



DISCOVERING DUMFRIES AND GALLOWAY'S PAST

GEOPHYSICAL SURVEY AT **BARWHILL, GATEHOUSE-OF-FLEET:** INTERIM REPORT



COVER IMAGE: MAGNETIC SURVEY TEAM AT BARWHILL, GATEHOUSE-OF-FLEET



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Summary

Volunteers undertook a single day of resistance and magnetic survey adjacent to Girthon Cemetery, Barwhill, Gatehouse-of-Fleet, where air photo survey had previously recorded the quarry pits of a Roman Road, and other features suggested as barrow ditches.

A wide range of volunteers drawn from the local community participated in the survey, receiving training in both types of survey.

Acknowledgements

The survey would not have been possible without the enthusiasm of all volunteers who turned up on the day; our thanks to all those listed in Appendix 2. Background research was greatly assisted by Dave Cowley at RCAHMS, and the input of Ronan Toolis, GUARD Archaeology Ltd. and Dr. Chris Bowles, SBC is gratefully acknowledged. Permission to carry out survey was granted by landowner, Mrs Fiona Hesketh. This phase of Discovering Dumfries and Galloway's Past is jointly funded by the Scottish Government and The European Community, Dumfries and Galloway LEADER 2007-2013; The Crichton Foundation and The University of Glasgow.

Introduction

This report presents the results of a single day of both magnetic (gradiometer) and resistance survey carried out adjacent to Girthon Cemetery, c.800m to the N of the centre of Gatehouse-of-Fleet (centred on NX 5971 5713). A series of cropmarks have been recorded across this area in oblique aerial photographs taken in 1978 and 1984 by RCAHMS. These include the regular and irregular sets of quarry pits which mark the line of the Glenlochar to Loch Ryan Roman Road through this area (NMRS NX55NE 24) and the squarely defined cropmark suggested as a settlement (NMRS NX55NE 9).

The main feature across this area is a series of ditched enclosures with apparent central pits. These cropmarks have been suggested as representing a barrow cemetery; the "clearly square" morphology of one of the enclosures, and the possible straight sides of three others, has been used to suggest a 1st millennium AD date (Cowley, 1996; NMRS NX55NE 19).

All cropmarks have been transcribed by RCAHMS.

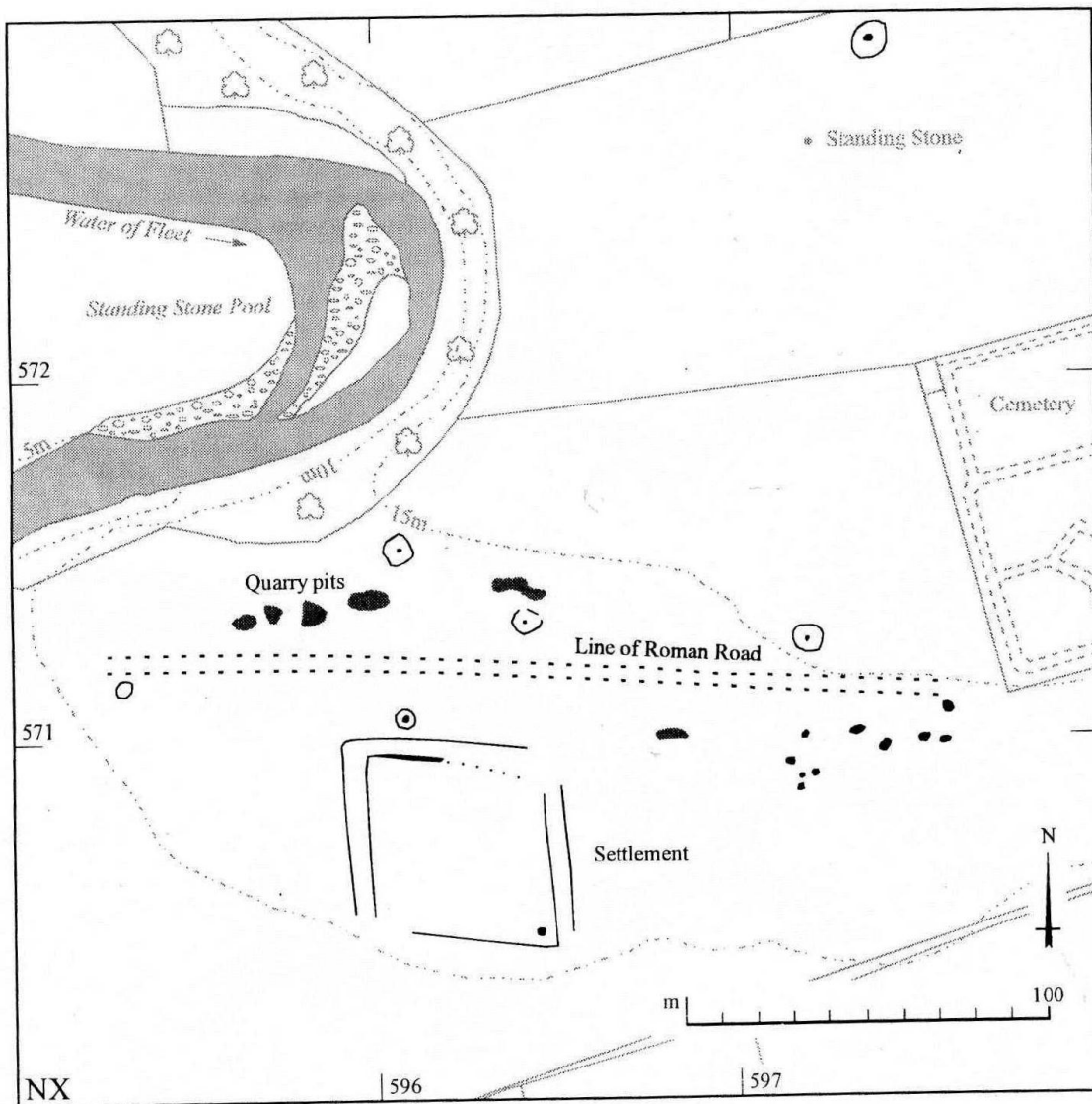


Figure 1. Barwhill. Computer-aided rectified plot of cemetery, Roman road and possible prehistoric settlement (Based on the OS map, Crown Copyright).

Transcription of cropmarks. Source: Cowley, 1996: Fig. 1

A total of 4000m² of magnetic survey and 2400m² of resistance survey were carried out over the course of a single day of survey.

This fieldwork was carried out by volunteers drawn from the local community and a NSA volunteer work party, under the supervision of staff from the University of Glasgow. The survey was part of Discovering Dumfries and Galloway's Past, a project engaging local communities across the region in non-intrusive archaeological fieldwork.

Project Background

Site Location

The survey area was an area of pasture adjacent to Girthon Cemetery, which gently slopes from east to west down to the Water of Fleet.

Ground conditions were generally good during the survey, and the weather was largely dry and bright, with some light showers. The focus of survey was 50m to the west of the back wall of the cemetery, as it was thought that overhead electricity cables would interfere with the magnetic survey. However, this appears to have had little effect on the results obtained.

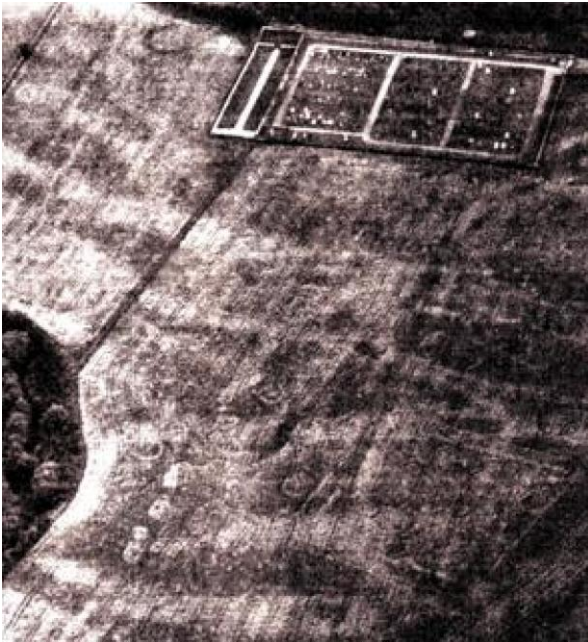
Aims and objectives

The purpose of any geophysical survey is to “as far as reasonably possible, determine the nature of the detectable archaeological resource within a specified area using appropriate methods and practices” (English Heritage, 2008: 3).

As a training exercise, and community archaeology project, a key purpose was to provide hands-on experience for local volunteers in planning, setting up and conducting a geophysical survey.

Archaeological and historical background

The ‘target’ of the survey, as outlined above was a number of features first noted by RCAHMS on a set of aerial photographs taken in 1978 and 1984 (see figure 1).



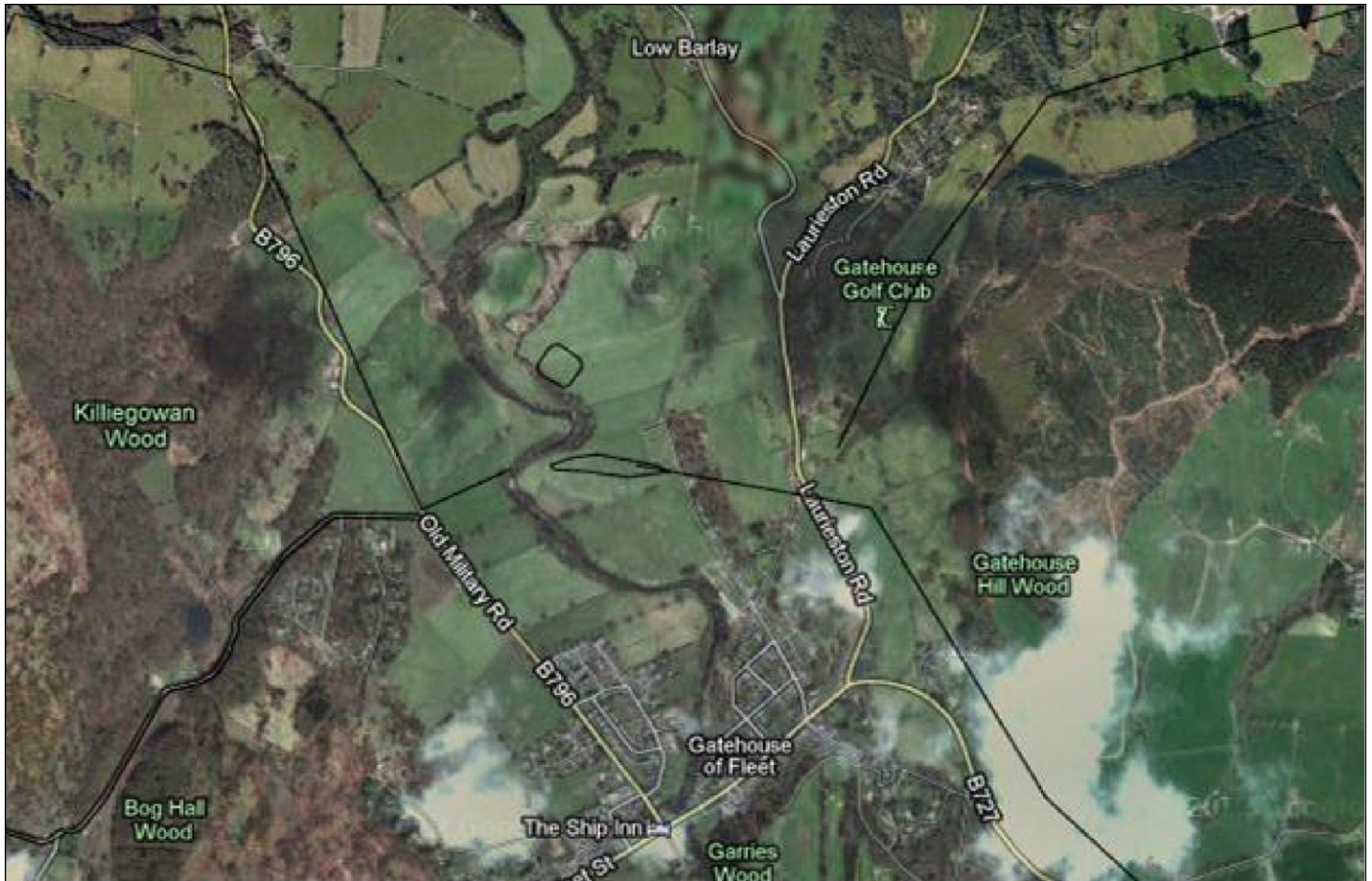
The set of elongated ovoid cropmarks represent quarry pits of the Roman Road through this area running from Glenlochard to Loch Ryan (NMRS NX55NE 24),

The postulated line of the Roman Road, to the south of the small Flavian fortlet excavated by J K St Joseph in 1960 and 1961 (NMRS NX55NE 10) was confirmed in excavations carried out by Shepherd Frere. The road was comprised of 0.3m of gravel on the old ground surface, topped by a layer 0.1m thick of clay. The road, 6.1m was bedded on top of this and consisted of cobbles and boulders; no road surface survived. A single kerbstone was recorded. Additionally, one of the quarry pits was excavated; its southern end had been reused as a gravel pit (Frere, 1985). No plan is available for this work.

The sub square enclosure recorded as a ‘settlement’ across this area (NMRS NX55NE 9) is recorded as measuring “about 48m across within two parallel narrow ditches, set between 5m and 7m apart. The inner ditch is the broader,

Extract from aerial photograph showing cropmarks in relation to cemetery; slightly enhanced. © RCAHMS

measuring up to 2m across, while the outer measures no more than 1m across and may have held a palisade. The line of the palisade trench is not visible along the S side of the enclosure where the ground drops away sharply to the valley floor on the E bank of the Water of Fleet. In the NW corner of the interior there are the faint markings of what may have been a timber round house measuring about 10m in diameter. What may be a pit, measuring between 2m and 3m across, is visible in the SE corner of the interior” (D. Cowley, see NMRS record). It has not been investigated further and lay outside the current survey area.



The Roman Road as recorded through this area, with the Flavian fortlet to the north. Source: D&G Council HER

The main feature across this area is a set of five enclosures, with a sixth to the north, which have been interpreted as a barrow cemetery (Cowley, 1996; NMRS NX55NE 9). “It comprises a cluster of five barrows to the west of the modern cemetery, with a sixth barrow lying to the north-north-west. A narrow ditch (1m to 2m across) defines each barrow, five of which measure between 6m and 10m across (within the ditch), while the sixth measures about 3m across. One of the barrows is clearly square, while three appear to have at least one straight side.” Set within each barrow there is a burial pit measuring up to 2m across (Cowley, 1996: 108-109).

Together with other examples across the region, a 1st millennium AD date is most frequently suggested, with discussion concentrating on their Pictish associations (Cowley, 1996: 114). With little dating evidence available across Dumfries and Galloway, morphological comparison with examples drawn from the Pictish ‘heartlands’ is used to suggest dates.

The suggested ‘Pictish’ associations are of especial interest given the proximity to the vitrified hillfort of Trusty’s Hill (NMRS NX55NE 2), “conspicuous amongst the hillforts of Galloway in that it contains a Pictish inscribed stone” (Toolis and Bowles, 2012: 5). Excavations in 2012 have provided a radiocarbon

date from construction levels of the main rampart in the early sixth to early seventh centuries AD (Toolis and Bowles, 2012: 9).

Survey

Geophysical survey

Standards

The surveys and subsequent reporting were carried out in accordance with English Heritage's guide to *Geophysical Survey in Archaeological Field Evaluation* (2008), the IfA's *Standard and Guidance for Archaeological Geophysical Survey (Draft)* (IfA, 2010) and the ADS' *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt, 2001).

Field methods

An overall survey grid was established using tapes, with reference to known points on Ordnance Survey mapping. A grid-line was initially set along the back wall of the cemetery, and subsequently offset at 50m to try and limit the electromagnetic effects of overhead cabling on the survey.

Data collection was carried out using a standard methodology, with data collected in 20m grid units, with all grids walked in the same direction (N-S).

A Geoscan RM15 resistance meter was used to conduct the resistance survey; the sample interval used was 1.0m with a traverse interval of 1.0m. A Bartington Grad 601-2 dual fluxgate gradiometer was used to collect magnetic survey data; the sample interval used was 0.25m with a traverse interval of 0.5m – with all data being logged in continuous mode.

All grids were walked in a zig-zag traverse scheme.

Data processing

Geoplot software (version 3) was used to download and process the resistance data. Greyscale plots of both raw and processed data were produced in Geoplot. Raw data is held in the project archive, processed data and interpretations are presented in this report as figures 3-8.

The 'raw' data has been subject to minimum editing to remove operator error, with data subsequently processed to remove geological and background biases and interpolated to aid interpretation (see appendix 1).

Results

A set of interpretative diagrams are presented in figures 5 and 8, with certain anomalies annotated for ease of reference in the discussion below.

Resistance survey

The results of the resistance survey has produced a number of anomalies which broadly correlate with the transcription of the aerial photographs (figure 7), with a number of features appearing to have 'shifted' slightly during the process of transcribing an oblique aerial photograph to the vertical plane. For example, the amorphous areas of high resistance (**B**), representing back-filled pits, very closely correlate with the location of the quarry pits as plotted from the aerial photographs. A linear anomaly of low resistance (**C**), appears on this basis to represent the line of the road; its dimensions appear similar to the width of the road bed as recorded in Frere's excavation, at 6.10m wide (Frere, 1985).

The level of background spread of stonework, representing by wide areas of low resistance are difficult to interpret, They may be geological in origin, associated with the terrace drift deposits, or might be the result of later ploughing and quarrying activity across this area; this would appear to agree with the excavated evidence, which noted that ploughing had removed the road surface, and that one of the quarry pits had been re-used for gravel extraction (Frere, 1985).

Of particular interest are some discrete well-defined anomalies **(A)**. In the southernmost grid of survey, a broken low resistance arc encompasses an area of low resistance. This broadly correlates with the suggested ditched enclosure seen in aerial photography. However, it remains difficult to interpret, both because of its location on the edge of the survey area, and due to the generally high resistance background in this area. Further survey to the east and south would certainly aid interpretation.

The other subcircular anomaly is much slighter, but appears to be of similar morphology. It correlates broadly with the position of another ditched enclosure noted in the aerial photography.

Magnetic survey

A series of amorphous areas of magnetic enhancement **(D)** appear to again correlate broadly with quarry pits identified on the aerial photography; a number take a typical elongated form. The suggested line of the Roman road is much harder to define in this survey, but this is hardly surprising given its predominantly stone-built construction. There does however appear to be a broad area of magnetic enhancement trending WNW-ESE **(F)**, which appears to correlate with the line of the road postulated from resistance survey.

Of particular interest area is a well-defined weak arc of magnetic enhancement **(E)** that would appear to represent a discrete ditched enclosure, with an interesting linear extension to the SSE. This feature is not at all apparent from air survey, but its dimensions, c.10m diameter, is very similar to the ditched enclosures recognised as barrows (Cowley, 1996); however, its form is clearly circular, and it does not appear to enclose any anomaly. Additionally, a set of clearly defined broad linear anomalies run across the south of this ditched enclosure ESE. Intriguingly, this is a similar alignment to that postulated for the Roman road to the north, and appears to correlate closely with the line of the road as interpreted from aerial photographs by Cowley (1996: fig.1; see above). However this feature is not apparent in the resistance survey.

The relationship between the ditched enclosure and these linear anomalies is not clear. This is clearly an area that would benefit from higher-resolution magnetic and resistance survey.

The area of disturbance associated with the overhead cabling is confined to the south-east of the survey area. As suggested by Gaffney and Gater (2003: 81-82) the effect is a 'shadow' in the corner of the dataset **(H)**.

Some weak ploughing trends are visible to the north of the survey area **(G)**.

Conclusions

The results of this survey must be considered as a pilot, confirming the success of using both resistance and magnetic survey on this broad terrace above the Fleet. It has highlighted that further survey will be required to interpret these features in a proper context; in some areas, the results would be significantly clarified if higher-resolution survey was carried out.

A number of anomalies appear to correlate with those features noted previously in aerial photographs of this area. Some features identified in aerial survey were not located through geophysical survey.

Of particular note, anomaly **(E)**, a well-defined arc of weak magnetic enhancement, within the central area of survey cannot be correlated with any features identified from the air. This should certainly be the focus of any further survey carried out across this area.

Talk

A talk, showcasing the results gathered in the day of survey was presented on the evening of the 3rd October. This was attended by 26 people, comprised of both survey participants and local residents.

Appendix 1: Technical data

Resistance Data

1. 'Raw' Data

Clip (limits maximum and minimum values for display and subsequent processing): $-3/+3 \sigma$

Despike (removes large anomalies above a certain threshold): x-radius 1; y-radius 1; threshold 2

Zero Mean Grid (normalizes dataset to remove discrepancies between balancing of remote probes)

2. Processed data

Interpolation (smoothes greyscale appearance by adding extra data points into the dataset, calculated with reference to surrounding collected data) on both the Y and X-axis.

Gradiometer Data

1. 'Raw' Data

Clip (limits maximum and minimum values for display and subsequent processing): $-3/+3 \sigma$

Despike (removes large anomalies above a certain threshold): x-radius 1; y-radius 1; threshold 2

2. Processed data

Low pass filter (smoothes data and enhances larger weak anomalies)

Interpolation (smoothes greyscale appearance by adding extra data points into the dataset, calculated with reference to surrounding collected data) on both the Y and X-axis.

For more technical information on data processing, see (Geoscan Research, 2005: Chapter 6).

Appendix 2: Volunteers

Thanks to all the following for their help over the course of survey:

Heather Clark
Laura Gough-Cooper
David Steel
Alan James
John Clark
Pat Wilson
Kenny Wilson
Brian Lloyd Jones
Bill Gardner
Henry Gough-Cooper
Alexander Kinnell
Jo Ward

Bibliography

Cowley, D. 1996 Square barrows in Dumfries and Galloway *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society* **71**

English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation* [online] _
<http://www.english-heritage.org.uk/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf> 04/07/2011

Frere, S. 1985 Roman Britain in 1984. I. Sites Explored *Britannia* **16** p.267

Gaffney, C. and Gater, J. 2003 *Revealing the Buried Past: Geophysics for Archaeologists* Stroud: Tempus

Geoscan Research 2005 *Geoplot Instruction Manual* [consulted online]
<http://www.geoscan-research.co.uk/Gp300Proc3.pdf> 04/07/2012

IfA, 2010 *Draft Standard and Guidance for Archaeological Geophysical Survey* [online] _
<http://www.archaeologists.net/sites/default/files/node-files/geophysicsSG.pdf> 04/07/20112

Schmidt, A. 2001 *Geophysical Data in Archaeology: A Guide to Good Practice* York: Archaeology Data Service

Toolis, R. and Bowles, C. 2012 *The Galloway Picts Project: Excavation and Survey of Trusty's Hill Summary Report* Unpublished interim report [online] <http://www.gallowaypicts.com>

Other sources

National Monument Record of Scotland (NMRS) – consulted at <http://canmore.rcahms.gov.uk>

National Collection of Aerial Photography – consulted at <http://aerial.rcahms.gov.uk>

National Library of Scotland – consulted at <http://maps.nls.uk>

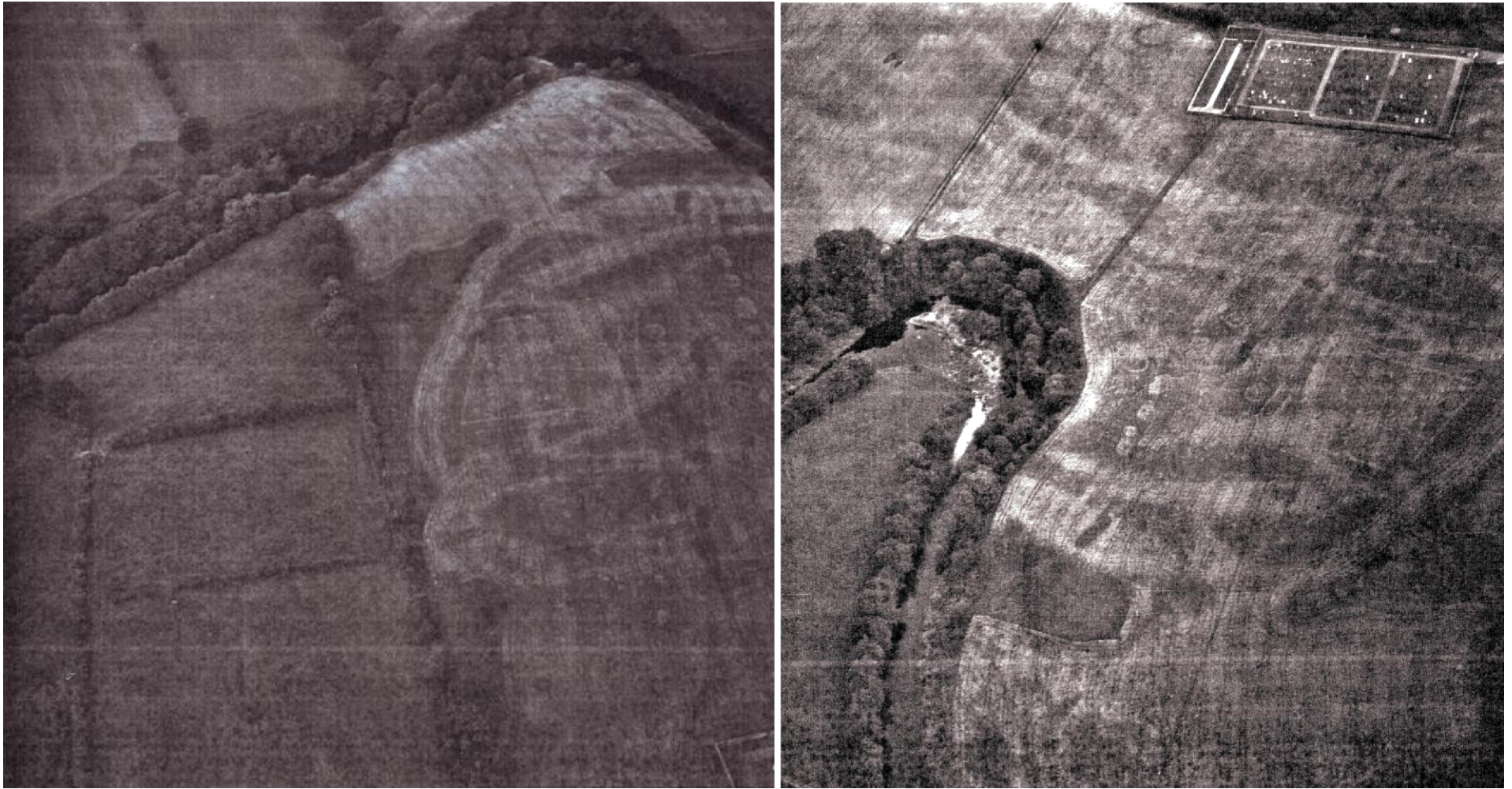
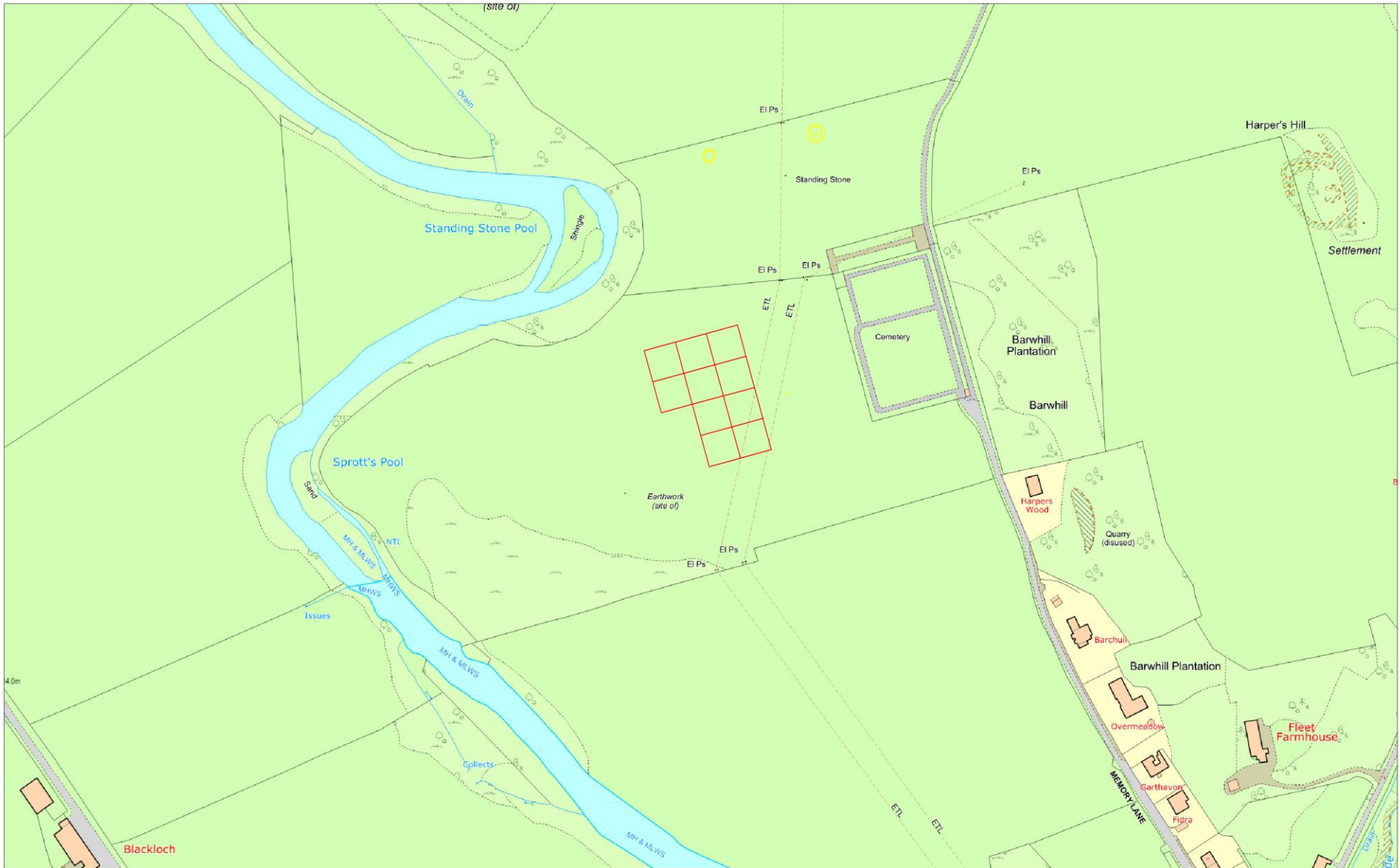


FIGURE 1: AERIAL PHOTOGRAPHS SHOWING SERIES OF CROPMARKS IN RELATION TO SURVEY AREA. LEFT: LOOKING W (REF: KB 1107) RIGHT: LOOKING ENE (REF: KB 1106) © RCAHMS



Discovering Dumfries and Galloway's Past: Survey at Barhill, Gatehouse of Fleet



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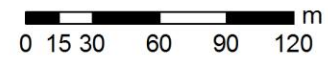
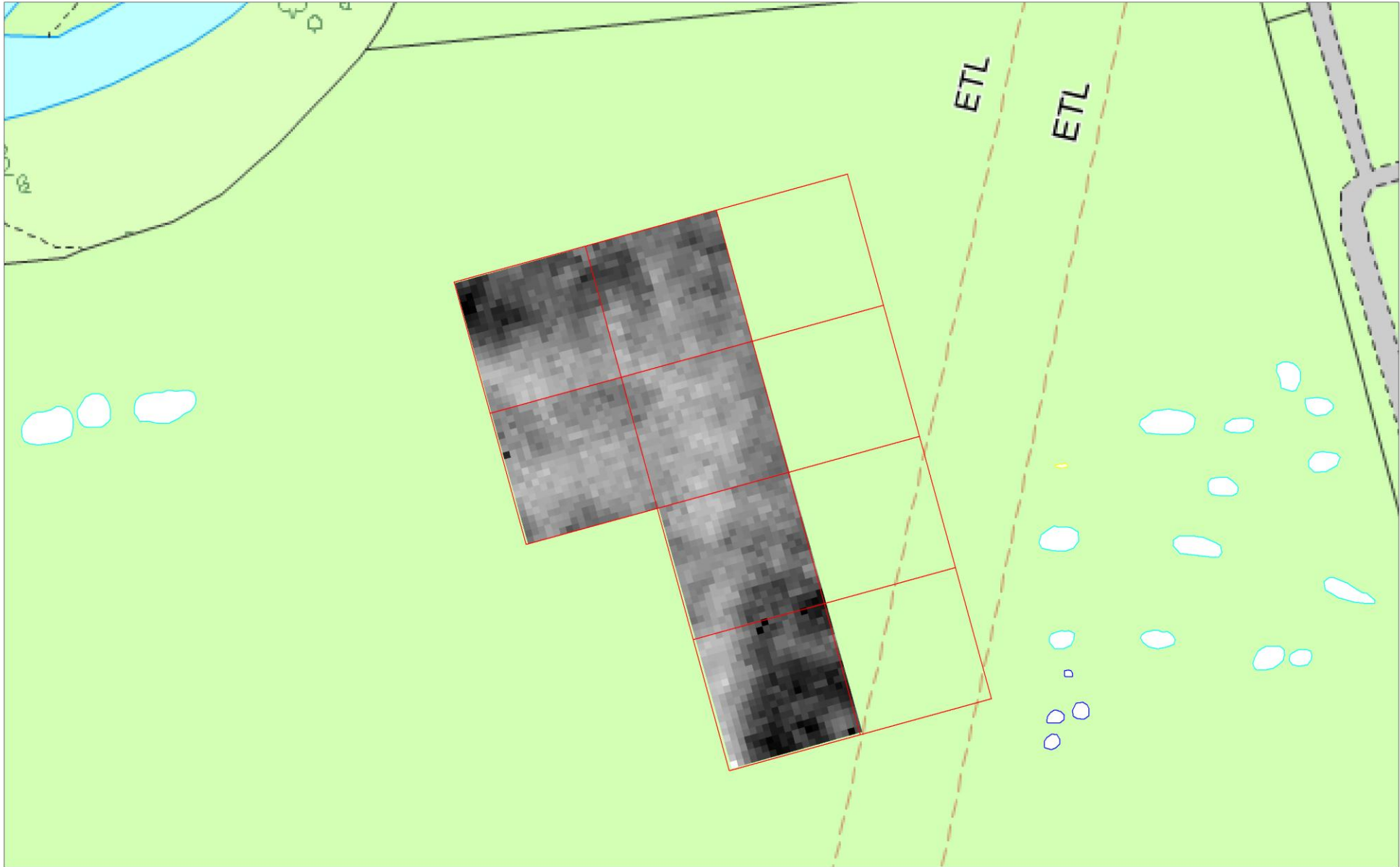


FIGURE 2: GENERAL LOCATION OF SURVEY AREA



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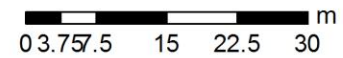
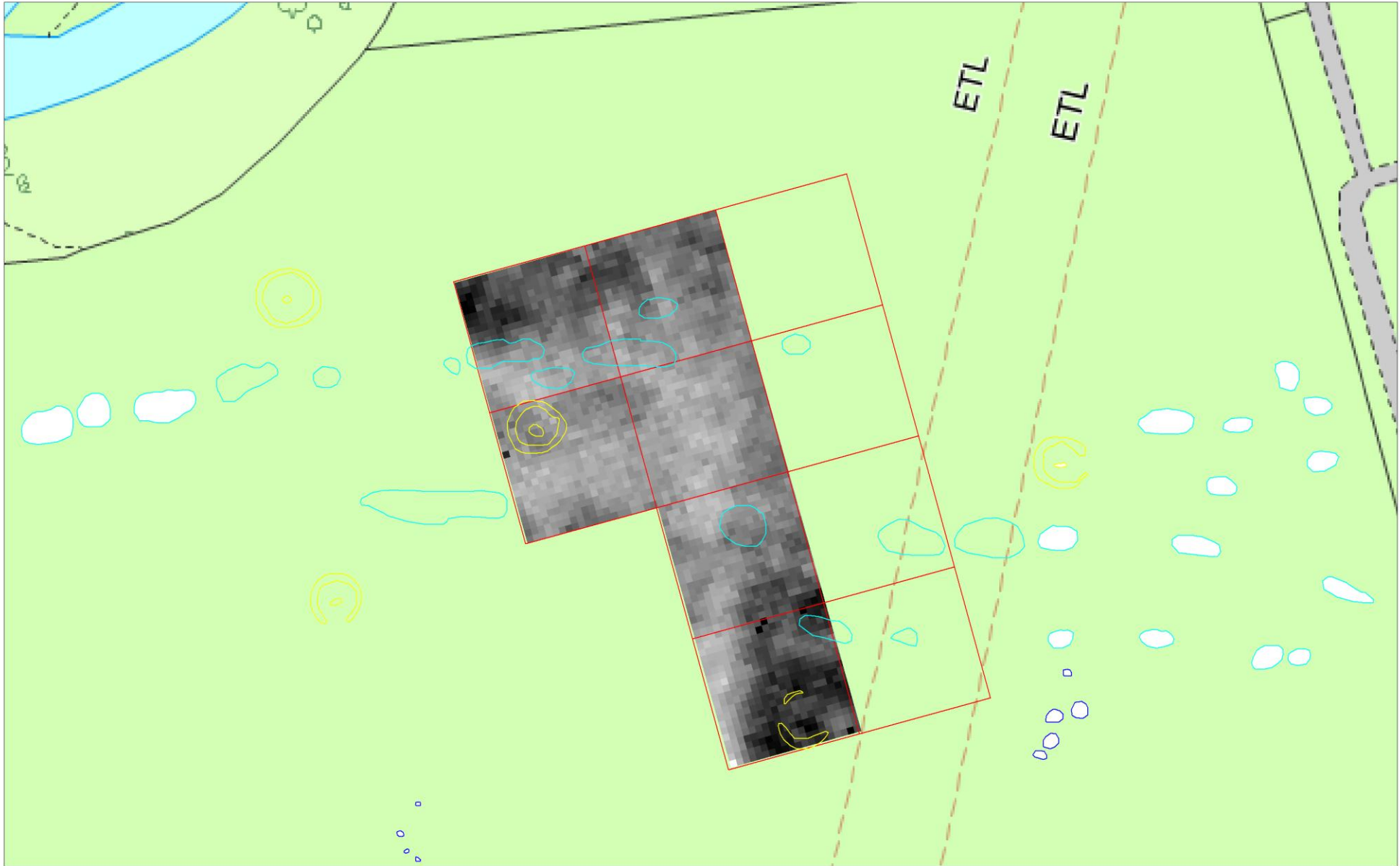


FIGURE 3: PROCESSED RESISTANCE SURVEY DATA



Discovering Dumfries and Galloway's Past: Survey at Barhill, Gatehouse of Fleet

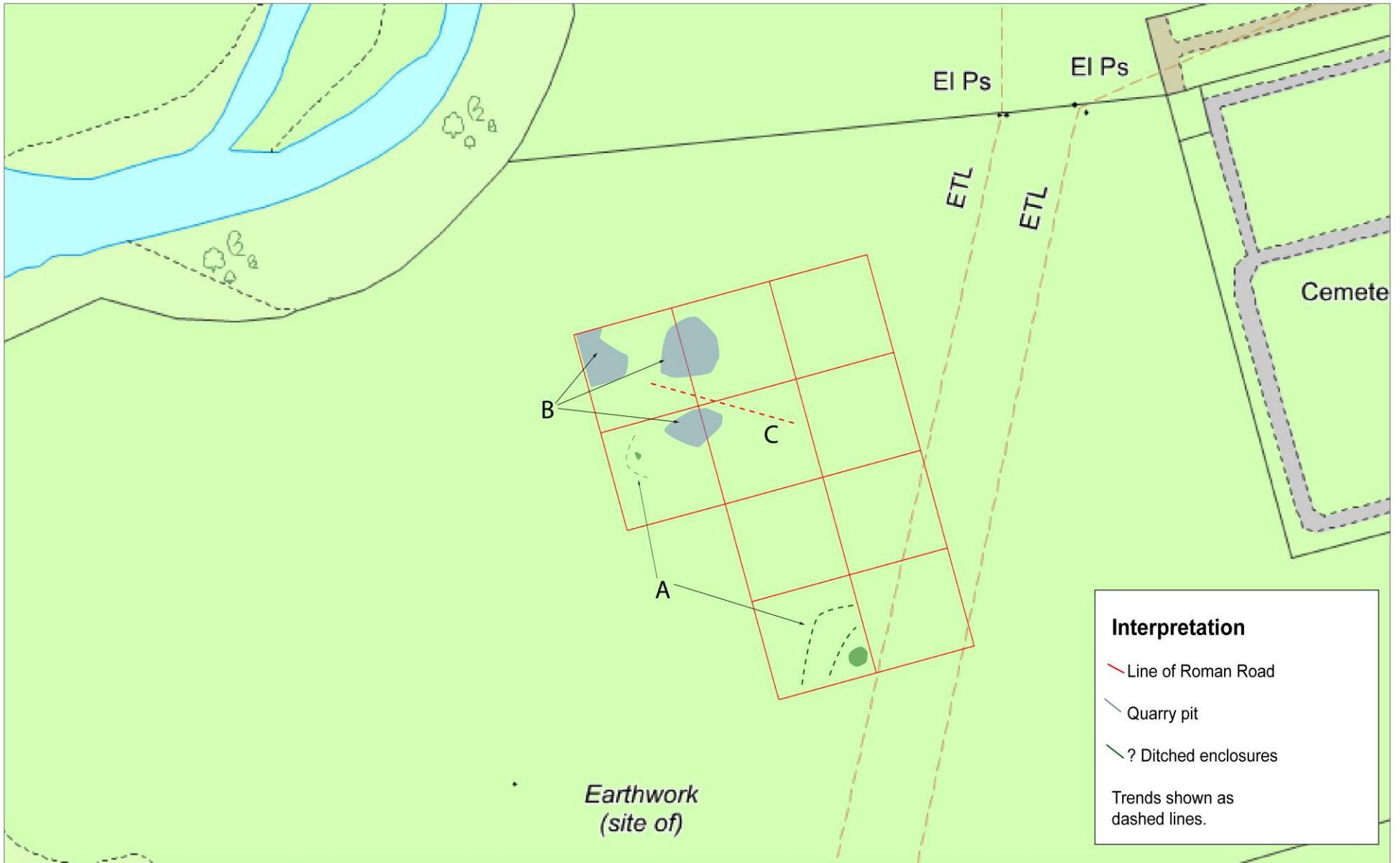


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FIGURE 4: AERIAL PHOTOGRAPH CROPMARK TRANSCRIPTION (© RCAHMS) SUPERIMPOSED ON RESISTANCE SURVEY DATA



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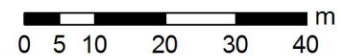
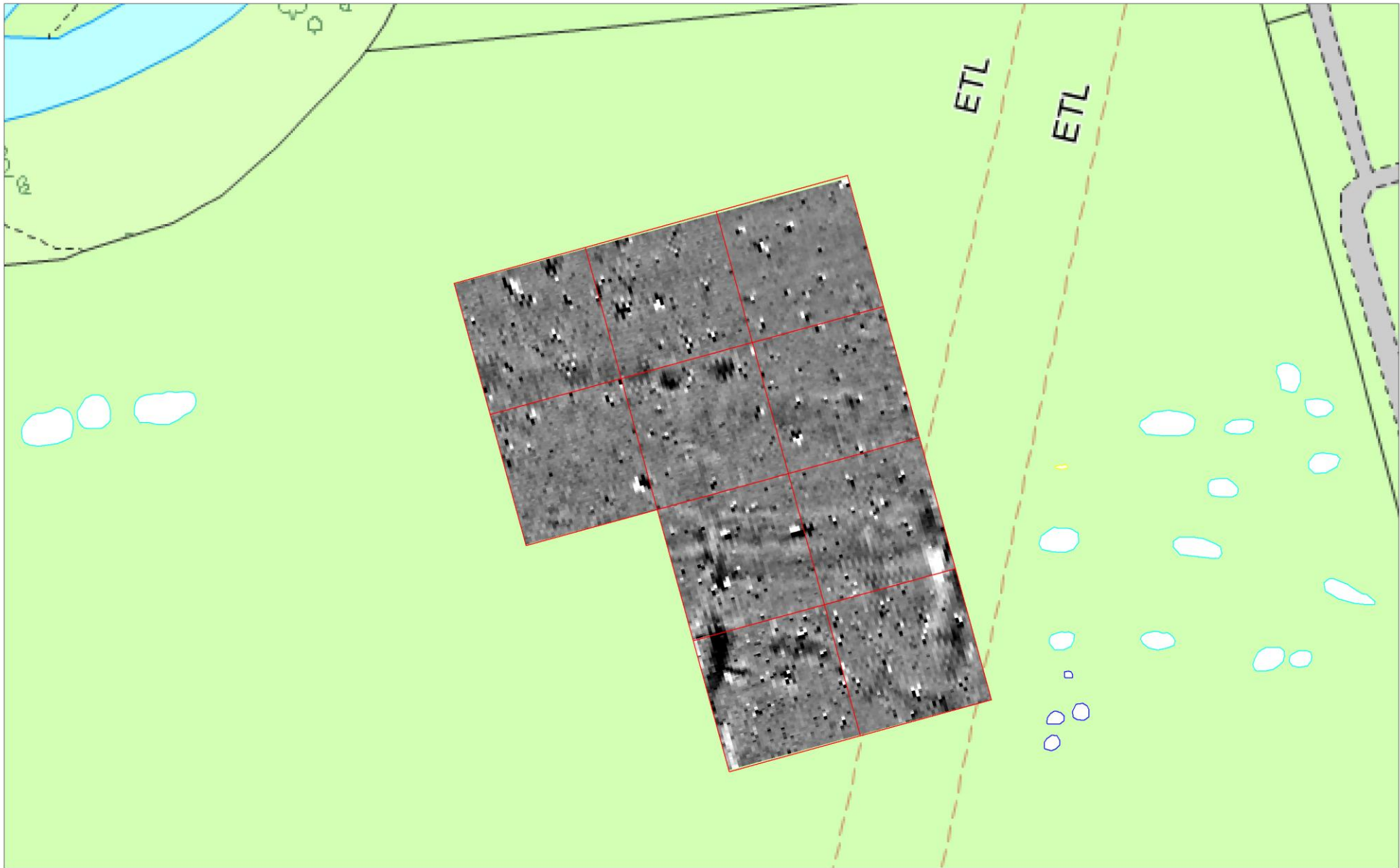


FIGURE 5: RESISTANCE SURVEY - INTERPRETATION



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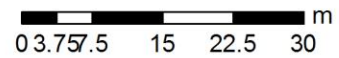
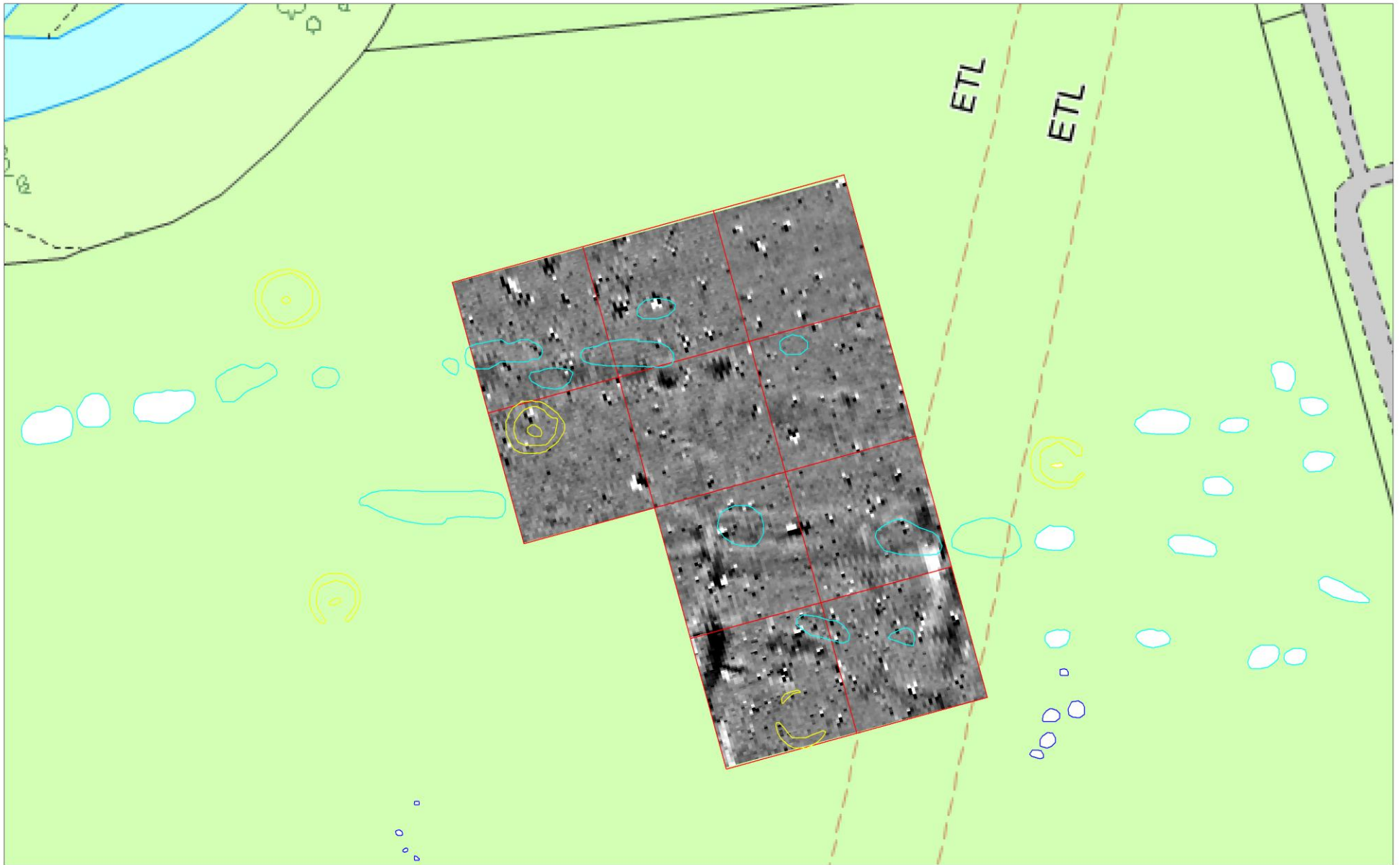


FIGURE 6: PROCESSED MAGNETIC SURVEY DATA



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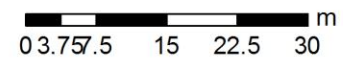
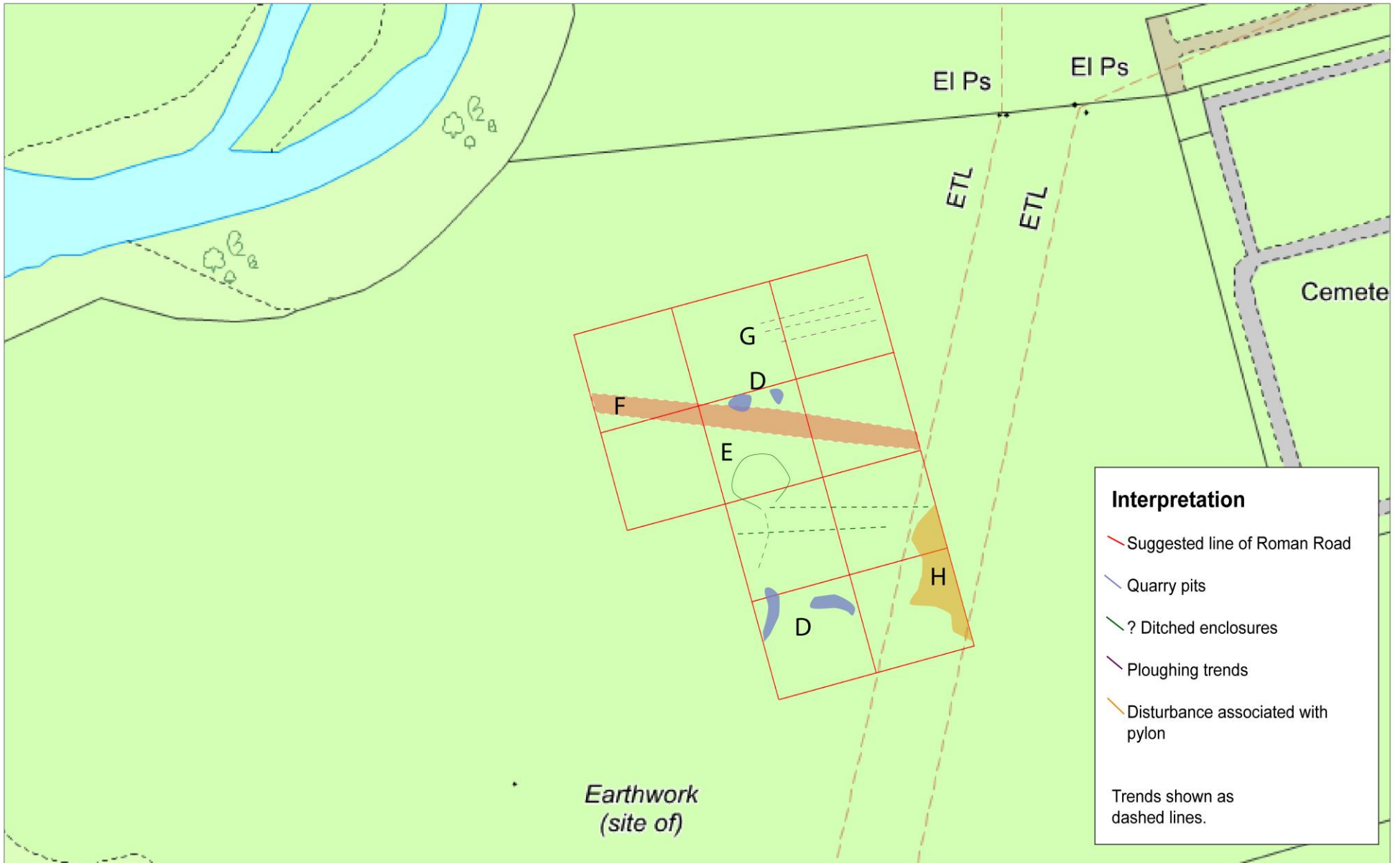


FIGURE 7: AERIAL PHOTOGRAPH CROPMARK TRANSCRIPTION (© RCAHMS) SUPERIMPOSED ON MAGNETIC SURVEY DATA



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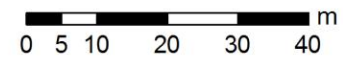


FIGURE 8: MAGNETIC SURVEY - INTERPRETATION