

Land at Ely Road, Milton, South Cambridgeshire

geophysical surveys

on behalf of **CgMs Consulting**

Report 1949-2 June 2008

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1. Summary

The project

- 1.1 This report presents the results of geophysical surveys conducted in advance of proposed development of land at Ely Road in Milton, South Cambridgeshire. The works comprised earth electrical resistance survey of approximately 4.3ha.
- 1.2 The works were commissioned by CgMs Consulting and conducted by Archaeological Services Durham University.

Results

- 1.3 The surveys have demonstrated the potential for archaeological features to be present across the site. Such features almost certainly include enclosures defined by soil-filled ditches and may also include ring-ditch remains and stone-founded structures. Some of these potential features could be associated with the known remains to the east of the present site.
- 1.4 The combined surveys have collected good quality data to inform the archaeological potential at the site, therefore no further geophysical survey or data processing is warranted with regard to the proposed development.

2. Project background

Location (Figures 1 & 2))

2.1 The study area comprised land at Ely Road, Milton, South Cambridgeshire (NGR centre: TL 483 629). The site lies at the north-east end of Milton village, Cambridge, approximately 0.5km west of the River Cam, and occupies the 18th-century parkland of Milton Hall, which contains a boating lake on its southern side and a 19th-century gate lodge at its north-western corner. The areas for geophysical survey covered approximately 4.5ha.

Development proposal

2.2 The proposed development includes the construction of 121 retirement units and associated buildings and services for a retirement and care home. Recreational facilities are to be located within the broader parkland.

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 and reporting were undertaken in accordance with instructions from CgMs Consulting and an Evaluation Brief prepared by Cambridgeshire Archaeology Planning & Countryside Advice (CAPCA). In response to the brief, Archaeological Services prepared a Written Scheme of Investigation (WSI), which was then approved by CAPCA.

Dates

2.5 Initial fieldwork was undertaken between 21st and 29th April 2008, with a second phase undertaken between 25th and 27th June 2008. This revised version of the original report was prepared on 30th June 2008.

Personnel

2.6 Fieldwork was conducted by Edward Davies, Andrea Dixon, Richard Mason, Natalie Swann (Supervisor) and Richie Villis (Supervisor). This report was prepared by Duncan Hale (the Project Manager) with illustrations by Janine Wilson.

Archive/OASIS

2.7 The site code is **CMH08**, for **C**ambridge **M**ilton **H**all 2008. 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 **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (OASIS). The OASIS ID number for this project is **archaeol3-41907**.

3. Archaeological and historical background

- 3.1 The study site lies in an area known for its high concentration of archaeological cropmarks, which, where previously investigated, have represented the remains of settlement dating from the Bronze Age to the Roman period.
- 3.2 An assessment of the archaeological and historical potential of the area has been undertaken by CgMs Consulting (Gailey 2008).
- 3.3 Based on known find-spots, previous archaeological investigations and other available evidence from within a 1km radius, the assessment established that the site had good archaeological potential for the later prehistoric, Roman and medieval periods. The Roman period in particular was considered likely to be represented in the eastern part of the site due to the presence of a known Roman settlement just east of the site.

4. Landuse, topography and geology

- 4.1 At the time of fieldwork the majority of the survey area comprised two pasture fields, being former parkland associated with Milton Hall to the west (Figure 2). The most recent former use of the site was for providing training in overhead cable maintenance and consequently these two fields contained c.100 pylons and other structures.
- 4.2 It was not practical to conduct survey within an additional small area to the north-west, next to North Lodge, due to the overgrown nature of the area; only c.200 sqm out of c.1680 qm were available for survey there.
- 4.3 The proposed development area lies on a river terrace to the west of the River Cam. It was essentially level with a mean elevation of 6m OD.
- 4.4 The geology of the area comprises Quaternary river terrace deposits of sand and gravel.

5. Geophysical survey

Standards

5.1 The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in archaeological field evaluation 2nd 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, based on cropmark evidence and previous work, it was considered likely that cut features such as ditches and pits would 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 nature and depth of targets, the presence of so many pylons and cables across the site, and the high concentration of cropmarks in the vicinity, an earth electrical resistance survey technique was considered most appropriate for detecting each of the types of feature mentioned above. Earth resistance survey records variations in the same physical property that can give rise to cropmarks, volume concentration of ground moisture, and the technique would not be affected by the presence of the pylons and associated above-ground ferrous materials, as geomagnetic survey would.
- 5.5 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, soil-filled features, which retain more moisture, will provide relatively low resistance values while stone features, including metalled surfaces and wall foundations, will give relatively high resistance values.

Survey strategy

- 5.6 Electrical resistance survey began in the south-eastern part of the site, where archaeological features were thought likely to be present. Since low resistance anomalies were clearly detected there, almost certainly reflecting soil-filled ditch features of potential archaeological significance, the technique was continued across the remainder of the survey area.
- 5.7 Technical problems (faulty RM15 memory module) and extreme weather during the initial fieldwork resulted in data corruption and grid edge discontinuities respectively. A second field visit in June 2008 was used to recollect data from the central and north-eastern parts of Area A and all the data were then reprocessed as necessary.

Field methods

5.8 A 20m 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.

- 5.9 Measurements of earth electrical resistance were determined using Geoscan RM15 Advanced resistance meters with twin probe arrays and mobile electrode spacings of 0.5m, enabling resistance data to be logged at a theoretical depth of 0.75m. A zig-zag traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was set to 0.10hm, the sample interval to 1.0m and the traverse interval to 1.0m, thus providing 400 sample measurements per 20m grid unit.
- 5.10 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

- 5.11 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, high resistance anomalies are displayed as dark grey and low resistance anomalies as light grey. Palette bars relates the greyscale intensities to anomaly values in ohms.
- 5.12 The following basic processing functions have been applied to each dataset:

clip	clips, or limits data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.
add	adds or subtracts a positive or negative constant value to defined blocks of data; used to reduce discontinuity at grid edges.
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.

5.13 Despite the survey of Area A being undertaken in two phases, the first being during a period of extremely heavy showers and the second during a consistent dry spell, it has been possible to adjust much of the data to a common background level and so avoid shifts in data levels between adjacent grids.

Interpretation: anomaly types

5.14 Colour-coded geophysical interpretations are provided in Figure 3. 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

- 5.15 Colour-coded archaeological interpretations are provided in Figure 3.
- 5.16 Large, amorphous anomalies of relatively high or low resistance have been detected across the site. These almost certainly reflect natural local variation within the sand and gravel geology and have not been highlighted on the interpretation drawings.
- 5.17 The free-draining nature of the geology has provided clear resistance contrasts within the data. Many low resistance anomalies have been detected across the site. These anomalies all typically reflect deposits which retain more moisture than the surrounding sediments, in this case almost certainly soil-filled ditches cut into the sand and gravel subsoil.
- 5.18 Some of the longer ditch features form rectilinear enclosures, or in Area A at least, internal divisions within one particularly large enclosure. A large curvilinear ditch forms the northern side of a D-shaped enclosure measuring approximately 65m by 45m, immediately west of the large enclosure mentioned above.
- 5.19 A number of smaller, arcuate low resistance anomalies have also been detected, particularly in the eastern part of the site, Area A. These anomalies are also likely to reflect soil-filled features, some perhaps being the remains of ring-ditches, possibly associated with roundhouses.
- 5.20 Broad bands of low resistance in Area B measure up to 10m in width. Whilst these are wider than usual for ditches they also appear too regular to be natural features and so have been included in the archaeological interpretation plan.
- 5.21 Several high resistance anomalies were also detected. These typically reflect materials with low moisture content, often stone features. One particular group of short rectilinear anomalies in the north-western quarter of Area A could reflect stone wall-footings. Occasional other such anomalies could reflect the remains of similar features elsewhere on the site.
- 5.22 Broad bands of high electrical resistance were also detected in both areas. Some of those in the eastern half of Area B and the western end of Area A correspond to existing gravel tracks while the others probably reflect former gravel tracks.

6. Conclusions and recommendations

- 6.1 Electrical resistance survey has been undertaken over approximately 4.3ha of land at Ely Road, Milton, Cambridge, prior to proposed development.
- 6.2 The survey has demonstrated the potential for archaeological features to be present across the site. Such features almost certainly include enclosures defined by soil-filled ditches and may possibly include ring-ditch remains and stone-founded structures. Some of these potential features could be associated with the known remains to the east of the present site.
- 6.3 The combined surveys have collected good quality data to inform the archaeological potential at the site, therefore no further geophysical survey or data processing is warranted with regard to the proposed development.
- 6.4 It is understood that a programme of trial trench evaluation will be conducted.

7. Sources

- David, A, Linford, N, & Linford, P, 2008 Geophysical survey in archaeological field evaluation, 2nd 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
- Gailey, S, 2008 Archaeological desk-based assessment: Land at Ely Road, Milton, South Cambridgeshire, unpublished report by CgMs Consulting ref SG/9592
- Schmidt, A, 2002 *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Oxbow Books, Oxford

Appendix: Project brief

BRIEF FOR ARCHAEOLOGICAL EVALUATION Cambridgeshire Archaeology Planning & Countryside Advice

Site:	Land east of Milton Hall, Milton Cambridge
Planning Application:	pre-application
Company:	CgMs
Location:	NGR TL 482 629

This design brief is only valid for six months after the above date. After this period the Cambridgeshire Archaeology Planning & Countryside Advice office (CAPCA) should be contacted. Any specifications resulting from this brief will only be considered for the same period. <u>Please note</u> that this document is written for archaeological project managers to facilitate the production of an archaeological specification of work; the term project manager is used to denote the archaeological project manager only.

The project manager is strongly advised to visit the site before completing their specification, as there may be implications for accurately costing the project. The project manager must consult the Cambridgeshire Historic Environment Record (CHER) as part of the evaluation. Any response to this brief should follow IFA Standard and Guidance for Archaeological Field Evaluations, 1999.

NO FIELDWORK MAY COMMENCE UNTIL WRITTEN APPROVAL OF A SPECIFICATION HAS BEEN ISSUED BY THE CAMBRIDGESHIRE ARCHAEOLOGY PLANNING & COUNTRYSIDE ADVICE OFFICE (CAPCA)

1.0 Site Description

- 1.1 This site is located at the north east end of Milton village, Cambridge, on 1st terrace river gravels approximately 0.5km west of the River Cam. The site is located in the present 18th century parkland of Milton Hall, which contains a boating lake on its southern side and a 19th century gate lodge at its north western corner. Milton Hall itself is not included in the scope of the development, while its lodge is to be retained and redeveloped as part of the works.
- 1.2 The proposed development area exists in an area known for its dense archaeological cropmarks which, where tested in other schemes, denote the remains of settlement dating from the Bronze Age to the Roman period. The continuation of the known cropmarked sites can be expected at least in the eastern half of the development area, with suspected continuation of activity beyond this point. A desk based assessment collating the known archaeological evidence has been prepared by CgMs (Gailey 2008) which should be read in conjunction with this brief.

2.0 The nature of the development and archaeological requirements

- 2.1 The proposed development includes the construction of 121 retirement units and associated buildings and services for a retirement and care home. Recreational facilities are to be located within the broader parkland, the construction details for which have yet to be confirmed.
- 2.2 Due to the high archaeological potential of the site CAPCA has requested that the applicant provide information concerning the potential impact of the proposal on archaeological remains. In order to provide this information an archaeological evaluation of the site is necessary. This design brief sets out the requirements for the adequate archaeological evaluation of the site.
- 2.4 The required scheme shall include a field evaluation of threatened archaeological remains. Mitigation of any threat to identified remains will be outlined in a Further Design Brief.
- 2.5 The evaluation should include a programme of linear trial trenching and/or test-pitting to adequately sample the threatened available area and will excavate sufficient archaeological features to conform with section 3.0 below. <u>All</u> features must be investigated and recorded unless otherwise agreed with CAPCA. The trenching density will be based on the results of non-intrusive surveys but is expected to be in the region of between 3-5%.

3.0 Objectives

3.1 The evaluation should aim to determine, the location, extent, date, character, condition, significance and quality of any surviving archaeological remains liable to be threatened by the proposed development. An adequate representative sample of all areas where archaeological remains are potentially threatened should be studied. This office will be particularly

concerned with the amount of truncation to buried deposits, the presence or absence of a palaeosol or 'B' horizon, the preservation of deposits within negative features, site formation processes generally. To these ends buried soils and associated deposits should be inspected on site by a suitably qualified soil scientist and his/her advice sought on the whether soil micromorphological study or other analytical techniques will enhance understanding of the site. If so, analysis should be undertaken.

- 3.2 The project manager must arrange, through a suitably qualified specialist, the reassessment and re-plotting of available aerial photographic evidence at a scale of 1:2500. This reassessment should also involve the study of cropmarks lying outside the development, where a clear relationship exists. A digital copy of the air photograph evidence should be supplied with the report for inclusion in the CHER.
- 3.3 The project manager should consult an appropriate geophysical specialist, to assess the viability of various survey techniques on the site. A suitably qualified specialist organisation and/or individuals must undertake all geophysical work. Such work must be preceded by a sample scan to assess the effectiveness of the technique in relation to the site-specific geological/topographical conditions. Any subsequent survey work must be recommended by the specialist and where possible, approved by CAPCA.
- 3.4 The assessment of the environmental potential of the site through examination of suitable deposits must also be arranged with a suitably qualified specialist. Attention should be paid:
 - to the retrieval of charred plant macrofossils and land molluscs from former dry-land palaeosols and cut features, and to soil pollen analysis;
 - to the retrieval of plant macrofossils, insect, molluscs and pollen from waterlogged deposits located.
 - provision for the absolute dating of critical contacts should be made: *eg* the basal contacts of peats over former dryland surfaces; distinct landuse or landmark change in urban contexts

The project manager must make their results known to Peter Murphy, English Heritage regional science advisor. The assessment of environmental potential should consider the guidelines set out in the following documents: Association for Environmental Archaeology, 1995, *Environmental archaeology and archaeological evaluations*. *Recommendations concerning the environmental archaeology component of archaeological evaluations in England*. Working Papers of the Association for Environmental Archaeology 2, 8 pp. York: Association for Environmental Archaeology; Dobney, K., Hall, A., Kenward, H. and Milles, A., 1992, A working classification of sample types for environmental archaeology. Circaea 9.1 (1992 for 1991), pg. 24-26; Murphy, P.L. and Wiltshire, P.E.J., 1994, A guide to sampling archaeological deposits for environmental analysis. These documents are available for viewing at CAPCA.

- 3.5 The evaluation should also carefully consider any artefactual or economic information in particular, the survival of faunal evidence and provide an assessment of the viability (for further study) of such information. It will be particularly important to provide an indication of the relative importance of such material for any subsequent decision-making regarding mitigation strategies. Advice is to be sought from a suitably qualified specialist in Faunal Remains on the potential of sites for producing bones of fish and small mammals. If there is potential, a sieving programme is to be undertaken. Faunal remains collected by hand and sieving are to be assessed and analysed if appropriate.
- 3.6 The evaluation should include a comprehensive, illustrated assessment of the regional context within which the archaeological evidence rests and should aim to highlight any relevant research issues within a national and regional research framework.
- 3.7 The evaluation should provide a predictive model of surviving archaeological remains detailing zones of relative importance against known development proposals. An impact assessment should also be provided.
- 3.8 If any of these areas of analysis are not considered appropriate the report will detail justification for their exclusion.

4.0 Requirements

4.1 The evaluation must be undertaken by an archaeological team of recognised competence, fully experienced in work of this character and formally acknowledged by the CAPCA officers, advisors to the Local Planning Authority (LPA). Inclusion in The Institute of Field Archaeologists' Register of Archaeological Organisations is recommended. Details, including the name, qualifications and experience, of the site director and all other key project personnel

(including specialist staff) will be communicated to CAPCA as part of a specification of works that conforms to the guidelines contained in English Heritage's MAP 2 publication (Management of Archaeological Projects, specifically, Appendix 2). This specification must:

- 1. be supported by a research design which sets out the site specific objectives of the archaeological works.
- 2. detail the proposed works as precisely as is reasonably possible, indicating clearly on plan their location and extent.
- 3. provide a timetable for the proposed works including a "safety" margin in the event of bad weather or any other unforeseen circumstances that may effect this timetabling.
- 4.2 Care must be taken in the siting of offices and other support structures in order to minimise impact on the environment. Extreme care must also be taken in the structure and maintenance of spoil heaps for the same reasons and to facilitate a high quality reinstatement. This is particularly important in relation to pastureland.
- 4.3 The archaeological project manager must satisfy themselves that all constraints to groundworks have been identified, including the siting of live services, Tree Preservation Orders and public footpaths. The CAPCA officers bear no responsibility for the inclusion or exclusion of such information within this brief.
- 4.4 Human remains must be left *in situ*, covered and protected when discovered. No further investigation should normally be permitted beyond that necessary to establish the date, condition and character of the burial, and CAPCA and the local Coroner must be informed immediately. If removal is essential can only take place under appropriate Home Office and environmental health regulations.
- 4.5 All aspects of the evaluation shall be conducted in accordance with the Institute of Field Archaeologist's *Code of Conduct*, the *Standard and Guidance for Archaeological Field Evaluations* (rev 1999), and *Standards for Field Archaeology in the East of England* (EAA Occasional Paper 14). Reference should also be made to *Research and Archaeology: A Framework for the Eastern Counties 1. Resource Assessment and 2 Research Agenda and Strategy* documents (EAA Occasional Papers 3 and 8).
- 4.6 Before commencing work the project manager must carry out a risk assessment and liase with the site owner, client and CAPCA in ensuring that all potential risks are minimised. A copy of this must be given to CAPCA before the commencement of works.
- 4.7 Project Managers are reminded of the need to comply with the requirements of the Treasure Act 1996 (with subsequent amendments). Advice and guidance on compliance with Treasure Act issues can be obtained from the Cambridgeshire Historic Environment Record (CHER) office, and project managers are recommended to report any finds that could be considered treasure under the terms of the Act made during the process of fieldwork to CHER within 48 hours of discovery.
- 4.8 To assist with the curation of the project's archive, the Project Manager must contact the CHER office to obtain an event number. CHER will use this number as a unique identifier linking all physical and digital components of the archive. The unique event number must be clearly indicated on any specification received for this project and on any ensuing reports.
- 4.9 Arrangements for the long term storage and deposition of all artefacts must be agreed with the landowner and CHER before the commencement of fieldwork. The Project Manager should consult document ref HER 2004/1 (available from our website¹) regarding the requirements for the deposition of the archive, which must be deposited in the County Store on completion of post-excavation analysis and publication.
- 4.10 Cambridgeshire Archaeology supports the national stage of the Online Access to the Index of Archaeological Investigations (OASIS III) project and would encourage archaeological contractors to support this initiative. In order that a record is made of all archaeological events within the county occurring through planning systems, the archaeological contractor is requested to input details of this project online at the ADS internet site²: The OASIS reference ID should be cleared indicated on any reports.
- 4.11 An unbound copy of the report, clearly marked DRAFT, should be prepared and presented to CAPCA within four weeks of the completion of site works (unless there are reasonable grounds for more time). This report must conform to the format contained within the

¹ http://www.cambridgeshire.gov.uk/leisure/archaeology/historic/archives/herstore.htm

² http://ads.ahds.ac.uk/project/oasis

document $\underline{CAO1995/1}$ dealing with the production of archaeological evaluation reports. Copies can be obtained from the address below.

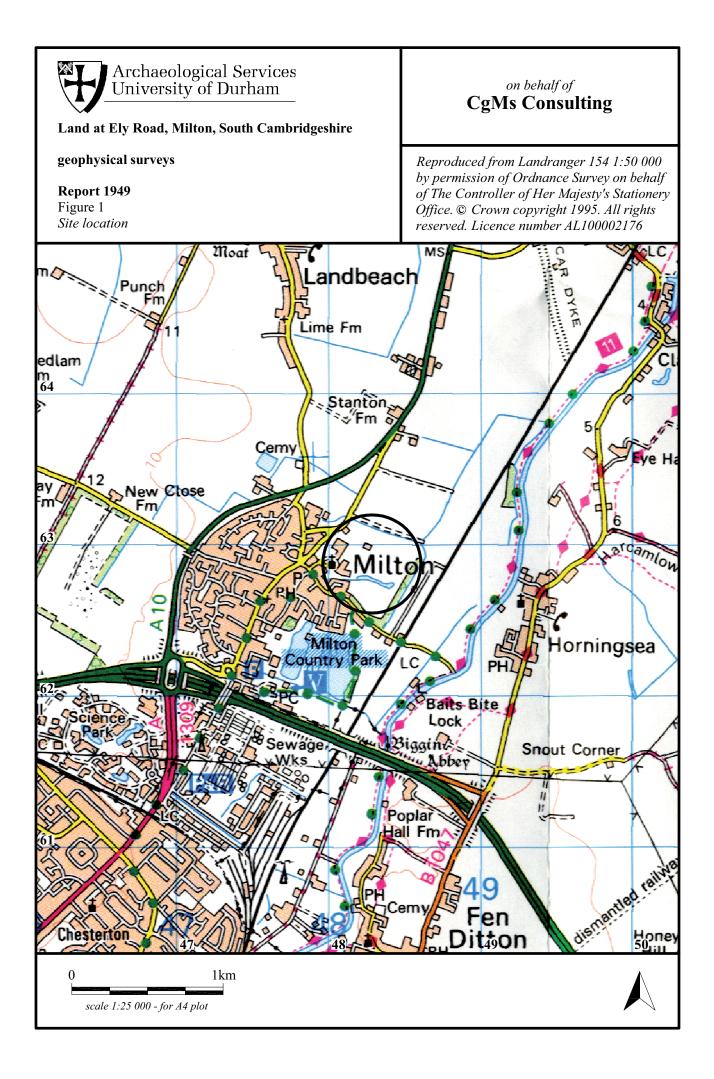
4.12 Following acceptance, two copies of the detailed report of the results should be submitted to CAPCA. A single hard copy should be presented to the CHER as well as a digital copy of the approved report.

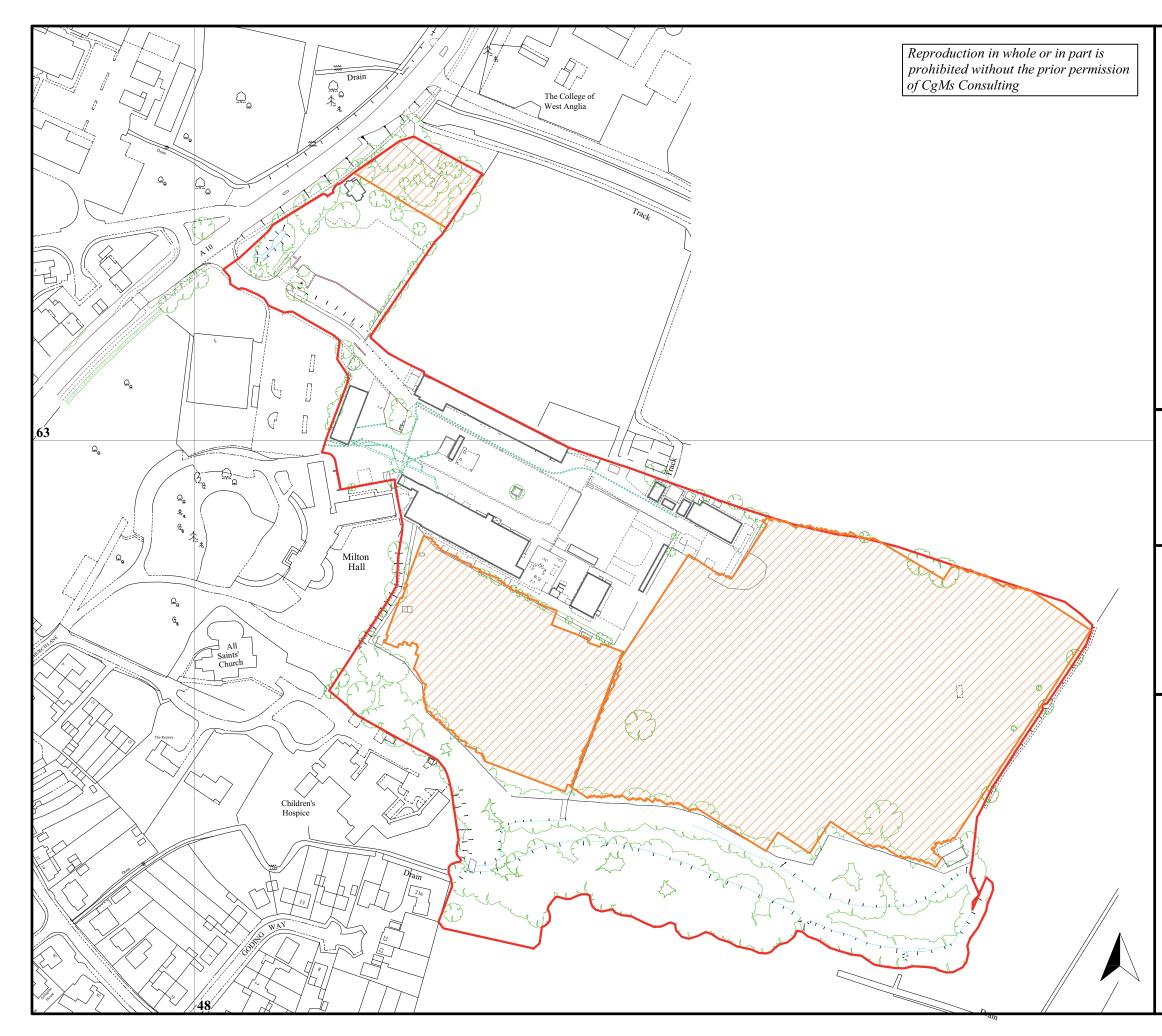
A summary statement may be required sooner to facilitate project planning decisions

- 4.13 CAPCA officers are responsible for monitoring all archaeological work within Cambridgeshire and will normally inspect site works and review the progress of excavation reports and archive preparation. The project manager must inform CAPCA in writing at least one week in advance detailing proposed start dates for the project.
- 4.14 Any changes to the specifications that the project manager may wish to make after approval by this office should be communicated directly to CAPCA for approval.
- 4.15 CAPCA should be kept regularly informed about developments both during the site works and subsequent post-excavation work.
- 4.16 The involvement of CAPCA should be acknowledged in any report or publication generated by this project.

As part of our desire to provide a quality service to all our clients we would welcome any comments you may have on the content or presentation of this design brief. Please address them to the author at the address below.

Kasia Gdaniec Development Control Archaeologist Cambridgeshire Archaeology Planning & Countryside Advice Box ELH 1108, Castle Court Castle Hill, Cambridge CB3 0AP





Archaeological Services University of Durham				
Land at Ely Road, Milton, South Cambridgeshire				
geophysical surveys				
Report 1949				
Figure 2				
Site boundary and survey areas				
on behalf of CgMs Consulting				
0 100m scale 1:2000 - for A3 plot				
site boundary geophysical survey areas				

