

This map shows the Brooksend area in Wokingham. Key features include:

- Church of England Primary School** in the top right corner.
- Great Brooksend Farm** and **Little Brooksend Farm** in the upper left.
- College Farm** in the center.
- Monkton Road Farm Cottages** in the lower center.
- Crispe Road** running diagonally from the bottom left to the top right.
- Cycle Way** running horizontally across the middle.
- Brooksend Lodge** and **Coney Lodge** in the lower left.
- Brooksend Cottages** near the center.
- The Red Houses** near the top left.
- Monkton Road** running vertically through the center.
- Wokingham** is visible in the top right corner.

The map is overlaid with a grid of red and blue lines, and a green line runs diagonally across the center.



Summary

These Standards and Guidance define the required approach for Aerial Investigation and Mapping (AI&M) projects funded or undertaken by Historic England. AI&M projects use aerial photographs and lidar data to identify, map and record archaeological features, creating spatial datasets and associated records suitable for integration with Historic Environment Records (HERs) and Historic England systems.

These Standards apply to:

- Historic England projects.
- Historic England grant-funded work.

They set out:

- The minimum technical standards for data capture, mapping, and recording.
- The required outputs, including GIS datasets, HER records, and reports.
- The processes and methods to ensure consistency, accuracy, and interoperability.
- The quality assurance requirements for all projects.

All projects must produce:

- GIS mapping datasets following the defined schema.
- New or updated HER monument records.
- An OASIS record.
- A final report in the Historic England Research Report Series.

The aim is to ensure that AI&M data are:

- Accurate and consistent.
- Compatible with HER systems and national datasets.
- Suitable for research, planning, and long-term management of the historic environment.



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Front cover: Aerial Investigation and Mapping showing Iron Age or Roman trackways and Bronze Age round barrows in Thanet, Kent. Ditched features are depicted in blue; embanked features are red. [Archaeological mapping © Historic England. Base map © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900].



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1. Introduction

Aerial Investigation and Mapping (AI&M) Standards aim to promote best use of aerial photographs and lidar data to create archaeological maps and descriptions suitable for Historic Environment Records (HERs). This systematic synthesis of archaeological information is intended to assist research, planning, and protection of the historic environment.

This Standards and Guidance document provides details of the processes involved in the production of mapping and recording from aerial photographs and lidar.

AI&M Standards apply to all Historic England projects and those undertaken by external contractors funded by Historic England grants. Adherence to the Standards and Guidance is a requirement of all internal and grant-funded projects.

These Standards and Guidance may be used and adapted by those using airborne remote sensing data in other contexts including smaller area or site-based work such as desk-based assessments. These Standards apply only to AI&M projects and should not be used as general guidance for other forms of aerial survey or remote sensing undertaken in archaeological or heritage contexts.

For the purposes of this document the following definitions are used:

Standard – a clear, concise measure against which a product or task can be assessed for compliance. Standards are listed in the text box at the beginning of each section.

Guidance – supporting reference material that can be used to ensure that a product or task meets the required standard. Guidance forms the main body of the document.



2. Interoperability and Data Standards

AI&M data must be structured to ensure compatibility with HERs, Historic England systems, and national heritage data standards.

To achieve this, all project outputs must adhere to the following:

Alignment with HER systems

All monument records must be created or updated within the appropriate HER wherever possible. Data structures and terminology must be compatible with HER database requirements to ensure successful ingestion and long-term use.

MIDAS Heritage Compliance

Monument records must follow the principles of MIDAS Heritage, the UK standard for recording information about the historic environment. This ensures consistency in record structure, terminology and content across different organisations.

FISH Vocabularies

Controlled vocabularies from the Forum on Information Standards in Heritage (FISH) must be used for:

- Monument type
- Period
- Evidence

This ensures consistency of terminology and enables effective searching, filtering and analysis of data across datasets.

GIS and Attribute Schema

All spatial data must conform to the attribute schema defined in Appendix 1. Field names, formats and values must be applied exactly as specified.

This is required to:

- Enable automated ingestion into Historic England systems
- Ensure compatibility with the Aerial Archaeology Mapping Explorer
- Support reuse of data in the Historic England Open Data Hub



Unique Identifiers

HER identifiers (or Historic England identifiers where applicable) must be used consistently to maintain links between spatial datasets and monument records.

Data Reuse and Integration

Adherence to these standards ensures that AI&M outputs can:

- Be integrated into HER systems
- Be published through Historic England platforms without reformatting
- Be used reliably for planning, research and analysis



3. Project Planning and Design

This section provides guidance to support the effective planning and design of AI&M projects.

Standards for Project Planning

- Projects must be planned and executed in accordance with project management best practice.
- The scope and objectives must be explicitly defined.
- A clearly defined project area must be established.
- The required project outputs must be defined.
- The availability and quantity of aerial photographs and lidar data must be assessed.
- The known archaeology of the project area must be quantified.
- A timetable and resource estimate must be prepared based on project scope, sources and data availability.
- Project Experts must be suitably trained, or an agreed training plan must be in place.
- Arrangements must be made for access to relevant aerial photographs and data sources.
- Consultation with relevant HERs and Historic England teams must be undertaken prior to submission of a Project Proposal or Project Design.

General Considerations

Projects should be planned and executed in accordance with recognised project management best practice. The following sections identify aspects to be considered during the planning of an AI&M project. Inadequate planning may result in delays, incomplete outputs, or failure to meet the required standards.

From the outset there should be consultation with potential stakeholders including the relevant Local Authority or National Park Authority. For projects funded via Historic England grants this consultation must also include the appropriate Historic England Regional team and the Aerial Survey team.

Early consultation with relevant aerial photograph archives is necessary to ensure that access or loan arrangements are agreed.



The following aspects should be considered when planning AI&M projects:

- Clear project objectives and scope.
- Clear definition of the project area.
- Required AI&M products.
- Quantification of aerial photographs and lidar.
- Quantification of current archaeological knowledge.
- Costs of copyright and licenced use of source material.
- Timetable assessment.
- Project stages and tasks.
- Team structure and skills.
- Allowance for liaison with stakeholders.
- Risks and their management.
- Hardware and software costs.
- Data management and storage.
- Provision for quality assurance and review.
- Clear mechanisms for population of the Historic Environment Record.
- Archive and dissemination.
- Project Closure.

Setting Objectives

Objectives should be clearly articulated and include their expected contribution to the understanding, management and protection of the historic environment.

Reference should be made to relevant strategic documents such as Regional Research Frameworks, World Heritage Site Research Agendas and National Park or Landscape Management Plans. Projects must also reference the **Historic England Strategic Plan 2026 to 2031**.

Defining the Project Area

The project area must be clearly defined and illustrated within the Project Proposal or Project Design. It may be necessary to subdivide the project area for loan management purposes. Details should be discussed with the Historic England Archive.

AI&M projects should normally cover 100 square kilometres or more and take account of the location of previous digital AI&M projects. Existing AI&M data are available via the **Aerial Archaeology Mapping Explorer** or the **Historic England Open Data Hub**.

A single, contiguous project area is encouraged unless there is a strong business case for sampling; in such cases, sampled areas must still be of sufficient size to ensure meaningful results. A single project area with straight sides is more efficient for archive



retrieval and re-filing and is a more efficient use of sources. Whole kilometre squares should be completed unless they cross the Scottish or Welsh borders.

Products

The project should deliver the following outputs:

- Georeferenced GIS mapping datasets of the form and extent of all archaeological features visible on aerial photographs and lidar.
- New and amended HER records.
- A summary report in the Historic England Research Report Series, providing an overview of the archaeology recorded by the project, analysing its character, diversity, distribution and landscape associations, as well as recommendations for future work.
- An OASIS record.

Quantification of Aerial Photographs and Lidar

The identification and quantification of available aerial photographs and other sources is an essential part of project planning. This should include the numbers and types of aerial photographs held in archives, and any other readily available sources of imagery and remote-sensed data. Further requirements, including the mandatory sources for AI&M projects, are set out in Section 6 (Sources).

Historic England grant-funded AI&M projects may be eligible to receive loans from the Historic England Archive, subject to certain conditions and requirements. A list of aerial photographs (a 'coversearch') should be requested from the Historic England Archive by providing a shapefile of the proposed project area.

Any costs and conditions of use associated with acquiring material from aerial photograph archives should be identified.

The aerial photograph quantification should be presented in the Project Proposal or Design.

Quantification of Current Archaeological Knowledge

Existing HER monument records should be assessed to evaluate the density, geographic location, distribution, period and type of known archaeological sites within the project area.

The results of this assessment should be presented in the Project Proposal or Design.



Timetable Assessment

The project timetable should be developed based on an informed assessment of the work required. This should take into account:

- Experience gained from comparable previous projects.
- The experience and capacity of the project team.
- A quantification of aerial photographs and other data.
- Access arrangements at archives.
- The quantification of the archaeological record to inform anticipated density of archaeological features.
- Any additional tasks beyond interpretation, mapping and recording.

Mapping and Recording Rates

The timetable assessment should estimate the expected rate of mapping and recording in person days per square kilometre. An average of 1.1 person days per square kilometre is usual for the interpretation, mapping and recording phase of AI&M projects.

More, or less, time may be required depending on the density and complexity of the archaeological remains, the number of aerial photographs and the scope of the project. Analysis of previous projects has demonstrated that the number of monuments per square kilometre is the key factor impacting time taken for mapping and recording (Evans 2019).

The Project Proposal or Design must demonstrate how the quantification of aerial photographs and other sources, and current archaeological knowledge have been used to estimate time allocations for mapping and recording.

Other Project Tasks

Itemise time for tasks such as visiting aerial photograph archives, aerial photograph loan management, field trips, meetings, progress reports, dissemination, and report writing. Time allocated to these tasks (especially report writing) must reflect the size of the project area and the anticipated density and character of archaeological sites.

Include a Gantt chart in the Project Proposal or Design to illustrate the timetable of tasks for the duration of the project.

Team Structure and Skills

Project Experts must have a minimum of 4-6 months' professional experience in the interpretation and mapping of archaeological landscapes using aerial photographs and lidar. Training of less experienced staff should be delivered by an appropriately qualified AI&M Investigator (internal or external) with a minimum of two years' relevant experience.



The impact of any training on the project timetable and overall project cost must be clearly accounted for. Training requirements will vary; however, up to 45 person-days per trainee is typically required.

The Historic England Aerial Survey team may be able to provide training, subject to prior agreement. Provision of such training will depend on staff capacity and sufficient lead-in time.

Copyright and Licenced Use of Source Material

Copyright permission and referencing information must be sought for all material sourced from the Historic England Archive, CUCAP, HERs or other third parties. The Historic England Archive, HERs and other repositories do not always hold the copyright for items in their collections. It is the responsibility of the project team to ensure that conditions of use are adhered to.

Intellectual Property Rights of products produced by grant-funded AI&M projects are held by the grant recipient. Historic England has a perpetual non-exclusive licence which allows use of the products for any purpose, including hosting mapping on the Aerial Archaeology Mapping Explorer and Historic England Open Data Hub.



4. Project Set-Up

Following project planning, appropriate systems, data and processes should be in place before analysis and mapping can begin. This section outlines those requirements.

Standards for Project Set-Up

- Hardware and software must be sufficient to support image scanning and analysis, rectification and data management.
- Appropriate GIS project structures, including layer schema and attribute tables must be established prior to the commencement of mapping.
- Project data management arrangements, including file structure and naming conventions must be established.
- Physical access to aerial photographs, a stereoscope and digital access to other aerial sources and lidar must be in place prior to analysis.
- Systems and processes must be in place to ensure the regular and secure backup of all project data.
- An event record must be created for each AI&M project using **OASIS**.
- Arrangements must be in place to enable input to the appropriate HER system. Where this is not possible, provision may be made for input to Historic England's monument recoding system (Warden).

Hardware, Software and Storage

Hardware and software should be of sufficient capability to manage, visualise and process large image datasets and GIS data efficiently. This includes a computer suitable for moderate data processing, two high-quality monitors and a scanner.

Software requirements typically include:

- A GIS, such as ArcGIS Pro or QGIS.
- Adobe Photoshop or equivalent.
- AERIAL 5.36.
- Relief Visualization Toolbox (standalone or Esri ArcGIS Pro/QGIS plug-in).
- Google Earth Pro (or web version).
- A method for direct input to the relevant HER monument recording database, or Warden.
- Microsoft Office.



Equivalent software may be used where it provides the same functionality.

Project Data and GIS Set-Up

Appropriate GIS project structures should be established prior to mapping. This includes the setup of required data layers, attribute tables and coordinate systems.

File structures and naming conventions should be defined at the outset to ensure consistency across the project and to support data management and archiving.

Data Security and Backup

Systems and processes must be in place to ensure the regular and secure backup of all project data. Backup procedures should include regular automated backups and secure storage in more than one location where possible.

OASIS

OASIS is an online system for reporting investigations into the historic environment and linking research outputs and archives. It enables project reports to be shared with HERs, and where appropriate, disseminated through the Archaeology Data Service (ADS) Library.

An event record must be created for each AI&M project using **OASIS**. Further guidance on completing OASIS records is available via the OASIS help pages and associated training materials.



5. Sphere of Interest

The scope of archaeological features to be identified and recorded must be defined. AI&M projects must map and record all archaeological features visible on aerial photographs and lidar, within this defined scope.

Standards for Sphere of Interest

- AI&M projects must map all archaeological features visible on aerial photographs and lidar within the defined project area.
- All mapped archaeological features within scope must be represented in the GIS dataset.
- Archaeological features from all periods, from the Neolithic to the 20th-century must be considered within scope.
- Features visible as cropmarks, earthworks, soilmarks or structures must be included where they fall within scope.

AI&M Scope

AI&M projects systematically identify, map and record archaeological features visible on aerial photographs and lidar.

AI&M projects must map and record all archaeological features visible on aerial sources within the defined project area and scope. All mapped features must be represented in the GIS dataset and recorded as monument records within the relevant Historic Environment Record (HER).

AI&M enables the identification of multi-period archaeological landscapes, including features visible as cropmarks, earthworks, stonework and structures. The earliest features recognised typically date from the Neolithic onwards, and projects should consider all archaeological features through to 20th-century military and industrial remains.

AI&M Standards provide a consistent national methodology while allowing flexibility to adapt to specific project requirements. Any project-specific variations in scope must be defined in the Project Proposal or Project Design.



Cropmarks, Parchmarks and Soilmarks

Sub-surface archaeological features visible as cropmarks, parchmarks or soilmarks should be mapped and recorded.

Earthworks

All archaeological earthworks should be mapped and recorded. This includes features visible on historic aerial photographs that have since been levelled.

Archaeological monuments depicted on Ordnance Survey mapping, known as '*sites of antiquity*', should be mapped and recorded.

Buildings and Structures

Foundations of buildings visible as cropmarks, soilmarks, parchmarks, earthworks or ruined stonework should be mapped and recorded.

Standing buildings, whether roofed or unroofed, are generally out of scope unless they form part of industrial or military sites or are of clear archaeological relevance.

Structures formed of stone, concrete, metal or timber should be recorded where they are of archaeological interest, including features such as fish traps, wrecks, timber circles and military remains (including ephemeral features such as barbed wire and tank obstacles).

20th-century Military Remains

Military sites may exhibit multiple phases of development within the period of photographic coverage. A representative phase should be depicted, typically the latest coherent phase (for example c.1945).

Industrial Features and Extraction

Industrial features and extraction sites are within scope. These may include buildings, structures, spoil heaps and transport features associated with industrial processes.

The approach to widespread or small-scale extraction (for example chalk pits) should be proportionate to project aims and resources and agreed at the proposal or design stage.

Parkland, Landscape Parks, Gardens and Country Houses

Relict park and garden features within historic parks, country houses and urban parks should be mapped and recorded.

Natural features

Geological and geomorphological features are out of scope. Where there is uncertainty between archaeological and natural features, this should be discussed within the monument record.



6. Sources

AI&M projects require the systematic assessment of aerial photographs, lidar and supporting datasets. All relevant sources must be identified and evaluated for quality, date, coverage and suitability. Archaeological interpretation must be based on the combined use of these datasets wherever possible. Multiple periods of coverage should be assessed to identify changes in the landscape and to support interpretation of archaeological features.

Standards for Sources

- All readily available sources of aerial photographs and lidar must be identified and assessed.
- As a minimum, the following sources must be assessed:
 - Historic England Archive vertical and oblique aerial photographs
 - APGB orthophotography.
 - Environment Agency lidar at a resolution of at least 1m.
 - HER aerial photograph collections
 - Online aerial and satellite imagery
- Projects encompassing the coastal zone must assess the aerial photograph and lidar datasets available via the National Network of Regional Coastal Monitoring Programmes.
- Vertical print photographs must be viewed in 3D, using a stereoscope.
- Appropriate supplementary sources (including geological, soil, and historic mapping data) must be used to support interpretation.
- Copyright and conditions of use must be established for all sources.
- Sources used for mapping must be referenced consistently within project outputs.

Primary Sources

The following sources must be assessed for all AI&M projects:

Historic England Archive

The Historic England Archive is the largest repository of aerial photographs in England and the primary source for AI&M projects. A list of aerial photographs held for a project area (known as a 'coversearch') is provided by the Archive Services team.



Historic England grant-funded projects are eligible to receive loans from the Historic England Archive subject to certain conditions and requirements. The Historic England Archive can provide further information on the loans policy and guidance on request.

Aerial photographs obtained from the Historic England Archive will typically require rectification prior to use in mapping, see Section 7 (Aerial Photograph Rectification).

Historic England does not always hold the copyright for aerial photographs held in the archive. Permissions must be checked before reproducing any images; this may include restrictions on scanning for rectification and mapping purposes.

See the [Historic England Archive website pages](#) for contact details.

Aerial Photography for Great Britain (APGB)

Orthophotographs are supplied by Bluesky International via the APGB agreement in 1km tiles at 25cm or 12.5cm resolution. False-colour infrared photography is also available at 50cm resolution. As well as the most recent coverage, archive aerial photography dating back to 1999 is available and should be assessed.

Under the terms of the APGB agreement, Historic England can supply data to external contractors funded by a Historic England grant. A sub-contractor licence must be signed before data can be provided. The Historic England Aerial Survey team should be contacted at the beginning of the project to arrange data provision and licencing.

Lidar

The most comprehensive source of lidar in England is the [Environment Agency](#) which has national coverage at a minimum of 1m resolution. Environment Agency lidar is free to use under the [Open Government Licence](#).

Other sources of lidar data may be available and on rare occasions lidar may be commissioned as part of an AI&M project. Copyright, reproduction and access conditions must be established and outlined in the Project Proposal or Design.

See Section 8 (Use of Lidar) for further details.

HER Aerial Photograph Collections

Where local HER aerial photograph collections are available, they must be identified and assessed as part of the overall source review. These collections may contain unique material not represented in national archives and are an important source of evidence. In some counties, the aerial photograph collection is held by an archive or County Records Office.



Aerial photographs held by HERs may duplicate material available in the Historic England Archive. An assessment of duplication should be carried out before planning an in-person visit to the HER. If an in-person visit is required, it may be most efficient to assess HER aerial photographs last, once mapping from primary sources is completed.

HERs do not always hold the copyright for the aerial photographs they hold. Access arrangements, scanning policies and any associated costs should be considered at the Project Proposal or Project Design stage.

Online Aerial and Satellite Imagery

Google Earth provides access to multiple years of aerial and satellite imagery. Much of the aerial photography available replicates data supplied through the APGB agreement. Where equivalent data are available, APGB orthophotography should be used in preference for mapping due to its higher resolution and spatial accuracy.

Bing Maps provides access to a single layer of vertical aerial photography. In some urban and peri-urban areas, oblique imagery may also be available, although coverage is limited. This source is supplementary and may support interpretation but should not be used as primary mapping source where higher quality data are available.

As the spatial accuracy and resolution of these platforms can vary, they should not be relied upon for precise mapping or spatial alignment unless additional rectification is undertaken.

Online mapping platforms may be used to support interpretation; however, their use is subject to licensing restrictions. They must not be relied upon as primary sources for the creation of mapped datasets unless this is explicitly permitted under the relevant terms of use.

Supplementary Aerial Sources

The following are useful additional sources of aerial imagery and may be useful for AI&M projects:

Cambridge University Collection of Aerial Photography (CUCAP)

CUCAP comprises almost 500,000 aerial photographs and is another significant national archive. However, the CUCAP library is currently closed, and the print collection is therefore inaccessible to AI&M projects. The Historic England Archive and some HERs hold duplicate prints of selected images.

Some low-resolution thumbnail images are available to view via the **online CUCAP catalogue**. Additionally, a small number of aerial photographs have been scanned at high-resolution and are available to view on the **Cambridge University Library website**.



Permission to scan or reproduce CUCAP photographs must be sought from Cambridge University, even when prints are held in another archive.

Esri Imagery

Other web-based mapping platforms such as **Esri World Imagery** and the Wayback imagery archive may also provide access to additional aerial or satellite imagery, including historic coverage not available through other sources. However, their spatial accuracy, resolution and licencing constraints can vary. This should not be relied upon as a primary source for mapping or precise spatial alignment, unless their suitability has been verified and additional rectification is undertaken.

National Network of Regional Coastal Monitoring Programmes (NNRCMP)

The NNRCMP provides access to a substantial archive of coastal survey data for England, including ortho-rectified aerial photography and repeat lidar surveys. These datasets are collected systematically to support coastal management and enable analysis of coastal change over time, particularly within intertidal and nearshore environments.

Data can be accessed via an online map viewer and catalogue or streamed into GIS software using web services (e.g. WMS). While WMS layers support visualisation and interrogation, they are not suitable for raster analysis and do not replace downloaded datasets where detailed assessment is required.

Coverage is largely limited to coastal zones, and survey specifications may vary between regions and survey phases. Users should consult metadata to confirm resolution and suitability. Users should ensure that data are used in accordance with relevant licence conditions and that appropriate attribution is provided. As with other supplementary datasets, NNRCMP data should support, rather than replace, the assessment of core national datasets where these are available.

Satellite Imagery

Satellite imagery may also be useful in some contexts, particularly where aerial photographic coverage is limited. Some satellite datasets include multispectral data, which may support interpretation through the identification of variations in vegetation health or soil moisture.

However, due to variability in resolution and consistency, such imagery should not be relied upon as a primary source for AI&M projects and is not a substitute for the assessment of core datasets.

Freely available satellite imagery (such as Sentinel data) is typically available at a spatial resolution of around 10m and is therefore unsuitable for detailed archaeological mapping. Higher-resolution commercial satellite imagery is available but is often subject to licensing costs and access restrictions. Such data may support interpretation but should not replace



higher-quality aerial photography or lidar datasets; careful consideration should therefore be given to its use.

Uncrewed Aerial Vehicle (UAV) Data

Site specific UAV-borne photography and lidar are becoming increasingly common. Photography is often processed using digital photogrammetry – commonly known as Structure from Motion (SfM). Products can include seamless photomosaics and orthophotographs, as well as 3D height data. If use of UAV-borne SfM products or lidar is anticipated, this should be outlined at Project Proposal or Design stage. UAV-derived data are supplementary and should be used to support, rather than replace the assessment of primary sources.

Assessment of Images

Aerial photographs and lidar should be assessed together for each site or area. Interpretation should be based on the combined assessment of multiple sources rather than reliance on a single dataset, with each source used to corroborate or refine understanding of the archaeological features.

Studying imagery in date order can help to understand how the landscape has changed over time and support the identification and interpretation of archaeological features.

The visibility of archaeological features may vary between sources due to factors such as lighting conditions, season, crop growth, soil moisture and land use. Levelled archaeological features, visible as cropmarks or parchmarks, may only be apparent under optimal conditions and may therefore appear in only a limited number of images or not be visible in some datasets. Features should be assessed across multiple images to ensure that all evidence is considered.

Stereo aerial photography must be viewed in 3D using a stereoscope. This is essential to fully assess the source and ensure that all archaeological earthwork features are identified.

Features identified and interpreted from the assessment of stereo imagery should directly inform mapping decisions and monument recording.

Supporting Data Sources

Consulting non-aerial sources is essential to support interpretation and contextualise archaeological features identified through aerial photographs and lidar. As a minimum, the following sources should be routinely consulted:

- Existing HER monument records.
- **British Geological Survey geology data.**



-
- **UK Soil Observatory** soil data.
 - Historical Ordnance Survey mapping (and other readily available sources such as tithe maps).
 - Previous archaeological investigations, including any adjacent AI&M project data.
 - Relevant published material and grey literature.

An increasing number of sources are freely available online. For spatial data, it is recommended that they are incorporated into the project GIS as standalone datasets or dynamic links such as a Web Map Services (WMS) to enable them to be viewed alongside aerial photographs and lidar.

All available HER monument data should be acquired as spatial data and text records. The level and completeness of HER data available vary between regions.



7. Aerial Photograph Rectification

Aerial photograph rectification is the process of correcting distortion in aerial images so that they can be accurately georeferenced and positioned within a GIS environment. This enables archaeological features to be mapped in their correct real-world spatial location. The accuracy of rectification directly affects the reliability of subsequent mapping and interpretation.

Standards for Aerial Photograph Rectification

- Aerial photographs must be rectified using appropriate specialist software.
- Rectification must use accurate control derived from Ordnance Survey MasterMap (or equivalent) and/or APGB orthophotography.
- Digital Terrain Model (DTM) data must be incorporated where appropriate to account for topographic variation.
- Rectified imagery must achieve a level of spatial accuracy suitable for mapping and integration with GIS datasets.
- Rectification must be carried out by suitably trained personnel following accepted best practice.
- The limitations of rectified imagery must be understood and taken into account when undertaking mapping.

Rectification Software

AERIAL 5.36 is the specialist software used by Historic England for the rectification of oblique and vertical aerial photographs. It accurately georectifies aerial photographs, correcting for height and tilt distortions. This differs from 'rubber-sheeting' – a common function in GIS software – which distorts images to fit a map base and does not account for camera geometry or topographic variation.

Users must be familiar with best practice, including an awareness of potential limitations and pitfalls. Training should be provided by a suitably experienced practitioner. The Historic England Aerial Survey team can be contacted to discuss any training requirements.

AERIAL 5.36 is available from the Historic England Aerial Survey team on request.



Control Information

The absolute accuracy of mapped features is dependent on the quality of control information used during the rectification process. Ordnance Survey MasterMap – or map data with an equivalent level of accuracy – is a minimum requirement of AI&M projects.

APGB orthophotographs can provide a useful supplementary source of control as they show features that are not depicted on maps. They can be particularly valuable in areas such as open moorland where there are relatively few distinct features, such as field boundaries.

Control points should be clearly identifiable, stable features that can be accurately located in both the source image and the reference dataset. Where possible, control should be selected to achieve a high level of positional accuracy, typically within ± 2 metres of the referenced source, although this may vary depending on image quality and the availability of suitable control (Fig.1).

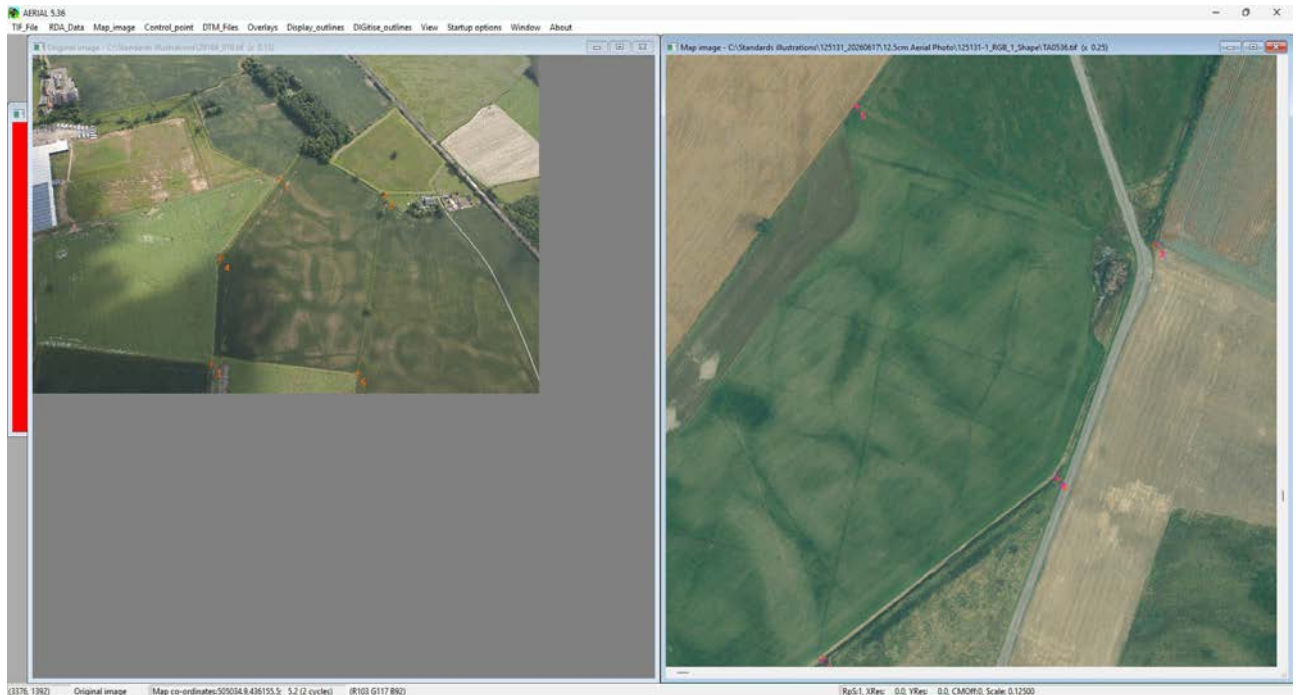


Figure 1: Using AERIAL 5.36 software for rectification of an oblique photograph (left). In this example the source for control is an APGB orthophotograph (right). Control points are placed in the same location on both the images. [Image NMR 28166_018 20 JUN-2011 © Historic England Archive and APGB © Bluesky International Limited 2024 and onwards].

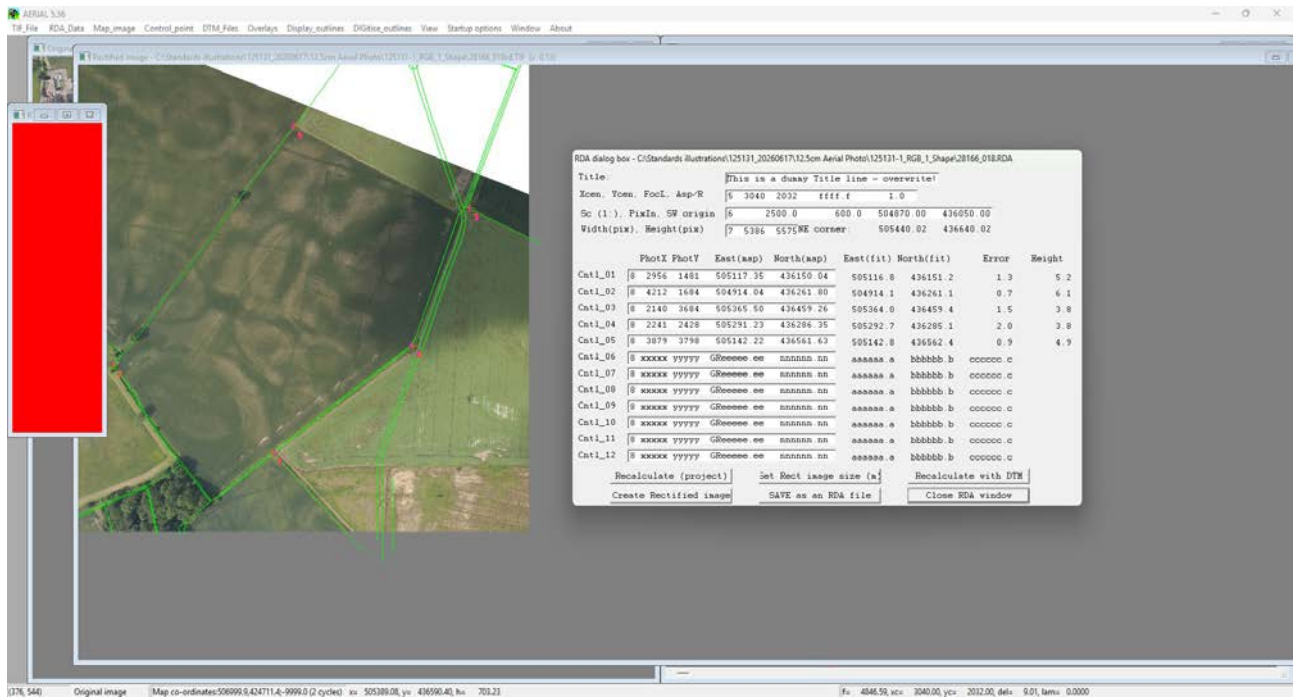


Figure 2: The rectified and georeferenced oblique photograph overlain by Ordnance Survey mapping to check the fit. The RDA table shows the control point locations, heights and error values. The rectified image can be inserted into a GIS. [Image NMR 28166_018 20 JUN-2011 © Historic England Archive and OS mapping © Crown Copyright and database right 2026. All rights reserved. Ordnance Survey Licence number 100024900].

DTM Data

Incorporation of DTM data into the rectification process improves accuracy by accounting for distortions in the image caused by topographic variation across the landscape. These distortions occur in both oblique and vertical photographs.

DTM data should have a minimum contour interval of 5m. This level of resolution is appropriate for most AI&M applications, providing a balance between capturing topographic variation and reducing the impact of modern ground surface change.

Digital Surface Model (DSM) data should not be used, as this is likely to introduce errors into the rectification process.

In areas where there have been significant changes in the ground surface between the date of the source photography and the DTM data (for example, extensive quarrying), inaccuracies may occur. In cases such as this, it may be appropriate to omit DTM data from the rectification process where its use would reduce overall accuracy.

AERIAL 5.36 can import height data in a number of different file formats, but the use of ASCII grid data is recommended.



Under the terms of the APGB agreement, Historic England can supply height data to external contractors funded by a Historic England grant. A sub-contractor licence must be signed before data can be provided. The Aerial Survey team should be contacted at the beginning of the project to arrange data provision and licencing.

Scanning

Photographs should be scanned at a resolution appropriate for rectification, ensuring sufficient detail is captured for accurate interpretation. This will depend on the scale of the photograph and the nature of the archaeology. A minimum resolution of 400dpi for oblique photographs and 600dpi for vertical photographs is generally recommended, but higher resolutions may be required where fine detail needs to be captured. Files should be saved as uncompressed Tagged Image File (.tif) format, which is suitable for storing high-quality raster images.

Outputs

Rectified aerial photographs should be exported as georectified raster images suitable for use within the project GIS environment. Rectified aerial photographs should be exported as TIFF raster images with an associated world file (.tfw) to ensure correct spatial referencing (Fig. 2).

Accuracy and Limitations

Rectified images are an interpretation based on available control and terrain data and may retain residual distortion. Factors such as terrain complexity, image quality and the availability of reliable control points can affect accuracy. Rectified imagery should be assessed critically and used in conjunction with other sources when undertaking mapping.



8. Use of Lidar

Lidar is a primary remote sensing dataset for AI&M projects, providing high-resolution elevation data that, when visualised, can reveal archaeological features. Its ability to penetrate vegetation cover and record subtle variations in topography makes it particularly valuable for identifying archaeological earthworks and understanding landscape morphology.

Standards for Use of Lidar

- Environment Agency lidar at a minimum resolution of 1m must be assessed.
- Multiple lidar visualisations must be created, including a multi-directional hillshade as a minimum.
- Lidar data must be used in conjunction with aerial photographs to inform interpretation and mapping.

Full technical guidance on the use and visualisation of lidar data is beyond the scope of these Standards and Guidance. For detailed guidance see:

Historic England 2018 Using Airborne Lidar in Archaeological Survey: The Light Fantastic. Available at [Using Airborne Lidar in Archaeological Survey - The Light Fantastic | Historic England](#)

EAC Guidance 10 The use of Airborne Laser Scanning (Lidar) in Archaeology across Europe has been developed by the European Archaeological Council (EAC). Available at [https://doi.org/10.5281/zenodo.14609210.](https://doi.org/10.5281/zenodo.14609210)

Environment Agency Lidar

Environment Agency lidar at a minimum resolution of 1m is available for the whole of England and is a standard source for AI&M projects. Where higher-resolution data exist (50cm or 25cm), they are likely to reveal subtle earthworks and finer archaeological detail. Environment Agency lidar is free to use under the [Open Government Licence](#) and can be downloaded from the [Defra Survey Data Download](#) portal. Further guidance on [Accessing Environment Agency lidar tiles from the](#) web is available.

In some areas, multiple years of coverage are available. The use of multi-temporal datasets can enhance interpretation. Earlier surveys may preserve evidence of features that have since been levelled or otherwise obscured by land-use change. Conversely, later



datasets may offer improved data quality, vegetation conditions, or processing techniques, making certain features more visible. Comparing datasets from different years can therefore improve confidence in mapping; it may also assist in identifying recent damage or change.

However, the benefits of analysing multiple lidar surveys must be balanced against the additional time and resources required. It is recommended that the 'National Lidar Programme' data should be used as the standard source with additional data used when appropriate. Earlier or alternative datasets should only be incorporated where they are likely to add clear interpretative value, particularly in areas subject to significant landscape change. This should be considered at Project Proposal or Design stage.

Use of Digital Terrain Model (DTM) and Digital Surface Model (DSM) data

The algorithms used to generate DTM data can have a smoothing effect on archaeological features and may interpolate across areas where surface features have been removed. As a result, subtle earthworks can be reduced in clarity or lost altogether.

In open areas, DSMs are recommended for mapping in preference to DTMs, as they retain more of the original surface detail and can better support archaeological interpretation.

In areas of woodland or other dense vegetation, DTM data should be assessed, as these datasets have been processed to filter and remove vegetation and woodland cover to produce an interpolated model of the underlying ground surface. The complementary use of both datasets can often provide the most robust basis for interpretation (Fig. 3).

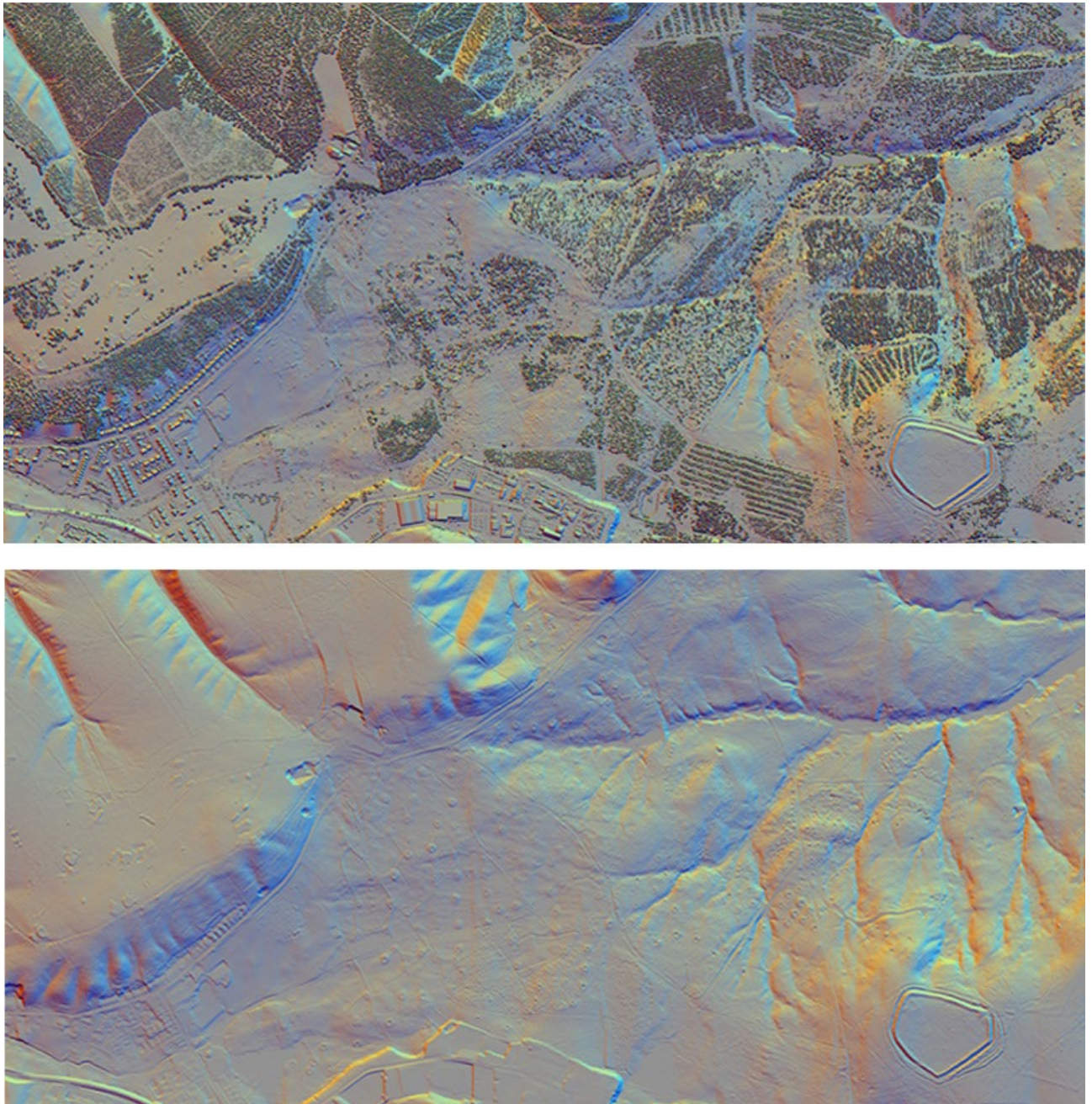


Figure 3: Cannock Chase, Staffordshire. Comparison of DSM (top) and DTM (bottom) shows that removal of surface features, such as tree cover, reveals previously obscured archaeological remains, including coal pits. However, the DTM can appear smoother due to reduced ground-point density and interpolation in vegetated areas, which may reduce the clarity of certain archaeological features. [Lidar © Historic England; source Environment Agency].

Visualisations

Lidar visualisations are two-dimensional images derived from lidar data to support archaeological interpretation. A wide range of visualisations can be generated, each using algorithms that process elevation data to represent topography in different ways. The effectiveness of each visualisation varies depending on the type of archaeological feature



and the landscape context; for example, some are more effective in flat, lowland environments, while others are better suited to upland or complex terrain. Detailed guidance is provided in: Kokalj, Ž and Hesse, R 2017 *Airborne Laser Scanning Raster Data Visualization. A Guide to Good Practice*. Available at <https://omp.zrc-sazu.si/zalozba/catalog/book/824>

To maximise the interpretative value of lidar data, multiple visualisations should be produced and analysed. These should always include a multi-directional hillshade, which provides an intuitive and accessible representation of terrain. Other visualisations should be selected according to their suitability for the project area and anticipated feature types. It is recommended that the most effective visualisations are identified and tested at an early stage so that they can be prioritised during mapping (Fig. 4).

Relief Visualization Toolbox (RVT)

RVT is recommended for producing the visualisations used in AI&M projects. It is a free software package developed by the Institute of Anthropological and Spatial Studies at the Research Centre of the Slovenian Academy of Sciences and Arts, with support from the European Commission's Culture Programme (ArchaeoLandscapes Europe) and the Slovenian Research Agency.

A standalone version of RVT is available to download [here](#). Alternatively, RVT GIS plugins for ArcGIS Pro, QGIS and Python are available to download [here](#). These integrated options can streamline the lidar visualisation and mapping workflow within a GIS environment.

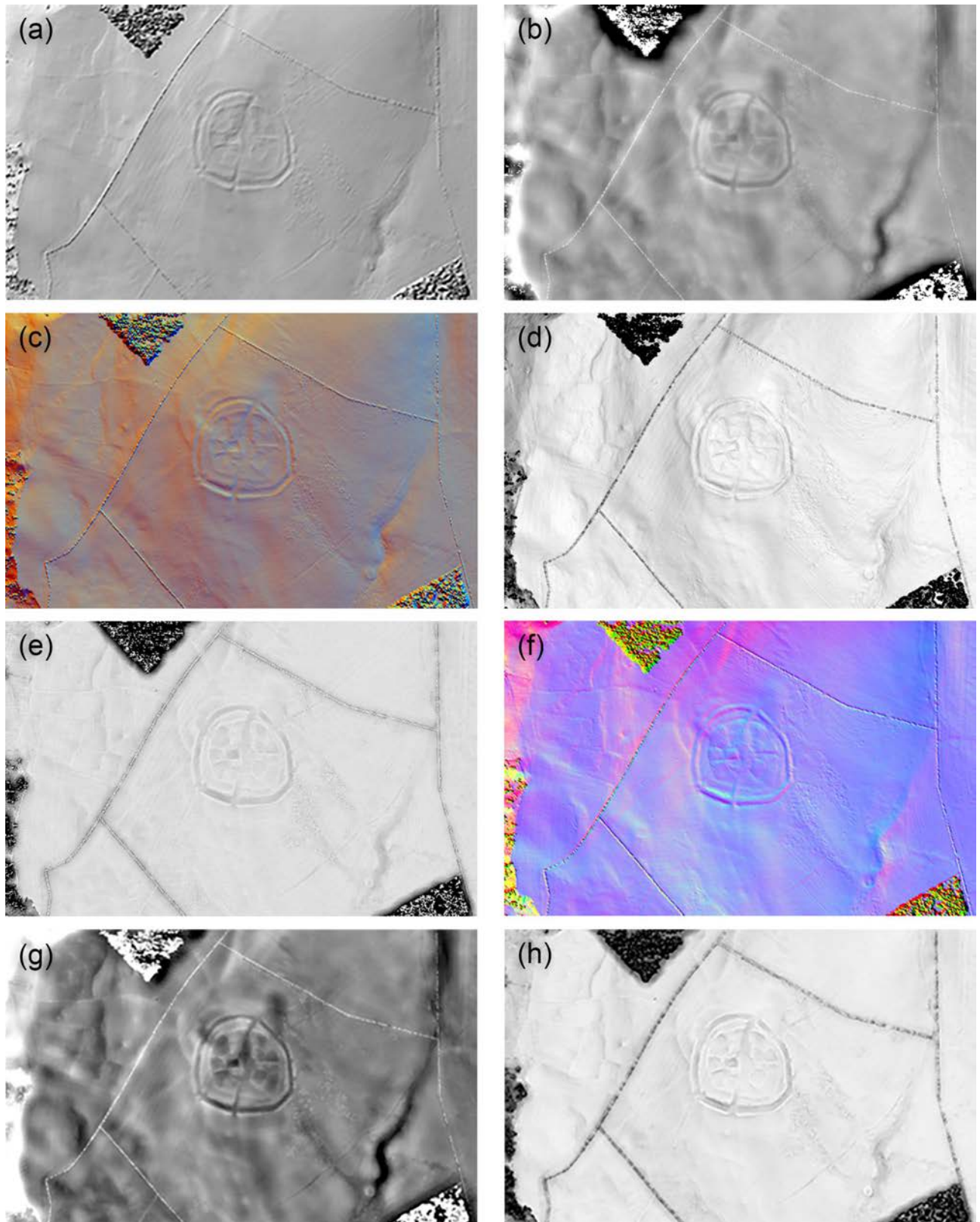


Figure 4: Comparison of lidar visualisations of the Iron Age defended enclosure, at Castle Hill, Lancashire. (a) Single-direction hillshade; (b) simple local relief model (c) multi-directional hillshade; (d) slope; (e) positive openness; (f) principal component analysis; (g) local dominance; and (h) Visualisation for Archaeological Topography (VAT blend). Differences highlight their varying sensitivity to microtopography, edge definition and subtle relief. [Lidar © Historic England; source Environment Agency].



9. Mapping

Mapping involves the systematic digitisation of archaeological features within a GIS environment, together with the creation of associated attribute data in accordance with the defined schema.

Standards for Mapping

- Mapping must be undertaken in a Geographic Information System (GIS).
- The coordinate system must be set to British National Grid (EPSG:27700).
- Mapping must accurately represent the form and extent of archaeological features as observed in the source data.
- Attribute data is mandatory and must use the schema described in Appendix 1.
- Mapping and symbology must conform to the AI&M schema defined in Appendix 2.
- The FISH heritage standards must be maintained for attribute data.
- The HER or Warden identifier must be the permanent UID and not an interim identifier.
- Attribute data is required to feature level, not monument level.

Software

Mapping must be undertaken in a GIS, such as ArcGIS Pro or QGIS, which allows for the archaeological information derived from aerial sources to be accurately mapped and descriptive information added.

An ArcGIS Pro project template is available from the Historic England Aerial Survey team to support consistent project set-up, including predefined layer structure, symbology and attribute schema. Its use is recommended where appropriate. Use of this template is recommended for projects undertaken in ArcGIS Pro.

Mapping Outputs

AI&M projects must produce four spatial data outputs:

- AI&M_Lines (as shapefile or feature class).
- AI&M_Polygons (as shapefile or feature class).
- Monument_Polygons (as shapefile or feature class).
- Project_Area (as shapefile or feature class).



Mapping and Symbology

The extent of each archaeological feature is mapped as observed in the source data, ensuring its morphology and extent are accurately represented. Mapping must be carried out at a scale appropriate to the source data. This means that almost all archaeological remains will be mapped as polygons. Single-line depiction is only used for ridge and furrow alignment and slopes where the t-hachure symbol is applied (Fig. 5). The monument polygon is used to represent the overall extent of the monument.

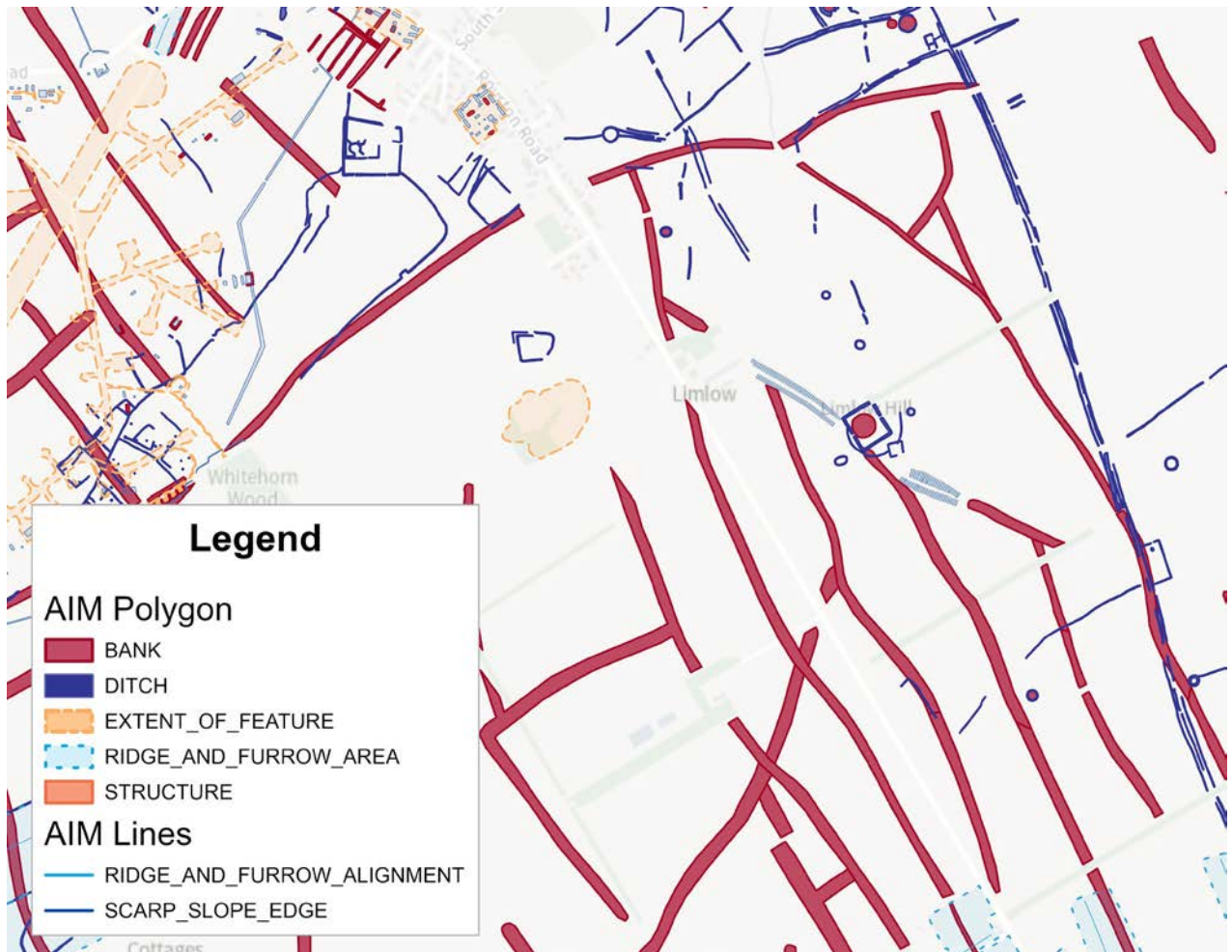


Figure 5: Detail of AI&M mapping from South West Cambridgeshire. [Mapping © Historic England. Base map © Crown Copyright and database right 2026].

Each archaeological feature is mapped using the appropriate AI&M layer. Symbology should be set to layer name.

Appendix 2 provides guidance on the appropriate use of each layer. Layer names must match exactly (including the use of capital letters and underscores) to ensure consistency across AI&M projects.



Attribute Data (textual data)

GIS attribute data is essential for each mapped element or feature (Fig. 6). It enables interrogation of the spatial data during the reporting stage and, importantly, allows the mapping data to function independently of HER monument records, increasing flexibility for AI&M data users and ensuring greater functionality in the Aerial Archaeology Mapping Explorer.

The attribute requirements for AI&M_Lines, AI&M Polygons, Monument_Polygons and Project_Area are outlined in Appendix 1. Field names and field types must match those specified exactly to ensure consistency and compatibility with existing datasets.

Use of the FISH heritage standards is mandatory for attribute data. Controlled vocabularies for period, monument types and evidence must be applied. These can be accessed at <http://www.heritage-standards.org.uk/fish-vocabularies/>. Standardised aerial photograph and lidar references must be used, as supplied by the Historic England Archive and Aerial Survey team.

The use of picklists within the project GIS is recommended to support efficient data entry and reduce errors such as typographical mistakes, abbreviations and non-standard terminology.

All attribute values must be capitalised. The most likely interpretation should be given for monument type and period, with uncertainty addressed within the monument record. The use of “UNCERTAIN” and multiple indexed terms should be avoided, as this reduces the usability of the dataset. Where multiple indexing is required, a backslash must be used to separate thesaurus terms (e.g. MEDIEVAL\POST MEDIEVAL or ROUND BARROWWINDMILL MOUND).

HER identifiers must be recorded using the permanent unique identifier (UID), not an interim identifier, to maintain the link between spatial data and monument records. All attribute fields must be populated where data exists. Where a value is not applicable or does not exist, a null value may be used (for example where no Historic England identifier (HE_UID) is available).



Field:	Add	Calculate	Selection: Select By Attributes Zoom To Switch Clear Delete Copy									
	FID	Shape *	OBJECTID	HE_UID	PERIOD	NARROWTYPE	BROAD_TYPE	EVIDENCE_1	SOURCE_1	EVIDENCE_2	SOURCE_2	HER_NO
323	324	Polygon	1133	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
326	325	Polygon	1134	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
327	326	Polygon	1135	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
328	327	Polygon	1136	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
329	328	Polygon	1137	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
330	329	Polygon	1138	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
331	330	Polygon	1139	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
332	331	Polygon	1140	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
333	332	Polygon	1141	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
334	333	Polygon	1142	440044	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE CIRCLE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV4998
335	334	Polygon	1143	1303468	POST MEDIEVAL	LEAT	LEAT	EARTHWORK	Historic England SfM...	EARTHWORK	Historic England SfM...	MDV80530
336	335	Polygon	1144	440047	NEOLITHIC/BRONZE AGE	STANDING STONE	STANDING STONE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53395
337	336	Polygon	1145	440047	NEOLITHIC/BRONZE AGE	RECUMBENT STONE	STANDING STONE	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53396
338	337	Polygon	1146	440047	BRONZE AGE	ROUND CAIRN	CAIRN	EARTHWORK	Historic England SfM...	EARTHWORK	Historic England SfM...	MDV3759
339	338	Polygon	1147	440047	UNCERTAIN	HOLLOW	CAIRN	EARTHWORK	Historic England SfM...	EARTHWORK	Historic England SfM...	MDV3759
340	339	Polygon	1148	440047	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE ALIGNMENT	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53397
341	340	Polygon	1150	440047	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE ALIGNMENT	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53397
342	341	Polygon	1151	440047	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE ALIGNMENT	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53397
343	342	Polygon	1152	440047	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE ALIGNMENT	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53397
344	343	Polygon	1153	440047	NEOLITHIC/BRONZE AGE	STANDING STONE	STONE ALIGNMENT	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV53398
345	344	Polygon	1154	1631073	BRONZE AGE	CAIRN	CAIRN	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV29078
346	345	Polygon	1155	1631073	BRONZE AGE	CAIRN	CAIRN	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV29078
347	346	Polygon	1156	1631073	BRONZE AGE	CAIRN	CAIRN	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV29078
348	347	Polygon	1157	1631073	BRONZE AGE	CAIRN	CAIRN	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV29078
349	348	Polygon	1158	1631073	BRONZE AGE	CAIRN	CAIRN	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV29078
350	349	Polygon	1159	1631073	BRONZE AGE	CAIRN	CAIRN	STRUCTURE	Historic England SfM...	STRUCTURE	Historic England SfM...	MDV29078

Figure 6: Example of a complete AI&M attribute table. Each polygon mapped within the GIS is represented by a corresponding row in the attribute table.

Data Cleaning

All teams working on AI&M projects are expected to undertake quality assurance on their own project data to ensure consistency. Data cleaning should be carried out as part of the mapping process to ensure that spatial and attribute data are complete, consistent and suitable for use.

This includes checking that attributes tables are filled out (with no empty fields) and that thesaurus terms have been used consistently across the project. This is particularly important where more than one individual has contributed to the mapping. Attribute values for each archaeological feature must be correct and consistent with those recorded in the monument record.

All archaeological monuments should have a monument polygon defining their full extent. Mapped features located outside a monument polygon should be checked, as they may indicate that elements have not been recorded within the HER monument record, or that the monument polygon requires expansion to incorporate additional features.



10. Monument Recording

Monument recording ensures that the results of AI&M projects are fully integrated into the HER. It provides a permanent, standardised record of archaeological features identified through mapping, linking spatial data with descriptive and interpretative information. This enables the results of AI&M projects to be used effectively for research, planning and the long-term management of the historic environment.

Standards for Monument Recording

- All archaeological monuments identified through the project must have a corresponding monument record created in an appropriate database.
- Monument records must be consistent with and correspond directly to the mapped spatial data.
- Monument records must describe the extent and character of the archaeological monument.
- Monuments dating to different periods must be recorded separately.
- Recording must follow MIDAS Heritage principles and relevant ALGAO advice.

HIAS principles

Heritage Information Access Simplified Principle 1 states that Local Authority HERs should be the first point of call for and primary trusted source of investigative research data and knowledge. The Historic England Research Record (formerly National Record of the Historic Environment (NRHE)) is currently being dispersed to local providers. Therefore, monument recording is ideally carried out by direct input to the appropriate local HER monument recording system.

Where this is not possible, the Historic England research recording system, Warden, may be used. The method of data exchange from Warden to the HER must be arranged at the Project Design stage and any associated costs agreed.

All recording must follow HE/MIDAS Heritage (the UK Historic Environment Data Standard) and Association of Local Government Archaeological Officer (ALGAO) guidelines, available at <https://archaeologydataservice.ac.uk/ifpl/>.



Unit of Record

The unit of record defines the archaeological monument or site for which a single monument record is created.

All archaeological monuments mapped by the project must have a corresponding monument record. The interpretation and text within the monument record must match the attributes in the spatial mapping.

Monuments dating to separate periods should be recorded separately. For example, a post-medieval quarry on the same site as a medieval settlement would require two monument records. A single record can be created for complex sites where overlapping phases cannot be clearly distinguished or where there is continuity of use, such as an Iron Age-Roman field system visible as cropmarks.

Each monument record should describe the full extent of the monument, not separated by artificial boundaries such as the parish boundary, modern field systems or the edge of the project area.

An example HER monument record, produced by an AI&M project can be found in Appendix 3.

Location Data

Monument polygons should be used to define the full extent of the archaeological monument within the HER database, where the system supports polygon geometry.

Where polygon geometry is not supported, points or lines may be used, although these provide only a limited representation of monument extent and must be interpreted in conjunction with the mapped spatial data.

Indexing

Period, monument type and evidence are mandatory and must match those recorded in the summary text and attribute data of the spatial mapping. Standard heritage vocabularies must be used. The latest evidence must be recorded, indicating whether the remains are upstanding, levelled or destroyed. Each monument record must include the OASIS event record identifier.

Summary Text

This should provide a concise summary of the evidence for the site. Use full sentences, avoid abbreviations and acronyms.

The first sentence should follow this structure:



A [period] [monument type] is visible as [evidence 1] on [source 1]. The feature has been [latest evidence], as shown on the latest [year] [source 2]. This monument was recorded as part of the [project name] Aerial Investigation and Mapping Project.

Additional detail may be included where required.

Sources

Sources must include the key aerial photographs used to map the site, including those that best illustrate the monument and those used to record the latest evidence for the site's condition.

Standard aerial photograph and lidar reference formats must be used, including the relevant archive name. Reference formats will be supplied by the Historic England Archive and Aerial Survey team.



11. Reporting

The reporting stage provides a structured synthesis and interpretation of the results of the AI&M project. It draws together spatial data, attribute data and monument records to present the character, extent and significance of the archaeological landscape. The report supports research, planning and the long-term management of the historic environment.

Standards for Reporting

- A Historic England Research Report must be produced, summarising and interpreting the results of the project.
- The report must summarise the results of the archaeological mapping and recording produced during the project.
- The report must include analysis of the character, diversity, distribution and associations of the archaeological features identified.
- Historic England Research Reports must conform to Historic England guidance, including accessibility requirements.
- Text must conform to Historic England House Style Guide.
- Reproduction permissions must be obtained for all illustrative material, and appropriate copyright and acknowledgement statements must be included.
- Accessible colours, as specified in Appendix 4, must be used for all illustrations.
- The completed report must be uploaded to the OASIS record.

Research Report Series

Historic England's Research Report Series (RRS) publishes research carried out or funded by Historic England. An RRS report must be produced on completion of the mapping and recording stage of the AI&M project, preferably by the project experts. The report must clearly summarise the results of the archaeological mapping and recording undertaken during the project.

Reports forming part of the RRS series must follow the Historic England House Style Guide and use the RRS template. The RRS template and guidance on its use can be found on the **Historic England Brand Hub** webpages.

The report must include analysis of the character, distribution and associations of the archaeological features identified.



Process for RRS Reports

Chapter plans and report content should be agreed with the Aerial Survey team at an early stage.

The draft report should be submitted to the Project Assurance Officer who will arrange circulation to Historic England staff for comment.

The final RRS report and RRS approval form should be submitted to the Project Assurance Officer who will sign off on the final version of the report and approve its inclusion on Historic England's Research Reports Database.

Illustrations

Authors must ensure that reproduction permissions are sought for any illustrations used in the report. The Historic England Archive will advise on reproduction of aerial photographs held in their collection and provide appropriate photograph references and copyright statements.

Accessible colours, as specified in Appendix 4, must be used to ensure that AI&M features are clearly distinguishable.



12. Quality Assurance

Quality Assurance ensures that the outputs of the AI&M project meet the required standards, satisfy the terms of the grant where applicable, and are suitable for integration with Historic England systems and HERs.

Standards for Quality Assurance

- Quality Assurance must be carried out by Historic England's Aerial Survey team.
- All project data must undergo internal quality checks prior to formal Quality Assurance.
- Any issues identified during Quality Assurance must be resolved ahead of project completion.

Quality Assurance Requirements

Historic England's Aerial Survey team will undertake quality assurance (QA) on projects using Historic England AI&M Standards.

All teams working on grant-funded AI&M projects must undertake internal quality checks on their own project data prior to formal QA to ensure consistency and completeness. Historic England's Aerial Survey team will provide advice as required and carry out QA on the analysis of aerial sources, mapping outputs and monument recording.

The project team must liaise with Historic England staff to agree the format and timetable for QA at the Project Proposal or Design stage. This will vary depending on the experience of the project team. For experienced teams, a minimum of 5% of the total project area will usually be quality assured. A greater proportion (up to 100%) should be considered for new or less experienced team members.

During the project delivery phase, project teams must identify a suitable area for QA in consultation with Historic England staff. This area should include a representative range of archaeological features and work completed by each team member. It may also include areas where issues have been encountered, such as interpretation challenges or uncertainty in depiction.

The project team is responsible for supplying all required data for the selected QA area. This must include all aerial sources assessed (including those not used for mapping), all



rectified photographs and associated files, and all monument records. Mapping data must be provided in a format suitable for use in ArcGIS Pro.

Quality Assurance Checklist

For the QA area only, the project team must supply:

- All aerial photographs, lidar and other source material
- Rectified photographs, with world files
- DTM data used in rectifications.
- All HER or Warden research records, as spatial data.
- All new or amended monument records, as .pdf.
- AI&M spatial data.

Where in-person QA is not possible, data may be supplied digitally.



13. Project Closure, Archiving and Dissemination

Project closure ensures that all project outputs are deposited, accessible and available for future use.

Standards for Project Closure, Archiving and Dissemination

- All project deliverables must be deposited with the relevant HER(s).
- Project spatial data must be submitted to the Historic England Aerial Survey team.
- The final report must be published on the Historic England Research Report Database.
- The project must be completed with an OASIS V record submission.

Upon completion, all project deliverables must be provided to the relevant HER(s). This will allow the project data to inform future research and planning decisions.

Project data must also be submitted to the Historic England Aerial Survey team, who will upload spatial datasets to the Aerial Archaeology Mapping Explorer and the Historic England Open Data Hub.

The final report must be published on the Historic England Research Report Database and uploaded to the OASIS V record.



14. References

European Archaeological Council (2024) *Guidance 10: The Use of Airborne Laser Scanning (Lidar) in Archaeology across Europe*. Available at:

<https://doi.org/10.5281/zenodo.14609210> (Accessed: 9 June 2026).

Evans, S. (2019) *Historic England Aerial Investigation & Mapping (formerly National Mapping Programme) Standards Technical Review*. Available at:

<https://historicengland.org.uk/research/results/reports/46-2019> (Accessed 9 June 2026).

Historic England (2018) *Using Airborne Lidar in Archaeological Survey: The Light Fantastic*. Swindon: Historic England. Available at:

<https://historicengland.org.uk/images-books/publications/using-airborne-lidar-in-archaeological-survey/> (Accessed: 9 June 2026).

Kokalj, Ž. and Hesse, R. (2017) *Airborne Laser Scanning Raster Data Visualization: A Guide to Good Practice*. Ljubljana: ZRC Publishing. Available at: **[https://omp.zrc-](https://omp.zrc-sazu.si/zalozba/catalog/book/824)**

[sazu.si/zalozba/catalog/book/824](https://omp.zrc-sazu.si/zalozba/catalog/book/824) (Accessed: 9 June 2026).

Historic England (n.d.) *Using Environment Agency lidar data*. Available at:

<https://historicengland.org.uk/content/docs/research/using-ea-lidar-data-pdf/> (Accessed: 9 June 2026).



15. Contact Details

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16. Appendix 1: Attribute Data Tables

For AI&M_lines and AI&M_polygons the minimum attribute data requirements are as follows:

Table 1: Attribute Data Tables.

Field Name	Type	Description	Sample data
LAYER	Text (50)	The form of the archaeological feature (AI&M Layer Name)	BANK
PERIOD	Text (254)	Date of feature (Periods List). Single or dual indexed terms.	MEDIEVAL or MEDIEVAL/POST MEDIEVAL
NARROWTYPE (please note lack of underscore, otherwise the field name is too long in GIS)	Text (254)	Monument Type (from Monument Types Thesaurus). Specific monument type for individual features. Avoid dual indexing.	TOFT
BROAD_TYPE	Text (254)	Monument Type (from Monument Types Thesaurus). Broader monument type to enable grouping of individual features. This field may not be useful in all cases, if not simply repeat the narrow type field. Avoid dual indexing.	SETTLEMENT
EVIDENCE_1	Text (254)	Form of remains (Evidence Thesaurus) as seen on SOURCE_1.	EARTHWORK
SOURCE_1	Text (254)	Source feature was mapped from aerial photograph or lidar.	HISTORIC ENGLAND ARCHIVE OS/67307 V 0065 20-AUG-1967
EVIDENCE_2	Text (254)	Latest form of remains (Evidence Thesaurus) as seen on SOURCE_2. If	LEVELLED EARTHWORK



Field Name	Type	Description	Sample data
		EVIDENCE_1 is CROPMARK, simply repeat CROPMARK (unless now quarried away then this would be DESTROYED MONUMENT).	
SOURCE_2	Text (254)	Latest available source aerial photograph or lidar to give indication of current state of preservation. For cropmarks sites repeat original source. Some professional discretion may be required if an earthwork shows well on lidar but is not visible on later but poorly lit photography.	LIDAR English Heritage Trust DSM 03 14-MAR-2016
HE_UID	Text (254)	Warden Unique Identifier (UID) for those monuments recorded in Warden or concorded with existing HE research records.	23092
HER_NO	Text (254)	HER number for those monuments recorded in the HER or concorded with existing HER records.	10928 or HER5683
HER_PREF_REF* *In some cases, this may be the same as the HER number.	Text (254)	Alternative HER UID that is used to create the Heritage Gateway URL	MNN10928 or MBD1198

There may be the need to add additional attribute fields if the monument has been recorded in another monument recording system previously. Use only as necessary HER_NO_2, HER NO_3 or HE_UID_2, HE_UID_3



Field Name	Type	Description	Sample data
HE_UID_2	Text (254)	Warden Unique Identifier (UID) for those monuments recorded in the HE research record or concorded with existing records.	23092
HER_NO_2	Text (254)	HER number for those monuments recorded in the HER or concorded with existing HER records.	10928 or HER5683

For MONUMENT_POLYGONS the attribute data is as follows:

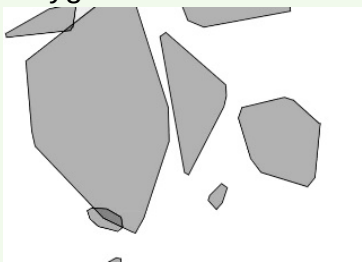
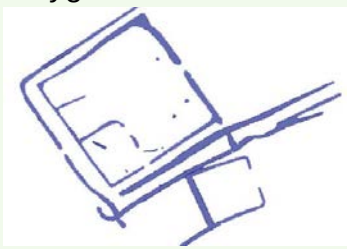
Field Name	Type	Description	Sample data
HE_UID	Text (254)	Warden Unique Identifier (UID) for those monuments recorded in Warden or concorded with existing Warden records.	23092
HER_NO	Text (254)	HER number for those monuments recorded in the HER or concorded with existing HER records.	10928 or HER5683
HER_PREF_REF	Text (254)	Alternative HER UID that is used to create the Heritage Gateway URL	MNN10928 or MBD1198



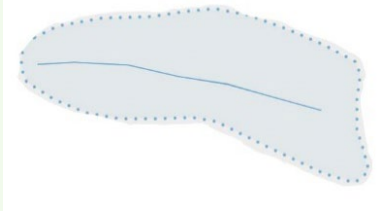
17. Appendix 2: Mapping Layer Conventions

The layer conventions are as follows:

Table 2: AI&M mapping layer name conventions

Layer Name	Description	Type
MONUMENT_POLYGON	Polygon encompassing features recorded.	Polygon 
BANK	Polygon for features such as banks, platforms, mounds and spoil heaps.	Polygon 
DITCH	Polygon for cut features such as ditches, hollows, pits or hollow ways.	Polygon 
EXTENT_OF_FEATURE	Polygon outlining a large area or group of features such as industrial complexes or boundaries of military complexes.	Polygon 



Layer Name	Description	Type
RIDGE_AND_FURROW_AREA and RIDGE_AND_FURROW_ALIGN MENT	Polygon depicting the outline of a ridge and furrow plot. Polyline depicting the direction and form of a block of ridge and furrow.	Polygon and Polyline 
STRUCTURE	Polygon for built features including stone, concrete, metal and wood.	Polygon 
SCARP_SLOPE_EDGE	Polylines in form of a schematic t-hachure depicting break of slope	Polyline 



18. Appendix 3: Example HER Monument Record

Monument

[232777] Monument: Ridge and Furrow, Hatch Grove (Post Medieval Ridge and Furrow)

System Reference Numbers

Primary Reference Number: 232777

Legacy ID: None

Monument Names

Name	Name Type
Ridge and Furrow, Hatch Grove (Post Medieval Ridge and Furrow)	Primary

Location Information

National Grid References

TQ3967493479

Localities/Administrative Areas

Borough: Waltham Forest

County: Greater London Authority

Descriptions

Description Type :Summary

Post Medieval Ridge and Furrow is visible as earthworks on 2023 0.25m lidar data (commissioned by City of London Corporation). These features were mapped as part of the 2024-2025 Epping Forest Aerial and Investigation Project carried out by Historic England.

Description Type :Full

Post Medieval Ridge and Furrow is visible as earthworks on 2023 0.25m lidar data (commissioned by City of London Corporation). The feature comprises a single long sub-rectangular unit on a NE/SW alignment. The distance between furrows measures c.5.5m. These features were mapped as part of the 2024-2025 Epping Forest Aerial and Investigation Project carried out by Historic England.

Bibliographic Source Citations

Source Number	Source Title
None	[231398] Bibliographic Source: Epping Forest Aerial Investigation and Mapping Project (2025)



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Monument

Monument Construction Phases

Construction Phase	Period	Monument Type	Construction Phase Start Date	Construction Phase End Date
	[17257] Post Medieval	Ridge And Furrow	None	None

Monument Use Phases

Functional Type	Period	Use Phase Start Date	Use Phase End Date
	[17257] Post Medieval	None	None

Associated Activities

[231249] Activity: Aerial Investigation and Mapping at Epping Forest (2024-2025)

Figure 7: An illustrative monument record produced as part of an AI&M project for the Greater London HER.



19. Appendix 4: Accessible Colours for Illustrations

Table 3: Accessible colours with codes

Layer Name	Colour (Hex)	Colour (RB)
STRUCTURE	F46D43	244,109,67
DITCH	313695	49,54,149
BANK	A50026	165,0,38
RIDGE_AND_FURROW_AREA	74ADD1	116,173,209
RIDGE_AND_FURROW_ALIGNMENT	74ADD1	116,173,209
EXTENT_OF_FEATURE	FDAE61	253,174,97
SLOPE	4575B4	69,117,180



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