ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Garry Hodgson Architectural Services
for
Brett Bros. Developments Ltd

# Langley Hall Farm
# Langley Moor
# County Durham

## geophysical survey and archaeological evaluation

report 3067
January 2013

Durham University

## Contents



## Figures




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# 1. Summary

## The project

1.1 This report presents the results of a geophysical survey and archaeological evaluation conducted in advance of a proposed development at Langley Hall Farm, Langley Moor, County Durham. The works comprised the geomagnetic and electrical resistance survey of two areas totalling 0.15ha and the excavation of three evaluation trenches.

1.2 The works were commissioned by Garry Hodgson Architectural Services for Brett Bros. Developments Ltd and conducted by Archaeological Services Durham University.

## Results

1.3 The geomagnetic survey revealed concentrations of anomalies across the proposed development area which are likely to reflect sub-surface fired or ferrous debris such as brick rubble, with little or no archaeological potential, possibly the result of landscaping or the disuse of the railway. The electrical resistance survey also detected areas of stone or brick rubble reflected as high resistance data. Areas of low resistance which may reflect soil-filled features were also detected.

1.4 Trench 1 confirmed the presence of modern brick and concrete rubble in the north-east part of the site. In Trench 2 to the south of the site, further brick rubble and a deposit of fine coal ash was identified. It is likely the soil-filled features identified in the geophysics reflect variations in the density of the materials in this area.

1.5 No modern rubble was identified in Trench 3 where a possible plough furrow and a relatively recent animal burial were excavated.

## Recommendations

1.6 No further archaeological works are recommended.

# 2. Project background

### Location (Figure 1)

2.1 The proposed development area is located east of Langley Hall Farm, Langley Moor, County Durham (NGR centre: NZ 24953 40807). It covers an area of approximately 0.15ha. To the north is Front Street, to the south is woodland and to the east is the former Durham to Bishop Auckland branch of the North Eastern Railway, now a footpath.

### Development proposal

2.2 The development proposal is for the construction of three houses.

### Objective

2.3 The principal aim of the surveys and evaluation trenching was to determine the nature and extent of any sub-surface features of potential archaeological significance within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the proposed development.

### Methods statement

2.4 The surveys and evaluation trenching have been undertaken in accordance with a Project Design provided by Archaeological Services Durham University and approved by the Durham County Council Archaeology Section and in accordance with instructions from the client and in line with national standards and guidance (see para. 5.1 below).

### Dates

2.5 Fieldwork for the geophysical survey was undertaken on the 18th December 2012; the evaluation trenching was undertaken on the 7th January 2013. This report was prepared for January 2013.

### Personnel

2.6 The geophysical survey was conducted by Ashley Hayes and Natalie Swann (supervisor). Trial trench evaluation was conducted by Andy Platell and Natalie Swann. This report was prepared by Natalie Swann, with illustrations by David Graham, and edited by Duncan Hale. The geophysical data were processed by Natalie Swann. Specialist reporting was conducted by Dr Carrie Drew (animal bones). The project manager was Daniel Still.

### Archive/OASIS

2.7 The site code is **DLH12**, for **D**urham **L**angley **H**all Farm 20**12**. The archive is currently held by Archaeological Services Durham University, and will be transferred to the Bowes Museum 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 **archaeol3-141115**.

# 3. Historical and archaeological background

### Previous archaeological works

3.1 No previous archaeological works have been conducted within the proposed development area (PDA). A programme of archaeological works was conducted

immediately south-east of the PDA which identified part of a Roman road and ditches dating to the late Iron Age and the medieval period (TWM Archaeology 2012). A further section of Roman road was exposed approximately 250m south of the PDA in 1963 (Archaeological Services 2012).

3.2 There is no direct evidence of prehistoric activity in the PDA, however, the excavation of an Iron Age ditch south-east of the site may indicate there is the potential for a resource dating to this period to survive.

3.3 There is no direct evidence of Roman activity within the PDA, however, the presence of a Roman road relatively close to the site indicates that there is some potential for remains dating to this period to survive. It is also possible that later prehistoric activity may have continued into the Roman period.

3.4 The village of Langley is recorded in the Charter Rolls for 1232 as *Lageleye*. The HER records the village as being in the centre of modern day Langley Moor, but earlier maps such as Saxton and Greenwood indicate that Langley stood much closer to the River Browney, across from Relley. This would suggest that the medieval settlement lies at the modern day Langley Farm, north of the PDA, and that it is a shrunken village. The landscape around Langley would have been exploited for agricultural purposes, both pastoral and arable (Archaeological Services 2012).

3.5 The Durham to Bishop Auckland branch of the North Eastern Railway, now disused, lies on the eastern boundary of the site.

## 4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised two small fields. Two horse boxes and a trailer were parked at the south end of Area 2 meaning it was not possible to collect data in this area during the geophysical survey.

4.2 The area sloped gently from approximately 89m OD in the south of the site to 88m OD in the north. To the east there was a gentle slope down to the former railway line. To the north there was a steep bank down to Front Street.

4.3 The underlying solid geology of the area comprises Pennine Middle Coal Measures, which are overlain by Devensian till.

## 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 *Guide to Good Practice: Geophysical Data in Archaeology* (Schmidt & Ernenwein 2011).

### 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, based on previous work in the area, 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 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.

5.5 Given the proximity of buildings and wire fences an electrical resistance survey was considered appropriate to complement the results of the geomagnetic survey. Earth electrical resistance survey can be particularly useful for mapping stone and brick features. When a small electrical current is injected through the earth it encounters resistance which can be measured. Since resistance is linked to moisture content and porosity, stone and brick features will give relatively high resistance values while soil-filled features, which retain more moisture, will provide relatively low resistance values.

### Field methods

5.6 Two surveys totalling 0.15ha were conducted in two land parcels. A 20m grid was established across each survey area and related to known, mapped Ordnance Survey points and the National Grid using a Leica GS15 global navigation satellite system (GNSS) with real-time kinematic (RTK) corrections typically providing 10mm accuracy.

5.7 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 20m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m, thus providing 1,600 sample measurements per 30m grid unit.

5.8 Measurements of earth electrical resistance were determined using Geoscan RM15D Advanced resistance meters and MPX15 multiplexers with a mobile twin probe separation of 0.5m. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was 0.1ohm, the sample interval was 1m and the traverse interval was 1m, thus providing 400 sample measurements per 20m grid unit.

5.9 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

5.10 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 3-7; the trace plots are provided in Figure 8. In the greyscale images, positive magnetic/high resistance anomalies are displayed as dark grey and negative magnetic/low resistance anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla/ohm as appropriate.

5.11 The following basic processing functions have been applied to the geomagnetic data:

| | |
|---|---|
| *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 |
| *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 |

5.12 The following basic processing functions have been applied to the resistance data:

| | |
|---|---|
| *despike* | locates and suppresses spikes in data due to poor contact resistance |
| *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

5.13 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 |

5.14 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**

**Area 1**

5.15 A dense concentration of dipolar magnetic anomalies has been detected across this area. These anomalies are likely to reflect sub-surface ferrous or fired debris such as brick fragments and are likely to have little or no archaeological significance. However, the intensity of these anomalies may have masked weaker anomalies associated with potential archaeological features.

5.16 In the resistance data areas of high resistance were detected which probably also indicate concentrations of stone or rubble.

5.17 Areas of low resistance were detected along the eastern edge of this survey area which may reflect soil-filled features such as pits or part of a ditch.

**Area 2**

5.18 The intense concentration of dipolar magnetic anomalies detected in Area 1 continues into this area, with the exception of a narrow strip along the western edge of the survey area. Again these anomalies are likely to reflect sub-surface fired or ferrous debris and may have little or no archaeological significance, however, they may mask underlying archaeological features.

5.19 A band of high resistance data has been detected in the north of this area. This anomaly may reflect a concentration of rubble such as bricks or building debris or concentrations of stone in a track or road.

5.20 Two areas of low resistance data have also been detected, one in the south-east corner of this area and the other in the north-east part of the survey which could possibly reflect soil-filled features such as pits.

# 6. The evaluation trenches

**Introduction**

6.1 Three trenches were excavated: Trenches 1 and 2 were positioned over geophysical anomalies; Trench 3 was positioned over an area with little or no anomalies in the geophysical data. Modern overburden was stripped using a mechanical excavator equipped with a toothless ditching bucket under archaeological direction.

**Trench 1** (Figures 9 & 10)

6.2 This trench was 15m by 1.5m, and was located over geophysical anomalies likely to reflect concentrations of stone or rubble. Natural subsoil, an orange-brown silt clay [1], was identified sloping from 87.56m OD at the south-west end of the trench to 86.29m OD at the north-east, 1.4m below the current ground level.

6.3 Overlying the natural subsoil was a thin layer dark grey-brown silt [2: 0.1m deep]. This was overlain by a deposit of poorly consolidated rubble [3: 1.2m deep] mostly consisting of brick and concrete but also with car tyres, plastic and metal piping mixed in; this deposit became shallower towards the south-west end of the trench.

This was sealed by a thin layer of dark grey-brown silt loam topsoil [5] and turf. No archaeological features were identified and no artefacts recovered.

**Trench 2** (Figure 11)

6.4 Trench 2 was 10m by 1.5m. Natural subsoil [1], an orange-brown clay silt was identified at a depth of 87.81m OD. Over this was a red-brown silt clay [5: 0.2m deep].

6.5 This was sealed by a deep deposit of loose black silt [6: 1m deep] mixed with coal ash, clinker, modern bricks and a porcelain toilet. It is possible the coal ash is a waste product from coke ovens shown on the historic Ordnance Survey maps to the south of the PDA at the Boyne Colliery. This was overlain by a dark grey-brown silt loam topsoil [4: 0.1m deep]. No archaeological features were identified and no artefacts recovered.

**Trench 3** (Figure 12)

6.6 This trench measured 15m by 1.5m. The natural subsoil, a yellow-brown sand silt clay [1], was identified at a depth of 87.68m OD, approximately 0.6m below the present ground level. A possible shallow plough furrow [F10: 1m wide, 0.01m deep] was identified at the centre of the trench aligned approximately north-east/south-west. This was overlain by a mid-brown clay-silt subsoil [7: 0.1m deep].

6.7 The subsoil was overlain by a dark grey-brown silt loam topsoil [4: 0.5m deep]

6.8 Cutting the soil horizons and the natural clay subsoil was an irregularly shaped vertical sided pit [F8: 0.8m wide, 0.15m deep] filled with a grey-brown silt loam [9]. Small animal bones and plastic carrier bag fragments were recovered from the fill suggesting it was modern in date, possibly the burial of a pet.

# 7. The finds

## Animal bone assessment

### Results

7.1 Animal bone was recovered from pit fill context [9]. This included two indeterminate shaft fragments, several rib fragments and a single vertebrae fragment, all of which are dog-sized. There is only one diagnostic bone, a left side fragment of humerus. Associated plastic bag fragments suggest this is a relatively recent interment, probably of a pet dog.

### Recommendation

7.2 No further work is recommended. The bones were disposed of.

# 8. The palaeoenvironmental evidence

8.1 No material suitable for palaeoenvironmental assessment was recovered.

## 9. The archaeological resource

9.1 Three trenches were excavated. Trench 1 was located over a geophysical anomaly thought to reflect rubble or concentrations of stone. The excavation confirmed this with 1.4m of brick rubble being present in this area.

9.2 Trench 2 was located over anomalies possibly reflecting rubble and soil-filled features. Brick rubble and a loose black soil were identified in the excavation; the geophysical anomalies are likely to be a result of changes in the density of the materials in this area.

9.3 Trench 3 was located over a relatively 'quiet' or 'blank' area in the geophysical data. The excavation showed there was no brick rubble in this area. A possible plough furrow and a modern pet burial were identified in this trench.

## 10. Impact assessment

10.1 No significant archaeological resource has been identified which will be impacted upon by the proposed development.

## 11. Sources

Archaeological Services 2012 *Land at Langley Moor, Durham; heritage statement.* Unpublished report **2831.** Archaeological Services Durham University

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

Gaffney, C, Gater, J, & Ovenden, S, 2002 *The use of geophysical techniques in archaeological evaluations*. Technical Paper **6**, Institute of Field Archaeologists

IfA 2011 *Standard and Guidance for archaeological geophysical survey*. Institute for Archaeologists

Schmidt, A, & Ernenwein, E, 2011 *Guide to Good Practice: Geophysical Data in Archaeology*. Archaeology Data Service

TWM Archaeology 2012 *Land north of Brandon Lane, Langley Moor; archaeological strip and record.* Unpublished report Project No. **1412**, TWM Archaeology

# Appendix 1: Data table

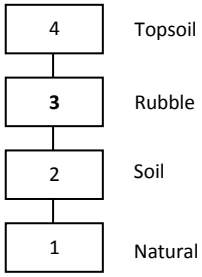
## Table 1.1: Context data

The • symbols in the columns at the right indicate the presence of finds of the following type: B bone

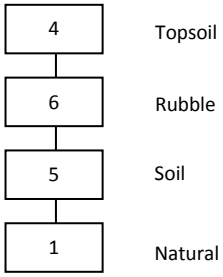
| No | Area | Description | B |
|---|---|---|---|
| 1 | 1-3 | Natural subsoil | |
| 2 | 1 | Subsoil | |
| 3 | 1 | Modern rubble | |
| 4 | 1-3 | Topsoil | |
| 5 | 2 | Subsoil | |
| 6 | 2 | Modern rubble | |
| 7 | 3 | Subsoil | |
| F8 | 3 | Cut small pit | |
| 9 | 3 | Fill of small pit | • |
| F10 | 3 | Possible plough furrow | |

# Appendix 2: Stratigraphic matrices

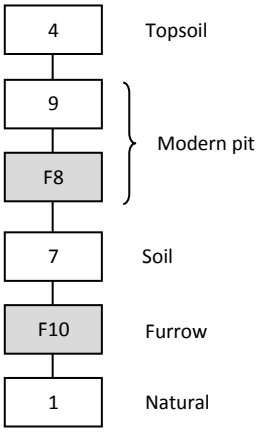
Trench 1




Trench 2




Trench 3



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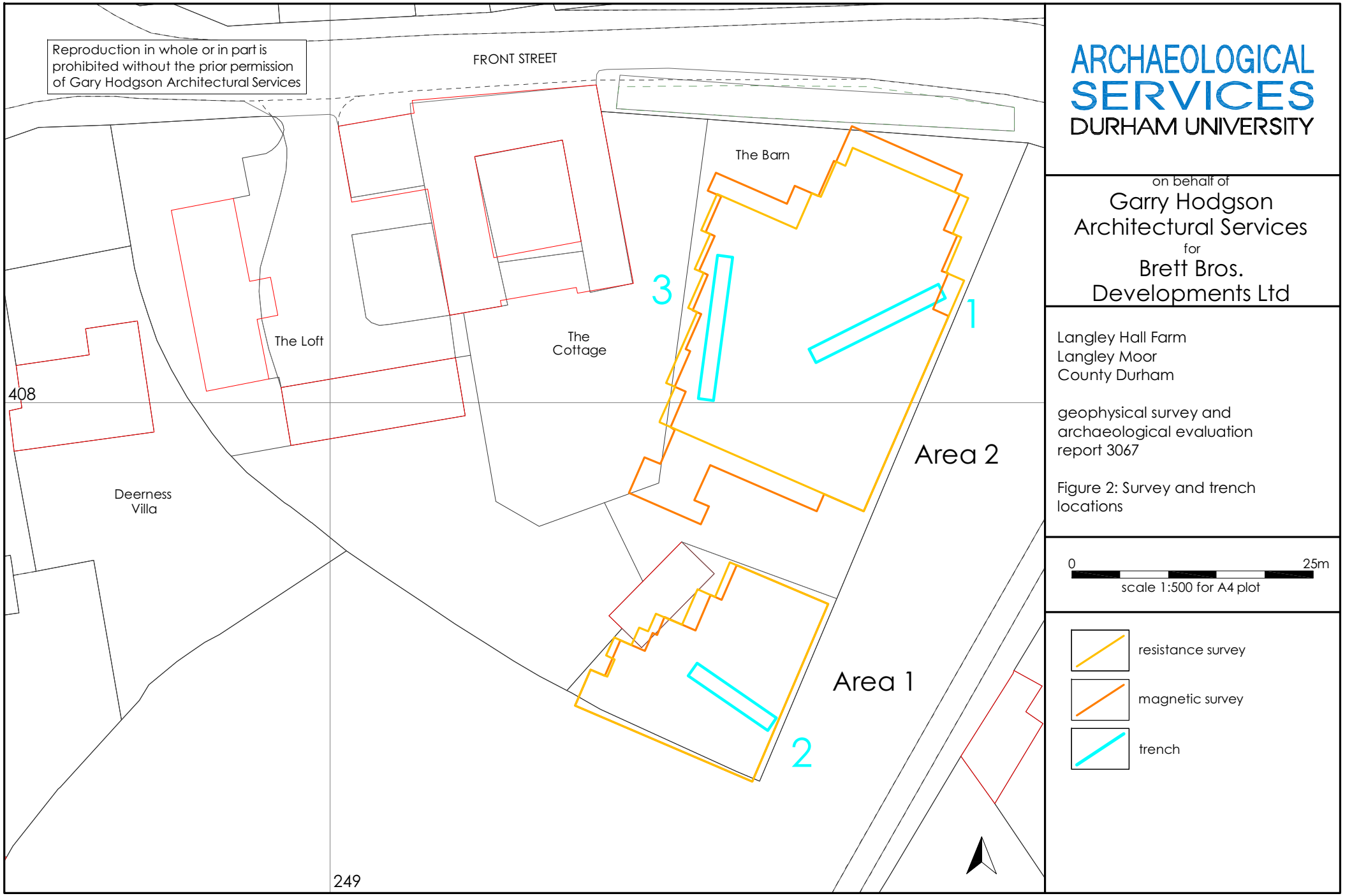
report 3067

Figure 1: Site location



site location

0 1km
scale 1:25 000 for A4 plot

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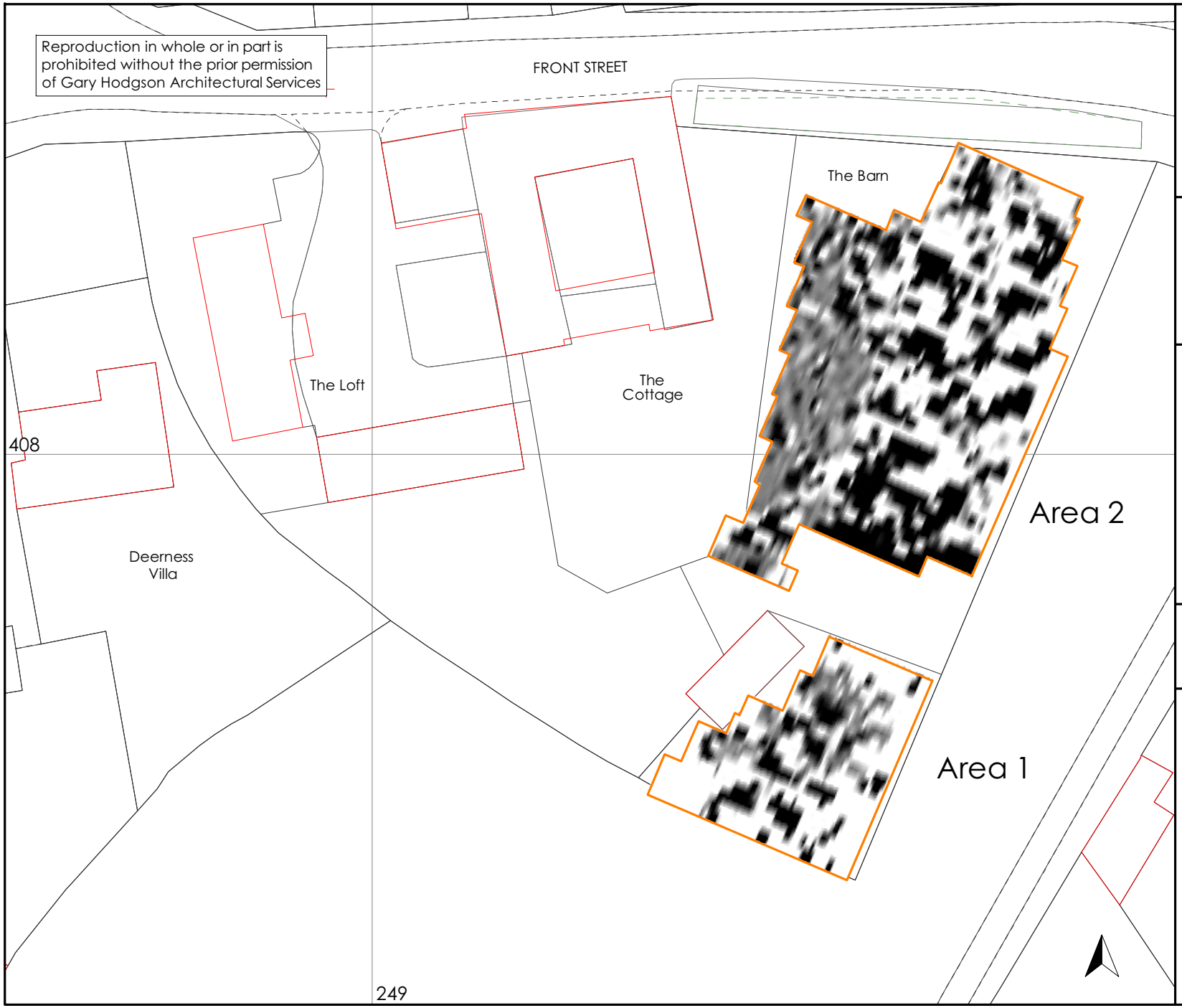
Langley Moor
County Durham

geophysical survey and archaeological evaluation report 3067

Figure 2: Survey and trench locations

0 25m
scale 1:500 for A4 plot

resistance survey
magnetic survey
trench

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Langley Moor
County Durham

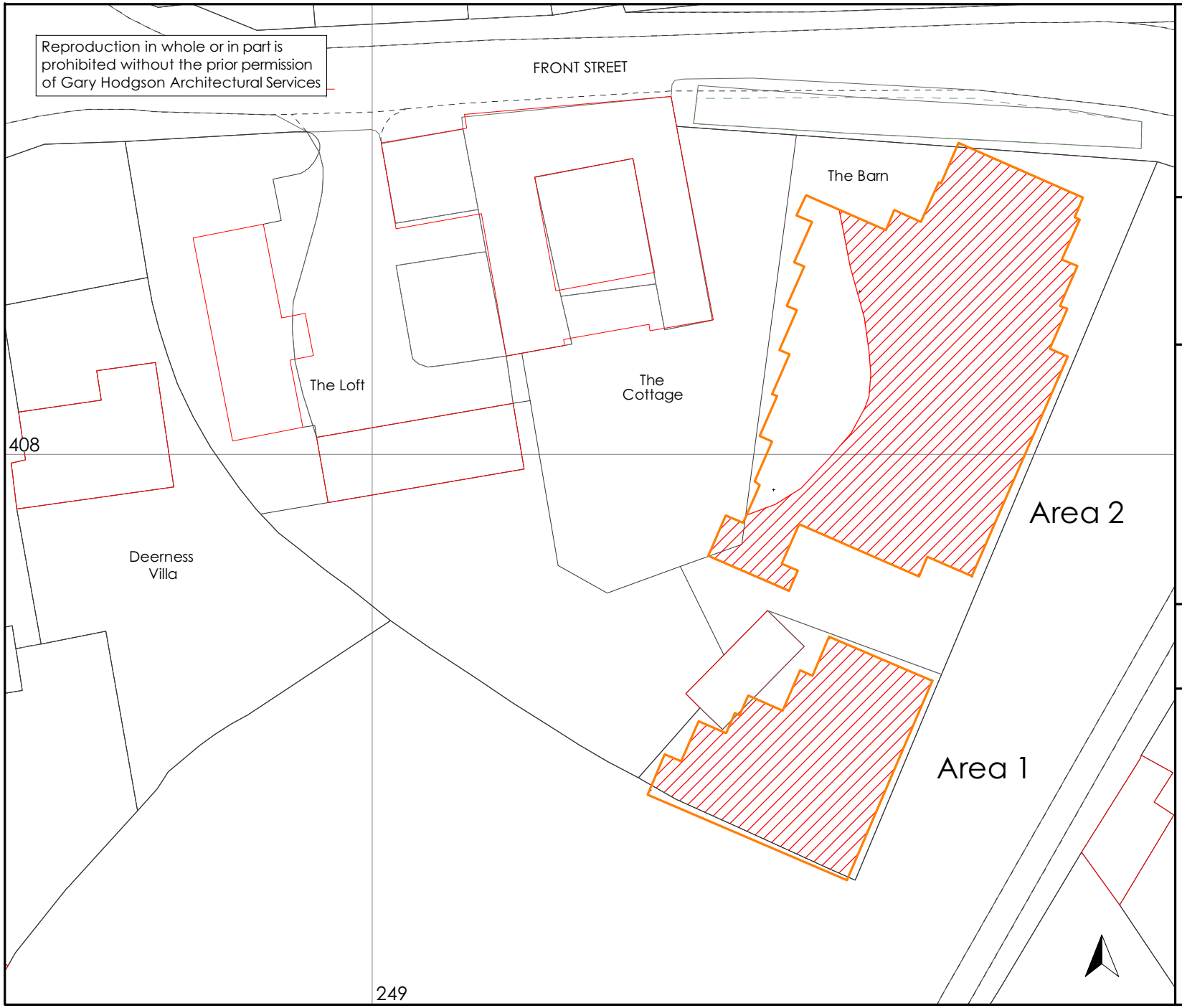
geophysical survey and archaeological evaluation report 3067

Figure 3: Geomagnetic survey

0 25m
scale 1:500 for A4 plot

magnetic survey

-5 nT 5

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Langley Moor
County Durham

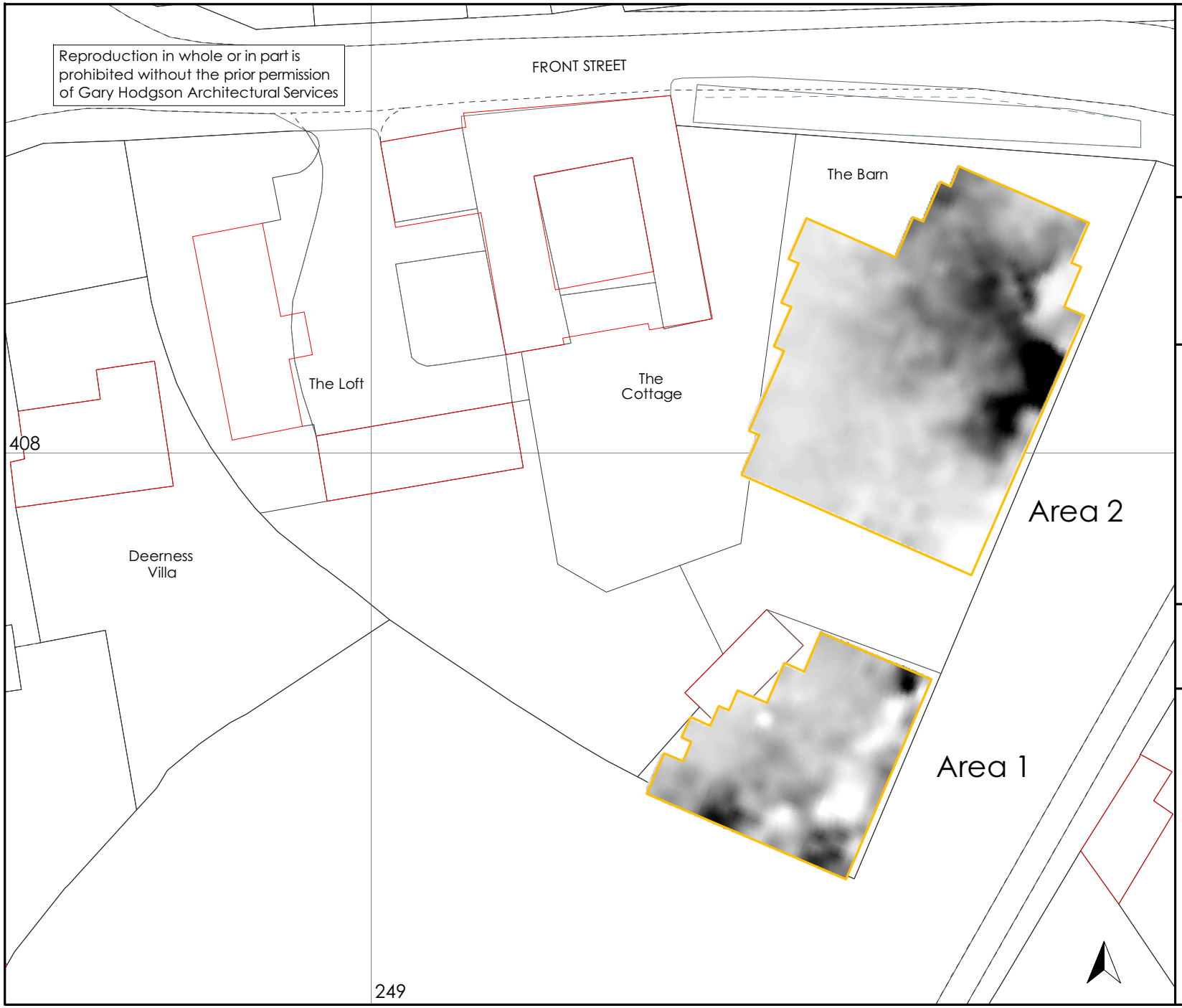
geophysical survey and archaeological evaluation report 3067

Figure 4: Geophysical interpretation of geomagnetic data

0 25m
scale 1:500 for A4 plot

magnetic survey

dipolar magnetic anomaly

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Langley Moor
County Durham

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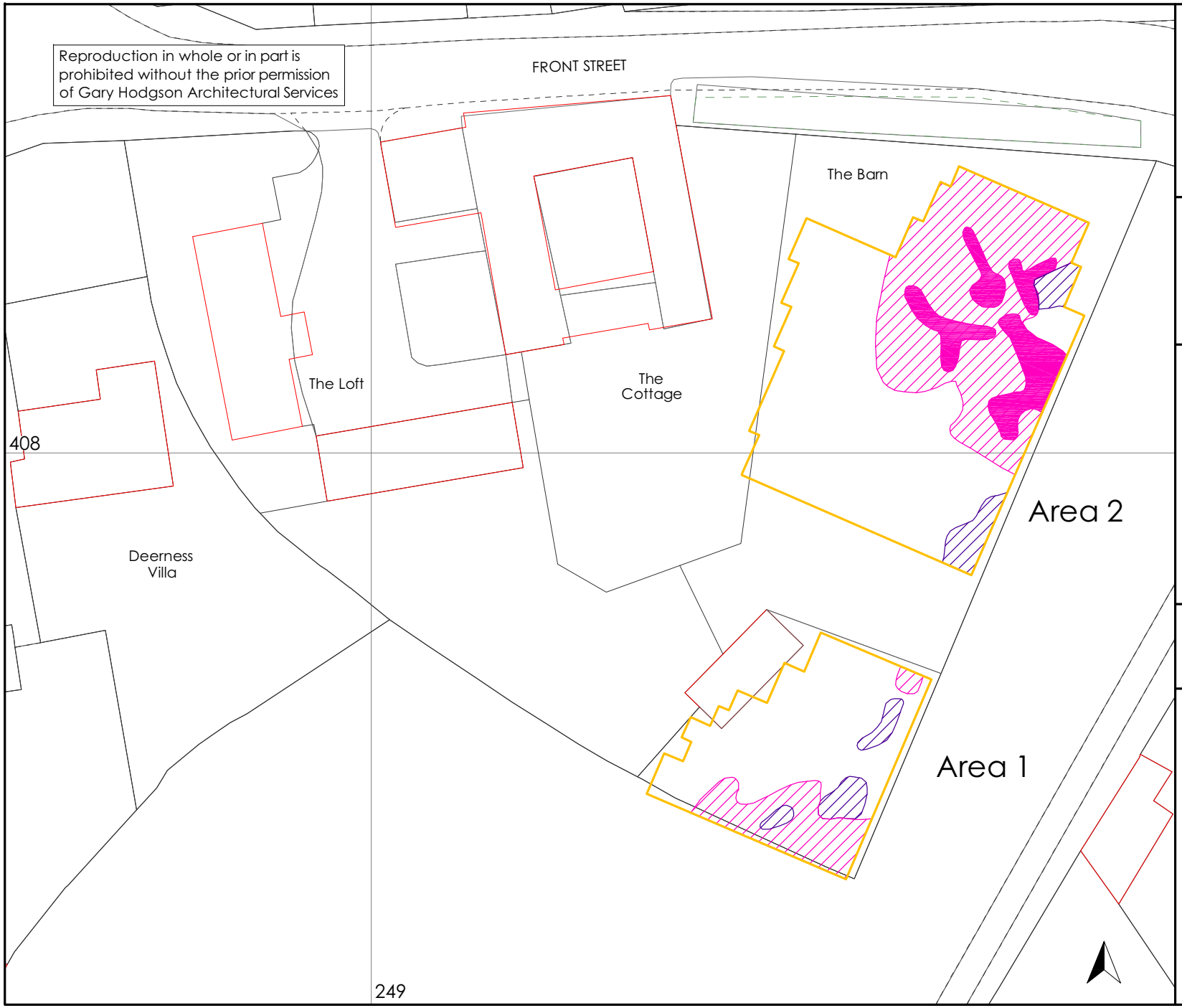
Figure 5: Earth electrical resistance survey

0 25m
scale 1:500 for A4 plot

resistance survey

20 ohm 50

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County Durham

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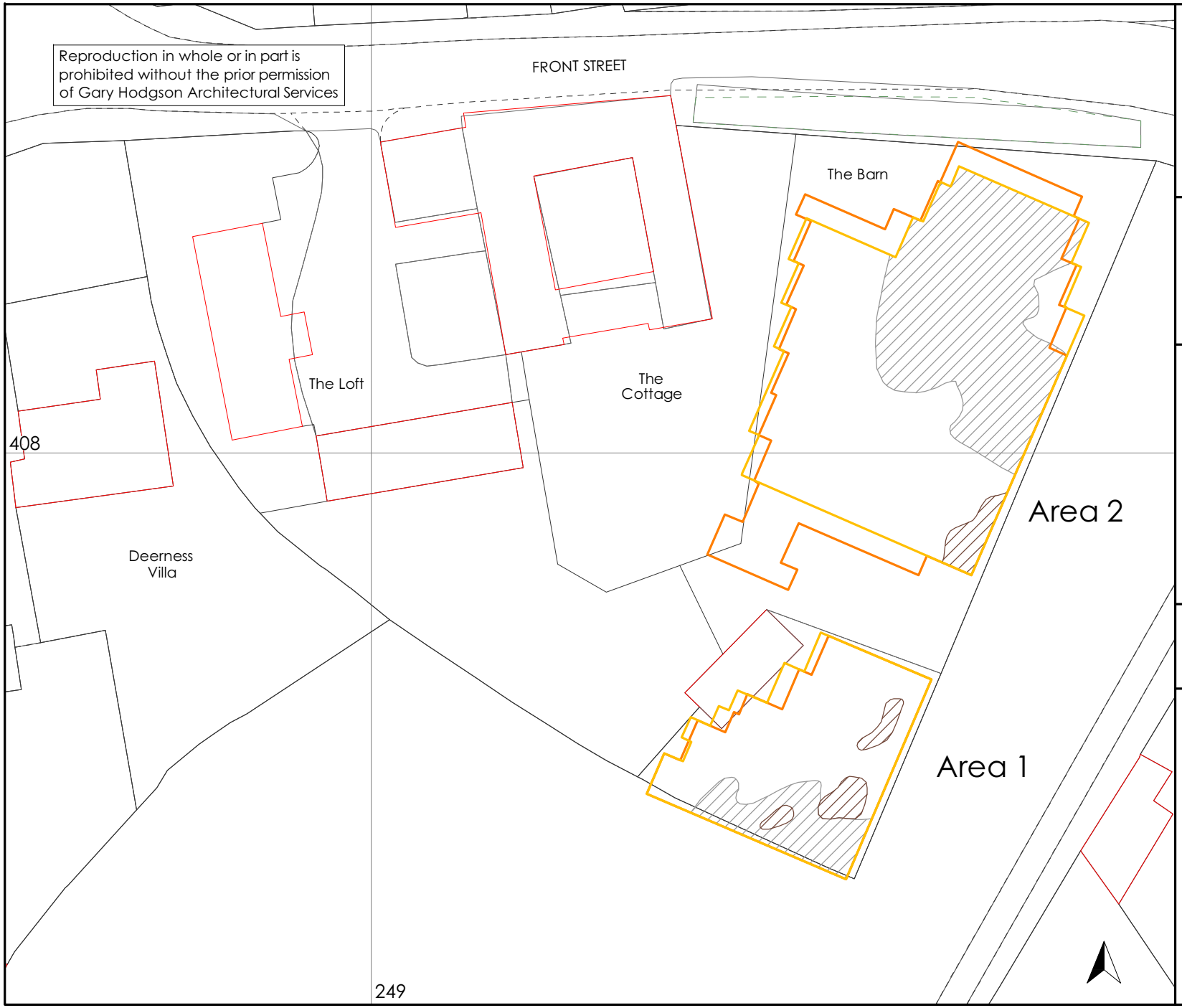
Figure 6: Geophysical interpretation of earth electrical resistance data

0 25m
scale 1:500 for A4 plot

resistance survey
high resistance anomaly
low resistance anomaly

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Langley Moor
County Durham

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Figure 7: Archaeological interpretation

0 25m
scale 1:500 for A4 plot

resistance survey
magnetic survey
soil-filled feature
rubble

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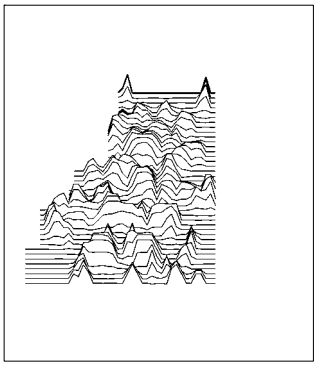
Langley Moor
County Durham

geophysical survey and archaeological evaluation
report 3067

Figure 8: Trace plots of geophysical data

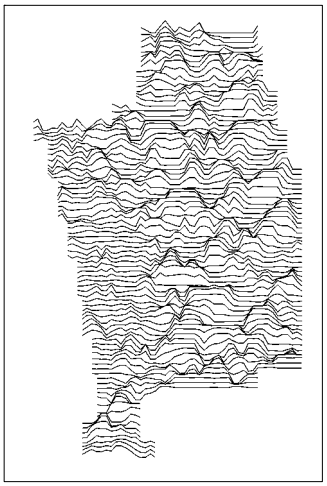
Area 1
geomagnetic data

265.60nT/cm



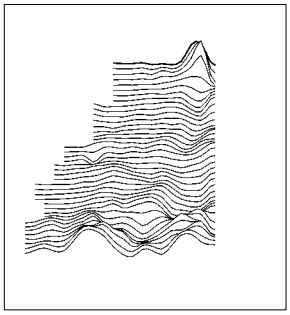
Area 2
geomagnetic data

430.20nT/cm



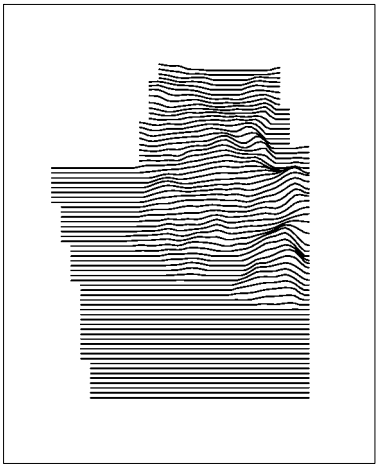
Area 1
resistance data

55.20ohm/cm



Area 2
resistance data

75.50ohm/cm



0 40m
scale 1:800 for A4 plot

Figure 9: Trench 1, looking north-east

Figure 10: Rubble in section of Trench 1, looking north-west

Figure 11: Trench 2, looking south-east

Figure 12: Trench 3, looking north