

## **Summary**

- *A fluxgate gradiometer survey was undertaken along sections of the proposed route of the A14 Ellington to Fen Ditton road improvement scheme in Cambridgeshire.*
- *The survey detected a number of archaeological sites, including probable settlement activity to the immediate east of the East Coast Main Line Railway at Offord Cluny (plot 0267/1).*
- *Traces of enclosures were detected in 0226/4 (northeast corner of a well-defined double ditched feature), 0301/2, 0218/1, 0218/2, 0299. A small ring ditch (and other ditches) was detected at the eastern end of the survey in 0378. Ditches and potential pits were also recorded in 0208/2, 0189, 0162/1, 0162/2 and 0305/3.*
- *Elsewhere, the survey registered possible archaeological remains in 0301/1, 0274/2, 0305/1, 0305/6 and 0229/2.*
- *It is likely that the bulk of magnetic variation encountered along the route relates to natural features and processes including glacial erratics, tree boles, concentrations of ferrous rich silt deposits/iron pans in low-lying areas and/or palaeochannels.*
- *Residual traces of ridge and furrow were encountered along the route.*
- *The survey recorded a number of former known boundaries, as referenced on the 1<sup>st</sup> Edition Ordnance Survey.*

## 1.0 Introduction

WSP commissioned Pre-Construct Geophysics to undertake a fluxgate gradiometer survey along sections of the proposed route of the A14 Ellington to Fen Ditton road improvement scheme in Cambridgeshire.

## 2.0 Location and description (Figs 1-19)

*Sections 2 – 4 and 6 contain information extracted from an environmental assessment (EA) of the scheme (Allen, 2006).*

The route extends c. 43km from the A14 at Ellington (NGR: 518630 271870) southwards to the immediate west of the A1 before turning eastwards from the junction of the A1 and Buckton/Brampton Roads) to continue across the Great Ouse, the East Coast Main Line Railway and the A1198 at Godmanchester. It continues eastwards and to the south of the current A14 until it converges with the latter to the East of Fenstanton. It follows the course of the current A14 to terminate at Fen Ditton.

Survey was undertaken along the majority of c.27km of the westernmost section of the route that extends across gently undulated agricultural land from Ellington to just north of the A14-M11 interchange (NGR: 542100 261400).

The remainder of the route eastwards to Fen Ditton lies within the highway boundary and is considered unsuitable for geophysical survey.

## 3.0 Geology

The western part of the route comprises solid deposits of Oxford Clay, overlain by superficial drift deposits, principally boulder clay and gravels that accumulated during the glacial and post-glacial periods.

Between the A1 and Godmanchester, the route encounters also alluvium and gravel terraces deposited within the valley of the Great Ouse.

The response of archaeological remains to magnetic survey within alluvium and till is variable, where depths of alluvium and inconsistencies within glacial till can sometimes mask archaeological features. The response on sands, gravels and mudstones is also variable.

## 4.0 Archaeological context

Detailed descriptions of recorded and potential archaeological sites within a 500m study corridor are listed in the environmental assessment (Allen, 2006). Where applicable, comparative reference to these is made in Section 6 of this report (Results).

## 5.0 Methodology

The survey methodology was based upon English Heritage guidelines: *'Geophysical Survey in Archaeological Field Evaluation'* (David, 1995).

**Gradiometry** is a non-intrusive scientific prospecting technique that is used to determine the presence/absence of some classes of sub-surface archaeological remains (e.g. pits, ditches, kilns, and occasionally stone walls). By scanning the soil surface, geophysicists identify areas of varying magnetic susceptibility and can interpret such variation by presenting data in various graphical formats and identifying images that share morphological affinities with diagnostic archaeological remains.

The gradiometer survey was undertaken using two Bartington Grad-601 Dual Fluxgate Gradiometers. The zigzag traverse method of survey was used, employing 1.0m wide traverses with readings taken at 0.25m intervals along a (predominately) 30m wide corridor. Wider or narrower surveys were undertaken at various points, particularly at junction sites. The survey areas were established by Differential Global Positioning satellite (DPGS) by National Grid.

The data was processed using *ArcheoSurveyor v.1.3.0.6*. It was clipped to reduce the distorting effects of extremely high or low readings caused by discrete pieces of ferrous metals, and the results are plotted as greyscale and trace images at 1:5000 (Figs. 5 - 19) and 1:1250 (Figs. 20 - 50).

The survey was undertaken by Peter Heykoop, George Bunn, Sophie Bunn, Gareth Ward-Stevens, Neil Paveley, Christopher Oatley, Alex Redmayne and David Bunn during January and February 2008.

90.85ha was surveyed.

## 6.0 Results (Figs. 5 - 50)

For ease and clarity of reporting, the results are presented and described sequentially from west to east, commencing at 0226 (owner/occupier)/1 (field 1) and terminating at 0379.

### 6.1 Principal types of magnetic variation recorded along the route (Figs. 20 - 50)

It is suggested that the vast majority of magnetic variation recorded relates to natural inconsistencies in the subsoil or traces of relatively insignificant past human activity (cultivation, recent field boundaries, ferrous objects etc):

- Dipolar anomalies, 'iron spikes', were recorded in the majority of survey areas (discrete examples circled in pink: ○). These typically indicate modern materials such as horseshoes and brick/tile fragments, where the latter are often introduced during manuring, drain construction or as relatively widespread rubble deposits (zones: □).
- Strong magnetic variation was recorded at the boundaries of many fields, usually reflecting wire fencing (including buried remnants) and/or ferrous debris deposited along field edges (pink lines: —).
- Closely spaced parallel linear anomalies probably indicate cultivation, including residual traces of ridge and furrow (orange lines: —).
- Land drains were recorded in a number of fields (purple lines: —).
- A number of linear anomalies clearly relate to former field boundaries (yellow lines: —), depicted on 1<sup>st</sup> Edition Ordnance Survey maps.
- The survey recorded magnetically weaker discrete/grouped anomalies. Explanations of these may include tree boles (removal by burning would produce a relatively strong predominantly positive magnetic signature), extraneous materials (rocks/boulders) within glacial till, glacial fractures, or ferrous-rich deposits (e.g. pockets of peat and silt, particularly in low-lying areas/palaeochannels). Examples of anomalies considered to reflect natural features are highlighted in green (□○—).
- Services/pipelines (blue lines: —).

In a number of areas, the magnetic variation is more indicative of buried archaeological remains:

- Examples of discrete/grouped anomalies that are thought to represent pits/burnt deposits have been circled in red (○). Any such interpretation refers not only to magnetic signature, but also to an occurrence within a known or suspected archaeological landscape.

Similarly, certain linear/rectilinear or curvilinear anomalies display greater archaeological potential as ditches, including those that define early enclosures (red lines: — ∟).

## 6.2 Survey plots

### 0226/1 (Figs. 5, 20)

The results indicate the strong magnetic response of an existing track at the western edge of the survey and a widespread scatter of ferrous rich material across the field (Fig. 20: highlighted in pink).

A broad and magnetically weak zone of magnetic variation in the southern half of the survey probably indicates a natural feature, such as a palaeochannel (Fig. 20: boxed in green).

### 0226/2 (Figs. 5, 20)

The survey recorded a probable land drain (Fig. 20: purple line) and a former known field boundary (Fig. 20: yellow line).

### 0226/3 (Figs. 5, 20)

Traces of probable palaeochannels were detected (Fig. 20: zone boxed in green).

Ephemeral parallel linear anomalies indicate cultivation, possibly ridge and furrow (Fig. 20: orange lines).

A survey extends across the southern part of the field (Fig. 20: blue line).

Miscellaneous modern ferrous material was recorded at the southern edge of the field (Fig. 20: zone boxed in pink).

### 0226/4 (Figs. 5, 21)

An initial survey at the northern end edge of the field detected a probable ditch. A limited survey extension to the south and west of this feature revealed a series of rectilinear and parallel ditches that define the north east corner of an enclosure complex (Fig. 21: highlighted in red). These might relate to 'multiple enclosures and large stockades indicated by pit alignments', as listed by EA for this area (site 9).

The (above) service extends southwards into this field (Fig. 21: blue lines).

Probable ridge and furrow and a former field boundary were recorded in the southern part of the field (Fig. 21: orange/yellow lines).

### 0226/5 (Figs. 5, 21)

The results indicate traces of cultivation, possibly ridge and furrow (Fig. 21: orange lines).

Strong magnetic variation was recorded at the northern and southern ends of the field (Fig. 21: boxed in pink). These almost certainly represent modern ferrous materials.

### 0301/1 (Figs. 6, 22)

A number of potential ditches were detected in the mid and southern part of the field (Fig. 22: red lines). These might be elements of a former field system.

Other linear anomalies correspond to known former boundaries (Fig. 22: yellow lines).

For the most part, it is likely that a relatively dense scatter of discrete anomalies represent natural features, such as tree boles or glacial erratics (Fig. 22: examples highlighted in green). However, a number of possible pits were also detected (Fig. 22: circled in red).

Potential ridge and furrow was recorded (Fig. 22: orange lines).

### **0301/2 - 3** (Figs. 6, 23)

The survey detected a number of ditches and pits/burnt material, principally in the mid and southern parts of the survey (Fig. 23: highlighted in red). They include elements of partially detected enclosures close/adjacent to the southern edge of the field.

These possibly relate to known and suspected sites, as listed by the EA (Sites 14, 16: undated cropmarks of linear/circular features and an enclosure).

The strong magnetic response of services was recorded (Fig. 23: blue lines). These may be masking adjacent magnetically weaker features.

A probable palaeochannel was recorded at the western edge of the survey (Fig. 23: zone boxed in green).

### **0218/1** (Figs. 6, 24)

Enclosure ditches (see above) continue into the northern part of the field (Fig.24: red lines).

A probable ditch was detected close to (and roughly parallel to) the southern edge of the field (Fig.24: red line).

Elsewhere, a number of potential pits were detected (Fig.24: examples circled in red).

A linear anomaly at the eastern edge of the survey corresponds to western edge of an existing quarry (Fig.24: zone boxed in pink).

### **0218/2** (Figs. 6, 24)

Ditches were detected in the mid point of the survey (Fig.24: red lines).

### **0299** (Figs. 6, 25, 26)

The survey detected a series of ditches, most of which appear to define enclosures (Fig. 25: red lines). Amongst these is the northern extent of a large enclosure, complete with a wide access point along its northern edge. This feature also appears to contain a smaller enclosure to the southeast of the putative entrance.

The survey also recorded a number of potential pits, principally in the mid western part of the field (Fig. 25: circled in red).

A band of weak magnetic variation recorded to the immediate north of the large enclosure is almost certainly of natural origin, possibly a palaeochannel (Fig. 25: zone boxed in green).

To the south and west of this it is likely that the bulk of random magnetic anomalies indicate natural inconsistencies, such as tree boles, alluvial deposits of ferrous minerals and glacial erratics (Fig. 25: highlighted in green). A similar zone of anomalies was recorded at the northwest corner of the field (boxed in green).

A service extends across the southern corner of the survey (Fig. 25: blue line).

### **0242/2 – 0241/1** (Figs. 7, 27)

The survey detected residual traces of ridge and furrow (Fig. 27: orange lines).

### **0241/2** (Figs. 7, 27)

A zone of magnetic variation in the mid part of the site probably reflects natural inconsistencies (Fig. 27: boxed in green).

Linear anomalies in the eastern half of the survey are probably modern possibly land drains (Fig. 27: purple lines).

Strong magnetic readings at the eastern edge of the field indicate modern ferrous, possibly a former boundary and a backfilled pond/quarry pit (Fig. 27: zones boxed/circled in pink).

**0267/1 – 2** (Figs. 8, 28, 29)

The survey detected traces of settlement activity (Figs. 28, 29: highlighted in red). These possibly relate to known and suspected sites, as listed by the EA (Site 37: undated cropmarks of enclosure/ring ditches).

The primary route extends across an array of settlement ditches and pits/burnt material, which appear (for the most part) to lie either side of a possible east to west aligned track/road (Fig. 28: annotated). At its eastern end it cuts (or is cut by) a ditch (dashed red line) that extends southwards from a group of enclosure ditches (including a circular ditch). This suggests at least two phases of development.

Potential settlement was detected to the south east of this, within the proposed 'straightening' route of the road that currently lies to the immediate east of the field (Figs. 29: highlighted in red). Given the limited extent of the survey, it is not clear whether these features represent a southeasterly continuation of those discussed above or form part of a separate settlement complex.

A service extends across the eastern edge of the field (Figs. 28, 29: blue line).

The survey recorded residual traces of a recently removed boundary (Figs. 28: yellow line).

Weakly magnetic parallel linear striations almost certainly indicate ridge and furrow (Figs. 28, 29: orange lines).

**0267/3, 0231, 0234** (Figs. 8, 9, 30)

Little of archaeological potential was recorded in these fields, possibly excepting a number of pit-like anomalies (Fig. 30: circled in red).

Magnetic anomalies indicate ridge and furrow (Figs. 30: orange lines), an existing farm track (Figs. 30: yellow line) and miscellaneous ferrous material (Figs. 30: highlighted in pink).

**0377, 0208/1** (Figs. 9, 31)

The survey recorded ploughed ridge and furrow (Figs. 31: orange lines), former known field boundaries (Figs. 31: yellow lines) and modern ferrous (Figs. 31: highlighted in pink).

**208/2, 0064** (Figs. 9, 32)

The survey detected an L-shaped ditch in the eastern part of 0208/2 (Figs. 32: red line).

Elsewhere, magnetic anomalies resolve as ridge and furrow and known former boundaries (Figs. 32: orange/yellow lines) and modern ferrous (highlighted in pink).

**0226/1, 0226/2, 0226/3, 0215/1** (Figs. 10, 33)

The survey recorded ridge and furrow (Figs. 33: orange lines), a former known boundary in 0226/1 (Figs. 33: yellow line) and probable natural deposits (Figs. 33: circled in green).

**0215/2** (Figs. 11, 34)

A random scatter of weak magnetic anomalies at the eastern end of the survey probably reflects natural features (Fig.33: boxed in green).

**0274/1** (Figs. 11, 34)

A potential ditch and pits/burning were detected in the eastern part of the field (Fig. 34: highlighted in red).

The survey recorded a land drain and cultivation scores (Fig. 34: purple/orange lines).

**0274/2** (Figs. 12, 34)

Potential ditches and pits/burning were detected in the eastern part of the field (Fig. 34: highlighted in red).

**0244/0189** (Figs. 12, 35 - 37)

Isolated and grouped ditches were detected in the mid part of the field (Figs. 35, 37: highlighted in red).

A number of potential pits were also recorded (Figs. 35, 37: circled in red). These features lie within a zone of recorded archaeological remains, including Iron Age and Romano-British settlement activity (EA: Site 58).

It is likely that the majority of magnetic variation relates to natural features/processes, probably indicative of alluvial deposits of ferrous rich material, such as iron pans and silt (Fig. 35: zones highlighted in green).

Linear anomalies include potential land drains (purple lines), cultivation (orange lines) and a former known boundaries (yellow lines).

**0307/1** (Figs. 12, 37)

For the most part, it is likely that bands of distinct magnetic variation in the western half of the field are the result of natural processes, probably indicative of palaeochannels (Fig. 37: zones boxed in green). However, it is possible that linear trends within the easternmost zone relate to former boundaries (Fig. 37: yellow lines).

Probable ridge and furrow was recorded in the eastern half of the field (Fig. 37: orange lines).

**0307/2, 0240/1, 0240/2, 0240/3** (Figs. 13, 38)

The bulk of magnetic anomalies along this section clearly resolve as ridge and furrow (Fig.38: orange lines), a former known boundary in 0307/2 (Fig.38: yellow line) and service in 0240/1 (Fig.38: blue line).

A group of pit-like anomalies were detected at the western edge of the survey (Fig.38: circled in red).

**0162/1** (Figs. 13, 39)

Potential ditches and pits/burnt soil were detected in the mid part of the field (Fig.39: red lines). The EA lists iron working, fragmentary cropmarks and a small enclosure in this area (site 89).

Elsewhere, magnetic variation probably indicates natural features (Fig.39: zones boxed in green), former boundaries (yellow lines) and cultivation (orange lines).

**0162/2** (Figs. 14, 40)

Probable curvilinear ditches were detected in the mid part of the field, including an unusual U-shaped example (Fig.40: red lines). Undated cropmark ditches are listed in this area (EA, site 82).

A service extends across the eastern end of the survey (Fig.40: blue line).

**0305/1** (Figs. 14, 41 - 43)

A series of routes and junctions were surveyed.

For the most part, this field (where surveyed) does not appear to contain potentially significant features, apart from possible ditches close to the northern edge of the field - an L-shaped ditch in 0305/1R2A (Fig.42: red line) and a two ditches in 0305/1R5 (Fig.43: red lines).

Other anomalies appear to resolve as potential ridge and furrow (Figs. 41 – 43: orange lines), land drains (Figs. 41 – 43: purple lines), current tracks or former known boundaries (Figs. 41 – 43: yellow lines) and modern ferrous (Figs. 41 – 43: highlighted in pink).

**0305/2** (Figs. 14, 44)

The survey recorded a ditch-like anomaly at the eastern end of the survey (Fig. 44: red line).

Elsewhere, anomalies indicate traces of cultivation, land drains and modern activity (Fig. 44: highlighted in orange, purple and pink respectively).

**073** (Figs. 15, 44)

This field appears to contain a dense spread of modern ferrous material (Fig. 44: boxed in pink).

**0305/3** (Figs. 15, 44)

Probable ditches and pits were detected at the eastern end of the field (Fig.44: highlighted in red).

**0305/4, 0305/5, 0305/6** (Figs. 15, 45)

The survey recorded potential land drains and a service (Fig.45: purple/blue lines).

**0201/1, 0201/2, 0201/3, 0201/4** (Figs. 16, 46)

A service extends along this section (Fig. 46: blue line). It is likely that its construction will have destroyed any remains that may have existed in this area.

**0229/1, 0229/2, 0167/1 – 2, 0167/3, 0167/4** (Figs. 17, 47)

It is possible that linear anomalies recorded in 0229/1 indicate ditches, although an alternative origin as cultivation scores is also feasible (Fig.47: red lines).

Two short ditches lie in the mid part of 0167/1-2 (Fig.47: red lines).

Land drains and modern ferrous were recorded (Fig.47: purple lines/highlighted in pink).

**0117/0224, 0082** (Figs. 18, 48)

The results indicate services and modern ferrous (Fig.48: blue lines/highlighted in pink).

**0378/1, 0378/2, 0378/3** (Figs. 19, 49)

A series of proposed routes and junctions were surveyed.

Ditches, including a ring ditch were detected along route 2 (Fig. 49: red lines, 0378/1R2A – 0378/1R2D).

A potential ditch was recorded in 0378/1R1A (Fig. 49: red lines).

**0379** (Figs. 19, 50)

A series of proposed routes and junctions were surveyed.

For the most part, anomalies indicate cultivation (Fig. 50: orange lines) and services (Fig. 50: blue lines).

## **7.0 Conclusions**

The survey has identified a number of archaeological sites.

**7.1** Clear traces of archaeological activity were recorded in:

**0226/4** (Figs 5, 21): the northeastern corner of an enclosure complex.

**0301/2** (Figs 6, 23): miscellaneous ditches and pits.

**0218/1** (Figs 6, 24): enclosure ditches.

**0218/2** (Figs 6, 24): enclosure ditches.

**0299** (Figs 6, 25 – 26): enclosure ditches and pits.

**0267/1** (Figs 8, 28 - 29): extensive evidence of settlement enclosure ditches and pits.

**0208/2** (Figs 11, 32): L-shaped ditch.

**0189** (Figs 12, 35 - 37): ditches and pits.

**0162/1** (Figs 13, 39): ditches and pits.

**0162/2** (Figs 14, 40): ditches and pits.

**0305/3** (Figs 15, 44): ditches and pits.

**0378/1R2** (Figs 19, 49): ditches and pits, including a ring ditch.

**7.2** Elsewhere, potentially significant anomalies were recorded in less density or in relative isolation. The full extent of most of these has not been established:

**0301/1** (Figs 6, 22): potential ditches in mid part of field.

**0274/2** (Figs 12, 34): potential ditches.

**0305/1R2A** (Figs 14, 42): potential L-shaped ditch.

**0305/1R5** (Figs 14, 43): potential ditch.

**0305/6** (Figs 15, 45): potential ditch.

**0229/2** (Figs 17, 47): potential L-shaped ditches.

**7.3** It is likely that substantial magnetic variation encountered along the route relates to natural features and processes including glacial erratics and concentrations of ferrous rich silt deposits/iron pans in low-lying areas and/or palaeochannels.

**7.4** Residual traces of ridge and furrow were encountered along the route.

**7.5** The survey recorded a number of former known boundaries, as referenced on the 1<sup>st</sup> Edition Ordnance Survey.

