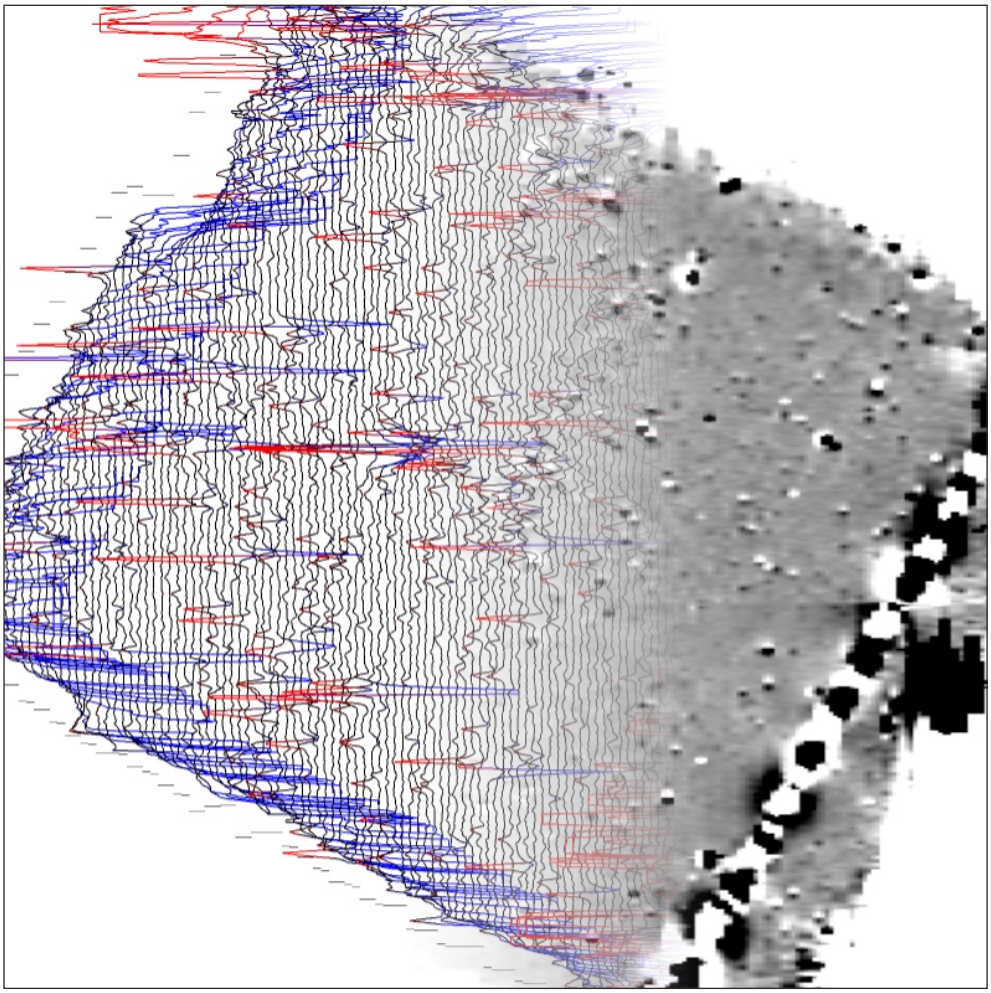
making sense of heritage

Land at Ashford Road, Sellindge, Kent

Detailed Gradiometer Survey Report



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October 2013

geoservices

Land at Ashford Road, Sellindge, Kent

Detailed Gradiometer Survey Report

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Planning Application Ref.		**Ordnance Survey (OS) national grid reference (NGR)**	610370 138010		

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v01	I	*S. Mounce*	*BCU*		04/10/2013
File:	\\192.168.2.5\wessex\PROJECTS\101140 Sellindge\Report\Working versions\Geophysics\101140_Geophysics_Report.docx				
File:					
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* I = Internal Draft; E = External Draft; F = Final

Land at Ashford Road, Sellindge, Kent

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land at Ashford Road (A20), to the southwest of Sellindge, Kent. The project was commissioned by CgMs Consulting Limited with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the Site ahead of the proposed redevelopment of the Site as a low rise residential housing estate.

The Site comprises a mixture of pasture and arable fields to the southwest Ashford Road (A20); the proposed scheme totals 10.5ha and gradiometer survey was undertaken over all accessible parts of the Site. The Site occupies largely flat land, with a general rise from south to north.

A desk-based assessment conducted by CgMs Consulting Limited (2013) identified a low potential for uncovering early prehistoric, Romano-British, Saxon and early medieval archaeology within the Site. The archaeological potential for the Bronze Age was recorded as moderate and for the Iron Age as good across the Site. Evidence for late medieval and post-medieval archaeology exists in the number of field boundaries still identifiable on the 1838 Tithe map.

The gradiometer survey has demonstrated the presence of anomalies of probable and possible archaeological interest within the survey area, along with regions of increased magnetic response and several modern services.

Two pit-like anomalies of probable archaeological interest and several pit-like anomalies of possible archaeological interest have been identified across the survey area, although these appear clustered in places. A number of trends have also been recorded of which the majority are likely to be land drains; however some may have an archaeological potential.

A number of spreads of ferrous and increased magnetic response appear to form linear patterns which run parallel with existing field boundaries. Some of these spreads are interspersed with linear anomalies of probable and possible archaeology enhancing the likelihood of these anomalies functioning as former field boundaries. It is possible that some of these former field boundaries correspond with those recorded on historic mapping.

Land at Ashford Road, Sellindge, Kent

Detailed Gradiometer Survey Report

Acknowledgements

The detailed gradiometer survey was commissioned by CgMs Consulting Limited and the assistance of Duncan Hawkins is gratefully acknowledged in this regard. Wessex Archaeology would also like to thank the landowner for granting access to the survey area.

The fieldwork was undertaken by Jennifer Smith, Clara Dickinson and Rachel Williams. Ross Lefort and Sarah Mounce processed and interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Ben Urmston. Illustrations were prepared by Linda Coleman. The project was managed on behalf of Wessex Archaeology by Mark Williams.

Land at Ashford Road, Sellindge, Kent

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by CgMs Consulting Limited to carry out a geophysical survey of land at Ashford Road (A20), to the southwest of Sellindge, Kent (**Figure 1**), hereafter "the Site" (centred on NGR 610370, 138010). The survey forms part of an ongoing programme of archaeological works being undertaken prior to the submission of a planning application for the redevelopment of the Site as a low rise residential housing estate.

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area.

1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.2 The Site

1.2.1 The survey area comprises a mixture of pasture and arable fields off Ashford Road (A20), to the southwest of Sellindge in Kent (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site; the proposed scheme boundary totalled 10.5 ha.

1.2.2 The Site occupies largely flat land, lying at around 62m above Ordnance Datum (aOD) in the south east of the Site and sloping gently up to a maximum height of 68m aOD on the Ashford Road before declining to 66m aOD in the north west of the Site. The survey area was bounded by Ashford Road (A20) to the north and east, by the M20 and Grade II listed Somerfield Court and Grade II listed Somerfield Court Barn to the south and by Grove House and Rotherwood Farm to the west.

1.2.3 A desk-based assessment conducted by CgMs Consulting Limited (2013) identified a low potential for uncovering early prehistoric, Romano-British, Saxon and early medieval archaeology within the Site. The archaeological potential for the Bronze Age was recorded as moderate and for the Iron Age as good across the Site. Evidence for late medieval and post-medieval archaeology exists in the number of field boundaries still identifiable on the 1838 Tithe map. A number of listed buildings surround the Site.

1.2.4 The soils underlying the Site are likely to comprise typical argillic gley soils of the 841e (Park Gate) association across the majority of the Site, with typical argillic brown earths of the 571c (Malling) association in the very south west end of the Site (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through gradiometer survey.

2 METHODOLOGY

2.1 Introduction

2.1.1 The detailed gradiometer survey was conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (2008).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 2nd and 5th September 2013. Field conditions at the time of the survey were good, with the survey area having been recently drilled and rolled.

2.2 Method

2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS system, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).

2.2.2 The gradiometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Data were collected in the zigzag method.

2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function (±5nT thresholds) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. These two steps were applied to all survey areas, with no interpolation applied.

2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

3.1.1 The gradiometer survey has been successful in identifying anomalies of probable and possible archaeological interest across the Site. Regions of increased magnetic response and a number of modern services have also been detected.

3.1.2 Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:2000 (**Figures 2** to **4**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale images and the XY trace plots are presented at 25nT per cm.

3.1.3 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

3.1.4 Numerous ferrous anomalies are visible throughout the detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

3.2 Gradiometer Survey Results and Interpretation

3.2.1 **Field A** has one linear weak positive anomaly **4000** aligned roughly east-west towards the northern extent of the field, and has been interpreted as possible archaeology. To the north and east of this linear anomaly is an interrupted L-shaped linear of ferrous and increased magnetic response **4001**. The anomaly is oriented northeast-southwest and turns northwest at its northeastern end, respecting existing field boundaries. Located along the very south western boundary of the field is a spread of ferrous and increased magnetic response at **4002**. Its amorphous shape suggests that it is likely to be a spread of magnetically enhanced debris as a result of anthropogenic activity. A modern service **4003** was recorded towards the eastern extent of the field and running parallel with the south eastern field boundary.

3.2.2 **Field B** comprised a roughly square-shaped area of increased magnetic response **4004** towards the northeastern corner of the field. This area most likely relates to a spread of magnetic anthropogenic debris and a roughly L-shaped band of ferrous responses is visible near its centre, parallel with the nearby boundaries. Within the region of increased magnetic response, several anomalies of probable and possible archaeological interest are visible. Towards the northwestern extent of the field, a short linear band of increased magnetic response **4005** and linear positive anomaly of probable archaeological interest **4006** share a common northwest-southeast alignment., and it is possible that anomalies **4004**, **4005** and **4006** once formed a continuous field boundary. To the south of these anomalies is a linear positive anomaly located at **4007**, which runs on a similar alignment and has been interpreted as probable archaeology. Two pit-like positive anomalies at **4008** and **4009** have also been interpreted as probable archaeology. A modern service **4010** has also been identified running along the eastern and southern extents of the field.

3.2.3 **Field C** contains a number of spreads of ferrous anomalies and increased magnetic response located at **4011**, **4013** and **4015**; these are considered to be spreads of magnetic anthropogenic debris. Another spread of ferrous and increased magnetic response located at **4014** is roughly linear shaped extending from the northern to southern limits of the field on a northwest-southeast alignment. This may represent a ploughed-out field boundary or a variation in the underlying geology. A number of land drains marked as trends, such as **4012**, and three modern services located at **4016**, **4017** and **4018** have been recorded within this field.

3.2.4 **Field D** recorded two modern services **4021** running along the southern and south western extents of the field. This service is a continuation of **4010**, **4017** and **4018** to the west which is a high voltage electric cable. The strong magnetic disturbance associated with this service has masked much the surrounding data, especially towards the southern extent of this field. Located at the eastern end of the field was another modern service **4020** oriented northeast-southwest. The majority of the rest of the field was covered by a large area of ferrous and increased magnetic response at **4019**. This area is possibly a spread of magnetic anthropogenic debris or more likely the result of ground disturbance from laying the modern services to the south and west.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of probable and possible archaeological interest within the Site, in addition to regions of increased magnetic response and several modern services.

4.1.2 Two pit-like anomalies of probable archaeology and several pit-like anomalies of possible archaeology have been identified across the survey area. A number of trends have also

been recorded of which the majority are likely to be land drains; however some may have an archaeological potential. These anomalies lie within or close to regions of increased magnetic response, and it is therefore possible that these regions are associated with the ploughed out remains of archaeological deposits; however, it is equally possible that they are the result of more modern dumping.

4.1.3 A number of spreads of ferrous and increased magnetic response appear to form linear patterns which run parallel with existing field boundaries. Some of these spreads are interspersed with linear anomalies of probable and possible archaeology enhancing the likelihood of these anomalies functioning as former field boundaries. It is possible that some of these former field boundaries correspond with those recorded on historic mapping.

4.1.4 The relative dimensions of the modern services identified by the gradiometer survey are indicative of the strength of their magnetic response, which is dependent upon the materials used in their construction and the backfill of the service trenches. The physical dimensions of the services indicated may therefore differ from their magnetic extents in plan; it is assumed that the centreline of services is coincident with the centreline of their anomalies, however. Similarly, it is difficult to estimate the depth of burial of the services through gradiometer survey. It is not clear from the geophysical data whether the below ground services identified are in active use or not. Also gradiometer data will not be able to locate and identify all services present on Site. This report and accompanying illustrations should not be used as the sole source for the service locations and appropriate equipment (e.g. CAT and Genny) should be used to confirm the location of buried services before any ground works take place on Site.

4.1.5 The extent of magnetic disturbance associated with the services and the frequency of small-scale ferrous anomalies have reduced the area in which it is possible to detect archaeological features.

4.1.6 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be encountered than have been identified through geophysical survey.

5 REFERENCES

CgMs Consulting Limited (2013) *Cultural Heritage Desk Based Assessment. Land at Ashford Road, Sellindge, Kent, TN25 6JX.* Unpublished report, ref.: DH/KB/15670

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

Soil Survey of England and Wales, 1983. *Sheet 6, South East England*. Ordnance Survey, Southampton.

APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey Methods and Equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ±100nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.

Post-Processing

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)
- Periodic Filter – This function is used to reduce or remove the amplitude of regular, periodic features present in the data. This is most commonly used to correct for operator error during the collection of data;
- Low Pass Filter – The low pass filter can be used to remove small scale, high frequency spatial detail. It is used to suppress noise in the data to enhance larger and weaker anomalies;
- Add – The add function simply involves adding or subtracting data values to a selected area of the data

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into two main categories: archaeological and unidentified responses.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The unidentified category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.

Finally, services such as water pipes are marked where they have been identified.

APPENDIX 3: KENT COUNTY COUNCIL HER SUMMARY FORM

Site Name: Land at Ashford Road, Sellindge, Kent

Site Address:
As above

Summary of discoveries:
The gradiometer survey has demonstrated the presence of anomalies of probable and possible archaeological interest within the survey area, along with regions of increased magnetic response and several modern services.
A number of spreads of ferrous and increased magnetic response appear to form linear patterns which run parallel with existing field boundaries. Some of these spreads are interspersed with linear anomalies of probable and possible archaeology enhancing the likelihood of these anomalies functioning as former field boundaries. It is possible that some of these former field boundaries correspond with those recorded on historic mapping.
Two pit-like anomalies of probable archaeology and several pit-like anomalies of possible archaeology have been identified across the survey area. A number of trends have also been recorded of which the majority are likely to be land drains; however some may have an archaeological potential.

District/Unitary: Shepway	**Parish:** Sellindge

Period(s): Unknown

NGR (centre of site to nearest 1m): 610370 138010

Type of archaeological work: Geophysical Survey

Date of fieldwork (dd/mm/yy) From: 2-09-2013 **To:** 5-09-2013

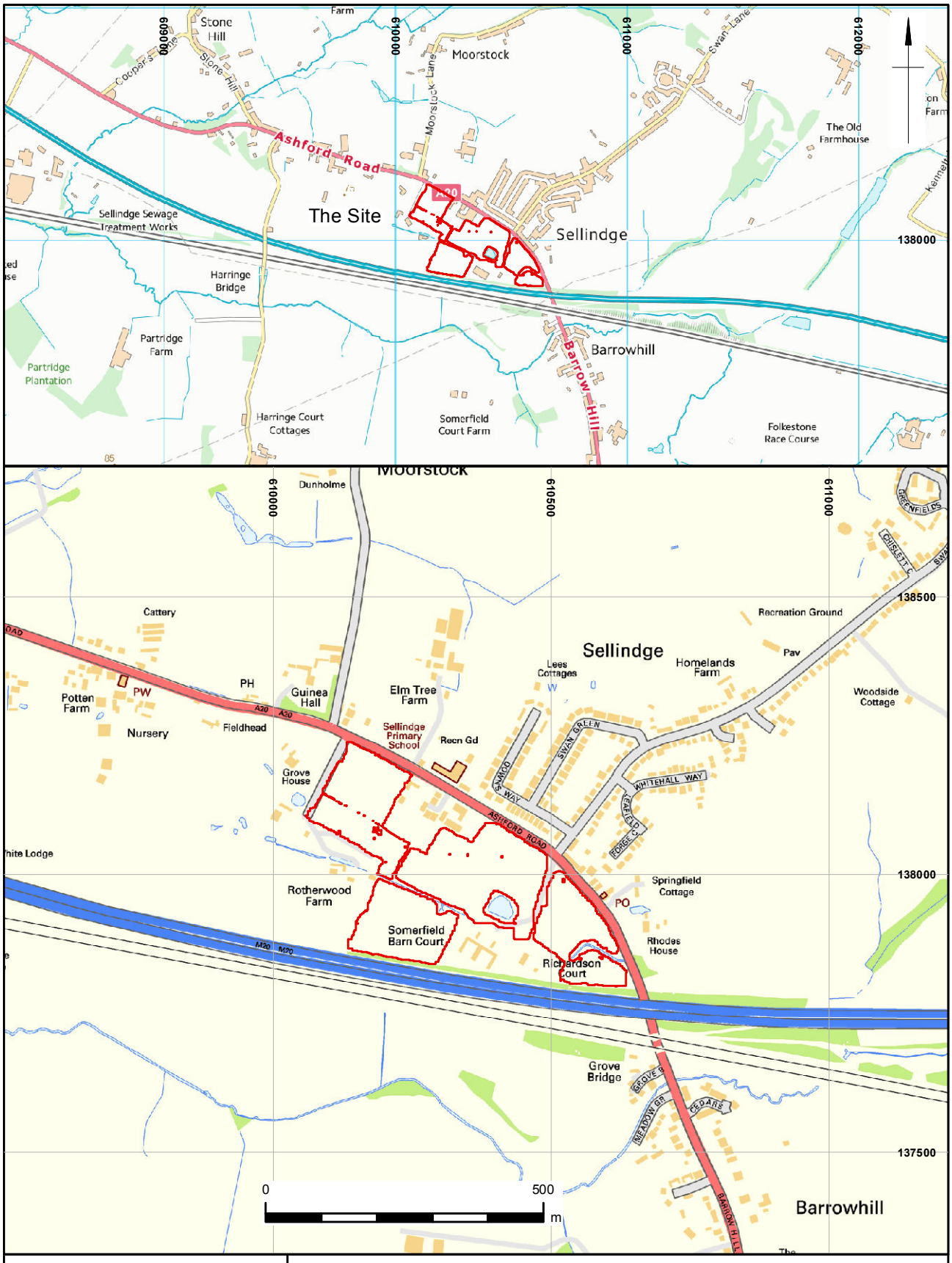
Unit/contractor undertaking recording: Wessex Archaeology (Rochester)

Geology: Sandgate Formation comprising sandstone, siltstone and mudstone

Title and author of accompanying report: Land at Ashford Road, Sellindge, Kent. Detailed Gradiometer Survey Report.
Author: Wessex Archaeology

Summary of fieldwork results (begin with earliest period first, add NGRs where appropriate)
Field A has one linear weak positive anomaly **4000** aligned roughly east-west towards the northern end of the field. It has been interpreted as possible archaeology. To the north and east of this linear anomaly is an interrupted L-shaped linear of ferrous and increased magnetic response **4001**. The anomaly is aligned northeast-southwest and turns northwest at its north eastern end, respecting existing field boundaries. Located along the very south western boundary of the field is a spread of ferrous and increased magnetic response at **4002**. Its amorphous shape suggests that either it is a spread of magnetic anthropogenic debris or a variation in the underlying geology.
Field B comprised a roughly square-shaped area of increased magnetic response **4004** towards the north eastern corner of the field. This area is most likely representing a spread of magnetic anthropogenic debris as a result of the anomalies identified within this area. A roughly L-shaped linear of ferrous interrupted by linear anomalies of probable and possible archaeology was recorded. The orientation of this L-shaped anomaly respects the existing field boundaries. Further to the north west of the L-shaped anomaly is a short linear anomaly of ferrous and increased magnetic response **4005**, with a linear positive anomaly of probable archaeology located at **4006**, further to the north west. Both anomalies are on a northwest-southeast alignment, both respecting the existing field boundary to the north. It is possible that anomalies **4004**, **4005** and **4006** once formed a continuous field boundary. To the south of these anomalies is a linear positive anomaly located at **4007** which runs on a similar alignment and has been interpreted as probable archaeology. Two pit-like positive anomalies at **4008** and **4009** have also been interpreted as probable archaeology.
Field C contains a number of spreads of ferrous and increased magnetic response located at

4011, **4013** and **4015**; these are considered to be spreads of magnetic anthropogenic debris. Another spread of ferrous and increased magnetic response located at **4014** is roughly linear shaped extending from the northern to southern limits of the field on a northwest-southeast alignment. This may represent a ploughed-out field boundary or a variation in the underlying geology. **Field D** recorded two modern services **4021** running along the southern and south western extents of the field. This service is a continuation of **4010**, **4017** and **4018** to the west which is a high voltage electric cable. The magnetic strength of this service has greatly masked a lot of the surrounding data, especially towards the southern end of **Field D**. Located at the eastern end of the field was another modern service **4020** aligned northeast-southwest. The majority of the rest of the field was covered by a large area of ferrous and increased magnetic response at **4019**. This area is possibly a spread of magnetic anthropogenic debris or more likely the result of ground disturbance from laying the modern services to the south and west.	
Location of archive/finds: Wessex Archaeology (Rochester)	
Contact at Unit: M. Williams	**Date:** 4-10-13



Survey Extents

Date:	03/10/13	Revision Number:	0
Scale:	1:25 000 & 1:10 000 at A4	Illustrator:	LJC
Path:	R:\PROJECTS\101140 Sellindge\GIS\FigsMXD		

Site location and survey extents

Figure 1

610000

610500

138000

Field A

Field C

Field D

Field B

+3nT

-2nT

0

100

m

Survey Extents

Date:	03/10/13	Revision Number:	0
Scale:	1:2000 at A3	Illustrator:	LJC
Path:	R:\PROJECTS\101140 Sellindge\GIS\FigsMXD		

Greyscale

Figure 2

610000

610500

138000

Field A

Field C

Field D

Field B

+25nT

-25nT

0

100

m

Survey Extents

Date:	03/10/13	Revision Number:	0
Scale:	1:2000 at A3	Illustrator:	LJC
Path:	R:\PROJECTS\101140 Sellindge\GIS\FigsMXD		

XY trace

Figure 3

610000

610500

138000

Field A

Field B

Field C

Field D

4000

4001

4002

4003

4004

4005

4006

4007

4008

4009

4010

4011

4012

4013

4014

4015

4016

4017

4018

4019

4020

4021

Survey Extents

Trend

Probable Archaeology

Possible Archaeology

Ferrous

Modern Service

Increased Magnetic Response

0 100 m

Date:	03/10/13	Revision Number:	0
Scale:	1:2000 at A3	Illustrator:	LJC
Path:	R:\PROJECTS\101140 Sellindge\GIS\FigsMXD		

Interpretation

Figure 4

wessex archaeology

salisbury rochester sheffield edinburgh

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