ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Dr David Petts
Durham University

Margrove Park
Saltburn-by-the-Sea
Teesside

geophysical survey

report 3451
July 2014

Durham University

Contents

Figures

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1. Summary

The project

1.1 This report presents the results of a geophysical survey conducted as part of ongoing research into the history of Heartbreak Hill work camp at Margrove Park, Saltburn-by-the-Sea, Teesside. The works comprised detailed geomagnetic survey of five areas totalling 1.2ha.

1.2 The works were commissioned by Dr David Petts of the Department of Archaeology at Durham University and conducted by Archaeological Services Durham University.

Results

1.3 Several areas of disturbed ground or dumped materials were detected.

1.4 No features of likely archaeological significance were identified.

2. Project background

Location (Figure 1)

2.1 The survey area was located at Margrove Park, Saltburn-by-the-Sea, Teesside (NGR centre: NZ 65627 16037). Five surveys totalling 1.2ha were conducted in five land parcels.

2.2 To the north was open countryside; to the east was a forest; to the south was open land with the village of Margrove Park beyond; and to the west was Margrove Road with open countryside beyond.

Objective

2.3 The principal aim of the surveys was to assess the nature and extent of any sub-surface features of potential archaeological significance, particularly any that might be associated with the Depression era work camp known as Heartbreak Hill. The surveys contribute to ongoing research directed by Dr David Petts at Durham University.

Methods statement

2.4 The surveys have been undertaken in accordance with instructions from Dr Petts and national standards and guidance (see para. 5.1 below).

Dates

2.5 Fieldwork was undertaken on 27th May 2014. This report was prepared for July 2014.

Personnel

2.6 Fieldwork was conducted by Patricia Edwards and Natalie Swann (supervisor). The geophysical data were processed by Natalie Swann. This report was prepared by Richie Villis with illustrations by David Graham and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.7 The site code is **SMP14**, for **S**altburn **M**argrove **P**ark 20**14**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-181402**.

Acknowledgements

2.8 Archaeological Services Durham University is grateful for the assistance of the landowners and tenants in facilitating this scheme of works.

3. Historical and archaeological background

3.1 Dr David Petts of Durham University is currently conducting research into the Great Depression era work camp known as Heartbreak Hill, at Margrove Park in Teesside. The following information is taken principally from three local history websites: http://republic-of-teesside.blogspot.co.uk/2012/08/from-heartbreak-hill-to-todays-high.html; http://charltons-

history.wikispaces.com/Royal+visit+to+the+Charltons+area+in+1933; and http://www.hidden-teesside.co.uk/2010/08/02/heartbreak-hill/.

3.2 During the Great Depression between 1929 and 1933 most of the Cleveland mining industry collapsed, with unemployment rates reaching highs of 91% in 1934 in the area served by the Saltburn Labour Exchange. Land was purchased by Major James Pennyman near the mining communities of Margrove Park, Boosbeck and Lingdale. The land was cultivated as work camps to provide alternative employment for the ex-miners and their families.

3.3 A royal visit from HRH Prince George in 1933 was reported in the local press: "The market garden which unemployed miners at Boosbeck are wreting from the rough moorland called Heartbreak Hill greatly impressed the Prince. He inspected the allotments and hen runs and was introduced to Rebecca, the pig, and Daisy, the goat. The men lined up and gave him a warm welcome." (*Northern Echo* 17th February 1933). The same article also mentions 60 men directly involved with the scheme and a flourishing poultry business. The intention of the scheme, to provide work for the unemployed through working the land and selling the produce, was summed up by Major Pennyman: "Here we have an answer to those who say that the unemployed are umemployable." (*ibid.*).

3.4 David Walsh describes the work as "gruesome", claiming that the unemployed were coerced into breaking stones to cultivate the moorland. A film of Heartbreak Hill at the time has been described as showing the "...degradation of making unemployed miners perform..." and "...the cloying condescension shown by the powers-that-be to the unemployed, with the implication that part of the reason for their joblessness is 'lack of character and physique'." (http://republic-of-teesside.blogspot.co.uk/2012/08/from-heartbreak-hill-to-todays-high.html).

4. Landuse, topography and geology

4.1 At the time of survey the study area comprised five fields of ungrazed pasture, with various tracks, animal feeders, rock outcrops and standing structures.

Area	Size (ha)	NGR
1	0.40	NZ 65616 15954
2	0.08	NZ 65548 15970
3	0.17	NZ 65598 16025
4	0.29	NZ 65617 16074
5	0.26	NZ 65637 16126

4.2 The survey area was predominantly level with a mean elevation of approximately 125m OD.

4.3 The underlying solid geology of the area comprises Jurassic strata of the Whitby Mudstone Formation, which are overlain by Devensian glaciofluvial sand and gravel in the north and Devensian till in the south (BGS 2014).

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) *Standard and Guidance for archaeological geophysical survey* (2011); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

Technique selection

5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.

5.3 In this instance it was considered likely that cut features such as ditches and pits might be present on the site, and that other types of feature such as trackways, wall foundations and fired structures (for example kilns and hearths) might also be present.

5.4 Given the anticipated shallowness of targets and the non-igneous geological environment of the study area a geomagnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

5.5 A 30m grid was established across each survey area and related to the Ordnance Survey National Grid using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 10mm accuracy.

5.6 Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601-2 dual fluxgate gradiometers. A zig-zag traverse scheme was employed and data were logged in 30m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid unit.

5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw (minimally processed)

data. The greyscale images and interpretations are presented in Figures 2-4; the trace plots are provided in Figure 5. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to each dataset:

clip	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
zero mean traverse	sets the background mean of each traverse within a grid to zero; for removing striping effects in the traverse direction and removing grid edge discontinuities
de-stagger	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
interpolate	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

Interpretation: anomaly types

5.10 A colour-coded geophysical interpretation plan is provided. One type of geomagnetic anomaly has been distinguished in the data:

dipolar magnetic	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths

Interpretation: features

5.11 A colour-coded archaeological interpretation plan is provided.

5.12 Small, discrete dipolar magnetic anomalies have been detected in all of the survey areas. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments, and in most cases have little or no archaeological significance. A sample of these is shown on the geophysical interpretation plan, however, they have been omitted from the archaeological interpretation plan and the following discussion.

Area 1

5.13 A number of dipolar magnetic anomalies have been detected across this area. It is considered likely that these reflect ground disturbance or dumped materials. The concentration detected in the north-west corner of the area surrounds a pond feature, and may reflect the backfilled material of a previously larger body of water.

5.14 A linear strong dipolar magnetic anomaly has been detected at the south-west corner of the area. This runs north-west into a larger concentration of dipolar magnetic anomalies, which continues into Area 2. This is likely to reflect an area of disturbed ground or dumping.

5.15 Strong dipolar magnetic anomalies detected at the north and south edges of the area correspond to metal fences bounding the area. A brick rubble and clinker track ran along the south of the area, beyond the fence, and this also is reflected by the dipolar anomalies detected here.

5.16 Small unsurveyed parts of the field correspond to obstacles noted on the ground, including rocky outcrops, trees and rubbish dumps.

Area 2

5.17 A concentration of strong dipolar magnetic anomalies has been detected across most of this area and continues east into Area 1. It is likely that these anomalies reflect an area of disturbed ground or dumping, possibly associated with the construction of the adjacent road or track.

Area 3

5.18 Many small discrete dipolar magnetic anomalies have been detected across this area, which probably reflect a high concentration of near-surface fired or ferrous debris.

5.19 Strong dipolar magnetic anomalies detected along the north, west and south edges of the area reflect the adjacent metal fences.

Area 4

5.20 Concentrations of dipolar magnetic anomalies have been detected in this area. These are likely to reflect areas of disturbed ground or dumped materials.

5.21 A very large and strong dipolar magnetic anomaly has been detected in the south-east corner of the area; this corresponds to a raised track and metal gate. Large and strong dipolar magnetic anomalies detected in the south-west corner of the area also correspond to a track. Dipolar magnetic anomalies detected along the north and west edges reflect metal fences.

Area 5

5.22 As with the other areas, dipolar magnetic anomalies have been detected across this area. The large and strong anomaly detected in the south of the area is likely to reflect a larger piece of near-surface ferrous material. Dipolar magnetic anomalies detected along the north and west edges reflect the metal fences there. The large and strong dipolar magnetic anomaly detected in the north-east corner of the area reflects the adjacent brick buildings.

6. Conclusions

6.1 Approximately 1.2ha of detailed geomagnetic survey was undertaken at Margrove Park, Saltburn-by-the-Sea, Teesside, as part of ongoing research into the former work camp of Heartbreak Hill.

6.2 Several areas of disturbed ground or dumped materials were detected.

6.3 No features of likely archaeological significance were identified.

7. Sources

David, A, Linford, N, & Linford, P, 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage

BGS 2014 online *Geology of Britain viewer* available from: http://mapapps.bgs.ac.uk/geologyofbritain/home.html accessed 13th June 2014

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People's Republic of Teesside online blog available from: http://republic-of-teesside.blogspot.co.uk/2012/08/from-heartbreak-hill-to-todays-high.html accessed 1st July 2014

Schmidt, A, 2013 *Geophysical Data in Archaeology: A Guide to Good Practice*. Archaeology Data Service & Digital Antiquity, Oxbow

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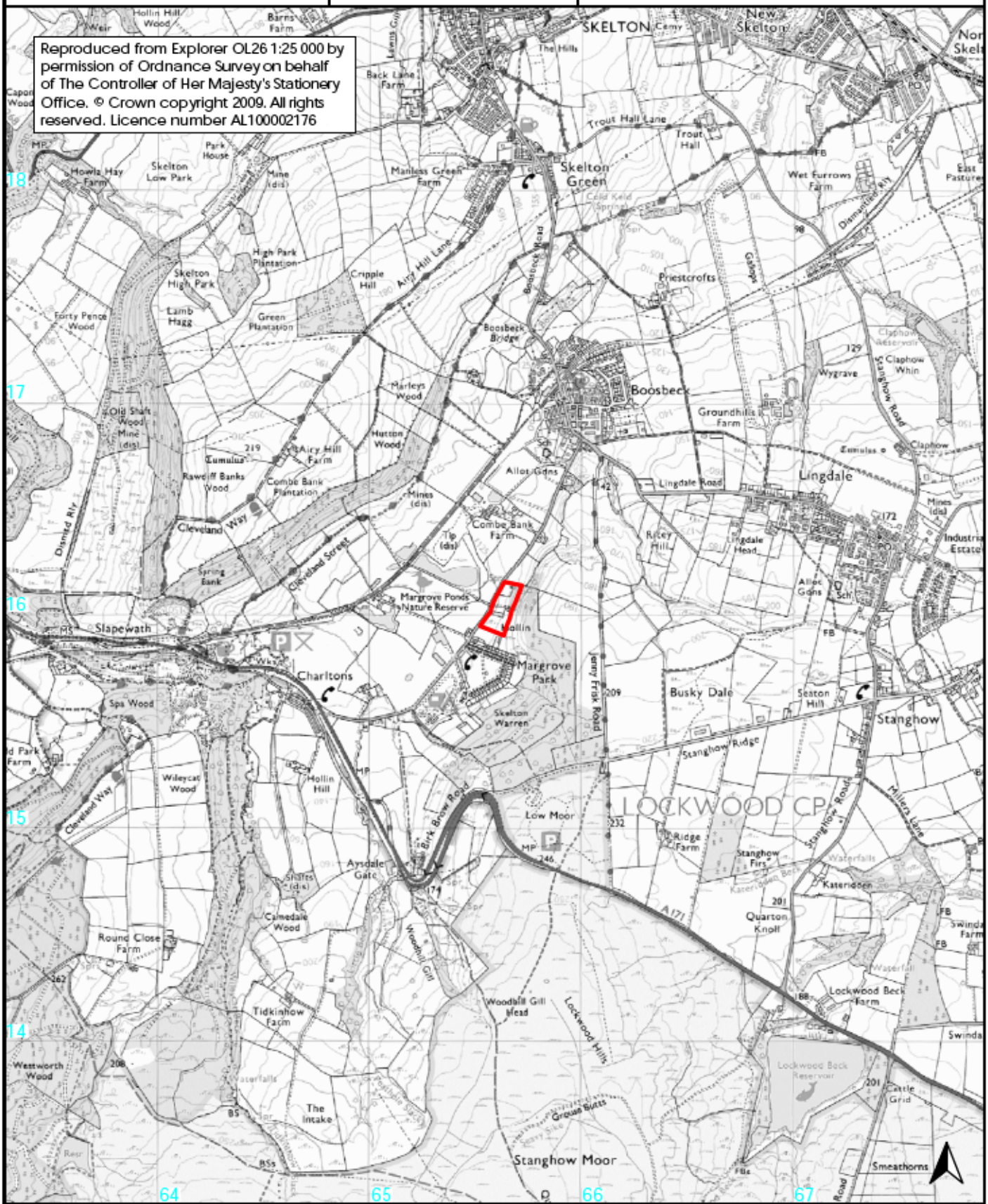
Figure 1: Site location



site location

0 1km
scale 1:25 000 for A4 plot

magnetic survey

-8 nT 8

Spring

Area 5

Area 4

Area 3

Area 2

Area 1

122.2m

125.0m

Holl

Hollin

Den-o-glen

yside

161

160

159

655

656

657

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0 50m
scale 1:1000 for A3 plot

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Figure 2: Geophysical survey

magnetic survey

dipolar magnetic anomaly

Spring

Area 5

Area 4

Area 3

Area 2

Area 1

122.2m

125.0m

Holl

Hollin

Den-o-glen

yside

161

160

159

655

656

657

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0 50m
scale 1:1000 for A3 plot

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Figure 3: Geophysical interpretation

magnetic survey

disturbed area/dumped materials

Spring

Area 5

161

122.2m

Area 4

Holl

Area 3

160

Area 2

Area 1

125.0m

Den-o-glen

yside

Hollin

159

655

656

657

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0 50m
scale 1:1000 for A3 plot

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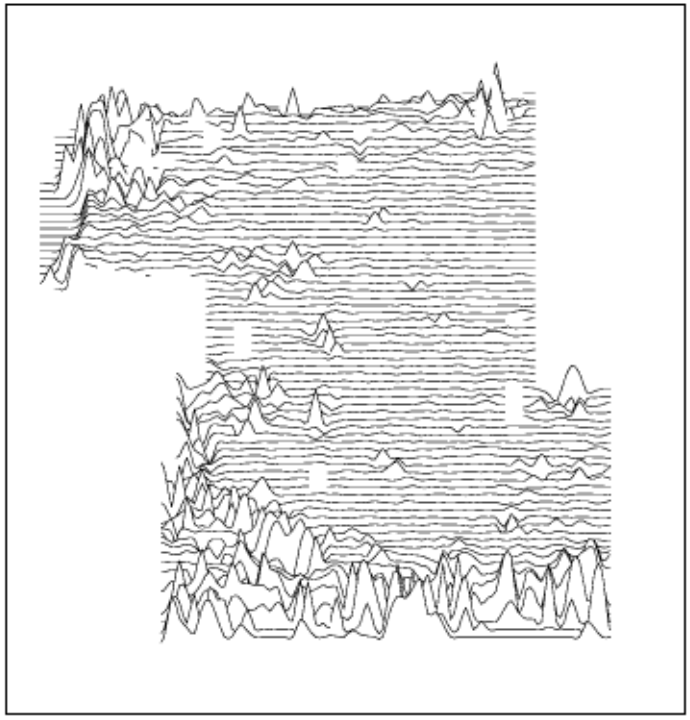
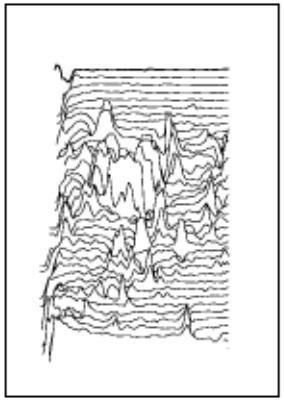
Figure 4: Archaeological interpretation



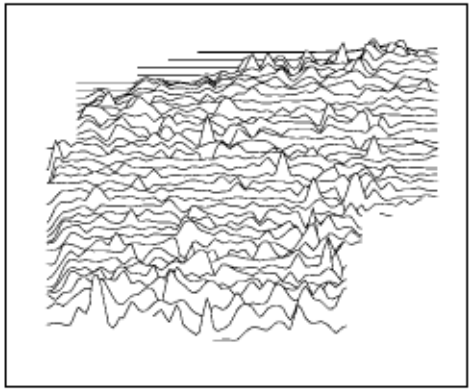
Area 2

237.30nT/cm



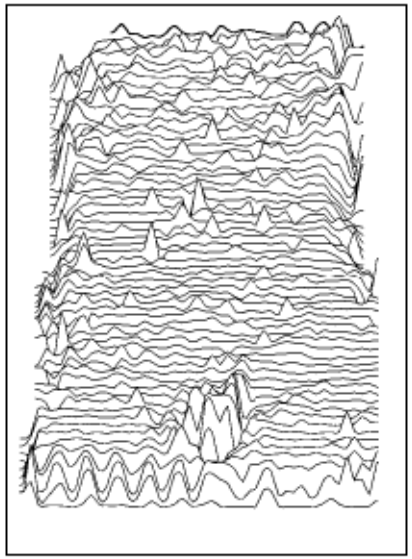
Area 3

54.40nT/cm



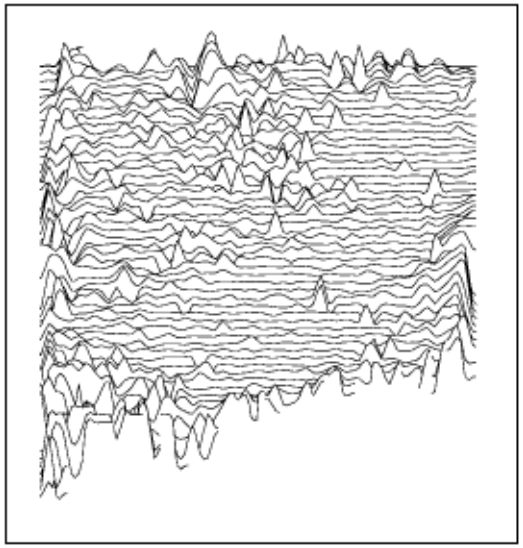
Area 5

51.80nT/cm



Area 1

52.20nT/cm



Area 4

57.00nT/cm

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Figure 5: Trace plots of geomagnetic data

0 50m
scale 1:1000 for A4 plot