ARCHAEOLOGICAL
SERVICES
DURHAM UNIVERSITY

on behalf of
Persimmon Homes

Tunstall Vale
Ryhope
Sunderland
Tyne & Wear

geophysical survey and archaeological evaluation

report 3429
May 2014

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 Ryhope. The works comprised a residential development.

1.2 The works were commissioned by Persimmon Homes 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 and ferrous material, with little or no archaeological potential.

1.4 A linear anomaly was identified running across the site, thought to be of geological origin, as well as a curvilinear feature with possible archaeological origins.

1.5 The evaluation trenches confirmed that the geophysical anomalies were all the result of either modern near-surface disturbance or geological variation.

1.6 Trench 2 established that the cropmarks identified in aerial photographs were the result of geological variation.

1.7 No archaeological deposits were identified in the evaluation trenches.

Recommendations

1.8 As no significant archaeological resource was identified, no further scheme of archaeological works is recommended in relation to this development.

2. Project background

Location (Figure 1)

2.1 The proposed development area is located in Ryhope, Sunderland, Tyne and Wear (NGR centre: NZ 4001 5286). It covers a total area of approximately 4.7ha and the area suitable for survey and evaluation measured 3.5ha. The site is bounded by housing to the south, east and west and recreation grounds to the north. A total of 2.75ha were surveyed and nine trial trenches were excavated across the site.

Development proposal

2.2 The works were undertaken prior to a proposed residential development.

Objective

2.3 The principal aim of the survey 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 survey and evaluation trenching have been undertaken in accordance with national standards and guidance.

Dates

2.5 Fieldwork was undertaken between 18th and 25th April 2014. This report was prepared for May 2014.

Personnel

2.6 The geophysical survey was conducted by Nathan Thomas (supervisor) and Patricia Edwards. The geophysical data were processed by Richard Villis. Trial trench evaluation was conducted by Beverley Still, Natalie Swann and Jonathan Dye (supervisor). This report was prepared by Jonathan Dye, with illustrations by David Graham, and edited by Duncan Hale (Senior Archaeologist). The project manager was Daniel Still.

Archive/OASIS

2.7 The site code is **SRP14**, for **S**underland **R**yho**p**e 20**14**. The archive is currently held by Archaeological Services Durham University, and will be transferred to Sunderland 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 **archaeol3-178823**.

3. Historical and archaeological background

3.1 A desk-based assessment was undertaken by Tyne & Wear Museums (Parker 2008). The historical background of the site is summarised as follows:

The prehistoric period (up to AD 70)

3.2 There are no known sites from the prehistoric period within the site or its immediate environs. However, before mining activity in the 19th century, prehistoric burials were found in hills to the west of Ryhope (Bateman). Ryhope Colliery, where these burials were located, used to lie approximately 0.5km north and north-west of the site. Aerial photographs of the site also show a possible rectilinear enclosure with a curvilinear feature inside it.

The Roman period (AD 70 to 5th century)

3.3 There is no evidence for Romano-British activity within the site or the surrounding area.

The medieval period (5th century to 1540)

3.4 The first documentary reference to Ryhope dates to 930 when King Athelstan gave 'South Wearmouth' and its appendages, which included 'duas Reofhoppas' (two Ryhopes) to the see of Durham (Fordyce, 1851). It is not known what happened to the second Ryhope, or indeed where it was.

3.5 According to Surtees (1816), the place name Tunstall originated during the Saxon period.

3.6 Tunstall (1km west of the site) and Ryhope (1.1km east of the site) were both listed in the Boldon Buke (1183) as well as Hatfield's Survey of 1349-81, although not as parishes in their own right. Tunstall contained 13 named tenants, 14 messuages, 1 cottage, a windmill and a common oven while Ryhope contained 2 free tenants, twenty four 12-acre holdings, 18 messuages, 3 cottages and extensive exchequer land (HER 103 and 224).

3.7 Aerial photographs of the area show medieval ridge and furrow within an area of open land between Runswick Close and Runcorn in Tunstall (0.7km west of the site) and within the now developed land immediately west of the site. This suggests that the site and surrounding area were used for agricultural purposes during the medieval period.

The post-medieval period (1541 to 1899)

3.8 During the post-medieval period, the populations of both Tunstall and Ryhope grew steadily. Tunstall's population grew from 53 in 1801 to 70 in 1851 and Ryhope grew from 254 inhabitants in 1801 to 475 in 1851 (Summers, 1858). From the 1850s onwards, the populations of both villages rapidly grew to 6,025 in Ryhope in 1881 and 4,306 in Tunstall in the same year. This was due to the opening of collieries and limestone quarries in the locality (HER 2953-5, 2961 and 2962).

3.9 The First Edition Ordnance Survey map of 1856 shows the site as an open field, surrounded by farmland. Within the north-eastern corner of the site is a small farmstead called Ox Close. To the south of the Ryhope to Houghton-le-Spring road, Mill Hill and Mill House are marked. These buildings are also shown on an 1869 plan together with a windmill within the field next to Mill House.

3.10 Ryhope Colliery opened in 1857 and closed in 1966. With the colliery came housing for the workers forming terraces a mile long, chapels, a school, miners' hall, shops and co-operative stores (HER 6994). By the time of the Ordnance Survey Second Edition of 1898, Ryhope Colliery (HER 6994) had a railway which connected to the Silksworth Colliery Railway (HER 6996) immediately north of it. These railways are located approximately 0.6km north of the site.

3.11 The Second Edition Ordnance Survey map of 1898 again shows the site as an open field surrounded by farmland. Ox Close was still present in the north-east corner of the site and had expanded. Outbuildings shown on this map are still present on the site today although in a dilapidated state. Also shown on this edition is the presence of a boundary stone on the western boundary of the site. This stone was not visible at the time of the site visit as a new housing estate has been constructed to the west of the site which is surrounded by a timber fence and the ground to the east of this fence was overgrown. The construction of the new housing estate may have resulted in the removal of the boundary stone, but this cannot be confirmed. Mill House had been demolished by this time.

3.12 500m south-east of the site is the scheduled ancient monument of Ryhope Water Pumping Station (SAM 32, HER 4964). This was commissioned by the Sunderland and South Shields Water Company in 1868 and began to operate in 1870. The engines were built locally by Messrs Hawthorn of Newcastle to such high quality that they are still in perfect condition after a century of working. They are now possibly the finest pair of compound beam engines in Britain (HER 6994). Conscious efforts were made to produce an entire station where workman's residences, cooling ponds, reservoirs, boiler houses etc were linked by flower gardens, lawns and trees to achieve a considerable aesthetic effect (HER 6994). The pumping station closed in 1967. Several buildings within the pumping station complex are listed as grade 2 or grade 2*.

The modern period (1900 to present)

3.13 The Third Edition Ordnance Survey map of 1919 is much the same as the second edition, with the addition of a football ground 400m east of the site. By the time of the Fourth Edition Ordnance Survey map of 1938, the housing development to the east of the site had been partially constructed. Completion of this development had occurred by the 1960s. The development immediately west of the site occurred after 2002. A geophysical survey (Biggins, 2001) and archaeological evaluation (Brogan, 2002) revealed no significant archaeological remains on the site of this recent housing development.

4. Landuse, topography and geology

4.1 At the time of fieldwork the survey area comprised a single field of 3.44ha which had been left fallow. In some areas vegetation had reached a height and density which prevented survey, giving a total surveyed area of 2.75ha.

4.2 The site is located on a ridge running approximately east-west. The ground level rises from approximately 70m OD at the north end of the site to about 85m OD in the south.

4.3 The underlying solid geology of the area comprises dolostone of the Ford Formation, which is 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 & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

Technique selection

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

5.3 In this instance, based on aerial photographic 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.

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

Field methods

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

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

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

Data processing

5.8 Geoplot v.3 software was used to process the geophysical data and to produce both a continuous tone greyscale image and trace plot of the raw (minimally processed) data. The greyscale image and interpretations are presented in Figures 2-5; the trace plot is provided in Figure 6. In the greyscale image, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.9 The following basic processing functions have been applied to 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
de-stagger	corrects for displacement of geomagnetic anomalies caused by alternate zig-zag traverses
interpolate	increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

Interpretation: anomaly types

5.10 A colour -coded geophysical interpretation plan is provided. 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

Interpretation: features

5.11 A colour-coded archaeological interpretation plans is provided.

5.12 A weak positive (and a parallel weak negative) magnetic anomaly was detected aligned broadly east-west across the site. This reflects geomorphological and geological variation associated with a break in slope noted on the ground (Trench 4, below).

5.13 A curvilinear positive magnetic anomaly was detected aligned north-west/south-east near the centre of the survey area, which probably reflects a soil-filled feature. On excavation (Trench 7, below) the geophysical anomaly was found to be the result of geological variation.

5.14 A linear positive magnetic anomaly was detected parallel to the eastern boundary of the field, which probably reflects a soil-filled feature; this is probably a drainage ditch or gully associated with the adjacent track.

5.15 Discrete dipolar magnetic anomalies were detected across the site and clustered in several areas. These almost certainly reflect modern disturbance and items of near-surface ferrous and/or fired debris, such as horseshoes and brick fragments.

6. The evaluation trenches

Introduction

6.1 Nine trenches were positioned across the site, targeting geophysical anomalies, cropmarks and areas with no apparent archaeology. Modern overburden was stripped using a mechanical excavator equipped with a toothless ditching bucket under archaeological direction. Trenches were hand-cleaned for the identification of archaeological remains.

Trench 1

6.2 Trench 1 was 20m by 1.5m. Natural subsoil, a yellow sand and orange clay [102], was identified at a depth of 0.5m to 0.95m. Above this was a grey clay silt subsoil [101: 0.4m deep]. Over the subsoil was a grey clay silt topsoil [100: 0.35m-0.55m deep]. No archaeological features were identified and no artefacts recovered.

Trench 2 (Figures 7 and 8)

6.3 Trench 2 was 30m by 1.5m. Natural subsoil, an orange clay in the north of the trench and a yellow sand to the south [201], was identified at a depth of 0.35m. Over the subsoil was a grey clay silt topsoil [200: 0.35m deep]. No archaeological features were identified and no artefacts recovered. Cropmarks previously identified as possibly prehistoric archaeology in this area are the result of the geological variation.

Trench 3

6.4 Trench 3 was 20m by 1.5m. Glacial grey orange clay [302] was identified at a depth of 1.2m. Above this was orange brown clay sand subsoil [301: 0.6m deep]. Over the subsoil was a grey clay silt topsoil [300: 0.6m deep]. Four field drains crossed the trench, all aligned roughly north-south. Two were modern clay drains, one was a French drain and one was stone-lined. An area of grey clay [304] was present in the centre of the trench, probably associated with waterlogging.

Trench 4

6.5 Trench 4 was 30m by 1.5m. Glacial subsoil [402] was identified in the southern end of the trench as grey brown clay at a depth of 0.4m. In the northern end of the trench it was a mottled brown and orange clay with sandy patches at a depth of 1.1m. A red brown silt sand subsoil [401: 0.6-0.8m deep] was also present in the northern end of the trench. Over the subsoil was a grey clay slit topsoil [400: 0.3m deep]. The trench was located over a steep slope, which is evident in the changing natural deposits and corresponds with the geophysical survey. No archaeological features were identified and no artefacts recovered.

Trench 5

6.6 Trench 5 was 20m by 1.5m. Glacial orange clay with patches of sand [502], was identified at a depth of 0.6m to 0.8m. Above this was red brown sandy silt subsoil

[501 0.2-0.4m deep]. Over the subsoil was a grey clay silt topsoil [500: 0.3m deep]. No archaeological features were identified and no artefacts recovered.

Trench 6

6.7 Trench 2 was 20m by 1.5m. Glacial orange clay with patches of sand [602] was identified at a depth of 0.4m-0.5m. Above this was red brown sandy silt subsoil [601 0.1-0.3m deep]. Over the subsoil was a grey clay silt topsoil [600: 0.4m deep]. No archaeological features were identified and no artefacts recovered.

Trench 7

6.8 Trench 7 was 20m by 1.5m. Glacial subsoil [701] was identified at a depth of 0.4m-0.5m in the form of red brown silt sand in the east end of the trench and a yellow sand in the west. Over the subsoil was grey clay silt topsoil [700: 0.2m-0.3m deep]. No archaeological features were identified and no artefacts recovered. The geophysical anomaly targeted by this trench was the result of geological variation.

Trench 8

6.9 Trench 7 was 20m by 1.5m. Glacial subsoil [801] was identified at a depth of 0.3m-0.4m in the form of red brown silt sand in the west end of the trench and a yellow sand with boulders in the east. Over the subsoil was grey clay silt topsoil [800: 0.3m-0.4m deep]. No archaeological features were identified and no artefacts recovered.

Trench 9

6.10 Trench 9 was 20m by 1.5m. Glacial subsoil [901] was identified at a depth of 0.4m in the form of red brown silt sand. Over the subsoil was grey clay silt topsoil [900: 0.4m deep]. No archaeological features were identified and no artefacts recovered.

7. The artefacts

7.1 No artefacts were recovered.

8. The palaeoenvironmental evidence

8.1 No material suitable for palaeoenvironmental assessment was recovered.

9. The archaeological resource

9.1 No archaeological deposits were identified within the evaluation area.

9.2 Geophysical anomalies across the site proved to be the result of recent drainage, geological variation and near-surface disturbance.

9.3 Cropmarks identified from aerial photographs correspond with geological variation.

9.4 Field drains were identified in Trench 3.

10. Impact assessment

10.1 Groundworks associated with the development are unlikely to remove or truncate any significant archaeological deposits.

11. Recommendations

11.1 As no significant archaeological resource was identified, no further scheme of archaeological works is recommended in relation to this development.

12. Sources

Bateman, B, nd, *A History of the village of Ryhope*

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Surtees, R, 1816 *The History and Antiquities of the County Palatine of Durham, Vol 1*

Appendix 1: Data table

Table 1.1: Context data

No	Trench	Description
100	1	Topsoil
101	1	Subsoil
102	1	Natural
200	2	Topsoil
201	2	Natural
300	3	Topsoil
301	3	Subsoil
302	3	Natural
400	4	Topsoil
401	4	Subsoil
402	4	Natural
500	5	Topsoil
501	5	Subsoil
502	5	Natural
600	6	Topsoil
601	6	Subsoil
602	6	Natural
700	7	Topsoil
701	7	Natural
800	8	Topsoil
801	8	Natural
900	9	Topsoil
901	9	Natural

Appendix 2: Stratigraphic matrices

Trenches 1 and 3-6

Topsoil	100	300	400	500	600
Subsoil	101	301	401	501	601
Natural	102	302	402	502	602

Trenches 2 and 7-9

Topsoil	200	700	800	900
Natural	201	701	801	901

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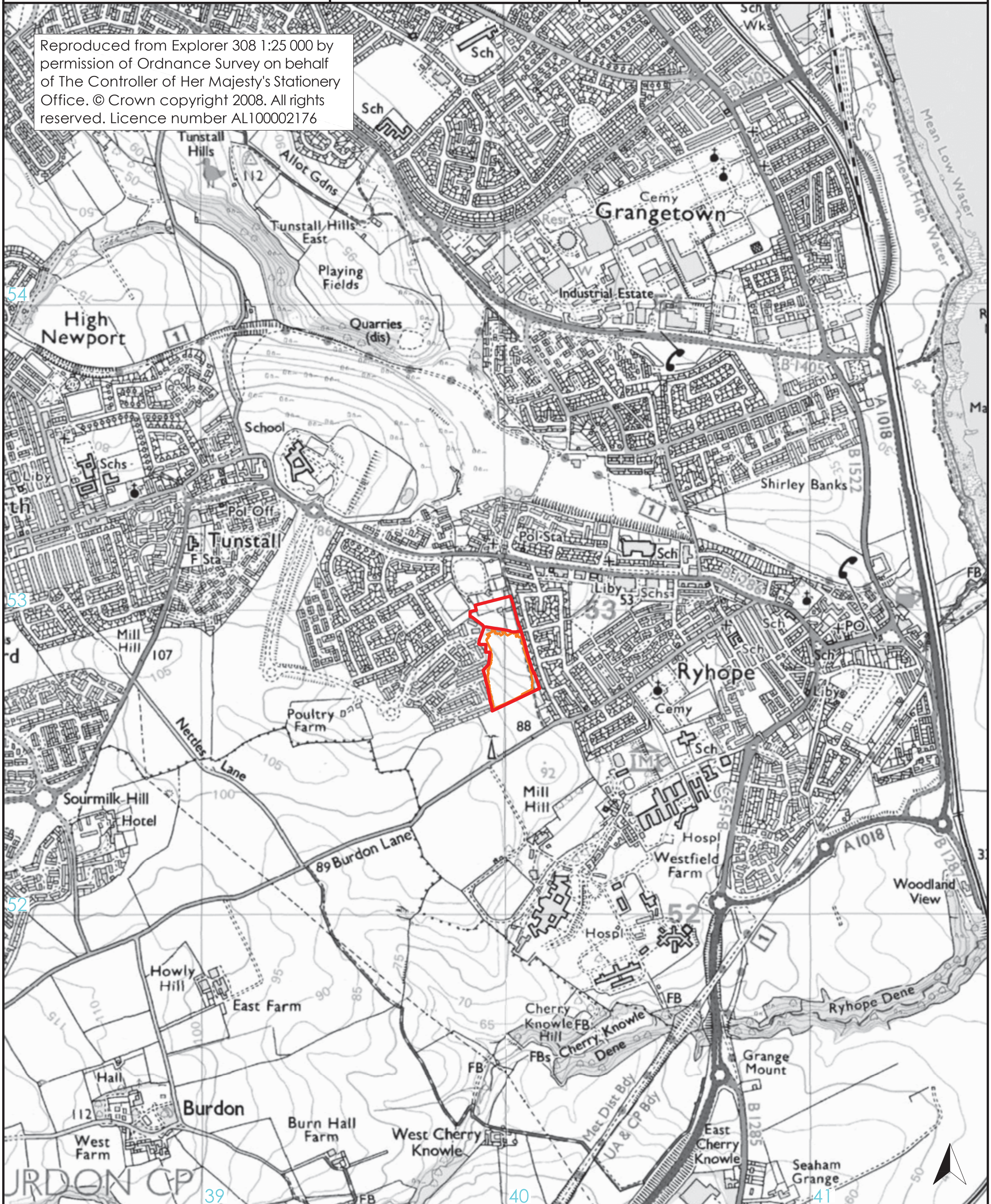
geophysical survey and archaeological evaluation
report 3429

Figure 1: Site location



site boundary

survey location

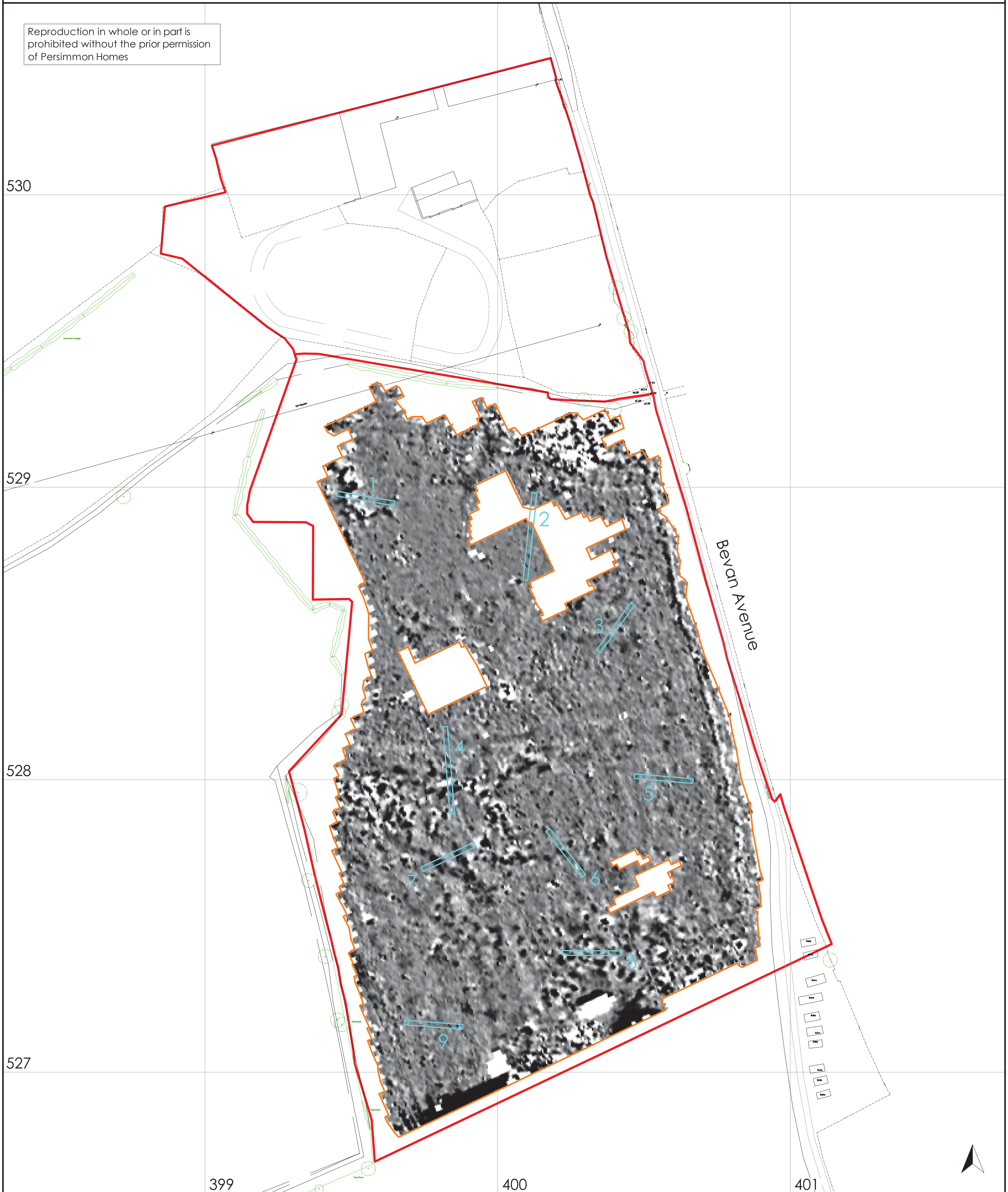
0 800m
scale 1:17 500 for Ax plot

magnetic survey

site boundary

trench

-8 nT 8



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0 50m
scale 1:1250 for A3 plot

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Sunderland
Tyne & Wear

geophysical survey and archaeological evaluation
report 3429

Figure 2: Survey and trench locations

magnetic survey
site boundary
-8 nT 8

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0 50m
scale 1:1000 for A3 plot

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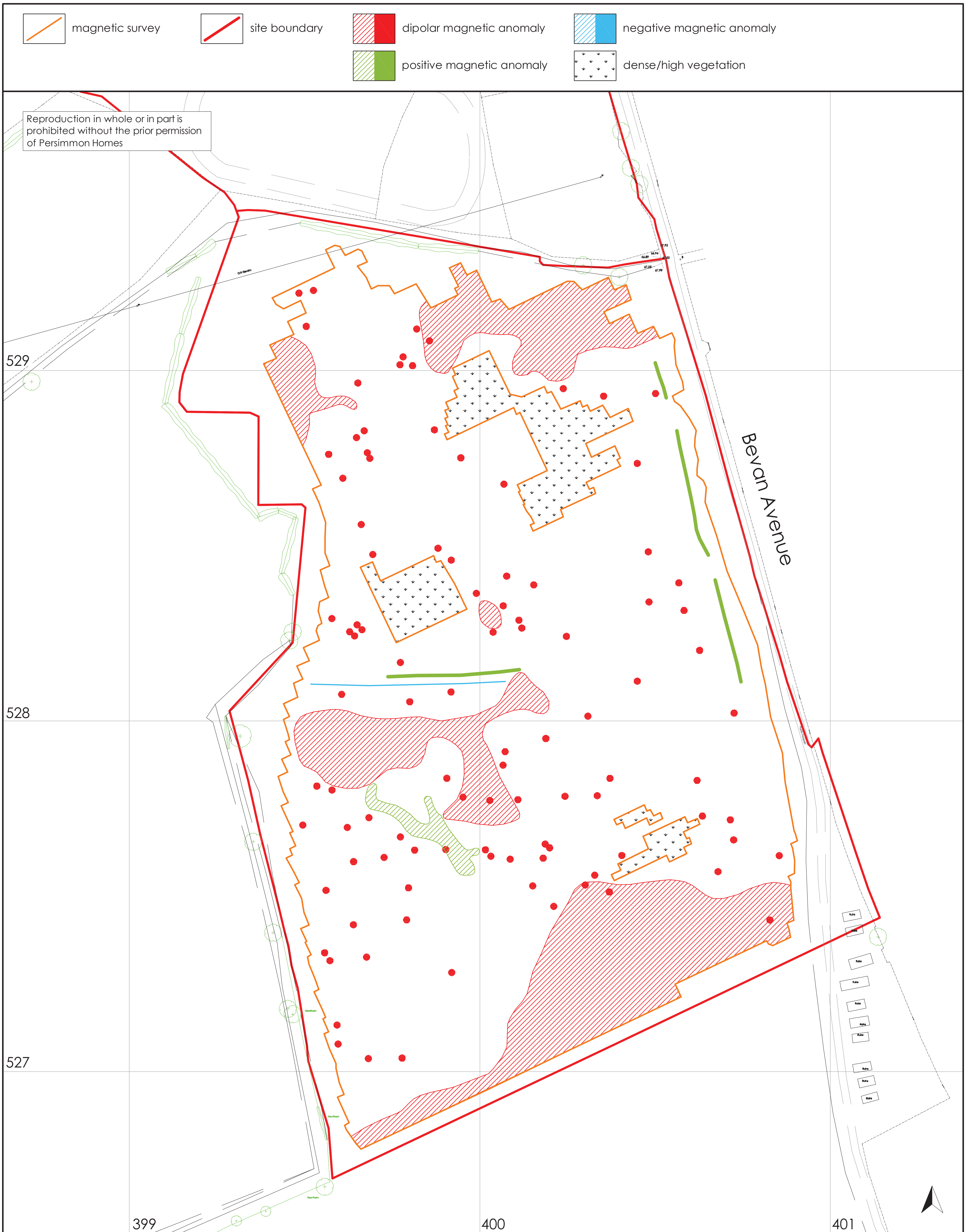
Sunderland
Tyne & Wear

geophysical survey and archaeological evaluation
report 3429

Figure 3: Geophysical survey



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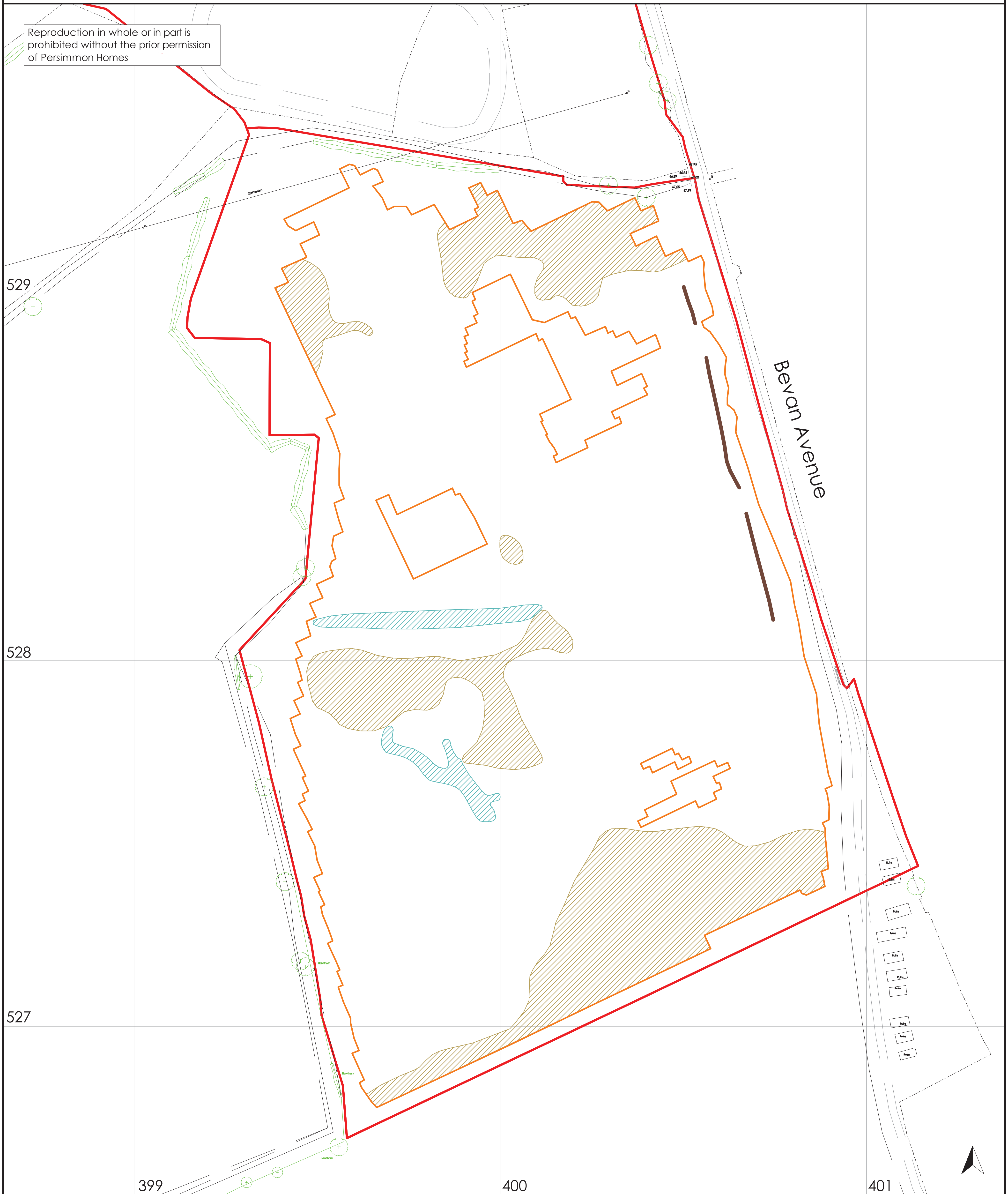
Tyne & Wear

geophysical survey and archaeological evaluation
report 3429

Figure 4: Geophysical interpretation

magnetic survey | site boundary | soil-filled feature | disturbed area | geological feature



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Tyne & Wear

geophysical survey and archaeological evaluation
report 3429

Figure 5: Archaeological interpretation

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Tyne & Wear

geophysical survey and archaeological evaluation
report 3429

Figure 6: Trace plot of geomagnetic data

Figure 7: Trench 2, looking north

Figure 8: Trench 2, geological variation