GEOPHYSICAL SURVEY REPORT

Bey More,

County Meath

Date: 27/04/2016

Licence: 15R0135

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GEOPHYSICAL SURVEY SUMMARY SHEET
BEY MORE, COUNTY MEATH

Site Name	Bey More, County Meath	**Ref No.**	15031
Townland	Bey More	**Licence No.**	15-R-0135
County	Meath	**Licence Holder**	Joanna Leigh
ITM (centre)	E709579/N772892	**Purpose**	Research
Client	Geraldine Stout	**Planning No.**	NA

Closest RMP	ME020:031	**Classification**	Gatehouse
ITM	E709545/N772877	**Location**	Within application area
Townland	Bey More		

Current land use	Pasture

Survey Type	Detailed resistance (1m x 1m) and gradiometer survey (1m x 0.25m).

Summary of Results

The resistance survey successfully identified numerous linear and rectilinear responses indicative of structural remains. These suggest foundations extending to the north of the extant remains of the gatehouse.

Further responses to the south-west of the gatehouse are indicative of the remains of another building.

The eastern half of the data comprises of more high and low resistance responses. Although it is possible that more recent activity is represented here, it is possible that platform areas or terraced features are represented here. Farming practices associated with the probable structural remains may be represented here.

The gradiometer data comprises of magnetic disturbance in the vicinity of the probable structural remains. This response is typical over structural remains. Linear trends and responses correlate with responses in the resistance data and these may be agricultural in origin.

Report Date	27/04/2016	**Report Author**	Joanna Leigh

Contents

Geophysical Survey Report
Bey More, County Meath

1 Introduction

1.1 A geophysical survey has been conducted by J. M. Leigh Surveys as part of a research project in the townland of Bey More, County Meath. This survey has been conducted on behalf Geraldine Stout to provide information regarding the potential for archaeological remains surrounding the recorded gatehouse (ME020:031).

1.2 The remains of the recorded gatehouse comprise of extant walls upwards of 10m in height. The surrounding field boundaries comprise of overgrown vegetation but wall features within the boundaries are evident in places. The remains of a possible dwelling site are located to the north of the survey area and comprise of extant wall features c.0.3m in height.

1.3 The recorded gatehouse (ME020:031), may form part of a grange associated with a Cistercian house in Normandy. It is speculated that the surrounding lands form part of a Cistercian Abbey. It was the main aim of the geophysical survey to identify any archaeological remains that may be associated with the recorded gatehouse, suggesting the location of the former grange. A detailed gradiometer and resistance survey were conducted to investigate. Survey was conducted under licence 15R0135 issued by the Department of Arts, Heritage and the Gaeltacht.

1.4 A site location diagram is displayed in Figure 1 at a scale of 1:2,000 and presents the location of the geophysical survey and the recorded gatehouse (ME020:031).

2 Survey ground conditions and further information

2.1 The survey area is contained within a single pasture field bound by irregular shaped boundaries. The western extent of the field was not suitable for survey as it comprised of very wet ground.

2.2 There were no complications during fieldwork and on the whole ground conditions were excellent.

3 Survey Methodology

Detailed Resistance Survey

3.1 A detailed resistance survey is used to record variations in electrical resistance by passing an electrical current through the ground. The subsequent earth resistance (measured in ohms) is recorded and presented in map form for interpretation. Resistance surveys are typically conducted on sites where structural or stone features are anticipated.

3.2 Detailed resistance survey was conducted throughout the application area with a Geoscan RM15 instrument. Data was collected with a parallel twin-probe array of mobile and remote electrodes. The resistance survey mobile probes were separated by 0.5m. Data was collected with a sample interval of 0.5m and a traverse interval of 1m.

Detailed Gradiometer Survey

3.3 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.

3.4 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.

3.5 The instrument is calibrated in the field to ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.01nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.

3.6 All data was collected in ‘zigzag’ traverses. Grid orientation remained constant throughout each field to facilitate the data display and interpretation. The subsequent resistance survey was conducted on the same survey grid to allow a comparison of the results.

3.7 Data was collected with a sample interval of 0.25m and a traverse interval of 0.5m, providing 6400 readings per 40m x 40m grid. The survey grid was set-out using a GPS VRS unit. Survey tie-in information is available upon request.

4 Data display

4.1 The processed resistance data is presented in Figure 2 as a greyscale image at a scale of 1:750. An interpretation diagram is presented in Figure 3, also at a scale of 1:750.

4.2 The gradiometer survey results are presented in Figures 4 and 5 as a summary greyscale image and interpretation. These are also presented at a scale of 1:750.

4.3 Numbers and letters in parentheses in the text of the report refer to specific responses highlighted in the detailed resistance and gradiometer survey interpretation diagrams (Figure 3 & 5).

4.4 The raw and processed resistance and gradiometer data is displayed as an archive series of figures. These are for reference only and are provided 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

Resistance Survey (Figures 2 & 3)

5.1 The resistance survey has numerous high resistance responses of potential interest. In particular, rectilinear responses (1) to the north of the gatehouse ruins are of particular interest.

5.2 The rectilinear responses (1) are indicative of structural remains. The responses appear to extend at least 35m to the west from the eastern extant wall of the gatehouse. The responses continue to the northern extent of survey and most likely continue beyond. It is interpreted that internal wall features of a large building extending from the extant gatehouse have been identified.

5.3 To the south of the probable building (1) are another series of clear rectilinear responses (2). These suggest the remains of another building. The responses have a similar orientation to the adjacent field boundary and it is speculated that the field wall to the west of the responses marks the western extent of the probable building.

5.4 To the west of (1) are several responses (3). These are less well defined and interpretation is tentative. It is possible that a former boundary feature or drainage ditch is represented here. An association with the probable building remains (1) is unclear.

5.5 Along the south of the data set are rectilinear and linear high resistance responses (4). Although it is possible that these reflect more recent activity, they are typical of buried wall features and an archaeological interpretation must be considered. A walled area may be represented here. It is noted that a field entranceway is located in proximity to the south of these responses and may indicate a former entranceway, although this is speculative.

5.6 An area of low resistance (5) is located to the immediate west of (4) and may represent an associated feature. Low resistance here suggests a possible robbed out platform or even garden area. Interpretation is unclear but the response is of possible archaeological interest.

5.7 Extending north from (4) and (5) are a series of parallel responses and trends (6). These most likely represent agricultural ploughing trends and activity.

5.8 In the north of the data, responses (7) appear to be associated with the extant dwelling remains located to the north of the survey area. The responses (7) may represent drainage features.

5.9 Within the vicinity of (7) are high resistance responses (8). These have an irregular rectilinear pattern and it is possible that further buried wall features are located here. It is speculated that they are associated with the wall remains located within the adjacent field boundary. This is speculative but must be considered.

5.10 In the east of the data set there are large well defined spreads of high resistance (9). Archaeological interpretation of these areas is unclear. It is possible that the responses reflect spreads of rubble material or perhaps terraced platform areas. Although these may be of archaeological interest, interpretation is tentative.

5.11 In the north-east of the survey area several responses (10) have an amorphous appearance. There is no clear archaeological pattern and it is possible that more recent ground disturbance is represented here. Archaeological interpretation is tentative.

Gradiometer Survey (Figures 4 & 5)

5.12 The gradiometer survey identified clear areas of magnetic disturbance. These are typical of spreads of structural material or modern disturbance. Some of the spreads (A) correlate with the probable building remains identified in the resistance survey.

5.13 Fragmented linear responses (B) may be of interest. These are located in the vicinity of responses (4) in the resistance survey. It is possible that ditch features are represented here. However, these responses appear to run parallel to numerous ploughing trends, running north to south throughout the gradiometer data set. The responses (B) may represent agricultural features.

5.14 In the east of the data, two broad isolated responses (C) may be of interest. Although they are isolated, it is possible that large pit features are represented here. No clear pattern is evident but an archaeological interpretation must be considered.

6 Discussion & Conclusion

6.1 The resistance survey has identified clear areas of interest. Probable structural remains associated with the extant gatehouse have been located. Structural remains appear to extend to the north of the gatehouse and may continue outside the limits of this survey. Probable wall remains within the adjacent boundary may be associated with the structural responses identified.

6.2 To the south of the gatehouse, another series of responses is indicative of a second building. This is located in the corner of the field and wall features in the adjacent boundary may also represent features associated with the probable building.

6.3 Further responses in the data are also of interest. Possible platforms or terraced areas may relate to former agricultural activity. Ploughing trends are also evident in both the resistance survey and gradiometer data sets. Although these may reflect more recent activity, it is possible that farming activity associated with the probable buildings has been recorded here.

Technical Information Section

Instrumentation & Methodology

Fluxgate Gradiometer Survey

Gradiometer survey is the most frequently applied survey instrument as it can be used in 'Scanning' or detailed survey mode.

Scanning

This is a fast and effective reconnaissance technique. The instrument is set in scanning mode and regular traverses of the investigation area are made, usually at 10m intervals. This allows a fast and effective scan of the application area, looking for any responses which may be of archaeological potential. As the traverses are made, the operator observes the instrument readout, and any responses of interest are marked for further investigation.

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 20m x 20m, 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

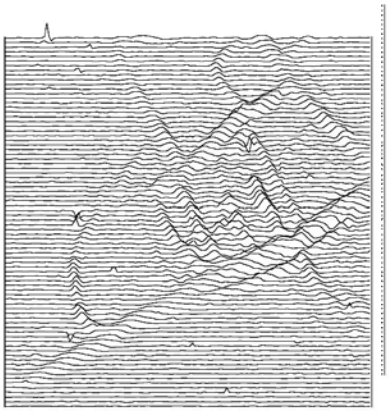
The Bartington *Grad* 601-2 instrument is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey very fast and effective. The sensors have a separation of 1m allowing greater sensitivity.

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

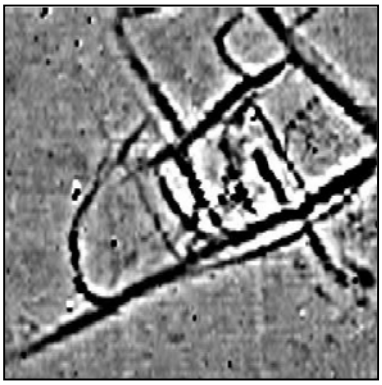
XY Trace

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.*

Electrical Resistance

The technique is used to record variations in electrical resistance by passing an electrical current through the ground. The standard instrument for archaeological investigations is a twin-probe array of mobile and remote electrodes maintained at a distance of about 20m.

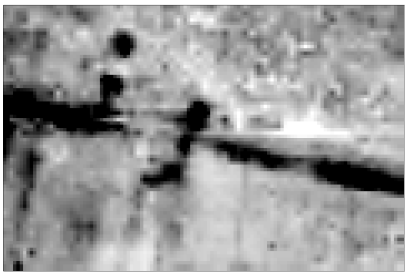
The mobile electrodes (one current and one potential, usually 1m apart) are mounted on a survey frame and connected to a Geoscan RM15 resistance meter, which records the specific resistance of the soil (measured in ohms).

The resistance meter is connected to the pair of remote probes (one current and one potential), which remain in a fixed location. Data are collected as the survey frame and mobile probes reach each designated sample interval. Survey was undertaken at 0.5 m sample intervals along 1 m traverses (i.e., 800 readings per 20m x 20m grid. The adaptability of the instrument enables increased sampling intervals, as well as a range of probe separations and arrays to operate at varying depth penetration.

Data Display & Presentation

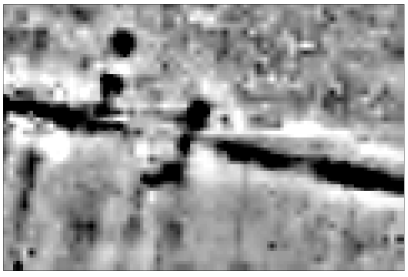
Greyscale

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 selected 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.



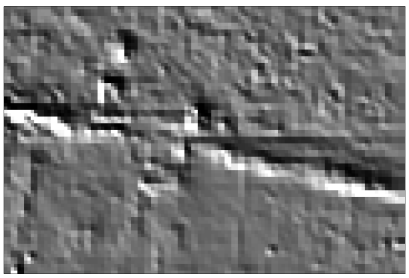
High Pass Filter

The data can be processed to enhance readings of interest. A High Pass Filter is commonly applied to increase the contrast of the responses with the natural background readings. The High Pass Filter can often emphasize responses of particular archaeological interest.



Relief Plot

The Relief Plot provides an aesthetic image of the data, giving the illusion of a 3-D data set. The illusion of height can provide a better visualisation of the resistance results and can be useful for interpretation and presentation.



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

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.

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List of Figures

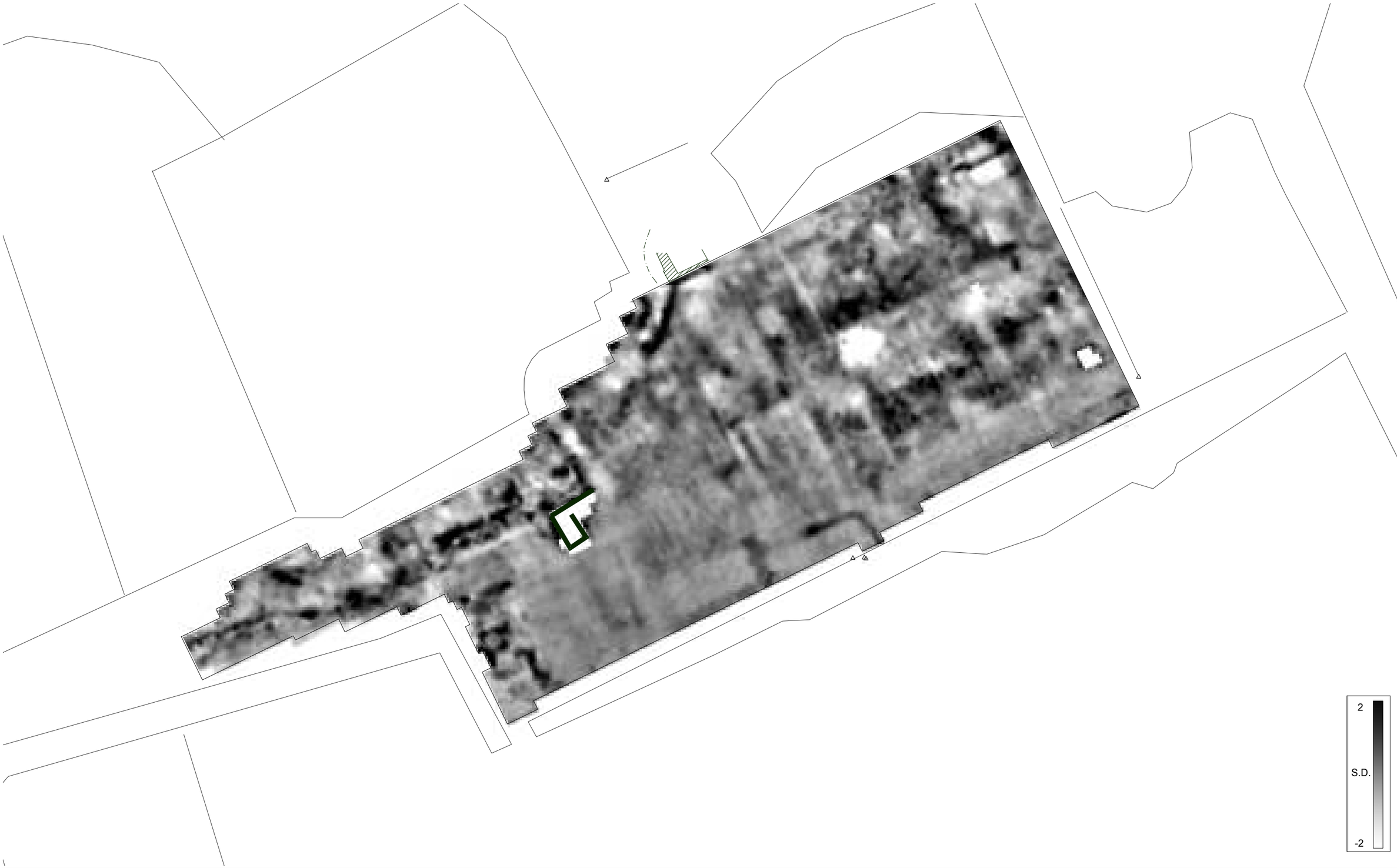
Detailed geophysical survey

Gatehouse RMP ME020:031

Dwelling remains

0 metres 80

Client:	Project:	Title:		
Geraldine Stout	Geophysical Survey: Bey More, County Meath	Survey Location Diagram	J.M.Leigh surveys www.jmlsurveys.com	Scale @ A4: 1:2,000 Figure: 1 Licence No.: 15-R-0135 Issue Date: 27.04.2016



Gatehouse
RMP ME020:031

Building remains

0 metres 30

Client: Geraldine Stout

Project: Geophysical Survey: Bey More, County Meath

Title: RESISTANCE SURVEY
Processed data
Summary Greyscale Image

J.M.Leigh surveys
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Scale @ A3:	1:750
Figure:	02
Licence No.:	15-R-0135
Issue Date:	27.04.2016

Archaeology
- High resistance Structural
- Trend - ? Structural

?Archaeology
- High resistance ?Archaeology
- Trend - ?Archaeolgy

Other
- High resistance ? Archaeology / Modern
- Low resistance ? Archaeology / Modern
- Trend - ?Ploughing / Modern

Gatehouse
RMP ME020:031

Building remains

0 metres 30

Client: Geraldine Stout

Project: Geophysical Survey: Bey More, County Meath

Title: RESISTANCE SURVEY Summary Interpretation

J.M.Leigh surveys
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Scale @ A3:	1:750
Figure:	03
Licence No.:	15-R-0135
Issue Date:	27.04.2016

Gatehouse
RMP ME020:031

Building remains

0 metres 30

N

Client: Geraldine Stout

Project: Geophysical Survey:
Bey More,
County Meath

Title: GRADIOMETER SURVEY
Processed data
Summary Greyscale Image

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Scale @ A3:	1:750
Figure:	04
Licence No.:	15-R-0135
Issue Date:	27.04.2016

Gatehouse
RMP ME020:031

Building remains

?Archaeology - Ditches & Pits

Trend

Modern Ferrous response

Magnetic disturbance

0 metres 30

Client: Geraldine Stout

Project: Geophysical Survey: Bey More, County Meath

Title: GRADIOMETER SURVEY Summary Interpretation

J.M.Leigh surveys
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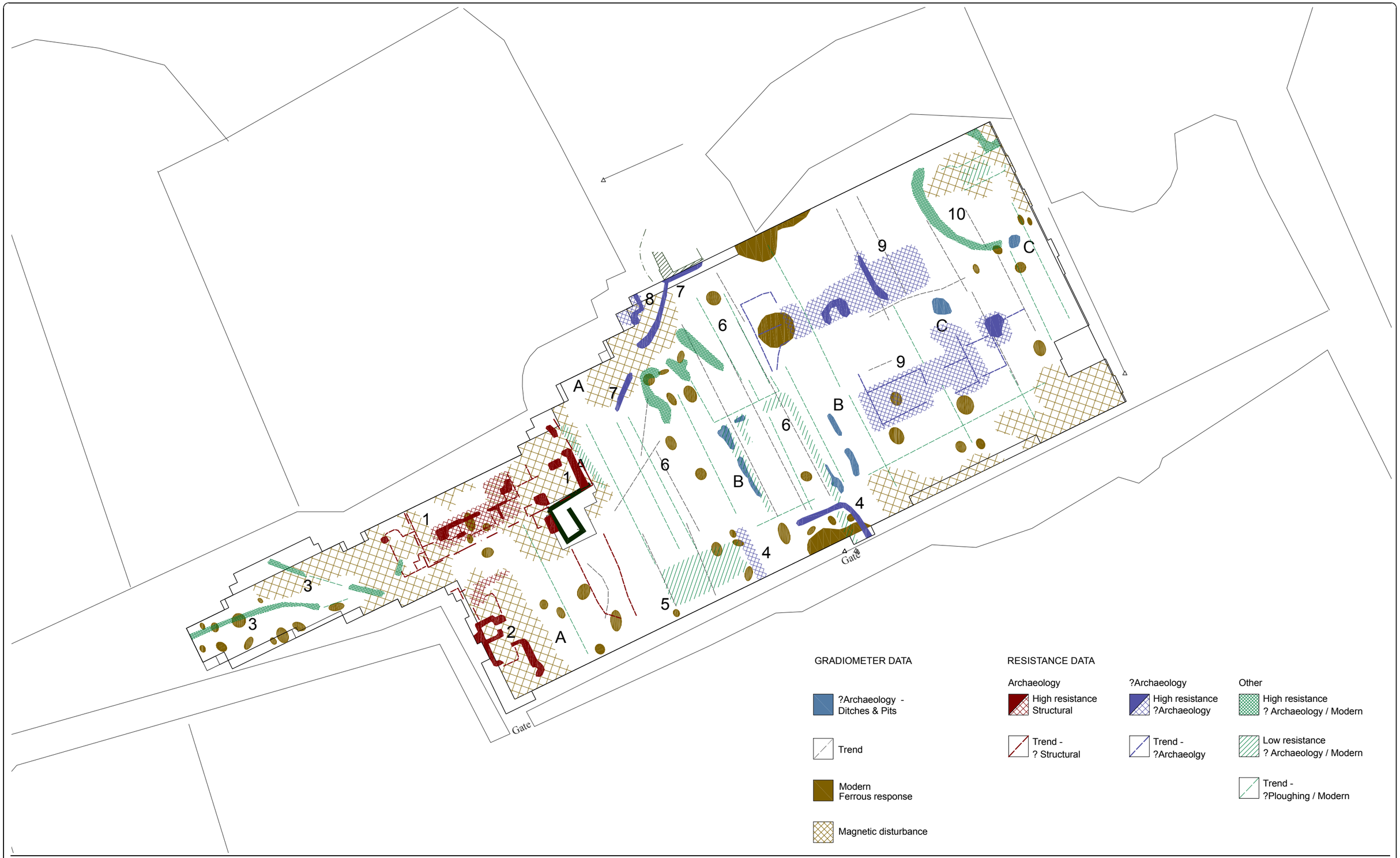
Scale @ A3:	1:750
Figure:	05
Licence No.:	15-R-0135
Issue Date:	27.04.2016



GRADIOMETER DATA

- ?Archaeology - Ditches & Pits
- Trend
- Modern Ferrous response
- Magnetic disturbance

RESISTANCE DATA

Archaeology	?Archaeology	Other
High resistance Structural	High resistance ?Archaeology	High resistance ? Archaeology / Modern
Trend - ? Structural	Trend - ?Archaeolgy	Low resistance ? Archaeology / Modern
		Trend - ?Ploughing / Modern

Gatehouse
RMP ME020:031

Building remains

0 metres 30

Client: Geraldine Stout

Project: Geophysical Survey: Bey More, County Meath

Title: Combined interpretation

J.M.Leigh surveys
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Scale @ A3:	1:750
Figure:	06
Licence No.:	15-R-0135
Issue Date:	27.04.2016