Staffordshire Hoard Research Report 1

Air Photo Mapping and Interpretation for *Contextualising Metal-Detected Discoveries: Staffordshire Anglo-Saxon Hoard*

Alison Deegan

2013

This report forms part of
The Staffordshire Hoard: an Anglo-Saxon Treasure
edited by C. Fern, T. Dickinson and L. Webster
and published by the Society of Antiquaries of London

Information about this report

This report was initially commissioned during the Assessment Stage of the project and formed Appendix 3 the Assessment and Project Design (Cool 2011). In 2011 the Cambridge University Collection of Aerial Photography was not available for consultation.

During Stage 1 of the Analysis project, further work was commissioned and the original report was updated following consultation of the Cambridge resources. It is this revised version which forms this document.

Alison Deegan

AIR PHOTO MAPPING,
INTERPRETATION AND
ANALYSIS FOR ALL
ARCHAEOLOGICAL APPLICATIONS
www.alisondeegan.co.uk

Air photo mapping and interpretation for *Contextualising Metal-Detected Discoveries: Staffordshire Anglo-Saxon Hoard*

Original version 1.1 May 2011
Updated version 1.2 Aug 2013
Project number 1112001
Undertaken by Alison Deegan BSc MIFA

Commissioned by
Barbican Research Associates Limited
16 Lady Bay Rd
West Bridgford
Nottingham
NG2 5BJ

6 WAIN CLOSE, SOUTH MILFORD, LEEDS LS25 5AH. Tel. 01977 684622, Mobile 07941 254850 alison.deegan@virgin.net

Summary

This report concerns the results of interpretation and mapping of archaeological features from existing air photographs around the site of recovery of the Staffordshire Anglo-Saxon Hoard, Hammerwich, Staffordshire. This version contains additional information pertaining to the air photographs held in the Cambridge University Collection of Aerial Photography, which were not available at the time of the original report in May 2011.

This survey has identified fragments of medieval and/or post medieval agricultural landscapes, a section of a post medieval canal system and the remains of post medieval and 20th century extraction pits. In addition features of natural cause and several features of uncertain origin have been observed and recorded.

This work was commissioned from Alison Deegan, 6 Wain Close, South Milford, Leeds LS25 5AH for the *Contextualising Metal-Detected Discoveries: Staffordshire Anglo-Saxon Hoard* project. This project is funded by English Heritage and operated by Barbican Research Associates Limited, 16 Lady Bay Rd, West Bridgford, Nottingham NG2 5BJ.

Contents

1 Introduction

1.1 Client details

1.1.1 This air photo survey was commissioned for the *Contextualising Metal-Detected Discoveries: Staffordshire Anglo-Saxon Hoard* project. This project is funded by English Heritage and operated by Barbican Research Associates Limited.

1.2 Specification

1.2.1 Mapping of levelled and upstanding archaeological features that are visible on the available air photographs, at a nominal scale of 1:2500 was required.

1.3 The Survey Area (see Figure 1)

1.3.1 The air photo survey area (hereon the Survey Area) consists of approximately 135 hectares of land centred at SK0637 0641 (406370, 306410).

1.3.2 The Survey Area is centred on the field from which a substantial hoard of Anglo Saxon metal work was recovered by metal detectorists and archaeologists in 2009. The Survey Area covers the field and the surrounding 500m of land.

1.3.3 The field in which the hoard was found is bounded by the A5 to the north, Hanney Hay Road to the west, Lichfield Road to the south and the M6 Toll Road to the east. It lies approximately 1.5km to the south-west of the village of Hammerwich.

1.3.4 The A5 follows the course of Watling Street Roman road and Roman Letocetum (Wall) is situated on the road, approximately 3.6km to the east of the field.

1.3.5 The field and most of the Survey Area lie within the modern parish of Hammerwich, but the historic township of Hammerwich lay to the north of the A5 Watling Street, land to the south being part of Ogley Hay until 1834.

1.3.6 Crane Brook runs in a small valley north-west to south-east across the Survey Area. The land to the north-east of the brook rises gently towards Hammerwich. To the south-west there are discrete high points or ridges. One such ridge runs north-west to south-east across the field where the hoard was recovered.

1.3.7 The Survey Area lies mostly on Wildmoor Sandstone Formation; some of those higher points are capped with Devensian till (Geology of Britain viewer). The overlying soils are slightly acidic and vary between slow to drain loamy/clayey, and more freely draining sandy textures (Soilscapes viewer).

1.3.8 As well as the communications routes mentioned above the Survey Area is traversed by a section of the South Staffordshire Railway line (disused) and part of the Wyrley & Essington Canal (disused). Much of the remainder of the Survey Area is under pasture or arable cultivation, with the exception of a small housing development to the west.

1.3.9 Appendix 1 provides a brief overview of the uses of air photographs for archaeological remote sensing.

2 Methodology

2.1 Data sources

2.1.1 The air photograph collections of English Heritage's (EH) National Monuments Record (NMR), CUCAP (Cambridge University Collection of Aerial Photography), Staffordshire Historic Environment Record (SHER) and the Staffordshire Record Office (SRO) were consulted for this survey.

2.1.2 The digital photographic images delivered freely online by the Google Earth website were examined on screen.

2.1.3 Lists of the individual air photographs and image datasets consulted are provided in Appendix 2.

2.2 Image capture, rectification and mapping

2.2.1 All of the available air photographic prints were systematically examined at the NMR, CUCAP, SHER and SRO, using x2 magnification where necessary and stereoscopically where possible. At the NMR selected prints were photographed with a hand-held digital camera. The CUCAP, SHER and SRO kindly provided scans of selected air photographs.

2.2.2 Current and historic Google Earth imagery was captured and georectified using Airphoto 3.44.

2.2.3 The copies of photographs were rectified to ground control points derived from the Ordnance Survey 1:2500 scale map obtained for the purposed of this project.

2.2.4 Image transformation was undertaken using the Bradford Aerial Photographic Rectification Programme, AERIAL5.14. Archaeological features were mapped to a scale of 1:2500 in accuracy and detail. The accuracy tolerance indicated in the Ordnance Survey map data is ±1-2.5m. AERIAL5.14 gives error readings for each control point, where 5 or more control points are used. In all cases errors of within ±3m were achieved for the control points. However this may not reflect the on-the-ground positional accuracy of the features mapped since these tend to be between rather than at the control points.

2.2.5 All of the georeferenced photographs were then collated in MAPINFO Professional 10.5 where the archaeological features were digitised, with reference back to the source photographs where possible. Features that are depicted on the Ordnance Survey base map were generally not duplicated. Data pertaining to each feature was recorded in the MapInfo table. The vector plots were then exported to Autodesk MAP 2004.

3 Results

3.1 The air photographs

3.1.1 For this Survey Area the NMR holds 43 black and white vertical air photographs from 10 different sorties flown between 1948 and 1993. Together these cover the whole Survey Area and provide good coverage for most decades. These vertical photographs were taken by the Royal Air Force, Meridian Airmaps Ltd and the Ordnance Survey for military, civil engineering and cartographic purposes rather than to record archaeological sites, however these photographs often incidentally record earthwork, soilmark and crop-marked archaeological features.

3.1.2 The NMR does not hold any specialist oblique or military oblique air photographs of the Survey Area.

3.1.3 The SHER holds just one set of vertical air photographs covering the Survey Area, these were taken in 1963. Although the SHER does also hold a collection of oblique air photographs taken for archaeological purposes, it does not contain any coverage of the Survey Area.

3.1.4 The SRO holds 10 vertical air photographs covering the Survey Area, from four different sorties. Although several of these sorties are duplicated in the NMR, in some instances the NMR only holds every other print in a sequence so this collection provided an opportunity to re-examine these with the advantage of stereo-overlapping pairs.

3.1.5 CUCAP holds 4 vertical and 5 oblique air photographs that cover all or part of the Survey Area. However only one of these photographs covers the area from which the hoard was recovered.

3.1.6 The Google Earth website displays imagery from 2003 and 2007, which provides a valuable snapshot of recent land use and monument condition.

3.2 Land use on the site of recovery during the period of air photography

3.2.1 At the beginning of the period of photography the field from which the hoard was recovered was two fields divided by a near north-west to south-east hedgerow. The table below summarises the landuse on those two fields and subsequently the single large field, in so far as it is possible to deduce this from the available air photographs.

YEAR (SOURCE)	Landuse		Direction of sowing/ploughing (where applicable)	
	west field (including hoard findspot)	east field	west field (including hoard findspot)	east field
1948 (CPE/UK/2555 4099)	?GRASS	?GRASS	NE-SW	NE-SW
1952 (RAF/540/813 5056)	ROOT OR LEAF CROP	GRASS OR CEREAL	NE-SW	NE-SW
1959 (RAF/58/2695 F21 76)	?GRASS	?CEREAL	NE-SW	NE-SW
1963 (HSL UK 6362 5992)	?GRASS	BARE SOIL	NNW-SSE	NE-SW
1968 (MAL/68075 012)	ROOT OR LEAF CROP	BARE SOIL	Mostly NNW-SSE	NE-SW
1971 (MAL/71013 96)	BARE SOIL		NE-SW across both fields	
1981 (MAL/81032 188)	ROOT OR LEAF CROP & BARE SOIL		crop planted in NNW to SSE rows but northern half ploughed in NE-SW	
1984 (RC8 FZ122)	GRASS, thin in parts showing BARE SOIL		NE-SW	
1989 (OS/89342 027)	mainly GRASS but also some ROOT OR LEAF CROP		MIXED N-S AND E-W	
1992 (GEONEX 92121 48)	west & north-east GRASS, south-east ROOT OR LEAF CROP		west NNW-SSE, north-east E-W & south-east NE-SW	
1993 (OS/93284 40)	BARE SOIL		NE-SW	
2003 Google Earth (OCT)	GRASS		NE-SW	
2005 Google Earth	GRASS		NE-SW	
2006 Google Earth	North half GRASS, southern half BARE SOIL		NE-SW	
2007 Google Earth	CEREAL		NE-SW	

3.2.2 The available air photographs only show a snap shot of the land use on the field for 15 of the 61 years up to the time of the hoard's discovery. This small sample suggests that the cultivation of an arable crop in 2007 followed several decades of grass and a root or leaf crop on the field.

3.3 Archaeological and other features (Figure 2)

3.3.1 The results of this survey are catalogued in Appendix 3 by archaeological feature or groups of archaeological features. The mapping is reproduced in Figure 2 within this report at an approximate scale of 1:4444. This report is supplied in conjunction with a digital version of the air photo mapping data which can be viewed and interrogated at up to 1:2500 scale.

3.3.2 Details, including the type, period and sources for individual archaeological features, can be accessed in the digital version of the mapping (see Appendix 4).

3.3.3 In the absence of direct archaeological evidence all attributions of date and type are open to re-interpretation. The following is a brief discussion of the results.

3.3.4 The following observations from the air photographs concern the field in which the hoard.

3.3.5 A low natural ridge runs north-west to south-east across the field; this feature is not recorded in the catalogue. A small area of Devenian till caps the southern part of this ridge (Geology of Britain viewer). The hoard was recovered near the north-west facing shoulder of the ridge. The northern end of the ridge was truncated when the A5 was widened at some time between 1959 and 1968 and by further road alterations at some time between 1993 and 2003.

3.3.6 The field was divided by a near north-west to south-east aligned boundary from at least 1884 (the date of the earliest large scale map consulted). This field boundary (**AP O**) survived as a hedgerow on post war air photographs but it was removed by 1971. Thereafter it appeared as a diffuse cropmark and soilmark. This field boundary ran along the upper eastern flank of the ridge. On the 1968 air photographs there is a perceptible difference in the ground level between the west and east side of the field boundary (with the former higher than the latter) but this appears to have been reduced by ploughing once the field boundary was removed. This feature corresponds with the field boundary (4404/4403) identified in Trench 5 during the 2010 excavations (Jones and Burrows 2010. para 6.6.4-6.6.5).

3.3.7 The 1952 air photographs show a line of parched crop running along the northern edge of the field (**AP P**). It is off-set by approximately 27m south of the centre line of the A5 Watling Street (as it was at that time, before subsequent alterations). This feature did not show on any other photographs and it is unlikely to have been of archaeological origin. The area of this feature was significantly truncated when the A5 was widened, sometime between 1993 and 2003.

3.3.8 The 1971 air photographs show a small bright mark in the soil to the immediate west of the hoard findspot (**AP M**). It is not visible on any other photographs and so it is unlikely that this mark was of archaeological origin and it may instead have been of superficial

cause. The area of this mark was truncated when the cutting for Hanney Hay Road was widened, sometime between 1993 and 2003.

3.3.9 Several air photographs show a curvilinear cropmark close to the hoard findspot (**AP N**) (see Fig. 3). This feature lies on one of the highest points of the natural ridge and just 50m to the south of the course of the Roman road. The appearance of the cropmarks varies between the air photographs but the consistency of their position indicates that they are caused by the same underlying feature. Taken together these cropmarks suggest an oval feature measuring approximately 50x40m.

3.3.10 The 2010 geophysical survey identified an anomaly which appears to correspond with the western side of the curvilinear feature **AP N** (Jones & Burrows, fig. 5). The anomaly was targeted by trial trenching and concluded to be the remains of an ice-wedge (Jones & Burrows 2010 para. 6.3.2).

3.3.11 There are some parallels between this curvilinear feature and the site known as Knave's Castle, which lies approximately 1.3km to the west, again to the immediate south of the course of the Roman road. Knave's Castle was depicted on Yate's map of 1775. This cartographic source indicates Knave's Castle and the hoard findspot were both located on and surrounded by extensive waste (part of Cannock Chase) at that time. Knave's Castle has been suggested to be a Roman barrow, a Roman signal station or a medieval castle mound. However, it is also reported that when the area was impacted by the A5 widening this site was deduced to be a natural hillock (information from NMR 304465).

3.3.12 Most of the features in the wider Survey Area probably date from the medieval and subsequent periods. There are some features for which no date is suggested because of lack of evidence.

3.3.13 The two sections of possible plough headlands (**AP E** & **G**) running near parallel to the north side of Crane's Brook may have their origins in the medieval period. Yate's map of 1775 suggests that in this area Crane Brook marked the divide between the cultivated ground around Hammerwich and the waste to the south-west (but see para. 3.3.15 below). These headlands may be the remains of an open field landscape associated with medieval *Humerwich* (Hammerwich).

3.3.14 The banks and ditches running perpendicular between the brook and the putative headland (**AP D** & **G**) are more likely to relate to post medieval enclosure than the medieval landscape. At least one of these boundaries was still in use on the Ordnance Survey map of 1884.

3.3.15 Land to the north of the A5 Watling Street, between Hanney Hay Road and Crane Beck survived as rough pasture until at least 1952. A field boundary ditch, water channel and a palaeochannel were visible as earthworks on some of the earliest air photographs

(**AP F**). The field boundary and water channel appear to coincide with features depicted on the 1834 Ordnance Survey map (see Fig. 5). This map also shows a possible building on the northern side of the water channel. Yates map of 1775 also indicates that this small area on the south side of Crane Brook was enclosed when much of the surroundings were still waste.

3.3.16 A section of the Wyrely and Essington Canal (**AP K**) crosses the Survey Area through a series of locks and basins. Construction of this feature, which linked the Birmingham Canal with the Birmingham and Fazeley Canal, began in the late 18th century (information from NMR 1340363). The canal was extant in 1948 but the air photographs show a gradual process of infilling and re-landscaping over the following decades.

3.3.17 There are several areas of extraction within the Survey Area. **AP I** is a sand pit dating from at least 1884. In the mid-twentieth century it was re-landscaped and now contains a small housing estate. **AP L** and **R** appears to have been started later, the latter was still active in 2007.

3.3.18 In addition there are several undated cropmarks, including **AP A, H, J** and **Q**.

3.3.19 The cropmarks in **AP Q** suggest a pair of conjoined rectilinear enclosures, but it is not certain that the marks are of archaeological origin. However it should be noted that that they lie close to Site 34, West of Crane Brook Cottage, where a Romano-British aisled building was excavated (Jones and Burrows 2010. para 3.3).

4 Concluding remarks

4.1.1 The table below summarises the key events associated with the hoard and the area from which it was recovered.

Date/Period	Event description
Roman	Construction of road (Watling Street). Military and subsequently civilian occupation at Letocetum (Wall)
Anglo – Saxon (7th century or later)	Deposition of the hoard within 60m of Roman road (Watling Street)
Medieval	Land to the north of Crane Brook towards the settlement of *Humerwich* (Hammerwich) probably cultivated, the hoard findspot was possibly not cultivated at that time
Post medieval	Gradual enclosure of waste land and open fields (Welch nd)
1775	The hoard findspot and its environs are demarcated as waste rather than productive land. (Yates 1775)
Late 18th century	Construction of the Wyrely & Essington Canal, passing 300m to the south of the hoard findspot
1846-49	Construction of the South Staffordshire railway line passing 300m to the north of the hoard findspot
Prior to 1884	Extraction from sand pit approximately 450m to the west of the hoard findspot
1948	Date of earliest air photograph available to this project
Between 1959 and 1968	A5 Watling Street (Roman road) widened, bring the road

Date/Period	Event description
	cutting closer to the find spot
By 1971	Field boundary (**AP O**) that had divided the two fields was removed
Between 1993 and 2003	A5 Watling Street (Roman road) further widened, Hanney Hay Road widened and roundabout between the two constructed. Bringing both routes closer to the hoard findspot
Up to Dec 2003	M6 Toll Road constructed taking a path to within 385m east of the findspot
Aug 2007	Latest available air photographs of the Survey Area were taken
July 2009	Hoard discovered by metal detectorist
July to Aug 2009	Geophysical survey and archaeological excavation around hoard findspot
March 2010	Resistivity survey and archaeological excavations

4.1.2 In the absence of other evidence the main feature of interest arising from this air photo investigation would be the curvilinear cropmarks described in **AP N**. However the results of geophysical survey and excavation strongly suggest that whilst these marks do indicate a sub-surface feature, this feature is of likely geological origin.

4.1.3 The absence of cropmark, soilmark or earthwork evidence in any part of the Survey Area should not be interpreted as the absence of archaeological features.

Appendix 1 Archaeology from black and white and colour air photographs

Air photographs taken in appropriate conditions can record crop marks, soilmarks and earthworks of archaeological origin.

Crop marks result from variations in leaf and stalk colour and plant height and vigour. Crop marks occur where there are anomalies below the ground: in-filled hollows, palaeochannels, frost cracks, archaeological pits, ditches, surfaces and banks or modern disturbances such as land drains. Crop marks can also be created by variations in the treatment of the topsoil and ground cover, for example the uneven application of fertilizers, pesticides and herbicides or damage.

Crop marks that delineate buried and levelled archaeological features are the effect of differential growth and ripening between the vegetation on the archaeological deposits and that on surrounding undisturbed ground. Variations in growth and ripening are most visible when there is a significant difference in the water and nutrient availability between the archaeological and natural deposits. Crop marks can form at any stage from germination to ripening but the optimal conditions are during periods when precipitation is exceeded by transpiration. This results in potential soil moisture deficit (SMD) and water-stressed plants (Jones and Evans 1975). Prolonged periods of SMD halt plant growth and then cause wilting of the plant leaves, stem and finally root. Water-stress is exacerbated by free-draining sub-surface deposits such as archaeological walls or road surfaces but mitigated by rich and humic ditch and pit deposits. Even after ripening, differences in crop height and bulk can indicate the presence of buried features where there are no tonal differences. Crop marks can be seen most clearly in large areas of homogenous, fast-growing plants such as cereal crops and, less frequently, in root crops and grass. Crop marks produced in arable and grass at times of significant moisture stress, usually over buried structures or other highly permeable archaeological deposits, are often referred to as parchmarks.

Soilmarks are the colour and tonal differences between archaeological deposits and the plough or subsoil. The action of ploughing, which can penetrate the ground to a depth of 45cm, brings to the surface previously buried material. The rotation of the plough exposes the cut surface uppermost. Where the plough cuts buried and infilled archaeological features such as banks and ditches it brings to the surface slices of these deposits. If these slices are sufficiently differentiated from the natural plough or subsoil they can be visible from the air.

Archaeological earthworks that are visible on the ground can also be seen from the air. Detection and recording of earthworks from the air is determined by their survival and visibility. The survival of earthworks depends on past and present land use; natural erosion processes, deliberate destruction and ploughing can all reduce upstanding features to ground level. Earthworks can be revealed by the pattern of sunlight and shadow, differential frost or snow cover or the distribution of standing and flood water. Large and subtle variations in ground relief are further accentuated when viewed stereoscopically. Most stereo images are vertical photographs taken in long, regular sorties but stereo-overlapping can also be achieved from correctly set-up oblique views.

Appendix 2 Sources consulted

National Monuments Record

English Heritage, National Monuments Record Centre (NMRC), The Engine House, Fire Fly Avenue, Swindon, SN2 2EH. Enquiry reference no. AP 60505. The vertical air photographs listed below were consulted at the NMRC on the 3rd May 2011. This collection does not hold any specialist (oblique) or military oblique air photographs of the Survey Area.

Vertical air photographs

Sortie number	Frame number	Date	Scale 1:
RAF/CPE/UK/2555	4099	27-MAR-1948	10000
RAF/CPE/UK/2555	4100	27-MAR-1948	10000
RAF/540/813	5464	16-JUL-1952	5300
RAF/540/813	5465	16-JUL-1952	5300
RAF/540/813	5466	16-JUL-1952	5300
RAF/540/813	5055	16-JUL-1952	5000
RAF/540/813	5056	16-JUL-1952	5000
RAF/540/813	5057	16-JUL-1952	5000
RAF/540/813	5058	16-JUL-1952	5000
RAF/58/2695 F21	75	28-JAN-1959	18000
RAF/58/2695 F21	76	28-JAN-1959	18000
MAL/68075	12	24-NOV-1968	3000
MAL/68075	13	24-NOV-1968	3000
MAL/68075	18	24-NOV-1968	3000
MAL/68075	19	24-NOV-1968	3000
MAL/68075	20	24-NOV-1968	3000
MAL/71013	85	09-MAR-1971	3000
MAL/71013	86	09-MAR-1971	3000
MAL/71013	87	09-MAR-1971	3000
MAL/71013	95	09-MAR-1971	3000
MAL/71013	96	09-MAR-1971	3000
MAL/71013	97	09-MAR-1971	3000
MAL/71013	124	09-MAR-1971	3000
MAL/71013	125	09-MAR-1971	3000
MAL/71013	126	09-MAR-1971	3000
MAL/71013	127	09-MAR-1971	3000
MAL/71013	153	09-MAR-1971	3000
MAL/71014	90	09-MAR-1971	3000
MAL/71014	91	09-MAR-1971	3000
MAL/71014	93	09-MAR-1971	3000
MAL/71014	94	09-MAR-1971	3000
MAL/71014	95	09-MAR-1971	3000
MAL/71014	115	09-MAR-1971	3000
MAL/71014	116	09-MAR-1971	3000
MAL/71014	117	09-MAR-1971	3000
MAL/71014	118	09-MAR-1971	3000
MAL/71134	25	08-SEP-1971	12000

Sortie number	Frame number	Date	Scale 1:
MAL/81032	188	02-AUG-1981	10000
OS/68277	23	12-AUG-1968	7000
OS/68277	24	12-AUG-1968	7000
OS/89342	27	04-JUL-1989	8400
OS/93284	40	01-AUG-1993	8000
OS/93284	41	01-AUG-1993	8000

Staffordshire Historic Environment Record (SHER)

Development Services Directorate, Riverway, Stafford, ST16 3TJ. The following vertical air photographs of the Survey Area were consulted on the 10th May 2011.

Vertical air photographs

Reference nos.	Date	Scale 1:
Hunting Surveys Ltd UK 6362 5991	09-JUN-1963	c. 10000
Hunting Surveys Ltd UK 6362 5992	09-JUN-1963	c. 10000

Staffordshire Record Office (SRO)

Eastgate Street, Stafford. ST16 2LZ. The following vertical air photographs of the Survey Area were consulted on the 10th May 2011.

Vertical air photographs (* - duplicate air photographs consulted at NMR)

Reference nos.	Date	Scale 1:
RAF/CPE/UK2555 4099*	27-MAR-1948	10000
RAF/CPE/UK2555 4100*	27-MAR-1948	10000
RAF/CPE/UK2555 4101	27-MAR-1948	10000
MAL/71134 25*	08-SEP-1971	12000
MAL/71134 26	08-SEP-1971	12000
MAL/71134 27	08-SEP-1971	12000
MAL/81032 187	02-AUG-1981	10000
MAL/81032 188*	02-AUG-1981	10000
GEONEX/92121 (RUN 38) 47	20-JUL-1992	10000
GEONEX/92121 (RUN 38) 48	20-JUL-1992	10000

Other imagery consulted

The following resource was consulted between 19th April 2011 and 23rd May 2011.

Resource	Link/Source	Date(s)
Google Earth	http://earth.google.com/	26 OCT 2003 31 DEC 2003 12 SEP 2005 02 NOV 2006 10 AUG 2007

Cambridge University Collection of Aerial Photography (CUCAP)

Department of Geography, University of Cambridge, Downing Place, Cambridge, CB2 3EN. The following air photographs were examined at the library on 29th July 2013.

Reference	Type	Date
AAY33	Oblique	14-JUN-1960
AGT73	Oblique	12-JUN-1963
AOG91	Oblique	03-JUN-1966
AOG92	Oblique	03-JUN-1966
BFP45	Oblique	28-JUN-1971
RC8FZ101	Vertical	03-APR-1984
RC8FZ121	Vertical	03-APR-1984
RC8FZ122	Vertical	03-APR-1984
RC8FZ123	Vertical	03-APR-1984

Appendix 3 Catalogue of features (see Figs 2-4)

Ref.	Central NGR	Types	Periods	Description of features
AP A	SK0597 0662	DITCH	UNCERTAIN	A ditch of uncertain date is visible as a soilmark and cropmark on air photographs. It is aligned south-west to north-east between the A5 Watling Street and the railway line. It appears to underlie the extant field boundaries, which are probably of post medieval date. (1-2) 1 SHER HSL UK 6362 5992 09-JUN-1963 2 NMR RAF/CPE/UK2555 4099 27-MAR-1948
AP B	SK0602 0662	UNCERTAIN	POST MEDIEVAL	A disturbance of unknown cause but probable post medieval date is visible as cropmarks and earthworks on historic air photographs. It was located in the corner of a post medieval field unit, adjacent to Hanney Hay Road and covered approximately 0.16 hectares. (1-2) There are no visible surface indications of this disturbance on more recent air photographs. (3) 1 RAF/540/813 5056 2 NMR RAF/CPE/UK2555 4099 27-MAR-1948 3 Google Earth 10-AUG-2007
AP C	SK0622 0658	FIELD BOUNDARY	POST MEDIEVAL	A Y-shaped arrangement of post medieval field boundaries is visible on historic and recent air photographs. The field boundaries survived as hedgerows until 1959 but had been levelled their remains were producing cropmarks by 1963. (1-2) 1 NMR RAF/CPE/UK2555 4099 27-MAR-1948 2 SHER HSL UK 6362 5992 09-JUN-1963
AP D	SK0632 0670	FIELD BOUNDARY	POST MEDIEVAL	Two parallel field boundaries of probable post medieval date are visible on air photographs. The eastern boundary was still extant in 1948. Both were visible as soilmarks on 1971 air photographs. The northern extent of these boundaries was probably truncated by the railway line. (1-2) 1 NMR RAF/CPE/UK2555 4099 27-MAR-1948 2 NMR MAL/71014 117 09-MAR-1971

Ref.	Central NGR	Types	Periods	Description of features
AP E	SK0653 0675	PLOUGH HEADLAND FIELD BOUNDARY	MEDIEVAL/POST MEDIEVAL	A possible levelled plough headland or field boundary of possible medieval or post medieval date is visible as a broad, pale toned soilmark on air photographs. (1) This feature may be a continuation of a similar linear recorded in **AP G**. 1 NMR RAF/CPE/UK2555 4099 27-MAR-1948
AP F	SK0636 0655	WATER CHANNEL FIELD BOUNDARY PALAEOCHANNEL	POST MEDIEVAL UNCERTAIN	A water channel and field boundary of probable post medieval date together with sections of sinuous palaeochannel are visible as earthworks on historic air photographs. The field boundary appears to have defined a parcel of land on the south-west side of Crane Brook. The water channel appears to intercut the palaeochannel and it may have been intended to straighten the course of the brook at this point. (1) These features appear to have been levelled on more recent air photographs. (2) The field boundary and water channel are depicted on the Ordnance Survey map of 1834. This map also indicates that a building stood on the north-east bank of the water channel and that the brook was split with a northern diversion cutting across the meandering water channel.(3) The 1884 Ordnance Survey map does not depict the field boundary, water channel or the building and at that time the brook ran in a single channel following the northern diversion. (4) Yate's map of 1775 appears to show the small field on the south-east side of the brook, other land this side of the brook is depicted as waste.(5) 1 NMR RAF/540/813 5056 16-JUL-1952 2 Google Earth 10-AUG-2007 3 1834 Ordnance Survey map 4 1884 Ordnance Survey map 5 Yate's map of 1775
AP G	SK0698 0671	PLOUGH HEADLAND FIELD BOUNDARY	MEDIEVAL/POST MEDIEVAL	A possible levelled plough headland or field boundary and a ditched field boundary are visible as soilmarks on historic air photographs. The putative plough headland may be a continuation of features recorded in **AP E**. (1) 1 NMR MAL/71013 124 09-MAR-1971

Ref.	Central NGR	Types	Periods	Description of features
AP H	SK0694 0660	DITCH	UNCERTAIN	A ditch of uncertain date is visible as a cropmark on historic air photographs. It appears to be slightly irregular and curving in form. (1) 1 NMR RAF/540/813 5058 16-JUL-1952
AP I	SK0568 0623	SAND PIT	POST MEDIEVAL	The remains of a post medieval sand pit are visible on historic air photographs (1). This extraction pit, which covered approximately 2.5 hectares, dates back to at least 1884. (2). The pit was relandscaped in the mid-20th century and now contains housing. (3) 1 NMR RAF/CPE/UK2555 4099 27-MAR-1948 2 1884 Ordnance Survey map 3 SHER HSL UK 6362 5992 09-JUN-1963
AP J	SK9308 3867	BANK	UNCERTAIN	Pale toned soilmarks are visible on historic air photographs. These tentative features are aligned near east to west and may be levelled banks. (1) 1 NMR MAL/71013 097 09-MAR-1971
AP K	SK0626 0612	CANAL, LOCK, CANAL BASIN CANAL POUND,	POST MEDIEVAL	A section of the Wyrley and Essington canal system is visible on air photographs. Construction of this canal began in late 18th century. The canal, locks, basin and pounds were still extant in 1948 but were gradually infilled and relandscaped on later air photographs. (1-2) 1 NMR RAF/CPE/UK2555 4099 27-MAR-1948 2 NMR MAL/71134 25 08-SEP-1971
AP L	SK0615 0591	QUARRY	20TH CENTURY	A long narrow quarry of likely 20th century date is visible on historic air photographs. The quarry activity appears to have been active in 1948 but is now overgrown. It covers approximately 0.3 hectares. (1) 1 NMR RAF/CPE/UK2555 4099 27-MAR-1948
AP M	SK0619 0644	UNCERTAIN	UNCERTAIN	A small bright mark is visible on 1971 air photographs. It contrasts distinctly with the surrounding soil but it is not certain that this mark was of archaeological origin and it may have been of superficial cause. It appears that the site of this soilmark was truncated by a cutting for Hanney Hay Road when it was widened between 1993 and 2003. (1) 1 NMR MAL/71013 096 09-MAR-1971

Ref.	Central NGR	Types	Periods	Description of features
AP N	SK0623 0645	curvilinear cropmark (non-NMR Thesaurus term)	UNCERTAIN	Several different air photographs show curvilinear cropmarks at this location, which is immediately north-east of the area the hoard was recovered from. Although the form of these marks vary: a broad amorphous halo of faster ripening crop (see 1 and Fig. 3), a narrow ring of darker crop (see 2), or two partial circuits of lighter-toned crop (see 3-4 and Fig. 4), the consistency of their position suggests they are caused by the same underlying feature(s). Geophysical survey identified an anomaly that corresponds with the western side of the cropmarks (5). The geophysical anomaly was targeted by trial trenching and concluded to be an infilled ice-wedge (6). 1 NMR MAL/71013 96 09-MAR-1971 2 SHER HSL UK 6362 5992 09-JUN-1963 3 SRO Geonex/92121 (RUN 38) 48 20-JUL-1992 4 CUCAP RC8 FZ 122 03-APR-1984 5 Burrows and Jones 2010. figs. 5 & 6 6 Burrows and Jones 2010. para 6.3.2
AP O	SK0631 0641	FIELD BOUNDARY	POST MEDIEVAL	A post medieval field boundary is visible on air photographs. The field boundary was extant on historic air photographs but had been removed by 1971, after which time it appeared as a soilmark or cropmark. (1-2) 1 NMR RAF/540/813 5056 16-JUL-1952 2 NMR MAL/71013 97 09-MAR-1971
AP P	SK0643 0648	BANK	UNCERTAIN	A narrow line of parched crop is visible on a single set of air photographs. This feature ran parallel to and just to the south of the course of the Roman road. It is unlikely to be of archaeological origin and could have been caused by some superficial influence on the crop. The area of this feature was significantly truncated when the A5 was widened (sometime between 1971 and 1981). (1) 1 NMR RAF/540/813 5056 16-JUL-1952

Ref.	Central NGR	Types	Periods	Description of features
AP Q	SK0654 0648	UNCERTAIN	UNCERTAIN	Cropmarks resembling a pair of rectilinear enclosures are visible on a single set of air photographs. It is unlikely that these features are of archaeological origin. (1) 1 NMR OS/68277 24 12-AUG-1968
AP R	SK0704 0643	SAND PIT	20TH CENTURY	A sand pit is visible on air photographs. This extraction pit appears to be active in 1952. It was still active in 2007 and at that time covered approximately 2 hectares. (1-2) 1 NMR RAF/540/813 5058 16-JUL-1952 2 Google Earth 10-AUG-2007

Appendix 4 Structure and content of digital map dataset

The digital map data generated by this survey is arranged in a series of layers as follows

Layer name	Description
APBANK*	Archaeological bank outline
APBANKFILL	Archaeological bank hatch
APDITCH*	Archaeological ditch outline
APDITCHFILL	Archaeological ditch hatch
APEXTENT OF FEATURE*	Extent of vague or diffuse archaeological features
APNATURAL	Natural feature
APNATURALFILL	Natural feature hatch
APREF	Catalogue reference id.

Features in the layers marked with an asterix (*) above are also tagged with the following information

CATREF	Catalogue reference letter
TYPE	NMR Monument Type Thesaurus term
PERIOD	Period
LAYER	See above
APSOURCE1	NMR/SRO/SHER reference number of the source air photograph
APEVIDENCE1	Evidence (earthwork, soilmark, parchmark, cropmark) for feature on APSOURCE1
APSOURCE2	NMR/SRO/SHER reference number of the source air photograph
APEVIDENCE2	Evidence (earthwork, soilmark, parchmark, cropmark) for feature on APSOURCE2

This information can be accessed in AUTODESK products via the Property Pane.

References and resources cited

Jones, A and Burrows, B. 2010. *The Staffordshire Hoard. Archaeological Evaluation 2010.* Birmingham Archaeology Unpublished Report PN1971.

Jones, R J A and Evans, R 1975. 'Soil and crop marks in the recognition of archaeological site by air photography' in Wilson, D (ed) *Aerial Reconnaissance for Archaeology*. CBA Research Report 12. 1-11

Christopher M. Welch, C M (ND). Early Post-medieval Staffordshire West Midlands Regional Research Framework for Archaeology, Seminar 6 via *www.iaa.bham.ac.uk/research/projects/wmrrfa/seminar6/Chris_Welch.doc*

Digital resources

British History Online for

'Townships: Hammerwich', *A History of the County of Stafford: Volume 14: Lichfield* (1990), pp. 258-273. URL: http://www.british-history.ac.uk/report.aspx?compid=42362&strquery=ogley hay Date accessed: 23 May 2011.

'Ogbourn - Oldham', *A Topographical Dictionary of England* (1848), pp. 472-476. URL: http://www.british-history.ac.uk/report.aspx?compid=51192&strquery=ogley hay Date accessed: 23 May 2011.

Geology of Britain viewer (URL http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html) for geological information. Accessed 23/05/2011

Old-Maps (URL http://www.old-maps.co.uk) for the Ordnance Survey map of 1884. Accessed 19/04/2011

Soilscapes Viewer (URL http://www.landis.org.uk/soilscapes/) for soils information. Accessed 23/05/2011

Staffordshire Past Track (URL http://www.staffspasttrack.org.uk/) for Yate's 1775 map. Accessed 23/05/2011

Vision of Britain (URL http://visionofbritain.org.uk/maps/index.jsp) for the Ordnance Survey Map of 1834. Accessed 26/05/2011

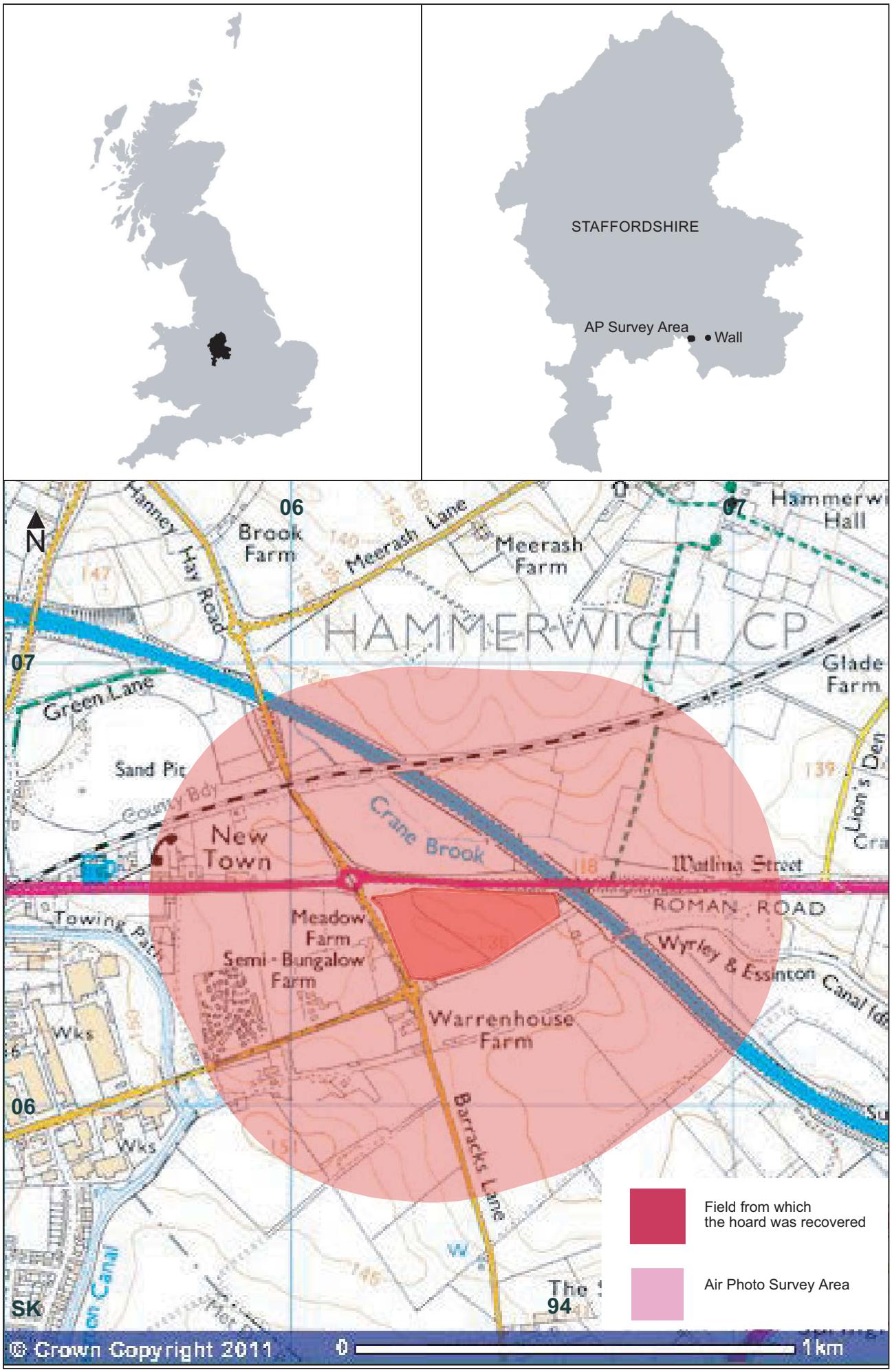

Figure 1.
Location plan of the Staffordshire Hoard air photo survey area, Hammerwich, Staffordshire.

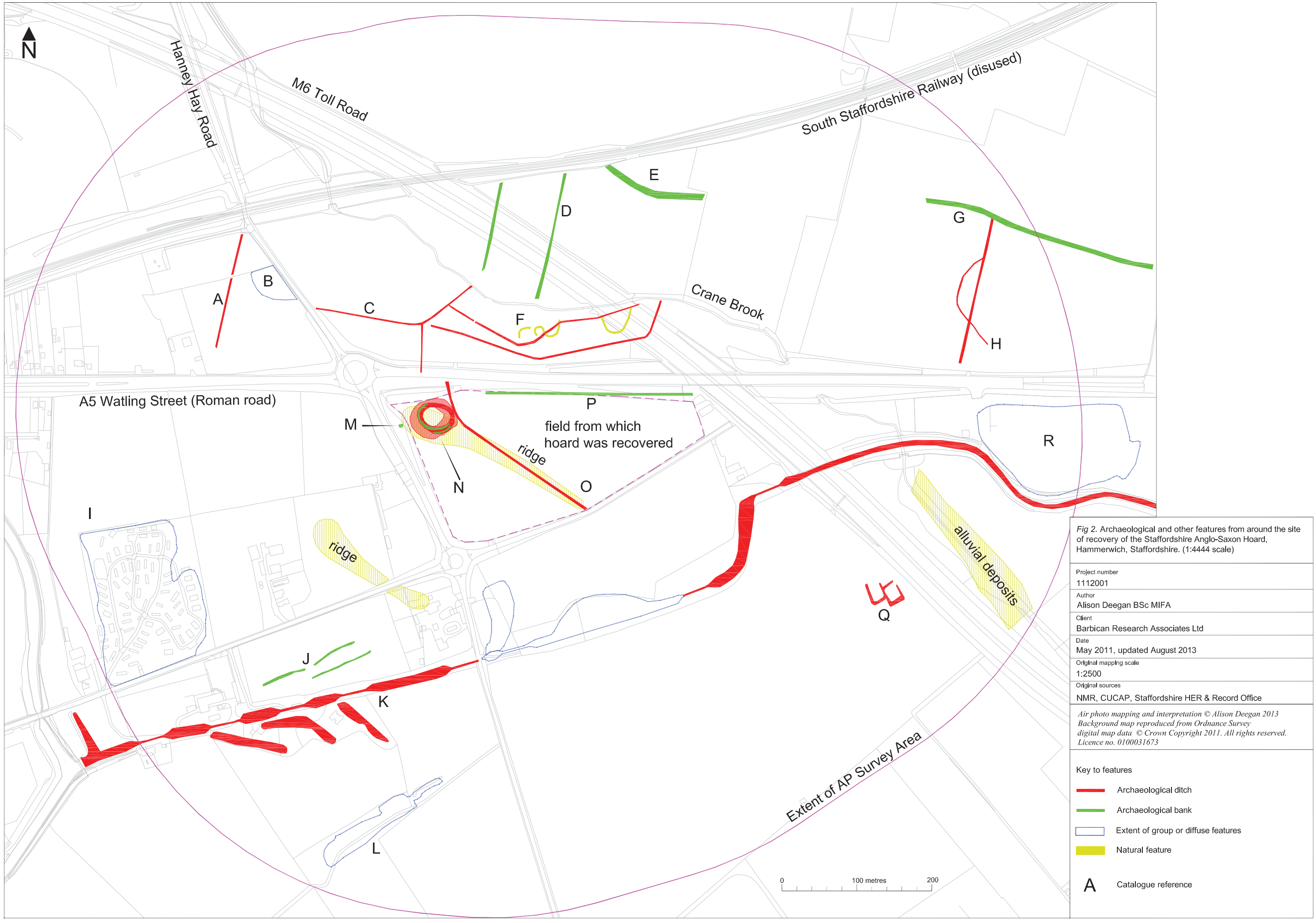

Fig 2. Archaeological and other features from around the site of recovery of the Staffordshire Anglo-Saxon Hoard, Hammerwich, Staffordshire. (1:4444 scale)

Project number	1112001
Author	Alison Deegan BSc MIFA
Client	Barbican Research Associates Ltd
Date	May 2011, updated August 2013
Original mapping scale	1:2500
Original sources	NMR, CUCAP, Staffordshire HER & Record Office

Key to features

- Archaeological ditch
- Archaeological bank
- Extent of group or diffuse features
- Natural feature
- A — Catalogue reference

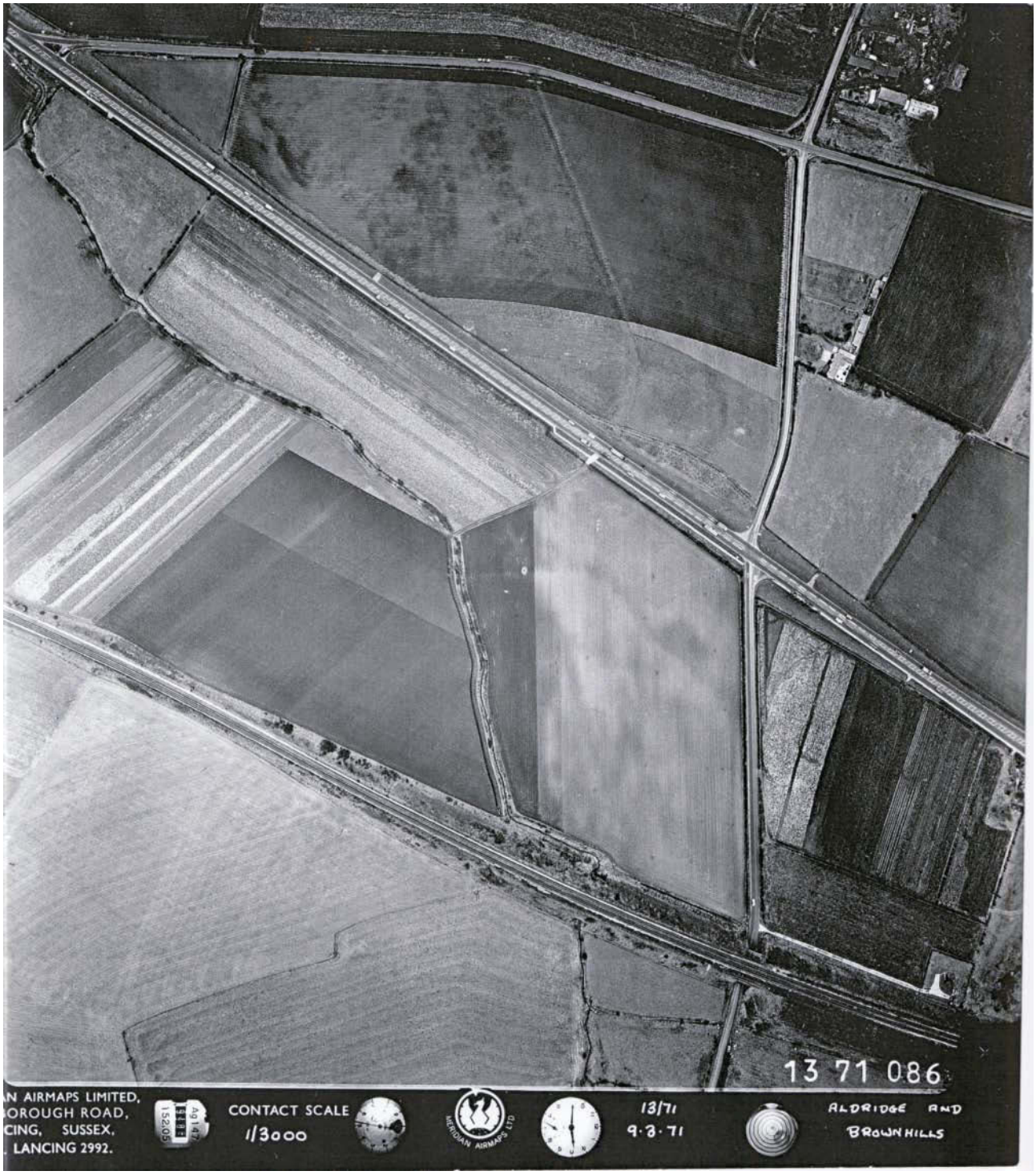

Figure 3.
Vertical air photograph showing the curvilinear cropmark **AP N** in the field where the hoard was discovered. (MAL/71013 86 09-MAR-1971)

Figure 4.
Extract from vertical air photograph showing the parching associated with the curvilinear cropmark **AP N** in the field where the hoard was discovered. (RC8 FZ 122 03-APR-1984)

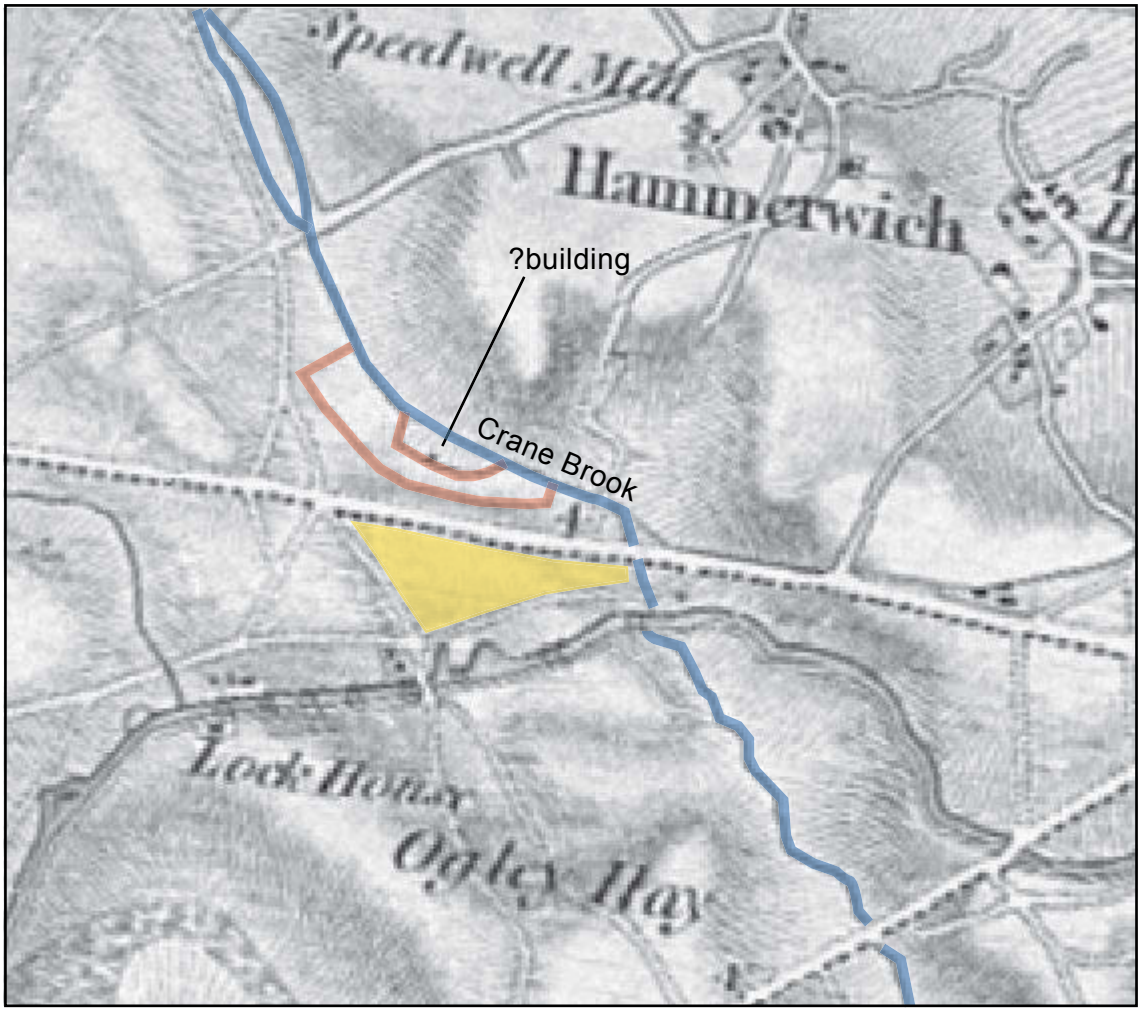

Figure 5.
An extract from the Ordnance Survey 1 inch to 1 mile 1834. Features that may correspond with those **AP F** are highlighted in red, the field from which the hoard was recovered is shaded yellow. Reproduced from http://visionofbritain.org.uk

Staffordshire Hoard Research Reports

Staffordshire Hoard Research Reports were produced by the project

Contextualising Metal-Detected Discoveries: Staffordshire Anglo-Saxon Hoard

Historic England Project 5892

The Staffordshire Hoard is owned by the Birmingham City Council and the Stoke-on-Trent City Council and cared for on their behalf by Birmingham Museums Trust and The Potteries Museum & Art Gallery.

The Staffordshire Hoard research project was conducted by Barbican Research Associates Ltd and funded by Historic England and the owners.

Historic England

Birmingham City Council

City of Stoke-on-Trent

Barbican RA

Birmingham Museums

The Potteries & museum art gallery