Archaeological Services WYAS

Pontefract Castle – Inner Bailey
Pontefract
West Yorkshire

Geophysical Survey

Report no. 2371

August 2012

Client: Wakefield Museum

Registered Organisation IfA

Pontefract Castle – Inner Bailey
Pontefract
West Yorkshire

Geophysical Survey

Summary

A geophysical (earth resistance and magnetometer) survey covering part of the inner bailey at Pontefract Castle was carried out as part of a Heritage Open Day. The primary aim of the survey was to demonstrate to the public the use of the two geophysical techniques but also to compare the results with surveys carried out in the 1980s and 1990s. The resistance survey confirmed the results of previous surveys by identifying rectilinear high resistance anomalies which are thought to represent structural remains. The magnetometer survey was hampered by the density of ferrous material within the topsoil, probably due to the importation of topsoil for liquorice cultivation, but did identify amorphous areas of magnetic enhancement corresponding to the possible structural earth resistance anomalies.

ARCHAEOLOGICAL
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WYAS

Report Information

Client:	Wakefield Museum
Report Type:	Geophysical survey
Location:	Pontefract Castle, Pontefract
County:	West Yorkshire
Grid Reference:	SE 4605 2236
Period(s) of activity represented:	Medieval to modern
Report Number:	2371
Project Number:	8172
Site Code:	PCA10
OASIS ID:	archaeol11-131698
Planning Application No.:	n/a
Museum Accession No.:	
Date of fieldwork:	12th September 2010
Date of report:	June 2012
Project Management:	Sam Harrison BSc MSc AIfA
Fieldwork:	Sam Harrison Alistair Webb BA MIfA
Report:	David Harrison BA MSc MIfA Sam Harrison
Illustrations:	Sam Harrison David Harrison
Photography:	n/a
Research:	n/a

Authorisation for distribution: ---

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ISOQAR ISO 9001:2008
Cert. No. 125QM8003

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Ian Downes, Senior Cultural Initiatives Officer at Pontefract Castle, to undertake a geophysical (magnetometer and earth resistance) survey over part of the Inner Bailey of Pontefract Castle, during a Heritage Open Day. The total area that was surveyed was 0.22 hectares.

Site location and topography (Figs 1 and 2)

The castle is situated in the centre of the town of Pontefract, centred at SE 4605 2236. It is bound by North Baileygate to the north and north-west, by Spink Lane to the south-west and by South Baileygate to the east and south-east.

The land within the bailey is flat and is situated at approximately 54m aOD (above Ordnance Datum).

Soils, geology and land-use

The solid geology comprises Ackworth Division sandstones of the Carboniferous Upper Coal Measures which are cross-bedded and which are known to weather rapidly where they outcrop (Goossens and Smith 1973). Overlying the bedrock is a variable depth of overburden that in places within the Inner Bailey results in the current ground surface being between 2m and 2.5m above the 11th century ground surface (Roberts 1990, 17).

The survey covered the northern section of the Inner Bailey (see Fig 2) and it was carried out on Sunday September 12th 2010 at which time the surveyed area was under short mown grass.

2 Archaeological and Historical Background

Pontefract Castle is a Scheduled Ancient Monument (National Monument No. 13298). The scheduling includes part of a late Saxon cemetery and town ditch, Norman motte and bailey castle and the later medieval enclosure. The Scheduled Area of the castle covers the whole of the area between the castle proper and South Baileygate.

Situated on a prominent hill near major trade routes, Pontefract Castle was an important and imposing stronghold, from the late 11th century until its destruction at the hands of Cromwell's forces in 1649. It enjoyed a reputation as one of the most secure fortresses in Britain and was feared as a place of imprisonment and execution for high ranking nobles.

Between the Civil War and the present day the castle and its grounds have been used for a multitude of purposes including stone quarrying, liquorice growing and sporting recreation.

No conservation or archaeological investigation was carried out on the site until the late 19th century when the castle was converted into a Victorian pleasure park. In the 1960s work was started by the Pontefract and District Archaeological Society that aimed to achieve a greater understanding of the castle remains. This work was continued in the early 1980s with a series of archaeological excavations initiated by the Archaeology Unit of the West Yorkshire Metropolitan County Council. It was at this time that it became official policy to excavate, conserve and display the ruins as an historic monument (Roberts 1990).

Three previous geophysical surveys have been carried out within the Inner Bailey area. The first of these surveys was conducted with a mobile probe spacing of 0.5m and identified high resistance anomalies thought to indicate building remains adjacent to the northern curtain wall and a possible extension to the Norman chapel (Gater *et al* 1982). A low resistance curvi-linear anomaly was also detected in the south-eastern corner of the Inner Bailey that was thought to represent the line of the early motte ditch.

The area encompassing this low resistance anomaly was later surveyed using ground penetrating radar (GPR) (Fenning and Brislin 1993). The results identified reflections indicative of layered soils and strata with the soil/bedrock interface being tentatively identified at a depth of between 2m and 2.5m below current ground level. The survey also identified an infilled ditch with a depth which varied from 3m, along the easternmost traverses, to in excess of 6m in the west, and a width of between 10m and 14m.

In 1998 ASWYAS conducted another resistance survey targeting the inner bailey with an increased mobile probe spacing of 1m. High resistance anomalies were identified within the north-west of the inner bailey and interpreted as being of probable structural origin, perhaps representing a 15th century chapel (Whittingham 2000). An area of low resistance was also identified along the south-western edge of the bailey that was thought to locate the infilled moat that surrounded the 11th century motte and bailey castle.

3 Aims and Objectives

The general aim of the survey was to:

- display to the public detailed earth resistance and magnetometer survey techniques;
- to determine the presence or absence of buried archaeological remains; and
- to provide information about the nature and possible interpretation of any anomalies identified.

Specifically the survey sought to provide information about the nature and interpretation of any anomalies, particularly the presence/absence of any anomalies that could be associated with the castle and its associated structures.

4 Methodology

Magnetometer Survey

A Bartington Grad 601 instrument was used to take readings at 0.25m intervals on zig-zag traverses 1m apart within 20m by 20m grids so that 1600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

Earth resistance survey

A Geoscan RM15 resistance meter was used during the earth resistance survey, with the instrument logging each reading automatically at 1m intervals on traverses 1m apart using a twin probe configuration within 20m by 20m grids so that 400 readings were recorded in each grid. The mobile probe spacing was 1m with the remote probes 15m apart and at least 15m away from the grid under survey. This mobile probe spacing gives an approximate depth penetration of up to 1m for most archaeological features.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey mapping is shown in Figure 1. The site location and scheduled monument area is shown on Figure 2 along with a greyscale image of the previous earth resistance survey data (Whittingham 2000) at a scale of 1:1000, the processed greyscale earth resistance data from the current survey is shown in Figure 3, also at a scale of 1:1000. The processed and 'raw' (unprocessed) earth resistance data from the survey, together with interpretations of the identified resistance anomalies, are presented at a scale of 1:500 in Figures 4, 5 and 6. The processed magnetometer greyscale data, the unprocessed XY trace plot data and interpretation figures are presented at a scale of 1:500 in Figures 7, 8 and 9.

The geophysical survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David *et al.* 2008) and by the Institute for Archaeologists (IfA 2010). All figures reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

Technical information on the equipment used, data processing and earth resistance survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the survey archive.

The figures in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

5 Results and Discussion

Resistance data

The resistance survey has successfully corroborated the results of the previous resistance surveys. The uniformity of the background resistance suggests an even distribution of sub-soil moisture across the site that may be attributable to the homogenous topsoil brought onto the site for liquorice cultivation. Two broad areas of high resistance have been identified within the north of the dataset, towards the north-western curtain wall of the castle, corresponding to high resistance anomalies identified in previous surveys. The linear and angular nature of these anomalies is thought to represent structural remains – in-situ walls/foundations amid broader areas of rubble/tumble or compacted surfaces/floors.

Towards the south of the dataset a faint curvilinear area of low resistance may be of archaeological interest, perhaps representing a curving ditch. The anomaly is ill-defined, however, and interpretation is tentative. It is possible that this anomaly represents a variation in the compaction of the upper soil horizons.

Magnetometer data

The magnetometer data is dominated by a series of linear dipolar (‘iron spike’) anomalies. This type of anomaly is typically caused by ferrous (magnetic) material, either on the ground surface or in the topsoil horizon, which causes rapid variations in the magnetic readings giving a characteristic ‘spiky’ XY trace. The regular layout and intervals between these anomalies is probably indicative of the cultivation of liquorice, or sporting recreation in the Victorian pleasure park.

Magnetic disturbance within the north-east of the dataset is likely to be the result of modern landscaping adjacent to the remains of St Clements Chapel.

Amorphous areas of magnetic enhancement within the north of the dataset correspond to high resistance anomalies indentified and are interpreted as being of possible archaeological origin. Elsewhere, interpretation of the magnetometer data is hampered by the frequency of high magnitude ferrous anomalies and no further responses of archaeological potential have been identified.

6 Conclusions

Resistance survey has successfully confirmed the continued presence of anomalies of archaeological potential within the north-west of the inner bailey at Pontefract Castle. The anomalies were previously identified by earlier geophysical surveys at the site (Gater *et al* 1982; and Whittingham 2000) and are likely to represent structural remains.

Given that the previous earth resistance survey with a probe separation of 1m identified similar anomalies as in the current survey it may be predicted that an increased probe separation may identify further, deeply located anomalies. Technological advances in ground penetrating radar and the processing and display of the data may reveal further information about the survival of structural remains under the overburden.

The magnetometer survey has identified limited amorphous areas of magnetic enhancement which correspond closely to the high resistance anomalies thought to represent structural remains. However, the magnetic anomalies offer no further clarity or definition. A series of dipolar anomalies throughout the survey area thought to attest to the presence of ferrous material incorporated in soils brought to the site for liquorice cultivation.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

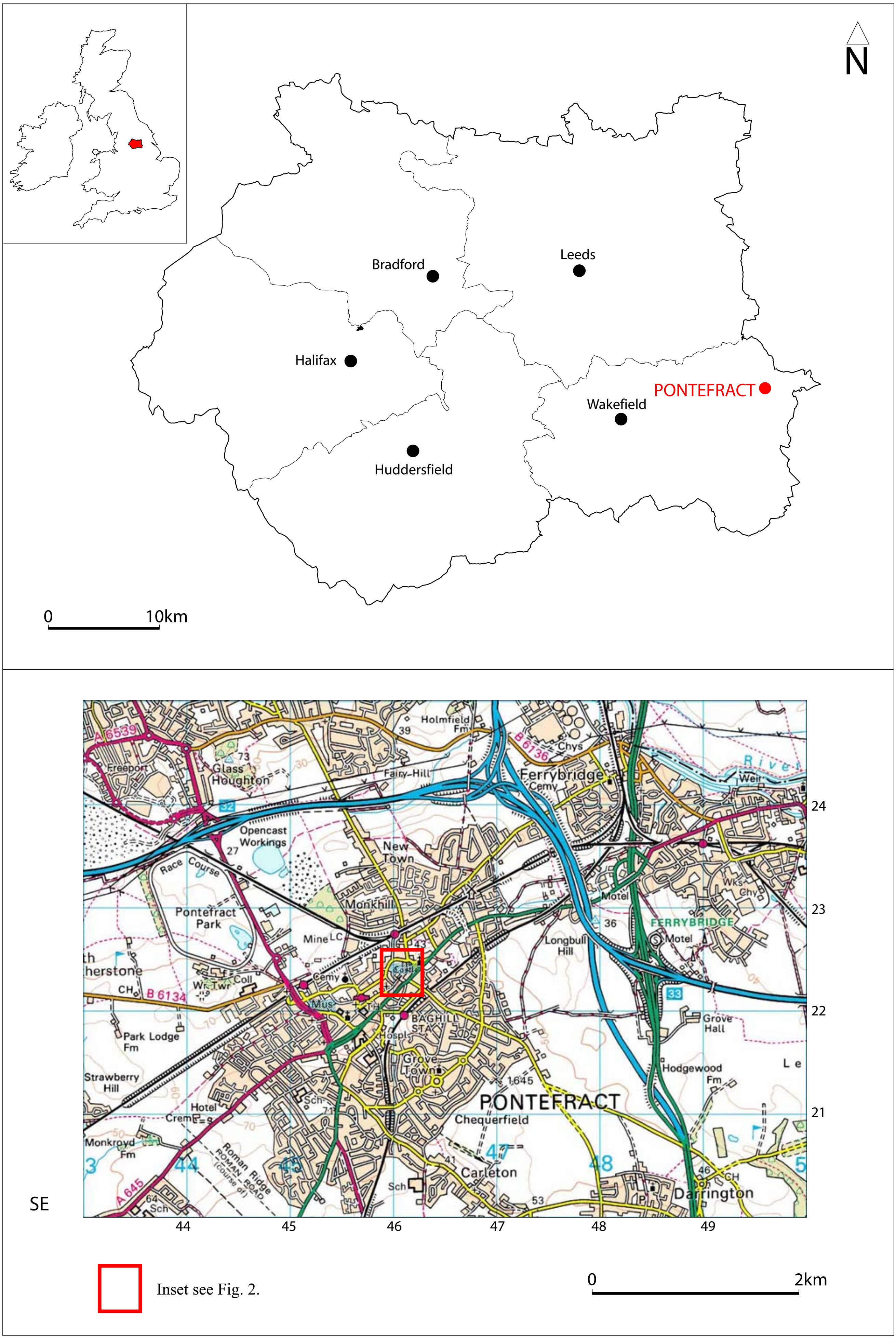

Fig. 1. Site location

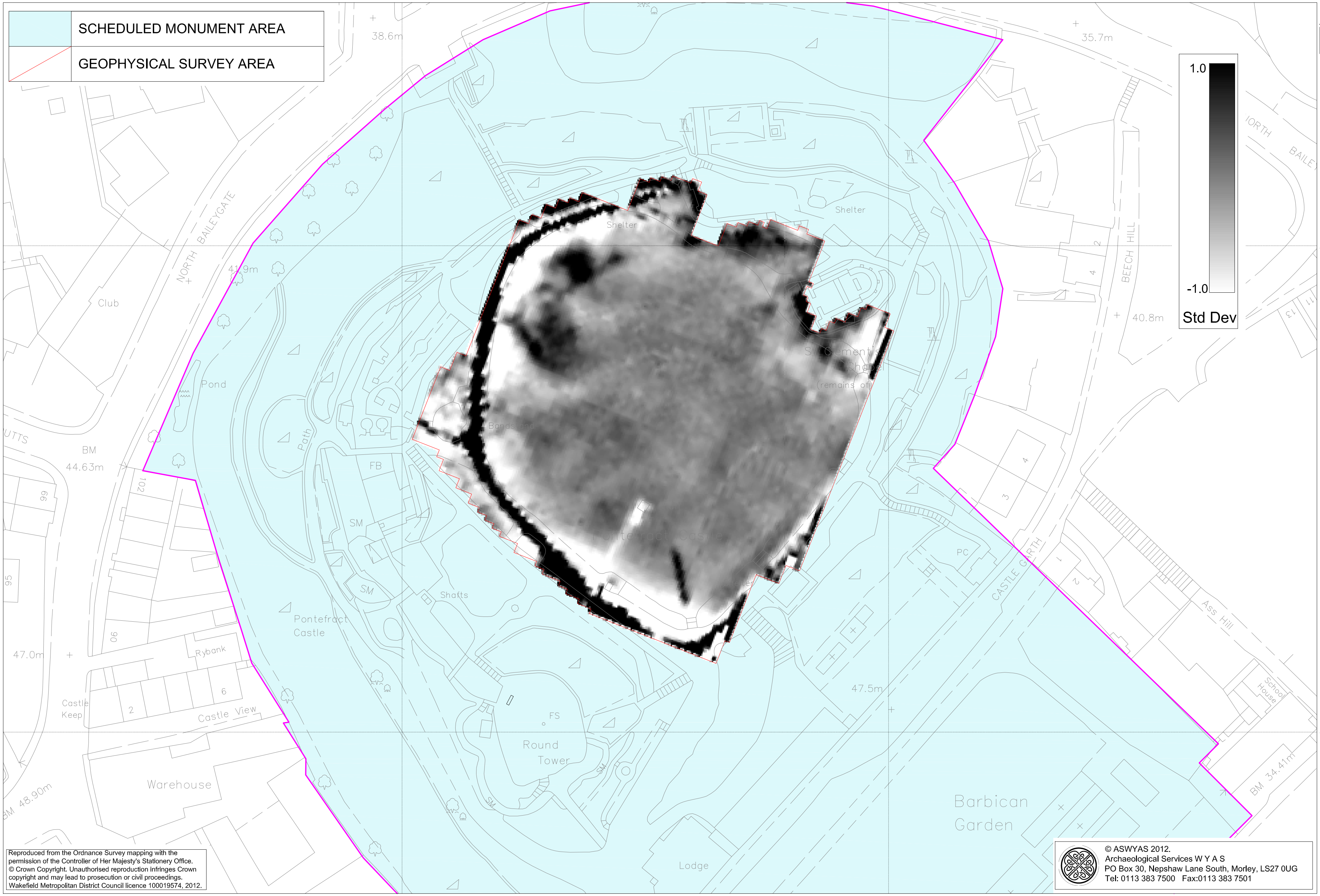

Fig. 2. Previous earth resistance survey (Whittingham 2000) (1:1000 @ A4)

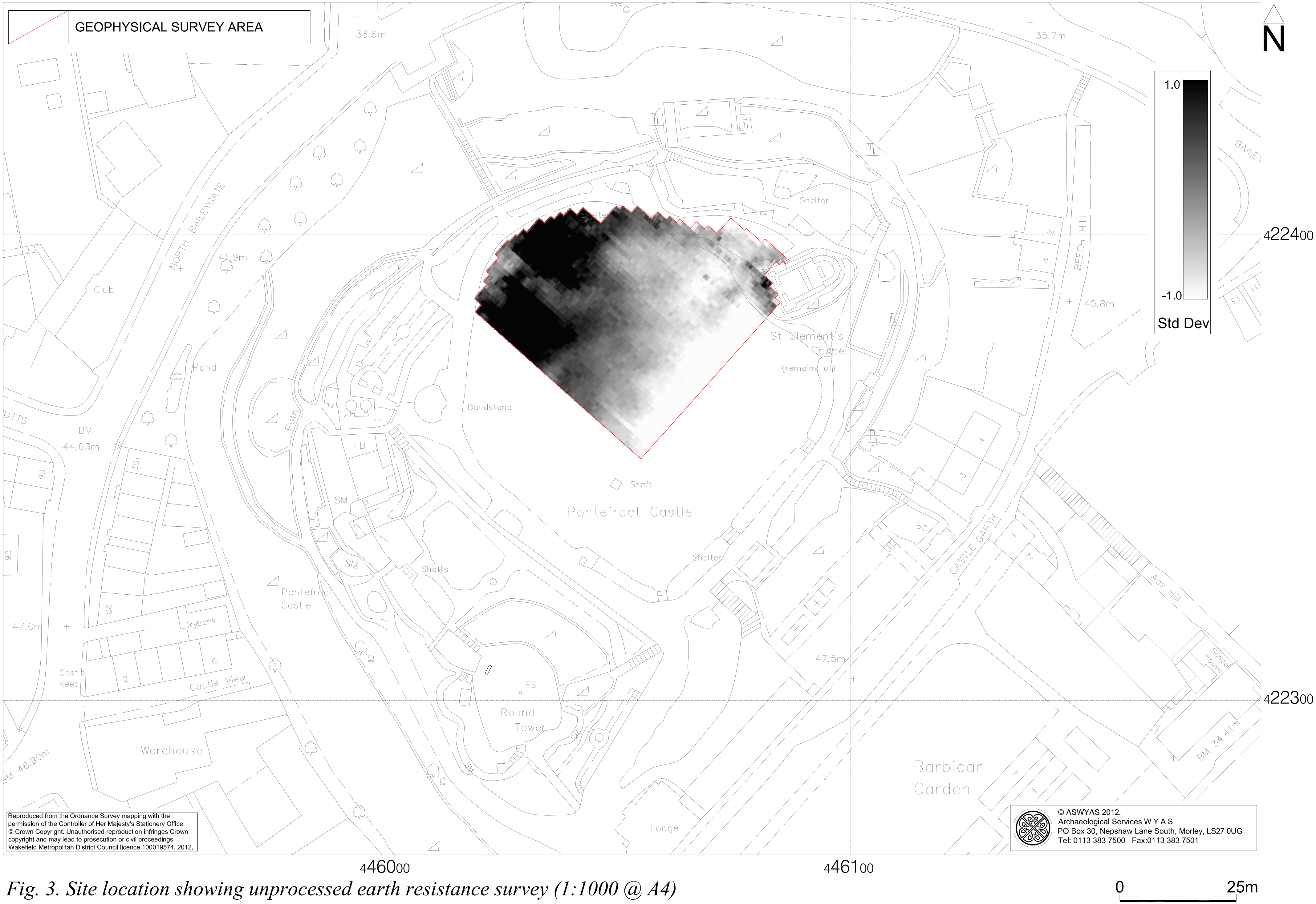

Fig. 3. Site location showing unprocessed earth resistance survey (1:1000 @ A4)

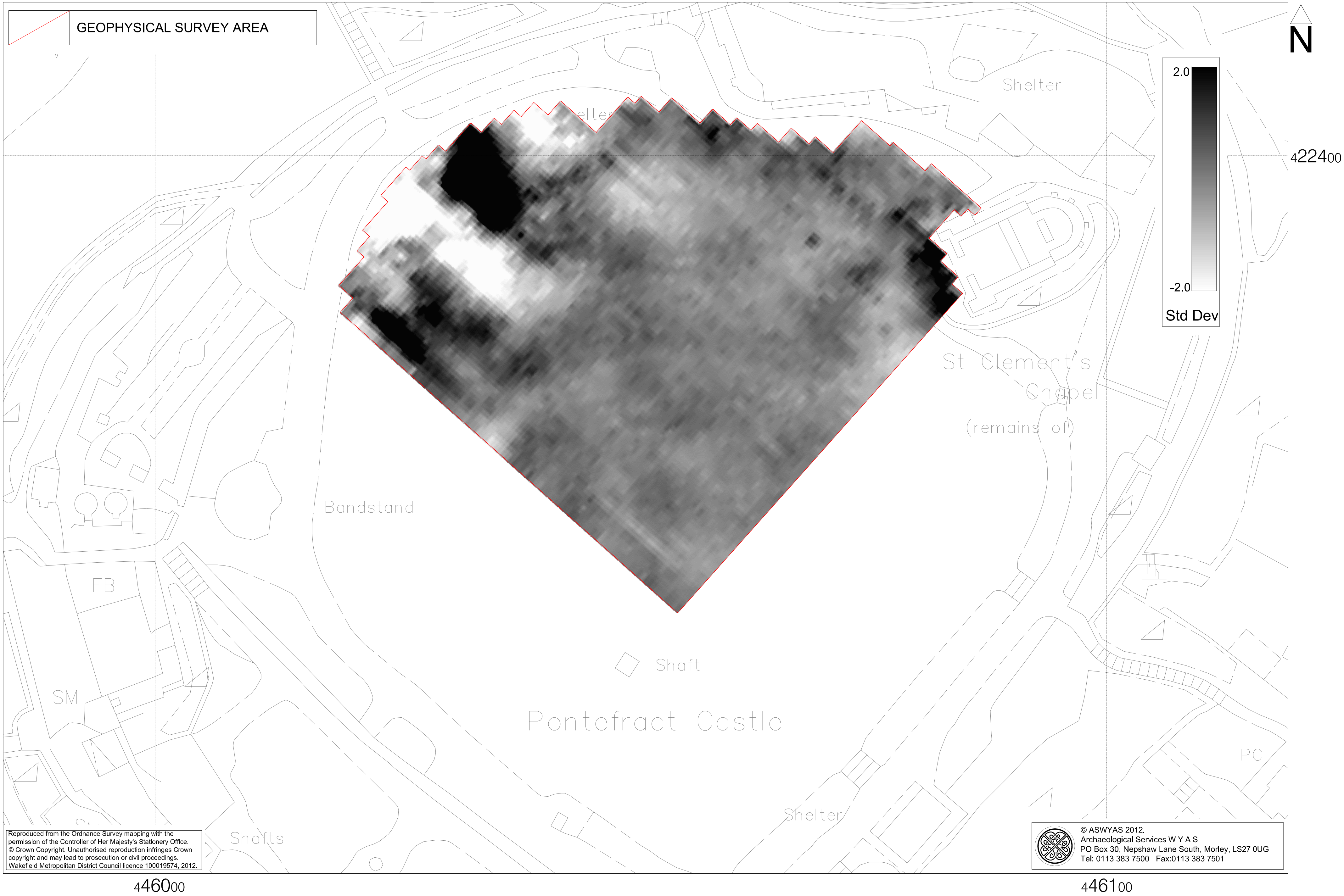

Fig. 4. Processed earth resistance data (1:500 @ A4)

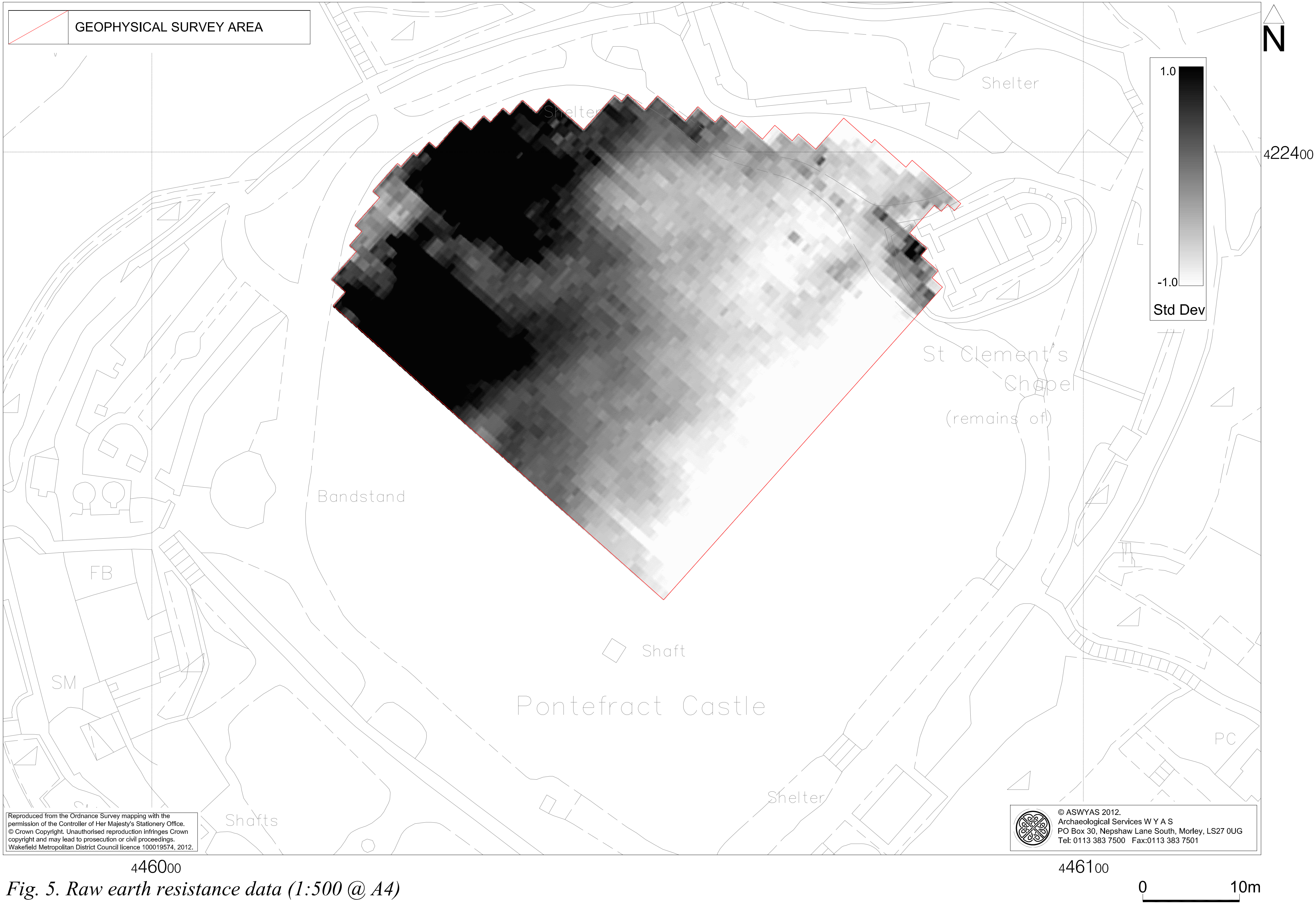

Fig. 5. Raw earth resistance data (1:500 @ A4)

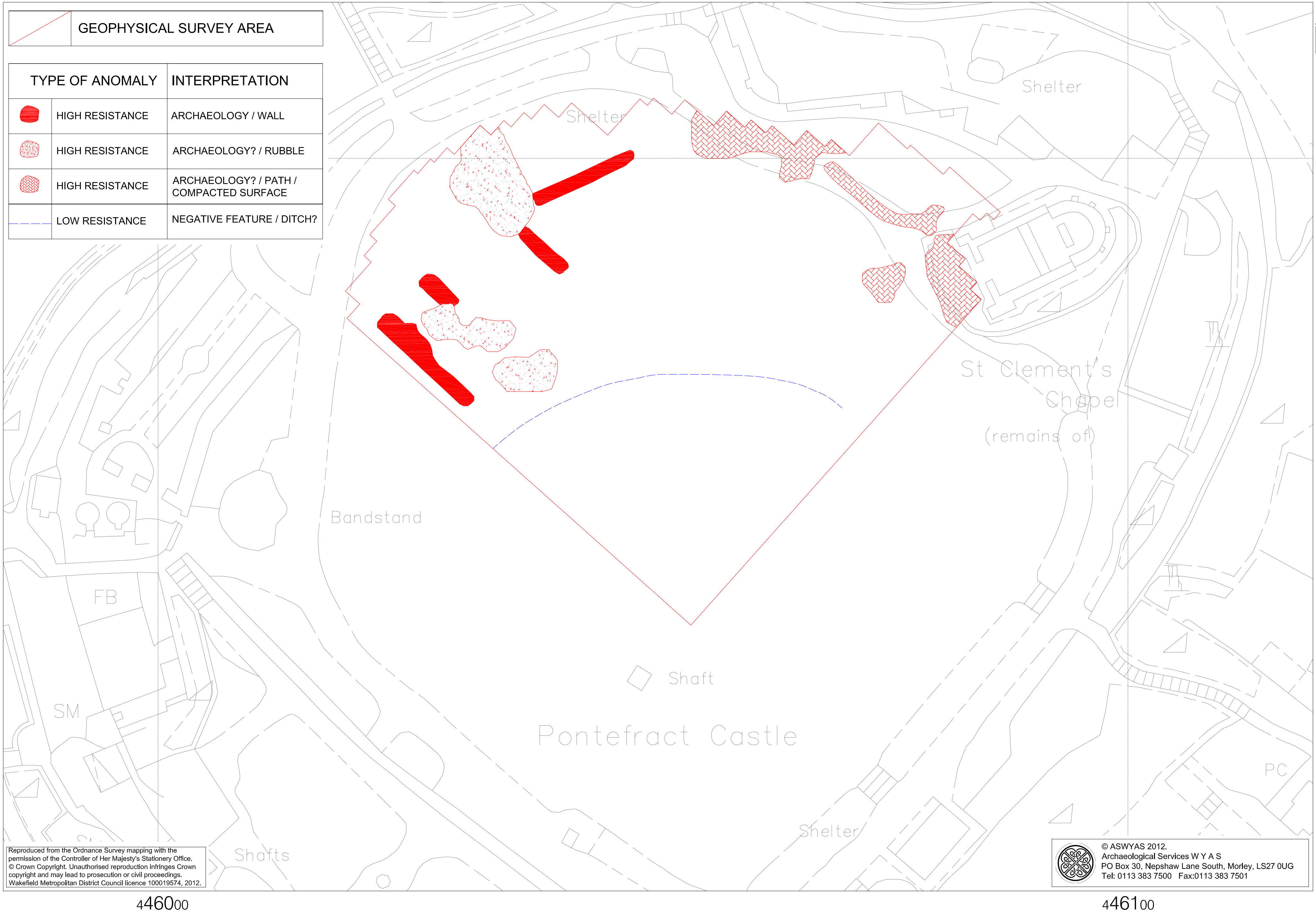

Fig. 6. Interpretation of earth resistance data (1:500 @ A4)

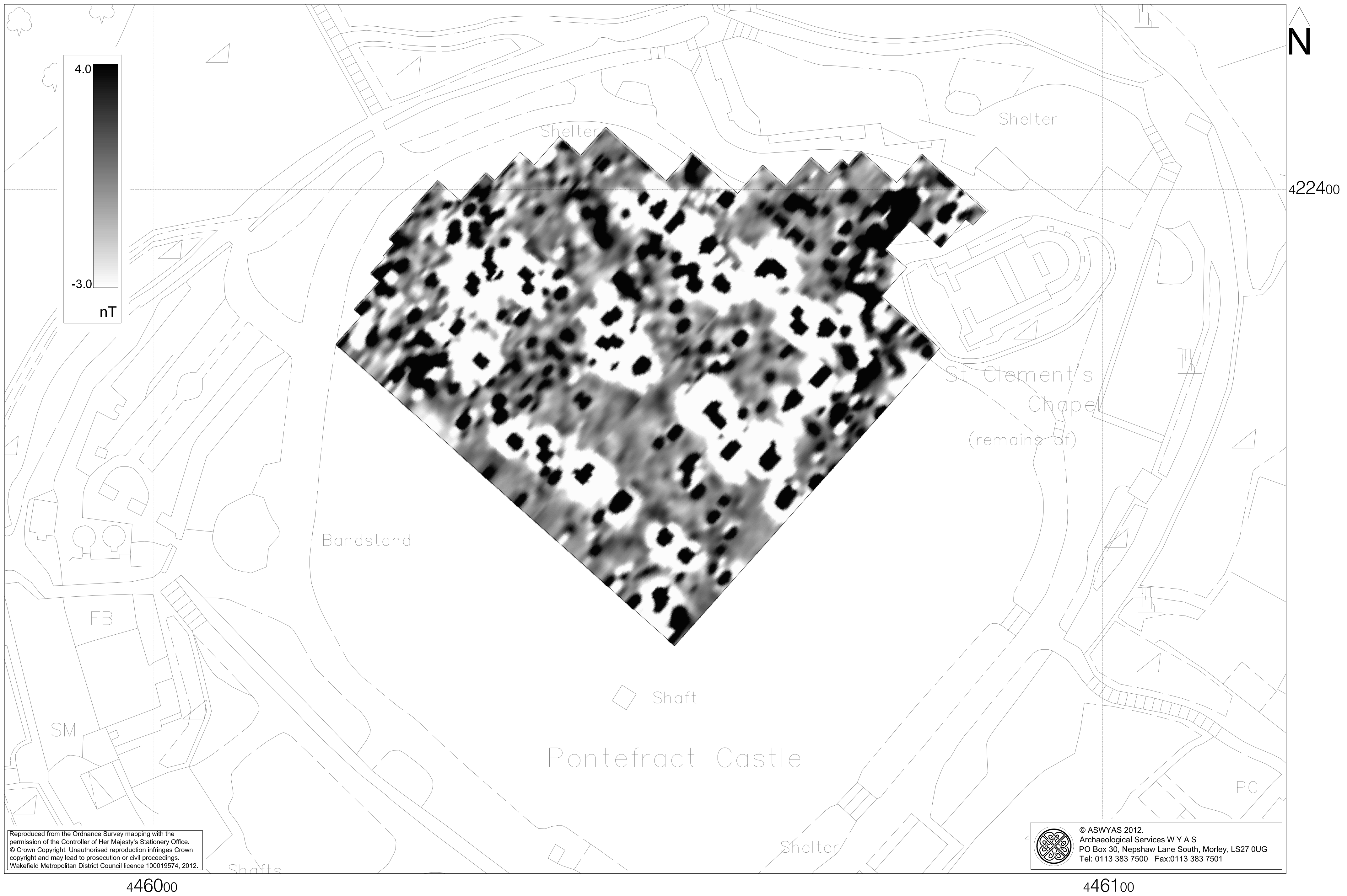

Fig. 7. Processed greyscale magnetometer data (1:500 @ A4)

Fig. 8. XY trace plot of unprocessed magnetometer data (1:500 @ A4)

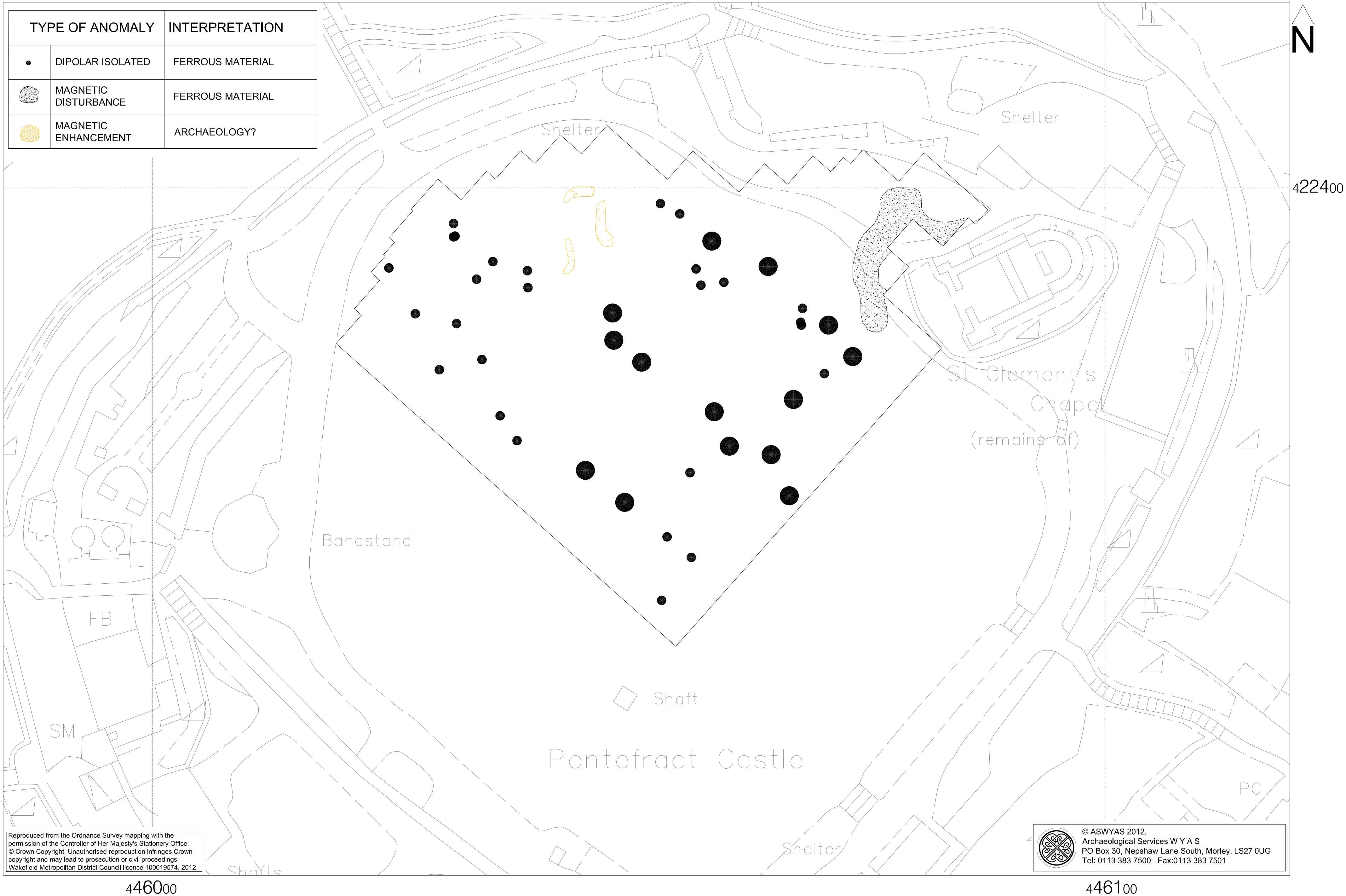

Fig. 9. Interpretation of magnetometer data (1:500 @ A4)

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic ‘spiky’ trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an ‘iron spike’ anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Methodology: Magnetic Susceptibility Survey

There are two methods of measuring the magnetic susceptibility of a soil sample. The first involves the measurement of a given volume of soil, which will include any air and moisture that lies within the sample, and is termed volume specific susceptibility. This method results in a bulk value that it not necessarily fully representative of the constituent components of the sample. For field surveys a Bartington MS2 meter with MS2D field loop is used due to its speed and simplicity. The second technique overcomes this potential problem by taking into account both the volume and mass of a sample and is termed mass specific susceptibility. However, mass specific readings cannot be taken in the field where the bulk properties of a soil are usually unknown and so volume specific readings must be taken. Whilst these values are not fully representative they do allow general comparisons across a site and give a broad indication of susceptibility changes. This is usually enough to assess the susceptibility of a site and evaluate whether enhancement has occurred.

Methodology: Gradiometer Survey

There are two main methods of using the fluxgate gradiometer for commercial evaluations. The first of these is referred to as ***magnetic scanning*** and requires the operator to visually identify anomalous responses on the instrument display panel whilst covering the site in widely spaced traverses, typically 10m apart. The instrument logger is not used and there is therefore no data collection. Once anomalous responses are identified they are marked in the field with bamboo canes and located on a base plan. This method is usually employed as a means of selecting areas for detailed survey when only a percentage sample of the whole site is to be subject to detailed survey.

The disadvantages of magnetic scanning are that features that produce weak anomalies (less than 2nT) are unlikely to stand out from the magnetic background and so will be difficult to detect. The coarse sampling interval means that discrete features or linear features that are parallel or broadly oblique to the direction of traverse may not be detected. If linear features are suspected in a site then the traverse direction should be perpendicular (or as close as is possible within the physical constraints of the site) to the orientation of the suspected features. The possible drawbacks mentioned above mean that a 'negative' scanning result should be validated by sample detailed magnetic survey (see below).

The second method is referred to as ***detailed survey*** and employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.25m intervals, on zig-zag traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in XY trace and greyscale formats. In the former format the data shown is 'raw' with no processing other than grid biasing having been done. The data in the greyscale images has been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of any archaeological anomalies.

An XY plot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a 'stacked' plot. A hidden line algorithm has been employed to block out lines behind major 'spikes' and the data has been clipped. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the 'shape' of individual anomalies can be discerned and potentially archaeological anomalies differentiated from 'iron spikes'. Geoplot 3 software was used to create the XY trace plots. The same program was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

Appendix 2: Earth Resistance Survey - technical information

Soil Resistance

The electrical resistance of the upper soil horizons is predominantly dependant on the amount and distribution of water within the soil matrix. Buried archaeological features, such as walls or infilled ditches, by their differing capacity to retain moisture, will impact on the distribution of sub-surface moisture and hence affect electrical resistance. In this way there may be a measurable contrast between the resistance of archaeological features and that of the surrounding deposits. This contrast is needed in order for sub-surface features to be detected by a resistance survey.

The most striking contrast will usually occur between a solid structure, such as a wall, and water-retentive subsoil. This shows as a resistive high. A weak contrast can often be measured between the infill of a ditch feature and the subsoil. If the infill material is soil it is likely to be less compact and hence more water retentive than the subsoil and so the feature will show as a resistive low. If the infill is stone the feature may retain less water than the subsoil and so will show as a resistive high.

The method of measuring variations in ground resistance involves passing a small electric current (1mA) into the ground via a pair of electrodes (current electrodes) and then measuring changes in current flow (the potential gradient) using a second pair of electrodes (potential electrodes). In this way, if a structural feature, such as a wall, lies buried in a soil of uniform resistance much of the current will flow around the feature following the path of least resistance. This reduces the current density in the vicinity of the feature, which in turn increases the potential gradient. It is this potential gradient that is measured to determine the resistance. In this case, the gradient would be increased around the wall giving a positive or high resistance anomaly.

In contrast a feature such as an infilled ditch may have a moisture retentive fill that is comparatively less resistive to current flow. This will increase the current density and decrease the potential gradient over the feature giving a negative or low resistance anomaly.

Survey Methodology

The most widely used archaeological technique for earth resistance surveys uses a twin probe configuration. One current and one potential electrode (the remote or static probes) are fixed firmly in the ground a set distance away from the area being surveyed. The other current and potential electrodes (the mobile probes) are mounted on a frame and are moved from one survey point to the next. Each time the mobile probes make contact with the ground an electrical circuit is formed between the current electrodes and the potential gradient between the mobile and remote probes is measured and stored in the memory of the instrument.

A Geoscan RM15 resistance meter was used during this survey, with the instrument logging each reading automatically at 1m intervals on traverses 1m apart. The mobile probe spacing was 0.5m with the remote probes 15m apart and at least 15m away from the grid under survey. This mobile probe spacing of 0.5m gives an approximate depth of penetration of 1m for most archaeological features. Consequently a soil cover in excess of 1m may mask, or significantly attenuate, a geophysical response.

Data Processing and Presentation

All of the illustrations incorporating a digital map base were produced in AutoCAD 2008 (© Autodesk).

The resistance data is presented in this report in greyscale format with a linear gradation of values and was obtained by exporting a bitmap from the processing software (Geoplot v3.0; Geoscan Research) into AutoCAD 2008. The data has been processed and has also been interpolated by a value of 0.5 in both the X and Y axes using a sine wave (x)/x function to give a smoother, better defined plot.

Appendix 3: Survey location information

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). The accuracy of this equipment is better then 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party or for the removal of any of the survey reference points.

Appendix 4: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2007) files.
- a full copy of the report

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the relevant Historic Environment Record).

Appendix 5: Section 42 Licence

ENGLISH HERITAGE

Ian Roberts
Principal Archaeologist
Archaeological Services WYAAS
PO Box 30
Nepshaw Lane South
Morley
Leeds
LS27 0UG

Direct dial: 01904 601990

Your ref: ISOQAR ISO 9001:2008

Our ref: AA/20077/5
SL 00000744

Date: 9th September 2010

Dear Ian

ANCIENT MONUMENTS AND ARCHAEOLOGICAL AREAS ACT 1979 - SECTION 42 LICENCE
Pontefract Castle
National Monument no. 13298

I refer to your proposal to carry out a geophysical survey at the above monument, made in your email of 4th August 2010, with attached supporting project design and site plan showing the proposed area of survey.

By virtue of powers contained in Section 42 of the 1979 Ancient Monuments and Archaeological Areas Act (as amended by the National Heritage Act 1983), English Heritage hereby grants consent for the geophysical survey of the part of the scheduled area as detailed in your application, attached here. This consent is subject to the following conditions:

a) This consent shall only be exercised by Ian Roberts of Archaeological Services WYAAS and his nominated specialist geophysical survey team, and by no other persons;

b) A full report summarising the results of the survey and their interpretation shall be sent, no later than 3 months after the completion of the survey, to:

(1) Keith Miller, English Heritage Yorkshire Region, 37 Tanner Row, York, YO1 6WP;
(2) Paul Linford, English Heritage, Geophysics Team, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth, Hampshire, PO4 9LD;
(3) Ian Sanderson, Principal Archaeological Officer, West Yorkshire Archaeology Advisory Service, Registry of Deeds, Newstead Road, Wakefield, WF1 2DE.

c) This consent shall cease to have effect 12 months from the date of this letter.

This letter does not carry any consent or approval required under any enactment, bye-law, order or regulation other than Section 42 of the Ancient Monuments and Archaeological Areas Act (as amended).

Finally, I suggest that any person nominated under this consent is provided with a copy of this letter together with a letter of nomination in case they should be challenged whilst on site.

Yours sincerely

Keith Miller

Inspector of Ancient Monuments
English Heritage
Yorkshire and the Humber Region
37 Tanner Row
YORK
YO1 6WP
Tel. 01904 601990
Email: keith.miller@english-heritage.org.uk

cc. Paul Linford, EH Geophysics Team, Fort Cumberland

ENGLISH HERITAGE

YORKSHIRE & THE HUMBER

Enclosure:

English Heritage Geophysical Survey Database Questionnaire

Survey Details

Name of Site: PONTEFRACT CASTLE, PONTEFRACT

County: WEST YORKSHIRE

NGR Grid Reference: SE 4605 2236

Start Date: 12TH SEPTEMBER 2010 **End Date:** 12TH SEPTEMBER 2010

Geology at site: THE SOLID GEOLOGY COMPRISES ACKWORTH DIVISION SANDSTONES OF THE CARBONIFEROUS UPPER COAL MEASURES.

Known archaeological Sites/Monuments covered by the survey:

NATIONAL MONUMENT NO. 13298

Archaeological Sites/Monument types detected by survey:
CASTLE BUILDINGS?

Surveyor:
ARCHAEOLOGICAL SERVICES (WYAS)

Name of Client, if any:
WAKEFIELD MUSEUM

Purpose of Survey:
RESEARCH / PUBLIC DEMONSTRATION

Location of:

a) Primary archive, i.e. raw data, electronic archive etc:
ARCHAEOLOGICAL SERVICES (WYAS)
PROJECT NO. 8172
SITE CODE. PCA

b) Full Report:
ARCHAEOLOGICAL SERVICES (WYAS)
PROJECT NO. 8172
SITE CODE. PCA10
REPORT NUMBER 2371
OASIS ID: archaeol11-131698
WEST YORKSHIRE HER

Technical Details

(Please fill out a separate sheet for each survey technique used)

Type of Survey: MAGNETOMETER

Area Surveyed, if applicable: 0.22HA

Traverse Separation, if regular: 1.0m

Reading/Sample Interval: 0.25m

Type, Make and model of Instrumentation: BARTINGTON GRAD601

Land use at the time of the survey : GRASSLAND

Type of Survey: EARTH RESISTANCE

Area Surveyed, if applicable: 0.22HA

Traverse Separation, if regular: 1.0m

Reading/Sample Interval: 0.5m

Type, Make and model of Instrumentation: GEOSCAN RM15 + MPX15

For Resistivity Survey:

Probe configuration: TWIN PROBE

Probe Spacing: 1m

Land use at the time of the survey : GRASSLAND

Additional Remarks (Please mention any other technical aspects of the survey that have not been covered by the above questions such as sampling strategy, non standard technique, problems with equipment etc.):

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