
AIR PHOTO SERVICES

21 GUNHILD WAY
CAMBRIDGE
CB1 8QZ
PHONE 01223 572063

**LAND AT DUMPLING GREEN,
EAST DEREHAM,
AREA CENTRED TG001116,
NORFOLK:**

AERIAL PHOTOGRAPHIC ASSESSMENT

REPORT No: 2010/2

MAY 2010

Commissioned by:
Archaeological Solutions Ltd
98-100 Fore Street
Hertford
SG14 1AB

**LAND AT DUMPLING GREEN, EAST DEREHAM,
AREA CENTRED TG001116,
NORFOLK:
AERIAL PHOTOGRAPHIC ASSESSMENT**

SUMMARY

This assessment of aerial photographs examined an area of some 56 hectares (centred TG001116) in order to identify and accurately map archaeological, recent and natural features.

No archaeological features were identified within the Study Area or in the area surrounding it.

It was uncertain whether this absence of information was a real absence of archaeological presence or whether it was due to the local soils, unresponsive crops or lack of aerial observation at appropriate times of year.

However, the field drains mapped on the west side of the Development Area were showing as lines of darker crop in 1999 and this suggests that similar cut archaeological features may also affect crop growth.

Land in the Development Area had been cultivated on all dates of photography between 1946 and 1999 but appeared to be set aside in 2006.

Original photo interpretation and mapping was at 1:2500 level.

**LAND AT DUMPLING GREEN, EAST DEREHAM,
AREA CENTRED TG001116,
NORFOLK:
AERIAL PHOTOGRAPHIC ASSESSMENT**

Rog Palmer MA MIFA

INTRODUCTION

This assessment of aerial photographs was commissioned to examine an area of some 56 hectares (centred TG001116) in order to identify and accurately map archaeological, recent and natural features and thus provide a guide for field evaluation. The level of interpretation and mapping was to be at 1:2500.

ARCHAEOLOGICAL AND NATURAL FEATURES FROM AERIAL PHOTOGRAPHS

In suitable cultivated soils, sub-surface features – including archaeological ditches, banks, pits, walls or foundations – may be recorded from the air in different ways in different seasons. In spring and summer these may show through their effect on crops growing above them. Such indications tend to be at their most visible in ripening cereal crops, in June or July in this part of Britain, although their appearance cannot accurately be predicted and their absence cannot be taken to imply evidence of archaeological absence. In winter months, when the soil is bare or crop cover is thin (when viewed from above), features may show by virtue of their different soils. Upstanding remains, which may survive in unploughed grassland, are also best recorded in winter months when vegetation is sparse and the low angle of the sun helps pick out slight differences of height and slope.

Grass sometimes shows sub-surface features through the withering of the plants above them. This may occur towards the end of very dry summers and usually indicates the presence of buried walls or foundations. Such dry summers occurred in Britain in 1949, 1959, 1975, 1976, 1984, 1989 and 1990 (Bewley 1994, 25) and more recently in 1995, 1996 and 2006. This does not imply that every grass field will reveal its buried remains on these dates as local variations in weather and field management will affect parching. However, it does provide a list of years in which photographs taken from, say, mid July to the end of August may prove informative.

Such effects are not confined only to archaeological features as almost any disturbance of soil and bedrock can produce its own range of shadow, crop and soil differences and it is hoped that a photo interpreter, especially one familiar with local soils, is able to distinguish archaeological from other features. There may, however, remain some features of unknown origin that cannot be classified without specialist knowledge or input from field investigation.

PHOTO INTERPRETATION AND MAPPING

Photographs examined

The most immediately informative aerial photographs of archaeological subjects tend to be those resulting from observer-directed flights. This activity is usually undertaken by an experienced archaeological observer who will fly at seasons and times of day when optimum results are expected. Oblique photographs, taken using a hand-held camera, are the usual products of such investigation. Although oblique photographs are able to provide a very detailed view, they are biased in providing a record that is mainly of features noticed by the observer, understood, and thought to be of archaeological relevance. To be able to map accurately from these photographs it is necessary that they have been taken from a sufficient height to include surrounding control information.

Vertical photographs cover the whole of Britain and can provide scenes on a series of dates between (usually) 1946-7 and the present. Many of these vertical surveys were not flown at times of year that are best to record the archaeological features sought for this Assessment and may have been taken at inappropriate dates to record crop and soil responses that may be seen above sub-surface features. Vertical photographs are taken by a camera fixed inside an aircraft and with its exposures timed to take a series of overlapping views that can be examined stereoscopically. They are often of relatively small scale and their interpretation requires higher perceptive powers and a more cautious approach than that necessary for examination of obliques. Use of these small-scale images can also lead to errors of location and size when they are rectified or re-scaled to match a larger map scale.

Cover searches were obtained from the Cambridge University Collection of Aerial Photographs (CUCAP) and the National Monuments Record: Air Photographs (NMRAP), Swindon. Sarah Howard (Norfolk Landscape Archaeology) provided information about the holdings in their HER, all of which were duplicated at NMRAP.

The relevant photographs were all from routine vertical surveys. Images current on Google Earth and Bing at the time of this work (April 2010) were also examined.

Photographs consulted are listed in the Appendix to this report.

Base maps

No useable base maps was provided by the client so a background was constructed by underlying an area cropped from Google Earth and then geolocated using AirPhoto (Scollar and Palmer 2008).

Study Area

Photographs were examined in detail for an area extending one modern field or thereabouts beyond the Assessment Area.

Photo interpretation and mapping

All photographs were examined by eye and under slight (2x) magnification, viewing them as stereoscopic pairs when possible. A digital copy of the most informative photograph was transformed to match the geolocated Google Earth background using the specialist program AirPhoto (Scollar 2002). This was set as a background layer in AutoCAD Map, where features were overdrawn using standard conventions while making reference to the original print. One additional image in Google Earth was selected from within AirPhoto which automatically geo-references saved files (Scollar and Palmer 2008). This was then imported into AutoCAD, interpreted and overdrawn. Layers from this final drawing have been used to prepare the figure in this report and have been supplied to the client in digital form.

Accuracy

The accuracy of the geolocated Google Earth background fixes the greatest accuracy that can be achieved from transforming other photographs on to it. When that facility was being added to AirPhoto and tested, checks were made on a random sample of 12 UK triangulation points and showed most to be positioned within 2.0 metres (Scollar and Palmer 2008, 16).

AirPhoto computes values for mismatches of control points on the photograph and map. In the single transformation prepared for this assessment the mean mismatches were less than $\pm 2.00\text{m}$.

COMMENTARY

Soils

The Soil Survey of England and Wales (SSEW 1983) shows the area to lie on chalky till and glaciofluvial drift (soil association 572n: BURLINGHAM 1). These are described as ‘Deep coarse and fine loamy soils with slowly permeable subsoils and light seasonal waterlogging. Some deep well drained coarse loamy and sandy soils.’

Aerial photographs show that the main use of this land between 1946 and the present has been arable and thus the possibility exists that sub-surface features such as archaeological ditches could affect crop growth and therefore be recorded on aerial photographs if these are taken at appropriate times of the year.

Archaeological features

No archaeological features were identified within the Study Area or in a broader context on the photographs examined.

This absence may be due to a number of factors or may be a real absence of archaeological features. The only known observations of the area by an airborne archaeologist resulted in photographs of the industrial estate west of the Study Area. These flights included one on 22 July 1988 – a date on which crops may be expected to indicate sub-surface features in suitable crops but on which no archaeological features had been observed or recorded within the Study Area.

Vertical photographs included at least two on dates when suitable crops would be expected to respond to sub-surface features (and a further five on which variations in crop growth may be anticipated) but nothing of that kind was identified. In fact crops in and surrounding the Study Area showed very little tonal differences which suggests that perhaps the local soils are unsuitable for encouraging differential growth of crops. The seasonal waterlogging noted by the Soil Survey (above) may act to 'blank out' any crop variations above various depths of any kind although field drains were identified in two different years as marks in the crop. This may suggest that similar cut archaeological features could affect crop growth, or may be because the drains are recent features and the soil remains disturbed above them or is wetter because of the drains themselves.

Non-archaeological features

Field drains were identified in one field on the west side of the Development Area. These looked relatively newly laid in May 1960 but were showing as darker lines in crop in 1999.

Land use

All fields within the Development Area have in cultivated use on all dates of photography between 1946 and 1999. However, it is unclear whether this cultivation was for cereal crops or for grass although it was clear that on a number of dates the fields in the northern part of the Area were grass. Cultivation patterns make it likely that these grass fields were mostly grown to be mown and stored rather than actively grazed. Thus there may be some damage to any archaeological contexts in the Development Area.

Photographs on Google Earth and Bing appear to show the fields as set aside in 2006.

REFERENCES

- Bewley, R. H., 1994. *Prehistoric Settlements*. Batsford/English Heritage, London.
- Scollar, I., 2002. Making things look vertical, in Bewley, R.H. and Rączkowski, W., (ed). *Aerial archaeology: developing future practice*. NATO Science Series, Vol 337, 166-172.
- Scollar, I. and Palmer, R., 2008. Using Google Earth Imagery. *AARGnews* 37, 15-21.
- SSEW, 1983. *Soils of England and Wales: sheet 4: Eastern England (1:250,000)*. Soil Survey of England and Wales, Harpenden.

APPENDIX

Aerial photographs examined

Source: Cambridge University Collection of Aerial Photographs (searched 2 April 2010)

The collection held no oblique or vertical photographs of this area

Source: Internet

Google Earth

Vertical photographs

Undated 1999
11 September 2006
Undated 2006

Microsoft Bing

Vertical photographs

Undated

Source: National Monuments Record: Air Photographs (cover search 49833)

Specialist collection

<i>Photo</i>	<i>Film and frame number</i>	<i>Original number</i>	<i>Date</i>	<i>NGR</i>
TF 9911 / 6	NLA 14060 / 7	AZV	28 APR 1986	TF 998114
TF 9911 / 15	NLA 6167 / 06	DTR	17 AUG 1988	TF 995119
TF 9911 / 16	NLA 6167 / 07	DTR	17 AUG 1988	TF 995119
TF 9911 / 18	NLA 5785 / 10	DEZ	22 SEP 1987	TF 996116
TF 9911 / 19	NLA 5785 / 11	DEZ	22 SEP 1987	TF 995118
TF 9911 / 22	NLA 5785 / 15	DEZ	22 SEP 1987	TF 995118
TF 9912 / 53	NLA 13982 / 01	DGW	13 OCT 1988	TF 997121
TF 9912 / 128	NLA 5766 / 06	DGY	22 JUL 1988	TF 997121
TF 9912 / 129	NLA 5766 / 07	DGY	22 JUL 1988	TF 998121
TF 9912 / 130	NLA 5766 / 08	DGY	22 JUL 1988	TF 998121
TF 9912 / 131	NLA 5766 / 09	DGY	22 JUL 1988	TF 998121
TF 9912 / 152	NLA 5785 / 09	DEZ	22 SEP 1987	TF 996120

Vertical collection

<i>Sortie number</i>	<i>Library number</i>	<i>Camera position</i>	<i>Frame number</i>	<i>Centre point</i>	<i>Date</i>	<i>Scale 1:</i>
RAF/3G/TUD/UK/52	181	V	5064	TG 008 112	31 JAN 1946	10500
RAF/3G/TUD/UK/52	181	V	5065	TG 000 111	31 JAN 1946	10500
RAF/3G/TUD/UK/100	258	V	5431	TF 995 124	30 MAR 1946	10000
RAF/3G/TUD/UK/100	258	V	5432	TG 001 125	30 MAR 1946	10000
RAF/106G/UK/1606	401	FS	2113	TG 003 111	27 JUN 1946	9800
RAF/106G/UK/1606	401	FS	2114	TF 997 110	27 JUN 1946	9800
RAF/106G/UK/1606	401	RP	3267	TG 001 121	27 JUN 1946	9800
RAF/106G/UK/1606	401	RP	3268	TF 996 120	27 JUN 1946	9800
RAF/541/569	1137	RS	4002	TG 005 106	08 JUN 1950	9960
RAF/541/569	1137	RS	4003	TF 999 106	08 JUN 1950	9960
RAF/58/5842	2160	F21	64	TG 004 120	23 JUL 1963	10000
RAF/58/5842	2160	F21	65	TG 003 111	23 JUL 1963	10000
RAF/543/T/899	2660	F21	8	TF 998 120	05 MAY 1960	10002
RAF/543/T/899	2660	F21	9	TF 992 122	05 MAY 1960	10002
MAL/65044	4099	V	4	TF 997 113	12 MAY 1965	2400
MAL/65044	4099	V	5	TF 997 115	12 MAY 1965	2400
MAL/65044	4099	V	6	TF 996 117	12 MAY 1965	2400
MAL/65044	4099	V	7	TF 996 119	12 MAY 1965	2400
MAL/65044	4099	V	190	TF 999 112	12 MAY 1965	2400
MAL/65044	4099	V	191	TF 998 114	12 MAY 1965	2400
MAL/65044	4099	V	192	TF 998 116	12 MAY 1965	2400
MAL/65044	4099	V	193	TF 998 118	12 MAY 1965	2400
MAL/65044	4099	V	194	TF 998 120	12 MAY 1965	2400
US/7PH/GP/LOC276	6918	V	5043	TG 005 134	18 APR 1944	10000
OS/71046	10123	V	222	TF 998 105	11 APR 1971	7000
OS/64197	11732	V	72	TF 993 117	13 SEP 1964	7500
OS/64197	11732	V	73	TF 998 121	13 SEP 1964	7500
OS/64197	11732	V	74	TG 003 124	13 SEP 1964	7500
OS/64197	11732	V	96	TG 010 114	13 SEP 1964	7500
OS/64197	11732	V	97	TG 005 111	13 SEP 1964	7500
OS/64197	11732	V	98	TG 000 107	13 SEP 1964	7500
OS/73238	11965	V	80	TG 001 107	07 JUN 1973	7500
OS/95565	14925	V	3	TF 999 105	19 JUN 1995	8000
OS/95565	14925	V	4	TF 993 105	19 JUN 1995	8000
OS/95565	14925	V	61	TF 999 118	19 JUN 1995	8000
OS/95565	14925	V	62	TF 999 118	19 JUN 1995	8000
RAF/58/T/5378	15391	F21	99	TG 008 116	09 AUG 1962	7500
RAF/58/T/5378	15391	F21	100	TG 000 117	09 AUG 1962	7500
OS/92337	15424	V	80	TF 996 117	11 JUN 1992	7700

Most informative photographs

RAF/543/T899/F21: 8
Google Earth 1999

TERMS AND CONDITIONS

Air Photo Services have produced this assessment for their clients, Archaeological Solutions, subject to the following conditions:

Air Photo Services will be answerable only for those transcriptions, plans, documentary records and written reports that it submits to the clients, and not for the accuracy of any edited or re-drawn versions of that material that may subsequently be produced by the clients or any other of their agents.

That transcriptions, documentation, and textual reports presented within this assessment report shall be explicitly identified as the work of Air Photo Services.

Air Photo Services has consulted only those aerial photographs specified. It cannot guarantee that further aerial photographs of archaeological significance do not exist in collections that were not examined.

Due to the nature of aerial photographic evidence, Air Photo Services cannot guarantee that there may not be further archaeological features found during ground survey which are not visible on aerial photographs or that apparently 'blank' areas will not contain masked archaeological evidence.

We suggest that if a period of 6 months or more elapses between compilation of this report and field evaluation new searches are made in appropriate photo libraries. Examination of any newly acquired photographs is recommended.

That the original working documents (being interpretation overlays, control information, and digital data files) will remain the property of Air Photo Services and be securely retained by it for a period of three years from the completion date of this assessment after which only the digital files may be retained.

It is requested that a copy of this report be lodged with the relevant Sites and Monuments Record within six months of the completion of the archaeological evaluation.

Copyright of this report and the illustrations within and relevant to it is held by Air Photo Services © 2010 who reserve the right to use or publish any material resulting from this assessment.

Land at Dumpling Green, East Dereham, Norfolk:
Features identified on aerial photographs



- Development Area
- - - Study Area
- Field drain

Original photo interpretation and mapping at 1:2500 level
based on aerial photographs at NMRC, Google Earth and Bing.

Air Photo Services Cambridge
May 2010
Drawing: 1002EDereham.dwg