

IRISH GEOPHYSICAL AND ARCHAEOLOGICAL SURVEYS
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Report on

ARCHAEOGEOPHYSICAL SURVEY
(Licence No. 06R069)

at

LAUGHANSTOWN
Co. Dublin

by

Ian S. Elliott, M.A., M.Sc.,
for I.G.A.S. Ltd.,

on behalf of

C.R.D.S. Ltd.

for

Rail Procurement agency

(I.G.A.S. Job No. 06#679G)

May 2006

V.A.T. Number: IE6374793H

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Final Report

Archaeo-geophysical survey at Laughanstown td., Co. Dublin

1. Summary

At the request of CRDS Ltd., Ian Elliott of IGAS Ltd. undertook a short programme of archaeo-geophysical survey at Brennanstown and Laughanstown (Lehaunstown), Co. Dublin, on the proposed B1 route extension to the Luas light rail system [NGR 2232 2238] (Fig. 1). Previous testing/excavation in advance and during construction of commercial and residential developments and the M11/M50 motorway have revealed extensive archaeological remains in this general vicinity (Fig. 2). On the basis of this information, the RPA's archaeological consultants, CRDS Ltd., had specified that geophysical survey should take place at this location in advance of any test excavation, as geophysical survey has not been carried out in this specific location before. Elsewhere the route generally follows the old "Harcourt St." alignment, but at this point the proposed alignment deviates to the south. The results of the survey are intended to better inform the subsequent programme of test trenching being undertaken by CRDS Ltd.

The soils, particularly in areas 1(compound) and 5, could best be described as noisy, and the signals are generally of a range associated with archaeological features. However the survey failed to yield any evidence of actual structures, and in these circumstances it is not possible to absolutely assign an archaeological significance to the numerous isolated anomalies. The detected signals may therefore be associated with intensive long-term agricultural activity, but their archaeological significance as an indication of intensive settlement may not be ruled out without further investigation through test excavation. In particular, a couple of broader, pit-like anomalies in area 1 should be targeted.

2. Proposed Development

The proposed development is part of the proposed extension to the Luas Green Line, being undertaken by the Rail Procurement Agency. The route extends some 7.6 km, in a generally southeastern direction from Sandyford to Cherrywood (Fig. 2).

3. Soils and solid geology

The ground conditions along the route were influenced by the last major glaciation. Typically, between 1 and 20m of glacial till overly the bedrock, which is in part granite in the area of the present survey. The survey data was assessed throughout the survey to determine the effect that the presence of underlying granite was having on the survey results, but the influence was deemed to be insignificant. The land has generally been intensively farmed. These latter conditions are generally conducive to magnetic survey.

4. Site

4.1 Location

The site of the present survey was in Laughanstown td., Co. Dublin, and was located to either side of Laughanstown Lane. The area surveyed comprised a 650 metre section of the ~20 metre-wide proposed land-take for the rail system, along with a 90m x 95m area reserved for a temporary construction compound (Fig. 3). The survey included the area where the proposed railway alignment deviates from the "Harcourt Street" railway line dismantled in the 1950s. In general the area to the west of Laughanstown Lane was referred to as "Brennanstown", while that to the east was "Laughanstown"(Lehaunstown).

4.2 Site description

The field surface was undulating but relatively smooth, but with an overgrown cover of long, coarse meadow grass, gorse, thistles and bramble patches which in places impeded the survey. The field boundaries generally consisted of mortared granite walls, in places overgrown by bramble hedges. The

land had been intensively farmed in the recent past. Some ferrous debris was identified and removed from the ground surface during the survey

5. Instrumentation

A Geoscan FM36 fluxgate gradiometer, controlled by a ST1 sample trigger, was employed in the present survey. Fluxgate gradiometry allows for relatively rapid ground cover over open pastureland (c. 0.8 – 1 ha. per day), while offering the further advantage over other methods of geophysical survey of being able to detect the broadest range of subsurface features, monuments and artefacts. These include ditches, hearths, kilns, pits, and more generalised soil disturbance, which are detected through the highly localised variations they generate in the earth's magnetic field. Given that these feature types generally match the archaeology already recorded in the locality of the two sites, the use of magnetic survey was clearly advocated.

6. Methodology

6.1 Survey

The foci for the survey were the area of the proposed temporary construction compound and a 650m long section of the proposed B1 rail alignment. This latter section was laid out as a 40m (2-grid) -wide sweep, which straddled the proposed CPO line; the wider survey was intended to give a broader picture and to ease interpretation of any detected extended anomalies.

A differential GPS was used to establish a baseline and grid of survey pegs across the sites. The survey was tied to the known NGR coordinates of established permanent ground markers, to be supplied by the consultant engineers. This allowed for a cohesive survey across the entire sites. Standardised survey panels, or "grids", of 20m x 20m were then set out as required for use during the magnetometer survey, which was carried out along successive 20m traverses, spaced 1m apart. Readings of the localised magnetic field gradient were recorded to the nearest tenth of a nanotesla (nT) at 25cm intervals along each traverse. Internally stored within the instrument, the data was regularly downloaded to PC for verification, assembly, and subsequent processing, using *Geoplot 3* software.

A total of approximately 1.7 hectares [42 grids] were subjected to survey in the Brennanstown section (areas 1 to 4), while approximately 0.8 hectares [20 grids] were covered in Laughanstown. Several intended grids, and portions of the surveyed ones, had to be eliminated during the course of the survey due to the presence of excessive overgrowth. The grids in the compound area were also traversed by a granite wall. Some of the northernmost grids in areas 1 and 2 were separated from the main body of survey by another boundary wall, but in any case lay within the abandoned Harcourt Street railway alignment, where the ground would have been extensively disturbed, and so were also left unsurveyed.

6.2 Data processing

Data were regularly downloaded to a laptop computer during the course of the survey, for assembly and verification. The raw data are displayed as linear greyscale plots, clipped to ± 10 nanoTesla (nT), relative to a background datum of 0nT (representing the undisturbed Earth's magnetic field of c. 48,000nT) (Figs. 4.1-4.5).

Subsequent processing with Geoscan Research *Geoplot3* software was limited to desloping a small number of grids to correct for drift (using the **Zero Mean Traverse** function) and edge-matching the grids (using the **Edge Match** and **Zero Mean Grid** functions). **Despike** was applied to reduce the obscuring effects of highly localised, typically ferrous-generated anomalies. The data plots were generated as bitmap images, were subsequently converted in MS *Paint* to jpeg format, and were cropped and assembled using Adobe *Photoshop* and *Illustrator*. The processed data are displayed as linear greyscale plots, clipped to ± 5 nT (Figs. 4.1-4.5).

7. Results and Interpretation

The survey results, as represented by the processed data set, have been analysed in detail. Anomalous features contrasting with the background, surrounding data have been identified. They have been interpreted according to their relative strengths, morphology and data treatment history, and according to inferences drawn from experience and knowledge of local geological, topographical, historical, archaeological, agricultural and modern interference conditions. A descriptive illustration of the interpretation has been drawn for the data set (Figs. 5.1 to 5.2).

7.1 Brennanstown (Figs. 5.1)

- a) The line of the granite boundary wall is clearly represented in the divided data set;
- b) A number of strong bi-polar anomalies are generated by the presence of a number of geological test wells and their associated ferrous hardware. Additional ground disturbance at these and other locations was generated by excavated geological test-pits;
- c) Of more significance are the numerous isolated ferrous anomalies, which are scattered across the survey area, and were particularly noted in the compound area. Fairly typical of agricultural soils, these may be predominantly modern in origin, though the presence of older, archaeologically significant objects cannot be ruled out.;
- d) Additionally, within the "compound" (area 1), and elsewhere, are numerous weaker isolated anomalies of archaeological strength, typically 3-20nT. Some of the larger ones could be interpreted as pit-like features, in an archaeological context. While modern disturbance could also cause such anomalies, and while there is a broad spread of them across the entire survey area, they do appear to be concentrated more in this area, possibly indicating habitation evidence in this slightly elevated area of the site. Fewer anomalies have been positively identified and marked in the other areas (2 – 4), as it has not been possible to realistically separate weaker anomalies from more general background noise.

7.2 Laughanstown (Fig 5.2)

- a) At least two test wells have generated ferrous interference along the centreline, within area 5;
- b) There are also two bi-polar anomalies in the southeasternmost grid resulting from the probable presence of significant bodies of ferrous material;
- c) A broad spread of isolated ferrous anomalies are present in the westernmost grid surveyed, and may indicate a concentration of modern waste material;
- d) The cause of weaker isolated anomalies of archaeological strength (indicated as purple dots) could also be of significance, possibly indicating the presence of small pits, or other archaeologically significant features or artefacts as a result of broader habitation. Numerous unidentified weaker anomalies may be present within the generally noisier background, the latter being most likely generated by intensive modern agriculture and soil enhancement.

8. Conclusions

There is no clear evidence of archaeologically-significant structures in the surveyed area at Brennanstown and Laughanstown (Fig. 6). However, a number of small, isolated pit-like features have been postulated, and should be examined by excavation. There is no direct evidence for habitation at the site, other than perhaps generalised soil disturbance in the western (compound) area of the site, but there could be many causes for this. It is suggested that any test excavation be specifically monitored to determine the nature of activity at the site. The broad spread of isolated anomalies may indicate actual habitation, or may be related to periodic enhancement of the agricultural soils.

Appendix 1 Outline of *Geoplot*® Processing Functions

Deslope

The Deslope function is used to remove a linear trend within a grid of data. It is typically used to correct for drift in gradiometer data where use of the Zero Mean Traverse function is inappropriate.

Despike

The Despike function can be used to automatically (a) locate and remove random, spurious readings often present in resistance data and (b) locate and remove random “iron spikes” often present in gradiometer and magnetometer data.

Edge Match

The Edge Match function may be used to remove grid edge discontinuities. These are often present in Twin Electrode resistance surveys as a result of improper placement of the remote electrodes.

Zero Mean Grid

The Zero Mean Grid function sets the background mean of each grid to zero. It is useful for removing grid edge discontinuities often found in gradiometer or similar bipolar data.

Zero Mean Traverse

The Zero Mean Traverse function sets the background mean of each traverse within a grid to zero. It is useful for removing striping effects in the traverse direction which often occur in Fluxgate gradiometer data. This also has the effect of removing grid edge discontinuities at the same time.


(Reproduced from *Geoplot 2.02*® Operating Manual, section 9-3.1. © Geoscan Research)

Appendix 2 Survey grid layout

Laughanstown Co. Dublin. Licence no. 06R069
Sitename: 'brenstn'


bren1m2.plm

brn01m	brn06m	brn11m	brn16m
brn02m	brn07m	brn12m	brn17m
brn03m	brn08m	brn13m	brn18m
brn04m	brn09m	brn14m	brn19m
brn05m	brn10m	brn15m	brn20m




bren2m1.plm

brn21m	
brn22m	brn25m
brn23m	brn26m
brn24m	brn27m




bren3m1.plm

brn28m	brn32m
brn29m	brn33m
brn30m	brn34m
brn31m	brn35m



bren4m1.plm

brn36m	brn39m
brn37m	brn40m
brn38m	brn41m
	brn42m



lau1m.plm

lau01m	lau06mm
lau02m	lau07mm
lau03m	lau08m
lau04m	lau09m
lau05m	lau10m
lau11m	lau16m
lau12m	lau17m
lau13m	lau18m
lau14m	lau19m
lau15m	lau20m



Note on Naming conventions

Two separate numbering conventions are used in the identification of survey grids. The completed survey grids (usually squares) carry identifying labels applied by the survey personnel (typically "dul01m", "dul02m", etc.) [as above]. Meanwhile, *Geoplot 3* software establishes its own naming system, based on a complete rectangular "master grid" or "plotmesh", and incorporating both surveyed and unsurveyed grids (typically "1", "2", etc.) [see Fig. 3]. This latter basis is used as the identification system for any subsequent processing.

Appendix 3 Licence

*National Monuments
Acts (1930-2004)
Consent to use a
Detection Device*



File No.

Consent No. **06R69**

Application having been duly made to me by Ian Elliot

Of IGAS Ltd
Unit 4 Dundrum Business Park
Dundrum Road
Dublin 14

For a consent to use a specified detection device Fluxgate Gradiometer, Earth Resistance Meter

at the site known as Laughanstown

In or under the portion of land owned by RPA Ltd

Of Parkgate Business Centre
Parkgate Street
Dublin 5

Being part of the townland of LAUGHANSTOWN

And county of Dublin

As indicated on the map attached to the said application for the purposes of Pre Development Assesment

The minister for the Environment, Heritage and Local Government, in accordance with the conditions of Section 2 of the National Monuments (Amendment) Act, 1987, as amended, and subject to the conditions and restrictions overleaf, does hereby issue his consent to the said applicant to carry out the specified works during a period of 3 weeks commencing on the 18/04/2006 to use a detection device for the purpose specified under that portion of land above mentioned.

Signed

18 April 2006



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Figure No.: 1 Client: CRDS/RPA
Drawn By: IE Scale: 1:50,000
Job No.: 06#679G Date: May 2006

0 2km



Fig. 1. Laughanstown, Co. Dublin. Extract from OS Discovery Series sheet 50, showing location of site

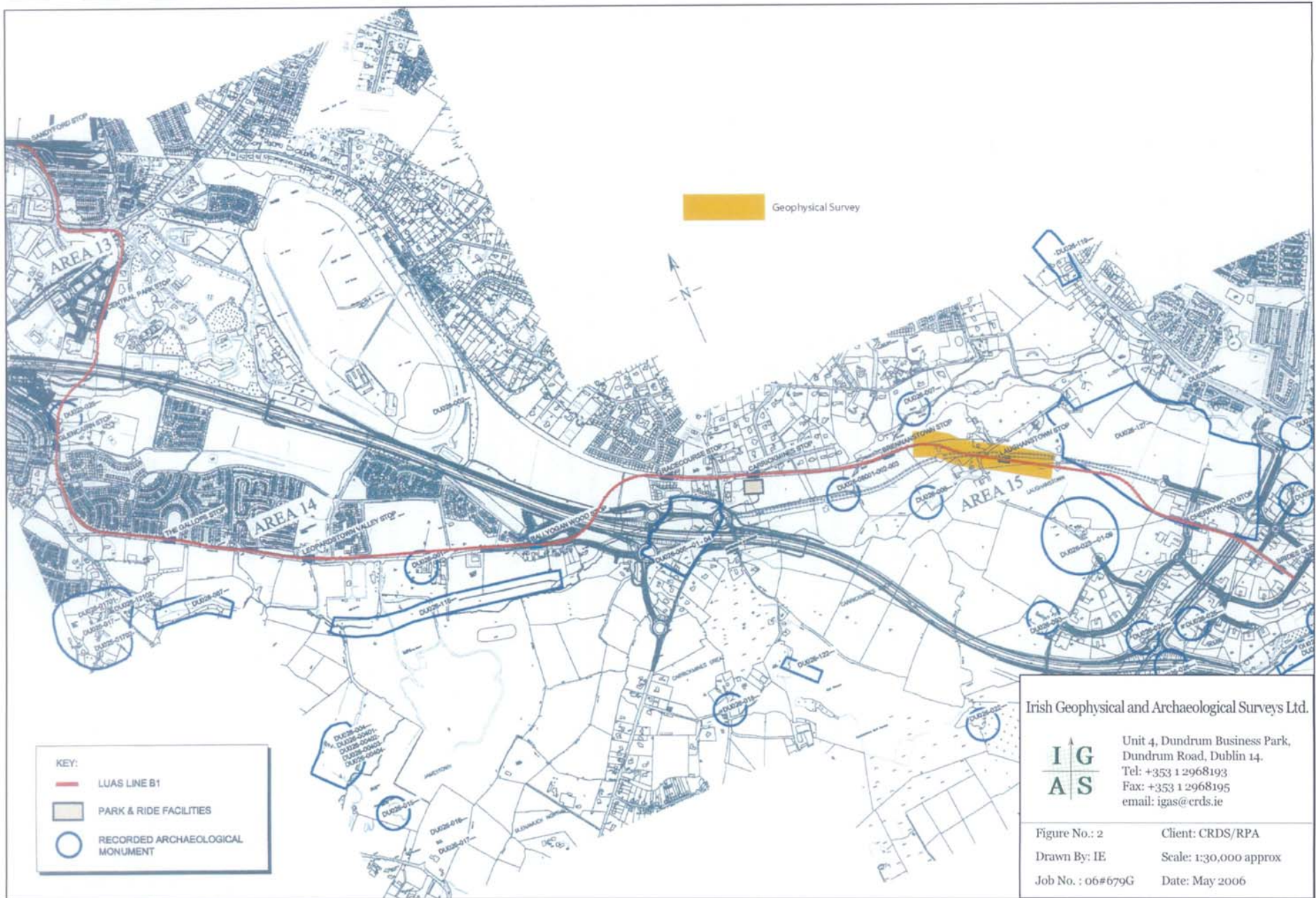


Fig. 2. Laughanstown, Co. Dublin. Overall view of light rail scheme, showing adjacent monuments

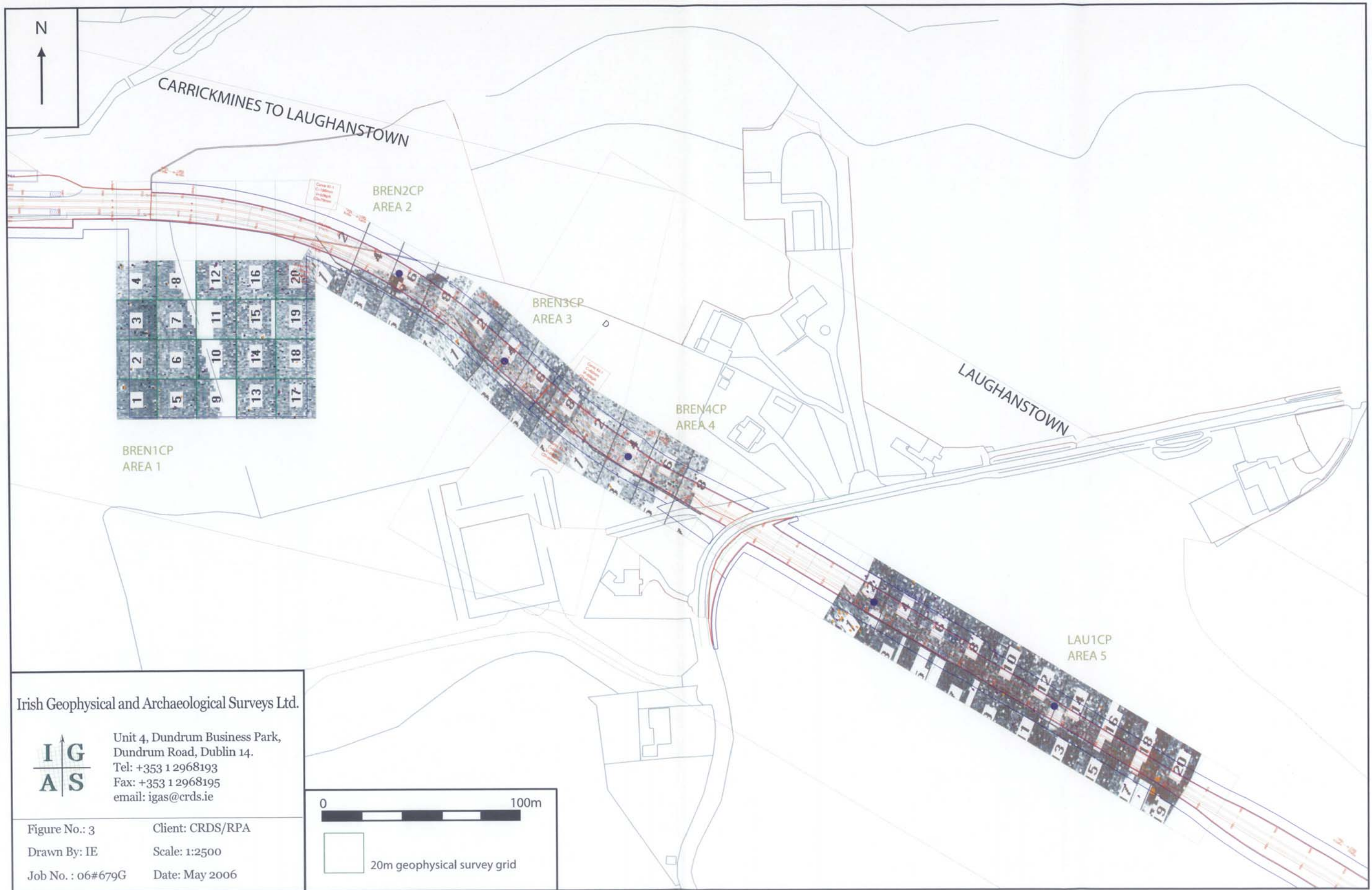


Fig. 3. Laughanstown, Co. Dublin. Geophysical survey layout

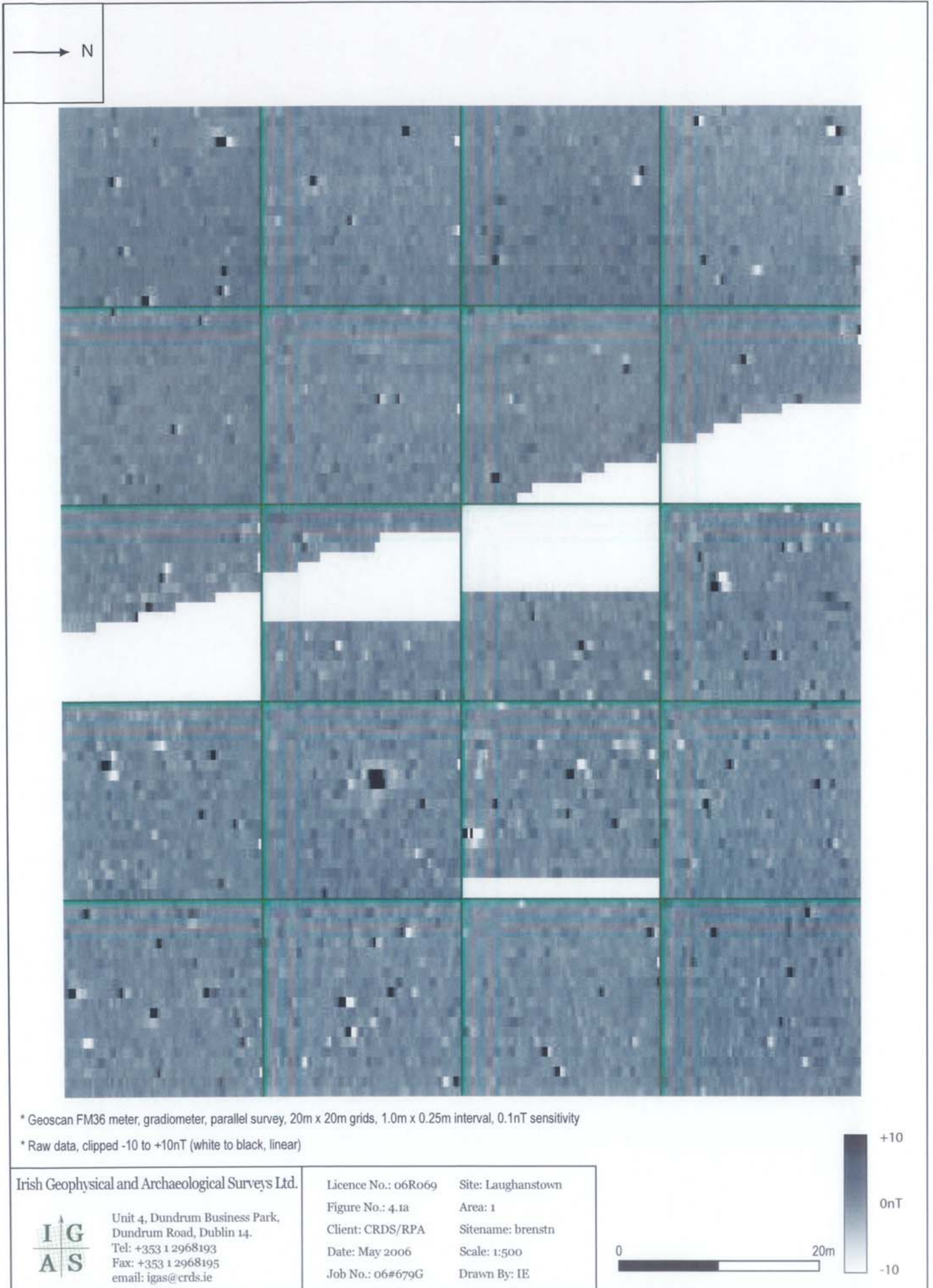


Fig. 4.1a. Laughanstown, Co. Dublin. Geophysical survey : Area 1 raw data

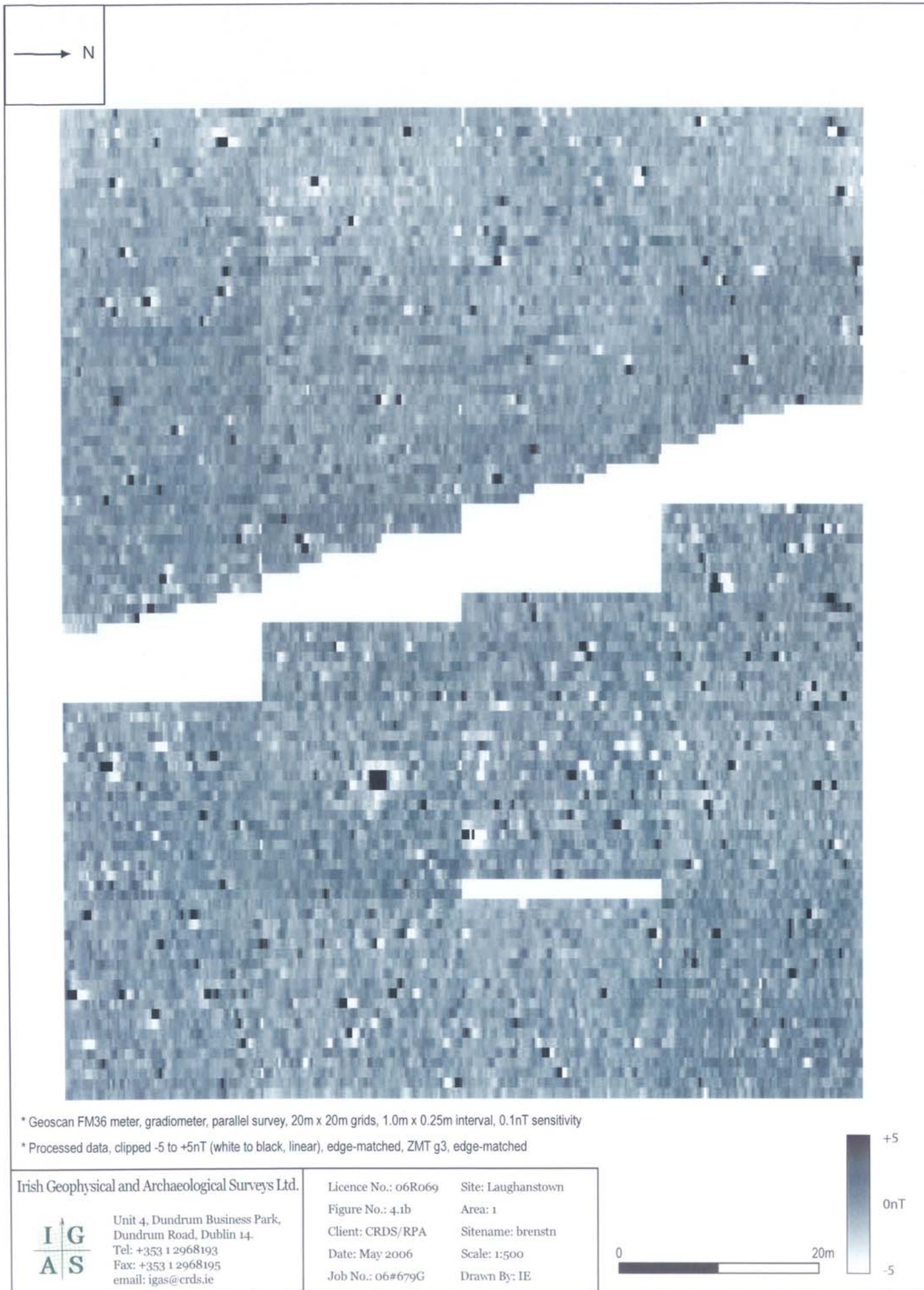


Fig. 4.1b. Laughanstown, Co. Dublin. Geophysical survey: Area 1 processed data

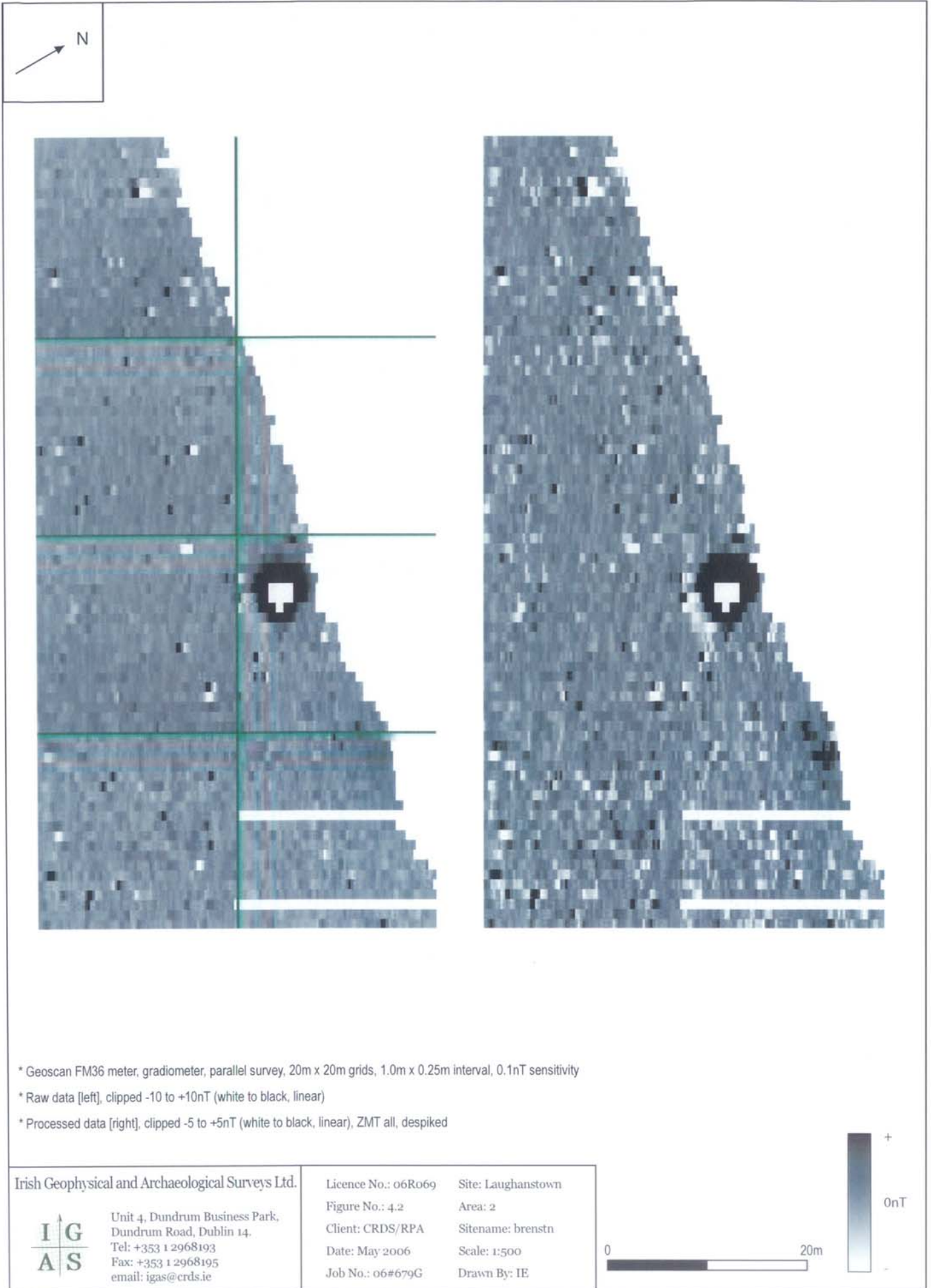
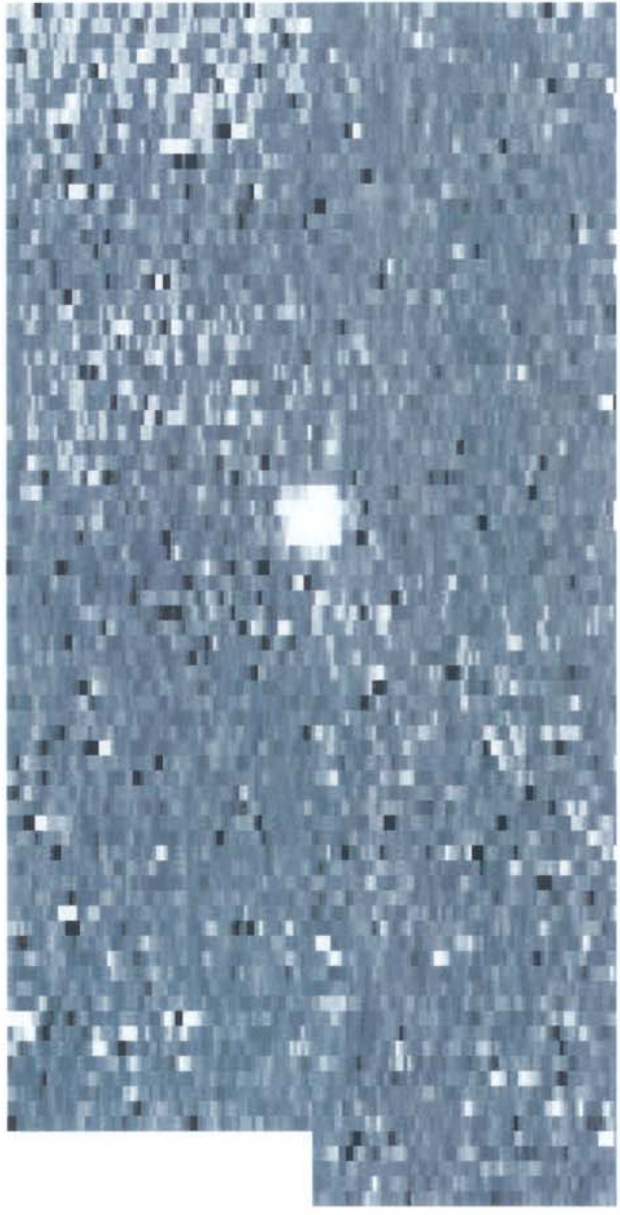
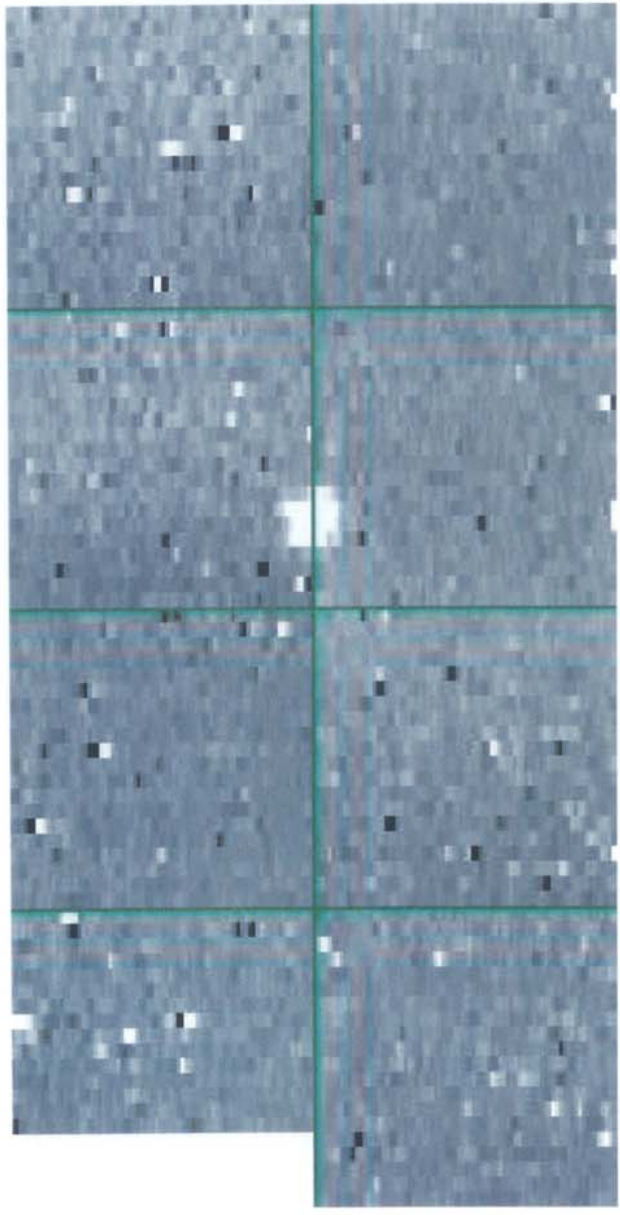
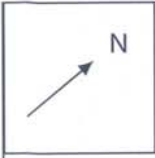



Fig. 4.2. Laughanstown, Co. Dublin. Geophysical survey: Area 2 data



* Geoscan FM36 meter, gradiometer, parallel survey, 20m x 20m grids, 1.0m x 0.25m interval, 0.1nT sensitivity
 * Raw data [left], clipped -10 to +10nT (white to black, linear)
 * Processed data [right], clipped -5 to +5nT (white to black, linear), ZMT all

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Licence No.: 06Ro69 Site: Laughanstown
 Figure No.: 4.3 Area: 3
 Client: CRDS/RPA Sitename: brenstn
 Date: May 2006 Scale: 1:500
 Job No.: 06#679G Drawn By: IE

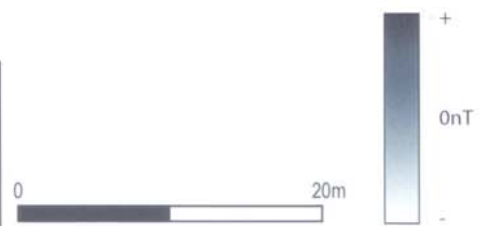
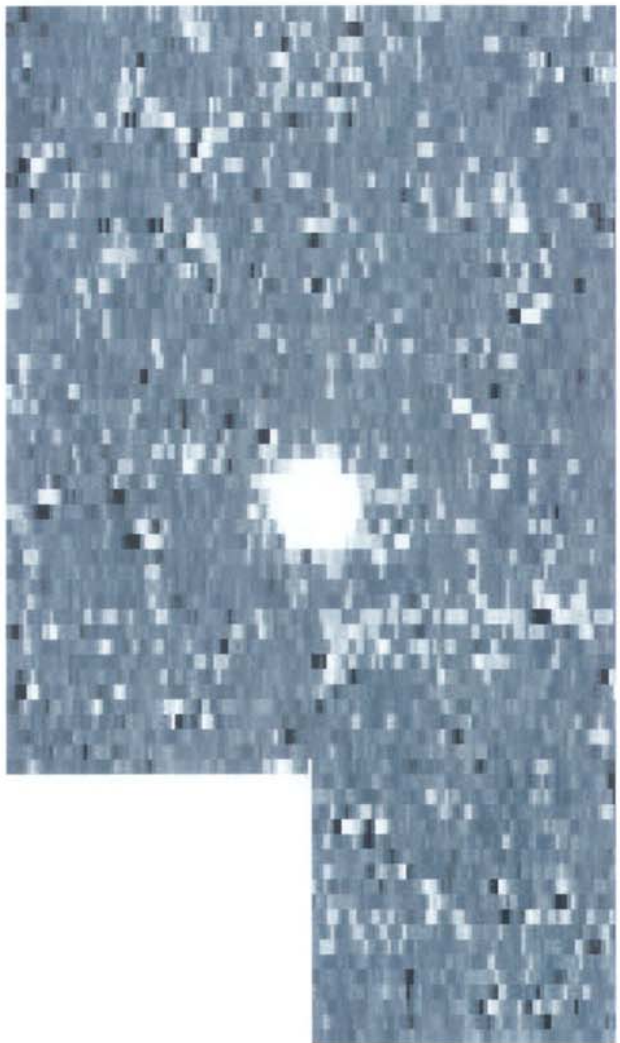
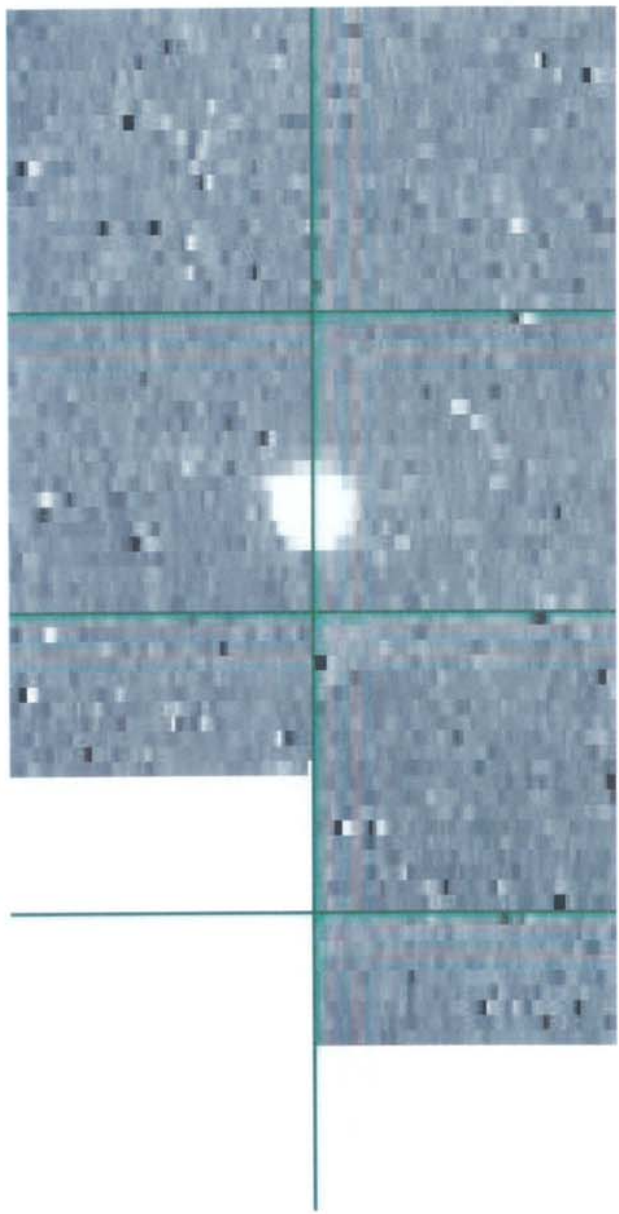
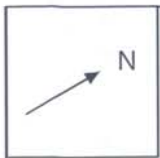


Fig. 4.3. Laughanstown, Co. Dublin. Geophysical survey: Area 3 data



- * Geoscan FM36 meter, gradiometer, parallel survey, 20m x 20m grids, 1.0m x 0.25m interval, 0.1nT sensitivity
- * Raw data [left], clipped -10 to +10nT (white to black, linear)
- * Processed data [right], clipped -5 to +5nT (white to black, linear), ZMT all, despiked

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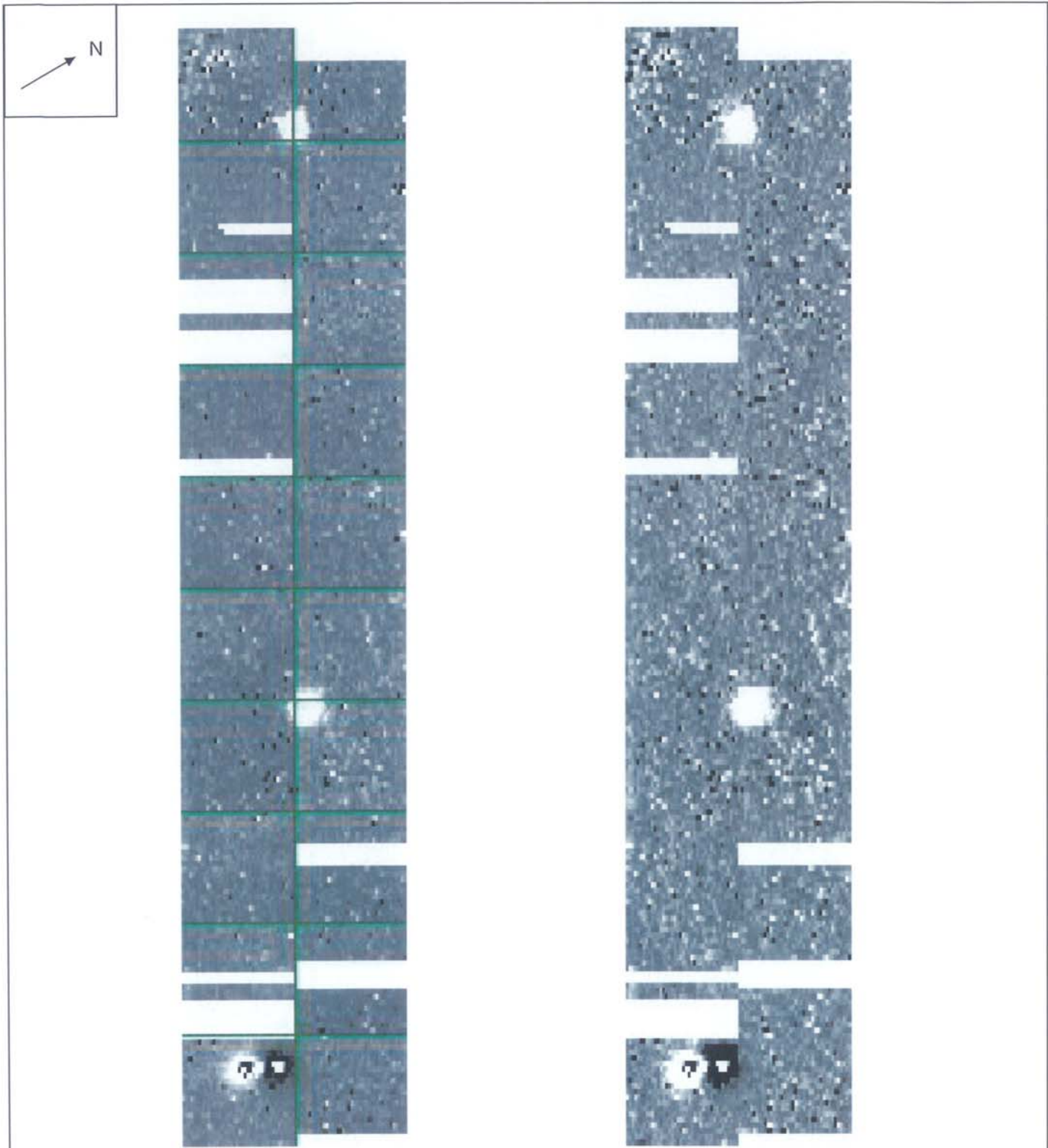
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Licence No.: 06R069
Figure No.: 4.4
Client: CRDS/RPA
Date: May 2006
Job No.: 06#679G

Site: Laughanstown
Area: 4
Sitename: brenstn
Scale: 1:500
Drawn By: IE



Fig. 4.4. Laughanstown, Co. Dublin. Geophysical survey: Area 4 data



* Geoscan FM36 meter, gradiometer, parallel survey, 20m x 20m grids, 1.0m x 0.25m interval, 0.1nT sensitivity

* Raw data [left], clipped -10 to +10nT (white to black, linear)

* Processed data [right], clipped -5 to +5nT (white to black, linear), edge-matched, ZMG all, ZMT all

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Licence No.: 06R069

Figure No.: 4.5

Client: CRDS/RPA

Date: May 2006

Job No.: 06#679G

Site: Laughanstown

Area: 5

Sitename: laughstn

Scale: 1:1000

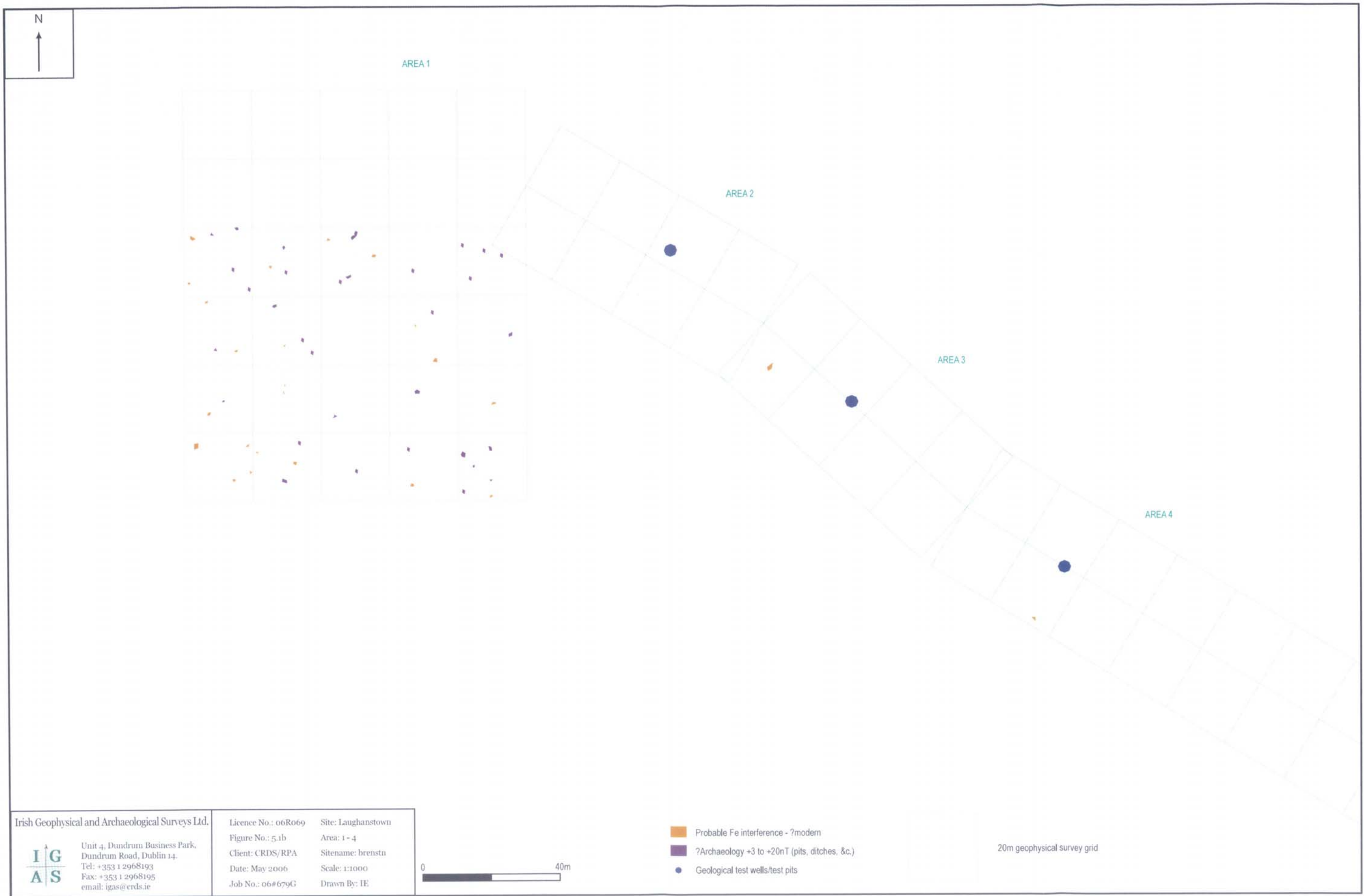
Drawn By: IE



Fig. 4.5. Laughanstown, Co. Dublin. Geophysical survey: Area 5 data



Fig. 5.1a. Laughanstown, Co. Dublin. Geophysical survey: Areas 1 - 4 data & interpretation



Irish Geophysical and Archaeological Surveys Ltd. 	Unit 4, Dundrum Business Park, Dundrum Road, Dublin 14.	Licence No.: 06R069	Site: Laughanstown
	Tel: +353 1 2968193	Figure No.: 5.1b	Area: 1 - 4
	Fax: +353 1 2968195	Client: CRDS/RPA	Sitename: brenstn
	email: igas@crds.ie	Date: May 2006	Scale: 1:1000
		Job No.: 06#679G	Drawn By: IE



- Probable Fe interference - ?modern
- ?Archaeology +3 to +20nT (pits, ditches, &c.)
- Geological test wells/test pits

20m geophysical survey grid

Fig. 5.1b. Laughanstown, Co. Dublin. Geophysical survey: Areas 1 - 4 interpretation

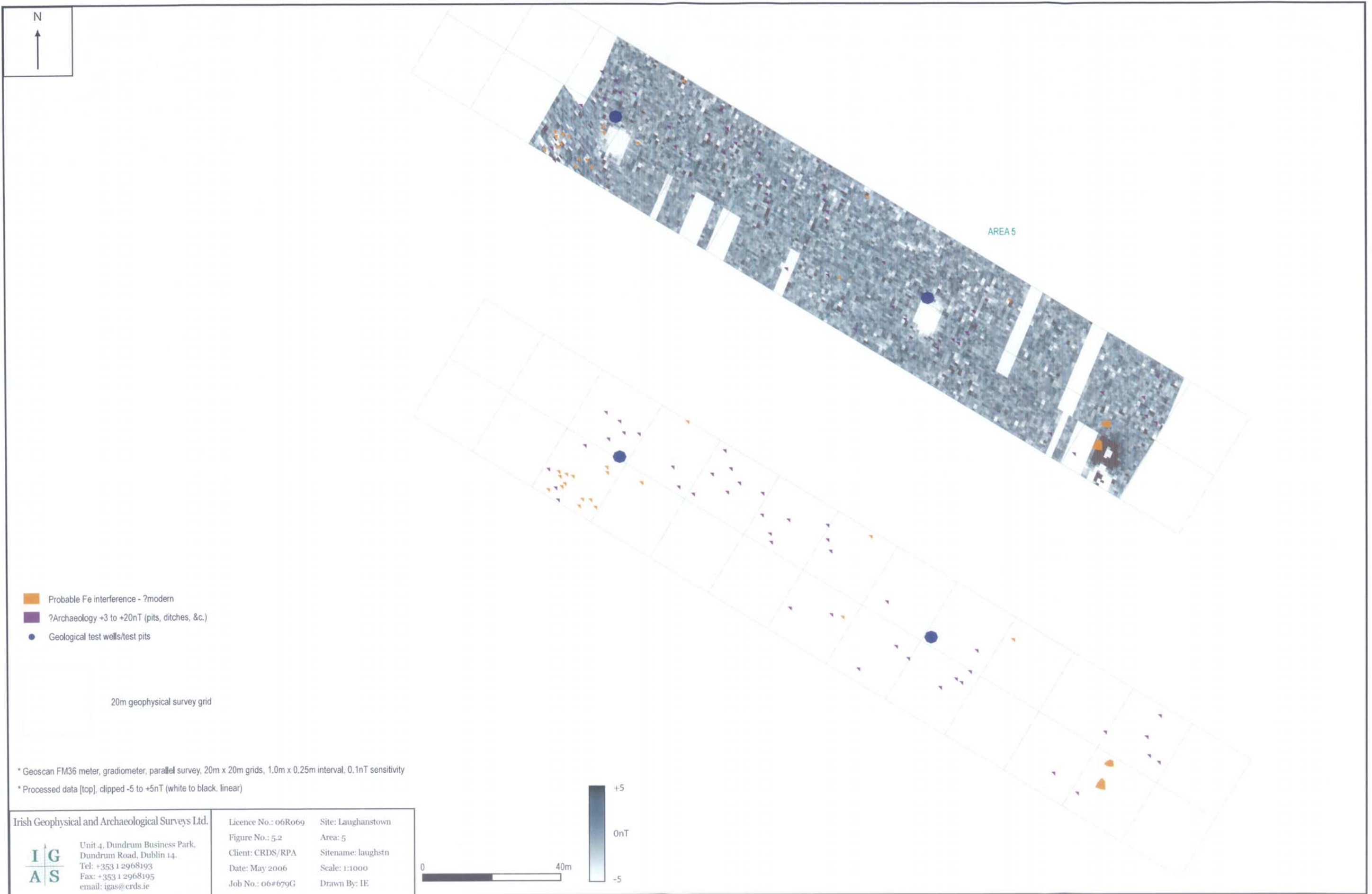


Fig. 5.2. Laughanstown, Co. Dublin. Geophysical survey: Area 5 data & interpretation

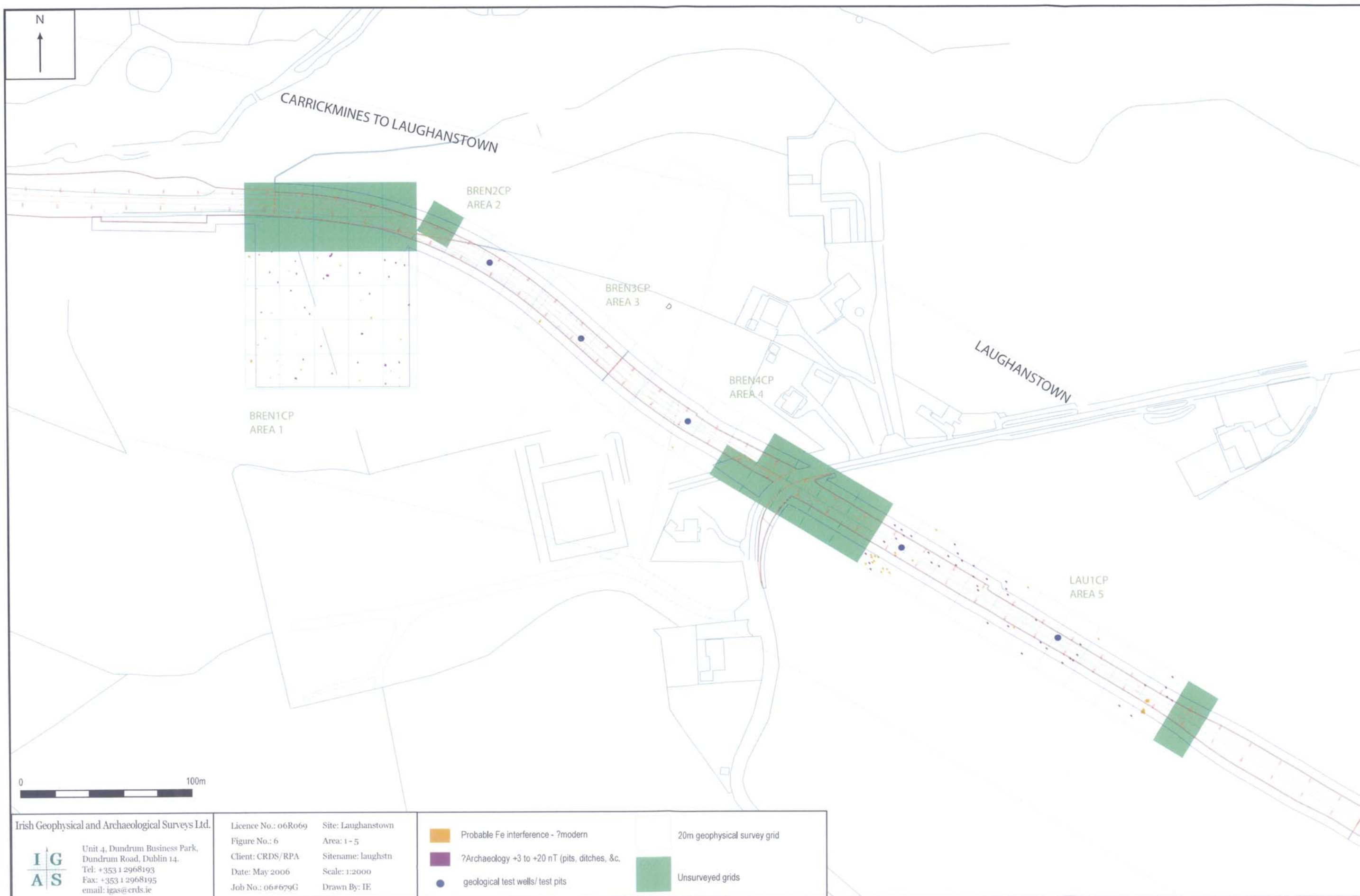


Fig. 6. Laughanstown, Co. Dublin. Geophysical survey: Areas 1 - 5 outline of data interpretation