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Archaeological Geophysics

Geophysical Prospection For Archaeological Assessment

Consultancy

Project Design

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Resistivity

Ground Penetrating Radar

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Motorway Route Selection

Pipeline Corridors

Area Surveys

Research

Geophysical Survey Report:

Baronstown 1 / Collierstown 2, Testing Area 6, M3 Clonee To North Of Kells Motorway Scheme, Contract 2
County Meath

Direction: A008/078

TAG Project No. 06/041

Client:

ARCHAEOLOGICAL CONSULTANCY SERVICES

On Behalf Of:

MEATH COUNTY COUNCIL

NATIONAL ROADS DESIGN OFFICE

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List Of Figures

Summary

Fig. 1	Survey Location Diagram	1:25,000 / 1:4000
Fig. 2	Summary Greyscale	1:1250
Fig. 3	Summary Interpretation	1:1250

Archive

Fig. 4	XY Trace & Greyscale	1:625
Fig. 5	Interpretation	1:625

***The archive to the main section of the report is included on the attached CD.**

Executive Summary

Introduction

Geophysical survey was undertaken within part of one pasture field situated in the townland of Collierstown, to the north-west of Dunshaughlin, in County Meath. The survey was carried out at the Collierstown 2 site, immediately to the south of the Baronstown 1 site, on Contract 2 of the planned M3 Clonee - North of Kells motorway scheme. The scheme extends in a north-westerly direction from the end of the existing Clonee Bypass for a distance of *c.*60 kilometres in length before rejoining the N3 North of Kells. This work was commissioned by ACS Ltd on behalf of Meath County Council, and forms part of the archaeological investigations being undertaken for the scheme.

Archaeological remains were identified at the Baronstown 1 site, immediately to the north of the current investigation area, during an earlier geophysical survey in 2000. The 2000 survey was undertaken during the route selection process for the scheme (Margaret Gowen & Company Ltd & GSB Prospection, 2000). A substantial circular enclosure and associated remains were recorded and subsequent testing by ACS Ltd in 2004 suggested these were likely to represent a possible ritual enclosure or settlement complex of prehistoric or early medieval origin (ACS Ltd. 2004). This recent phase of geophysical investigation was undertaken in Collierstown townland, immediately to the south of Baronstown 1, and within the landtake.

Survey Objectives

The geophysical survey objectives were to determine the location and extent of buried archaeological remains where present within the area highlighted for geophysical investigation, and to inform on subsequent proposals for evaluation in advance of the scheme.

Site Location

The area of investigation lies at NGR 294426 259216 (central coordinate), to the south of the enclosure recorded during the route selection, in Testing Area 6 of the Contract 2 section of the scheme (chainage 26700 – 26820). Dunshaughlin town is located approximately 7.5 kilometres to the south-east of the site. The area highlighted for geophysical investigation forms part of one pasture field and extends over a total 0.9ha of land.

Soils, Geology & Topography

The soils of the locality include predominant gleys and grey brown podsols (Associations 38 & 40) that overly till of Irish Sea origin, limestone and shale (National Soil Survey of Ireland, 1980). The survey area comprises a section of elevated ground sloping steeply to the west. A stream forms the western boundary of survey.

Archaeological Background

As part of the route selection process for the M3 Clonee – North of Kells scheme geophysical survey immediately to the north of the current investigation area was undertaken in Baronstown townland by GSB Prospection Ltd in 2000. The survey involved a preliminary gradiometer scan along the Navan - Dunshaughlin section of the scheme, with subsequent targeted recorded gradiometry conducted on the basis of the results from the initial scan. The gradiometer survey identified a large circular enclosure at Baronstown 1, which measured *c.*45m in diameter. Indications of possible dwelling remains were identified at the enclosure interior, and several outlying ditches and linear features thought to represent remains of a field system or settlement boundaries were also detected. No significant geophysical anomalies were noted during the earlier geophysical survey within the location of Collierstown 2.

The programme of testing by ACS Ltd at Baronstown 1 in 2004 revealed a complex of enclosure remains, ditches, pits and associated settlement remains which suggest a possible prehistoric or early medieval origin for the site (Licence 04E0423, Linda Clarke of ACS Ltd 2004). Testing immediately to the south at the Collierstown 2 site identified a Bronze Age cremation burial.

Recorded monuments within a 2 kilometre radius of Baronstown 1 and Collierstown 2 sites include a circular enclosure (ME038:001) and field system (ME038:002), situated to the south-east in the townlands of Ross and Ross / Clowanstown; ringfort and enclosure sites (ME032:032, ME032:037 & ME032:038) in Skreen to the north and north-east; and possible barrow site (ME032:039) in Collierstown to the east. The Hill of Tara is also situated *c.*2.3 kilometres to the north-west of the site, and comprises at least seventy monuments, ranging from a Neolithic passage tomb to Iron Age ceremonial earthworks.

Summary Of Results

A number of ill-defined linear responses and weak trends have been recorded from geophysical survey to the south of the enclosure complex. The anomalies are generally indicative of a south-easterly continuation of field system and early boundary features associated with the enclosure complex to the north. Faint indications of a continuation of some of these responses beyond the current survey block are also apparent in the data.

No definitive concentrations of response which might suggest significant remains of settlement activity or occupation are present within the results from this survey.

* **The summary of results from survey should be read in conjunction with the main report.**

1 Areas of Investigation *(Figure 1)*

1.1 A detailed gradiometer survey of the site was undertaken in the field directly to the south of the enclosure remains identified during the earlier geophysical survey and testing. This survey extended over a total area of 0.9ha of land. The survey grids were set out using tapes, ranging rods and an optical square and tied in to the National Grid using differential GPS. Details of survey tie-ins are available upon request.

1.2 Fieldwork was undertaken on the 31st August 2006 following consent from The Department of The Environment, Heritage & Local Government (Consent No. 06R/87).

1.3 Figure 1 presents the survey location situated along this section of the scheme at a scale of 1:25,000 & 1:4000, with the locations of recorded monuments in the vicinity of the site and differential tie-in points indicated.

2 Data Display

2.1 The results of the gradiometer survey are presented as a summary greyscale image in Figure 2 at a scale of 1:1250. An interpretation of the data is provided in Figure 3 at the same scale.

2.2 Archive plots of the results from survey are presented in Figures 4 & 5, and include XY trace and greyscale displays, and an interpretation diagram all at a scale of 1:625.

2.3 The display formats referred to above are discussed in the *Summary Technical Information* section attached to this report.

3 Ground Conditions & General Considerations

3.1 Ground conditions at the site were generally suitable for geophysical survey, the investigation area comprising an area of elevated pasture land situated within the landtake. Survey was precluded at the eastern and north-western edges of survey due to spoil heaps and recently cut trees respectively. Broad areas of ferrous disturbance from the metal fence outlining the route of the scheme and from adjacent boundaries have contributed high levels of ferrous disturbance at the perimeter of survey. An area of increased magnetic response with several overlying small scale anomalies and trends extends across the northern section of the survey. This group of responses relates to recent ground disturbance from the movement of machinery.

3.2 The soils are generally of a type that would be expected to provide a detectable magnetic contrast, and the locations of any features associated with occupation and industrial activity are also likely to be recorded if present. Features relating to ritual and burial that are often isolated from settlement cores should also be recorded, if present.

3.3 Instrument specifications and survey methodology are discussed in the *Summary Technical Information* document attached to this report.

4 Survey Results (Figures 2 – 5)

4.1 A number of generally ill-defined linear features, weak trends and sub-angular responses have been recorded from survey. These are mostly within the +/-1.0nT range and appear to form a south-eastern extension of the field system and settlement boundary remains identified during earlier geophysical survey and testing. Several of the responses present in this data set continue further to the south beyond the limits of survey.

4.2 No clear extensions of settlement enclosures or significant traces of occupation activity have been recorded within this current area of geophysical investigation.

4.2 In contrast to the previous geophysical survey, ploughing within this section of the scheme appears very limited.

5 Conclusions

5.1 The results from survey demonstrate that the central core of archaeological remains lies within Baronstown 1 to the north of the current geophysical investigation area. Several anomalies have been highlighted as being of potential archaeological interest from this recent survey at Collierstown 2, and these are mostly linear in form, at times bound by isolated and sub-angular responses. The linear responses are thought to represent a south-easterly continuation of field system remains and parts of settlement boundaries related to the enclosure complex to the north. Many of the anomalies, particularly those more isolated in nature, are at the limits of instrument detection, and the potential that some of these may derive from variations in the underlying soils or geology, or from modern ferrous debris in the topsoil is suggested.

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Date of Survey:	31st August 2006
Date of Report:	8th December 2006

References:

Shiel, Harvey & Martinez (2000), *N3 – Navan To Dinsaughlin Road: Geophysical Survey*. GSB Prospection Ltd, Unpublished Report.

Clarke, L, (2004), *M3 Clonee – North of Kells, Contract 2, Testing Area 6. Report On Archaeological Assessment At Testing Area 6 Baronstown, Collierstown & Skreen, County Meath.* ACS Ltd Unpublished Report. Licence Ref. 04E0433.

National Soil Survey of Ireland (1980), *General Soil Map 2nd Edition (1:575,000.* An Foras Taluntais).

Summary Technical Information

Fluxgate Gradiometer Survey

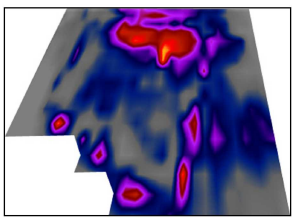
Surveys are undertaken using a Bartington *Grad* 601-single axis dual sensor gradiometer. The instrument has a vertical 1m sensor separation permitting finite resolution of buried archaeological features. Surveys are undertaken in scan or detailed (zig-zag traverse) modes for reconnaissance or high-density mapping. The fluxgate sensors are highly stable, minimizing requirements for excess data processing, and their dual or single configuration enables reliable flexibility during fieldwork. The instrument can be employed in both commercial and research based investigations allowing for completion of projects within short timescales. Regular grid sample densities from standard 1600 readings to 12800 readings per $20m^2$ grid are permitted.

A constant high quality of data is assured by experienced field staff operating in accordance to English Heritage Research & Professional Guidelines *Geophysical Survey In Archaeological Evaluation (David, A, 1995)*.

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. Surveys are usually undertaken at 1 m sample intervals along 1 m traverses (i.e., 400 readings per 20m x 20m grid. The adaptability of the instrument enables increased sampling intervals, as well as a range of probe configuration to operate at varying depths.

Magnetic Susceptibility



Field and laboratory magnetic susceptibility measurements are taken by applying a low magnetic field and measuring the resultant magnetisation of the soil sample. The magnetic susceptibility of the soil is measured as a proportional constant of the resultant magnetisation of the soil and the applied field. The most common methods used to measure magnetic susceptibility are as follows:

Volume-specific magnetic susceptibility
The volume, or field, specific susceptibility method employs a hand-held Bartington MS2D field coil connected to an MS2 susceptibility bridge and measures the volume-specific susceptibility of the soil in SI units. The field-sampling interval is commonly 10 m.

Mass-specific magnetic susceptibility
Mass, or laboratory, specific susceptibility measurements are taken using a Bartington MS2 susceptibility bridge connected to an MS2B laboratory sensor into which previously dried and sieved samples are inserted. Units of measurement are given in m^3kg^{-1},at 5m sample intervals.

**The relevant technical information for ground penetrating radar, phosphate analysis and further geophysical survey techniques are included as appropriate.*

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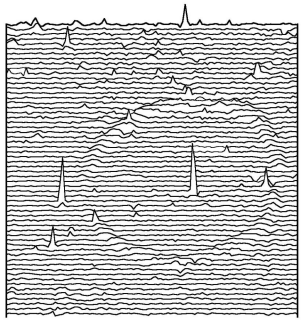
Data Display Formats

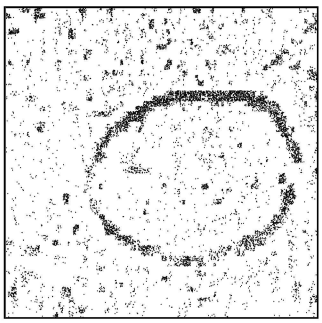
XY Trace

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.



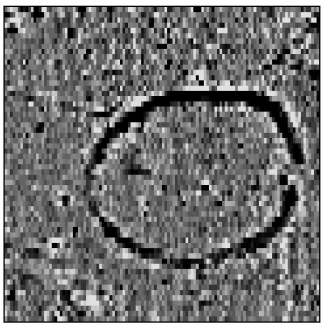
Dot Density Plot

Each datum is assigned a cell in which the intensity or number of dots displayed is proportional to the magnitude of the individual response. The visibility or presentation of responses within a given survey area is governed by numeric parameters specific to both soil morphological and archaeological conditions observed on site. Typically, the range of weak to strong responses is manifested by a low to high level of dot density. The format is useful for displaying gradiometer and resistance data particularly for identifying low-level responses.



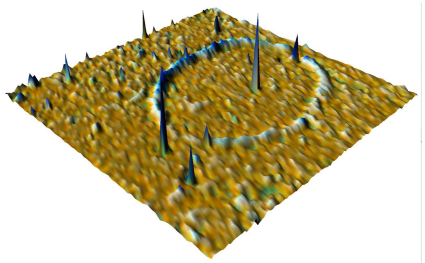
Greyscale

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.



3D Surface Plot

3D Surface plots employ selected colour scale, offset display, and relief plotting to replicate 3D view of datum across a given survey area. Perspective and orthographic projection, variable field view angle, rotation and tilt, are used to demonstrate the magnitude and breadth of responses.



**XY Trace and dot density 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. 3D Surface Plots are included where deemed beneficial to the viewing and interpretation of the results from survey.*

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Glossary of Interpretation Terms

Archaeology

This category refers to responses usually supported by comparative archaeological evidence (i.e., photographic transcriptions, excavation, etc). 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 debris.

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 cultivation trends.

?Natural

Resulting from localised natural variations in the magnetic background of the subsoil, these responses are often recorded in areas of low-lying land prone to flooding.

Ferrous

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 Strong 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.

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