Archaeological Services
University of Durham

Oaklands, Nosterfield, North Yorkshire

geophysical surveys – phase 2

on behalf of

On-Site Archaeology

ASUD Report 1306
July 2005

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Contents

1. Summary

The project

1.1 This report presents the results of a second phase of geophysical investigation conducted in advance of a possible extension to Nosterfield Quarry near Thornborough, North Yorkshire.

1.2 The works were commissioned by On-Site Archaeology, on behalf of Mike Griffiths Associates, and conducted by Archaeological Services University of Durham in accordance with instructions provided by On-Site Archaeology.

Results

1.3 An electrical resistance survey has been conducted over *c.*1ha of Area E, towards the eastern end of the study area. The survey overlapped with one of the recent geomagnetic survey areas (ASUD 2005a).

1.4 A number of areas of particularly high resistance values have been identified. One of these corresponds to a clearly visible earthwork, which almost certainly contains stone wall-footings for a building. A possible track or yard surface and ditch have also been identified, probably associated with the building.

1.5 Additional processing of the other high resistance areas has not identified further structural remains. Low resistance anomalies detected here typically reflect hollows and ditches visible on the ground.

2. Project background

Location (Figure 1)

2.1 The study area is located on land to the north of Nosterfield in North Yorkshire (NGR centre: SE 275 815) and measures approximately 49 ha divided into six parts, Areas A-F. A sample of 6ha was recently surveyed, with surveys located in Areas A, D, E and F (ASUD 2005a).

2.2 The current survey was also undertaken in Area E, centred on SE 2795 8140.

Development proposal

2.3 The survey was carried out prior to a possible proposal to extend Nosterfield Quarry to the north of its present site.

Brief

2.4 The survey was undertaken in accordance with instructions provided by On-Site Archaeology.

Objective

2.5 The principal aim of the survey was to determine the extent and nature of any sub-surface features of likely archaeological interest, including cut, built and fired features, which would assist the client and the planning authority in determining appropriate mitigation strategies should archaeological deposits be found to survive within the study area.

Dates

2.6 Fieldwork was undertaken between 8th and 12th July 2005. This report was prepared between 13th and 22nd July 2005.

Personnel

2.7 Fieldwork was conducted by Lorne Elliot (Supervisor), Charlotte O'Brien, Duncan Hale and Jill Inglis. This report was prepared by Duncan Hale, with illustrations by Martin Railton. The Project Manager was Duncan Hale.

Archive/OASIS

2.8 The site code is **OFT052**, for **O**aklands **F**arm, **T**hornborough 20**05** phase **2**. The paper and data archive is currently held at Archaeological Services, University of Durham. It is anticipated that the data archive will be transferred to the Archaeology Data Service in due course. Archaeological Services University of Durham is registered with the **O**nline **Acces**S to the **I**ndex of archaeological investigation**S** project (OASIS). The OASIS ID number for this investigation is archaeol3-9346.

3. Archaeological and historical background

3.1 The area under investigation lies to the north of the early Neolithic complex of monuments known as the Thornborough Henges, consisting of three main

circular henges, associated with an earlier cursus monument and later pit alignments. Although some distance away from the present investigation area, the scale of this monumental complex requires the landscape to be interpreted with these in mind. These monuments were a centre of ritual activity throughout the Neolithic, and acted as a focal point for later activity demarcating and dividing the prehistoric landscape, with domestic settlement only being found some distance away from the henges.

3.2 Their importance in the landscape continued into the Bronze Age, seemingly acting as a hub for burial activity, with both inhumations and cremations having been discovered in the vicinity. Although an integral part of the ritual landscape of the Bronze Age, there is little evidence for domestic settlement, implying that landscape divisions formed in the Neolithic continued to be a factor in the Bronze Age.

3.3 There is little definitive evidence so far for Iron Age activity in the area, however, burials and pit alignments discovered to the north of the henges (south of the current investigation area) have shown that this area was in use through this period, and seemingly with a similar focus on ritual activity. Evidence for a number of pit alignments dug during this period suggests that there may have been a restructuring of landscape divisions during the Iron Age.

3.4 There is more evidence for settlement in the surrounding area during the Roman period. One of the main arterial Roman roads, Dere Street, lies to the east of the investigation area, with forts situated at regular intervals along its course. Villa complexes discovered in the area attest to a Romanisation of the surrounding landscape. A Roman bath-house discovered at Well, just 0.5km to the north-west, together with a portion of tesselated pavement, suggest that a villa complex of fairly high status would have been situated here. A corn-drying oven found just to the south in Nosterfield Quarry further illustrates that this landscape was utilised for agricultural purposes during the Roman period.

3.5 Little evidence is available regarding the post-Roman and early medieval period. The nearby settlement of Well has a church with features dating from the 12th century, and the surrounding land, including the investigation area, is likely to have been agricultural land, either as strip fields or common land. Most of this strip-field farming system would have been lost during the post-medieval period, as more and more land was taken by the Enclosure acts. These enclosed areas have in turn been replaced by more open fields as hedgerows have been removed during the 20th century to facilitate arable farming and larger grazing herds.

3.6 Aerial photography has previously recorded a cropmarked enclosure in Area A of the present study area; this was recently subjected to both geomagnetic and electrical resistance survey techniques (ASUD 2005a). The resistance survey was particularly effective and recorded evidence for a multi-phase system of ditched enclosures and associated features, probably dating to the late prehistoric/Romano-British periods. Geomagnetic surveys over the same area

failed to detect these features, indicating that gradiometer surveys are not well suited to detecting features of this type in the soil conditions found in here. This was somewhat unexpected as recent geomagnetic surveys along the A1 just 6km to the east and north-east have proved effective, particularly at Healam Bridge (ASUD 2005b).

3.7 Surveys in other areas at Oaklands detected evidence for later field systems, including ridge and furrow remains and old field boundaries, probably post-medieval in date (ASUD 2005a).

4. Landuse, topography and geology

4.1 At the time of survey the area comprised part of a pasture field containing upstanding earthworks. The area was predominantly level at a mean elevation of *c*.41m AOD.

4.2 The underlying solid geology of the area comprises Magnesian Limestone, which is overlain by sands, gravels and peat deposits.

5. Geophysical survey

Standards

5.1 The survey and reporting were conducted in accordance with English Heritage (1995) Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation*; the Institute of Field Archaeologists (2002) Paper No.6, *The use of geophysical techniques in archaeological evaluations*; and the Archaeology Data Service (2001) *Geophysical Data in Archaeology: A Guide to Good Practice*.

Technique selection

5.2 As described above (para. 3.6), the earlier phase of geophysical survey at Oaklands demonstrated that geomagnetic survey had not detected many features of archaeological significance, though such features were readily detected by electrical resistance survey. The latter technique was therefore employed for the current investigation. This technique is particularly well-suited to surveying sites where cropmarks are present since the soil properties which give rise to cropmarks/parchmarks (principally contrasts in soil moisture content) are essentially the same as those measured in an electrical resistance survey.

Field methods

5.3 The location of the survey was determined by upstanding earthwork targets. A 20m grid was established across *c*.1ha of Area E, and was tied-in to known, mapped Ordnance Survey points by On-Site Archaeology.

5.4 Measurements of electrical resistance were determined using a Geoscan RM15A resistance meter with automatic logging of the data. A zig-zag

traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was set to 0.1 ohms, the sample interval to 0.5m and the traverse interval to 1.0m, thus providing 800 sample measurements per 20m grid unit.

5.5 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

5.6 Geoplot v3 software was used to process the geophysical data and to produce both continuous tone greyscale images and trace plots of the raw data. The greyscale images and interpretations are presented in Figures 2-4; additional plots are provided in Appendix I. In the greyscale images, high resistance anomalies are displayed as dark grey and low resistance anomalies as light grey. A palette bar relates each greyscale intensity to anomaly values in ohms.

5.7 The following basic processing functions have been applied to the dataset:

Add - used in resistance surveys to add a set value to all readings within a defined area; used in this instance to adjust data collected over different days/ground conditions.

Clip - clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.

Despike - locates and suppresses localised spikes caused by poor contact resistance.

Interpolate - increases the number of data points in a survey; to match sample and traverse intervals and so create a smoother appearance to the data. In this instance the data have been interpolated from 1.0m x 0.5m to 0.25 x 0.25m intervals.

Interpretation: anomaly types

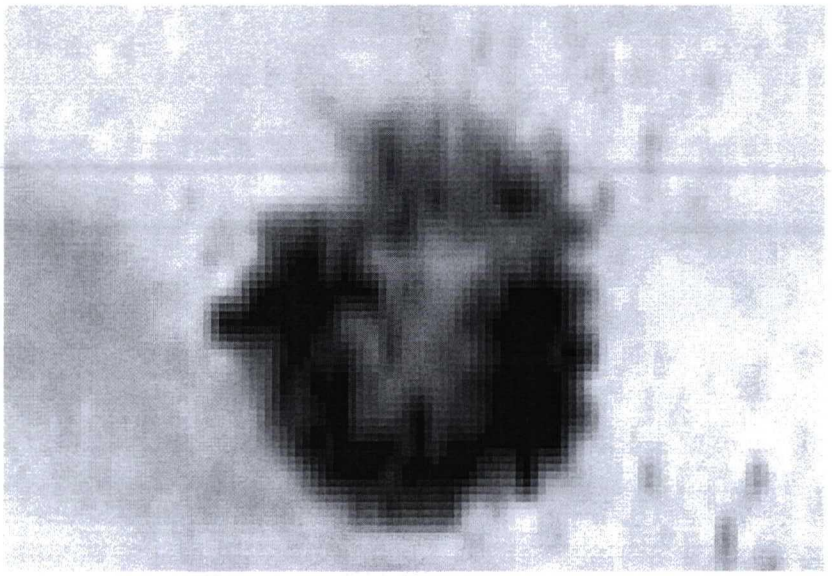
5.8 A colour-coded geophysical interpretation plan is provided in Figure 3. Two types of resistance anomaly have been distinguished in the data:

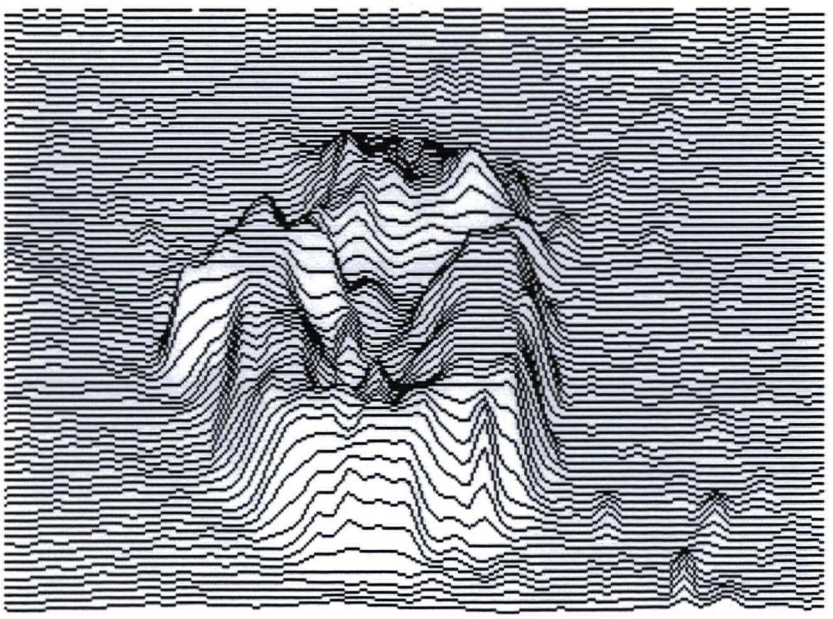
high resistance	regions of anomalously high resistance, which may reflect foundations, tracks, paths and other concentrations of stone or brick rubble.
low resistance	regions of anomalously low resistance, which may be associated with soil-filled features such as pits and ditches.

Interpretation: features

5.9 A colour-coded archaeological interpretation plan is provided in Figure 4.

5.10 The survey detected a number of regions of high electrical resistance. A sub-circular zone of particularly high values was identified in the north-western part of the survey area, over an upstanding earthwork situated at the end of a curvilinear depression. In order to enable the identification of any surviving structural remains beneath the earthwork the data has been extracted from the main survey for differential processing (see Appendix I). In the images below (not to scale), the very high resistance anomalies are more clearly defined. These anomalies almost certainly reflect stone wall-footings at the southern end of a building, measuring *c.*8m east-west. It has been suggested that the earthwork could represent the remains of a mill (pers. comm. N Pearson).





5.11 Immediately west of the building is an area of enhanced resistance values. These could reflect the remains of a track or hardstanding associated with the building.

5.12 A curvilinear band of low resistance heading east from the above structure corresponds to the linear depression visible on the ground. The anomaly measures between 3-5m in width and is flanked by two intermittent high resistance anomalies; these almost certainly reflect stone in the upcast from digging the ditch. If indeed the structure was a mill, then this would appear to have been the mill-race.

5.13 Differential processing was also undertaken for the other large areas of high resistance, however, no discrete features were identified; these anomalies reflect either spreads of stone or comparatively well-drained soils. Smaller, discrete areas of high resistance are also likely to reflect concentrations of stone.

5.14 Two areas of relatively low electrical resistance were identified in the north-eastern and southern parts of the survey area. These correspond to hollows noted on the ground, which retain more soil moisture than the surrounding land. Similarly, a linear low resistance anomaly aligned north-south in the southern part of the survey area corresponds to an existing ditch feature noted on the ground.

6. Conclusions

6.1 An earth electrical resistance survey has been carried out on land to the north of Nosterfield Quarry, Nosterfield, North Yorkshire, comprising the second stage of geophysical investigation at the site.

6.2 The remains of a building, possibly a mill, with an associated track or hardstanding area, have been identified in the north-western part of the survey. A ditch feature heading east from the building could be the remains of a race.

6.3 Additional anomalies largely reflect topographical features such as hollows/raised ground, ditches and likely concentrations of stone.

7. References

Archaeology Data Service (2001) *Geophysical Data in Archaeology: A Guide to Good Practice*. Arts and Humanities Data Service.

ASUD 2005a *Oaklands, Nosterfield, North Yorkshire: geophysical surveys*. ASUD Report 1273, Archaeological Services University of Durham.

ASUD 2005b *A1(T) Dishforth to Barton Improvement, North Yorkshire: geophysical surveys*. ASUD Report 1121, Vols I-III, Archaeological Services University of Durham.

English Heritage (1995) Research and Professional Services Guideline No.1, *Geophysical survey in archaeological field evaluation*. London.

Institute of Field Archaeologists (1991) Technical Paper No.9, *The use of geophysical techniques in archaeological evaluations*. Birmingham.

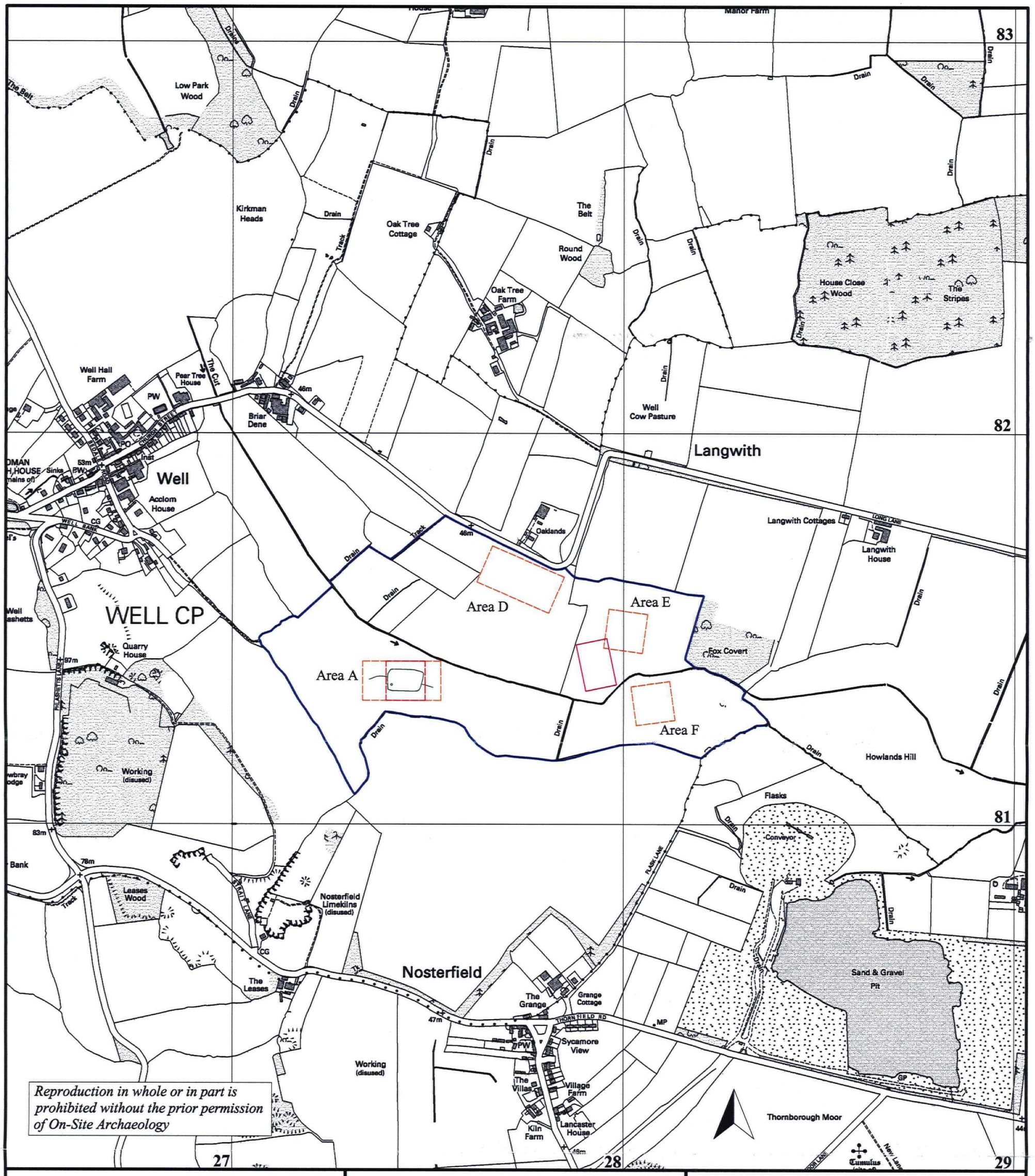


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Figure 1

Location map

on behalf of
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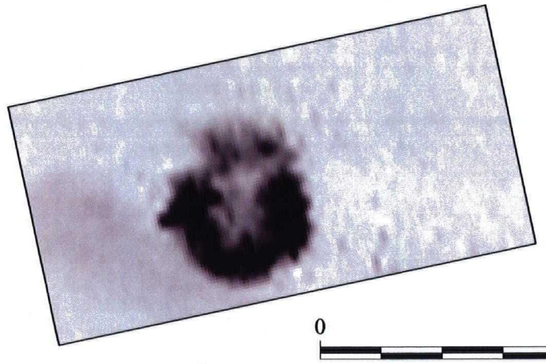
0 500m

scale 1:10 000 - for A3 plot

- area of interest
- Phase 2 resistance survey outline
- Phase 1 magnetic survey outline
- Phase 1 resistance survey outline
- crop marks from aerial photographs

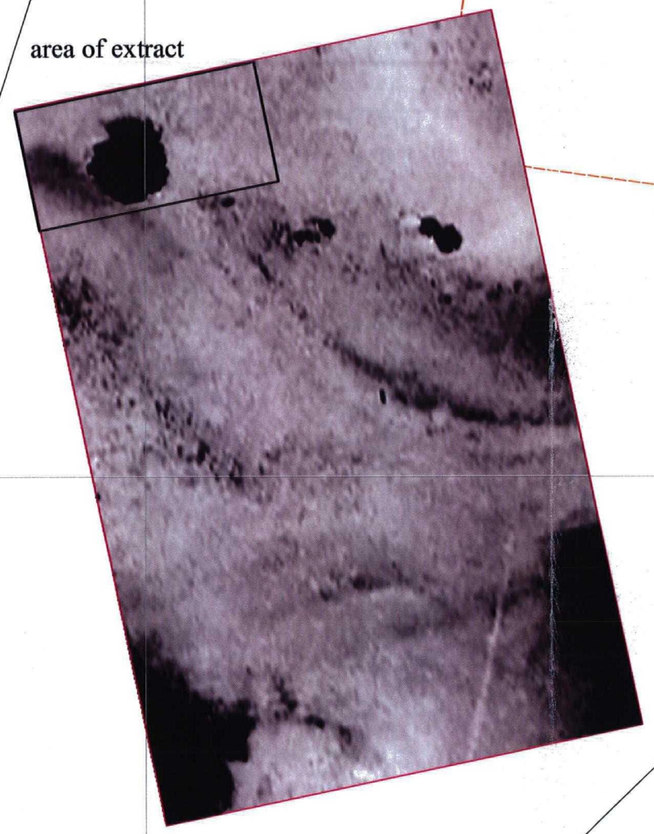
extract from resistance survey



0 25m

scale 1:500 - for A3 plot

area of extract



Area E

Area F

814

813

279

280

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Figure 2

Area E resistance survey

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0 50m

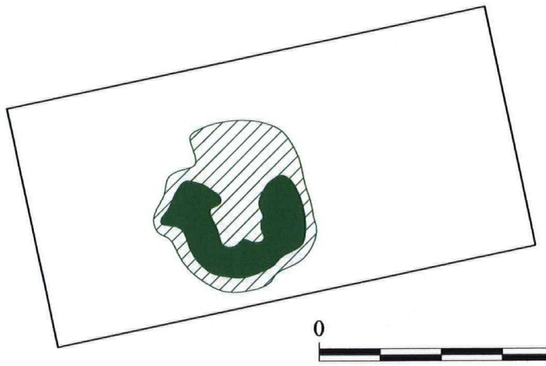
scale 1:1000 - for A3 plot

Phase 2 resistance survey outline

Phase 1 magnetic survey outline

scale bar (main)	*scale bar (extract)*
46.64	200.00
43.30	183.33
39.96	166.67
36.63	150.00
33.29	133.33
29.95	116.67
26.62	100.00
23.28	83.33
19.94	66.67
16.61	50.00
13.27	33.33
9.93	16.67
6.60 ohm	0.00 ohm

extract from resistance survey



0 25m

scale 1:500 - for A3 plot

area of extract

Area E

Area F

814

813

279

280

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Figure 3

Area E resistance interpretation

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0 50m

scale 1:1000 - for A3 plot

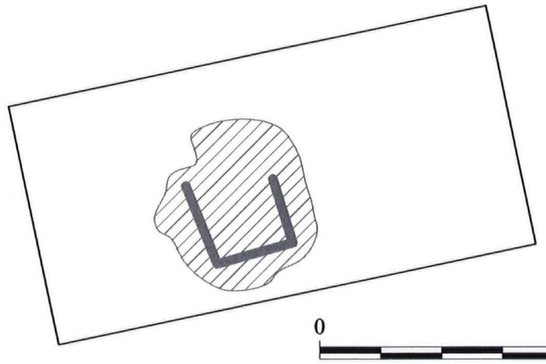
Phase 2 resistance survey outline

Phase 1 magnetic survey outline

low resistance

high resistance

extract from resistance survey



0 25m

scale 1:500 - for A3 plot

area of extract

Area E

Area F

814

813

279

280

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Figure 4

Area E archaeological interpretation

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0 50m

scale 1:1000 - for A3 plot

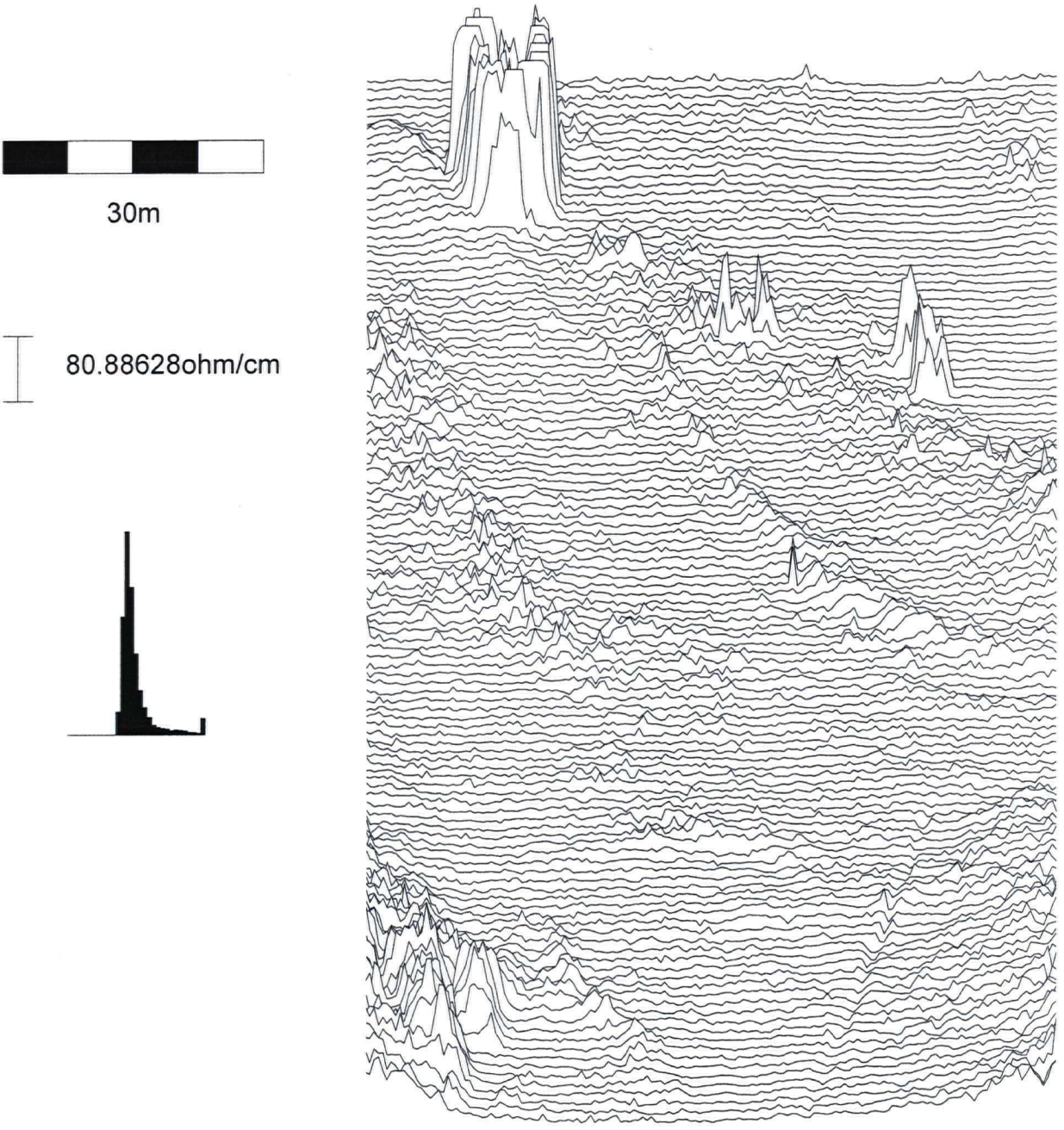
- Phase 2 resistance survey outline
- Phase 1 magnetic survey outline
- ditch
- track/yard
- earthwork
- walls
- hollows

Appendix I: additional plots of geophysical data

Oaklands, Nosterfield, North Yorkshire

Phase 2 geophysical investigation

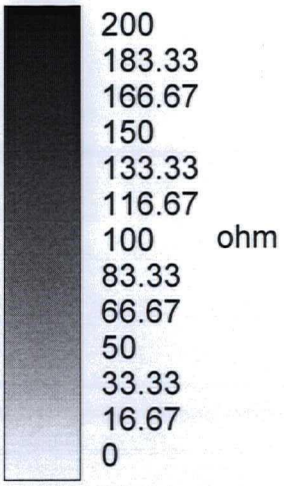
Area E resistance survey, trace plot, 1:750 @ A4



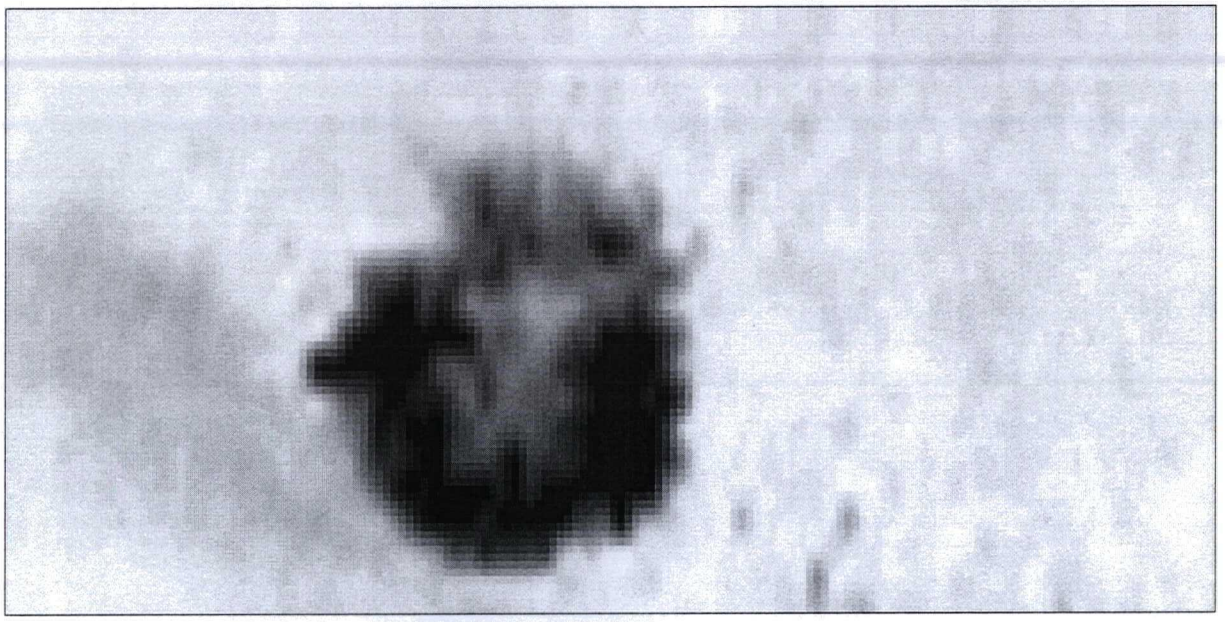
Oaklands, Nosterfield, North Yorkshire

Phase 2 geophysical investigation

Extracts from Area E resistance survey, 1:250 @ A4



a) greyscale image



b) trace plot