

National Roads Authority

Archaeological Geophysical Survey Database 2001-2010: Archive Report

This report has been archived by J. Bonsall, NRA Fellow at the University of Bradford. The archive was funded by and carried out under the auspices of, the National Roads Authority Research Fellowship Programme.

Survey Event No. **155**

Survey Name **Cuffsborough, M7 Portlaoise-Castletown / M8 Portlaoise-Cullahill**

This Geophysical Report should be Referenced or Acknowledged as:

Bonsall, J. and Gimson, H., 2006. Cuffsborough 4, M7 Portlaoise-Castletown / M8 Portlaoise-Cullahill, Contract 1 Gortnaclea to Oldtown: Archaeological Geophysical Survey. Earthsound Archaeological Geophysics. Unpublished Report No. 93. December 2006.

Detection Licence No. Not Applicable

Ministerial Directions No. A015 R 45

NRA Route No. M7 / M8

NRA Scheme Name Portlaoise to Cullahill/Castletown

NRA Scheme ID LS/07/423

Survey carried out for Laois County Council

Survey funded by the National Roads Authority

Known problems with this report

There are no known archive issues with this report

Depositor James Bonsall, NRA Fellowship Programme

Primary Archive held by Naas NRDO

Secondary Archive held by Earthsound Archaeological Geophysics

This archive was last updated on 18/11/2011

**Cuffsborough 4, M7 Portlaoise-Castletown / M8
Portlaoise-Cullahill, Contract 1 Gortnaclea To Oldtown**

Archaeological Geophysical Survey

Direction No. A015

Registration No. R45

(Adjacent to Testing Area 2 A015/014)

Survey undertaken on behalf of

Archaeological Consultancy Services Ltd.

J. Bonsall BA (Hons) MSc PIFA
H. Gimson BA (Hons) MSc MIAI

EAG 93

18 December 2006



Table of Contents

Summary of Results	ii
1. Introduction	1
1.1 Geography, Topography, Geology & Climate	1
1.2 Archaeological Background	1
1.3 Aims & Objectives	2
2. Methodology	3
2.1 Magnetic Gradiometer Survey	3
2.2 Reporting, Mapping and Archiving	4
3. Results & Discussion	5
3.1 Magnetic Gradiometer Survey	5
4. Conclusions	7
4.1 Achievement of Objectives	7
4.2 Summary of Results	7
4.3 Dissemination	7
5. Acknowledgements	8
6. Bibliography	8
7. Figures	9

Summary of Results

On the 21st November 2006, a geophysical survey funded by Archaeological Consultancy Services Ltd., was conducted outside the compulsory purchase order boundary of the proposed M7 Portlaoise to Castletown / M8 Portlaoise to Cullahill Road Scheme, County Laois. The areas were investigated using a fluxgate gradiometer at a sampling resolution of 1 x 0.25 m.

The survey was conducted upon a bedrock geology consisting of Waulsortian Limestone which consists of Dolomitised massive fine-grained limestone. The survey areas were covered in short grass which was amenable for geophysical surveys.

A double ditch feature has been located on the eastern edge of the survey area. This appears to define the habitation area revealed within the test trenching. If these features do indeed enclose the archaeology they suggest an extensive enclosure once stood on the site.

On the outside edge of this double ditch a partial rectangular ditch feature was detected. This may suggest habitation or land management within the area.

Further archaeological evidence was detected with possible field boundaries cutting across the survey area as well as extensive cultivation ridges. These suggest that extensive farming has been conducted within the area.



Statement of Indemnity

A geophysical survey is a scientific procedure that produces observations of results which are influenced by specific variables. The results and subsequent interpretation of the geophysical survey presented here should not be treated as an absolute representation of the underlying archaeological features, but as a hypothesis that must be proved or disproved. It is normally only possible to provide verification via intrusive means, such as Test Trench excavations.

1. Introduction

Earthsound Archaeological Geophysics were commissioned by Ms. D. Murphy of *Archaeological Consultancy Services Ltd.*, to execute a geophysical survey adjacent to a defined archaeological site known as Cuffsborough 4, which was revealed within Contract 1 of the proposed M7 Portlaoise to Castletown / M8 Portlaoise to Cullahill Motorway Scheme, County Laois.

Permissions to undertake the survey were obtained from the *Department of the Environment, Heritage and Local Government* (Scheme Number A015/168, Detection Licence Number R45).

There are no Recorded Monuments present and the site is not the subject of any legal instruments under the National Monuments Act (1930-94).

The geophysical survey was requested to determine the presence/absence of unknown archaeological features associated with the results of the excavation of Cuffsborough 4. The survey occurred beyond the motorway corridor in an attempt to define the extent of the archaeological deposits.

1.1 Geography, Topography, Geology & Climate

Located within the townland of Cuffsborough, in the parish of Aghaboe, the northwest corner of the site (Figure 1) lies at *Ordnance Survey of Ireland* Irish National Grid (ING) Reference E234235 N182853.

The site is located 180 m southwest of Cuffsborough cottage and 400 m southwest of Cuffsborough cross road. The site is accessed from the R443 Regional Road, between Ballycolla and Rathdowney. The survey area was situated on land which sloped to the southwest and northeast. Trees in the field had recently been felled leaving large piles of logs within the survey area; these were regarded as obstacles within the site. The bedrock geology is comprised of Waulsortian Limestone and consists of Dolomitised massive fine-grained limestone which provided a suitable contrast for a magnetic gradiometer geophysical survey.

In the week preceding the geophysical survey, the climatic conditions were mild and wet and this continued during the fieldwork. The weather is unlikely to have affected the survey.

1.2 Archaeological Background

Earthsound carried out magnetic susceptibility and magnetic gradiometer surveys immediately to the east of the present survey area, within the motorway route corridor. The geophysical survey (Bonsall & Gimson 2005) indicated the presence of a small number of occupational features. *Archaeological Consultancy Services Limited* excavated the land within the compulsory purchase order boundary (adjacent to the present survey area) in February 2006. Their excavation results suggested that the site consisted of a palisaded structure, a cremation burial, a house, two hut structures and bowl furnaces. A trackway with metal ruts was exposed with a ditch of probable post-medieval date beneath it. Metal finds and pottery finds were also recovered from the site.

1.3 Aims & Objectives

The aim of the geophysical survey was to determine the nature of the archaeological resource in advance of the proposed development scheme. Specific objectives were to:

- Determine the presence or absence of the suspected archaeology beyond the known features within the motorway corridor
Assessment of the spatial extent of the archaeology found during excavation
Map any further archaeological features

A detailed magnetic gradiometer survey was used to map the site, which ran contiguous to the earlier 2005 *EarthSound* survey.

2. Methodology

The fieldwork was carried out on the 21st November 2006 by J. Bonsall and I. Murin of *Earthsound Archaeological Geophysics*.

The geophysical survey was carried out using two *Geoscan Research* FM256 fluxgate gradiometers.

The survey area covered a total of 0.68 hectares. A rectangular grid was laid out using a *Trimble Pro-XRS* Differential Global Positioning System (see Technical Appendix 2), and divided in to 40 × 40 m sub-grids for the gradiometer survey.

2.1 Magnetic Gradiometer Survey

The survey was undertaken along lines parallel to the sub-grid edges, walking approximately west to east, starting in the northwest corner of each grid. Subsequent lines were surveyed in alternate directions ('zigzag').

Data were recorded using an FM256 at a spatial resolution of 1 m intervals between traverses and 0.25 m intervals along those lines. The instrument was positioned facing north, parallel to the Earth's magnetic field, to allow increased geo-magnetic resolution.

The instrument was set to a recording sensitivity of 0.1 nT. Prior to the beginning of the survey and after the completion of every two sub-grids, the electronic and mechanical set-up of the instrument were examined and calibrated as necessary over a common reference point. The magnetic drift from zero was not logged.

Data were collected automatically using an internal sample trigger while the operator walked at a constant pace along the traverse. The data were stored in an internal data logger and downloaded to a field computer using the *Geoscan Research* Geoplot v.3.00a software.

2.1.1 Data Processing

2.1.1.1 Preliminary Data Treatment

The data were pre-processed in Geoplot 3.00.

Spurious high intensity anomalies, commonly statistical outliers, are referred to as geophysical 'spikes'. In magnetic data, an 'iron spike' is a response to a buried ferrous object, often in the topsoil. Iron spikes are generally not removed in geophysical data; although often modern in origin, they can be indicative of archaeological material.

The raw data contained some poorly matched sub-grids, caused by the internal drift of the fluxgate gradiometer and the gradual misalignment of the fluxgate sensors between calibration episodes. To compensate for this, a zero mean traverse (ZMT) function was employed. The use of ZMT alters data to adjust the mean of each traverse to zero by increasing or decreasing data as necessary. This alters the statistical properties of the data to give a uniformly bipolar background, centred around zero. Post-ZMT plots were compared with raw data to analyse the potential removal of geophysical anomalies along the line of a traverse.

2.1.1.2 Further Processing

No further processing functions were applied due to the high quality of the data collection.

A low pass Gaussian filter was applied, reducing the variability of the data whilst improving the visibility of weak archaeological features. This also had a smoothing effect on the data.

A sine wave interpolation function was applied to provide a smooth, aesthetically pleasing image for presentation. For a given point x , the contribution of adjacent readings to the interpolated point is given by the function $\text{sinc}(x) = \sin \pi x / \pi x$ (Scollar 1990). This function is used as a sliding window along each transect, resulting in an interpolated image, expanding the resolution of the data from 1 m x 0.25 m to 0.5 m x 0.125 m. This function was chosen as giving a clearer interpolated image than linear interpolation (which assumes a direct linear change between each point) or bicubic interpolation (taking the surrounding sixteen values into account).

2.1.2 Graphical Display

Pre-processed data are displayed in XY traceplot format in Figure 2. An XY traceplot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a stacked plot. The data have been clipped at -3 and $+3$ nT. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the 'shape' of individual anomalies can be discerned and potentially archaeological anomalies differentiated from iron 'spikes'.

Processed data are shown in Greyscale format in Figure 3. The greyscale plot presents data as pixels on a linear grey shaded scale, increasing or decreasing dependent on the values of the maximum and minimum clip. The geophysical data in Figure 3 have been clipped at -2 (white) and $+2$ nT (black). Data values beyond the clip limits are shown as 'pure' black or white. The main advantage of this display option is that the data can be viewed as a base map.

Interpretation plots are presented in Figures 4 and 5.

2.2 Reporting, Mapping and Archiving

The geophysical survey and report follow the recommendations outlined in the *English Heritage Guidelines* (David 1995) and *IFA Paper No. 6* (Gaffney *et al.* 2002) as a minimum standard.

Geophysical data, figures and text are archived following the recommendations of the *Archaeology Data Service* (Schmidt 2001).

Field boundaries were mapped and drawn based upon data gathered by the DGPS. All figures reproduced from *Ordnance Survey Ireland* mapping are done so with permission from OSI copyright (Licence No. AR 0047306).

Technical information on the equipment used, data processing and methodology are given in Appendix 1. Appendix 2 details the survey geo-referencing information and Appendix 3 describes the composition and location of the archive.

3. Results & Discussion

The interpretation figures should not be looked at in isolation but in conjunction with the relevant discussion section and with the information contained in the Appendices. Features are numbered in Figure 4 and are described and interpreted within the text.

3.1 Magnetic Gradiometer Survey

Figure 3 – Magnetic Gradiometer Data

Figure 4 – Magnetic Gradiometer Interpretation

Figure 5 – Magnetic Gradiometer Interpretation & archaeological excavation results

In magnetic data, a dipolar anomaly or ‘iron spike’ is a response to buried ferrous objects, often in the topsoil. Iron spikes generally are not removed in geophysical data, although often modern in origin, they can be indicative of archaeological material.

Four different plough regimes were detected on the site. These appear to continue across the survey area suggesting that they are relatively modern in origin. The detection of four different plough regimes within such a small area is unusual and suggests that the field has been intensively cultivated, which may have led to the partial destruction of any underlying archaeological remains. The detection of archaeological features during the test excavations within the CPO boundary suggests that some preservation will remain.

Anomaly [1] comprises a pair of curvilinear parallel ditches that run along the eastern edge of the survey area. The location of this double ditch feature roughly corresponds to the marked CPO boundary and suggests that the archaeology revealed during test excavations is contained within a large probable enclosure, part of which has been detected within this geophysical survey. Measuring 120 m in length these suggest a possible substantial enclosure once existed on the site.

Anomaly [2] is a linear possible ditch feature located on the southeastern edge of the survey area. This feature runs across anomaly 1 and therefore is probably not contemporary with it. This probable ditch runs into the ACS excavation area.

Anomaly [3] is a possible ditch which appears to run from the inside edge of anomaly 1. The feature was detected for a length of 13 m and it appears to continue into the CPO and possibly into the excavation area.

Anomaly [4] is a diffuse area of magnetic enhancement located on the northern edge of anomaly 3. Running in an east to west direction the anomaly comprises isolated areas of high magnetism as well as an increase in background readings. It is possible that this feature has been elongated beyond its original size, by the extensive cultivation activity on the site, it is probably archaeological in nature, possibly a ditch or a series of occupational deposits.

Anomaly [5] represents a further area of magnetic enhancement located to the north of anomaly 4. This anomaly also contains the same type of magnetic signatures and are therefore likely to comprise the same type of material as anomaly 4, probably representing a ditch or a series of occupational deposits.

Anomaly [6] comprises three linear possible ditch features that form three sides of a roughly rectangular anomaly. Measuring 23 m by 16 m it is possible that this represents the remains of a structure or animal pen located on the outside of the habitation area defined by the double ditch (anomaly 1).

4. Conclusions

4.1 Achievement of Objectives

The geophysical surveys conducted at Cuffsborough has enabled a greater understand to be gained about the archaeology within the area and has allowed the detection of a possible boundary ditch which defines the habitation area revealed within the test trenching.

4.2 Summary of Results

An extensive double ditch feature has been located on the eastern edge of the survey area. This appears to define the habitation area revealed within the test trenching. If these features do indeed enclose the archaeology they suggest an extensive enclosure once stood on the site. The northern and southern ends of the enclosure appear to extend within the Motorway corridor.

On the outside edge of this double ditch a partial rectangular ditch feature was detected. This may suggest habitation or land management within the area.

Further archaeological evidence was detected with possible field boundaries cutting across the survey area as well as extensive cultivation ridges. These suggest that extensive farming has been conducted within the area.

4.3 Dissemination

The results of this survey were submitted to *Archaeological Consultancy Services Ltd.*. *Earthsound* will ensure that copies will be forwarded to the *Department of the Environment, Heritage and Local Government* and the National Museum of Ireland in compliance with the Licence agreement.

5. Acknowledgements

Project Management: James Bonsall BA (Hons) MSc PIFA
Fieldwork: James Bonsall
Igor Murin MSc
Report: Heather Gimson BA (Hons) MSc MIAI
Graphics: Heather Gimson

6. Bibliography

BONSALL, J. & GIMSON, H. 2006 *Testing Areas 2, 4, 6, 7 & 15, M7 Portlaoise-Castletown / M8 Portlaoise-Cullahill, Contract 1 Gortnaclea to Oldtown, Archaeological Geophysical Survey*, Report Number EAG 54, April 2005, unpublished report on behalf of Archaeological Consultancy Services Limited

CLARK, A.J. 1996 *Seeing Beneath the Soil*, London, Batsford

DAVID, A. 1995 *Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines*, No. 1. English Heritage

GAFFNEY, C., GATER, J. & OVENDEN, S. 2002 *The use of Geophysical Techniques in Archaeological Evaluations*, IFA Paper No. 6, Institute of Field Archaeologists

SCHMIDT, A. 2001 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Oxford, Oxbow

SCOLLAR, I., TABBAGH, A., HESSE, A. AND HERZOG, I. 1990 *Archaeological Prospecting and Remote Sensing*, Cambridge, Cambridge University Press. Topics in Remote Sensing Vol. 2

The following texts are referenced in the Technical Appendix:

WALKER, R. 2000 *Geoplot Version 3.00 for Windows, Instruction Manual, Version 1.2*, Clayton, West Yorkshire

7. Figures

- Figure 1: Site Location
- Figure 2: Pre-processed magnetic gradiometer data
- Figure 3: Processed magnetic gradiometer data
- Figure 4: Magnetic gradiometer interpretation
- Figure 5: Magnetic gradiometer interpretation and archaeological excavation results

Technical Appendix

Appendix 1

1. Magnetic Survey: Technical Information

1.1 Magnetic Susceptibility and Soil Magnetism

The Earth is comprised of approximately 6% iron. Via geological and pedological processes iron is present in soils and rocks as three main minerals; haematite, magnetite and maghaemite. Haematite is a very common mineral in archaeological soils and is largely responsible for most of the red colouration in the environment. Magnetite is a common mineral found in all igneous rocks, most sedimentary rocks and nearly all soils. These minerals have a weak, measurable magnetic property.

The magnetism observed in a rock is made up of remanent and induced components. In the weak magnetic field due to the earth, the induced component is proportional to the earth's field. The constant of proportionality is called the magnetic susceptibility. The susceptibility of a rock is controlled by the amount of ferrimagnetic material contained in them, their grain size, and mode of distribution.

An enhancement of ferrimagnetic minerals is responsible for the formation of magnetic anomalies in soils at archaeological sites. Magnetic Susceptibility (MS) measures how susceptible a material is to becoming magnetized. A MS survey can identify and classify different types of iron bearing materials in a safe, fast and non-destructive manner either in a laboratory or as a fieldwork component, complementing other archaeological analyses.

Anthropogenic activities can redistribute these minerals and alter others into more magnetic forms by a process of enhancement, such as burning, industrial activity, fermentation and manuring. MS enhancement of antiferromagnetic haematite in the topsoil is caused by the Le Borgne effect of domestic fires on soils and vegetational matter:

The burning of organic matter and the heating of non-organic matter above 200°C, allows electrons to be gained through a process of reduction, creating ferrimagnetic magnetite. As the matter cools, or in the case of organic matter, is combusted, electrons are lost through a process of re-oxidation, creating ferrimagnetic maghaemite.

The decay of organic material associated with areas of human occupation or settlement can be identified by measuring the MS of the topsoil and noting the degree of enhancement. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

There are five different types of magnetic behaviour found in Magnetic Susceptibility surveys, dependent upon the sub-atomic properties of the samples:

- *Ferromagnetism* Strongest
- *Ferrimagnetism*
- *Antiferromagnetism*
- *Antiferromagnetism*
- *Paramagnetism*
- *Diamagnetism* Weakest



Magnetic susceptibility is a value defined by a combination of all of the above types of magnetic behaviour, so that weaker paramagnetism and diamagnetism will be masked if other, *stronger*, magnetic properties are present. For example, a topsoil magnetic susceptibility survey will introduce additional contributions from colluvial/alluvial covering or a disturbed Ap horizon (cultivation/pasturing disturbance *etc.*) that may mask an archaeologically derived response.

1.2 Types of Magnetic Anomaly

Magnetic anomalies are either are termed '**negative**' or '**positive**' referring to their magnetic properties relative to the bipolar background (theoretically, 'zero').

The types of response mentioned above can be divided into five main categories which are used in the graphical interpretation of the gradiometer data:

Areas of positive/negative enhancement

These responses can be quite widespread, and often caused by rubble or foundations, burning, agricultural disturbance and general occupational induced enhancement.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by in-filled archaeological ditches or walls.

Isolated positive/negative anomalies

These generally represent small areas of enhancement. They may be caused by exotic geology or by in-filled archaeological pits.

Isolated Ferrous anomalies

Theses are very strong magnetic responses caused by ferrous (iron) debris, often found scattered in fields. These are usually modern in origin, although may represent archaeological material such as coffin nails.

Areas of Disturbance

These are mostly modern in origin, causing widespread magnetic interference, often masking all other magnetic features within the vicinity. These can be caused by nearby structures, metallic fences, road traffic and metallic pipelines.

1.3 Methodology

1.3.1. *Magnetic Susceptibility Survey*

The magnetic susceptibility meter displays the MS value of material when they are brought within the influence of the sensor, such as the field search loop. An oscillator circuit within the *Bartington* MS2 meter generates a low alternating magnetic field. Any material brought within the influence of the field (in the case of the search loop, the field of influence is between 0-18cm beneath the loop, i.e. generally the topsoil), will bring about a change in the oscillator frequency. The frequency information is returned in pulse form to the MS2, where it is converted in to a value of magnetic susceptibility, κ , in SI units.

A topsoil MS survey assumes that the sample size is infinite, as the precise mass of each sample point cannot be calculated in the field. Calibration therefore, is best expressed in units of Volume Specific susceptibility. Repeatability of the survey is dependent upon the uniformity of the surface under investigation. Volume susceptibility is expressed as $\kappa \times 10^{-5}$ SI units.

1.3.2. *Fluxgate Gradiometer Survey*

A detailed survey requires a sample trigger to automatically take readings at predetermined points. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning or magnetic susceptibility.

2. Data Processing and Presentation

2.1 Interpolation

Interpolation can be defined as the estimation of a value between known values. The data magnetometer data displayed in this project have been interpolated using the $\sin x/x$ function in *Geoplot* 3.0 (Walker 2000).

Gridding methods produce a regularly spaced, rectangular array of Z values from irregularly spaced XYZ data. The term "irregularly spaced" means that the points follow no particular pattern over the extent of the map, so there are many "holes" where data are missing. Gridding fills in these holes by extrapolating or interpolating Z values at those locations where no data exists.

A grid is a rectangular region comprised of evenly spaced rows and columns. The intersection of a row and column is called a grid node. Rows contain grid nodes with the same Y co-ordinate, and columns contain grid nodes with the same X co-ordinate. Gridding generates a Z value at each grid node by interpolating or extrapolating the data values. The *Kriging* gridding method produces visually appealing maps from irregularly spaced data. *Kriging* is a geostatistical gridding method that has proven useful and popular in many fields. *Kriging* attempts to express trends suggested in the data so that, for example, high points might be connected along a ridge rather than isolated by bull's-eye type contours.

Appendix 2

Survey Grid Re-location

1. Each survey grid was laid out using a *Trimble* Pro-XRS Differential Global Positioning System (DGPS), to an accuracy of $\pm 50\text{cm}$.
2. There was a good correlation between the geophysical survey data and the digital map base and it is estimated that the average 'best fit' error is lower than $\pm 0.25\text{m}$. It is important to note that local grid north (27/08/03) varies slightly from *Ordnance Survey* north, with an annual decrease of $0.9^{\circ}3'$.

Appendix 3

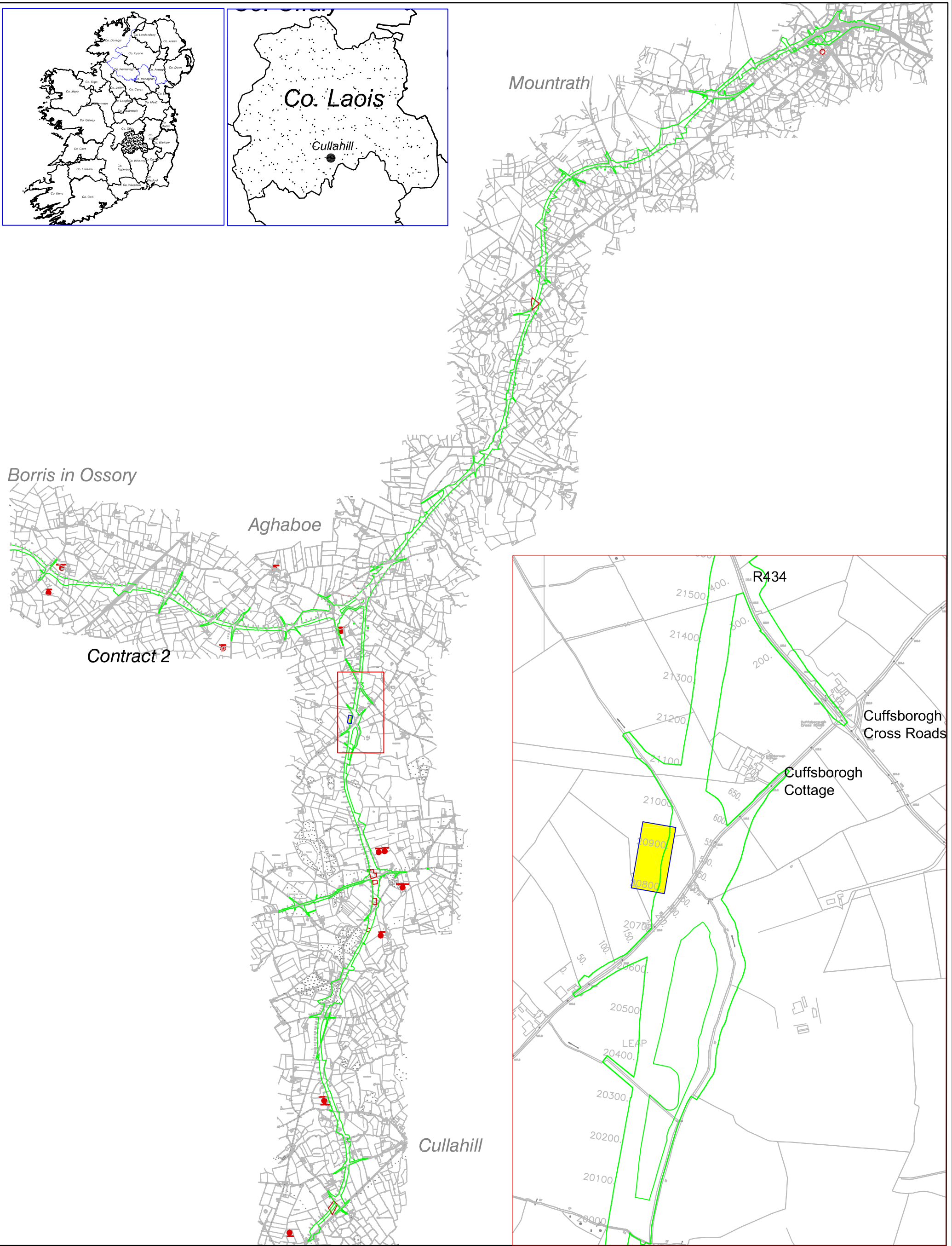
Geophysical Archive

Earthsound Archaeological Geophysics takes its archiving responsibilities very seriously. Archiving is a necessary measure to maintain a complete record of past research, prevent unnecessary duplication and allow the re-use and re-interpretation of geophysical data as analytical techniques evolve.

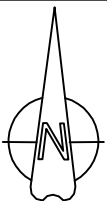
The geophysical archive comprises:-

- an archive CD-ROM containing files of the raw data (Geoplot 3.00a, MS-Excel), report text (Word 2000 9.0), and graphics files (AutoCAD 2000).
- a hard (paper) copy of the report

At present, two copies of the archive are held by *Earthsound Archaeological Geophysics*, at separate locations to ensure preservation against accidental damage or theft. The Client, *Archaeological Consultancy Services Ltd.*, holds one further copy of the archive. Additional paper copies intended for ultimate deposition with the *Department of the Environment, Heritage and Local Government* are in the guardianship, and are the responsibility of, *Earthsound Archaeological Geophysics*.



- Legend**
- CPO line
 - Basemap
 - RMP Sites
 - Geophysical survey area

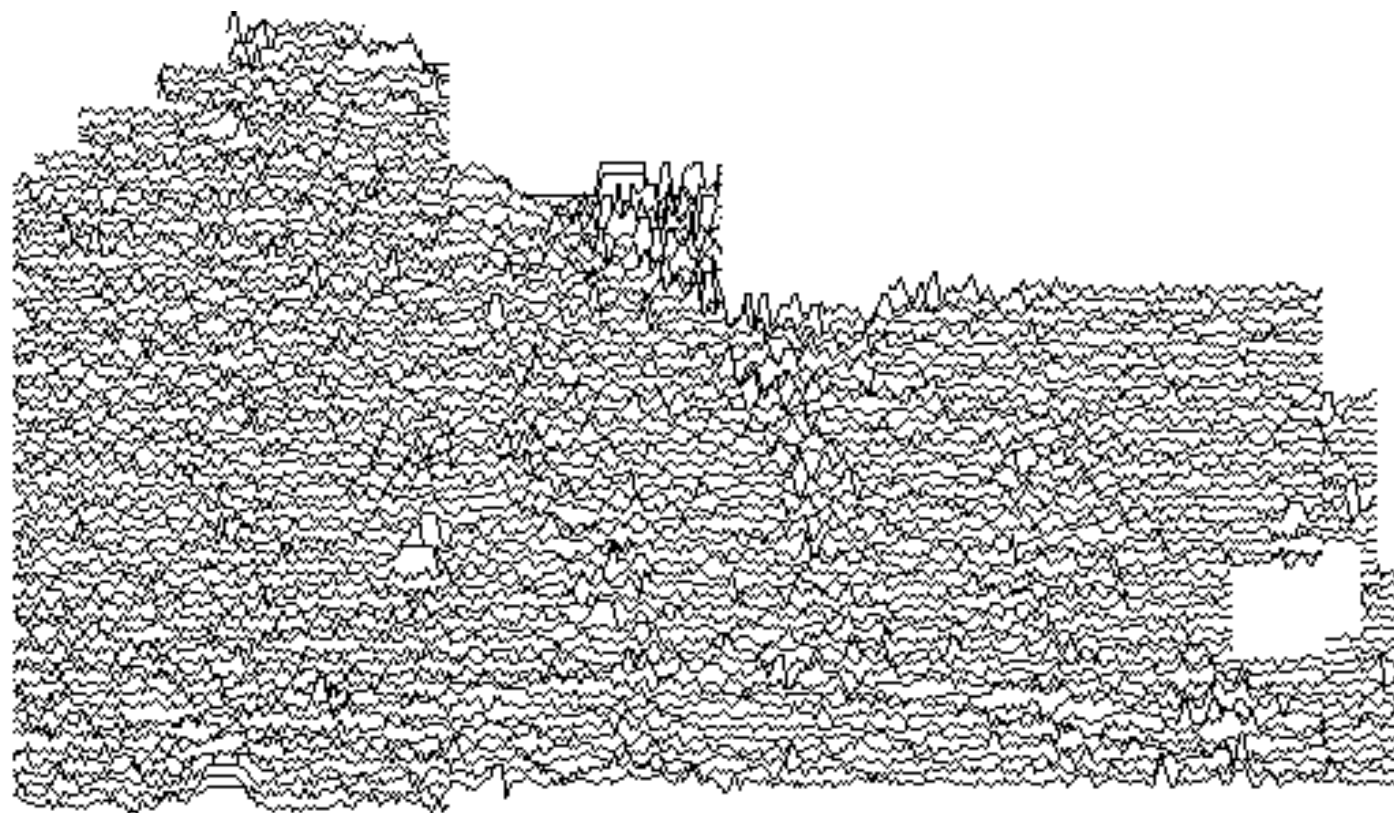


Site Location: Cuffsborough, Contract 1, M7 / M8, County Laois
Client: Archaeological Consultancy Services Ltd.
Drawing Courtesy of: LCC
Date 11/12/06
Drawing No.: 06-35/01
Ordnance Survey Ireland Licence No. AR 0047306
Copyright Ordnance Survey Ireland Government of Ireland
0m 2000m 4000m

Figure No. 1 Location map
EARTHSOUND
archaeological
geophysics

Cuffsborough, Contract 1, M7 / M8, County Laois

Figure 2: Pre-processed Fluxgate Gradiometer XY Traceplot



20.00 nT



N

0  20m

Resolution 0.5nT,

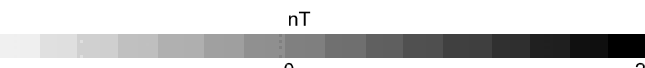
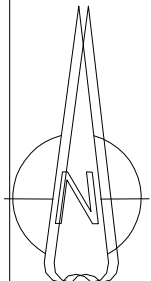


Data Clipped to ± 3 nT,

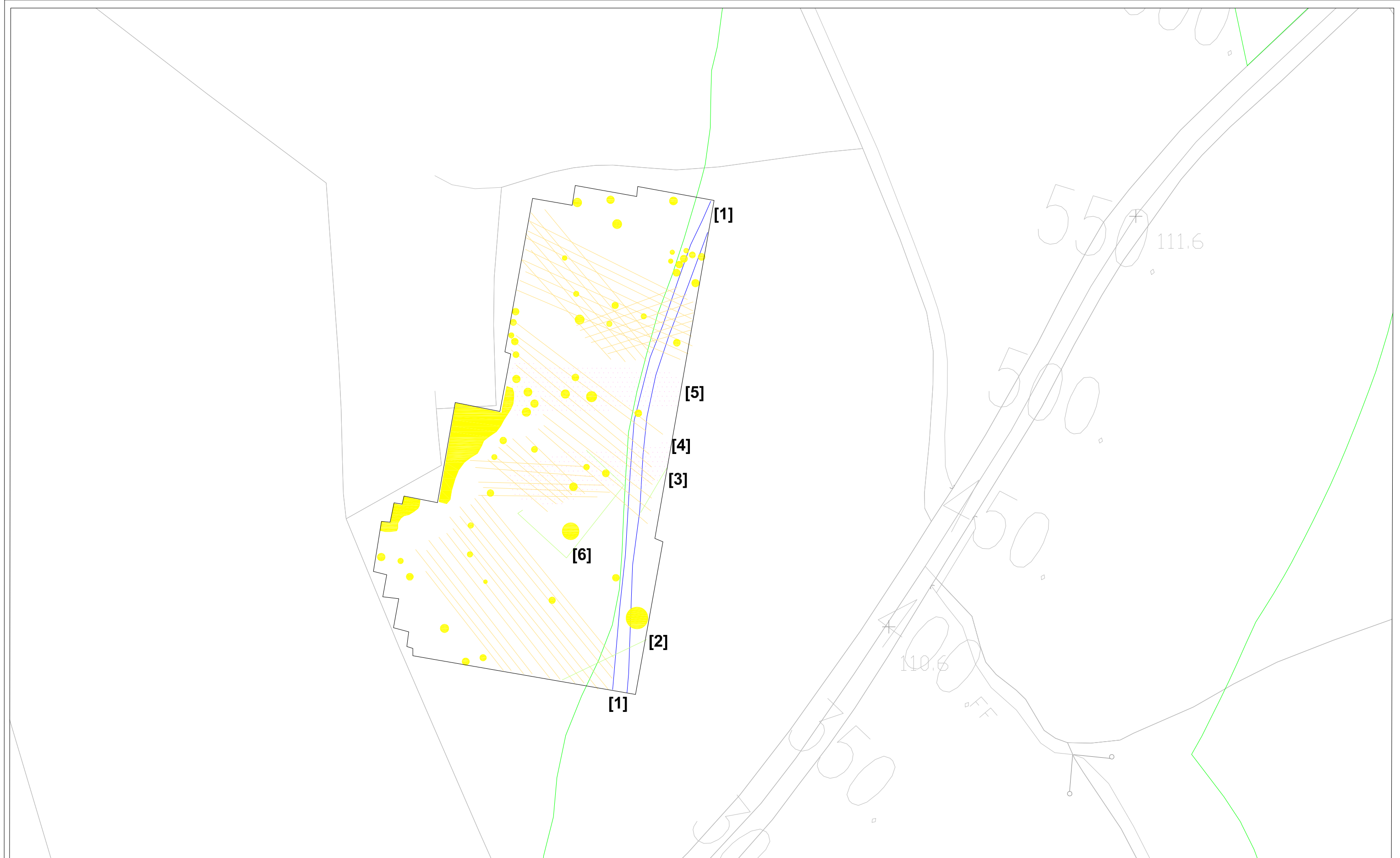
1m x 0.25m Sample Interval

EARTHSOUND
 archaeological
geophysics

Drawing No.: 06_35/02

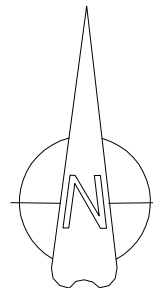


Legend — CPO line — Basemap ● RMP Sites 		Site Location: Cuffsborough, Contract 1, M7 / M8, County Laois		Figure No. 2 Magnetic Gradiometer data	
		Client: Archaeological Consultancy Services Ltd.			
		Drawing Courtesy of: LCC			
		Date: 11/12/06	Drawing No.: 06-35/02		
		Ordnance Survey Ireland Licence No. AR 0047306 Copyright Ordnance Survey Ireland Government of Ireland			
					



Legend

- | | |
|---|--|
|  CPO line |  Possible enclosure ditch |
|  Basemap |  Possible Ditch |
|  Survey area |  Dipolar Anomaly (Ferrous material) |
| |  Positive Magnetic Enhancement |
| |  Plough Furrows |



Site Location: Cuffsborough, Contract 1, M7 / M8, County Laois

Client: Archaeological Consultancy Services Ltd.

Drawing Courtesy of:LCC

Date 11/12/06

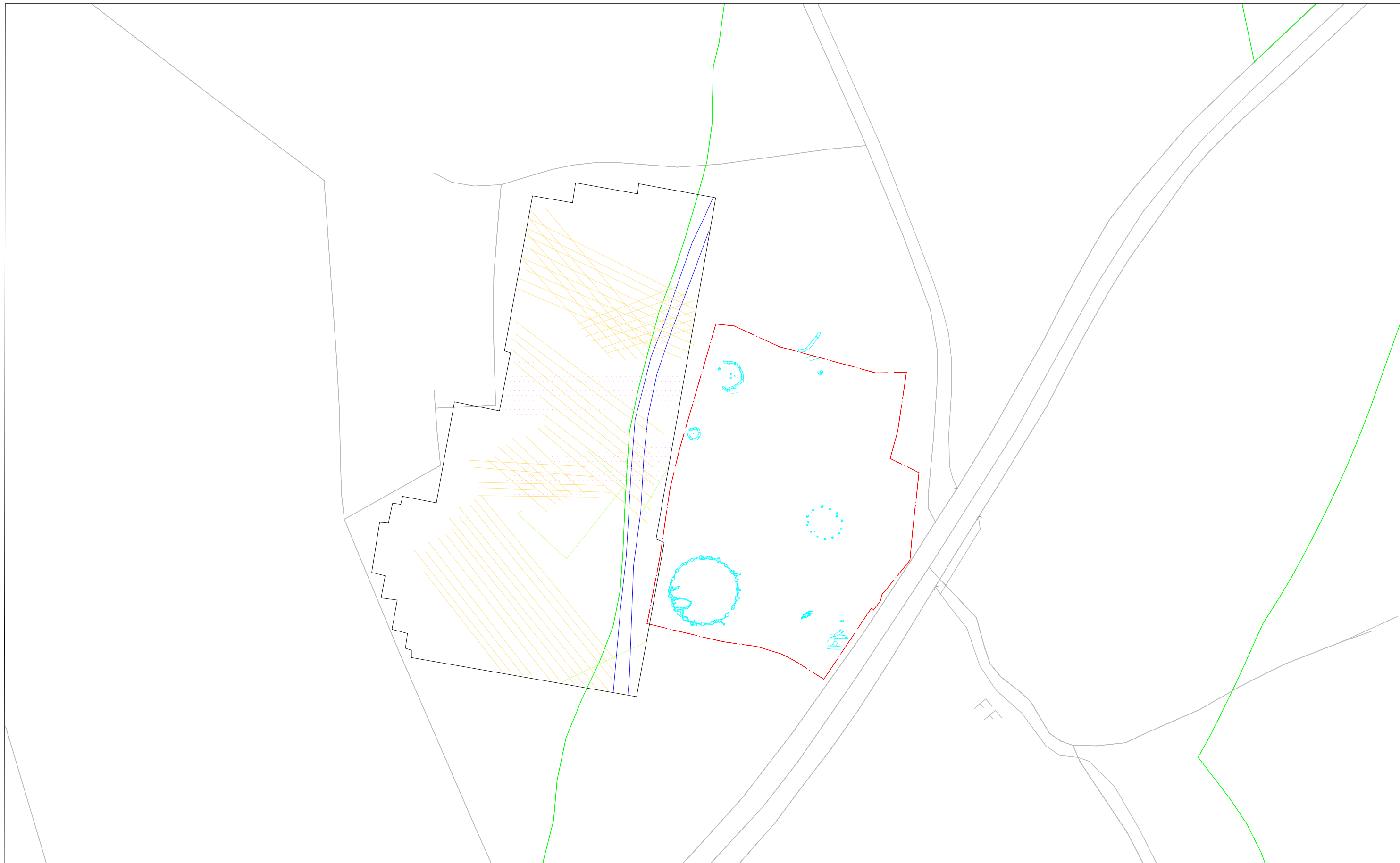
Drawing No.: 06-35/04

Ordnance Survey Ireland Licence No. AR 0047306
Copyright Ordnance Survey Ireland Government of Ireland



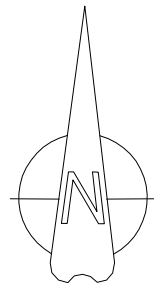
Figure No. 4 Magnetic Gradiometer interpretation





Legend

- CPO line
- Basemap
- Survey area
- Excavation area
- Excavated archaeological feature
- Possible enclosure ditch
- Possible Ditch
- Positive Magnetic Enhancement
- Plough Furrows



Site Location: Cuffsborough, Contract 1, M7 / M8, County Laois

Client: Archaeological Consultancy Services Ltd.

Drawing Courtesy of:LCC

Date 11/12/06

Drawing No.: 06-35/04

Ordnance Survey Ireland Licence No. AR 0047306
Copyright Ordnance Survey Ireland Government of Ireland

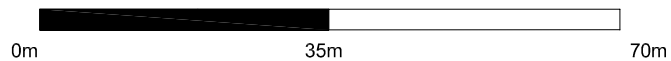


Figure No. 5 Magnetic Gradiometer interpretation and archaeological excavation results

