GEOPHYSICAL SURVEY REPORT

STRATASCAN™

SUMO Survey Services
SUMO Group Member

Project name:

Brill, Buckinghamshire

Client:

Michael Farley Archaeology

April 2014

Job ref:
J6661

Report author:
Thomas Richardson MSc AIfA

GEOPHYSICAL SURVEY REPORT

Project name:
Brill, Buckinghamshire
Client:
Michael Farley Archaeology

Job ref:
J6661

Techniques:
Ground Penetrating Radar

Survey date:
7th April 2014

Site centred at:
SP 654 138

Post code:
HP18 9RP

Field team:
Richard Fleming

Project manager:
Simon Haddrell BEng(Hons) AMBCS PIFA

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Checked by:
David Elks MSc AIfA

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1 SUMMARY OF RESULTS

A Ground Probing Radar survey was carried out in Brill, Buckinghamshire to identify the potential continuation of an extant earthwork. Four anomalies possibly relating to the extension of the known earthworks have been identified in the south west of the survey area. There is no further evidence for earthwork features in any of the other traverses.

2 INTRODUCTION

2.1 *Background synopsis*

Stratascan were commissioned to undertake a geophysical survey of Brill, Buckinghamshire with the aim of identifying the extents of known earthworks in the area. This survey forms part of an archaeological investigation being undertaken by Michael Farley Archaeology.

2.2 *Site location*

The site is located in Brill, Buckinghamshire at OS ref. SP 654 138.

2.3 *Description of site*

The survey consists of 26 traverses of GPR data in the village of Brill. These traverses target an area around the Red Lion public house, covering the possible extensions of the earthworks seen to the north of All Saints Church.

2.4 *Geology and soils*

The underlying geology is Whitchurch Sand Formation - Sandstone (British Geological Survey website). There is no recorded drift geology (British Geological Survey website).

The overlying soils are known as Banbury, which are typical ferritic brown earths. These consist of brashy fine and coarse loamy ferruginous soils over ironstone, some fine loamy over clayey soils (Soil Survey of England and Wales, Sheet 6 South East England).

2.5 *Site history and archaeological potential*

The linear bank of unknown date being investigated by this survey lies to the north of the parish church. Iron Age pottery was discovered when a section of the bank was removed during construction work. A number of theories relating to the origin of the bank have been put forward including it being the remnants of a hill fort, part of Edward the Confessors Hunting Lodge, or the remnants of a motte and bailey castle. Resistivity and magnetometery surveys conducted by local archaeological societies have identified the earthworks extending westwards from their known location as well as the remains of at least one building (Michael Farley, personal communication, 4th February 2014).

The earthwork is a Scheduled Ancient Monument, the survey took place outside of the scheduled area.

2.6 *Survey objectives*

The objective of the survey was to locate the extension and perimeter of the known earthworks.

2.7 *Survey methods*

This report and all fieldwork have been conducted in accordance with both the English Heritage guidelines outlined in the document: *Geophysical Survey in Archaeological Field Evaluation, 2008* and with the Institute for Archaeologists document *Standard and Guidance for Archaeological Geophysical Survey.*

Given the wide search area and variety of terrain it was decided to collect individual radar traverses targeted in open areas of the village. These were located where access permitted such as along footways, carriageways and paths. Ground penetrating radar (GPR) was selected as the most suitable methodology for this survey. More information regarding this technique is included in Appendix A.

2.8 *Processing, presentation and interpretation of results*

2.8.1 *Processing*

Manual abstraction

Each radargram has been studied and those anomalies thought to be significant were noted and classified as detailed below. Inevitably some simplification has been made to classify the diversity of responses found in radargrams. This abstraction is then employed as the primary source for producing the interpretation plot, but is not itself reproduced in the report.

i. Strong and weak discrete reflector.

These may be a mix of different types of reflectors but their limits can be clearly defined. Their inclusion as a separate category has been considered justified in order to emphasise anomalous returns which may be from archaeological targets and would not otherwise be highlighted in the analysis.

ii. Complex reflectors.

These would generally indicate a confused or complex structure to the subsurface. An occurrence of such returns, particularly where the natural soils or rocks are homogeneous, would suggest artificial disturbances. These are subdivided into both strong and weak giving an indication of the extent of change of velocity across the interface, which in turn may be associated with a marked change in material or moisture content.

iii. Point diffractions.

These may be formed by a discrete object such as a stone or a linear feature such as a small diameter pipeline being crossed by the radar traverse (see also the second sentence in iv. below)

iv. Convex reflectors and broad crested diffractions.

A convex reflector can be formed by a convex shaped buried interface such as a vault or very large diameter pipeline or culvert. A broad crested diffraction as opposed to a point diffraction can be formed by (for example) a large diameter pipe or a narrow wall generating a hybrid of a point diffraction and convex reflector where the central section is a reflection off the top of the target and the edges/sides forming diffractions.

v. Planar returns.

These may be formed by a floor or some other interface parallel with the surface. These are subdivided into both strong and weak giving an indication of the extent of change of velocity across the interface which in turn may be associated with a marked change in material or moisture content.

vi. Inclined events.

These may be a planar feature but not parallel with the survey surface. However, similar responses can be caused by extraneous reflections. For example, an "air-wave" caused by a strong reflection from an above ground object would produce a linear dipping anomaly and does not relate to any sub-surface feature. Normally this is not a problem as the antennae used are shielded, but under some circumstances these effects can become noticeable.

vii. Conductive surface.

The radiowave transmitted from the antenna has its waveform modulated by the ground surface. If this ground surface or layers close to the surface are particularly conductive a 'ground coupled wavetrain' is generated which can produce a complex wave pattern affecting part or all of the scan and so can obscure the weaker returns from targets lower down in the ground.

viii. A category for *"focused ringing"* has been included as this type of anomaly can indicate the presence of an air void. This is created by the signal resonating within the void, but with a characteristic domed shape due to the "velocity pull-up effect".

3 RESULTS

The ground penetrating radar survey conducted at Brill has identified four anomalies that have been classified as possible targets for the remains of the earthworks. All four anomalies are located in the south west of the survey area, around the allotment gardens and Clarkes Field Close. Anomalies 1-3 are similar inclined planar responses, indicative of former banks and ditches. Anomaly 4 is a complex response above an inclined horizon, this maybe related to a backfilled ditch.

4 CONCLUSION

The survey at Brill has identified four anomalies that are likely to be related to former bank and ditch features. These anomalies are isolated to an area in the south west of the site; however they appear to form a curve that could be an extension of the known earthworks to the north. No evidence for earthwork features can be seen in any of the other traverses.

5 REFERENCES

British Geological Survey South Sheet, 1977. *Geological Survey Ten Mile Map, South Sheet First Edition (Quaternary).* Institute of Geological Sciences.

British Geological Survey, 2001. *Geological Survey Ten Mile Map, South Sheet, Fourth Edition (Solid)*. British Geological Society.

British Geological Survey, n.d., *website*: (http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps) Geology of Britain viewer.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 6 South East England*.

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

Institute For Archaeologists. *Standard and Guidance for Archaeological Geophysical Survey.* http://www.archaeologists.net/sites/default/files/nodefiles/Geophysics2010.pdf

APPENDIX A – METHODOLOGY & SURVEY EQUIPMENT

Grid locations

The location of the survey traversess has been plotted in Figure 2 together with the referencing information. Traversess were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site.

Survey equipment and configuration

Two of the main advantages of radar are its ability to give information of depth as well as work through a variety of surfaces, even in cluttered environments which normally prevent other geophysical techniques being used.

A short pulse of energy is emitted into the ground and echoes are returned from the interfaces between different materials in the ground. The amplitude of these returns depends on the change in velocity of the radar wave as it crosses these interfaces. A measure of these velocities is given by the dielectric constant of that material. The travel times are recorded for each return on the radargram and an approximate conversion made to depth by calculating or assuming an average dielectric constant (see below).

Drier materials such as sand, gravel and rocks, i.e. materials which are less conductive (or more resistant), will permit the survey of deeper sections than wetter materials such as clays which are more conductive (or less resistant). Penetration can be increased by using longer wavelengths (lower frequencies) but at the expense of resolution (see 3.4.2 below).

As the antennae emit a "cone" shaped pulse of energy an offset target showing a perpendicular face to the radar wave will be "seen" before the antenna passes over it. A resultant characteristic *diffraction* pattern is thus built up in the shape of a hyperbola. A classic target generating such a diffraction is a pipeline when the antenna is travelling across the line of the pipe. However it should be pointed out that if the interface between the target and its surrounds does not result in a marked change in velocity then only a weak hyperbola will be seen, if at all.

The Ground Penetrating Impulse Radars used was a Dual Frequency system manufactured by Geophysical Survey Systems Inc. (GSSI).

The radar survey was carried out with a dual frequency GPR with 300MHz and 800MHz antenna. This range of frequencies offers a good combination of depth of penetration and resolution.

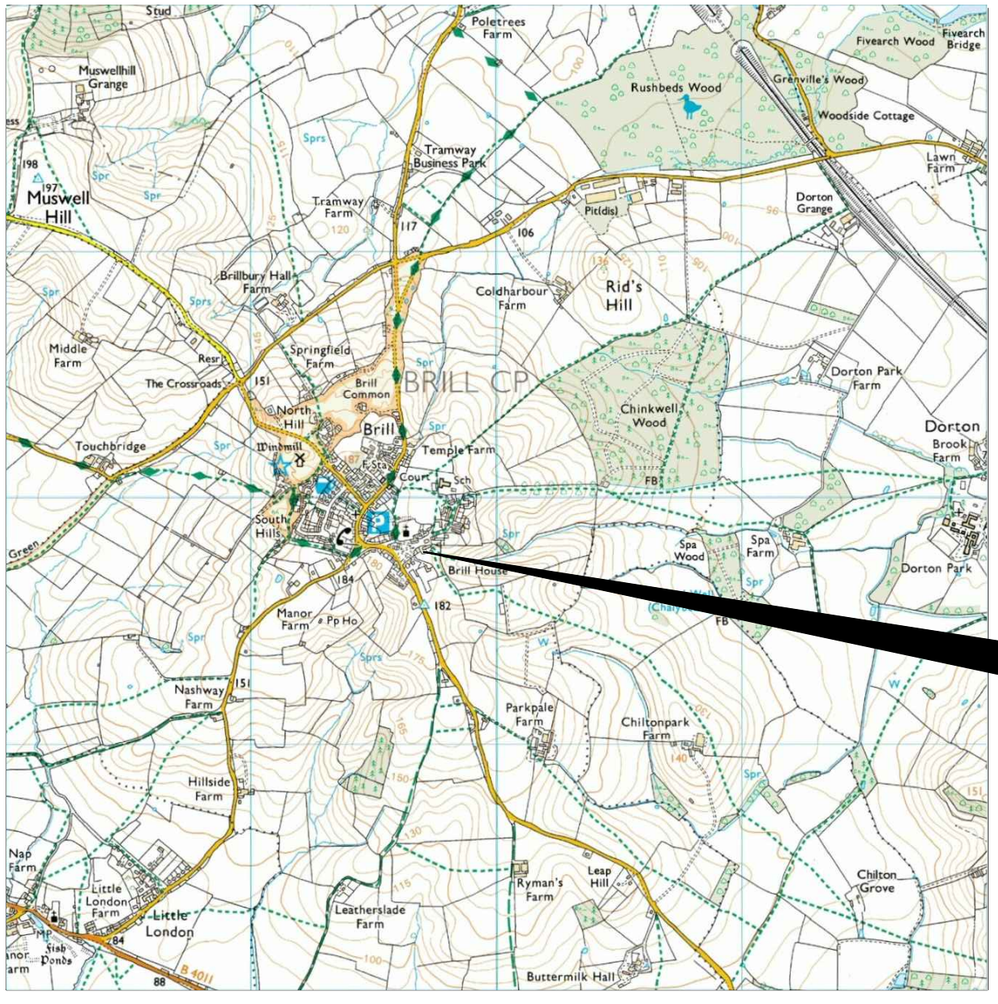
Data capture

Data is displayed on a monitor as well as being recorded onto an internal hard disk. The data is later downloaded into a computer for processing.

Processing

The radar plots included in this report have been produced from the recorded data using Radan software. Filters were applied to the data to remove background noise.

16
15
14
13
12



64 65 66 67 68

N

Amendments

Issue No.	Date	Description
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-	-	-

Site centred on NGR SP 654 138

Client
MICHAEL FARLEY ARCHAEOLOGY

Project Title Job No. J6661
BRILL, BUCKINGHAMSHIRE

Subject
LOCATION PLAN OF SURVEY AREA

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Survey date	Drawn by	Figure No.
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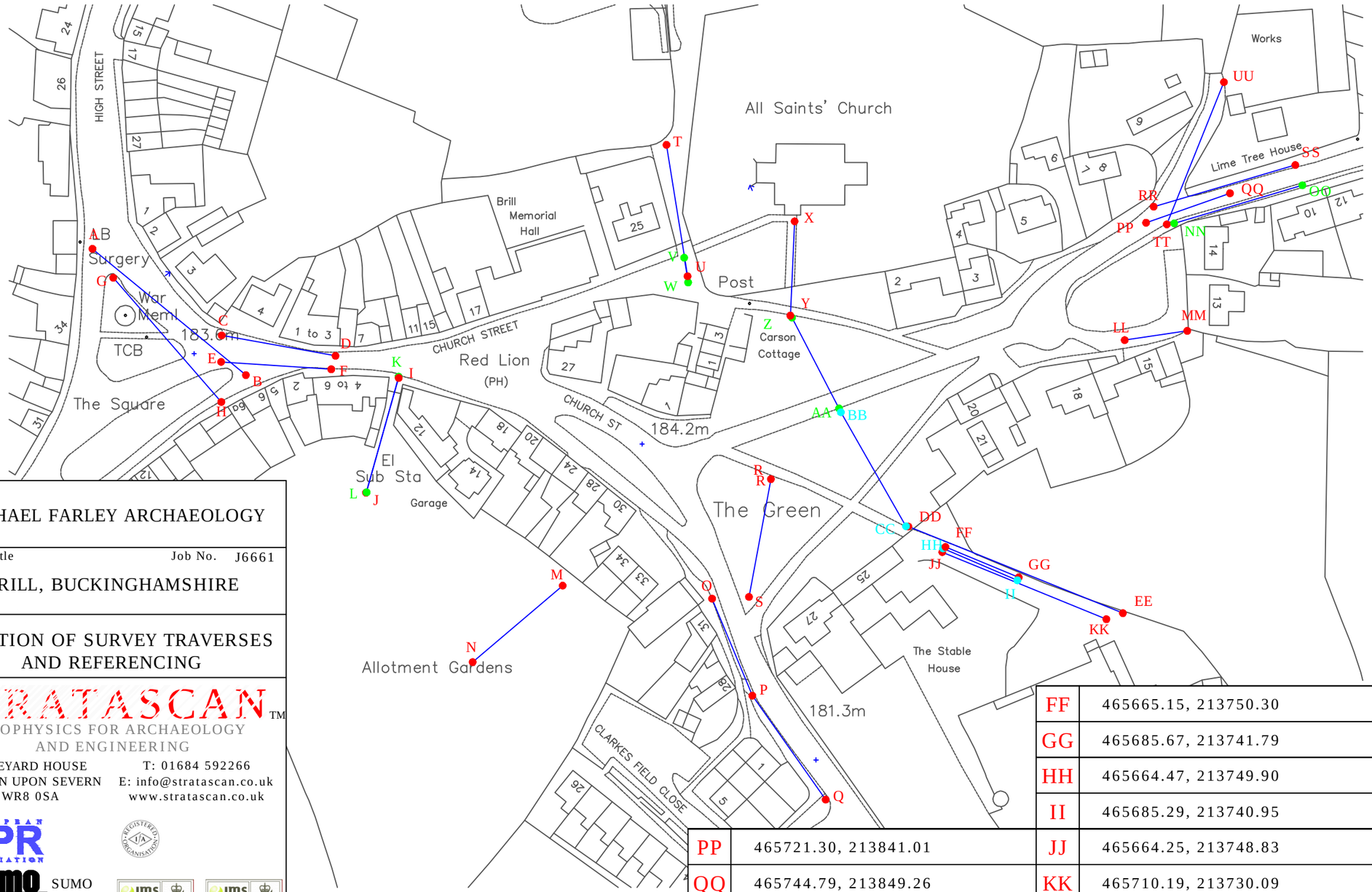

Client
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Subject
LOCATION OF SURVEY TRAVERSES AND REFERENCING

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Scale 1:1250 (0m 10 20 30 40 50m)

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Survey date	Drawn by	Figure No.
APRIL 14	TR	02

Amendments

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OS GRID REFERENCES

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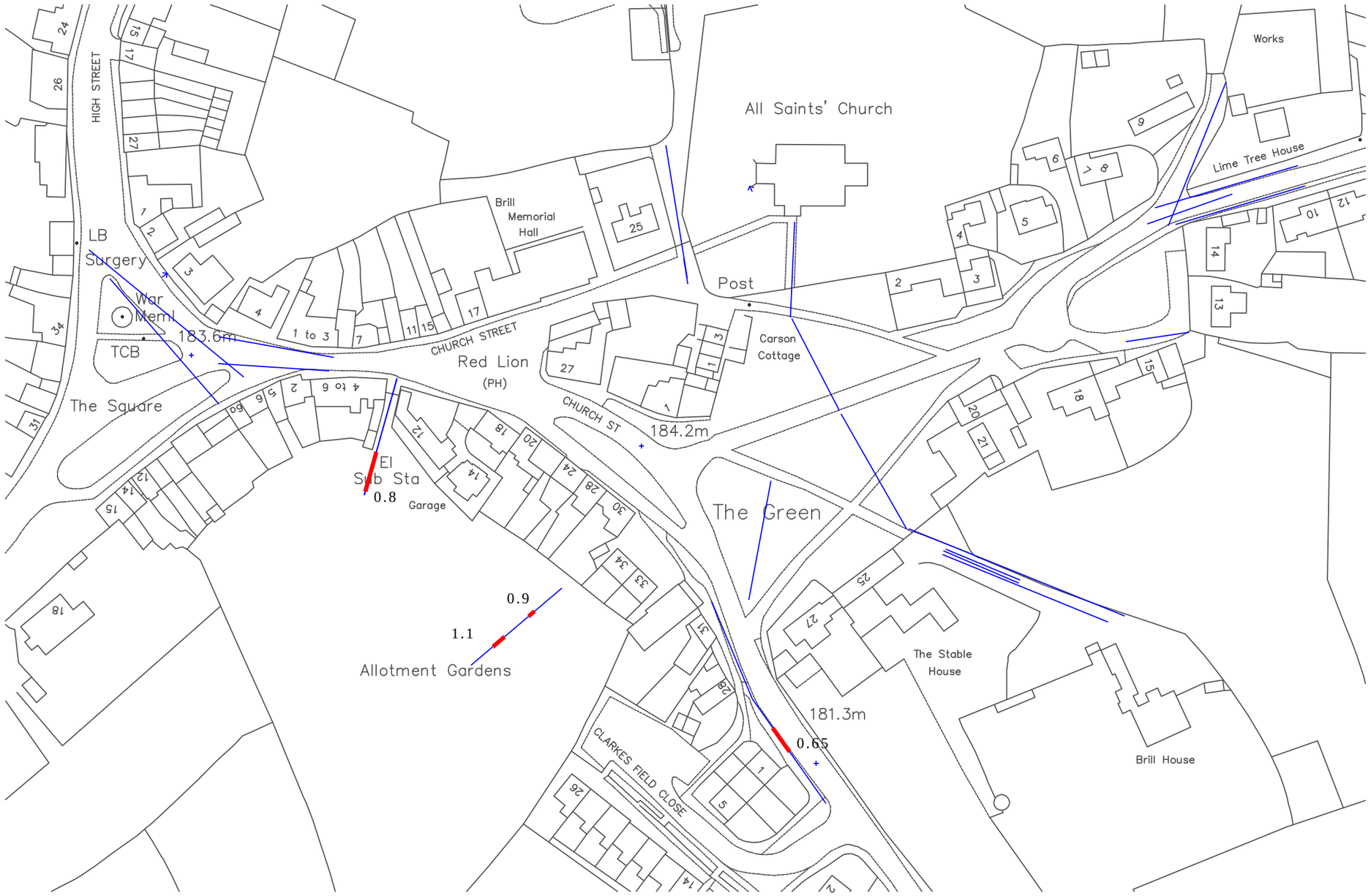

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KEY

	Inclined horizon - possible former bank or ditch
	GPR traverse
0.1	Depth to top of anomaly in metres

Client

MICHAEL FARLEY ARCHAEOLOGY

Project Title — Job No. J6661

BRILL, BUCKINGHAMSHIRE

Subject

GPR INTERPRETATION

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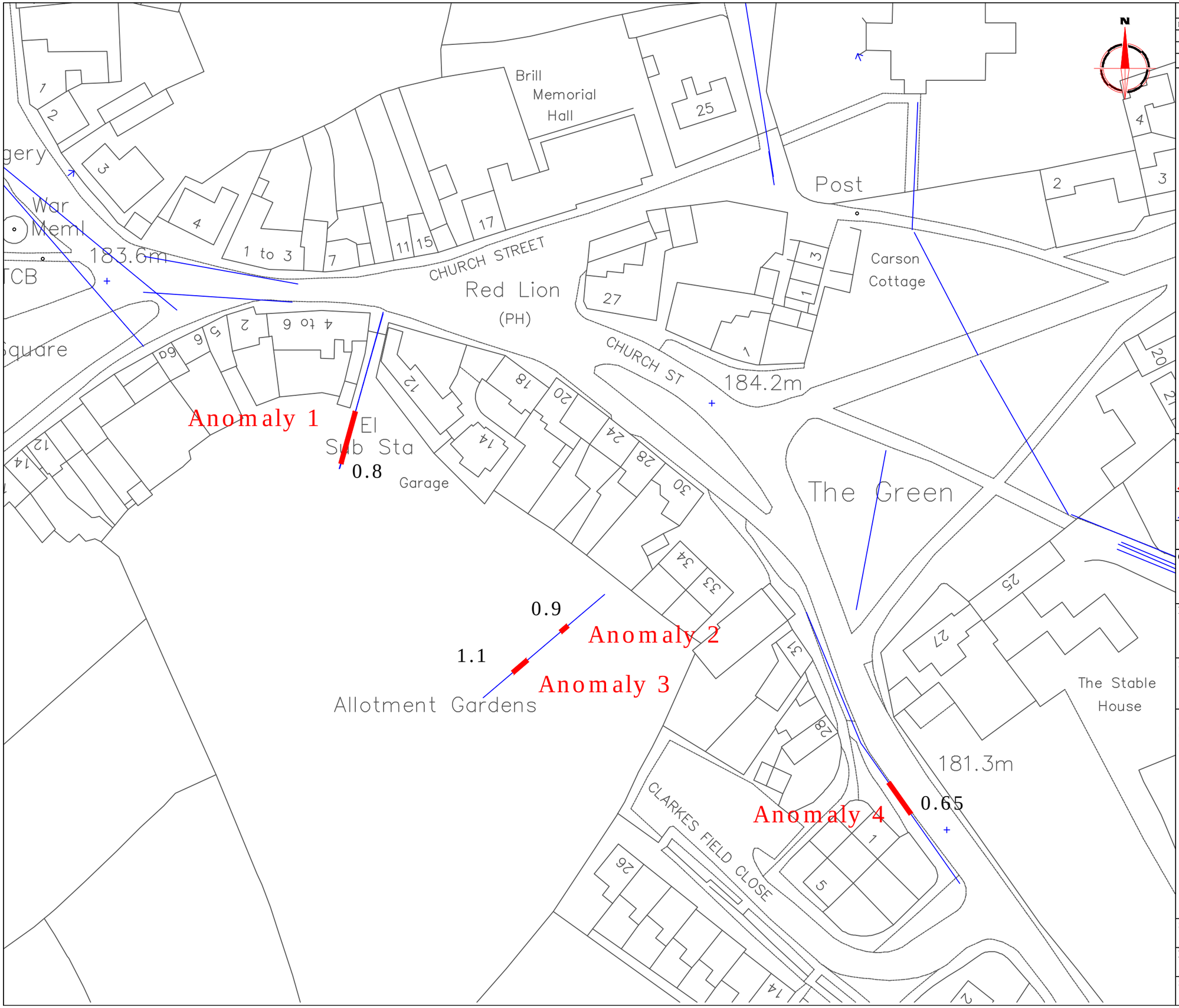

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	Inclined horizon - possible former bank or ditch
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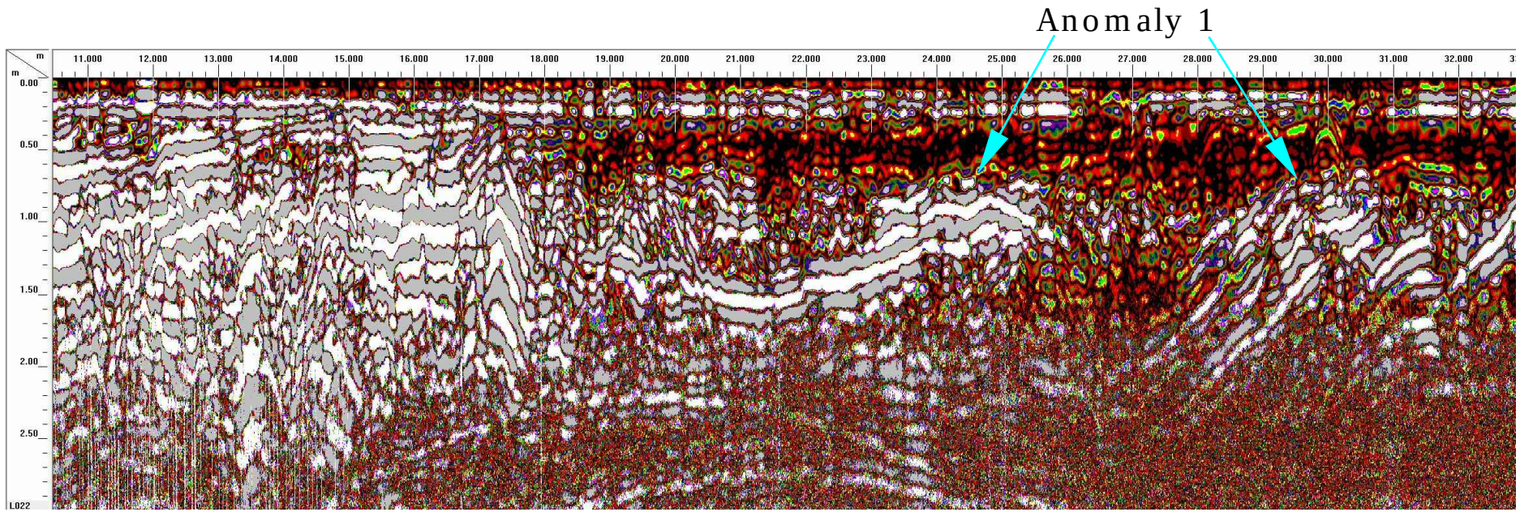

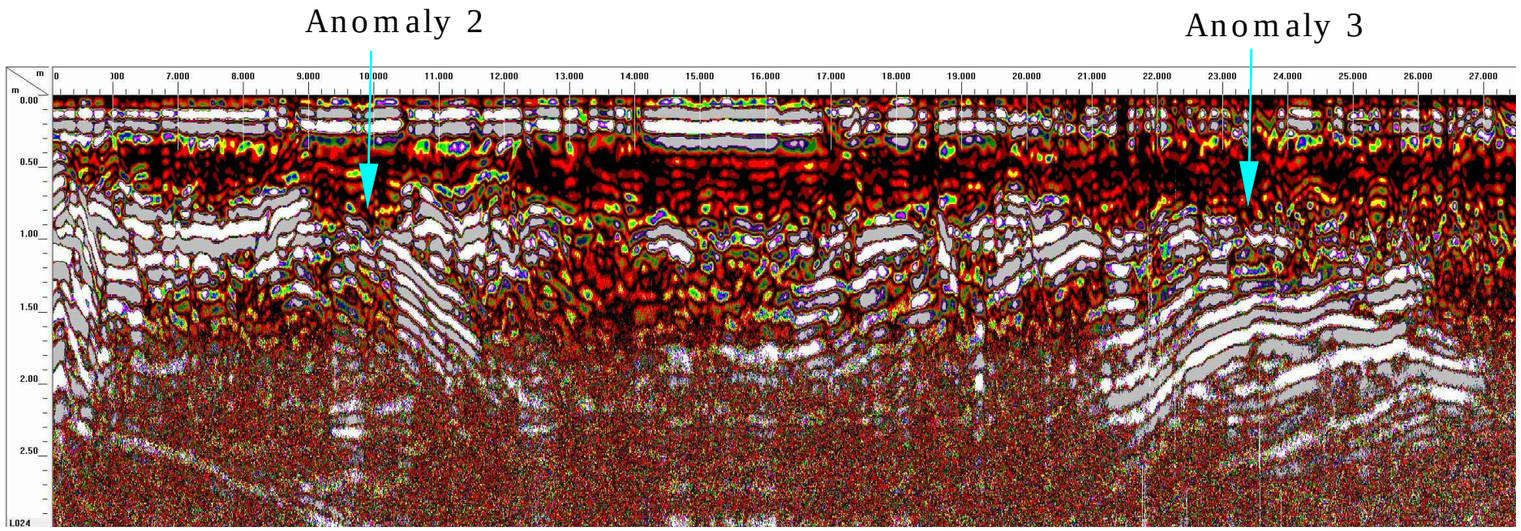

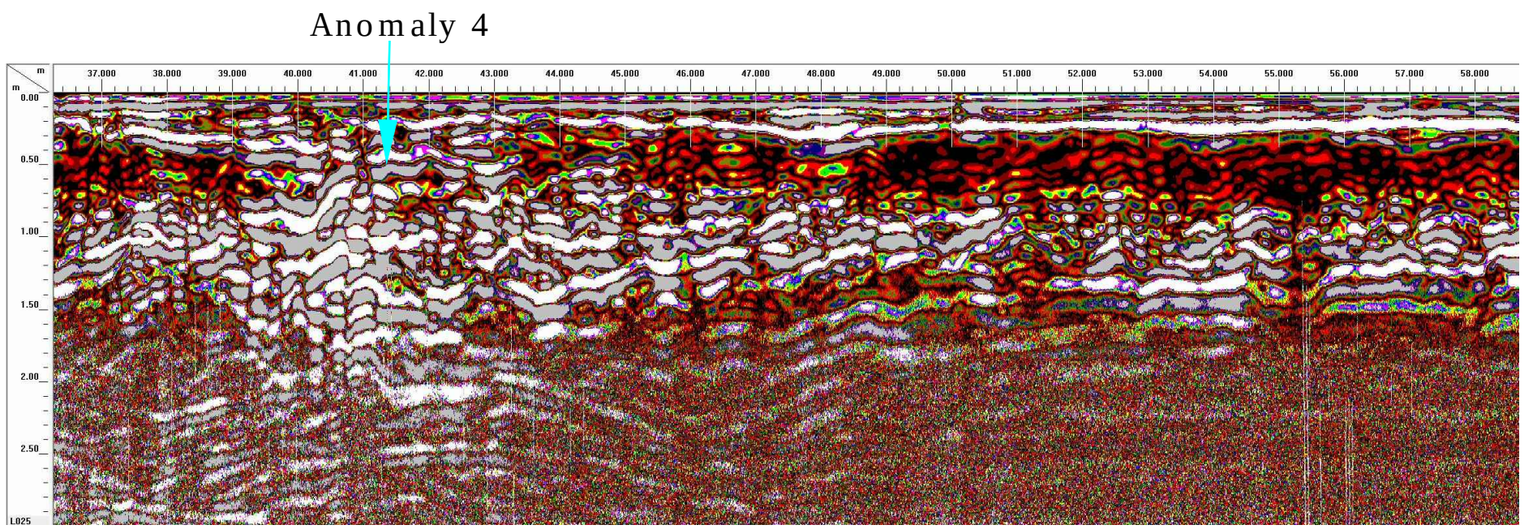

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-	-	-
-	-	-

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MICHAEL FARLEY ARCHAEOLOGY

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EXAMPLE RADARGRAMS

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Scale

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A3	DGE	01
Survey date	Drawn by	Figure No.
APRIL 14	TR	05

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