Geophysical Survey at Heavenfield

Northumberland

2015

Bernician Studies Group

Geophysics at Heavenfield 2015

Provisional report

By Jack Pennie and Max Adams, Bernician Studies Group

With contributions from Geoff Taylor, Ray Shepherd,
Deb Haycock and John McNulty

Introduction

The Bernician Studies Group carried out gradiometry surveys in fields adjacent to and on the course of Hadrian's Wall at Heavenfield, Wall CP, Northumberland: NY 935695 during the autumn of 2015 and in 2016. The landowner, Mr John Reay, granted permission for the work, which was undertaken subject to the licence issued by Heritage England on 16 July 2014. The licence period was extended into 2015 because of access issues, accommodating the landowner's grass-cutting schedules.

The rational for the work, as outlined in the Section 42 agreement, is attached as an appendix. In summary, in Book 3 Chapter 2 of the *Ecclesiastical History (Eccl Hist)*, the Venerable Bede gives an account of the arrival in the year 642 of Oswald at the place called Heavenfield, on the north side of the wall 'with which the Romans once girded the whole of Britain from sea to sea', that is Hadrian's Wall. Here, before engaging in battle with Caedwalla to regain his kingdom, Oswald set up a wooden cross which, by the later 7th century, was acknowledged as a cult object with healing properties. Following the successful outcome of the battle, Oswald established a monastic missionary centre on the island of Lindisfarne (Holy Island) in the Northumbrian coast, under the episcopacy of Aidan who had been sent out from the Irish Dal Riatan monastery of Iona, as described in *Eccl. Hist* 3.3 (Colgrave and Mynors, 1969, 214-219 and 208-221).

In a recent study of Oswald, Max Adams (2013, 156) suggests that a hole cut through the floor on Turret 25b, at a late stage in the stratigraphic sequence, as observed in the excavations of C. C. Woodfield (Woodfield 1965), might have been the foundation pit cut for Oswald's cross.

Adams further notes (2013, 160-7) that, according to Bede, (*Eccl Hist* 3.5), Aidan's successful mission was not the first to be sent from Iona, but that an unsuccessful venture had preceded it. This venture, he suggests, might have been led by Ionan monks accompanying Oswald's army on its campaign of re-conquest, and that they might have set up a monastery immediately after the victory around the site of the cross and modelled on their own home base. In this context, Adams draws attention to a distinctive patterning in the field boundaries around Turret 25b, both east and west, and both north and south of the line of Hadrian's Wall and the B6318 road which originated as the Military Road engineered by General Wade in 1746. (2013, 164-5).

Fig 1: Heavenfield, satellite view

Within a landscape setting in which many of the fields are rectangular with straight edges, a block of four fields, with Turret 25b towards the centre right, stands out as describing a sub-rectangular outline with rounded corners (see Fig 1). The total area, of some 6 hectares, and the length-breadth proportions are similar to those of the known monastic enclosure on Iona and of those reconstructed for Lindisfarne/Holy Island by Rob Young and Deirdre O'Sullivan (O'Sullivan and Young 1995, 41, fig 21). Adams therefore proposed the hypothesis that the shape in the field boundaries preserves the outline of an early monastic precinct established by the first – unsuccessful – Ionan mission to Northumbria.

The topography is gently undulating with a dramatic scarp facing north just beyond the current church at the site. To the south the land slopes gradually down towards the Tyne Valley; to the West there is a sharper drop into the North Tyne Valley at Chollerford; to the east the Wall follows a ridge to its junction with Dere Street at Portgate.

Summary of results

Geophysical results in the area of the enclosure identified by Adams were dominated by an extremely magnetic intrusion of the Whin Sill, masking any potential underlying or adjacent archaeology. The line of the Wall, robbed out by road construction in the 18th century, was detected; and there are minor archaeological or agricultural anomalies present in the adjacent fields. The distinct nature of the bend

in the road which conspicuously avoids the site of the turret remains to be explained. The site of the present church, which is unavailable for geophysical survey, may overlie an earlier foundation. Adams's hypothesis appears to be disproved. However, the potential for gradiometry to address such historic/landscape questions is noted. The work of the Bernician Studies Group on Inishowen has established its potential for detecting and mapping early monastic sites (O'Brien and Adams 2016f)

Historical and geographic context

Regardless of Heavenfield's possible association with an early Ionan mission, its position close to the intersection of two ancient routes linking Oswald's possible arrival from the west and his supporters in the northeast is significant. A continuation of the Devil's Causeway to the south-west beyond its junction with Dere Street (as suggested by Nick Hodgson, pers. comm.) would place an intersection with the Wall very close by Heavenfield. The local topography, just east of the North Tyne and up a steep incline, gives good protection to the west. The protection of the Wall from both attack and the weather would have been advantageous to a commander summoning disparate forces. In addition, although at relatively high altitude (between 210 and 220mOD), it is out of view of the Tyne Valley to the south, discretely far from the Stanegate and Warden Hill. It provides a good strategic point for collecting forces for an assault on either Hexham or Corbridge.

General Wade's Military Road, dating to the middle of the 18th century, although cutting through the site, has a curious alignment. Approaching from the east along the line of the wall, which it follows faithfully for some miles, at St Oswald's Hill Head Farm it veers off the line of the wall to follow the vallum further south (see the modern OS map below). Although the farm sits on a limestone ridge, this was no impediment to the Roman builders and Wade's own engineers faced harder tasks. Further west, the road again crosses on to the wall and then turns north-westerly, as the original Roman crossing of the North Tyne was further south than Wade's chosen point. This means that the road is forced into a steeper gradient as it descends towards the bridge, making that part of the route harder for both men and horses. It invites the question: what was so significant about this site that brought about this change to an apparently easier and more feasible engineering path?

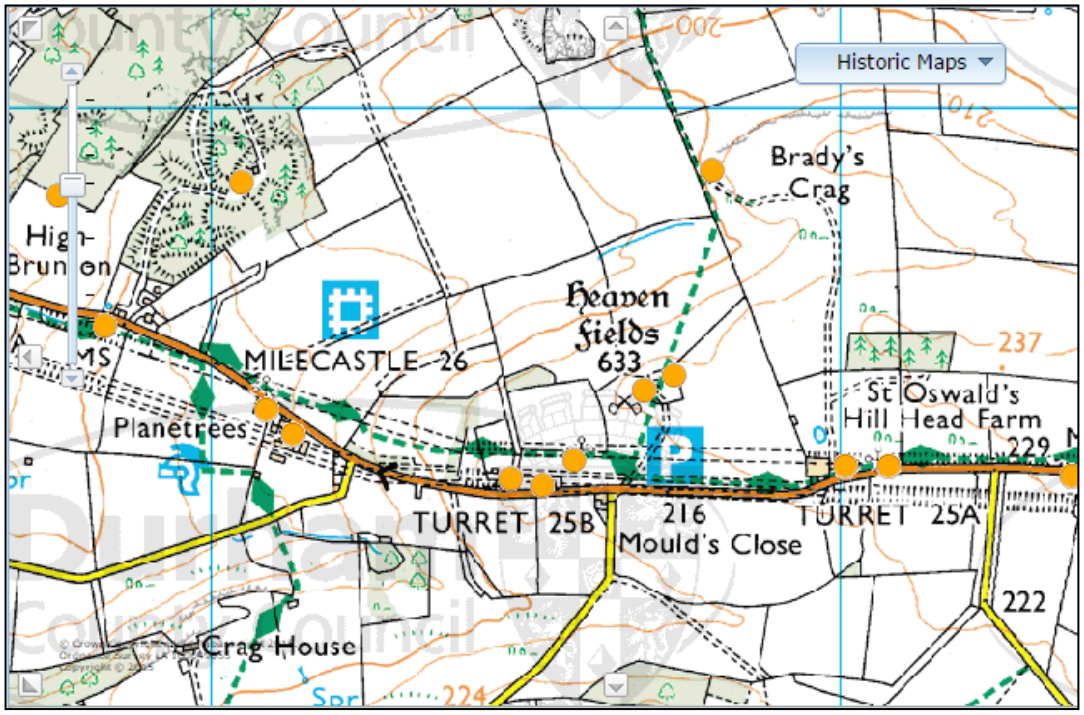


Fig 2: the setting

Bede notes (*HE* III.2) that the site was a significant place of pilgrimage down to his own day in the early 8th century, and that a church was constructed there. Such a church would have been constructed in wood and therefore difficult to locate geophysically; and there are no obvious signs of continued worship. Even the relatively small graveyard of the current church is not full of memorials. Bede again refers to an annual pilgrimage to the site and, indeed, the way from Hexham is marked by a cross at the top of ridge above Mould's Close at or near the 224m mark.

There is no surface trace of the Wall at Heavenfield, apart from some sections of the ditch to the north side. There are no significant carved blocks either in the church or the buildings and field walls close by. Wade's engineers may have systematically scavenged the Wall here, although excavations at Turret 25b (Woodfield 1965) showed that a course of the foundations remained. Wade's engineers used wall material for the foundations of his road in many places, although there are significant remains at Brunton. There was no shortage of used stone at hand. However, there are also signs of quarrying activity in the field north-east of the church and at Brady's Crag and High Brunton, a similar distance to Brunton Mile Castle. Even so, the line of the wall was not used, as it was to the immediate east and west of Heavenfield, for the foundations of the road. The reason for Wade's temporary diversion remains unclear, unless there was some pre-existing structure or significance to the Wall at Heavenfield.

The vertical satellite image (Fig 1) shows the unusual and distinctive lozenge shape of the fields, with the site of Turret 25b in the centre, just above and to the right of existing farm buildings. The church, whose current fabric is no earlier than the 18th

century, is located in the north-east corner of the image, with the Military Road running east-west through the centre of the lozenge shape. Richard Currie has kindly provided the BSG with a composite 3D scan of the fields north of the road, taken using a small drone-mounted camera. The geometric shapes are his software's interpretation of trees and foliage. As can be seen from this image, although the line of the wall and associated ditch are visible, it is far less pronounced than in the field to the west. Some evidence of former rig and furrow cultivation is visible, but there are no other features suggesting significant archaeological structures.

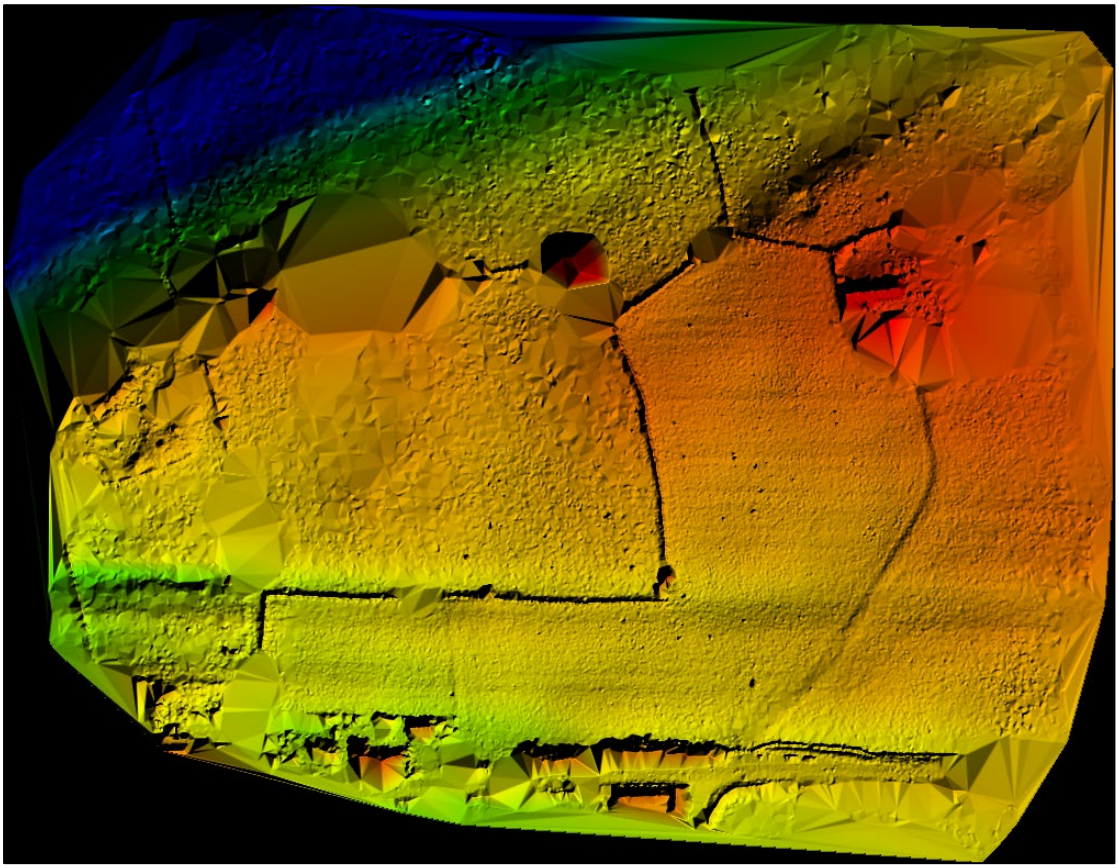


Fig. 3: software enhanced drone image

A further significant feature of this landscape is the boundary wall which crosses the Wall line above the farm buildings, then runs east for 200m or so, then turns at a right angle north, and then runs north-east before resuming a northerly course. This wall is distinctively made with very solid courses in a single build. It appears to be a rationalised enclosure-period version of a more organic township boundary which perhaps previously crossed the site in a north-easterly direction, dividing the townships of Wall and St Oswald Lee (see 1st edition 6-inch section below).

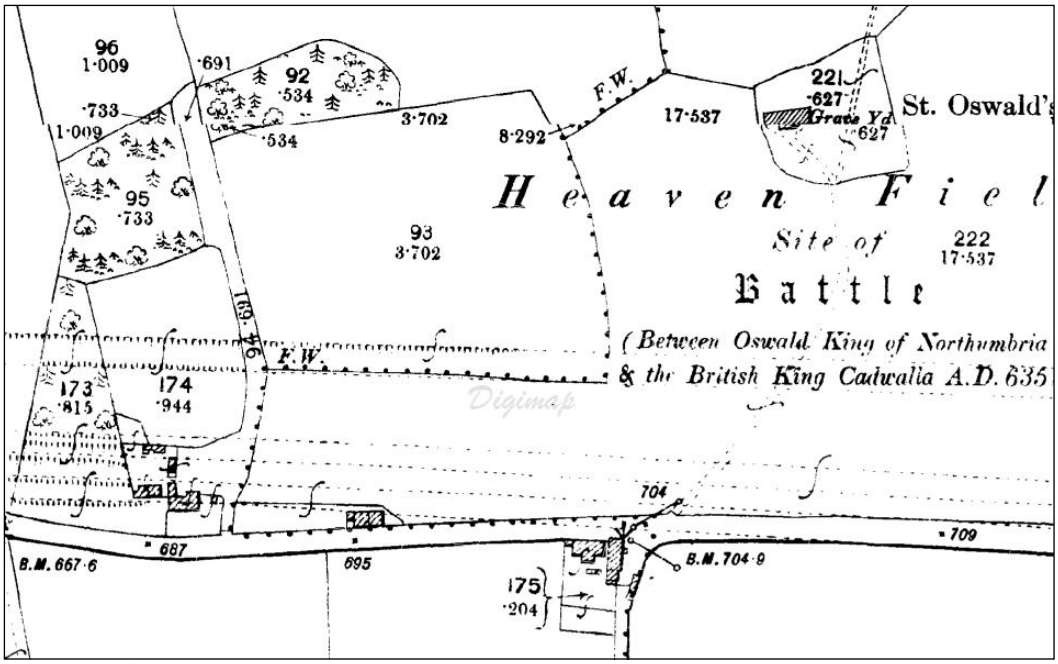


Fig. 4: 1st edition 6" OS map showing township boundary

Methodology

Surveying began along the line of the Wall, to establish its presence. This part of the church field to the west of the current cross is a long sliver of land 140m by 40m which follows the line of the wall and former township boundary. At this point both the wall and the ditch are not obviously visible, although the position of Turret 25b was known from previously published excavation work (Woodfield 1965), and the Wall line could followed from points east and west.

The FM256 gradiometer was set at a sensitivity of at 0.1Nt. Grids were surveyed in NS aligned passes with a 50cm separation and at a sample rate of 8 readings per metre, giving (8*2*20*20 = 6,400) reading per 20m grid. We used the same methodology in the north-east field, parts of the Church field and the southwest field. We returned to the second field the (northeast field) to resurvey a section that we thought may give more detail on a slightly higher setting of 1Nt.

The total number of grids surveyed was:
17 20*20m grids in Field 1 SW
35 in Field 2
25 in Field 1 NW
10 in Field 3
7 in Field 1 NE

The total area surveyed was 37,600 sq metres, not including repeated work. Survey was carried out on the following dates:

mon 20/10/2014
tue 21/10/2014
mon 01/12/2014
tue 02/12/2014
mon 04/05/2015
mon 18/05/2015
mon 01/06/2015
mon 15/06/2015

Survey results

Grids were surveyed in contiguous area (numbered 1-5) to sample fields internal and external to the hypothetical 'lozenge' shape enclosure. The figure below shows their locations on the modern 1:10,000 OS.

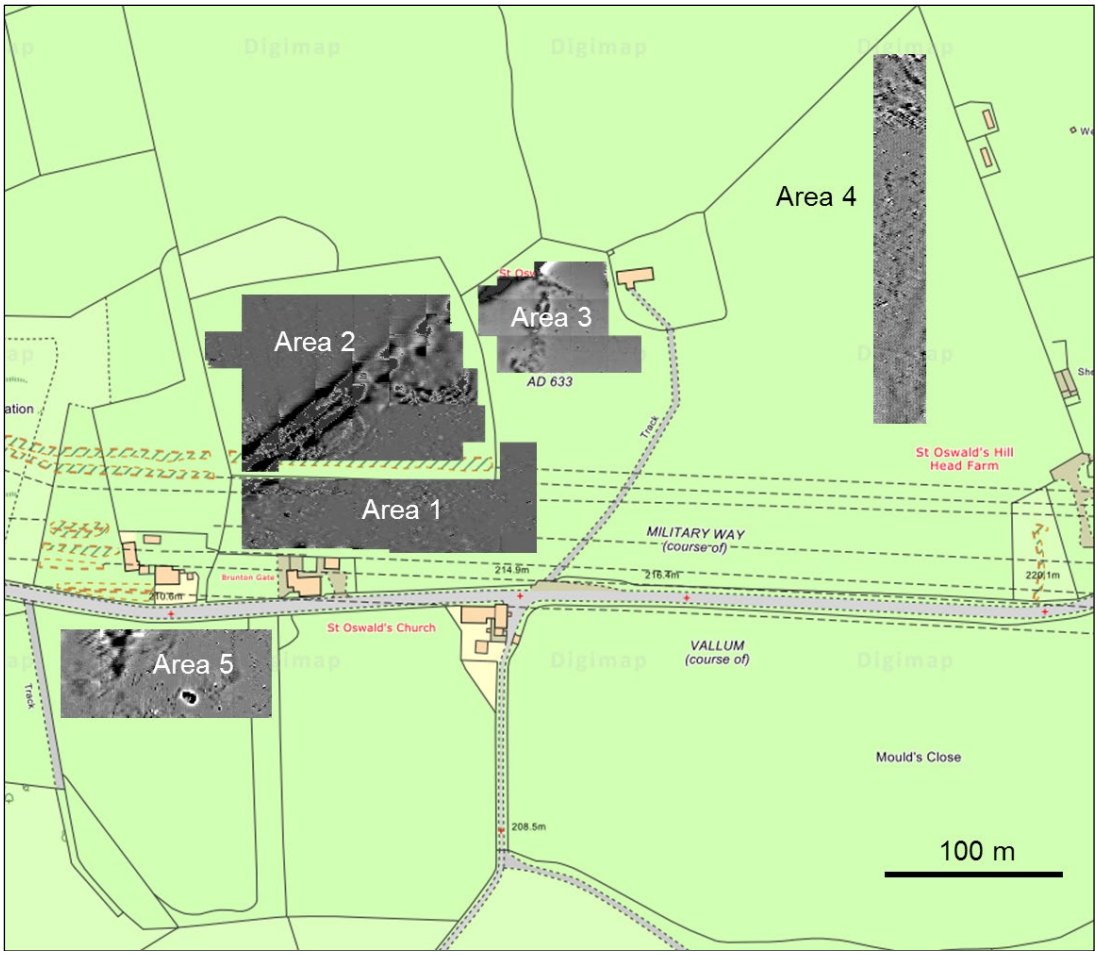
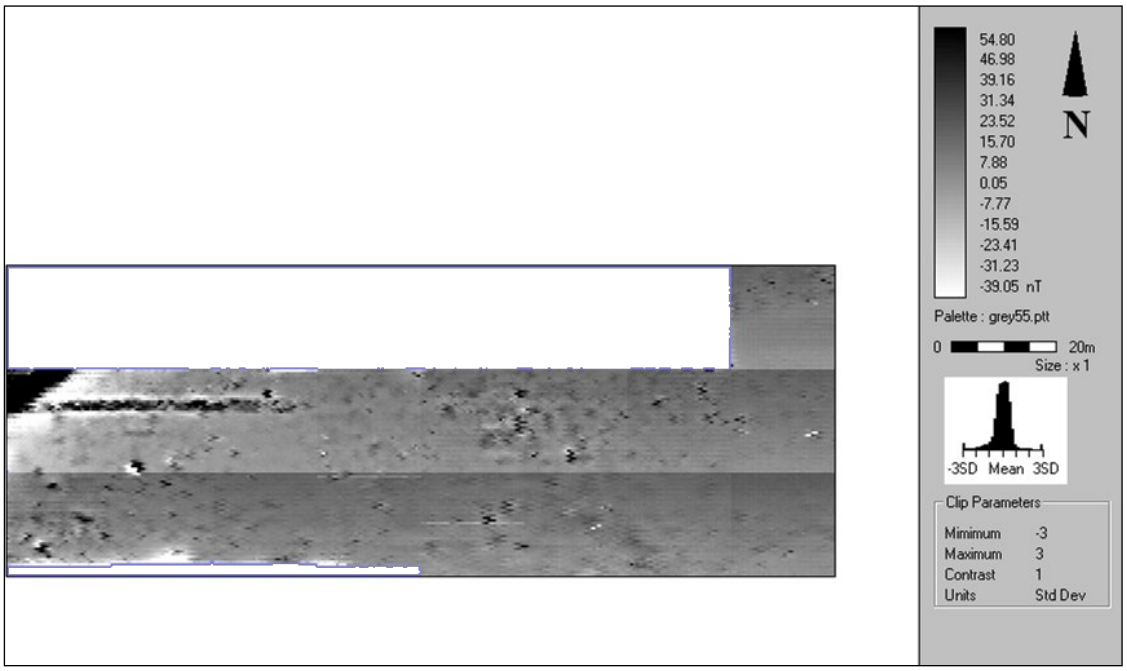
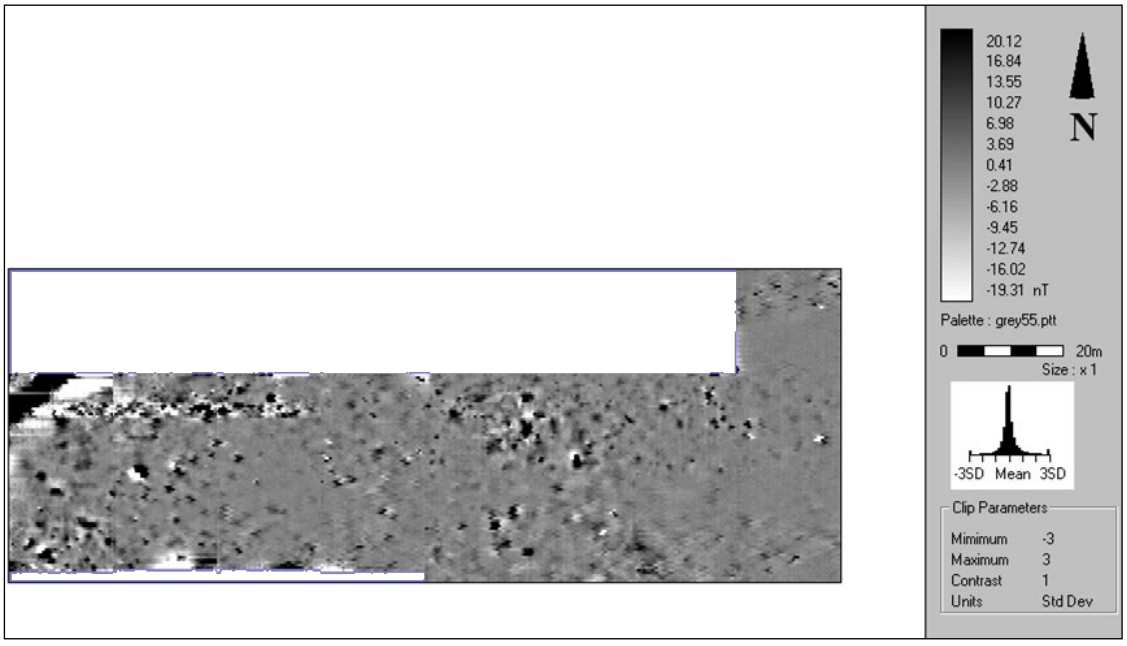


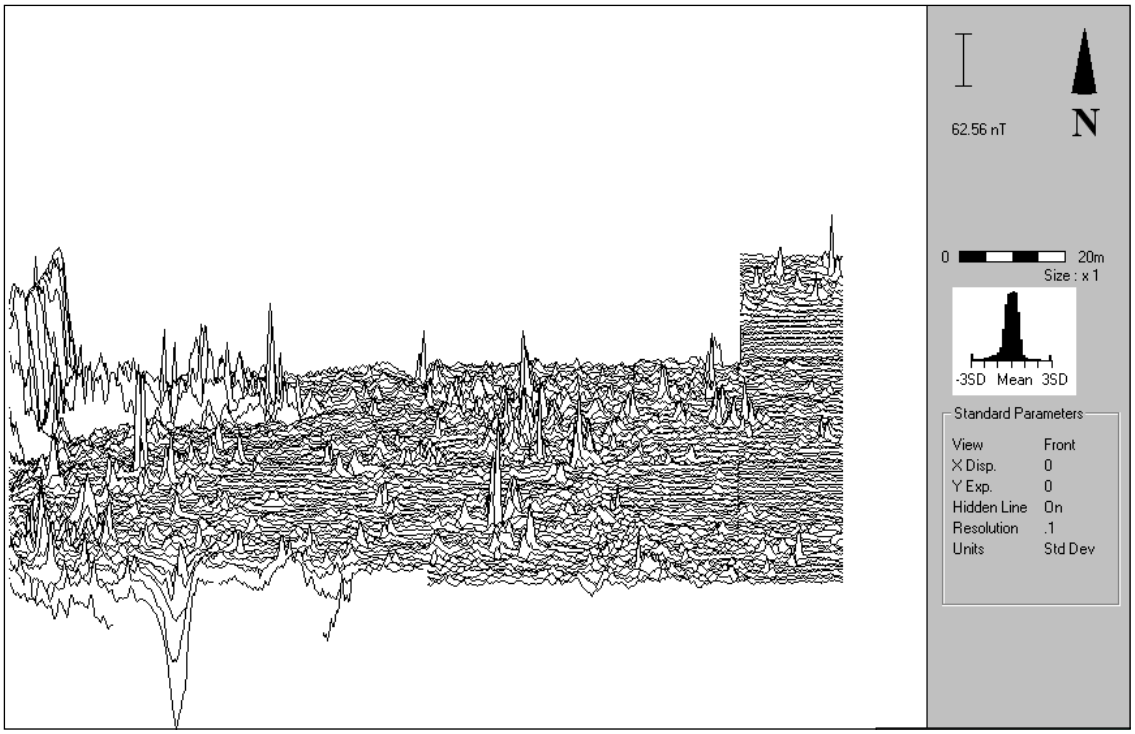
Fig. 5: locations of surveys

The following images show, respectively, the initial survey along the Wall line (Area 1); the survey extended into the north-east sector of the lozenge-shaped enclosure (Area 2); the field to the east, containing the church (Area 3; Area 4); and the southern part of the lozenge south of the Military Road (Area 5). Plots are shown as, respectively **raw data; despiked, clipped, edge matched and X & Y extrapolated**;

and wire mesh.

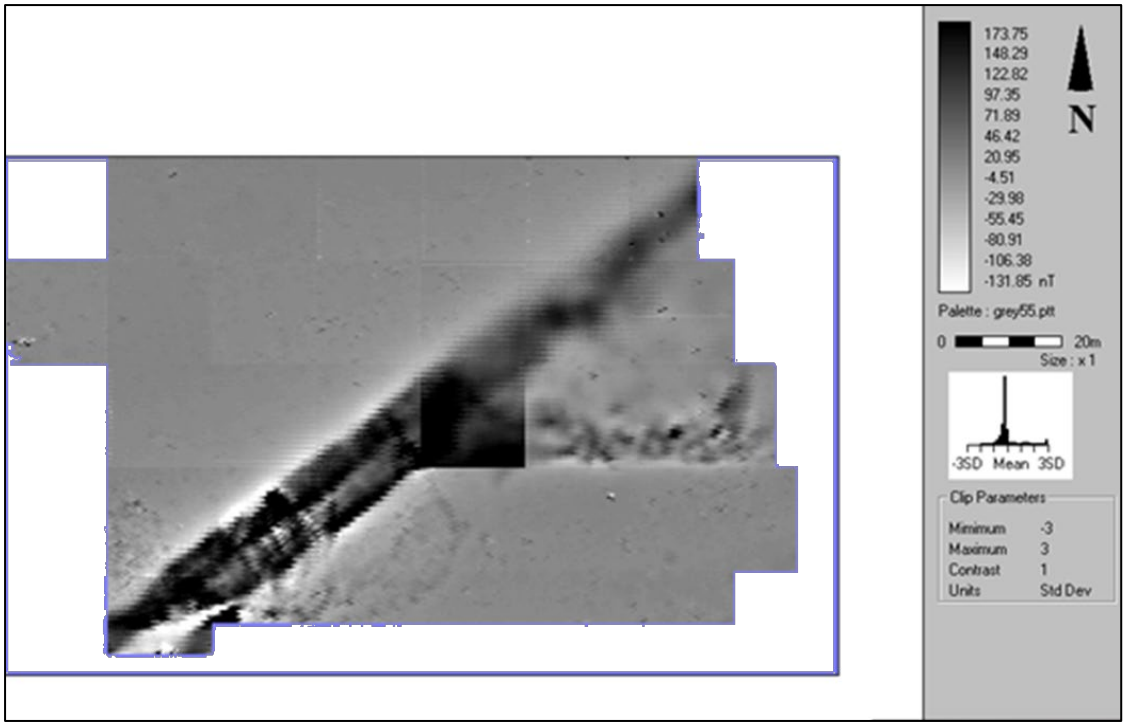


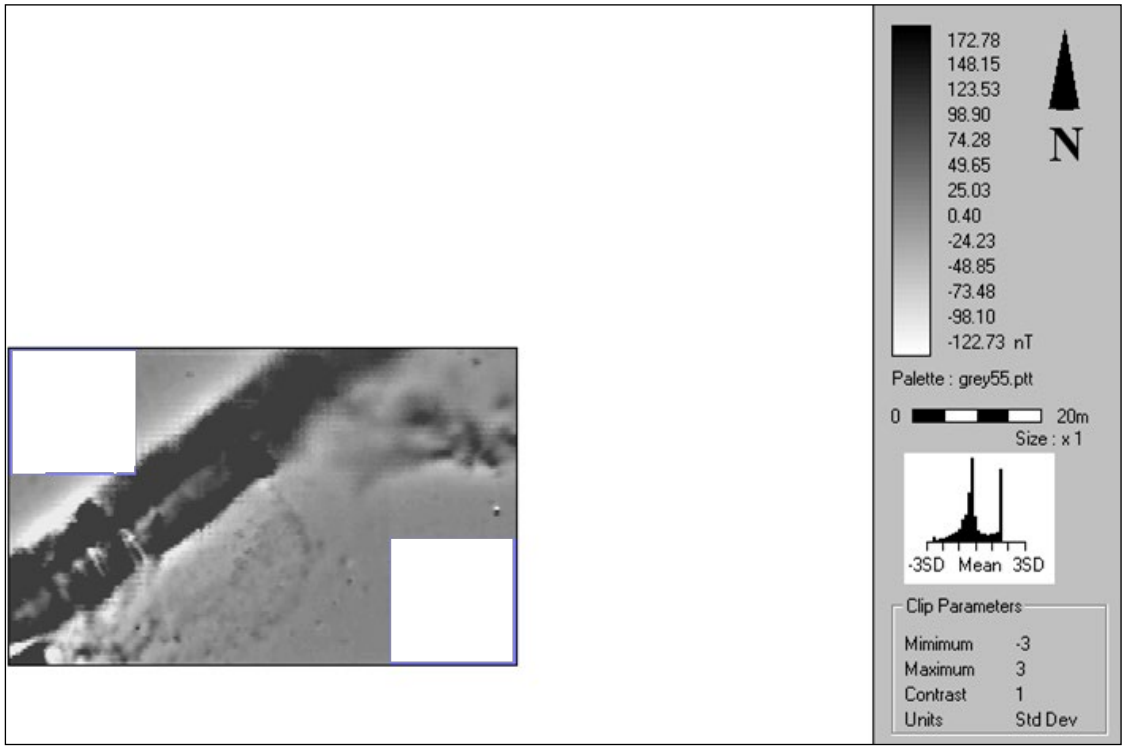




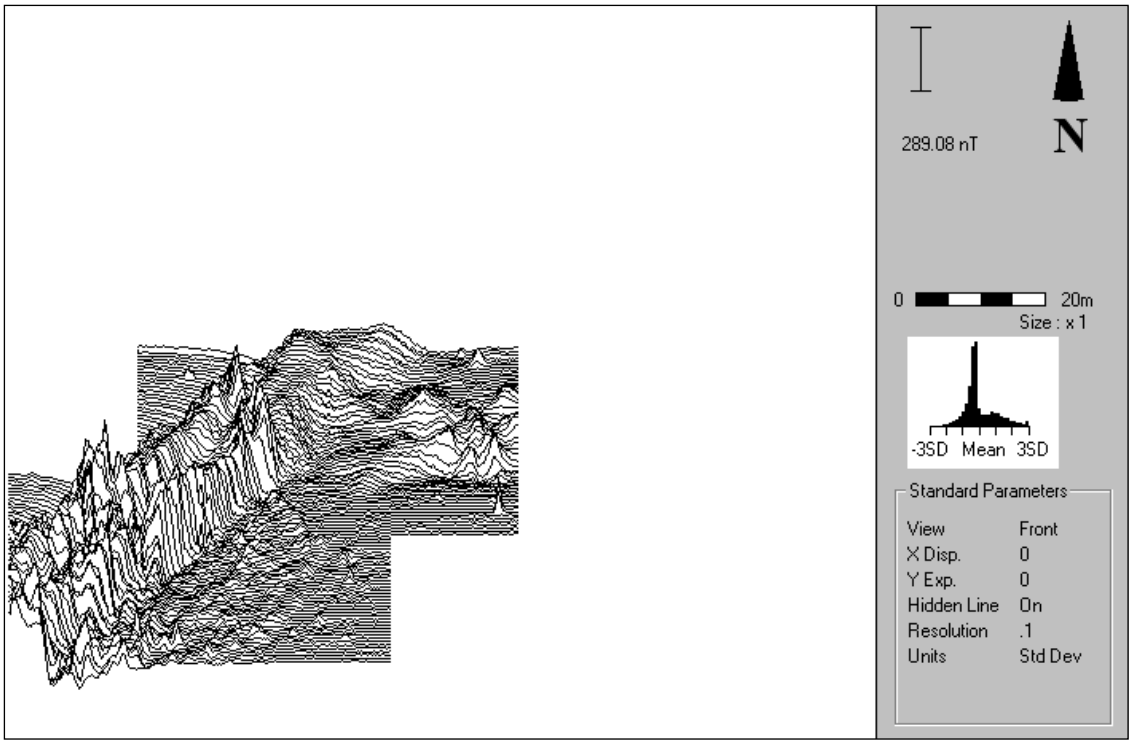
Figs 6, 7, and 8 (below): Area 1 plots

The most obvious feature is the black strip on the left edge (Grid1): a high magnetic response whose origins will be duly addressed. Firstly, the line of the Wall is seen faintly, running parallel to the top edge and best seen on the left as a series of black and white flecks and dots (Grids 1-3). This fades out about 60m in from the left and at about 85m, (Grids 5 & 6) there is a haphazard scatter spread over a greater area: the remains of turret 25b. In the right hand corner at Grid 17, the absence of features indicates the ditch line. It is also possible to make out the line taken by walkers cutting the corner of the field and an old field/ pen or paddock which can be seen best in the 3D image running north where the field widens slightly. The question of the nature of the red stripe suggested extending the survey to the north of the fence line at the base of the ditch which formed the extent of the first transects.





Figs 9, 10 and 11 (below): Area 2 plots – lower figures shows processed detail



Reference to the base geology of the area, however, shows the anomaly to be a section of the Great Whin Sill (data from the BGS Geology of Britain Viewer).

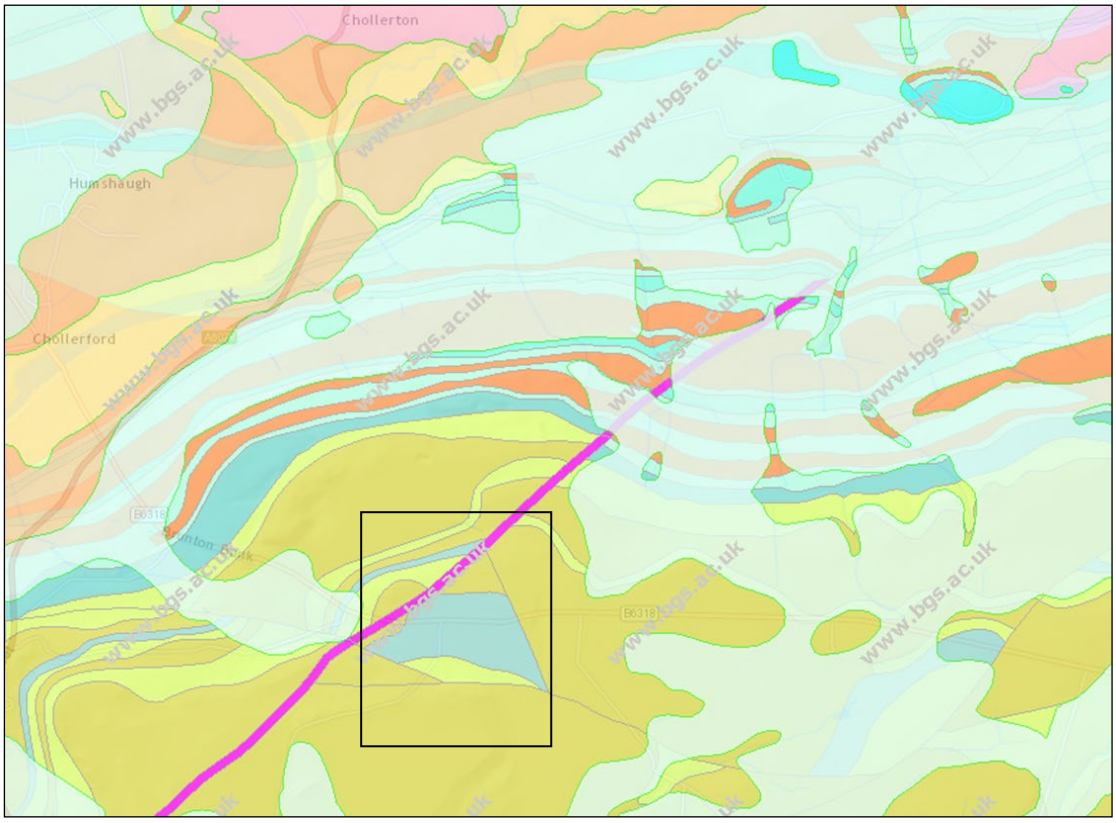
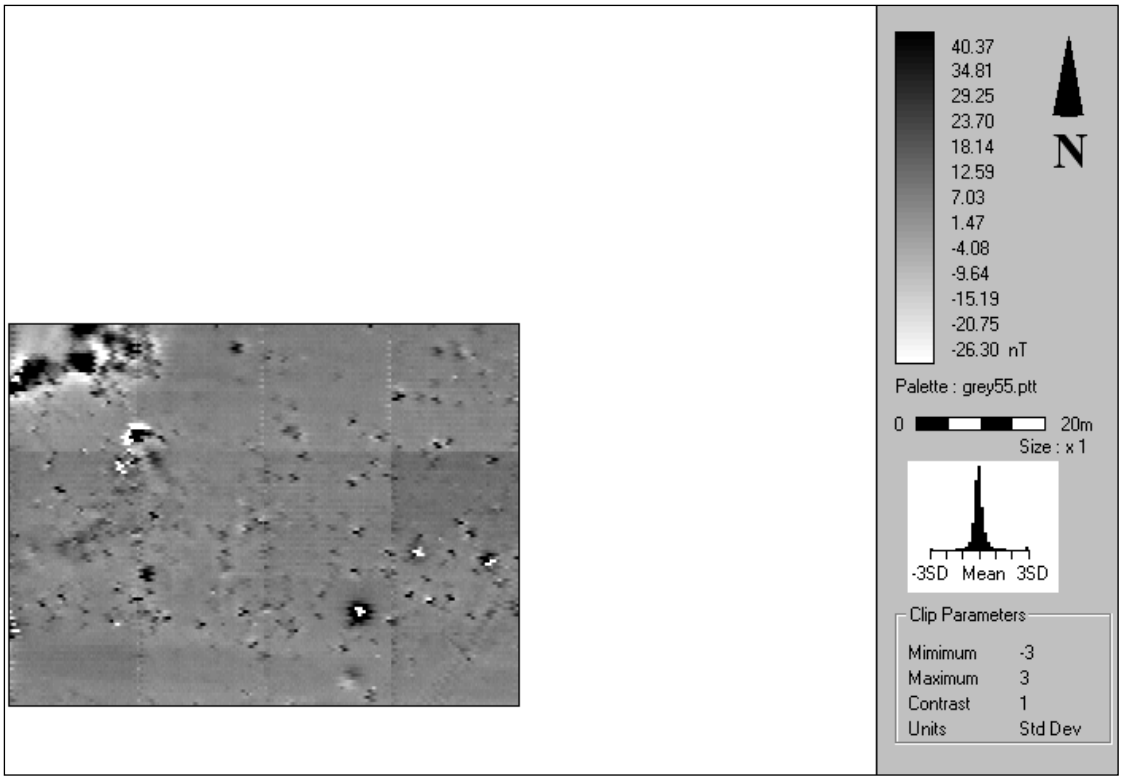
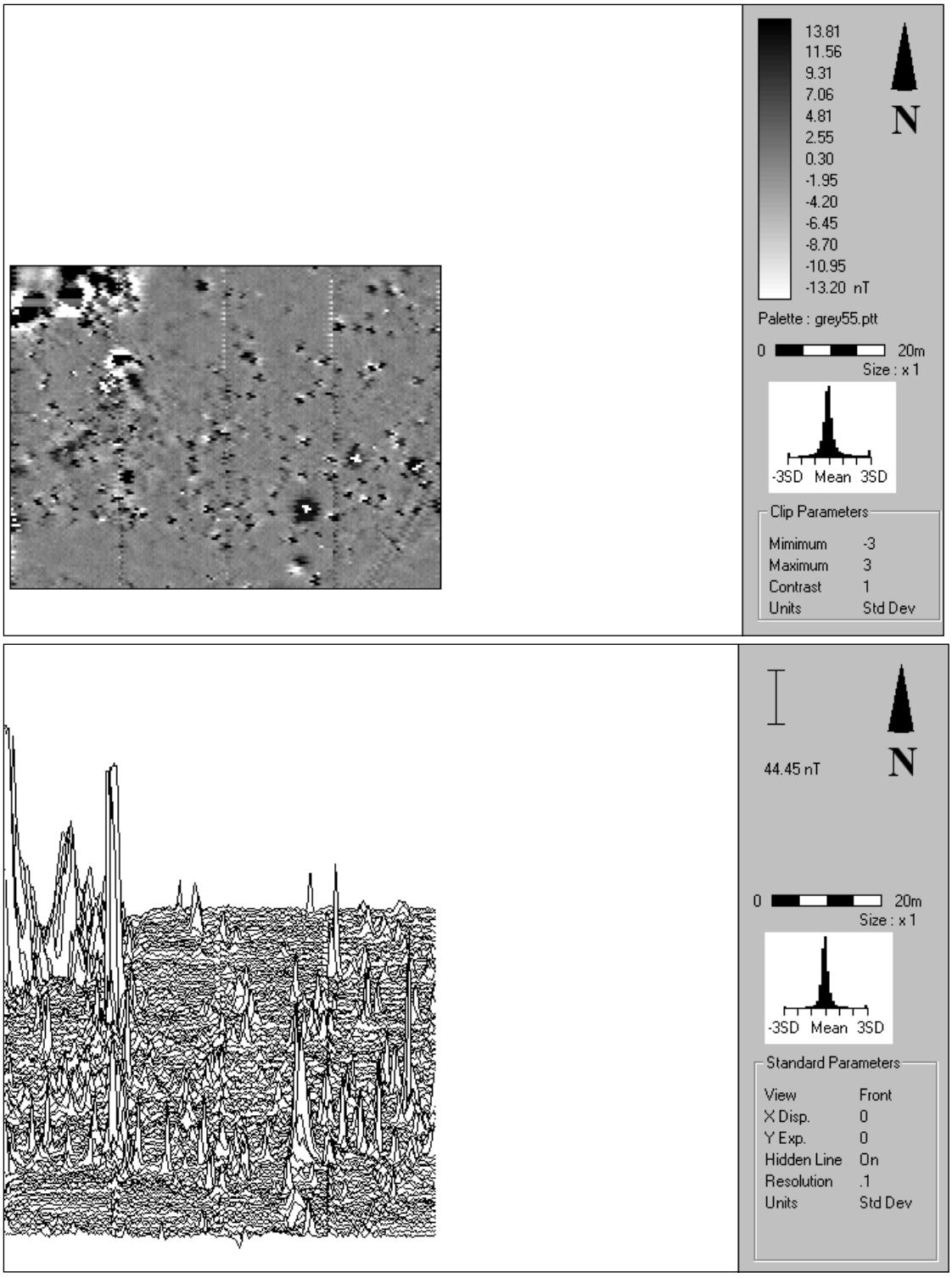


Fig 12: Geology Survey of Heavenfield area showing, in red stripe, the intrusive Whin Sill running across the site with the approximate area of the surveys outlined

The survey was subsequently extended to the east, to the fields surrounding the current church (Areas 3 and 4).

The image below shows a details of the Area 3 survey (full spread in Figure 16), the top left of the Church field picking up the Whin Sill and at the top right edge the Church wall, with the Whin Sill still dominating and rendering any minor features invisible, with the exception of a faint arc visible in the lower right of the image. This might be a field drain.





Figs 13, 14, 15: detail of Area 3 survey

The image following is a composite of Areas 1, 2 and 3. The strong magnetic anomaly that runs SW-NE across the image is so intense that it drowns out anything less significant. At first glance, the sub-circular high magnetic feature which overlaps the strong diagonal anomaly to its south-east (shown in red) could be archaeological, hence the requirement to return and redo this area with the higher 1Nt setting. The sub-rectangular feature shown in blue, on the southern edge of Area 2, mostly masked

by the diagonal anomaly, might represent the remains of an earthwork. Only trial excavation would address this question.

It appears, then, that the larger of the high magnetic anomalies is a natural intrusion from the Sill.

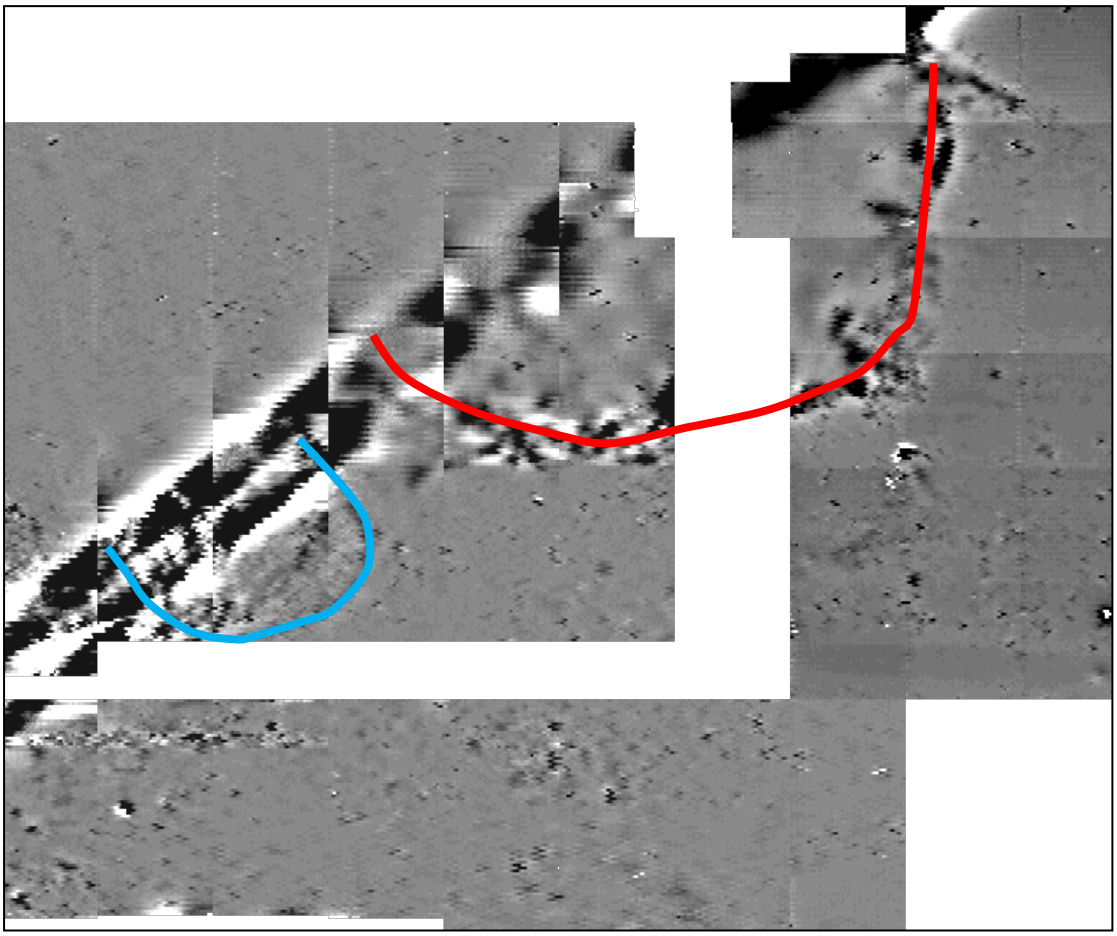


Fig 16: Compsite of Areas 1, 2 and 3

Two further days of survey at Heavenfield were undertaken in the southwest field (Area 5) in 10* 20m grids, and in the church field at its eastern edge (Area 4). The results are displayed below, neither of which indicate any extensive human activity other than farming. In the first image of the south-west field we again pick up the edge of the Whin Sill in the northeast corner. The large positive anomaly closer to the centre is of interest but it is isolated and may be a large piece of modern iron.

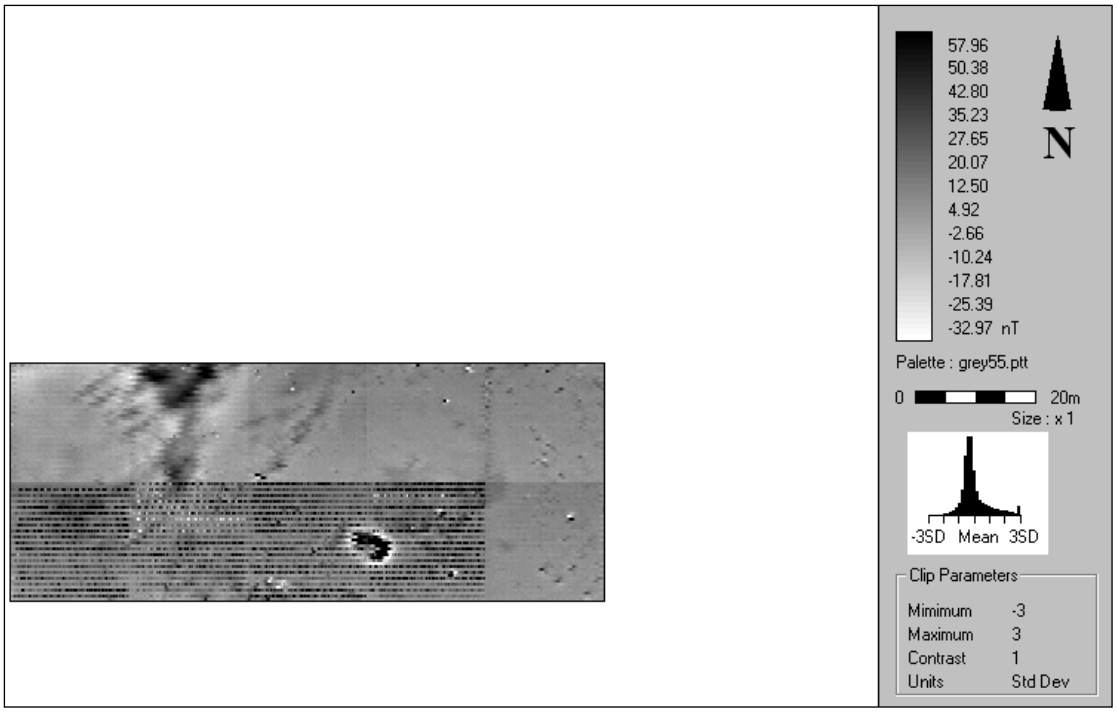


Fig 17: Area 5 survey

This part of the field rises to the north and the thin soil sometimes exposes the natural limestone pavement beneath: that is what we see at the top of the image.

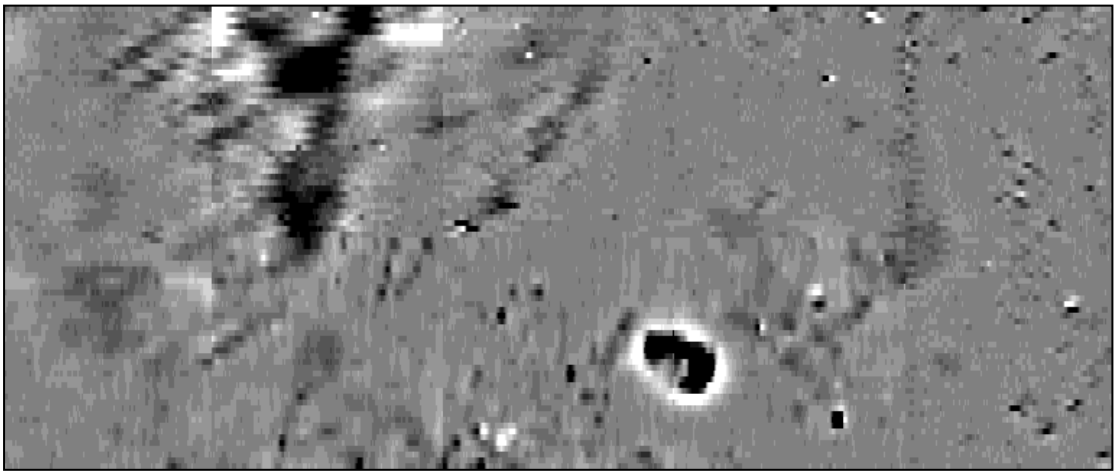


Fig 18: Area 5 survey with errors corrected

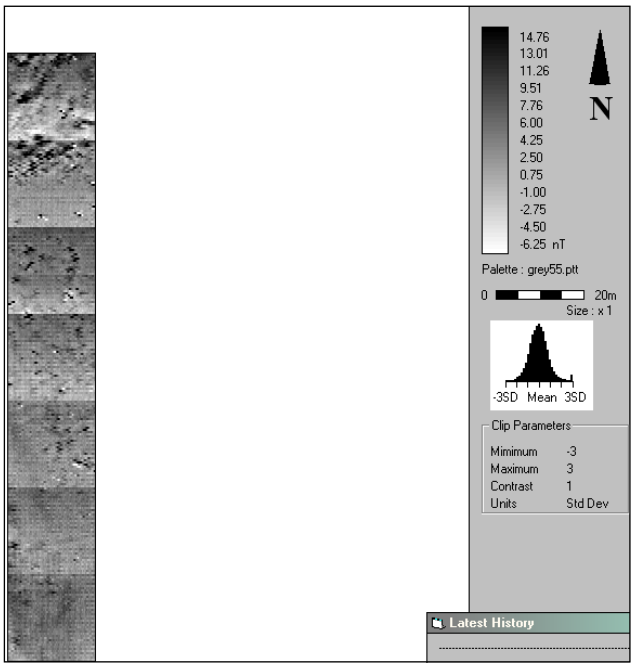


Fig 19: Area 4 survey

Conclusion

The site is enigmatic; other than the intrusive sill and the possible sub-rectangular anomaly in Area 2 it appears archaeologically sterile; the high response of the Sill renders any subtle features undetectable. It is possible that more extensive survey would identify archaeological features. However, even possible traces of the line of the Stanegate projecting south-west from the line of dere Street would coincide directly with the Sill.

This report will be published on www.bernicianstudies.eu.

References

Adams, M. 2013. *The King in the North: the life and times of Oswald of Northumbria*. Head of Zeus.

O'Brien, C. and Adams, A. *Cultural Landscapes of Inishowen: some preliminary results*. Paper delivered at conference 'Making Christian Landscapes', University of Cork, September 2012 and written paper in preparation for O'Carragain T and Turner S (eds) *Making Christian Landscapes in Atlantic Europe*. University of Cork Press 2016f

Colgrave, B. and Mynors, R. 1965. *Bede's Ecclesiastical History*. OUP
O'Sullivan, D. and Young, R. 1995 *The English Heritage Book of Lindisfarne Holy Island.* Batsford.

Woodfield, C. C. 1965 'Six Turrets on Hadrian's Wall.' *Archaeologia Aeliana*[4], 43, 87-200.

Appendix 1: Licence application and proposal

Application for a Section 42 Agreement Under the Ancient Monuments and Archaeological Areas Act 1979

For magnetometry survey in the vicinity of Hadrian's Wall Turret 25B, at Heavenfield, Northumberland NY 9369

Submitted by Colm O'Brien and Max Adams

On behalf of The Bernician Studies Group

June 2014

1: Proposal

To carry out a non-invasive geophysical survey with a Geoscan FM256 Fluxgate Gradiometer and data processing with Geoplot 3 software in an area in the immediate vicinity of Monument 26049, Hadrian's Wall Turret 25b at Heavenfield, Northumberland, NGR NY9369.

- See Fig 1 for the boundaries of the proposed survey area.
- See Appendix 1 for specification for field method and data processing.

2: Research Rationale

2.1: Historical Context

In Book 3 Chapter 2 of the *Ecclesiastical History (Eccl Hist)*, the Venerable Bede gives an account of the arrival in the year 642 of Oswald at the place called Heavenfield, on the north side of the wall 'with which the Romans once girded the whole of Britain from sea to sea', that is Hadrian's Wall. Here, before engaging in battle with Caedwalla to regain his kingdom, Oswald set up a wooden cross which, by the later 7th century, was acknowledged as a cult object with healing properties. Following the successful outcome of the battle, Oswald established a monastic missionary centre on the island of Lindisfarne (Holy Island) in the Northumbrian coast, under the episcopacy of Aidan who had been sent out from the Irish Dal Riatan monastery of Iona, as described in *Eccl. Hist* 3.3 (Colgrave and Mynors, 1969, 214-219 and 208-221).

2.2: Landscape Context

In a recent study of Oswald, Max Adams (2013, 156) suggests that a hole cut through the floor on Turret 25b, at a late stage in the stratigraphic sequence, as observed in the

excavations of C. C. Woodfield (Woodfield 1965), might have been the foundation pit cut for Oswald's cross.

Fig 1: Heavenfield, satellite view

Adams further notes (2013, 160-7) that, according to Bede, (*Eccl Hist* 3.5), Aidan's successful mission was not the first to be sent from Iona, but that an unsuccessful venture had preceded it. This venture, he suggests, might have been led by Ionan monks accompanying Oswald's army on its campaign of re-conquest, and that they might have set up a monastery immediately after the victory around the site of the cross and modelled on their own home base. In this context, Adams draws attention to a distinctive patterning in the field boundaries around Turret 25b, both east and west, and both north and south of the line of Hadrian's Wall and the B6318 road which originated as the Military Road engineered by General Wade in 1746. (2013, 164-5).

Within a landscape setting in which many of the fields are rectangular with straight edges, a block of four fields, with Turret 25b towards the right centre, stands out as describing a sub-rectangular outline with rounded corners (see Fig 1). The total area, of some 6 hectares, and the length-breadth proportions are similar to those of the known monastic enclosure on Iona and of those reconstructed for Lindisfarne/Holy Island by Rob Young and Deirdre O'Sullivan (O'Sullivan and Young 1995, 41, fig 21). Adams therefore proposes the hypothesis that the shape in the field boundaries preserves the outline of an early monastic precinct established by the first unsuccessful Ionan mission to Northumbria.

3: Research Proposal

Adams observes (2013, 164) that

> *without at least a geophysical survey it is impossible to determine how old this enclosure is or what it enclosed, except that it must predate the Jacobite rebellion of 1745 because it is neatly bisected by General Wade's military road.*

The research proposal here put forward is therefore to carry out the geophysical survey needed to pursue Adams' hypothesis, according to the methods defined in Appendix 1, by testing for boundary features, sub-divisions of space, structural features and other indications of occupation.

The terrain of the proposed survey area (Fig 1) is variable. Much is easily accessible for survey, particularly south of the road; there are some obstructions in the north-west quadrant, with some broken ground, field walls and the presence of the Hadrian's Wall ditch. Overall, our assessment is that a reasonably comprehensive coverage is possible.

4: Permissions

The land is held by Mrs Eve Reay of St Oswald's Farm, Wall NE46 4HB and farmed within the family. At a meeting with Max Adams and Colm O'Brien on 19June 2014 Mrs Reay agreed to allow access for geophysical survey as proposed in this application, subject to permission from English Heritage.

5: Reporting

4.1: A Report of Survey will be submitted to English Heritage and to the Northumberland Historic Environment Record within two months of completion of fieldwork.

4.2: Depending on the results of the survey, a report may be prepared and offered for publication in *Archaeologia Aeliana* or another appropriate journal.

6: The Bernician Studies Group

The Bernician Studies Group is a seminar and research group which originated within a University Lifelong Learning setting and which is now constituted as in the UK as a charity.

Insurance cover is provided by Aviva Insurance Ltd under its Aviva Archaeology & Heritage Combined Insurance policy no SO/005065. This provides for Public and Products Liability of £2,000,000.

The Group's studies, scholarly activities, and its fieldwork standards and practices are conducted under the guidance of its Research Directors, Max Adams and Colm O'Brien.

The Group has initiated a project in the Republic of Ireland, *The Inishowen Early Christian Landscapes Project*, within which it has conducted conducted two fieldwork seasons (2012 and 2013). Within this project, the Group has conducted full magnetometry survey at the early ecclesiastical centres of Carrowmore and Clonca, Co. Donegal and an evaluation survey at the ecclesiastical centre of Cooley, Co.

Donegal, in all cases under licence from the Department of Arts, Heritage and the Gaeltacht of the Irish Republic.

Publications arising from the Inishowen Project:
Adams, M. and O'Brien, C. 2013 *A geophysical survey at Carrowmore Ecclesiastical Complex, Inishowen, August 2012.* Donegal Annual Vol 65: 5-8

O'Brien, C. and Adams, A. *Cultural Landscapes of Inishowen: some preliminary results*. Paper delivered at conference 'Making Christian Landscapes', University of Cork, September 2012 and written paper in preparation for O'Carragain T and Turner S (eds) *Making Christian Landscapes in Atlantic Europe*. University of Cork Press 2014, forthcoming.

Adams, M., Haycock, D., O'Brien, C., Pennie, J., Tipping, R. *Archaeological excavation, survey and environmental evaluation in North Inishowen, 2013: Interim report for the Department of Arts, Heritage and the Gaeltacht.*

Early Christian Landscape of Inishowen: Results of Fieldwork 2012 and 2013. Web publication at
http://www.bernicianstudies.eu/wp-content/uploads/2014/03/Inishowen-Fieldwork-Report.pdf

The Bernician Studies Group is currently engaged on magnetometry survey on behalf of Beamish Museum. This work is at an early stage.

APPENDIX 2: METHODS OF GEOPHYSICAL SURVEY

Phase 1 Initial Evaluation Investigation
Following a comprehensive mapping and written sources exercise, an area will be delimited for initial field walking and geophysics.
The Group's standard for Evaluation Geophysics consists of setting up 20 metre by 20 metre square grids aligned North – South over areas identified by field walking and the mapping exercise. The FM256 Fluxgate Gradiometer set at 1nanoTesla (nT) sensitivity, balanced and aligned as per English Heritage *Geophysical Survey in Archaeological Field Evaluation* Standards. A zig-zag survey is undertaken by experienced group members, with readings every 0.125m on a traverse of 1m.

Phase 2 Geophysical Survey
If the Initial Evaluation indicates a need for a comprehensive Geophysical Survey then it is undertaken using the following Group standard.
A base line is set up across the whole site at the widest point for a N-S or an E-W alignment. From this base line 20m by 20m square grids aligned N – S and E-W are set up over the area. If this survey indicates that there may be archaeology between the edges of the squares and the site boundary then these partial grids may be included within the overall survey area up to 1m from the boundary edge. The FM256 Fluxgate Gradiometer set at 0.1(nT), a higher sensitivity than the evaluation. The FM256 is balanced, aligned and zeroed against drift as per English Heritage *Standards for Geophysical Survey*. A zig-zig survey is undertaken, with readings every 0.125m on a traverse of 0.5m. Although on very smooth flat sites of less than 2,000 square metres the group is capable of undertaking surveys with a traverse interval of 0.25m.

Phase 3 Post Survey Processing
Survey data are processed using Geoplot 3 software.

It is the group's aim to limit data processing to the barest minimum necessary. Therefore, as well as adhering to English Heritage Standards, processing is normally restricted to the following procedures:
Despiking, Clipping, Edge Matching and X & Y Extrapolation
Graphics are limited to Greyscale and 1 other appropriate colour representation.

Raw data, pre-processing, are retained in archive for reference.

This report will be posted to the Berncian Studies website.

Sample grid layout form: Field 1