

Appendix 13.1

GEOPHYSICAL SURVEY

REPORT

Tullamore,
Co. Offaly

Date:
03/10/2019

Licence: 19R0209

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**GEOPHYSICAL SURVEY SUMMARY SHEET
TULLAMORE, COUNTY OFFALY**

Site Name	Tullamore, County Offaly	Ref No.	19043
Townland	Clonminch, Gayfield	Licence No.	19-R-0209
County	Offaly	Licence Holder	Joanna Leigh
ITM (centre)	E635030, N723330	Purpose	Pre-planning investigation
Client	Archer Heritage Planning	Reference No.	N/A

Ground Conditions Ground cover comprised recently cut arable crop.

Survey Type Detailed gradiometer survey totalling c.9.5 hectares

Summary of Results

Some responses of potential interest have been recorded in the northern half of the application area. A small area indicative of a burnt spread of material is of potential interest. There are several linear responses and trends forming a vague rectilinear pattern. Although it is possible these may represent former field divisions, it is also possible that they represent archaeological ditch-type features. An archaeological interpretation must be considered.

Further linear responses and trends within the data most likely represent former field divisions and are considered most likely agricultural in origin.

Modern magnetic disturbance in the south-eastern field results from modern material that has been ploughed through the field. Although former field divisions are discernible in the magnetic disturbance, more subtle responses of potential interest may be masked and remain undetected.

Field Staff Joanna Leigh & Susan Curran

Report Date 03/10/2019 **Report Author** Joanna Leigh

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Geophysical Survey Report Tullamore, County Offaly

1 Introduction

- 1.1 A geophysical survey has been conducted by J. M. Leigh Surveys Ltd. at a site in the townlands of Clonminch and Gayfield in County Offaly. The survey has been undertaken as part of a pre-planning investigation by Archer Heritage Planning on behalf of Bennett Properties Ltd.
- 1.2 The site is located c.2km to the south-east of Tullamore, County Offaly. There are no recorded monuments within the application area or in the vicinity. The site and survey location area are presented in Figure 1 at a scale of 1:3,000.
- 1.3 The main aim of the survey was to identify any geophysical responses within the predefined survey area that may represent unknown archaeological features. A detailed gradiometer survey was conducted under licence 19R0209 issued by the Department of Culture, Heritage and the Gaeltacht.

2 Survey ground conditions and further information

- 2.1 Survey ground conditions were reasonable, comprising of harvested stubble fields. Straw bales were located in the northern fields and were problematic during survey. However, this has not impacted on the survey results and interpretation.
- 2.2 In Area A there was a steep natural bank with overgrown vegetation and a tree. This was not suitable for survey.
- 2.3 Except for the north-eastern portion of Area A which contained a natural hillock, the ground was relatively flat. No clear topographical features were noted during survey fieldwork.
- 2.4 In Area C magnetic disturbance was recorded resulting from an electricity pylon, adjacent house and derelict farm sheds.

3 Survey Methodology

- 3.1 A detailed gradiometer survey detects subtle variations in the local magnetic field and measurements are recorded in nano-Tesla (nT). Some archaeological features such as ditches, large pits and fired features have an enhanced magnetic signal and can be detected through recorded survey.
- 3.2 Data was collected with a Bartington Grad 601-2 instrument. This is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey fast and effective.
- 3.3 The instrument is calibrated in the field to ensure a constant high quality of data.
- 3.4 Data was collected in 'zigzag' traverses. Grid orientation was positioned to facilitate survey fieldwork.
- 3.5 Data was collected with a sample interval of 0.25m and a traverse interval of 1m. The survey grid was set-out using a GPS VRS unit. Survey tie-in information is available upon request.
- 3.6 The survey methodology, data presentation and report content adhere to the European Archaeological Council (EAC) (2016) 'Guidelines for the use of Geophysics in Archaeology'.

4 Data display

- 4.1 A summary greyscale image and accompanying interpretation diagram are presented in Figures 2 and 3 at a scale of 1:1,500.
- 4.2 Numbers in parenthesis in the text refer to specific responses highlighted in the interpretation diagram (Figures 3).
- 4.3 Isolated ferrous responses highlighted in the interpretation diagram most likely represent modern ferrous litter and debris and are not of archaeological interest. These are not discussed in the text unless considered relevant.
- 4.4 The raw gradiometer data is presented in archive format in A1.01 and A1.02. The data is displayed as a greyscale image and xy-trace plot, both at a scale of 1:625. The archive plots are used to aid interpretation of the results and are for reference only. The archive plots can be provided in PDF format upon request.
- 4.5 The display formats referred to above and the interpretation categories are discussed in the summary technical information section at the end of this report.

5 Survey Results

- 5.1 The data is dominated by agricultural trends and responses indicative of former field divisions. Some responses of potential interest were recorded in the northern half of the data.

Area A

- 5.2 Area A is sub-divided by a rectilinear field boundary. In the west of the area, there is a cluster of responses (1) within an area of increased magnetic response. Although it is possible that modern activity is represented here, the responses are indicative of burning activity, or a spread of burnt material. This is considered to be of archaeological potential.
- 5.3 A series of linear responses and trends (2) form a rectilinear pattern to the east of (1). Although it is possible that these represent former field divisions or farm trackways, it is possible that archaeological ditch-type features are represented here. It is possible that the remains of a former field system have been identified.
- 5.4 A negative response (3) is perpendicular to the adjacent field boundary. It is speculated that the remains of a former field boundary wall or possible drainage feature maybe represented here. Archaeological potential is considered limited.
- 5.5 Another area of increased response (4) with positive responses is of potential interest. This is similar to response (1) and may also represent a burnt spread. However, numerous modern ferrous responses are in the vicinity and (4) may equally result from modern ground disturbance. An archaeological interpretation is cautious.

Area B

- 5.6 Area B comprises of two fields divided by a modern farm trackway.
- 5.7 Area B is dominated by parallel and perpendicular ploughing trends. A linear response (5) and trend in the east of the data most likely represents a former field boundary.
- 5.8 A broad response (6) immediately adjacent to (5) may represent a spread of material or a broad shallow pit feature. However, no further responses of interest are recorded, and it is equally possible that the response is more recent in origin.
- 5.9 Modern disturbance (7) results from a modern farm track which forms the western extent of Area B.

- 5.10 A linear response (8) traverses the western field north to south and is indicative of a former field division.
- 5.11 A cluster of responses (9) is located along the northern extent of the data set. However, interpretation is cautious. Although it is possible that a cluster of pit-type features is represented here, there is no clear pattern or form and no further responses of interest are recorded. It is possible that more deeply buried ferrous debris is represented here.
- 5.12 Isolated responses in the south of the data have no clear pattern or form. They are near the modern field boundary and it is speculated that more deeply buried ferrous debris is represented here.

Area C

- 5.13 Area C comprises of numerous ploughing trends with different orientations. These represent different phases of agricultural activity.
- 5.14 A linear response (11) most likely represents a former field division. An unusual series of responses and trends (12) forms a small rectilinear pattern. This measures 7m x 11m. It is possible that the remains of a small farm building are represented here. Interpretation is unclear and it is possible that this is of potential archaeological interest.
- 5.15 Another linear response (13) suggests another former field division. Parallel trends (14) to the east of this may represent a former farm trackway, although it appears to have a different orientation to (13). Nevertheless, these trends are thought to be agricultural in origin.
- 5.16 Magnetic disturbance (15) results from an electricity pylon.

Area D

- 5.17 Area D has a heightened level of background response with numerous modern ferrous responses. This is modern in origin, most likely suggesting modern material has been ploughed out through the entire field. The heightened response and modern ferrous has made interpretation difficult. The modern responses may mask more subtle archaeological responses. Some linear responses and trends (16) are discernible within the background noise and most likely represent former field divisions. No responses of archaeological interest can be identified in Area D.

6 Conclusion

- 6.1 The survey results have identified some responses of potential interest in the northern half of the application area. A small area indicative of a burnt spread of material is of potential interest. Also in this vicinity, there are several linear responses and trends forming a vague rectilinear pattern. Although it is possible these may represent former field divisions and agricultural activity, it is possible that they represent archaeological ditch-type features. An archaeological interpretation must be considered.
- 6.2 Further linear responses and trends within the data most likely represent former field divisions and are considered most likely agricultural in origin.
- 6.3 Modern magnetic disturbance in the south-eastern field results from modern material that has been ploughed through the field. Although former field divisions are discernible in the magnetic disturbance, more subtle responses of potential interest may be masked and remain undetected.
- 6.4 Consultation with a licensed archaeologist and with the Department of Culture, Heritage and the Gaeltacht is recommended to establish if any additional archaeological works are required.

Technical Information Section

Instrumentation & Methodology

Detailed Gradiometer Survey

This is conducted to clearly define any responses detected during scanning, or can be applied as a stand-alone methodology. Detailed survey is often applied with a sample interval of 0.25m and a traverse interval of 1m. This allows detection of potential archaeological responses. Data is collected in grids 40m x 40m, and data is displayed accordingly. A more detailed survey methodology may be applied where archaeological remains are thought likely. A survey with a grid size of 10m x 10m and a traverse interval of 0.5m will provide a data set with high resolution.



Bartington GRAD 601-2

The Bartington Grad 601-2 instrument is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey very fast and effective. The sensors have a separation of 1m allowing greater sensitivity.

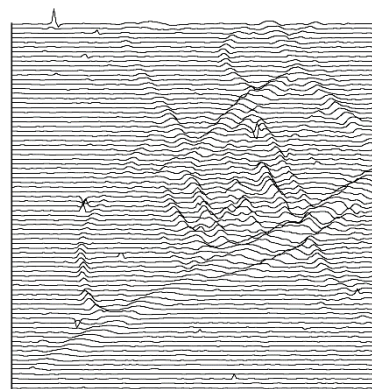
Frequent realignment of the instruments and zero drift correction; ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.1nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.



Gradiometer Data Display & Presentation

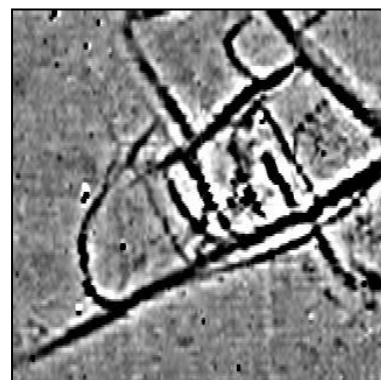
XY Trace

The data are presented as a series of linear traces, enabling a semi-profile display of the respective anomalies along the X and Y-axes. This display option is essential for distinguishing between modern ferrous materials (buried metal debris) and potential archaeological responses. The XY trace plot provides a linear display of the magnitude of the response within a given data set.



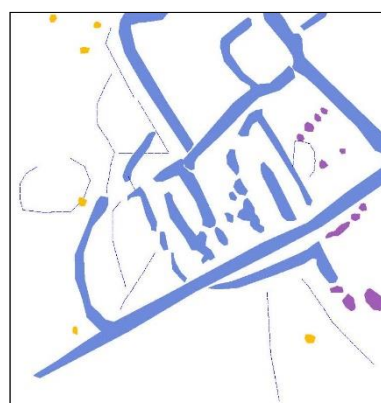
Greyscale*

As with dot density plots, the greyscale format assigns a cell to each datum according to its location on the grid. The display of each data point is conducted at very fine increments, allowing the full range of values to be displayed within the given data set. This display method also enables the identification of discrete responses that may be at the limits of instrument detection. In the summary diagrams processed, interpolated data is presented. Raw un-interpolated data is presented in the archive drawings along with the xy-trace plots.



Interpretation

An interpretation of the data is made using many of the plots presented in the final report, in addition to examination of the raw and processed data. The project managers' knowledge and experience allows a detailed interpretation of the survey results with respect to archaeological potential.



**XY Trace and raw greyscale plots are presented in archive form for display of the raw survey data. Summary greyscale images of the interpolated data are included for presentation purposes and to assist interpretation.*

Glossary of Interpretation Terms

Archaeology

This category refers to responses which are interpreted as of clear archaeological potential, and are supported by further archaeological evidence such as aerial photography or excavation. The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, storage pits and associated features.

? Archaeology

This term corresponds to anomalies that display typical archaeological patterns where no record of comparative archaeological evidence is available. In some cases, it may prove difficult to distinguish between these and evidence of more recent activity also visible in the data.

? Industrial

Such anomalies generally possess a strong magnetic response and may equate with archaeological features such as kilns, furnaces, concentrations of fired debris and associated industrial material.

Area of Increased Magnetic Response

These responses often lack any distinctive archaeological form, and it is therefore difficult to assign any specific interpretation. The resulting responses are site specific, possibly associated with concentrations of archaeological debris or more recent disturbance to underlying archaeological features.

Trend

This category refers to low-level magnetic responses barely visible above the magnetic background of the soil. Interpretation is tentative, as these anomalies are often at the limits of instrument detection.

Ploughing/Ridge & Furrow

Visible as a series of linear responses, these anomalies equate with recent or archaeological cultivation activity.

? Natural

A broad response resulting from localised natural variations in the magnetic background of the subsoil; presenting as broad amorphous responses most likely resulting from geological features.

Ferrous Response

These anomalies exhibit a typically strong magnetic response, often referred to as 'iron spikes,' and are the result of modern metal debris located within the topsoil.

Area of Magnetic Disturbance

This term refers to large-scale magnetic interference from existing services or structures. The extent of this interference may in some cases obscure anomalies of potential archaeological interest.

Bibliography

European Archaeological Council (EAC) (2016) '*Guidelines for the use of Geophysics in Archaeology*' by Armin Schmidt, Paul Linford, Neil Linford, Andrew David, Chris Gaffney, Apostolos Sarris and Jörg Fassbinder.

English Heritage (2008) '*Geophysical guidelines: Geophysical Survey in Archaeological Field Evaluation*.' Second Edition.

Gaffney, C. Gater, J. & Ovenden, S. (2006) '*The use of Geophysical Techniques in Archaeological Evaluations*.' IFA Paper No. 6.

Gaffney, C & Gater, J (2003). '*Revealing the buried past: Geophysics for Archaeologists*.' Tempus Publishing Limited.

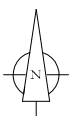
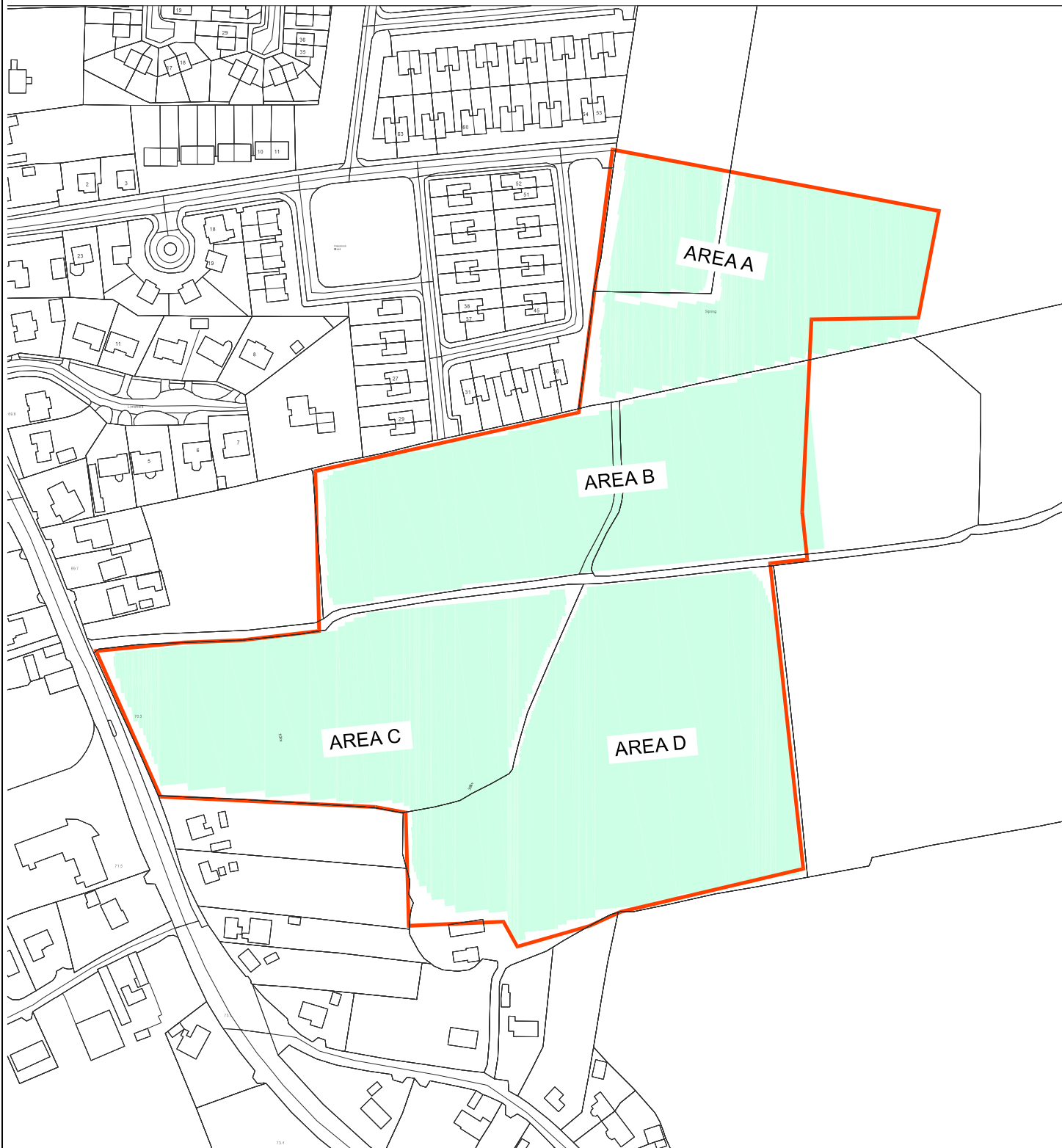
National Soil Survey of Ireland (1980) *General soil map second edition (1:575,000)*. An Foras Taluntais.

List of Figures

Figure	Description	Paper Size	Scale
Figure 1	Site & Survey Location Diagram	A4P	1:3,000
Figure 2	Overall summary greyscale image	A3P	1:1,500
Figure 3	Overall interpretation	A3P	1:1,500

Archive Data Supplied as a PDF Upon Request

A1.01	Raw data XY-Trace Plot	A0P	1:625
A1.02	Raw data greyscale image	A0P	1:625



Application Area



Detailed
Gradiometer Survey

0

metres

120

Client:

Archer Heritage Planning

Project:

Geophysical Survey
Tullamore, County Offaly

Title:

Site & Survey Location

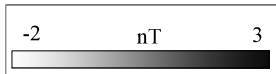
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Scale @ A4: 1:3,000
Figure: 1
Licence No.: 19R0209
Issue Date: 03.10.2019



Mapping supplied by the client

0 60 metres



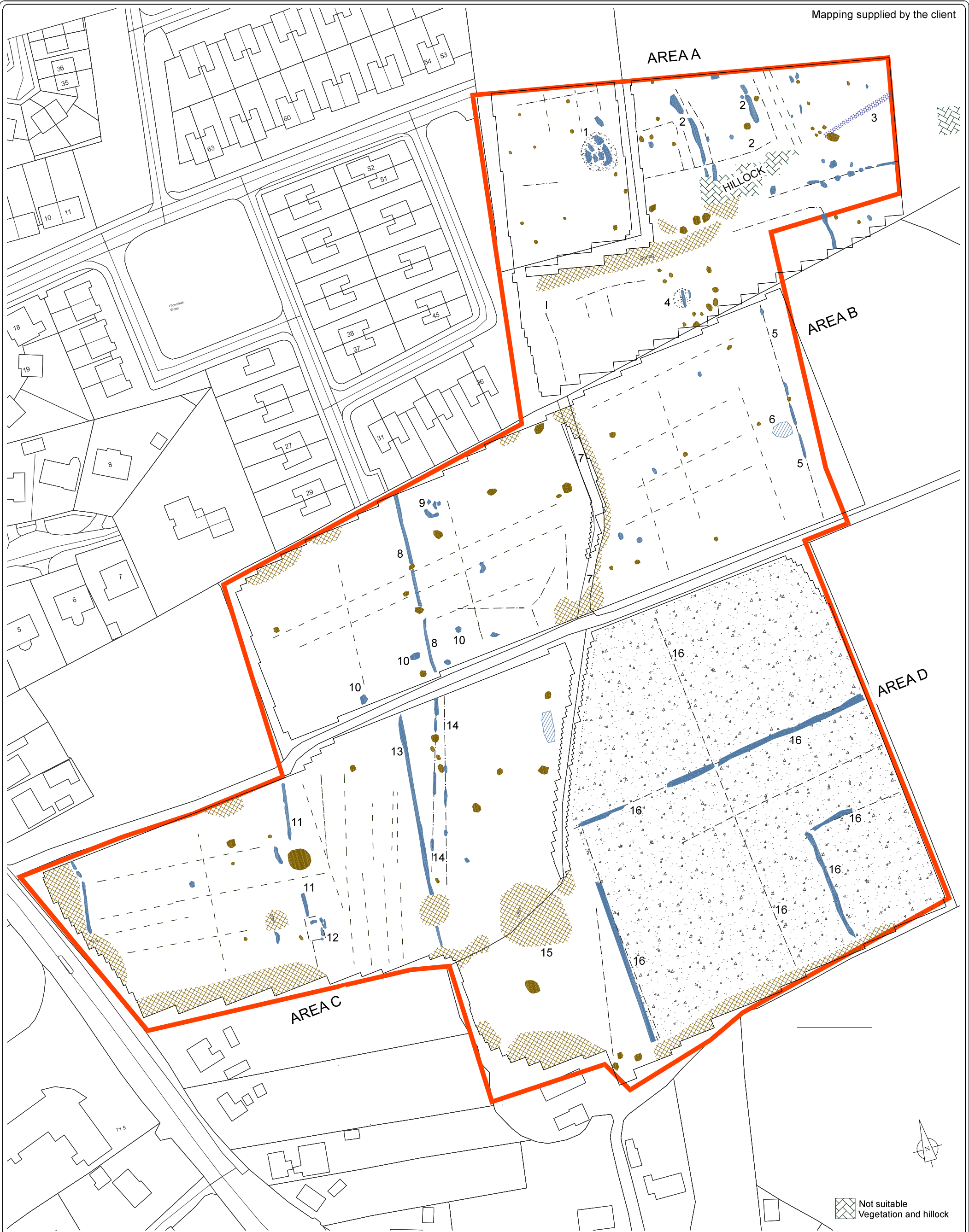
Client:
Archer Heritage Planning Ltd.

Project:
Geophysical Survey
Tullamore, County Offaly

Title:
Summary Greyscale Image

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Scale @ A3: 1:1,500
Figure: 2
Licence No.: 19R0209
Issue Date: 03.10.2019



Client:
Archer Heritage Planning Ltd.

Project:
Geophysical Survey
Tullamore, County Offaly

Title:
Summary Interpretation

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Scale @ A3: 1:1,500
Figure: 3
Licence No.: 19R0209
Issue Date: 03.10.2019