ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
Smith Marston LLP
for
Lord Durham Estate

Middle Herrington Farm
Foxcover Lane
Sunderland

geophysical and topographic surveys

report 2396
April 2010

Durham University

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Figures

South Road · Durham · DH1 3LE · tel 0191 334 1121 · fax 0191 334 1126
archaeological.services@durham.ac.uk · www.dur.ac.uk/archaeological.services

1. Summary

The project

1.1 This report presents the results of geophysical and topographic surveys conducted in advance of a proposed development on land west of Middle Herrington Farm, Foxcover Lane, Sunderland. The works comprised the geomagnetic and earth electrical resistance survey of 0.2ha of land and the topographic survey of existing ridge and furrow earthworks.

1.2 The works were commissioned by Smith Marston LLP and conducted by Archaeological Services Durham University.

Results

1.3 Linear geophysical anomalies reflecting the upstanding ridge and furrow earthworks were detected in the western half of the survey area. These features have also been recorded topographically.

1.4 A rectilinear anomaly was detected by the resistance survey, which could reflect the footing of a small building or animal pen.

1.5 The north, east and south of the survey area was shown to have been disturbed by the installation of services and drains.

Recommendations

1.6 No further archaeological works are recommended in relation to this development proposal.

2. Project background

Location (Figures 1 & 2)

2.1 The survey area was located west of Middle Herrington Farm, Foxcover Lane, Sunderland (NGR centre: NZ 3551 5320). One area was surveyed measuring approximately 0.2ha. It was bounded to the east by housing, to the north by Foxcover Lane and to the west and south by open farmland.

Development proposal

2.2 The development proposal is for the construction of a new farmhouse and barn.

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 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 development. The second aim was to record the existing ridge and furrow earthworks within the proposed development area.

Methods statement

2.4 The surveys have been undertaken in accordance with a specification provided by Tyne and Wear Specialist Conservation Team, reference number MON7935 (Appendix). Archaeological Services proposed a variation to the specification to undertake earth electrical resistance survey, which was approved by the Tyne and Wear Archaeology Officer.

Dates

2.5 Fieldwork was undertaken on 15th April 2010. This report was prepared for 28th April 2010.

Personnel

2.6 Fieldwork was conducted by Natalie Swann (Supervisor) and Richie Villis. Geophysical data processing and report preparation were conducted by Natalie Swann with illustrations by Edward Davies and edited by Duncan Hale, the Project Manager.

Archive/OASIS

2.7 The site code is **MHF10**, for **M**iddle **H**errington **F**arm 20**10**. 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 **archaeol3-76145**.

3. Historical and archaeological background

Previous archaeological works

3.1 An archaeological desk-based assessment was prepared for the site of the two houses immediately to the east of the proposed development in 1999 by Northern Counties Archaeological Service. This was followed by an evaluation trench on that site in 2000 by Archaeological Services Durham University. The evaluation found no evidence of the cursus (below) nor any other features or finds of archaeological or

historical interest. In 2008 two trenches were excavated by Archaeological Research Services on the site to the immediate north of the new houses. Again, no sign of the cursus was found.

The prehistoric period (up to AD 70)

3.2 The site lies on the projected line of a prehistoric cursus which is aligned southwards down Hastings Hill and possibly beyond. The cursus is defined by parallel ditches around 0.4m deep. Part of the cursus on Hastings Hill is protected as a Scheduled Ancient Monument along with a prehistoric barrow (SAM 32070). In the fields south of the barrow a number of other possible prehistoric enclosures have been identified, including a sub-circular enclosure measuring around 100m by 60m.

The medieval and post-medieval periods (5th century to 1899)

3.3 Middle Herrington is not explicitly mentioned until 1333 when it was coupled with East Herrington, both being the property of Roger de Eshe. By 1855 the village had a vaguely two-row, east-west form; the north row consisted of two farms, one at each end of the row. On the south side was Herrington Hall and Park; the hall has now gone but the park survives.

3.4 Between West and Middle Herrington, on both sides of the Herrington Burn and in the park south of Middle Herrington there are upstanding ridge and furrow earthworks, without extant field boundaries.

4. Landuse, topography and geology

4.1 At the time of survey the proposed development area comprised a single field of pasture. A small area against the west field boundary was fenced off and contained a trailer and farm machinery.

4.2 The survey area was predominantly level with a mean elevation of approximately 78m OD. Upstanding ridge and furrow earthworks were visible in the field, aligned approximately north-south.

4.3 The underlying solid geology of the area comprises Permian Magnesian limestone, which is overlain by drift geology of glacial till.

5. Topographic survey

5.1 A total station survey instrument was used to record the location, course and heights of the ridge and furrow earthworks within the proposed development area. Their locations were tied-in to known, mapped Ordnance Survey points.

5.2 Two representative profiles through the sequence of ridge and furrow earthworks were also recorded. The results of the topographic survey are shown in Figure 3.

6. Geophysical surveys

Standards

6.1 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 Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2002).

Technique selection

6.2 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.

6.3 In this instance, based on aerial photographic and cropmark evidence, 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.

6.4 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.

6.5 Given the proximity of buildings, services and wire fences an earth electrical resistance survey was also considered appropriate. Although more time-consuming than magnetometry, this method can be used in a wider range of locations since it is not affected by nearby buildings/fences or igneous geology. Electrical resistance survey can also 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

6.6 A 20m grid was established across the survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system with real-time correction.

6.7 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

0.03nT, the sample interval 0.25m and the traverse interval 1.0m, thus providing 1,600 sample measurements per 20m grid unit.

6.8 Measurements of earth electrical resistance were determined using a Geoscan RM15D resistance meter with a mobile twin probe separation of 0.5m and a MPX15 multiplexer. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was set to 0.1ohm, the sample interval to 1.0m and the traverse interval to 1.0m, thus providing 400 sample measurements per 20m grid unit.

6.9 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

6.10 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 4-6; the trace plots are provided in Figure 7. 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.

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

clip	clips, or limits, 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.
destagger	corrects for displacement of anomalies caused by alternate zig-zag traverses.
despike	locates and suppresses iron spikes in gradiometer data.
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.

6.12 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

6.13 Colour-coded geophysical interpretations are provided. Three types of geomagnetic anomaly have been distinguished in the data:

positive magnetic	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.
negative magnetic	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids.
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.

6.14 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

6.15 A colour-coded archaeological interpretation plan is provided.

6.16 A series of alternate parallel positive magnetic/high resistance and negative magnetic/low resistance anomalies has been detected across the western part of the survey area. These anomalies correspond to upstanding ridge and furrow earthworks with the positive magnetic/high resistance anomalies reflecting the ridges and the negative magnetic/low resistance anomalies reflecting the furrows.

6.17 A number of linear dipolar and negative magnetic anomalies, which correspond to low resistance anomalies, have been detected across the survey area. These almost certainly reflect services, pipes and drains; one is marked on the supplied plan as a main sewer.

6.18 A rectilinear high resistance anomaly was detected in the north-west of the survey area; this probably reflects stone or rubble and may represent the footings of a small building or animal pen.

6.19 The dipolar magnetic anomalies detected on the eastern side of the survey area probably reflect near-surface fired and ferrous debris such as bricks and horseshoes.

7. Conclusions

7.1 Geophysical and topographic surveys were undertaken on land west of Middle Herrington Farm, Sunderland, prior to proposed development.

7.2 Linear geophysical anomalies reflecting the upstanding ridge and furrow earthworks were detected in the western half of the survey area. These features have also been recorded topographically.

7.3 A rectilinear anomaly was detected by the resistance survey, which could reflect the footing of a small building or animal pen.

7.4 The north, east and south of the survey area was shown to have been disturbed by the installation of services and drains.

8. Sources

Archaeological Services 2000 *Middle Herrington Farm, Sunderland, Tyne and Wear: archaeological evaluation*. Unpublished report **674**, 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

Schmidt, A, 2002 *Geophysical Data in Archaeology: A Guide to Good Practice.* Archaeology Data Service, Arts and Humanities Data Service

Appendix: Project specification

Tyne and Wear Specialist Conservation Team
Specification for Survey of Ridge and Furrow and Geophysical Survey at land west of Middle Herrington Farm, Sunderland
Planning Application: pre-application
Author: Jennifer Morrison
Tyne and Wear Archaeology Officer
West Chapel
Jesmond Old Cemetery
Jesmond Road
Newcastle upon Tyne
NE2 1NL
Tel (0191) 2816117
jennifer.morrison@newcastle.gov.uk
Date: 18 March 2010
County Archaeologist's Reference Number: MON7935
The Tyne and Wear Specialist Conservation Team is the curatorial service for archaeology, industrial archaeology and historic buildings throughout the Tyne and Wear districts. It helps and advises Newcastle, Gateshead, North Tyneside, South Tyneside and Sunderland Councils to carry out their statutory duties to care for the precious historic environment of Tyneside and Wearside. The Team can be found at the Strategic Housing, Planning and Transportation Division of the Environment & Regeneration Directorate of

Newcastle City Council

Introduction
Grid reference NZ 3551 5320
A site to the west of Middle Herrington Farm is proposed for a new farmhouse, farm store and garage. The site lies outside (to the immediate west of) the presumed extent of Middle Herrington Village, but it is within the associated medieval field system as aerial photographs show extant broad ridge and furrow. The earthworks at Herrington are fairly extensive and are quite spectacular.
HER 245 Middle Herrington village
Middle Herrington is not explicitly mentioned until 138 x 1333 when it was coupled with East Herrington, both being the property of Roger de Eshe. Both were held from him by John Denum, Middle Herrington by dringage service. The latter does not seem to have become a separate township, and the two remain as part of the same estate, passing to the Lambton family in 1825. In 1855 the village had a vaguely 2-row, east-west, form with Fox Cover Lane running north in a dog leg from the north side. By then it probably consisted of two farms, one at each end of the north row, and - on the south side - Herrington Hall, ancillary buildings and park. The park survives, but the hall has gone and its site has been grassed over. A farm remains at the north-west end, but the remainder of the village is covered by modern houses.
HER 487 Herrington, ridge and furrow
Between West and Middle Herrington, on both sides of the Herrington Burn, which here flows from W to E, and also in the Park S of Middle Herrington, there is fine ridge and furrow, without extant field boundaries. The Tithe Awards for both settlemnts of 1847 suggest that the township boundary ran N-S across the first of these areas, leaving a single field (W Herrington no. 60, Battle Field) to the W. On the E side of the line there were apparently 5 fields divided between 3 farms, nos. 62 The Meadows, 63 Blakeless and 75 in the Middle Herrington west farm, no. 64 West Blakeless in John Gibson's Farm, and no. 74 with the land attached to Middle Herrington Hall. All at that time were down to grass. In the second area, no. 80 The Park was grass, no. 98 Far Park was arable.
The site lies on the projected line of a prehistoric cursus which runs south-west down Hasting Hill and possibly beyond. The cursus is defined by parallel ditches around 400mm deep. Part of the cursus on Hasting Hill is protected as a Scheduled Ancient Monument (SAM 32070). If the cursus were to survive on this site English Heritage may decide to extend the scheduled area. The cursus is only one part of a wider prehistoric landscape which also includes a scheduled barrow and interrupted ditch enclosure.
HER 110 Hasting Hill, cursus
A rectangular structure, marked by ditches has been tentatively identified as a cursus. Its square north end is c. 30 m wide, and close to but not touching the south-east side of Site no. 109. It is aligned roughly north-south, and its parallel sides are visible for a length of some 200 m. In 1980, a little to the south of Site no. 109, the cursus ditch was located and excavated. "It is about 1 m wide and 40 cm deep, with a V shape of asymmetrical profile and some sizeable stones in the bottom".
HER 109 Hasting Hill, interrupted ditch enclosure
The enclosure measures c. 100 m x 60 m, and is marked by a single interrupted ditch. In 1980 the ditch was tested in 2 places. On the west side it was preserved to a width of 2.20 m, and showed up as a compact silty brown soil against the whitish limey natural soil. Its depth was not explored, but the deposits appear to be well preserved. On the south side the ditch was barely 1 m wide and only 20 to 30 cm deep, i.e. it had been severely damaged by ploughing. A small amount of animal bone came from just below the modern plough soil. The gradiometer survey showed the main ditch, with gaps, and internal features including "a circular ditched thing".
HER 111 Hasting Hill, circular features
There are a number of circular and sub-circular features visible as cropmarks in the same field. Two might be cut by HER 109. Some have been described as ring ditches or barrows and one such is clear outside the south end of HER 110 (1).
HER 113 Hasting Hill, barrow
A small round barrow, on the highest point of Hasting Hill, at its west end. It was described by Trechmann as low, flat and slightly bowl-shaped, with the dimensions 40 feet diameter, c. 2 ft 9 in high in the middle, 3 ft at the edge. There is some inconsistency in the measurements: HBMC 12-15 m diam, 1 m high; Young 19.85 m diam, 1.95 m high. It appears to be of cairn construction, consisting of earth and stones, some large, of limestone, sandstone, whin and erratics, and to lack a surrounding bank and ditch.

There is an O.S. trig pillar on top of the mound. It was excavated by Trechmann in 1911 and, in addition to separate entries HER 112, 451-83, he found in the make-up of the mound scattered human bones of at least 10 individuals, animal bones and flint chippings.
HER 452 Hasting Hill barrow, cremations
Find I: calcined bones in a cist, mixed with fragments of a food vessel, a pygmy cup and flints. Trechmann suggested that the two vessels were thrown on the pyre with the body, and some of the fragments were then gathered up with the bones. A secondary burial.
HER 112 Hasting Hill barrow, Neolithic pottery
In 1911 Trechmann excavated the Hasting Hill barrow. In the material of the mound he found, among other things, frags of 2 Neolithic pots. 1. 3 sherds of a shallow semi-globular bowl, 4+" diam., in dark orange fabric with vertical incised lines around exterior and shallow indentations on rim bevel. 2. Rim sherd in Peterborough Ware. T-shaped profile forming an internal bevel. Hard red fabric, much grit, decorated with deeply scored lines on rim bevel and neck, fingernail impressions on exterior of rim. Reason for the deposition of this pottery uncertain. Small bowl might have originally accompanied a burial or burial deposit scattered by the insertion of the numerous Bronze Age burials. Alternatively,...with the flints and animal bones also in the mound, it "could have been derived from an earlier occupation preserved by the erection of the barrow mound".
HER 325 Hasting Hill, antler pick
"Antler pick (cervus elephas) found 'a quarter of a mile W of Hasting Hill'".
HER 467 Hasting Hill barrow, antler pick
Find VII: "A pick formed of a stag's antler, 16 inches in length. It was found among limestone rubble a few feet NW of the primary grave and a few inches above the limestone rock. This is the type of implement apparently in general use in constructing barrows. The brow tine nearest the skull of the animal has been used as the point of the pick and has the end broken off or worn away. The fragment of stag's antler found in the primary grave may very possibly be the end of this pick broken off and left in the grave by accident. The pick has a part of the skull attached, showing it to be the antler of a killed stag and not merely a shed antler".
HER 480 Hasting Hill barrow, Food Vessel
On the level of the limestone, and about 16 inches from the feet of skeleton (SMR 479) but apparently not associated with that or any other burial, Trechmann found the rim of a food vessel. "Finely decorated with incised herringbone interrupted by single encircling twisted cord lines. Red-brown fabric".
HER 451 Hasting Hill, inhumation
Before his excavation of the barrow in 1911, Trechmann was informed by the tenant, Mr. Thomas Brown of East Herrington, that on 5 October 1827, "a contracted skeleton had been found there having the hair on its head, and that the finders concluded that a murder had been committed. The supposed hair on the head was probably some small fibrous roots of plants grown round the skull, and as the skeleton was found in the contracted position it was undoubtedly British".
An archaeological desk based assessment was produced for the site of the two houses to the immediate east in 1999 (Northern Counties Archaeological Services). This was followed by an evaluation trenches in 2000 (Archaeological Services Durham University). No evidence of the cursus was found. In 2008 two trenches were excavated by Archaeological Research Services on the site to the immediate north of the new houses. Again, no sign of the cursus was found.
The appointed archaeologist must familiarise themselves with the results of the desk based assessment before starting work. Copies are held by the HER.

Description of Site

The client will provide a site location plan which will accompany this specification.
The commissioning client will advise on the size of the site.

Solid geology, drift geology, current land use and surface conditions

The solid and drift geology is Permian magnesian limestone, overlain with glacial till (boulder clay). The site is covered by scrubby grass. Ridge and furrow earthworks are visible. There are a couple of small buildings along the west boundary of the site.

Work RequiredI

In accordance with PPG16 and UDP Policies B13 and B14, a programme of archaeological work is required, starting with a survey of the ridge and furrow and a geophysical survey. The appointed archaeologist will advise the client if any vegetation needs cutting down to allow the work to be undertaken. All staff on site must understand the project aims and methodologies.

Survey of ridge and furrow

Metrical survey of the ridge and furrow earthworks using a combination of transcription of aerial photographs and field survey.
Aerial Photographs can be obtained from:

- Durham University Archaeology and Geography Departments
- Sunderland City Council Planning Department
- The NMR at Swindon
- www.ukaerialphotos.com – online RAF photos from WW2 to present day
- Cambridge University Committee on Aerial Photography
- Google Earth
- Google Maps

Use an EDM to record the location, course and spot heights of the individual ridges and furrows.
Plot the ridge and furrow onto a modern site plan at an appropriate scale using the surveyed field boundaries as reference points. Define the top of the ridges with a long dashed line, and the base of the furrows with a short dashed line.
Record representative profiles through a sequence of ridge and furrow in the field.Relate the spot heights to the Ordnance Survey datum from an established benchmark.

Geophysical Survey

Geophysical evaluation is required to inform the Planning Authority as to the likelihood that important archaeological sites might be encountered, to assist the Planning Authority in determining appropriate mitigation should deposits be found to survive on the site.
The appointed archaeological contractor must be a specialist in geophysical survey techniques.
All staff employed by the Archaeological Contractor shall be professional field archaeologists with appropriate skills and experience to undertake work to the highest professional standards.
All fieldwork, data processing and reporting must comply with English Heritage guidelines of 2008 (“Geophysical Survey in Archaeological Field Evaluation”).

Geophysical survey should be part of an integrated programme of research as promoted in 'Management of Research Projects in the Historic Environment' (MoRPHE).
The purpose of this brief is to obtain tenders for this work. The report must be the definitive record for deposition in the Tyne and Wear HER, and it must contain recommendations for any further work needed on this site before development destroys any archaeological remains.
It is proposed that archaeological trial trenching will be undertaken after the geophysics to investigate any anomalies identified by the survey and to test 'blank' areas. The County Archaeology Officer will have to check with Sunderland City Council if it is acceptable to excavate in the Greenbelt, before this can be done.
Notification
The County Archaeologist needs to know when archaeological fieldwork is taking place in Tyne and Wear so that he can inform the local planning authority and can visit the site to monitor the work in progress. The Archaeological Contractor must therefore inform the County Archaeologist of the start and end dates of the Geophysical Survey. The Client will give the County Archaeologist reasonable access to the development to undertake monitoring.
Methodology
A programme of geophysical survey will be undertaken which provides 100% coverage of the site. Any areas found to be disturbed should be excluded from the survey however, as these will not be conducive to producing reliable results.The survey aims to map subsoil disturbances and locate anomaly-producing structures or deposits which might indicate the presence of archaeological sites. To ensure fair and equal tendering, contractors will assume that this will be a 100% detailed magnetometer survey (scanning or magnetic susceptibility are not appropriate techniques). Survey must be conducted with a continuously recording magnetometer of appropriate sensitivity. If the appointed contractor thinks that a resistivity or ground penetrating radar survey would provide better results they must discuss this with the County Archaeology Officer before providing their client with a revised tender. The survey grid is the network of control points used to locate the geophysical survey measurements relative to base mapping and/or absolute position on the Earth's surface. Whether physically marked on the ground or measured while surveying using s global positioning system (GPS) these must be located to survey-grade accuracy (+/- 0.1m). The survey grid must be independently re-locatable on the ground by a third party either by measurement to permanent features and/or by the use of GPS coordinates. The survey grid will be tied into known Ordnance Survey points with a total station etc. Care must be taken to ensure that any survey markers are not a hazard to people or animals.
The data will be logged in 10m grid units.The sample interval will be set to 0.25m and the traverse interval to 1m.
The geophysical survey will be conducted under the principle of repeatability – i.e. that within reason the data obtained should be capable of independent duplication.
Data Interpretation
The interpretation of survey data must be undertaken by a competent archaeological geophysicist who is knowledgeable of the archaeological and geomorphological conditions of the site. The interpretation of magnetometer data must endeavour to distinguish between anthropogenic from other causes of magnetic enhancement on the site. A clear distinction must be made between interpretation that is scientifically demonstrable and that which is based on informed speculation. Any reference to negative evidence must be fully explained. Lack of geophysical anomalies cannot be taken to imply a lack of archaeological features. Evaluation trial trenching should be considered in these cases.
The Report
The production of Site Archives will be undertaken according to English Heritage Guidelines (Managing Archaeological Projects 2nd Edition and MORPHE).
A full report should be produced within three months of the completion of the field-work. All drawn work should be to publication standard. The report must contain and synthesise the results of the geophysical survey mentioned above. Some form of Digital Mapping, in CAD or GIS software that supports DFX or similar format would be greatly helpful to the Planning Authority.
The report will include clear text supported by tables, figures, appendices and references.
The report will stand independent of supporting material and should combine concise technical description linked to lucid and objective analysis and interpretation. It should be intelligible to specialists and non-specialists alike. The final section of the work should make recommendations for any required further work, particularly the need to do targeted field-walking and trial trenching to validate the results of the survey and test the suggestions that archaeological sites have been detected. Where evaluation is recommended, the finished report will include a suggested trench location plan.The report must have the following features:-

1. Site location plan with scale with survey grid superimposed on the plan
2. Site grid reference
3. Summary/Abstract
4. Project background, objectives
5. Date of work and personnel
6. Historical and archaeological background
7. Site land use, ground conditions, topography, solid and drift geology, soil type and weather
8. Methodology – equipment, instrument and techniques employed and why, technique used for data processing, software used
9. Results – description and analysis of results and their interpretation.
10. Conclusions – discussion of the survey results with reference to the original objectives. Summary of the archaeological significance of the survey findings, the need for future archaeological work
11. plots and plans:
    - survey location plan demonstrating relationships to other mapped features. Minimum scale 1:2500
    - an image of minimally processed survey data, preferred scale 1:1000
    - where appropriate a trace (or X-Y) plot of raw magnetic data. For very large sites a sample of data might be supplied instead, to support specific interpretation of anomalies on identified grayscale images.
    - A grayscale plot, or dot density plot. Minimum scale 1:1000
    - One or more interpretative plans or diagrams. Minimum scale 1:1000

The location plan must be directly relatable to the OS National Grid. Reproduction of any part of an OS map requires copyright permission. Each plan and plot must have a bar scale or annotated metric grid and an accurately orientated north arrow. Greyscale, dot density and trace plots must also have annotated scales indicating the range of variables depicted.

12. List of all sources consulted, and their location
13. A card cover with title, date, author, contractor organization and commissioning client
14. Some form of binding that permits photocopying.

Report Dissemination

One paper copy of the report needs to be submitted

- for deposition in the County HER

Three pdf copies on CD are needed:

- one for the commissioning client one for the planning authority (City of Sunderland) – to be submitted formally by the developer with the planning application
- and one for deposition in the County HER. Please do not attach this to the report. The CD will also include the grayscale plot in a format that can be uploaded into the HER GIS system (Arcview 9.2) so that any archaeological features can be accurately digitized.

The report and CD for the HER must be sent by the archaeological consultant directly to the address below. If the report is ent via the planning department, every page of the report will be stamped with the planning application number which ruins the illustrations. The HER is often sent a photocopy instead of a bound colour original which is unacceptable.

Archiving

A viable digital copy of the raw survey data must be retained for future interrogation, together with adequate information on the location of the survey and the survey methodology. The archive must be stored on a secure medium. Survey practice and data files must be appropriately documented. The archiving of geophysical data should follow the advice in 'Geophysical Data in Archaeology: A Guide To Good Practice' by A. Schmidt 2002 (Oxbow) and 'Archaeological Archives: A Guide to Best Practice in Creation, Compilation, Transfer and Curation' by D.H. Brown 2007 (IFA on behalf of the Archaeological Archives Forum.

OASIS

The Tyne and Wear County Archaeologist supports the Online Access to the Index of Archaeological Investigations (OASIS) project. This project aims to provide an online index/access to the large and growing body of archaeological grey literature, created as a result of developer-funded fieldwork.

The archaeological contractor is therefore required to register with OASIS and to complete the online OASIS form for their geophysical survey at http://www.oasis.ac.uk/. Please ensure that tenders for this work takes into account the time needed to complete the form.

Once the OASIS record has been completed and signed off by the HER and NMR the information will be incorporated into the English Heritage Excavation Index, hosted online by the Archaeology Data Service.

The ultimate aim of OASIS is for an online virtual library of grey literature to be built up, linked to the index. The unit therefore has the option of uploading their grey literature report as part of their OASIS record, as a Microsoft Word document, rich text format, pdf or html format. The grey literature report will only be mounted by the ADS if both the unit and the HER give their agreement. The grey literature report will be made available through a library catalogue facility.

Please ensure that you and your client understand this procedure. If you choose to upload your grey literature report please ensure that your client agrees to this in writing to the HER at the address below.

For general enquiries about the OASIS project aims and the use of the form please contact: Mark Barratt at the National Monuments Record (tel. 01793 414600 or oasis@english-heritage.org.uk). For enquiries of a technical nature please contact: Catherine Hardman at the Archaeology Data Service (tel. 01904 433954 or oasis@ads.ahds.ac.uk). Or contact the Tyne and Wear Archaeology Officer at the address below.

This specification is based on English Heritage, 2008, Geophysical Survey in Archaeological Field Evaluation.

If you need this information in another format or language, please contact Jennifer Morrison at the above address.

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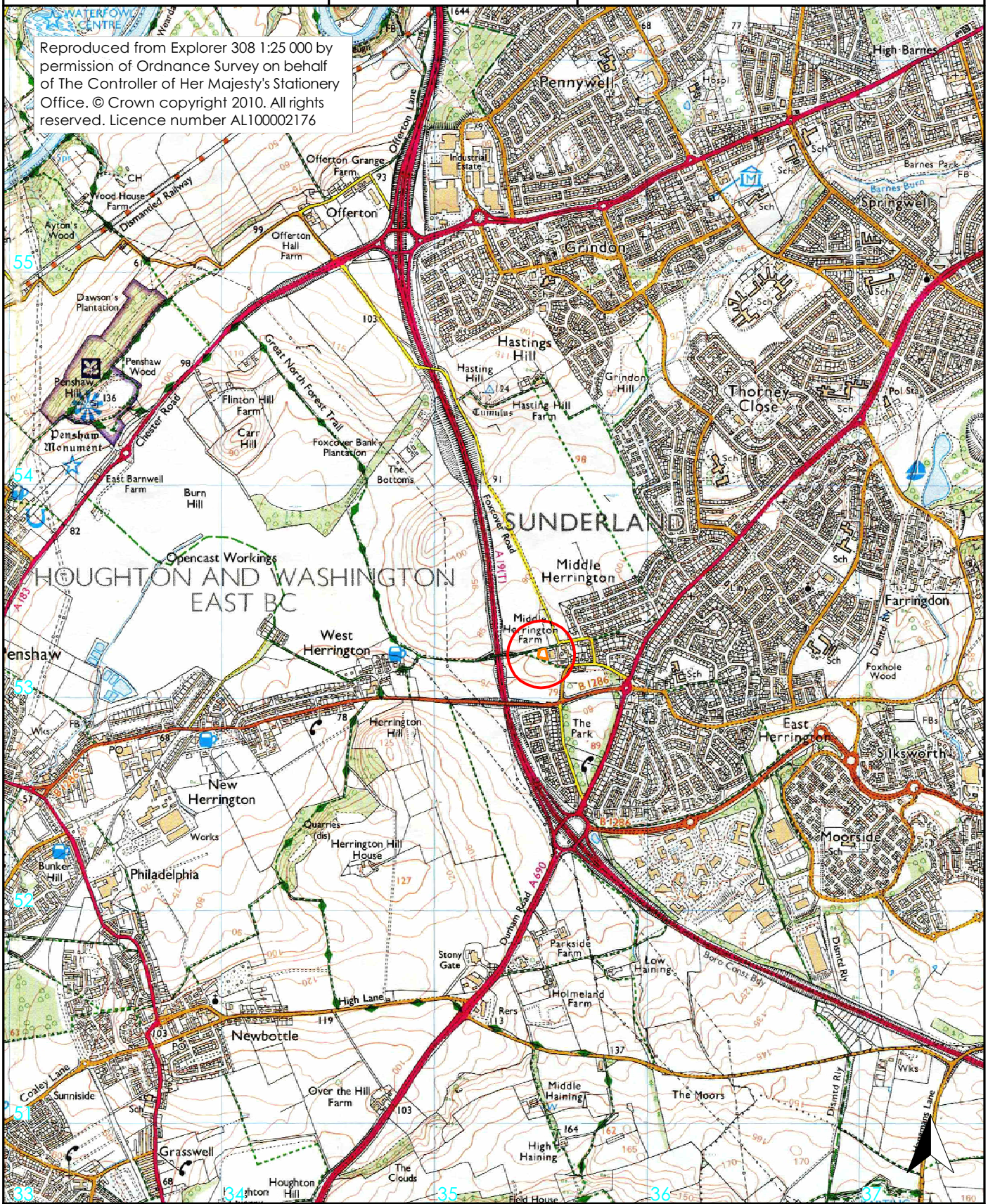
Figure 1: Site location



site location

0 1km
scale 1:25 000 for A4 plot

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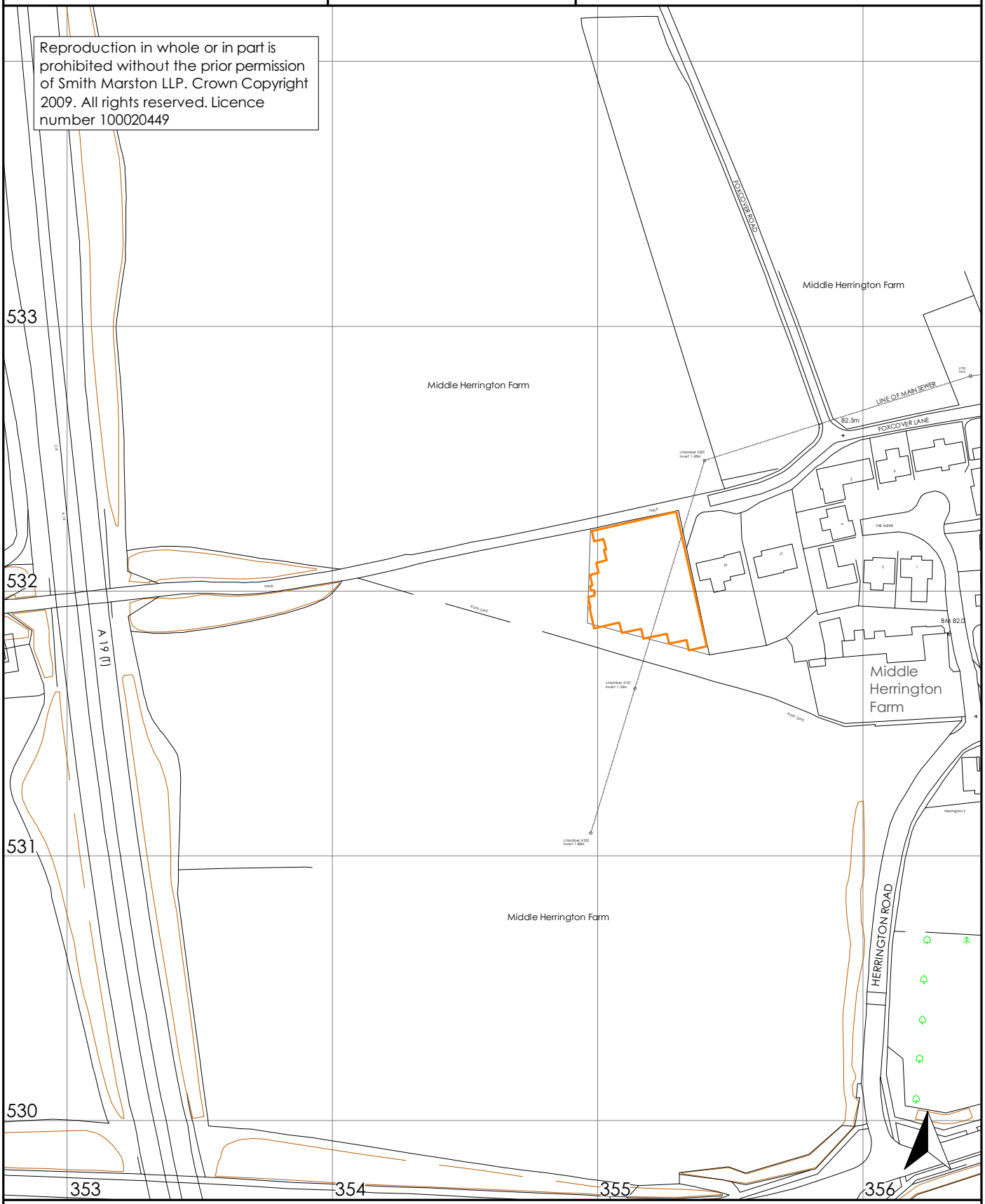
Figure 2: Survey area



survey location

0 100m
scale 1:2000 for A4 plot

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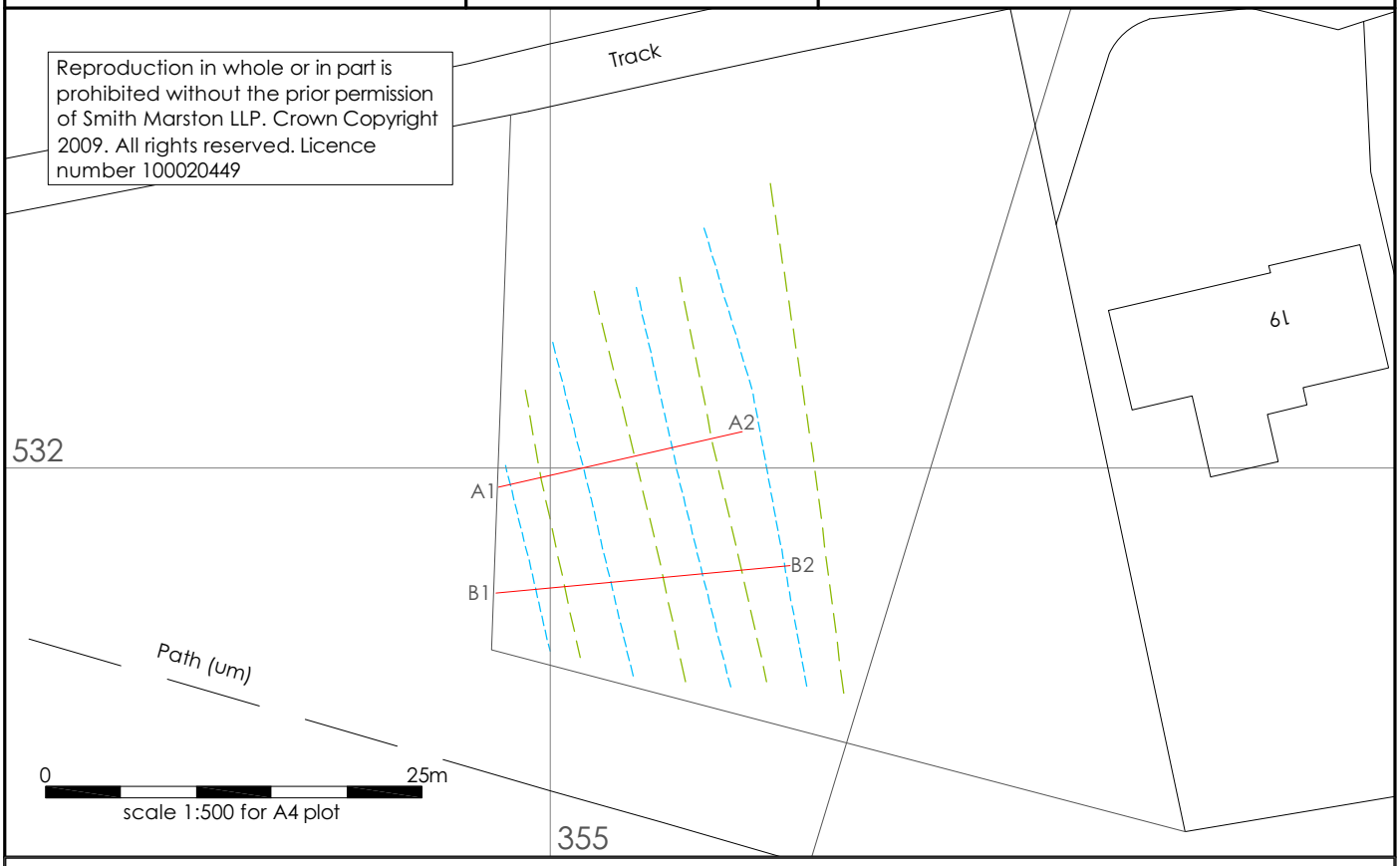
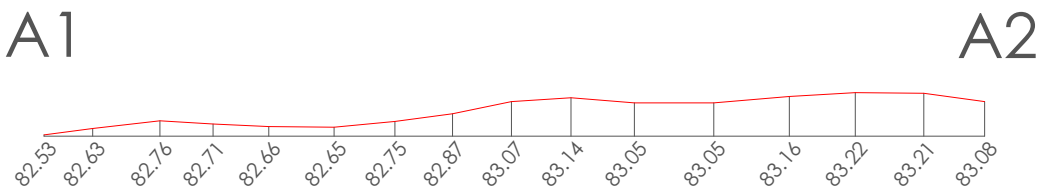
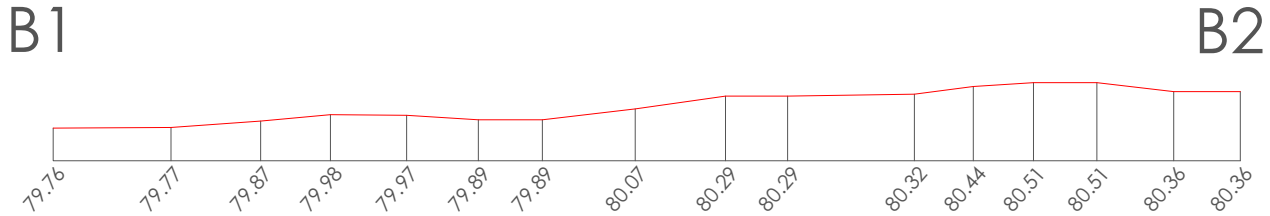
Figure 3: Topographic survey







0 5m
scale 1:125 for A4 plot

All heights are in m OD

ridge furrow profile

Magnetic survey

Resistance survey

chamber 5201
invert 1.45M

Track

61

532

Path (um)

chamber 5101
invert 1.10M

355

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Figure 4: Geophysical surveys

0 25m
scale 1:500 for Ax plot

magnetic survey
-5 nT 5

resistance survey
20 ohm 50

Magnetic survey

chamber 5201
invert 1.45M

Track

61

532

Path (um)

chamber 5101
invert 1.10M

355

Resistance survey

chamber 5201
invert 1.45M

Track

61

532

Path (um)

chamber 5101
invert 1.10M

355

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Figure 5: Geophysical interpretation

0 25m
scale 1:500 for A3 plot

Magnetic survey

- dipolar magnetic anomaly
- positive magnetic anomaly
- negative magnetic anomaly

Resitance survey

- high resistance anomaly
- low resistance anomaly

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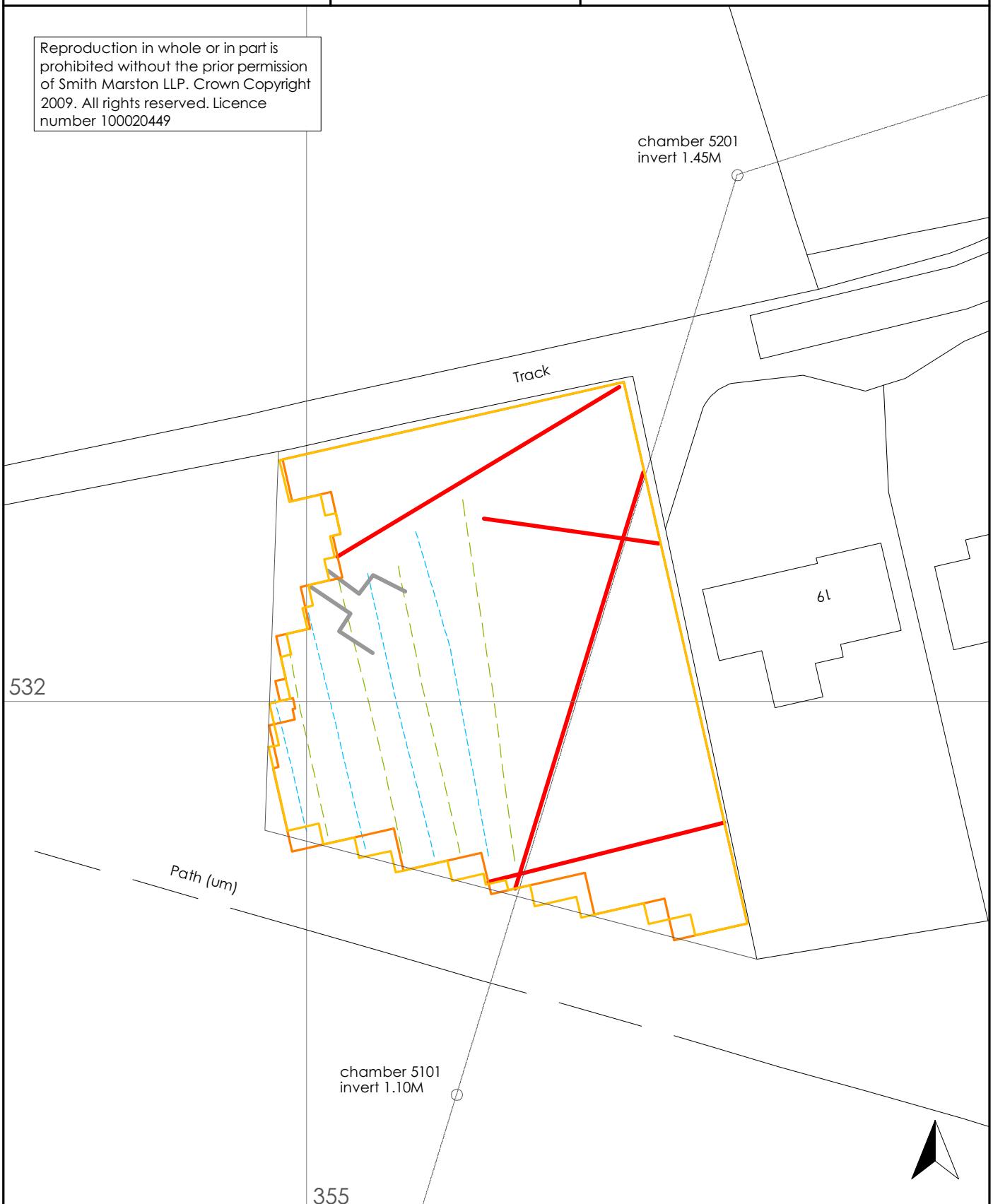
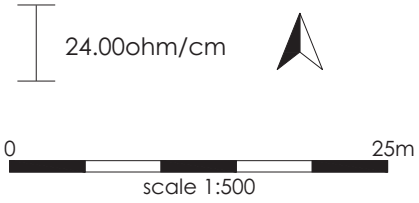
Figure 6: Archaeological interpretation

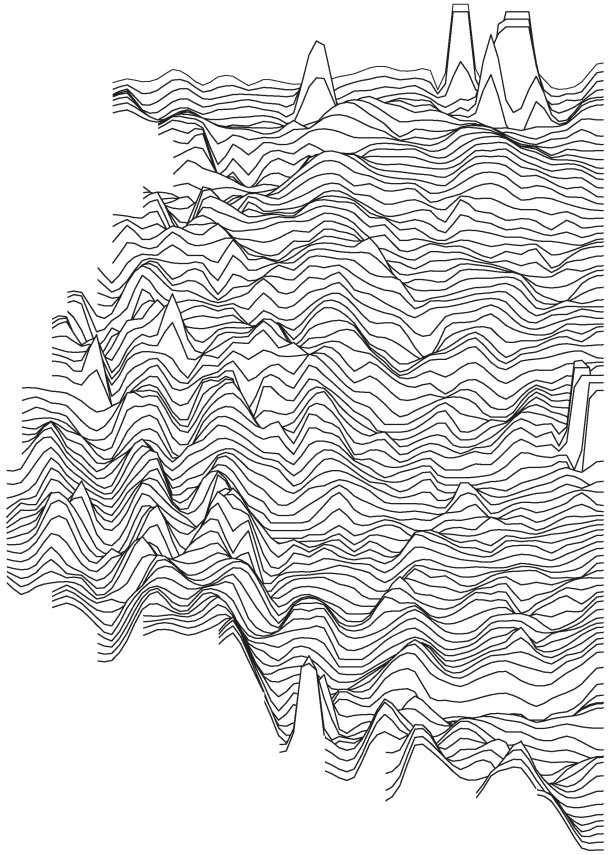


service pipe
stone/brick
ridge
furrow

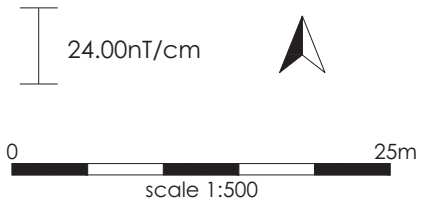
0 25m
scale 1:500 for A4 plot

Resistance survey





Magnetic survey



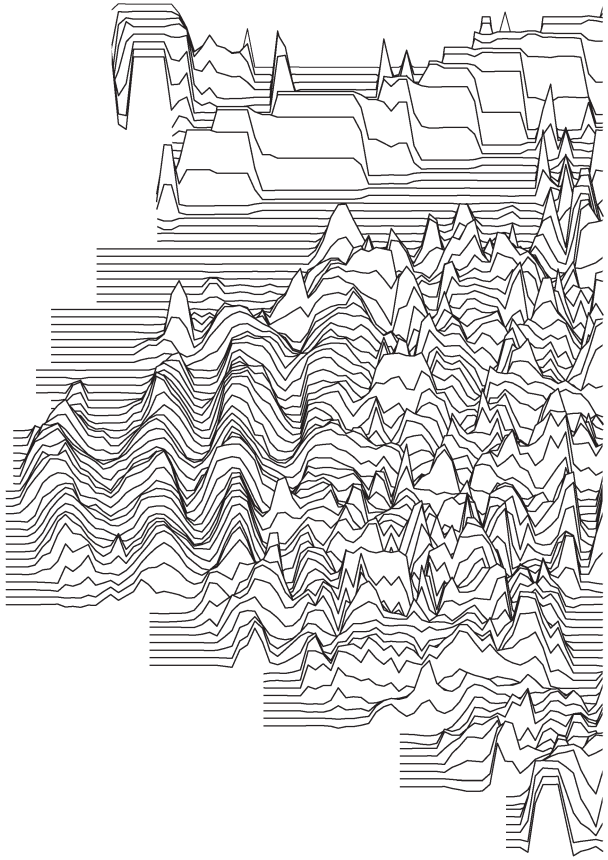


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Figure 7:
Trace plots of geophysical data