

**Archaeological geophysical survey
at Cranfield Airport
Bedfordshire
June 2022**

Report No: 22/064

Authors: Adam Meadows
John Walford



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Project Manager: John Walford
NGR: SP 95000 43300

MOLA Northampton
Kent House
30 Billing Road
Northampton
NN1 5DQ 01604 809800
www.mola.org.uk
business@mola.org.uk

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Kent House
30 Billing Road
Northampton
NN1 5DQ
01604 809 800
www.mola.org.uk
business@mola.org.uk

STAFF

Project Manager: John Walford MSc

Supervisors: Adam Meadows BSc PCIfA
Christopher Manktelow BSc PCIfA

Assistants: Daniel Whatton
Joseph Pacheco BA MA

Text: Adam Meadows
John Walford

OASIS REPORT FORM

Archaeological geophysical survey at Cranfield Airport		OASIS No: molanort1-508513	
ACTIVITY TYPE			
Project/Activity type	Geophysical survey		
Reason for investigation	Planning: Pre-application		
Development type	Non-residential / Industrial building		
PROJECT LOCATION			
National grid ref	SP 95000 43300		
Site name	Cranfield Airport		
REVIEWERS/ ADMIN			
HER for project	Central Bedfordshire Historic Environment Record		
National organisation	Historic England		
WORK UNDERTAKEN			
Methodological summary	Magnetometer survey with a cart-mounted array of Bartington Grad601 fluxgate gradiometers.		
Previous work?	No	Future works?	Yes
Dates - Start date:	20th June 2022	End date:	30th June 2022
GEOPHYSICS			
Geology	Stewartby Member mudstones overlain by Oadby Member Diamicton		
Land use	Waste ground Grassland - undifferentiated		
Survey type	Magnetometer survey		
Size of survey area	c 41ha		
Instrumentation	Bartington Grad 601		
Configuration	Multiple		
Spatial resolution	Traverse spacing	0.8m	Sample interval 0.25m
Resolution (data values)	0.1nT		
BIBLIOGRAPHY			
Title	Archaeological geophysical survey at Cranfield Airport Bedfordshire, June 2022		
Author(s)	Meadows, A. and Walford, J.		
Publisher, place and date	MOLA Northampton / Northampton / 2022		
Report number	22/064		
Report release delay?	6 months		
PEOPLE			
Organisation	MOLA Northampton		
Project manager	John Walford		
Project supervisors	Adam Meadows		
Funding body	MGPH		
KEYWORDS			
Monuments found/ date	Enclosure – Iron Age/ Roman Ridge and furrow – Medieval Trackway – Post medieval Airfield – Modern		
RESULTS			
Description of outcomes	The survey detected evidence of a probable late Iron Age to Roman enclosed settlement and other, less substantial, archaeological remains as well as medieval ridge and furrow cultivation and remnants of historic features associated with the wartime Cranfield Airfield.		
ARCHIVES			
Accession ID	TBC		
Paper Archive repository	None		
Digital Archive repository	Archaeology Data Service		
<i>No finds made during survey - no finds archive to be deposited</i>			

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Archaeological geophysical survey at Cranfield Airport, Bedfordshire June 2022

ABSTRACT

MOLA (Museum of London Archaeology) was commissioned by MGPH Ltd to conduct a geophysical survey on land at Cranfield Airport, Cranfield, Bedfordshire. The survey detected evidence of a probable late Iron Age to Roman enclosed settlement and other, less substantial, archaeological remains as well as evidence of medieval ridge and furrow cultivation and remnants of historic features associated with the Second World War RAF Cranfield.

1 INTRODUCTION

MOLA (Museum of London Archaeology) was commissioned by MGPH Ltd to conduct a magnetometer survey on 48ha of land located to the west and north-west of the main runway at Cranfield Airport, Cranfield, Bedfordshire (centred NGR SP 95000 43300, Fig 1). The survey was conducted in response to a requirement from Hannah Firth of the Central Bedfordshire Historic Environment Team and was intended to identify areas of potential archaeological interest that may be disturbed by a proposed development.

The survey commenced on the 20th June 2022 and was completed by the 30th June 2022. It was conducted according to the Written Scheme of Investigation (WSI) for the project (Meadows 2022), the details of which were informed by the Chartered Institute for Archaeologists and European Archaeological Council guidelines (CIfA 2020 and Schmidt *et al* 2015). The extent of coverage was c 41ha, the remaining 7ha being omitted due to due to unfavourable ground conditions and access restrictions.

2 BACKGROUND

2.1 Location and land use

The survey area, though all under the ownership of Cranfield University, was split between two main zones, 'air-side' and 'land-side' of the airport boundary (Fig 1).

The larger, land-side zone was situated to the north-west of the airport, and was bounded by College Road and Crawley Road to the west and north respectively. It was subdivided into seven fields by trees and hedgerows, and had been left uncultivated. Tall grass was present throughout, and there were patches of scrub and brambles dominating localised areas, rendering them unsurveyable.

The 'air-side' portion of the survey comprised three blocks of land within the bounds of the airport. The southern of these was a large, grassed area located between the main runway to the east and the hangars and apron to the west and entirely bounded by taxiways and former runways. To its north was a second area, located north-east of the airfield buildings and south of Merchant Lane. The ground conditions here were largely

overgrown scrubland and grass. A third, very small, area was positioned further north, near to the northern end of the runway.

MOLA was not permitted access to the small northern air-side area or to the easternmost corner of the southern area, as the airport staff judged these to be dangerously close to the main runway. As a result, these areas were scoped out from the survey.

2.2 Topography and geology

Cranfield Airport lies on a moderately level plateau of high ground at between 105m and 110m above Ordnance Datum.

The solid geology of the survey area comprises Stewartby Member mudstones originating from the shallow seas of the Jurassic Period. These are entirely overlain by a superficial deposit of Oadby Member Diamicton, laid down under the Ice Age conditions of the Quaternary Period (BGS 2022).

2.3 Historical and archaeological background

Two Central Bedfordshire Historical Environment Record (HER) entries (HER Nos. 21432 and 1504) relate to large expanses of ground encompassing the current survey area.

HER record 21432 relates to an expanse of medieval to post-medieval ridge and furrow, as recorded and mapped during the Bedford Borough National Mapping Programme Project in 2016. Most of these former cultivation earthworks have been levelled, though some are still upstanding.

HER record 1504 relates to Cranfield Airport (formerly RAF Cranfield), which was built in the 1930s as part of the RAF's inter-war expansion scheme. During the Second World War it was used as a military airfield and training centre along with satellite airfields located at Stagsden (HER 9276) and Twinford Farm by Clapham (HER 9274). It suffered several wartime air-raids, most of which proved ineffective with only minimal damage or cratering occurring. Post-war usage saw the site repurposed as the College of Aeronautics, which gained university status as the Cranfield Institute of Technology in 1969 and was renamed as Cranfield University in 1993.

The Central Bedfordshire HER also contains several entries relating to sites and findspots within close proximity of the survey area, as summarised below:

A mid to late Iron Age enclosure was detected in an archaeological geophysical survey c 300m south-east of the survey area, north of Cranfield High Street. It was partially excavated during a subsequent trial trench evaluation (HER 19791).

A Roman coin hoard consisting of around 1700 silver and copper coins was found alongside fragments of a vessel during ploughing in 1946 at Warley Farm, c 900m west of the survey area. The coins were identified as being largely of the emperors Constantine I and II (HER 46), with the date of the hoard being deposited likely to be post-348 AD.

A quantity of Roman pot sherds were recovered by a labourer while working within an orchard just north of Wharley Farm, at 'Wharley Ringtail', during the 1960s (HER 47).

Evidence of medieval and post-medieval ridge and furrow cultivation has been recorded in a number of locations in close proximity to the survey area, including at

Newlands Farm, just north of Crawley Road and immediately north of the survey area (HER 21431). Other traces of ridge and furrow were recorded in excavations south-east of the airstrip, c 300m from the survey area (HER 19790).

A geophysical survey and trial trench excavation c 800m east of the survey area, near Mill Road, identified possible evidence for a post-medieval windmill (HER 20288).

Historic maps, dating from the 19th to 20th centuries, show the survey area to have been in agricultural use prior to the construction of the airfield, with various farmsteads located in the near vicinity. The earliest detailed map is a plan of Joseph Ashby Partridge's estate in 1807 (Bedfordshire Archives and Records Service, ref: X206/1), which shows the pattern of strip fields prior to enclosure. Later maps, such as the 1882 Ordnance Survey six inch edition, shows the pattern of post-enclosure field boundaries which, outside of the area cleared for the airfield, have largely remained until the present day.

3 METHODOLOGY

3.1 Fieldwork

The magnetometer survey was undertaken with a Bartington magnetometer cart. This is a two-wheeled, lightweight sensor platform operated by hand. The cart incorporates a bank of six vertically-mounted Bartington Grad-01-1000L magnetic sensor tubes, spaced at 0.8m intervals along a bar aligned crossways to the direction of travel. It also incorporates a Leica Geosystems Viva GNSS antenna, mounted on the central axis.

The magnetic sensors were calibrated ('zeroed') at the start of each day's work to minimise any heading errors or offsets between the zero points of each individual sensor.

The magnetic sensors were set to output data at a rate of eight readings per second. The GNSS antenna was set to output NMEA format data (GGA messages) at a rate of one position per second. These data streams were compiled into a single raw data file by MultiGrad601 logging software.

The cart was propelled along straight and parallel traverses across each survey area, with data-logging being manually toggled on and off at the start and end of each traverse to avoid the collection of spurious data whilst turning. Traverse ends were marked with ranging poles to aid even coverage, and the evenness of coverage was further checked by monitoring the positional trace plotted in real time by the logging software.

The typical speeds of coverage were c1.7m/s, with some variation depending on the terrain and slope. The combination of sensor spacing, survey speeds and data output rates ensured that the spatial resolution of all the datasets would be better than 0.25m x 0.80m.

3.2 Data processing and presentation

The raw survey data was initially processed with MLGrad601 software, which calculated a UTM co-ordinate for each data point by interpolating the GPS readings and applying offset corrections based on the array geometry and calculated heading direction. This produced an output file in XYZ format which could be imported into TerraSurveyor software for data visualisation and further processing.

The raw data exhibited striping caused by slight mismatches in the calibration of the individual magnetic sensors. This was removed in TerraSurveyor by applying the median de-stripe function to runs of data from each sensor.

The raw and processed survey data is presented in this report as greyscale raster images which have been rotated and scaled to fit against Ordnance Survey base-mapping. The processed data (Figs 2–4) are presented at a greyscale range of $-/+4nT$ and the raw data (Figs 8–10) at $-/+10nT$.

The interpretation of the data has been undertaken in a qualitative manner, based on the recognition of distinctive anomaly types and patterns and taking into account field observations and historic map evidence. The interpretation figures (Figs 5–7) show the main anomalies identified but, for clarity's sake, omit some minor anomalies including magnetic halos and the majority of small ferrous dipoles.

4 SURVEY RESULTS

4.1 Archaeological features

Site 1

An archaeological site has been detected in the northern portion of the survey area, roughly 250m north-west of the end of the main runway (Figs 2 and 5). It appears in the data as a pattern of linear anomalies, representing ditches, ring-shaped anomalies, representing the remains of roundhouses, and small irregular blobs that are likely to represent pits.

The clearest anomalies, at the core of the site, define one complete enclosure ditch with a second, incomplete enclosure to its south and spurs of ditch running off to the south and east implying that a continuation may exist, undetected in these locations. Several roundhouses lie in and around the enclosures, and the way that these overlap with each other and with the ditches shows that at least two phases of remains are present. The form and size of the enclosures and the presence of roundhouses give the impression that this site is likely to be a small farmstead of late Iron Age to Roman date, i.e. broadly c 80 BC to AD 100.

Some very weak and fragmentary linear anomalies have been detected to the north-east of the core of this site. These probably represent the remains of outlying structures and boundary ditches which, lacking the magnetic enhancement of the core features, have been less well resolved by the survey.

Approximately 150m west of the enclosures there are four very weak, parallel linear anomalies. Whilst these may indicate nothing more than modern field drains, there is a low possibility that they might represent part of a system of Roman planting beds for vegetable cultivation (*cf Wiseman et al 2020*).

Site 2

There is a second potential archaeological site in the west of the survey area, close to College Road (Figs 3 and 6). Several irregularly shaped linear anomalies are present, and seem likely to represent fragments of enclosure ditches. Unfortunately, the evidence is limited by the incomplete survey coverage (due to dense vegetation) and by an overlying band of debris relating to a modern trackway. As a result, the original form and age of the remains are indeterminable.

Other

There may be a very small ring ditch and two other short lengths of ditch in the airside area, slightly north-east of the apron and hangars, and perhaps another ditch and further planting beds, close to the southern boundary of the survey area (Figs 4 and 7). However, the former lie in an area which is heavily disturbed by former tracks and hardstandings, and the latter are represented by very weak and nondescript anomalies, so in neither case is the evidence strong enough to support a definite conclusion.

4.2 Ridge and furrow

The buried remains of ridge and furrow cultivation in the medieval to early post-medieval period occur across much of the site, and are represented in the data by sequences of parallel, regularly spaced, linear anomalies with gently curved profiles. Such anomalies cover the entire northern part of the site but are less widely present in the south, having been disrupted or masked in a few places by episodes of ground disturbance associated with the development of the airport.

4.3 19th-century field boundaries and trackways

Many of the stronger linear anomalies detected in the southern portion of the survey area (Figs 4 and 7) correspond with the pattern of field boundaries depicted on the 1st Edition six-inch Ordnance Survey map (1882). In some cases, the anomalies include, or are composed of, near-continuous chains of dipolar anomalies due to the presence of ferrous debris within the backfilled boundary ditches.

A further linear anomaly, in the northern portion of the site, is also interpreted as a field boundary (Figs 2 and 5). Although it does not correlate with anything shown on the historic mapping, it continues the line of an extant boundary to the immediate west. It is probably a 19th-century feature that was removed at some point prior to the creation of the 1882 map.

The 1882 Ordnance Survey map shows an angular network of trackways in the northern part of the survey area, which later maps identify as access for allotments. Their remains of these have produced a very mixed set of magnetic anomalies (Figs 2 and 5). The strongest is aligned perpendicular to Crawley Road. To its south the line continues more weakly and turns westwards at a near 90-degree angle before terminating. Another spur runs westwards at sharp angles crossing into the western field and ending a short distance from the western field boundary.

4.4 Airfield-related features

The survey has detected a very complex set of magnetic responses across the southern and western portions of the survey area, many of which will relate to historic airfield features or to ground disturbance during the airfield's construction and operation. These cannot be fully disentangled and interpreted, but some key points are summarised below.

Ferrous debris

Discrete magnetic dipoles, indicating buried ferrous objects, occur sparsely across the whole of the survey area. Most will relate to loose pieces of scrap metal, although a few of the larger ones may relate to *in-situ* objects.

There are areas on the airport, particularly in front of the apron and to the south of Merchant Lane, where the ferrous dipoles are very densely clustered, forming zones of incoherent 'magnetic noise'. This could be due to general accumulations of rubbish or to spreads of hardcore, made ground or demolition debris with a significant ferrous component.

Tracks and hardstandings

Distinct areas and strips of magnetic noise with sharp boundaries are evidence of former hardstandings, taxiways and roads that have been incompletely removed, leaving behind the remains of their hardcore bases. In some cases there are separate anomalies around their borders, perhaps relating to kerbs or drainage gullies.

Grass landing strip

A fragmentary set of weak linear anomalies correspond to the edges of a former pair of grass landing strips, located between the apron and the main runways (visible on Google Earth imagery dated 2005). Small patches of ferrous debris at two ends of the strips show the locations of runway markers (Fig 7, inset).

Signal square and lettering

A large square response near the southern end of the apron probably represents the grassed-over remains of the airfield's signal square (Fig 7, inset). Immediately to its west there are traces of three letters from the airfield name marker 'CRANFIELD', and 200m to the east, by the grass landing strips, is a solitary 'H' shaped anomaly, showing the location of a helicopter landing marker.

Anchor points

Five parallel rows of moderately large ferrous objects, aligned north-west to south-east, lie in front of the hangars and apron. Comparison with aerial photographs (Google Earth imagery, dated 2005) shows that they are anchor points for light aircraft (Fig 7, inset).

Ground disturbance

Discrete, irregularly shaped areas of magnetic disturbance with narrow negative halos have been detected across the southern portion of the survey area (Figs 4 and 7). These are best interpreted as rubbish pits or, less probably, patches of bonfire debris. Some smaller anomalies have also been placed into this category, and they could represent a variety of pits, pockets of burnt soil, or small earthmoving scars.

4.5 Buried utilities

Several strongly magnetic linear anomalies with alternating polarity have been detected crossing the survey area. Anomalies of this type are typical of underground pipes constructed of iron or steel. Some weaker anomalies of similar type may represent drains or cable ducting. There is also one very strong linear anomaly with equal positive and negative 'sides' which resembles the response expected from a live electricity cable.

4.6 Miscellaneous features

Modern barns

A patch of intense magnetic noise alongside College Road, directly opposite 'Fourwinds' bungalow, marks the site of two recently demolished modern barns (Figs 3 and 6).

Field drains

A number of probable field drain anomalies have been detected in various locations in the southern half of the survey area. These are varied in character, and usually identified by their arrangement into parallel sets which often form a 'herringbone' shaped cluster feeding into a field boundary ditch or a central collector drain.

Wheel ruts

Some closely spaced pairs of thin, magnetically weak linear anomalies with a 'tramline' like appearance occur in the southern portion of the survey area (Figs 4 and 7). These are likely to represent wheel-ruts from heavy vehicle movements.

Uncertain

The category 'uncertain' has been used for a variety of linear anomalies which seem unlikely to have an archaeological origin but lack enough evidence to support any other specific interpretation. The most probable causes would be drains or boundary ditches, though other causes cannot be ruled out.

4.7 Geology

A sinuous linear anomaly extends through the southern portion of the survey area, roughly paralleling one of the historic field boundaries (Figs 4 and 7). Its form and width are suggestive of an old stream channel, although there is no historic map evidence to confirm this interpretation.

5 CONCLUSION

The magnetometer survey has identified an archaeological site located in the north of the survey area. At its core there is a pair of sub-rectangular ditched enclosures and an overlapping group of roundhouses. The layout of these features is typical of a late Iron Age to early Roman habitation, where unplanned irregular settlement designs began to take a more rectilinear planned form as a result of increased Roman influence. Some faint magnetic anomalies surrounding the area suggest that archaeological remains extend beyond those which are clearly visible within the survey data.

There is probably a second archaeological site approximately 500m south-west of the enclosures and roundhouses, close to College Road. Some irregularly curving sections of ditch have been detected, and perhaps defines parts of one or more enclosures. However, the evidence is limited by a combination of modern ground disturbance and gaps in the survey data (the latter being due to overgrown vegetation).

Both of the above archaeological sites lie on the land-side portion of the survey area, and the evidence for archaeology 'air-side', within the airport perimeter, is much less conclusive. However, the data from the air-side portion of the survey area is generally

quite noisy, which does increase the risk of archaeological features being masked from detection.

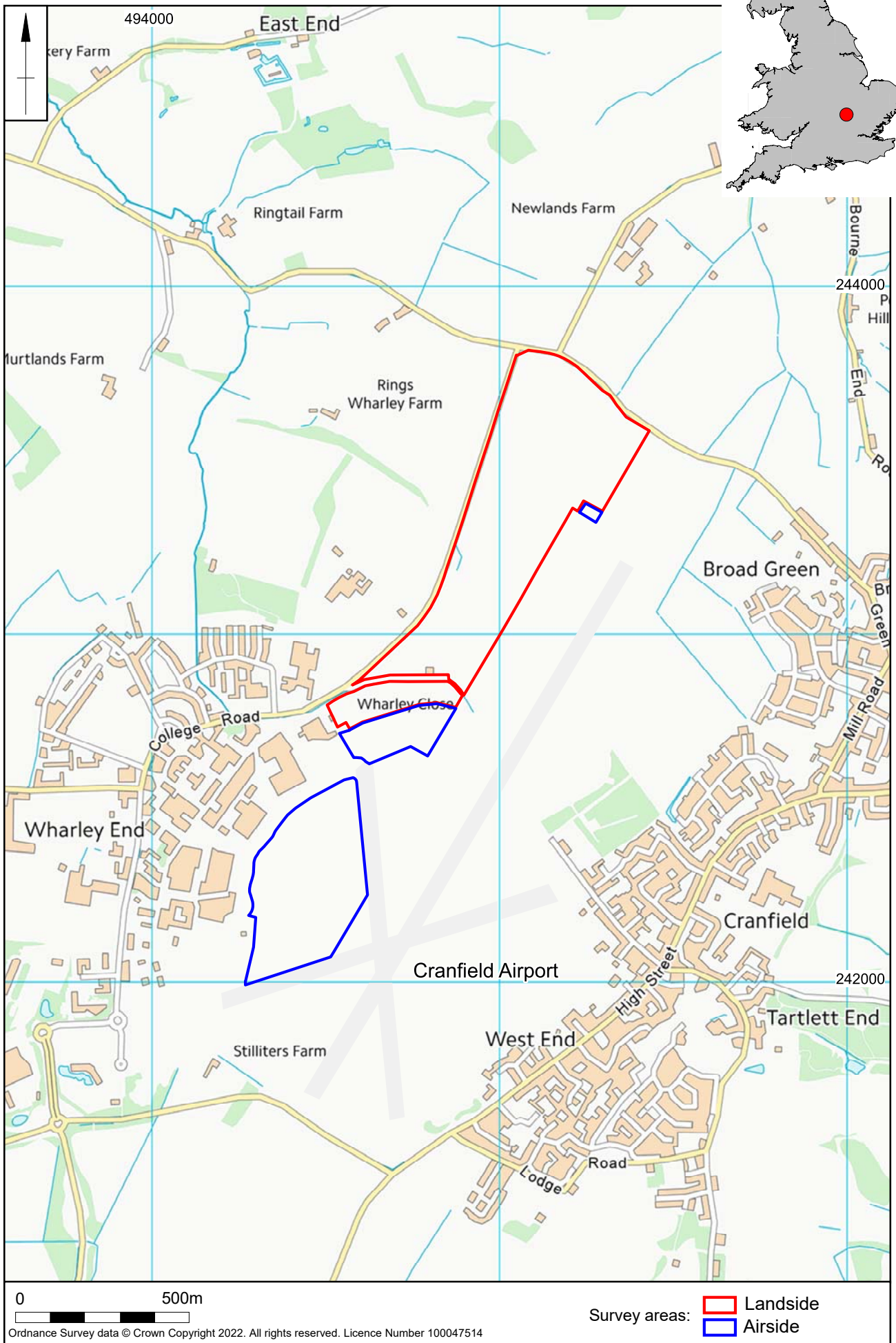
The remnants of medieval to post-medieval plough furrows and 19th-century field boundaries have been detected across much of the survey area, including within the bounds of the airfield. This demonstrates that, although the construction of the airfield involved localised ground disturbance, there was no widespread truncation of the soil horizon at which any surviving archaeology would be found.

Within the airport, the survey has detected abundant modern features, including drains, utilities, former tracks and hardstandings. There are also a large number of features which, although not definitively interpreted, might be rubbish pits or bonfire sites. Whilst some of these features could hold slight historic interest, others, including any buried utilities, may be better regarded as obstructions to be avoided by any excavation that might follow this survey.

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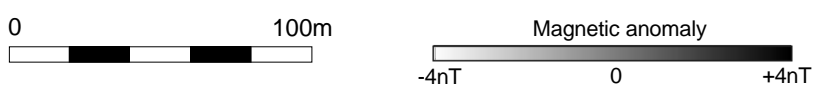


Scale 1:15,000

Site location Fig 1



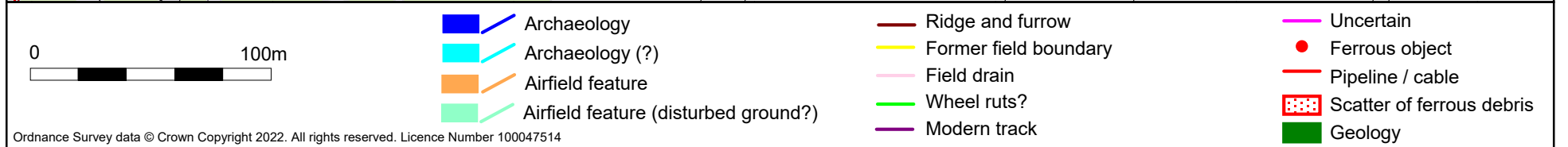
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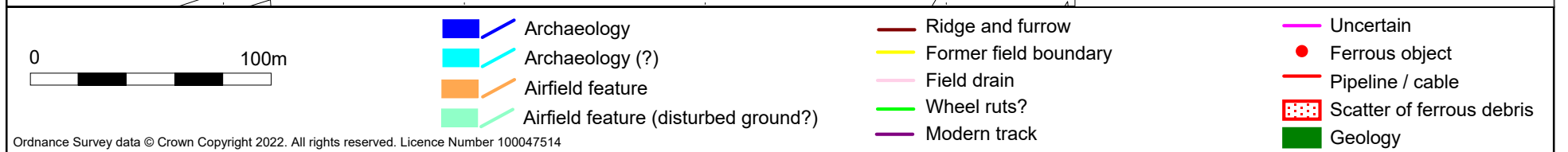
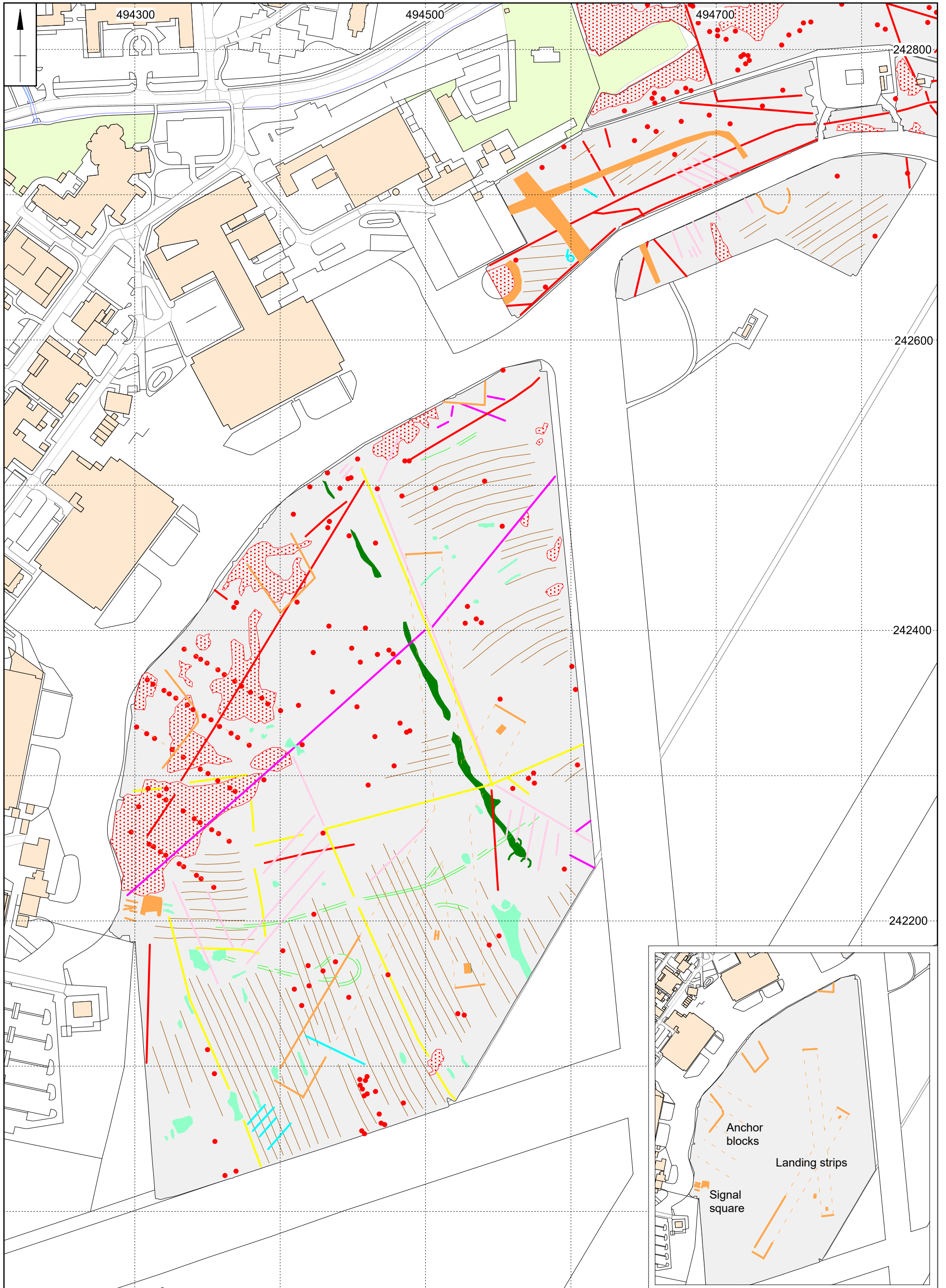
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Scale 1:2500 (A3)

Magnetometer survey interpretation (north) Fig 5





Scale 1:2500 (A3)

Magnetometer survey interpretation (south) Fig 7



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MOLA
Kent House
30 Billing Road
Northampton
NN1 5DQ
01604 809800
www.mola.org.uk
business@mola.org.uk