.56
K2	**0.00110907**	1.5e-05					1.00	-0.99	-0.15	-0.66
K3	**-0.000146443**	3e-06						1.00	0.14	0.63
P1	**-0.000150167**	2.7e-06							1.00	0.15
P2	**-0.00089047**	3.8e-06								1.00

Table 2. Calibration coefficients and correlation matrix.

Ground Control Points

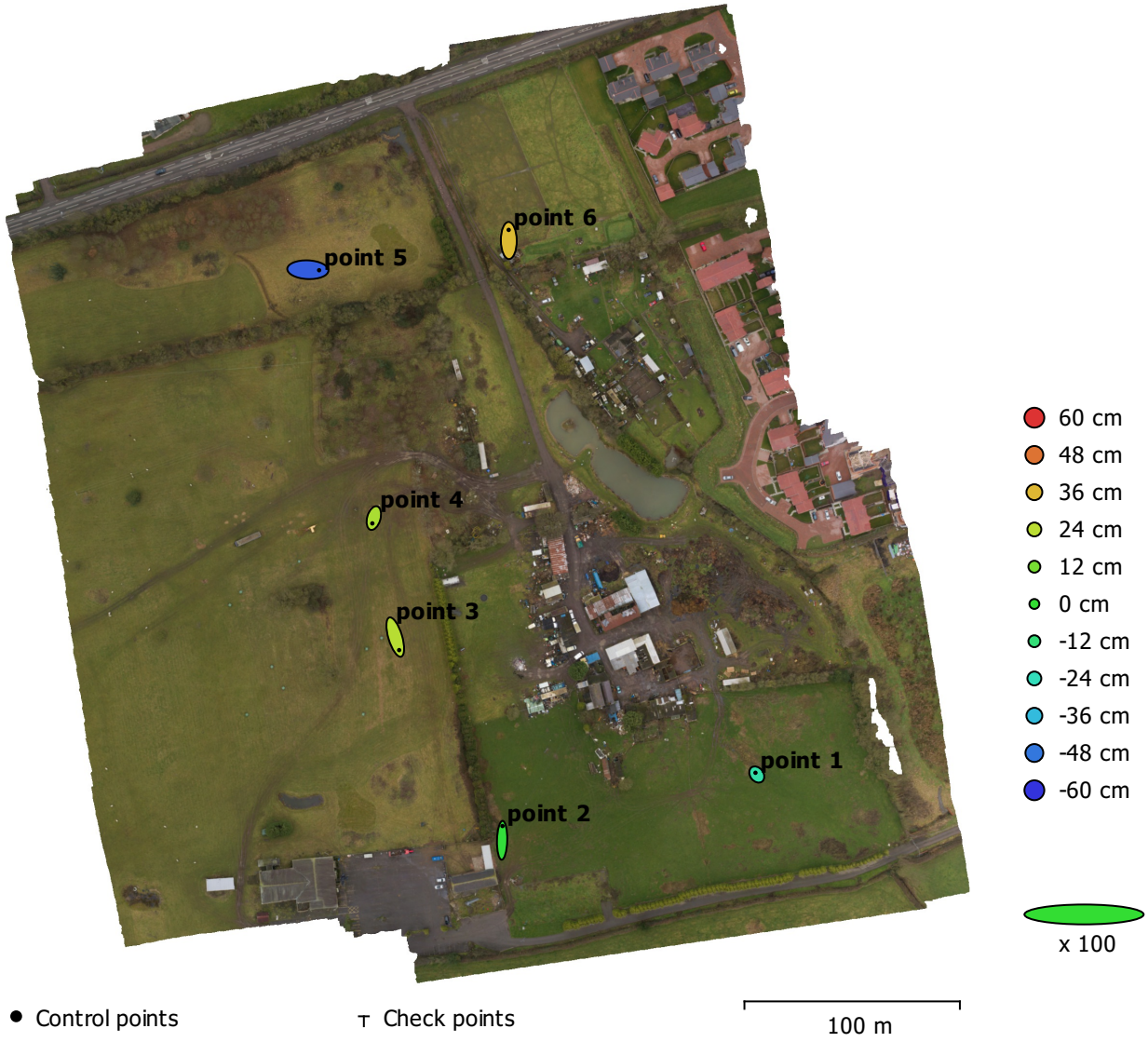


Fig. 3. GCP locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
6	4.58477	8.62553	30.1422	9.76832	31.6855

Table 3. Control points RMSE.
X - Easting, Y - Northing, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
point 1	-1.2134	1.60361	-20.4348	20.5335	0.136 (46)
point 2	0.31781	13.2684	-1.92499	13.4111	0.087 (66)
point 3	3.64329	-12.0813	23.0821	26.3062	0.079 (31)
point 4	-1.38566	-4.93216	20.5298	21.1593	0.080 (33)
point 5	10.4566	-0.476409	-52.7699	53.798	0.103 (38)
point 6	-0.115988	9.86233	35.932	37.2611	0.109 (33)
Total	**4.58477**	**8.62553**	**30.1422**	**31.6855**	**0.102**

Table 4. Control points.

X - Easting, Y - Northing, Z - Altitude.

Digital Elevation Model

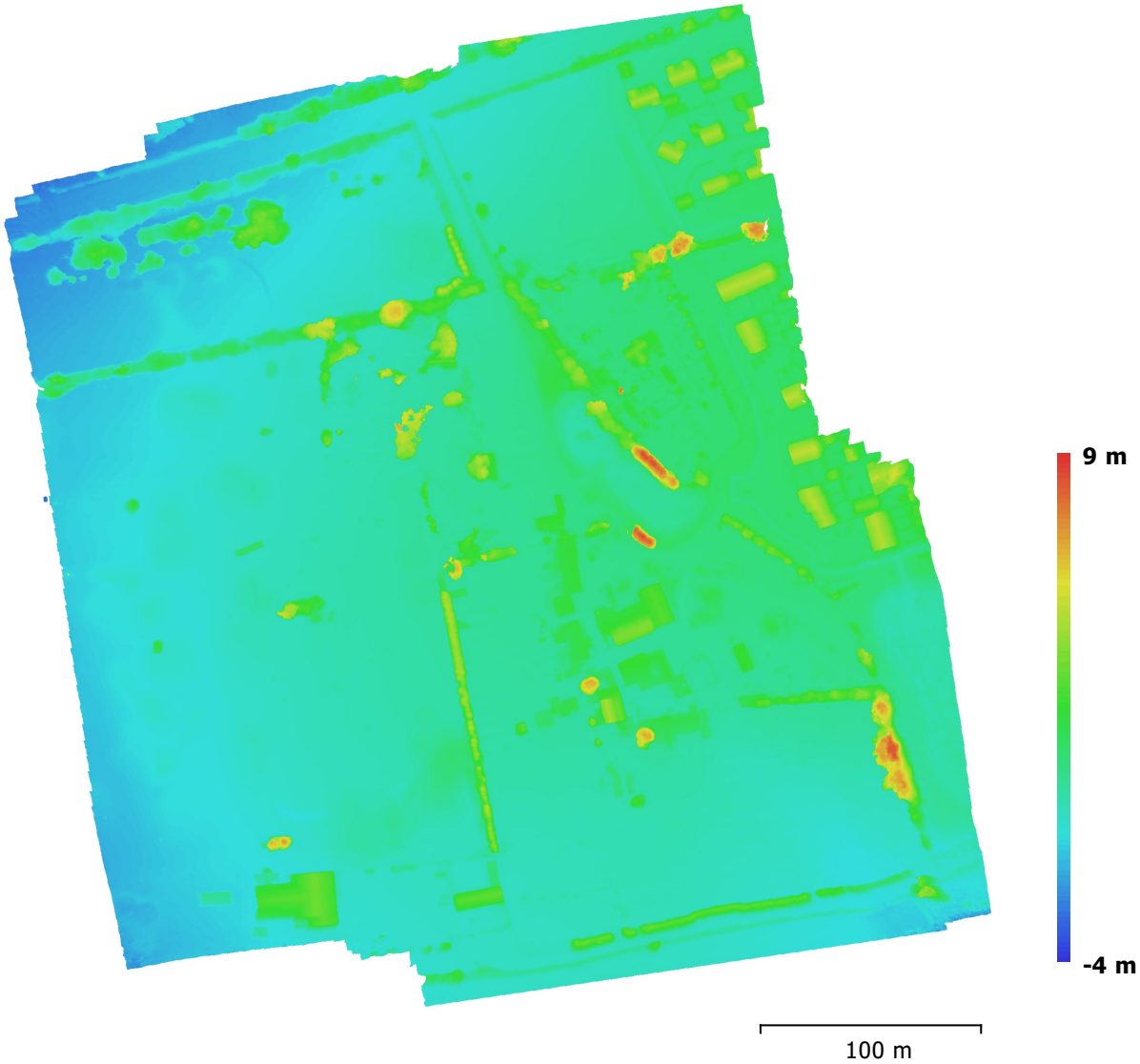


Fig. 4. Reconstructed digital elevation model.

Resolution:	9.99 cm/pix
Point density:	100 points/m²

Processing Parameters

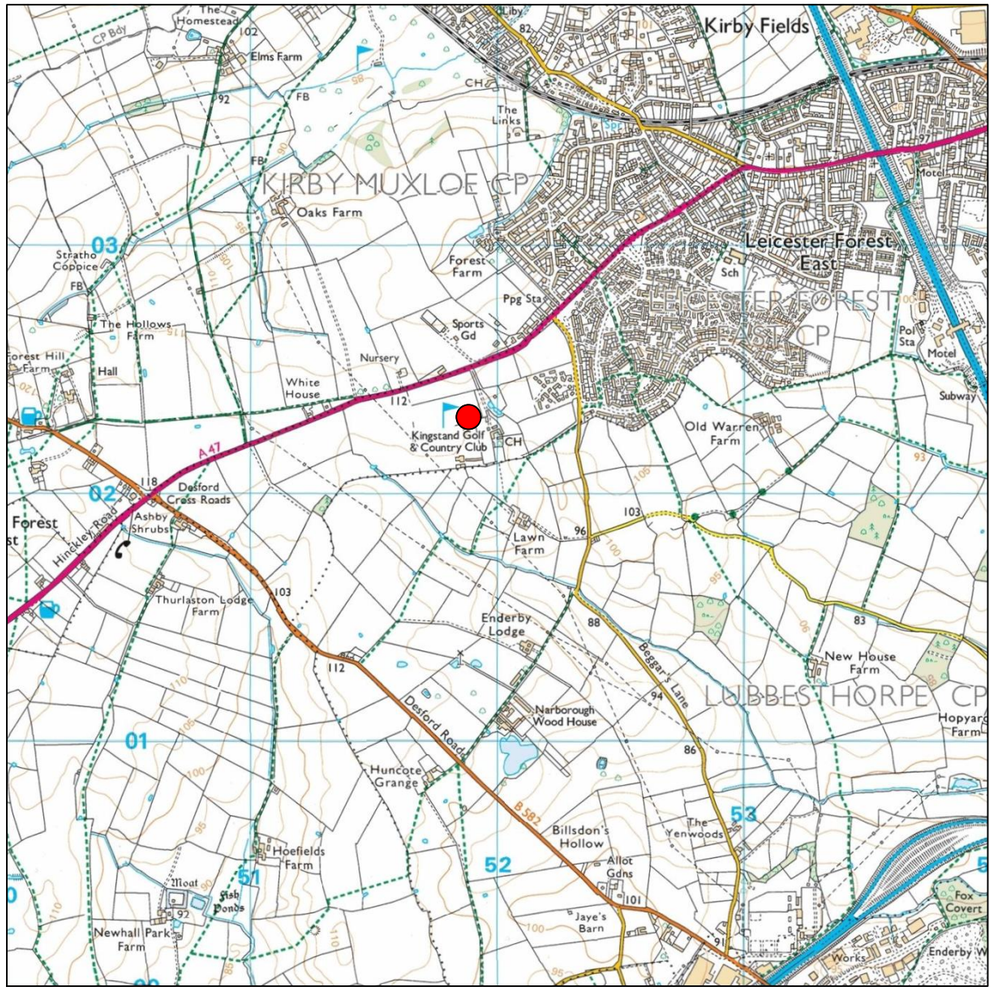
General	
Cameras	382
Aligned cameras	382
Markers	6
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Rotation angles	Yaw, Pitch, Roll
Point Cloud	
Points	88,213 of 112,168
RMS reprojection error	0.271673 (1.39994 pix)
Max reprojection error	1.60477 (40.9595 pix)
Mean key point size	5.4943 pix
Effective overlap	14.7388
Alignment parameters	
Accuracy	Medium
Generic preselection	Yes
Reference preselection	Yes
Key point limit	40,000
Tie point limit	4,000
Adaptive camera model fitting	Yes
Matching time	4 minutes 26 seconds
Alignment time	3 minutes 11 seconds
Optimization parameters	
Parameters	f, b1, b2, k1-k3, p1, p2
Fit rolling shutter	No
Optimization time	50 seconds
Depth Maps	
Count	382
Reconstruction parameters	
Quality	Medium
Filtering mode	Aggressive
Processing time	18 minutes 50 seconds
Dense Point Cloud	
Points	18,154,753
Reconstruction parameters	
Quality	Medium
Depth filtering	Aggressive
Depth maps generation time	18 minutes 50 seconds
Dense cloud generation time	22 minutes 2 seconds
Model	
Faces	5,000,000
Vertices	2,502,745
Reconstruction parameters	
Surface type	Arbitrary
Source data	Dense
Interpolation	Enabled
Quality	Medium
Depth filtering	Aggressive
Face count	5,000,000
Processing time	16 minutes 40 seconds
DEM	
Size	4,592 x 4,905
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Reconstruction parameters	
Source data	Dense cloud
Interpolation	Enabled
Processing time	45 seconds

Orthomosaic

Size	17,884 x 18,460
Coordinate system	OSGB 1936 / British National Grid (EPSG::27700)
Channels	3, uint8
Reconstruction parameters	
Blending mode	Mosaic
Surface	DEM
Enable color correction	Yes
Enable hole filling	Yes
Processing time	17 minutes 5 seconds

Software

Version	1.3.4 build 5067
Platform	Windows 64



N

Site Location

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Site Location Diagram

Client:
CgMs Heritage (part of RPS)

Project:
12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:
0 metres 1000
1:25000 @ A3

Fig No:
01

N

Magnetometer Survey Area - showing 30m grid

Aerial Survey Area

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Location of Survey Areas

Client:
CgMs Heritage (part of RPS)

Project:
12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
02

N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:

Magnetometer Survey - Greyscale Plots

Client:

CgMs Heritage (part of RPS)

Project:

12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:

0 metres 75

1:1500 @ A3

Fig No:

03

N

KEY

	Uncertain Origin (discrete anomaly / trend)
	Agriculture (ridge and furrow)
	Magnetic disturbance
	Magnetic disturbance (made ground)
	Ferrous

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

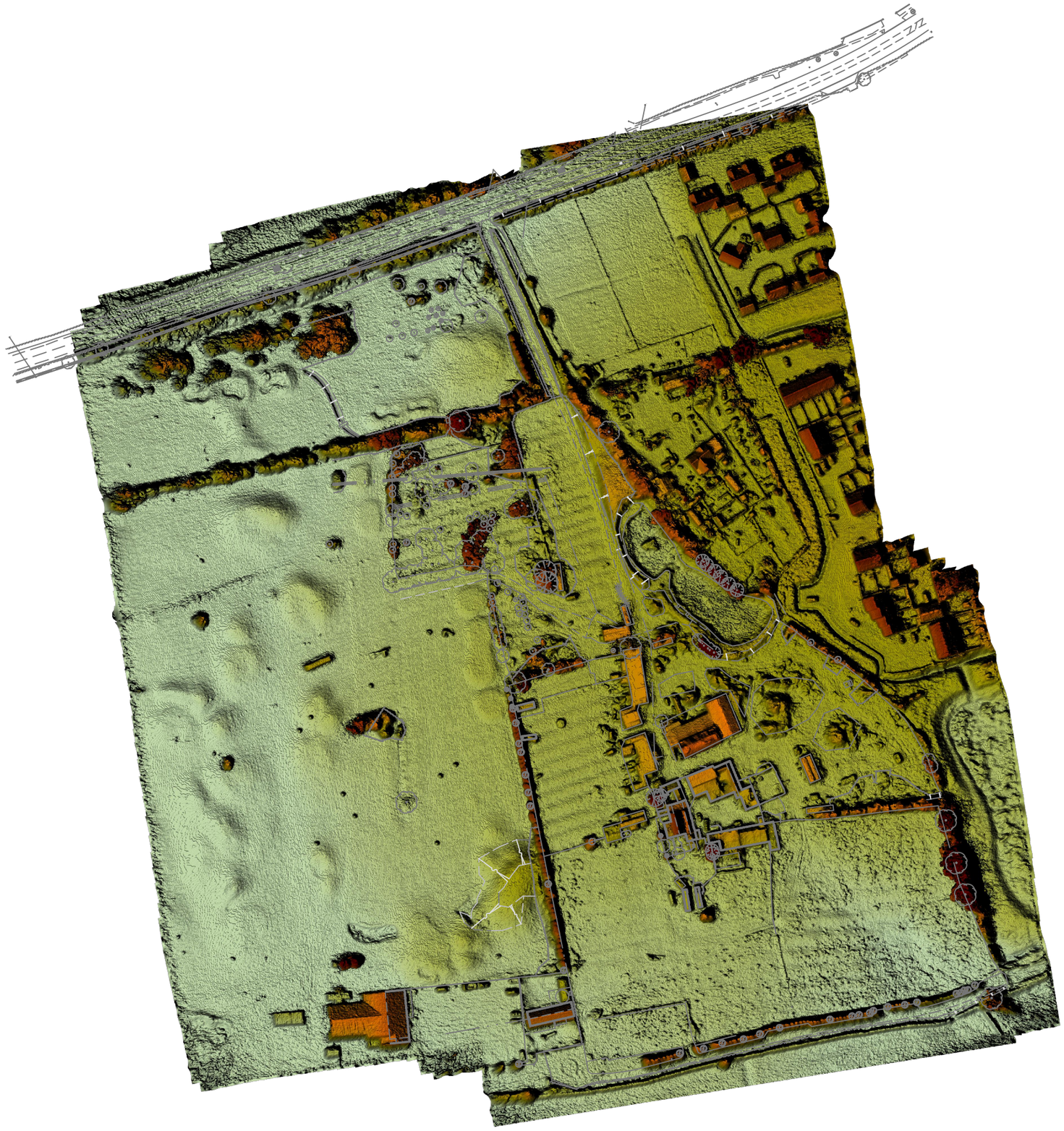
Title:
Magnetometer Survey - Interpretation

Client:
CgMs Heritage (part of RPS)

Project:
12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:
0 metres 75
1:1500 @ A3

Fig No:
04



N

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Aerial Survey - Digital Elevation Model

Client:
CgMs Heritage (part of RPS)

Project:
12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
05

N

+2nT

-1nT

sumo Survey

GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:

Aerial Survey - Orthophotograph

Client:

CgMs Heritage (part of RPS)

Project:

12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:

0 metres 100

1:2000 @ A3

Fig No:

06

N

KEY

	Banked feature
	Cut feature
	Agricultural

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

Title:
Aerial Survey - Interpretation

Client:
CgMs Heritage (part of RPS)

Project:
12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
07

N

KEY

	Feature associated with former golf course
	Uncertain
	Agricultural

sumo Survey
GEOPHYSICS FOR ARCHAEOLOGY & ENGINEERING

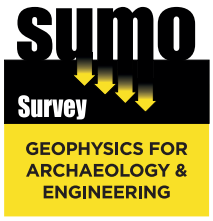
Title:
Magnetometer and Aerial Survey - Combined Interpretation

Client:
CgMs Heritage (part of RPS)

Project:
12270 - Kingstand Farm, Leicester Forest East, Leicestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
08



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

SUMO Services Ltd, incorporated under the laws of England and Wales,
Company Registration No.4275993.
Registered Office Unit 8 Hayward Business Centre, New Lane, Havant, Hampshire, PO9 2NL