THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire

Geophysical Survey (Magnetic)

by Tim Dawson

Site Code: LGC 12/128

(TL 2175 3065)

Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire

Geophysical Survey (Magnetic) Report

For Letchworth Golf Club

by Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code LGC 12/128

September 2013

Summary

Site name: Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire

Grid reference: TL 2175 3065

Site activity: Magnetometer survey

Date and duration of project: 16th - 20th September 2013

Project manager: Steve Ford

Site supervisor: Tim Dawson

Site code: LGC 12/128

Area of site: 7.25ha

Summary of results: The majority of the magnetic anomalies recorded can be interpreted as modern services, 19th- and 20th-century field boundaries and objects or features relating to the site's current use as a golf driving range and academy course. Other anomalies are more likely to be of archaeological origin, particularly four sets of parallel lines which represent ditches, possibly historic field boundaries or droveways. Also of note are a group of strong magnetic spikes that appear to be evenly spaced and form two parallel lines. These most likely represent buried metallic objects.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by:	Steve Ford✓ xx.xx.13
	Andrew Mundin✓ xx.xx.13

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Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire
A Geophysical Survey (Magnetic)

by Tim Dawson

Report 12/128b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire (TL 2175 3065) (Fig. 1). The work was commissioned by Mr Stuart Downs of Woodland Environmental Ltd, Thatches, Kingston Common, Ringwood, Hampshire, BH24 3AY on behalf of Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire, SG6 3NQ.

Planning permission for the redevelopment of the existing driving range and academy course has been granted by North Hertfordshire District Council subject to a condition (25) which requires the implementation of a geophysical survey and archaeological trial trenching.

This is in accordance with the Department for Communities and Local Government's *National Planning Policy Framework* (NPPF 2012), and the District's policies on archaeology. The field investigation was carried out to a specification approved by Mr Andy Instone, Planning Archaeologist at Hertfordshire County Council. The fieldwork was undertaken by Tim Dawson and Anna Ginger between 16th and 20th September 2013 and the site code is LGC 12/128.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site currently consists of a landscaped driving range and academy course in the south-eastern corner of the, much larger, Letchworth Golf Club (Plates 1-4). This is located immediately to the south of Letchworth Garden City and to the west of the shrunken medieval village of Willian. The land slopes gently downhill from the north-east with a watercourse and lake just outside the site boundary to the south-west. The site is bordered by hedge-lined roads to the east and south, a track across the golf course which serves as access to a pumping house to the west and the rest of the golf course and Letchworth Hall Hotel to the north. It covers an area of 7.25ha centred on NGR TL 2175 3065 and is located on Lowestoft Formation gravels (Till) at the eastern and western ends with two bands, one of mid-Pleistocene glaciofluvial chalky sand and gravel and the other of mid-

Pleistocene glaciolacustrine sand and gravel, across the centre of the site (BGS 1995). The land is at a height of approximately 75m above Ordnance Datum.

The weather during the survey period ranged from sunny through overcast to heavy rain. Throughout this time the ground remained dry and firm.

Site history and archaeological background

The earliest evidence for the human occupation of the Letchworth area is seen in flint tools dating to the Palaeolithic period that have been recovered from clay pits to the south-west around Hitchin (Thompson 2005, Wymer 1999). The most prolific site, Jeeve's Pit on the southern edge of Hitchin, produced 64 palaeoliths and it is thought that the area's location within the Hitchin Gap was formed as the result of sub-glacial erosion during the retreat of the Anglian ice sheet. This would have left behind hollows which filled with water to become lakes and around which people would have moved and hunted, discarding tools into the lakes, where they have been preserved within the sand and gravel (Wymer 1999, 163).

Later prehistoric artefacts and sites have been found across the Letchworth and Hitchin region with a large concentration of later Bronze Age evidence to the north-west of the proposal site between the two towns at Wilbury Hill and along Icknield Way (Thompson 2005, 5–6). The hillfort at Wilbury Hill is Late Bronze Age in origin, although it was substantially redeveloped in the Middle Iron Age, and forms part of a chain of such monuments strung along the Chiltern ridge (Cunliffe 1978, 92). Several Bronze Age round barrows, both upstanding and visible as cropmarks, are also dotted along the ridge. Another barrow cemetery is located to the south of the hillfort of which the Ickleford tumulus still stands and was excavated in the early 19th century, yielding an assemblage of late copper alloy spearheads.

While Hitchin may have been the site of a Roman settlement the archaeological evidence is ephemeral (Thompson 2005, 7), with the most substantial site in the area being a wealthy villa discovered at Purwell, *c*.2km south-west of the proposal site. Further afield, extensive excavations have shown Baldock to be the location of an early planned undefended settlement at the junction of several important routes, including the road to *Verulamium*, Roman St Albans (Burnham and Wacher 1990).

By the medieval period the settlements of Letchworth and Willian had become established although neither appears to have developed beyond the size of a small village with only the construction of the Garden City in the early 20th century enlarging Letchworth to the size of a town.

A map progression produced as part of a desk-based assessment of the site (Dawson 2012) shows that since at least the 19th century the site has been divided into three, later two fields and, since the early 20th century has included two tennis courts in the northern corner of the driving range. These were all removed to make way for the golf course.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 20m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 1600 sampling points across a full 20m × 20m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The grid was aligned to the site's northern boundary although in practice this was rotated slightly due to the effect of the site's topography on the positioning of the total station. A small number of grid points were not able to be surveyed due to the trees which dot the area obstructing the station's line of site.

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations set out by both English Heritage (2008) and the Institute for Archaeologists (2002).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for fast yet detailed survey of an area.

The detailed magnetometry survey was carried out using a dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometer. The instrument consists of two fluxgates mounted 1m vertically apart with a second set

positioned at 1m horizontal distance. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches, can be seem from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

A Trimble GeoXH 6000 handheld GPS system with sub-decimetre accuracy was used to tie the site grid into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the TerraSurveyorLite software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -2.00 to 2.00 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 3), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.53, producing a .FC7 file format, and printed as a .PDF for inclusion in the final report.

The greyscale plot of the processed data is exported from TerraSurveyorLite in portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is rotated to orientate it to north and

combined with grid and site plans in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

Results

The magnetic survey highlighted several buried features which appear as anomalies on the data plot (Fig. 3). A large number of these can be tied to either objects or features of the current golf course, such as bunkers, flags, range markers and greens (Fig. 4: orange) or the positions of known modern services, e.g. gas, electricity, telephone, and their associated inspection covers (Fig. 4: blue). Other causes of this magnetic disturbance include, particularly along the site's northern boundary, nearby metal fences and, in the south, the close proximity of the contractor's metal cabins and excavation machinery.

Once this magnetic interference has been stripped away the underlying features become clearer. Of these a positive linear anomaly, indicating the presence of a buried ditch, and associated magnetic disturbance can be seen crossing the site from southeast to northwest, forking as it nears the northern boundary **[Fig. 4: 1]**. A similar positive linear anomaly can be seen running perpendicular to the first cutting across the north-western area of the site and probably joining another that runs parallel to the first **[2]**. These can all be matched to various field boundaries which are shown across several historic maps dating to between 1837 and 1938 (Dawson 2012). Several parallel positive and negative linear anomalies can be seen on the magnetic plot (Fig. 3) on the same orientation as the field boundaries. These most likely represent the ploughing of the site before it was converted into a golf course. Another magnetic anomaly that can be identified on historic maps, this time dating to between 1938 and 1974, is the large area of extreme magnetic disturbance in the northern corner of the north-western part of the site **[3]**. This coincides with the recorded position of two tennis courts which were removed for the construction of the golf course.

Anomalies which likely represent features of archaeological interest are limited to four sets of parallel positive linears which together cross the entire site from east to west. The first of these are a pair, *c*.6m apart widening to 8m towards the eastern end, that run south-westwards from the site's eastern boundary into the south-western edge **[4]**. They are well defined and most likely represent substantial cut features, i.e. ditches, possibly a track- or drove-way. A second set **[5]**, again *c*.6m apart, head north-northwest perpendicular to the first set from their western end becoming faint when they enter the area of services and magnetic disturbance in the site's north-western corner. Another pair of this time much weaker positive anomalies is aligned perpendicular to the second set, heading southwest from the second set's northern end **[6]**. A final set of very

weak positive anomalies **[7]** appear to cut across the previous set **[6]** on an orientation different to the other pairs. This set of anomalies is possibly archaeological in origin but may equally be more modern.

The site is covered with dipolar magnetic spikes of varying sizes, each of which consist of a single positive anomaly with associated negative response and, because of their strength, most likely indicate the presence of ferrous objects. While the majority of spikes that were plotted across the site occur in random scatters there is a group of larger dipolar anomalies, each *c*.3m across, arranged in two parallel lines at the site's eastern end **[8]**. It is conceivable that these represent pits, possibly the boles of an avenue of trees, although the strength of the magnetic signatures suggests that they are more likely to be ferrous objects.

The remaining two positive anomalies of note appear to be geological in origin **[9, 10]**. These irregular linear anomalies occur at the site's eastern end in the location of an interface between two different types of superficial geology: mid-Pleistocene glaciolacustrine deposits of clay and silt to the west and Lowestoft Formation diamicton (glacial till) to the east (BGS 1995).

Conclusion

The geophysical survey of the driving range and academy course area at Letchworth Golf Club succeeded in identifying and interpreting a range of magnetic anomalies, some of which may be archaeological in origin. Much of the site is subject to magnetic interference from services, nearby metallic objects and other features and objects relating to the golf course itself. These and the anomalies caused by tennis courts and historic field boundaries may have had a masking effect on any underlying archaeological features. The only anomalies likely to be archaeological in origin are the four pairs of parallel positive linears which probably represent ditches either side of a track- or drove-way. Also potentially of interest is the set of large dipolar anomalies which form two parallel lines in the eastern part of the site.

References

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Appendix 1. Survey and data information

Raw data
COMPOSITE
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: Tim Dawson, Anna Ginger on 20/09/2013
Assembled by: Tim Dawson on 20/09/2013
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32000

Dimensions
Composite Size (readings): 1360 x 360
Survey Size (meters): 340 m x 360 m
Grid Size: 20 m x 20 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 100.00
Min: -100.00
Std Dev: 12.09
Mean: -0.33
Median: 0.21
Composite Area: 12.24 ha
Surveyed Area: 6.1937 ha

PROGRAMME
Name: TerraSurveyor
Version: 3.0.19.22

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Processed data

Stats

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Min:	-2.00
Std Dev:	0.94
Mean:	0.00
Median:	0.00

Processes: 5

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3 De-stagger: Grids: All Mode: Both By: -2 intervals
4 De-spike Threshold: 1 Window size: 3x3
5 Clip from -2.00 to 2.00 nT

Georeferencing:

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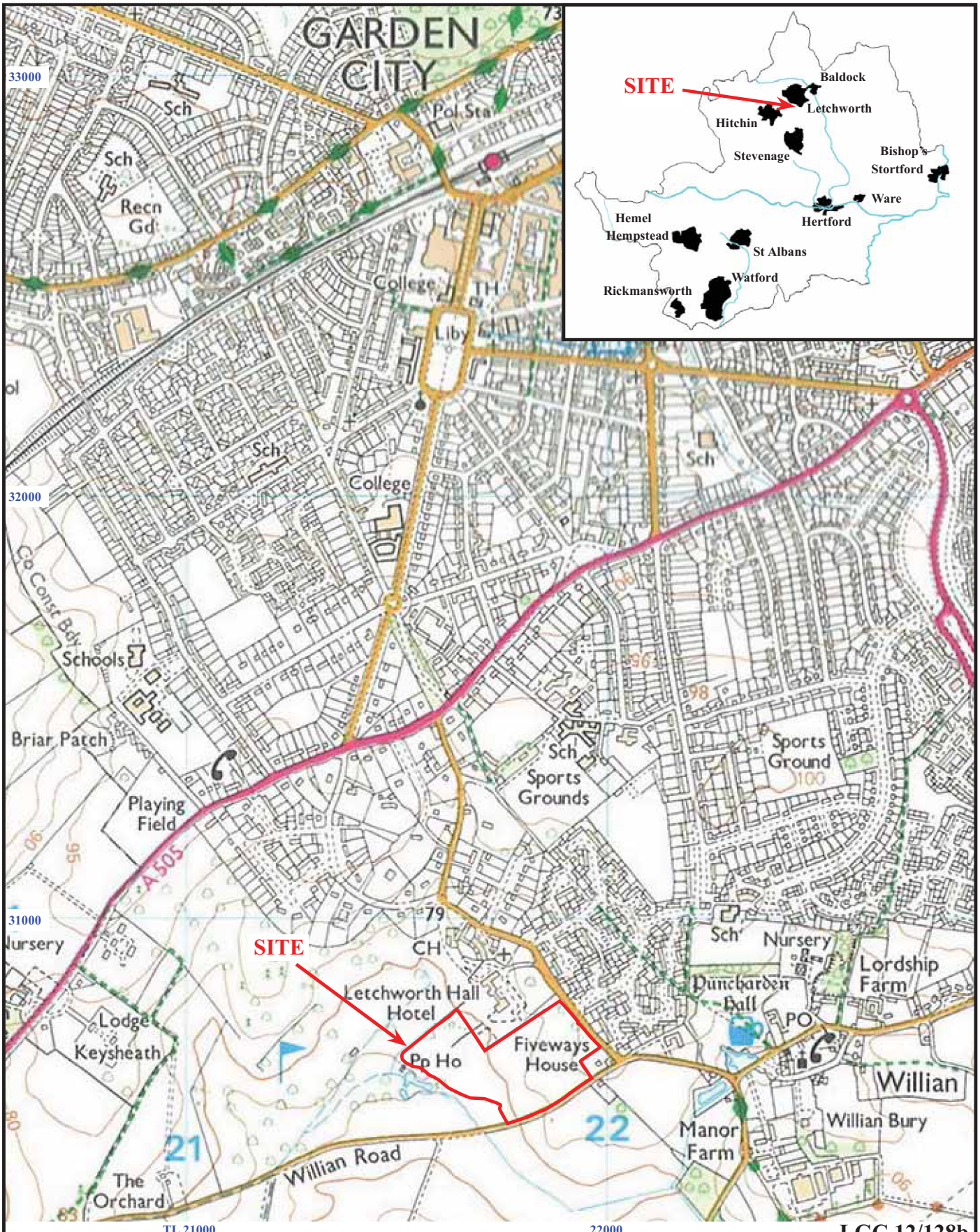
Geo2: E 521758, N 230641



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Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire, 2013
Geophysical Survey (Magnetic)

Figure 1. Location of site within Letchworth Garden City and Hertfordshire.

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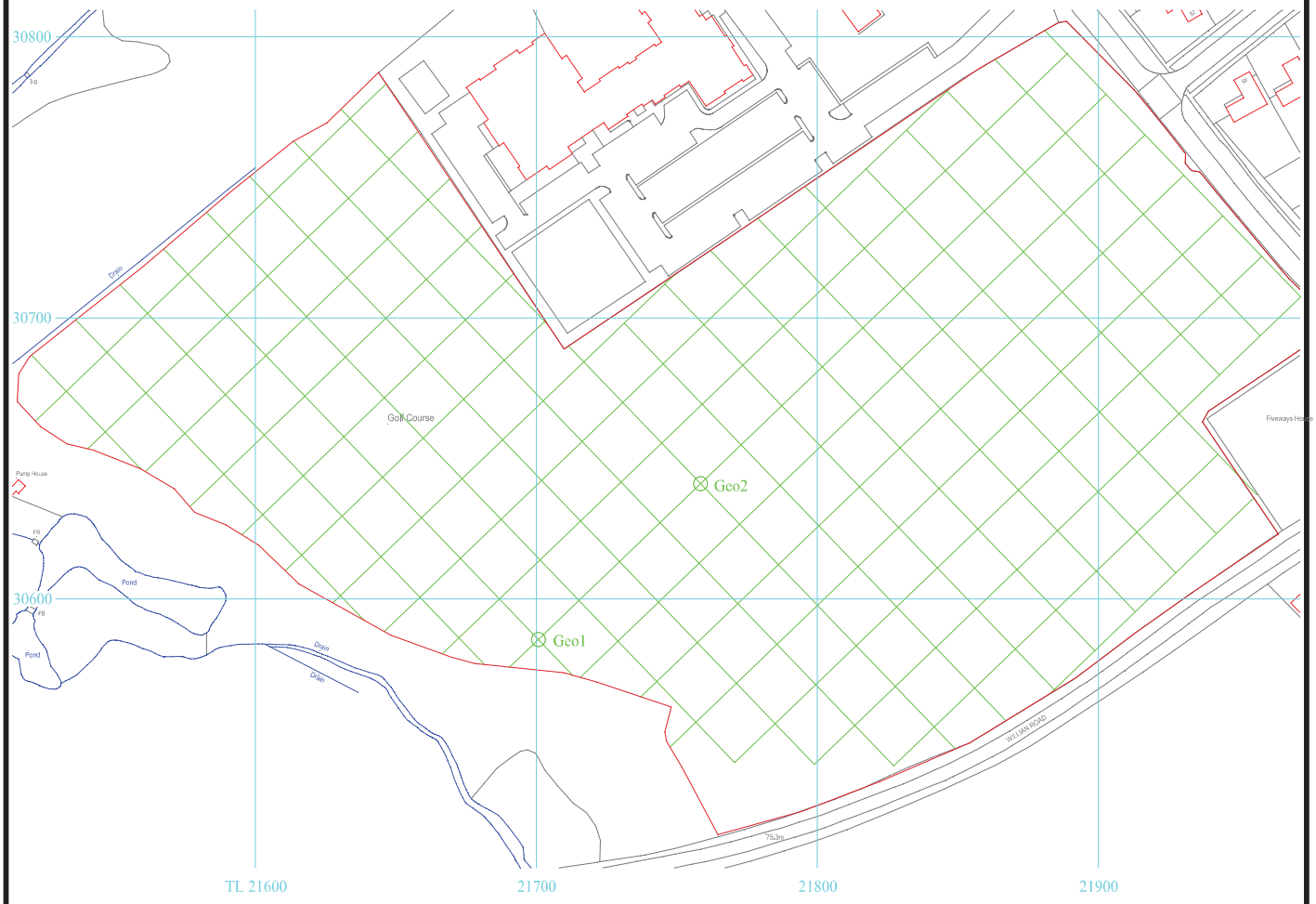

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Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire, 2013 Geophysical Survey (Magnetic)

Figure 2. Survey grid layout with georeferencing (Geo) points.

0 125m

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Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire, 2013 Geophysical Survey (Magnetic)

Figure 3. Plot of minimally processed gradiometer data.

+2 nT

-2 nT

0m 125m

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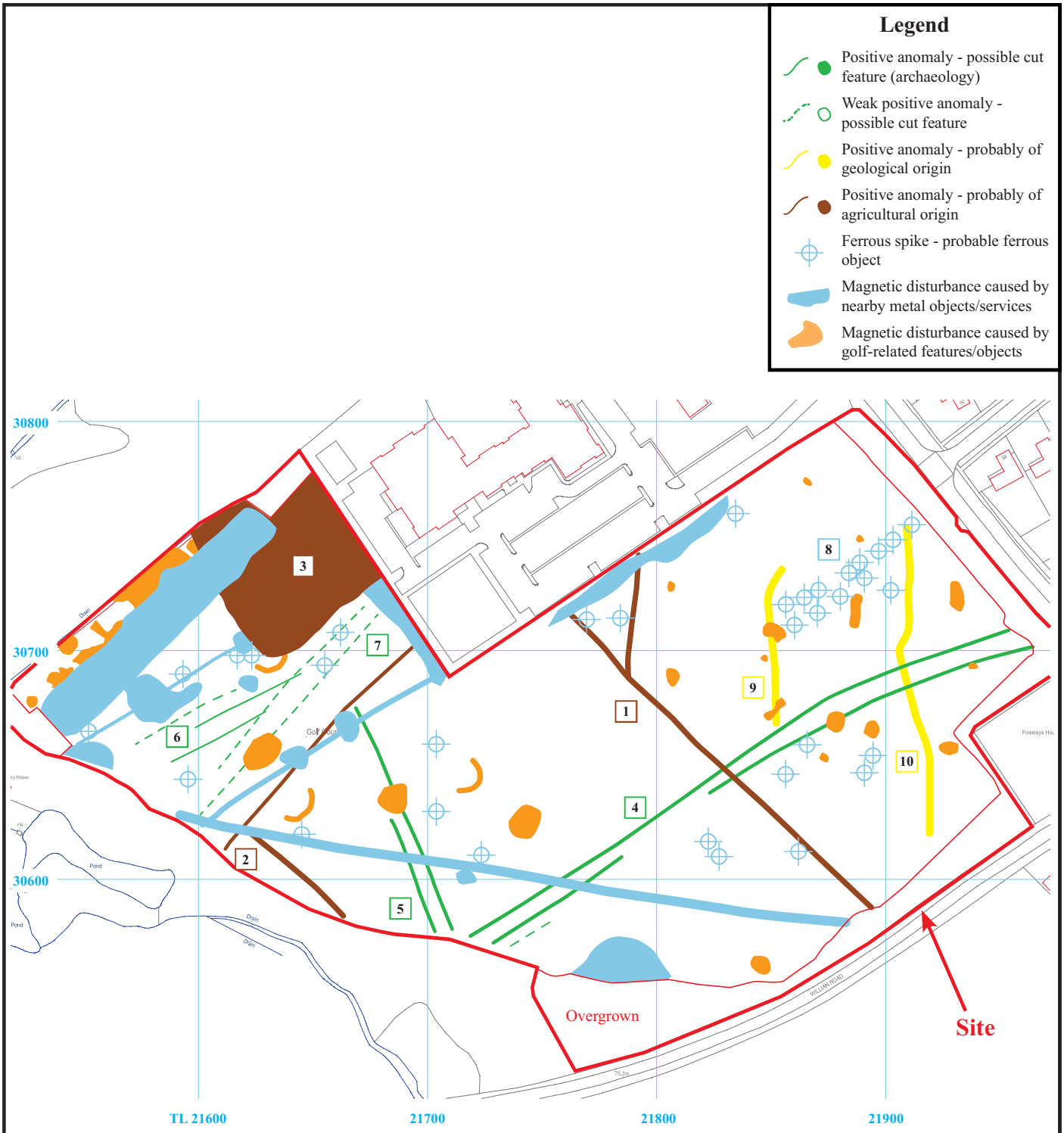

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Letchworth Golf Club, Letchworth Lane, Letchworth Garden City, Hertfordshire, 2013 Geophysical Survey (Magnetic)

Figure 4. Interpretation plot.

0m 125m

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Plate 1. Western side of the site, looking southeast from the driving range tee.

Plate 2. Western end of the site, looking north towards Letchworth Hall Hotel.

Plate 3. Eastern end of the site, looking northeast towards Letchworth Lane.

Plate 4. 19th century field boundary in centre of the site still visible and banks and ditch, looking east.

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Letchworth Golf Club, Letchworth Lane,
Letchworth Garden City, Hertfordshire, 2013
Geophysical Survey (Magnetic)
Plates 1 - 4.

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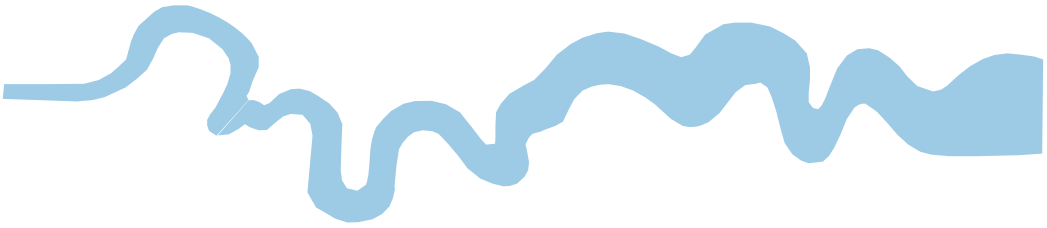
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC



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