

**Shotton Hall School, Peterlee,  
County Durham**

**geophysical surveys**

*on behalf of*

**Carillion Construction Ltd**

**Report 2157**

March 2009

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# Shotton Hall School, Peterlee, County Durham

## geophysical surveys

### *Report 2157*

March 2009

*Archaeological Services Durham University*

on behalf of

*Carillion Construction Ltd*

*Carrillion Building, Fairway Court, Elland Rd, Leeds, LS11 8BU*

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## **1. Summary**

### ***The project***

- 1.1 This report presents the results of geophysical surveys conducted in advance of proposed development at Shotton Hall School, Peterlee, County Durham. The works comprised the geomagnetic survey of three areas.
- 1.2 The works were commissioned by Carillion Construction Ltd and conducted by Archaeological Services in accordance with instructions from Carillion Construction Ltd.

### ***Results***

- 1.3 The surveys suggest that the land around Shotton Hall School has been subject to cut and fill operations and other ground disturbance during the construction of the present school and playing fields.
- 1.4 Land drains were detected in Areas 1 and 3.
- 1.5 No features of archaeological origin have been identified, though such features may survive under areas of infill.

## 2. Project background

### *Location* (Figure 1)

- 2.1 The study area was located at Shotton Hall School, Peterlee, County Durham (NGR centre: NZ 4418 5395). Three areas totalling approximately 4ha were surveyed on two playing fields to the north and west of the school, and on a steep bank between the playing fields.

### *Development proposal*

- 2.2 The development proposal is for a new school to replace the existing site.

### *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 advance of development.

### *Methods statement*

- 2.4 The surveys have been undertaken in accordance with instructions from Carillion Construction Ltd.

### *Dates*

- 2.5 Fieldwork was undertaken between 26<sup>th</sup> and 27<sup>th</sup> February 2008. This report was prepared between 27<sup>th</sup> February and 2<sup>nd</sup> March 2009.

### *Personnel*

- 2.6 Fieldwork was conducted by Natalie Swann (Supervisor) and Richie Willis. This report was prepared by Natalie Swann with illustrations by Janine Watson and edited by Duncan Hale, the Project Manager.

### *Archive/OASIS*

- 2.7 The site code is **SHS09**, for **Shotton Hall School 2009**. The survey archive will be supplied on CD to the client for deposition with the project archive in due course. Archaeological Services is registered with the **Online Access to the Index of archaeological investigations project (OASIS)**. The OASIS ID number for this project is **archaeol3-56192**.

## 3. Archaeological and historical background

- 3.1 The earliest known find from the area is a gold armlet of Roman date found east of the proposed development site in the grounds of Shotton Hall in 1881.
- 3.2 Little is known of the village until 1165 when the name was first recorded as 'Sottun'. Old Shotton, the old village, is centered around Shotton Hall, and is now just inside the boundary of Peterlee.

- 3.3 Shotton Hall itself was constructed in the mid-18<sup>th</sup> century and altered in the 19<sup>th</sup> century; it is a Grade II listed building.

#### **4. Landuse, topography and geology**

- 4.1 At the time of survey the proposed development area comprised two school playing fields and a steep bank between them. Area 1 was bordered to the south by a man-made bank, to the west and north by trees and hedges, and to the east by the school security fence. Area 2 was situated on a steep bank between Areas 1 and 3. Area 3 was bordered by trees to the northwest, the school security fence to the northeast and a car park to the southeast.
- 4.2 Area 1 was level with a mean elevation of 119m OD. Area 3 was also level with a mean elevation of approximately 110m OD. Area 2 comprised the bank between these two terraces.
- 4.3 The underlying solid geology of the area comprises Magnesian Limestone, which is overlain by boulder clay and morainic drift.

#### **5. Geophysical survey**

##### ***Standards***

- 5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation 2<sup>nd</sup> edition* (David, Linford & Linford 2008); the Institute of Field 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***

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a variety of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar and electromagnetic survey. Some techniques are more suitable than others in particular situations, depending on a variety of 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 it was considered possible 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 each survey area and tied-in to known, mapped Ordnance Survey points using a Trimble Pathfinder Pro XRS global positioning system (GPS) with real-time correction providing sub-metre 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 set to 0.1nT, the sample interval to 0.25m and the traverse interval to 1.0m, thus providing 3600 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 continuous tone greyscale images and trace plots of the raw (unfiltered) data. The greyscale images and interpretations are presented in Figure 3; the trace plots are provided in Figure 4. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relates the greyscale intensities to anomaly values in nanoTesla.
- 5.9 The following basic processing functions have been applied to each dataset:

<i>clip</i>	clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.
<i>zero mean traverse</i>	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.
<i>destagger</i>	corrects for displacement of anomalies caused by alternate zig-zag traverses.
<i>interpolate</i>	increases the number of data points in a survey to match sample and traverse intervals. In this instance the data have been interpolated to 0.25x 0.25m intervals.

### ***Interpretation: anomaly types***

- 5.10 Colour-coded geophysical interpretation plans are 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.

***Interpretation: features***

- 5.11 Colour-coded archaeological interpretation plans are provided.

**Area 1**

- 5.12 Several chains of small dipolar magnetic anomalies have been detected across the survey area aligned north-south and northeast-southwest. These anomalies almost certainly reflect clay land drains.
- 5.13 Area 1 appears to have been subject to cut and fill landscaping. The anomalies at the eastern end almost certainly reflect rubble and other materials in the infill.

**Area 2**

- 5.14 The dipolar magnetic anomalies across this area suggest the bank is a man-made structure, probably constructed during the landscaping of the present school and grounds.

**Areas 3**

- 5.15 The chains of dipolar magnetic anomalies in this area almost certainly reflect a herringbone arrangement of clay land drains. This area also appears to have been disturbed, or filled, during construction of the existing school.

**6. Conclusions**

- 6.1 Geomagnetic survey was undertaken on land north and west of Shotton Hall School, Peterlee, County Durham.
- 6.2 Land drains were detected in Areas 1 and 3.
- 6.3 Cut and fill landscaping was detected in Area 1, possibly a result of the construction of the school and playing fields. Modern ground disturbance was also detected in Areas 2 and 3.
- 6.4 No features of archaeological origin have been identified, though such features may survive under areas of infill.

**7. Sources**

David, A, Linford, N, & Linford, P, 2008 *Geophysical survey in archaeological field evaluation, 2<sup>nd</sup> edition*, 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.





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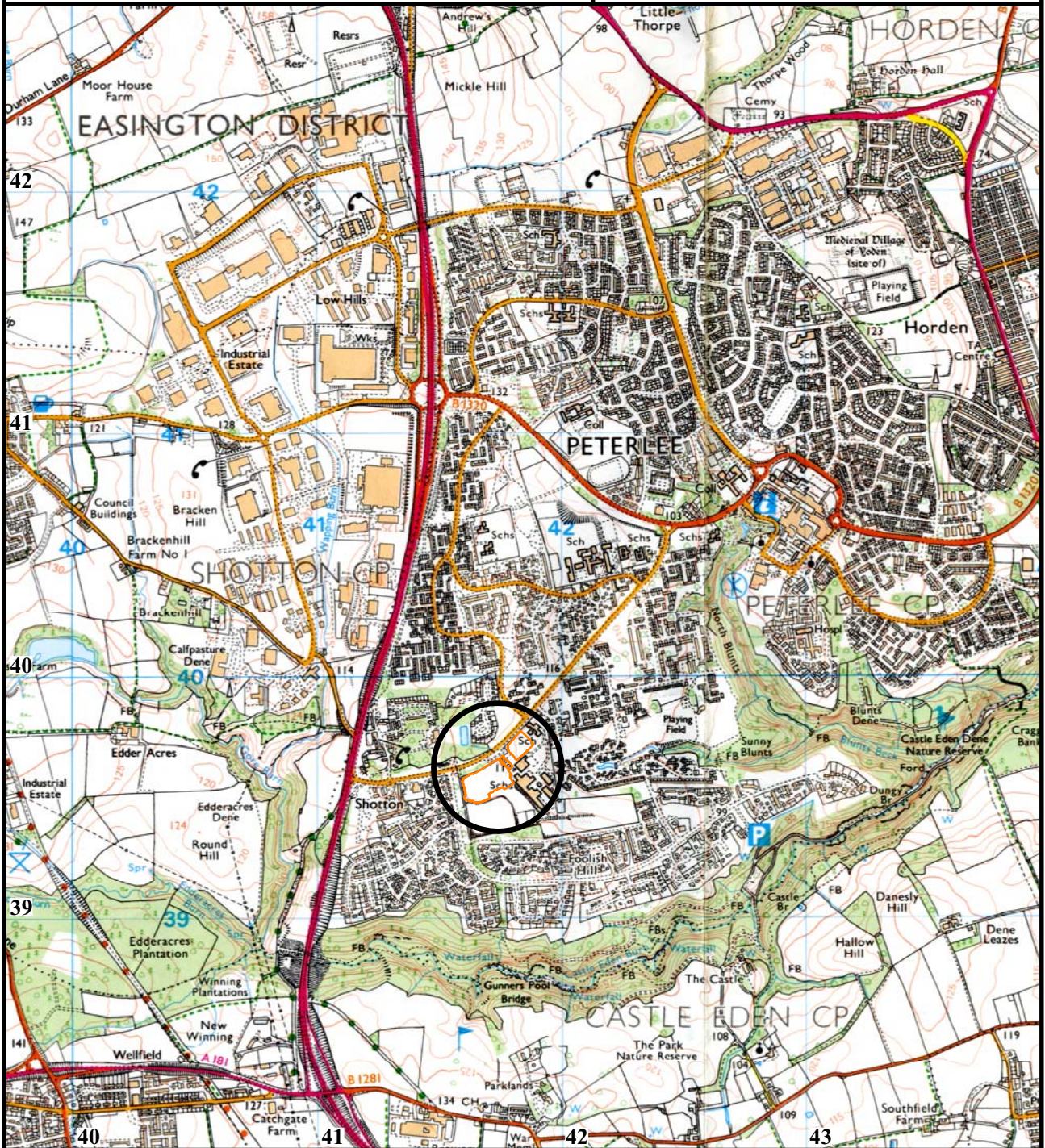
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Figure 1

Site location

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survey outline



scale 1:25 000 - for A4 plot





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Figure 2

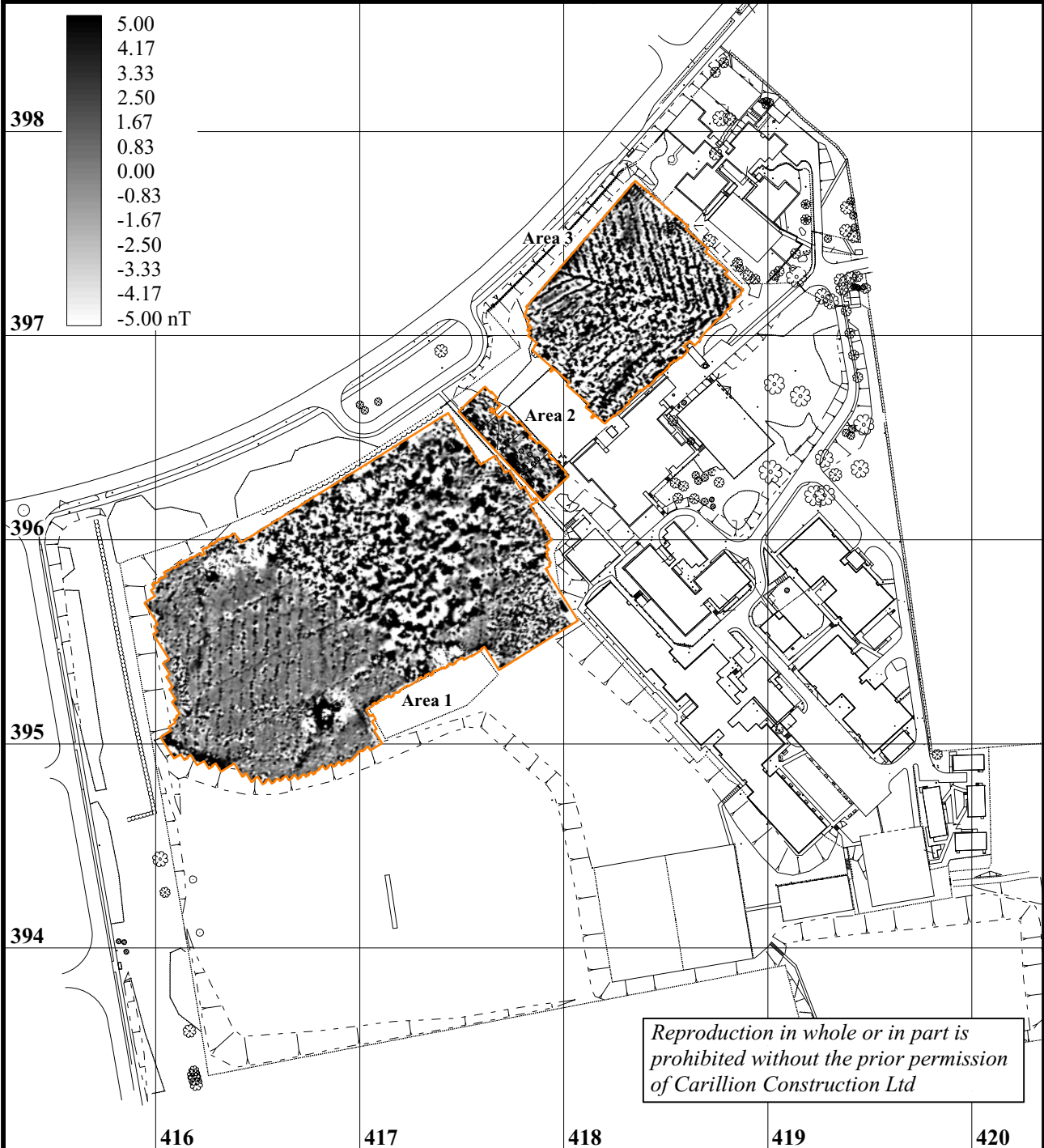
Survey locations

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0 150m



scale 1:3000 - for A4 plot



survey outline



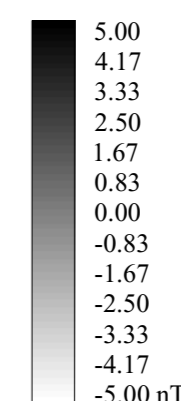
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**a**



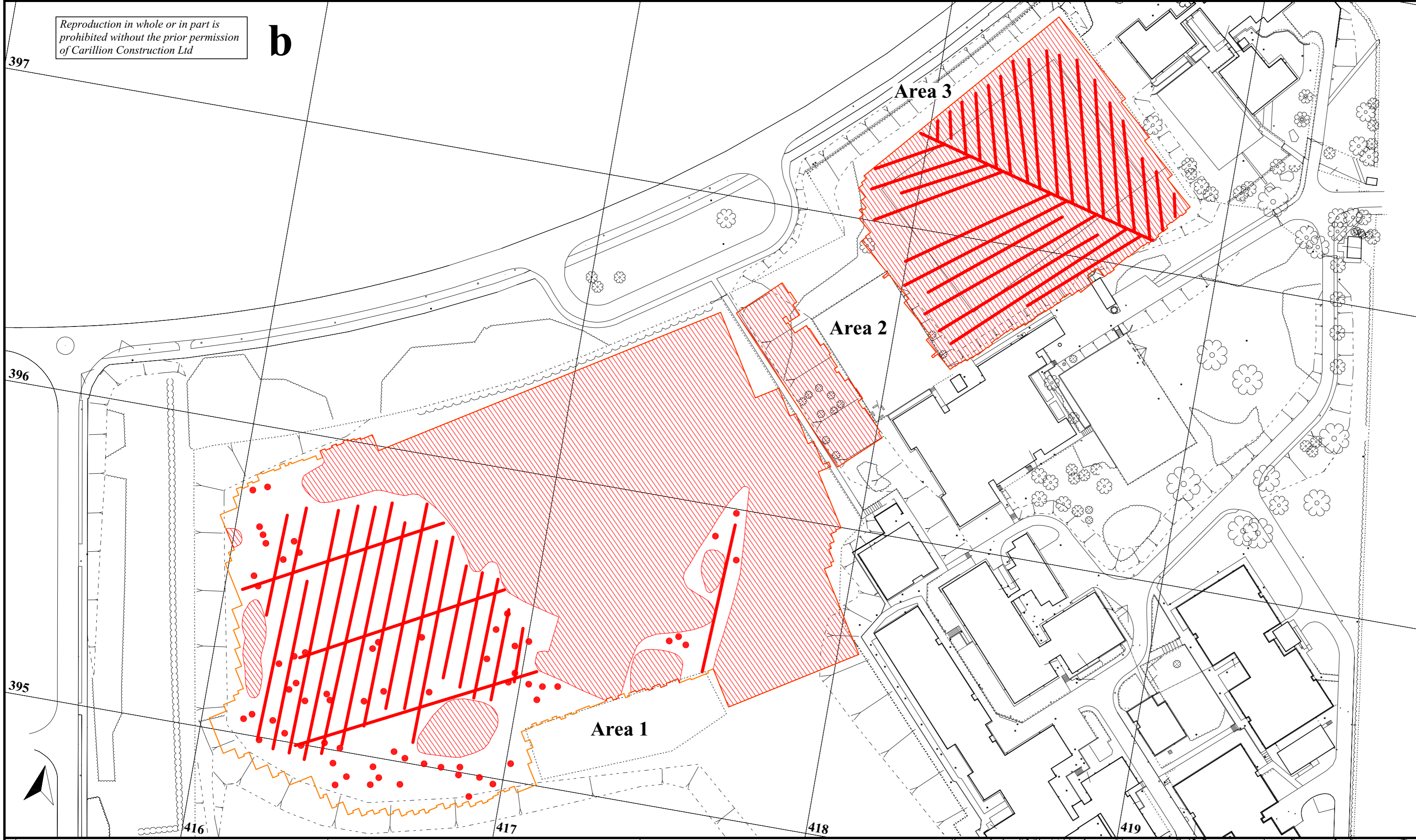
**a) Geophysical survey**

outline of survey area



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**b**

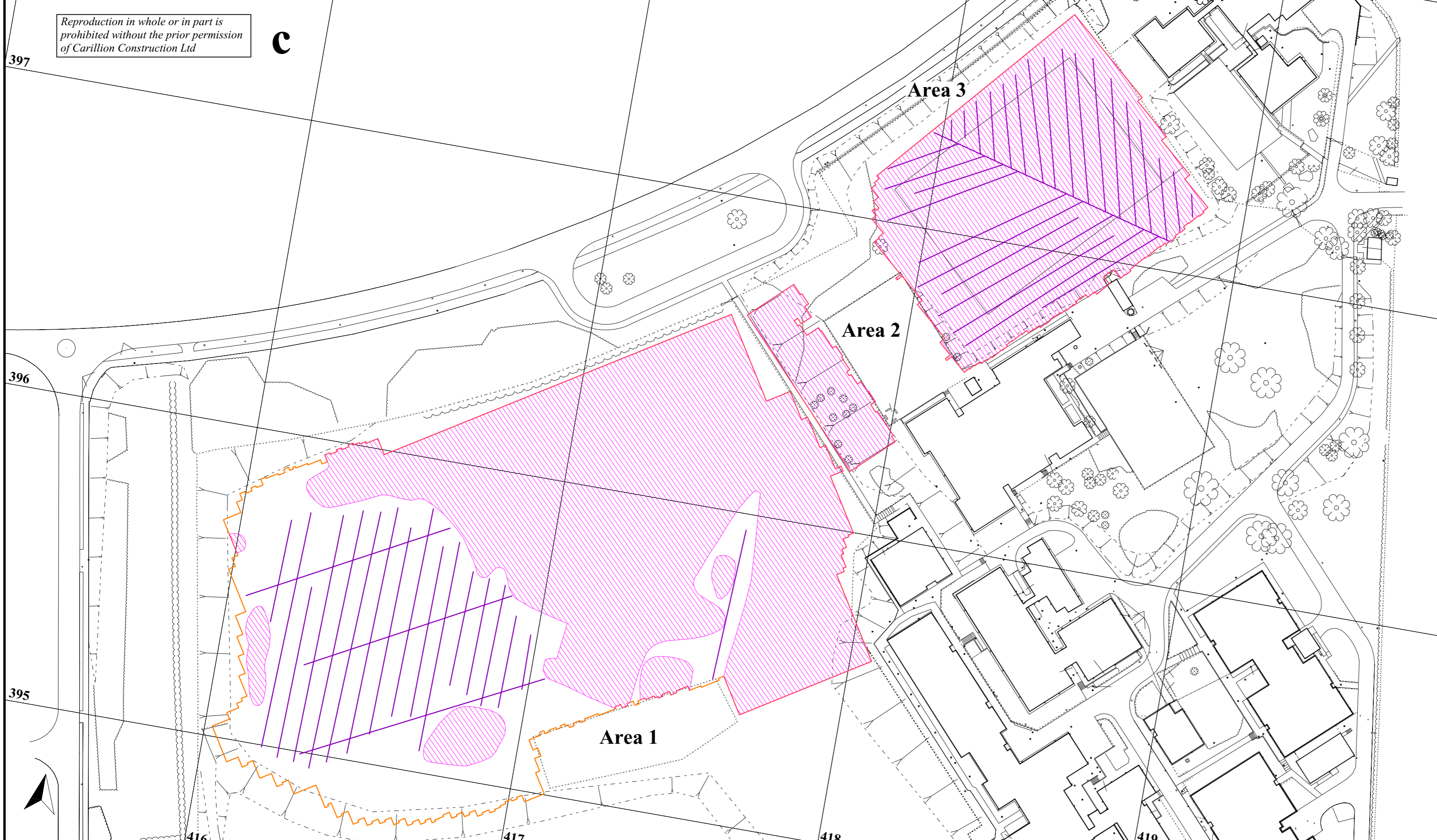


**b) Geophysical interpretation**

dipolar magnetic anomalies

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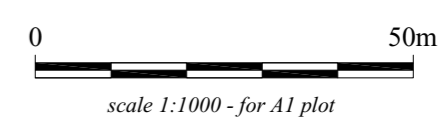
**c**



**c) Archaeological interpretation**

disturbed ground

land drains



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Figure 3

Geophysical surveys, geophysical and  
archaeological interpretations

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Figure 4: Trace plots of geomagnetic data

