Historic England

Geophysics

Verlucio and Environs Project, Bromham House Farm and Villa, Bromham, Wiltshire, Report on Geophysical Surveys, January and March 2018

Neil Linford, Paul Linford and Andrew Payne

Discovery, Innovation and Science in the Historic Environment

Research Report Series no. 64-2018

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE REPORT ON GEOPHYSICAL SURVEYS, JANUARY AND MARCH 2018

Neil Linford, Paul Linford and Andrew Payne

NGR: ST 9735 6655

ISSN 2059-4453 (Online)

The Research Report Series incorporates reports by Historic England's expert teams and other researchers. It replaces the former Centre for Archaeology Reports Series, the Archaeological Investigation Report Series, the Architectural Investigation Report Series, and the Research Department Report Series.

Many of the Research Reports are of an interim nature and serve to make available the results of specialist investigations in advance of full publication. They are not usually subject to external refereeing, and their conclusions may sometimes have to be modified in the light of information not available at the time of the investigation. Where no final project report is available, readers must consult the author before citing these reports in any publication.

For more information write to Res.reports@HistoricEngland.org.uk
or mail: Historic England, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD

Opinions expressed in Research Reports are those of the author(s) and are not necessarily those of Historic England.

SUMMARY

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted over a series of cropmarks at Bromham House Farm and the presumed location of the Bromham Roman villa, Bromham, Wiltshire, as part of the Verlucio and Environs project. The vehicle-towed caesium magnetometer survey (27.7ha) covered an extensive complex of enclosure ditches, boundaries and field systems, of possible Iron Age or Roman date, together with three probable Bronze Age barrows. Additional later medieval or post medieval boundaries are also present, together with quarrying activity of unknown date. The GPR coverage (20.6ha) targeted the majority of monuments identified from the cropmark record and investigated a series of small paddocks to the south west of the survey area, possibly the site of the Bromham Roman villa first identified through excavation in the late C18th. The geophysical surveys have revealed evidence for more extensive multi-period activity across the site, although the precise location of structural remains associated with the villa remains ambiguous.

CONTRIBUTORS

The geophysical fieldwork was conducted by Neil Linford, Paul Linford and Andrew Payne.

ACKNOWLEDGEMENTS

The authors are grateful to all the landowners, for allowing access to the site and facilities kindly provided at Bromham House Farm for the surveys to take place.

ARCHIVE LOCATION

Fort Cumberland, Portsmouth.

DATE OF SURVEY

The fieldwork was conducted over two weeks between 15th to 19th January 2018 and 5th to 9th March 2018, with the report completed on 18th October 2018. The cover image shows the caesium magnetometer survey in progress over land belonging to Bromham House Farm.

CONTACT DETAILS

Paul Linford, Geophysics Team, Historic England, Fort Cumberland, Fort Cumberland Road, Eastney, Portsmouth PO4 9LD.
Tel: 02392 856769. Email: paul.linford@historicengland.org.uk

CONTENTS

INTRODUCTION

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted over a series of cropmarks at Bromham House Farm and the presumed location of the Bromham Roman villa, Bromham, Wiltshire, as part of the Verlucio and Environs project (Roberts 2017). This project has been developed following the success of the wider area West Wiltshire National Archaeological Identification Survey (NAIS) which recognised the significance of the site at Verlucio and recommended a separate phase of investigation (Last *et al.* 2016, 49, 70, Figures 25, 26 and 40). Verlucio, currently the only unscheduled fortified Roman town in southern Britain, developed as a settlement on the Roman road between Bath and London via Silchester (route XIV in the Antonine Itinerary), which later formed part of a major Anglo-Saxon boundary known as Wansdyke. The NAIS project showed that the environs around the core of Verlucio have outstanding archaeological potential including the sites of the Nuthills and Bromham Roman villas, the roadside settlement east of Verlucio and several large square double-ditched enclosures (Figure 1). Overall, this small town and its landscape may present one of the most important unprotected landscapes of Roman date in England, with the later prehistoric precursor sites and post-Roman developments being equally informative in assessing the overall significance of this region.

The aim of the geophysical surveys were to investigate cropmarks south of the Roman town representing a probable later prehistoric oval enclosure with traces of an outer ditch and several internal pits (AMIE Monument HOB UID 1578325), and three Bronze Age round barrows (HOB UID 1578332, 1578334 and 1578336). Cropmarks related to a probable later prehistoric field system are also found in this area (HOB UID 1578329), together with a possible linear boundary ditch (HOB UID 1578341) and fragments of an enclosure (HOB UID 1578347), both of uncertain date. Despite various episodes of excavation, from circa 1765 onwards, the precise location of the Bromham villa remains rather vague (HOB UID 211997), although Roman pottery and a blue glass bead were discovered when digging the foundations of council houses on the site in 1911. A medieval or post medieval field boundary visible as an earthwork bank aligned NE-SW, extends 280m from the houses (HOB UID 211997).

Course loamy and sandy soils of the Fyfield 4 association (571g) have developed over Cretaceous Lower Greensand (Geological Survey of Great Britain 1974; Soil Survey of England and Wales 1983). The fields were down to grass on Bromham House Farm and fallow following harvest of a maize crop in the autumn elsewhere, leaving an uneven surface along extant rows of stubble with some deep vehicle ruts and extensive waterlogging. Weather conditions were generally bright and fine, although very cold.

METHOD

Magnetometer survey

Magnetometer data were collected along the instrument swaths shown on Figure 2 using an array of six Geometrics G862 caesium vapour sensors mounted on a non-magnetic sledge (Linford *et al.* 2018a). The sledge was towed behind a low-impact All-Terrain Vehicle (ATV) which housed the power supply and data logging electronics. Five sensors were mounted 0.5m apart in a linear array transverse to the direction of travel and, vertically, 0.36m above the ground surface. The sixth was fixed 1.0m directly above the centre of this array to act as a gradient sensor. The sensors sampled at a rate of 25Hz resulting in an along-line sample density of ~0.15m given typical ATV travel speeds of 3.5-4.0m/s. As the five non-gradient sensors were 0.5m apart, successive survey swaths were separated by approximately 2.5m to maintain a consistent traverse separation of 0.5m. Navigation and positional control were achieved using a Trimble R8 Global Navigation Satellite System (GNSS) receiver mounted on the sensor platform 1.65m in front of the central sensor and a second R8 base station receiver established using the Ordnance Survey VRS Now correction service. Sensor output and survey location were continuously monitored during acquisition to ensure data quality and minimise the risk of gaps in the coverage.

After data collection corresponding readings from the gradient sensor were subtracted from the measurements made by the other five magnetometers to remove any transient magnetic field effects caused by the towing ATV or other nearby vehicles using the upward continuation method described by Linford *et al.* (2018a, Fig 4). The ATV and magnetometer electronics also create a slight constant magnetic bias dependent on the direction of travel relative to magnetic north (heading error) and an additional variable bias can be introduced owing to the diurnal variation of the Earth's magnetic field. To correct for these effects the median value of each instrument traverse was adjusted to zero by subtracting a running median value calculated over a 32s (approx. 100m) 1D window (see for instance Mauring *et al.* 2002). A periodic striping effect due to ploughing was apparent in the datasets from all but the easternmost of the fields surveyed and this was also removed using the Fourier domain directional cosine filter technique (cf Linford *et al.* 2018a, Fig 3; 2018b, Figure 9). A linear greyscale image of the combined magnetic data after these operations is shown superimposed over the base Ordnance Survey (OS) mapping in Figure 4 and minimally processed versions of the range truncated data (-150 to +175nT/m) are shown as trace plots in Figures 6 and 7, and as equal area greyscale images following the processing discussed above in Figures 8 and 9.

Ground Penetrating Radar survey

A 3d-Radar MkIV GeoScope Continuous Wave Step Frequency (CWSF) Ground Penetrating Radar (GPR) system was used to conduct the survey collecting data with a multi-element DXG1820 vehicle towed, ground coupled antenna array (Linford *et al.* 2010; Eide *et al.* 2018). A roving Trimble R8 Global Navigation Satellite System (GNSS) receiver, together with a second R8 base station receiver established using the Ordnance Survey VRS Now correction service, was mounted on the GPR antenna array to provide continuous positional control for the survey collected along the instrument swaths shown on Figure 3. Data were acquired at a 0.075m x 0.075m sample interval across a continuous wave stepped frequency range from 40MHz to 2.99GHz in 4MHz increments using a dwell time of 3ms. A single antenna element was monitored continuously to ensure data quality during acquisition together with automated processing software to produce real time amplitude time slice representations of the data as each successive instrument swath was recorded in the field (Linford 2013).

Post-acquisition processing involved conversion of the raw data to time-domain profiles (through a time window of 0 to 75ns), adjustment of time-zero to coincide with the true ground surface, background and noise removal, and the application of a suitable gain function to enhance late arrivals. Representative profiles from the GPR survey are shown on Figure 10. To aid visualisation amplitude time slices were created from the entire data set by averaging data within successive 2.5ns (two-way travel time) windows (e.g. Linford 2004). An average sub-surface velocity of 0.088m/ns was assumed for Bromham House Farm (0.8m/ns for Bromham Villa) following constant velocity tests on the data, and was used as the velocity field for the time to estimated depth conversion. Each of the resulting time slices therefore represents the variation of reflection strength through successive ~0.11m intervals for Bromham House Farm (~0.1m for Bromham Villa) from the ground surface, shown as individual greyscale images in Figures 5 and 11 to 17. Further details of both the frequency and time domain algorithms developed for processing this data can be found in Sala and Linford (2012).

Due to the size of the resultant data set a semi-automated algorithm has been employed to extract the vector outline of significant anomalies shown on Figure 19. The algorithm uses edge detection to identify bound regions followed by a morphological classification based on the size and shape of the extracted anomalies. For example, the location of possible pits is made by selecting small, sub circular anomalies from the data set (Linford and Linford 2017).

RESULTS

Magnetometer survey

A graphical summary of significant magnetic anomalies [**m42-116**] discussed in the following text superimposed on base OS map data is provided in Figure 18 continuing the sequence used for previously reported surveys in the project area (Linford *et al.* 2018b, Figure 13).

Bromham House Farm

The large oval, presumably Iron Age enclosure, is defined by an inner ditch circuit [**m42**], which exhibits variable levels of enhancement particularly to the south and south west, together with a concentric southern outer ditch [**m43**] of generally weaker response. A broad sinuous, strongly positive ditch or trackway [**m44**] breaches the enclosure and appears to initially respect the alignment of [**m42**], before continuing south-east where it changes in character to a series of weaker, narrow linear anomalies [**m46**] indicative of double parallel flanking ditches defining a road corridor or droveway. Further to the east [**m46**] appears to bifurcate at [**m47**] into separate double-ditched trackways continuing south east [**m48**] and heading to the east [**m49**]. A scatter of pit type anomalies [**m50**], together with an increased magnitude of response visible along some sections of [**m48**], might perhaps be suggestive of "roadside" occupation, although this could also be due to natural background variation of the geology and soils in this area.

A second possible trackway [**m45**] interrupts both of the ditches [**m42**] and [**m43**], and appears as a strongly enhanced, broad anomaly within the interior of the oval enclosure to the south, perhaps due to the presence of occupation or industrial activity found here. Beyond the enclosure to the south [**m45**] gradually changes to a series of parallel, initially weaker ditches 8m apart [**m51**], similar to the alteration of response along [**m46**], although the magnitude of response increases significantly at [**m52**] adjacent to an area of probable industrial activity indicated by a group of intense anomalies, [**m53**] and [**m54**], close to the modern field boundary. Further possible entrances are also found on the eastern side of the enclosure circuit at [**m55**] and [**m56**], and are perhaps associated with a series of ditch type anomalies [**m57**] rather than additional trackways.

Densely clustered, high magnitude oven, hearth or pit-type responses [**m58**] appear both within the interior and immediately to the north of the enclosure at the intersection of the trackways [**m44**] and [**m45**], continuing to a weakly defined boundary ditch anomaly [**m59**] which extends into the adjacent field to the west. Possible industrial activity may also be defined by intense magnetic anomalies at [**m61**] and [**m62**], and it is possible that this was deliberately set

a short distance away from the enclosure along the course of the trackway [**m44**]. A further strong, industrial type anomaly occurs at [**m63**] on the south west segment of the inner enclosure ditch [**m42**]. Some poorly defined negative rectilinear anomalies [**m64**] are perhaps associated with stone structures within the enclosure, together with some similar annular shaped responses at [**m65**] and [**m66**].

A linear boundary ditch [**m67**] follows a course approximately parallel to and 100m to the north of [**m44**] becoming a double-ditched alignment for a short section at [**m68**]. This then branches into three sections: [**m69**] heading to the north, [**m67**] continuing the main alignment heading west, and [**m59**] again extending east-west into the adjacent field.

The well-defined ring-ditch [**m70**] of the large, plough degraded, Bronze Age round barrow has a diameter of 52m and appears to be respected by the enclosure system [**m57**] as a pre-existing landscape feature. A number of localised positive anomalies are found within [**m70**] and may, possibly, represent associated funerary activity or could equally relate to non-contemporary occupation. Ring-ditches of the two other smaller round barrows are found at [**m71**] and [**m72**], ~27-29m in diameter, with some ferrous disturbance in the centre of [**m72**]. The ditch of [**m72**] also appears narrower and less substantial than [**m71**], perhaps suggesting either differing construction or poorer preservation due to the previous agricultural regime in the field to the south. A further very large pit or quarry type response [**m73**], some 5m across, appears significant and is located 40m to the west of [**m72**].

Ceramic field-drains [**m74**] concentrated in a lower lying area of the site are associated with a much subdued and less variable background magnetic response, possibly indicating a change in the soil type or geology influenced by seasonal waterlogging. Numerous possible pit-type and subtle linear anomalies [**m75-77**] are present south of the area of quieter magnetic response, and may represent poorly defined remnants of field and ditched enclosure systems with associated settlement activity. As with [**m50**] to the north, a natural origin for this disturbed and variable response cannot be entirely discounted. A partially resolved trackway is indicated by weakly defined parallel linear anomalies [**m78**] to the south, possibly exhibiting a faint response due to its distance from the concentrated focus of settlement activity. Both [**m77**] and [**m78**] also corroborate crop mark evidence found within this field (Last *et al*. 2016).

Bromham House Farm NW Area

A strongly resolved linear boundary ditch [**m79**] extends north from an apparent intersection with the perimeter of the oval enclosure [**m42**], and routeway [**m44**] which skirts around its northern perimeter, although the precise relationship between these anomalies is not entirely clear as their

conjunction occurs beneath the modern field boundary. The boundary ditch at [**m79**] also extends the line of [**m45**] which cuts through the centre of enclosure **[m42]** and may represent the continuation of the trackway towards the location of the Roman town. The course of [**m44**] may continue beyond the enclosure, heading to the east [**m80**], but this is only partially described in the current survey coverage. A number of weakly resolved linear ditch type anomalies head to the west [**m81**], and north-west, [**m82**] and [**m83**], possibly representing fragments of a field or enclosure system to the west of [**m79**].

The density of archaeological activity appears more concentrated to the west of [**m79**], suggesting this ditch forms a significant boundary, and is characterised by two sub-rectangular multiple ditched enclosures [**m84**] and [**m85**] connected by a linear ditch [**m86**], with evidence for quarrying [**m87**] and numerous pit-type responses found between the enclosures. Although both [**m84**] and [**m85**] are only partially described in the current survey coverage the enclosures are, perhaps, more typically Roman in form. Further evidence for pits and ditches is found to the west of the enclosures [**m88-90**], grouped around a series of more substantial and intense thermoremanent responses [**m91-94**], likely to represent industrial activity such as furnaces, kilns or ovens, perhaps also associated with the quarrying.

Bromham Villa

The network of rectilinear enclosures [**m95-101**] and a system of connecting double-ditched droveways [**m102-108**] found here is typical of organised Romano-British landscapes associated with villa settlements (cf Linford *et al.* 2013). It is possible that several phases of activity are represented owing to the differing alignments of some of the constituent ditch anomalies (for example at [**m95**] and [**m96**]). The most complex arrangement of enclosures is found to the south [**m96-98**] adjacent to the presumed site of the Bromham Roman villa in the vicinity of the council houses, although there is no convincing evidence for structural remains beyond a tentative pattern of negative anomalies within [**m97**] and [**m98**]. A group of intensely magnetised anomalies [**m109**] may possibly represent significant thermoremanent features, perhaps even associated with Roman building remains, but are too close to the modern buildings to allow a more confident interpretation.

The double-ditched droveway [**m102**] and [**m103**] follows a curvilinear alignment and meets two further parallel ditched trackways [**m104**] and [**m105**], possibly part of a large enclosure extending into the adjacent field to the east where it is partially defined by crop marks (Last *et al.* 2016). It then changes direction on a course to the WNW [**m106**] where it is joined by a straight alignment [**m107**] running NNE broadly parallel to a system of further trackways [**m108**] and field boundaries [**m110-113**]. A fragmented series of broad, more diffuse, linear anomalies [**m114**] crosses the field system and may

represent a routeway or field boundary aligned on a partially preserved extant field boundary also shown on historic mapping with a continuation [**m108**] to the north (OS Historic County Mapping Series: Wiltshire 1843 - 1893 Epoch 1).

The precise relationship of [**m114**] with the adjacent ditch systems is difficult to determine as the trackway [**m107**] appears to either stop or be cut by this boundary, whereas ditch [**m110**] continues to cross-through to the north suggesting a later superimposed phase. A series of further amorphous responses to the south of [**m108**] may represent an extension of the boundary, perhaps formed from in-filled hollows caused by long term trackway erosion, but coverage in this area was curtailed due to inaccessible ground conditions at the time of the survey.

Scatters of localised positive anomalies occur throughout this area and may represent pits or perhaps natural ground disturbance. A more weakly defined, amorphous response [**m115**] found to the north-west is possibly associated with an adjacent cluster of more strongly positive anomalies, surrounded by an oval arc of negative readings [**m116**], that may relate to some more significant archaeological activity.

Ground Penetrating Radar survey

A graphical summary of the significant GPR anomalies, [**gpr33-73**] discussed in the following text, superimposed on the base OS map data, is provided in Figure 19 continuing the sequence used for previously reported surveys in the project area (Linford *et al.* 2018b, Figure 14).

Bromham House Farm

Significant reflections have been recorded to approximately 50ns before the signal begins to become attenuated. The very near-surface data shows animal runs [**gpr33**] from the field gates, together with evidence for badger setts [**gpr34**] extending from the field margins. Some decoupling of the antenna from the ground surface is evident in the data to approximately 12.5ns (0.55m) and follows the direction of the GPR instrument swaths shown in Figure 3. A previous cultivation pattern also runs orthogonal to the instrument swaths, composed of parallel linear anomalies spaced approximately 5m apart. The response to the underlying geology appears from 10ns (0.44m) onwards together with a "herring bone" pattern of field drains [**gpr35**]. It is of interest to note that there is little correlation with the magnetic response to ceramic field drains in the vicinity of [**gpr35**], although these are quite clearly evident at [**m74**] in the adjacent field. Whilst this may be due to different construction materials for the drains, other more significant magnetic anomalies, for example [**m46**], also exhibit a markedly reduced magnitude of response here.

The response to the inner ditch of the oval enclosure appears as a low amplitude anomaly [**gpr36**] (cf [**m42**]) from between 12.5 and 37.5ns (0.55 to 1.65m), with a slightly variable width along its course of approximately 2 to 3m. The outer ditch [**gpr37**] produces a more subtle response in the radar data, perhaps also reflecting the reduced magnitude of the corresponding magnetic anomaly [**m43**]. Two ditch type anomalies [**gpr38**] and [**gpr39**] cut through the oval enclosure between 12.5 and 40ns (0.55 to 1.76m), with [**gpr39**] continuing in the data to 47.5ns (2.09m). The response to [**gpr38**] is most clearly defined through the centre of the oval enclosure, corresponding to the magnetic response [**m45**], with a wide, gently shelving profile narrowing from 10m to 2m over the recorded depth range, partially flanked by a more subtle section of ditch to the west. To the south [**gpr38**] appears to continue as narrow, high amplitude anomaly [**gpr40**] corresponding to a similar change in response found in the magnetic data. The profile of [**gpr39**] is similar to [**gpr38**], perhaps a slightly sharper ditch cut narrowing from a width of 10m to 4m, with the response weakening to the SE in a more waterlogged area of the site where the corresponding magnetic anomaly [**m44**] also fades.

A wider network of less pronounced ditch type anomalies [**gpr41-44**] suggests a rectilinear system of field boundaries, trackways or enclosures which appear to respect the oval enclosure [**gpr36**], where these meet. It is also unclear whether the series of parallel linear anomalies [**gpr42**] to the south represent a further extension of this ditch system, although [**gpr43**] appears to join [**gpr41**] with the double-ditched boundary [**gpr44**] (cf [**m67**]) found to the north. This field system passes through the more substantial ring-ditch of the large Bronze Age barrow [**gpr45**], which corroborates the magnetic response [**m70**] with a substantial ditch visible in the data between 12.5 and 45.0ns (0.55 to 1.98m). The ring-ditch of the smaller barrow [**gpr46**] (cf [**m71**]) immediately to the south is found through a similar depth range.

Some additional, more tentative low amplitude anomalies could, perhaps, be suggestive of another barrow [**gpr47**] and an irregular enclosure ditch [**gpr48**] further to the north. However, the absence of any corresponding magnetic anomalies and the variable response to the background geology hampers a more definitive interpretation.

Two sub-circular high amplitude anomalies [**gpr49**] and [**gpr50**] could also be due to a geological origin or, perhaps, related to more deeply buried badger setts in this area, but only [**gpr49**] is replicated in the magnetic data as [**m65**]. Evidence for the possible structural remains [**m64**] is more difficult to identify beyond a comparatively shallow planar anomaly [**gpr51**] between 12.5 and 15ns (0.55 to 0.66m) which is partially offset from the corresponding magnetic response. A rectilinear high amplitude anomaly [**gpr52**] appears to be more significant, evident between 12.5 and 20ns (0.55 to 0.88m), but there is no evidence for any structural response in the magnetic data and, perhaps, this is

more likely to be associated with the badger burrows [**gpr34**]. Immediately to the south there is a more subtle alignment of linear anomalies [**gpr53**] between 12.5 and 20ns (0.55 to 0.88m), but these may, perhaps, be field drains.

The limited coverage with the radar in the field to the south has just encompassed [**m73**] and this is replicated as a low amplitude response [**gpr54**], suggesting a large pit approximately 6m in diameter extending from between 10.0 and 32.5ns (0.44 to 1.43m) before the signal is attenuated.

Bromham House Farm NW Area

Waterlogged ground conditions restricted access within this area and produced a prominent near-surface response to the extant vehicle ruts, although more significant anomalies are revealed from 12.5ns (0.5m) onwards. The large ditch or routeway [**m79**] heading north from the oval enclosure is replicated as a broad, low amplitude response with a higher magnitude response to the east [**gpr54**], and the multiple-ditched enclosure [**m84**] is also evident [**gpr55**] between 12.5 and 40.0ns (0.5 to 1.6m).

The underlying geomorphology has hampered the interpretation in places, with anomalies such as [**gpr56**] producing a more complex response than might be expected from the ditch [**m86**] interpreted from the magnetic data. The area of quarrying appears as a large, low amplitude response [**gpr57**] suggesting the more pronounced magnetic activity here [**m87**] may possibly be due to subsequent infilling with midden deposits. Despite the presence of ceramic building material in the plough soil there is only highly tentative evidence for structural remains at [**gpr58**], although the dipping nature of the linear anomalies found here are more likely to be associated with a geomorphological response or the edge of the quarry workings.

Bromham Villa

The enclosure system [**m95-101**] is largely replicated in the radar data as a series of low amplitude anomalies [**gpr59-62**] cut through the response to the underlying geology between 12.5 and 27.5ns (0.55 to 1.21m), although a number of the ditches [**gpr63**] extend to 45ns (1.87m). Some definition is lost from the radar to the east where the response to the geology appears to dip gently into more highly attenuative channel deposits. One near-surface ditch type response [**gpr64**] is found between 10.0 and 22.5ns (0.44 to 0.99m) in an area without corresponding magnetic coverage, and there is also a very subtle pattern of linear anomalies [**gpr65**] on a north-south alignment between 15.0 and 55.0ns (0.66 to 2.42m) which only appear within the radar data.

A broad low amplitude anomaly [**gpr66**] replicates [**m114**] following the course of the original field boundary, perhaps suggesting this was a more

significant routeway or land division that has been preserved in the landscape until comparatively recently (OS Historic County Mapping Series: Wiltshire 1843 - 1893 Epoch 1). The profile of [**gpr66**] varies from approximately 8m wide to 3m through the recorded depth range between 10.0 and 42.5ns (0.44 to 1.87m), and also appears to become more shallow as it runs to the south. There is a large rectilinear anomaly [**gpr67**] found abutting [**gpr66**] to the south between 10.0 and 27.5ns (0.4 to 1.2m) and it is unclear whether [**gpr67**] is associated with the network of enclosures and trackways or if it is due to a more recent, perhaps agricultural origin. A second, broad, more diffuse low amplitude anomaly [**gpr68**] is found to the north of [**gpr66**] but is not fully defined in the survey area or replicated by a clear response in the magnetic data. It is, perhaps, possible that [**gpr68**] represents a geomorphological response.

The earthwork bank noted from aerial photography is possibly replicated by high amplitude reflections at [**gpr69**] and, further to the north as a series of parallel linear anomalies at [**gpr70**]. Both [**gpr69**] and [**gpr70**] are relatively subtle responses and occur close to the surface between 12.5 and 20.0ns (0.5 to 0.8m), perhaps suggesting the much broader anomaly seen on the aerial photography represents the ploughed out remains of the original bank. A group of linear high amplitude anomalies [**gpr71**] are found in the centre of enclosure [**gpr60**], but these are too fragmented to interpret confidently as structural remains, although this may in part be due to truncation through ploughing.

A network of mole runs is found in the paddocks to the south between 2.5 and 10.0ns (0.1 to 0.4m) before the response to the underlying geology becomes apparent, with low amplitude anomalies [**gpr72**] providing evidence for the extension of the enclosure system to the south. No entirely convincing evidence for structural remains associated with the possible location of the villa have been revealed in the paddocks beyond scatters of high amplitude reflectors [**gpr73**], although these are obscured by the response to the geology here.

CONCLUSIONS

Both the magnetic and GPR techniques have produced successful results throughout the areas available for survey, including over the heavily rutted and waterlogged fallow agricultural land. An extensive network of rectilinear, presumably Roman, enclosure systems has been revealed at a landscape scale, with a notable difference in alignment between the northern- and southern-most areas of survey coverage. Some questions remain regarding the relationship between the substantial linear ditches or routeways crossing the site and both the Roman and prehistoric enclosures. For example, one of the routeways appears to deliberately interrupt the ditches of the prehistoric oval enclosure, perhaps suggesting a degree of contemporaneity. The linear anomalies may also, in part, relate to the Anglo-Saxon demarcation of the landscape, although the localised magnetisation perhaps suggests they were

contemporary with the semi-industrial activity revealed by the survey, which appears to be associated with the Roman phase of settlement activity.

While some possible structural remains were found to the north of the survey area no convincing evidence for the location of the Bromham villa has been found. However, the partially complete enclosure system revealed by the geophysical survey provides further support for the most likely site of the villa being beneath the council houses, the modern road itself or, perhaps, one of the adjacent fields beyond the current coverage. Further geophysical survey would certainly help to understand how the separate parts of the landscape articulated. Figure 20 shows the current magnetic survey data reported here, together with additional fluxgate magnetometer coverage collected by volunteers from the Wiltshire Field Group to date (M McQueen *pers comm*).

LIST OF ENCLOSED FIGURES

REFERENCES

Eide, E, Linford, N, Persico, R and Sala, J 2018 'Advanced SFCW GPR systems' *in* Persico, R, Piro, S and Linford, N (eds), *Innovation in Near-Surface Geophysics Instrumentation, Application, and Data Processing Methods* Amsterdam: Elsevier, 253-285.

Geological Survey of Great Britain 1974 Marlborough. England and Wales Sheet 266. Solid and Drift Edition, 1:50,000 scale geology map. Ordnance Survey, Southampton for Institute of Geological Sciences.

Last, J, Carpenter, E and Evans, S 2016 *'West Wiltshire National Archaeological Identification Survey Lowland Pilot Project Report'*. Historic England Research Reports Series **38/2016**.

Linford, N 2004 'From Hypocaust to Hyperbola: Ground Penetrating Radar surveys over mainly Roman remains in the U.K.'. *Archaeological Prospection*, 11 (4), 237-246.

Linford, N 2013. *Rapid processing of GPR time slices for data visualisation during field acquisition*. In Neubauer, W, Trinks, I, Salisbury, R and Einwogerer, C (Editors), Archaeological Prospection, Proceedings of the 10th International Conference, May 29th - June 2nd 2013 2013 (Vienna: Austrian Academy of Sciences Press). 176-78.

Linford, N and Linford, P 2017. *The application of semi-automated vector identification to large scale archaeological data sets considering anomaly morphology*. In Jennings, B, Gaffney, C, Sparrow, T and Gaffney, S (Editors), 12th International Conference of Archaeological Prospection, 12-16th September 2017 2017 (Bradford: Archaeopress Archaeology). 138-9.

Linford, N, Linford, P, Martin, L and Payne, A 2010 'Stepped-frequency GPR survey with a multi-element array antenna: Results from field application on archaeological sites'. *Archaeological Prospection*, **17** (3), 187-198.

Linford, N, Linford, P and Payne, A 2013 *'Charlton Barrow Cemetery And Roman Villa, Wiltshire, Report On Geophysical Surveys, July 2012 and March 2013'*. English Heritage Research Reports Series **9/2013**.

Linford, N, Linford, P and Payne, A 2018a 'Advanced magnetic prospecting for archaeology with a vehicle-towed array of cesium magnetometers' *in* Persico, R, Piro, S and Linford, N (eds), *Innovation in Near-Surface Geophysics Instrumentation, Application, and Data Processing Methods* Amsterdam: Elsevier, 121-149.

Linford, N, Linford, P and Payne, A 2018b *'Verlucio And Environs Project, Bowood Estate, Calne Without, Wiltshire , Report on geophysical surveys, February 2018'*. Historic England Research Reports Series **41/2018**.

Mauring, E, Beard, L P, Kihle, O and Smethurst, M A 2002 'A comparison of aeromagnetic levelling techniques with an introduction to median levelling'. *Geophysical Prospecting*, **50** (1), 43-54.

Roberts, D 2017 *'HE0013 Verlucio and Environs Project Proposal v25'*Historic England unpublished draft project design.

Sala, J and Linford, N 2012 ' Processing stepped frequency continuous wave GPR systems to obtain maximum value from archaeological data sets '. *Near Surface Geophysics*, **10** (1), 3-10.

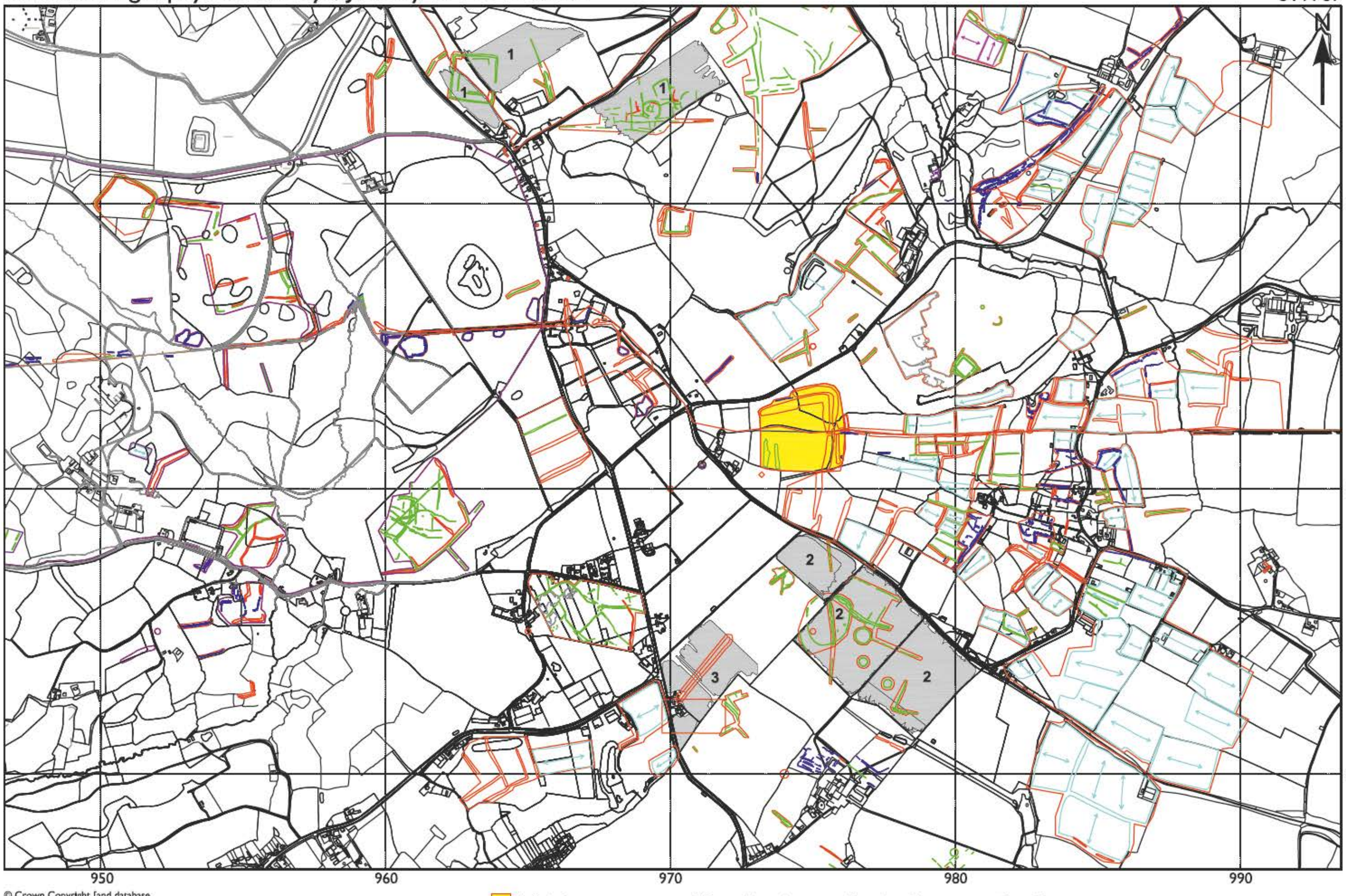
Soil Survey of England and Wales 1983 Soils of England and Wales, Sheet 5 - South West England, 1:250,000 scale soil map: Lawes Agricultural Trust, Harpenden.

Figure 1

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Location of geophysical surveys, January to March 2018

ST9767



0 750m

1:12500

Verlucio Roman town

HE geophysical survey areas [1-3]

1. Bowood Estate sites
2. Bromham House Farm
3. Bromham villa

aerial mapping evidence: ridge and furrow, bank, scarp, ditch

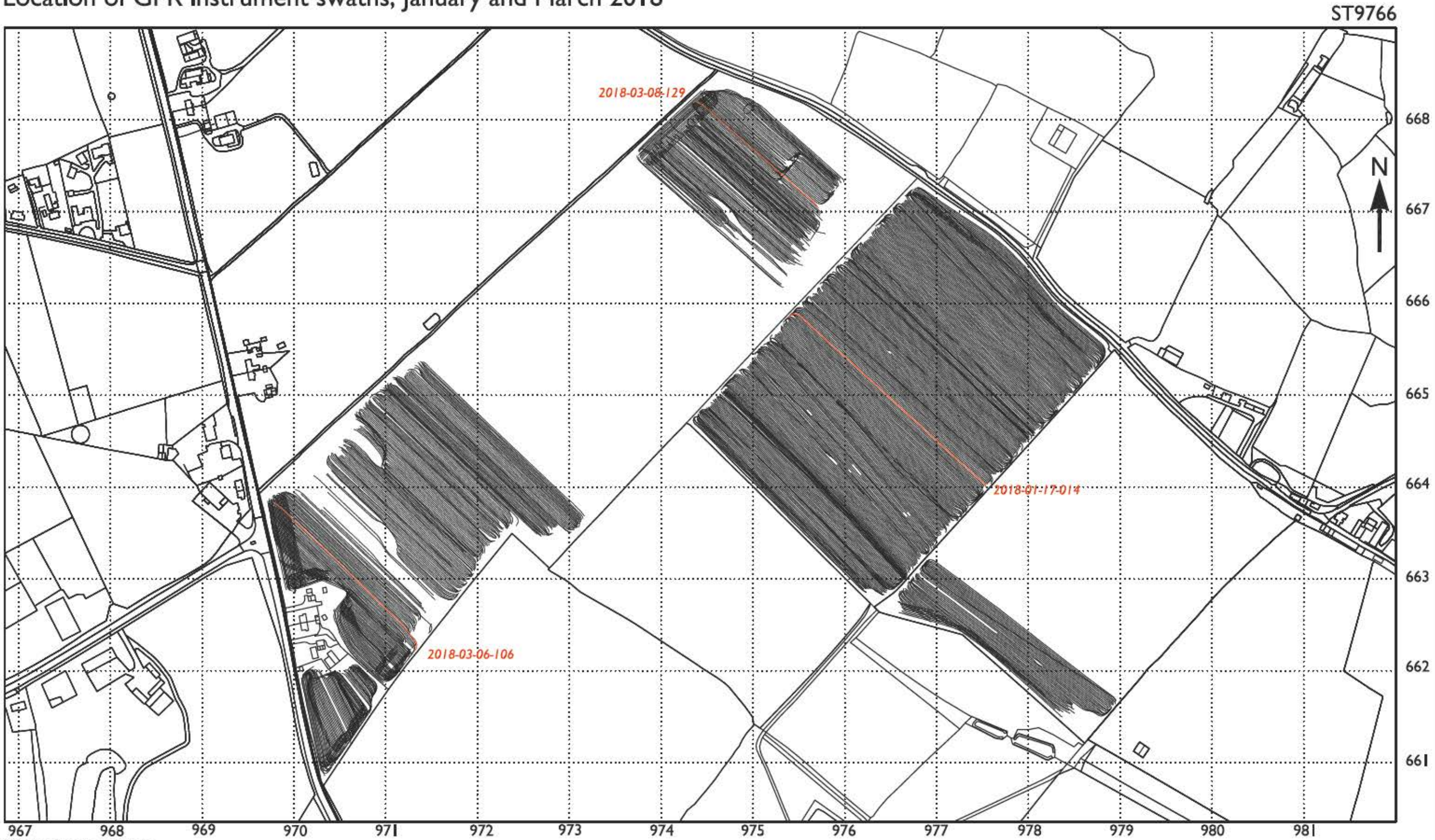
NRHE monument polygons

Historic England

Geophysics Team 2018

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
Location of GPR instrument swaths, January and March 2018

Figure 3



0 150m
1:4000

2018-01-17-014 Location of selected GPR profiles shown on Figure 10

Ground Penetrating Radar survey swaths

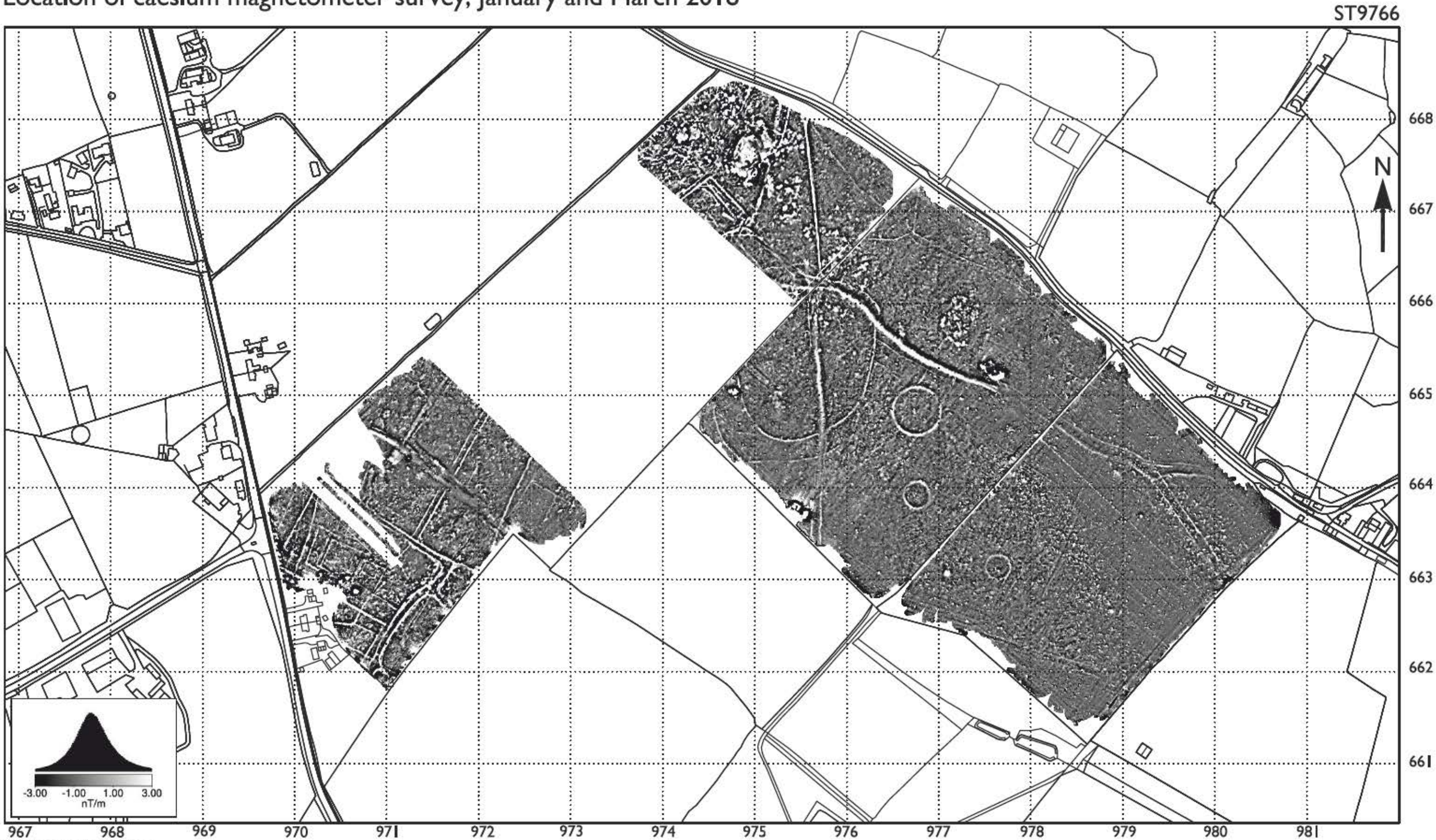
Geophysics Team 2018

Historic England

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Figure 4

Location of caesium magnetometer survey, January and March 2018



0 150m

1:4000

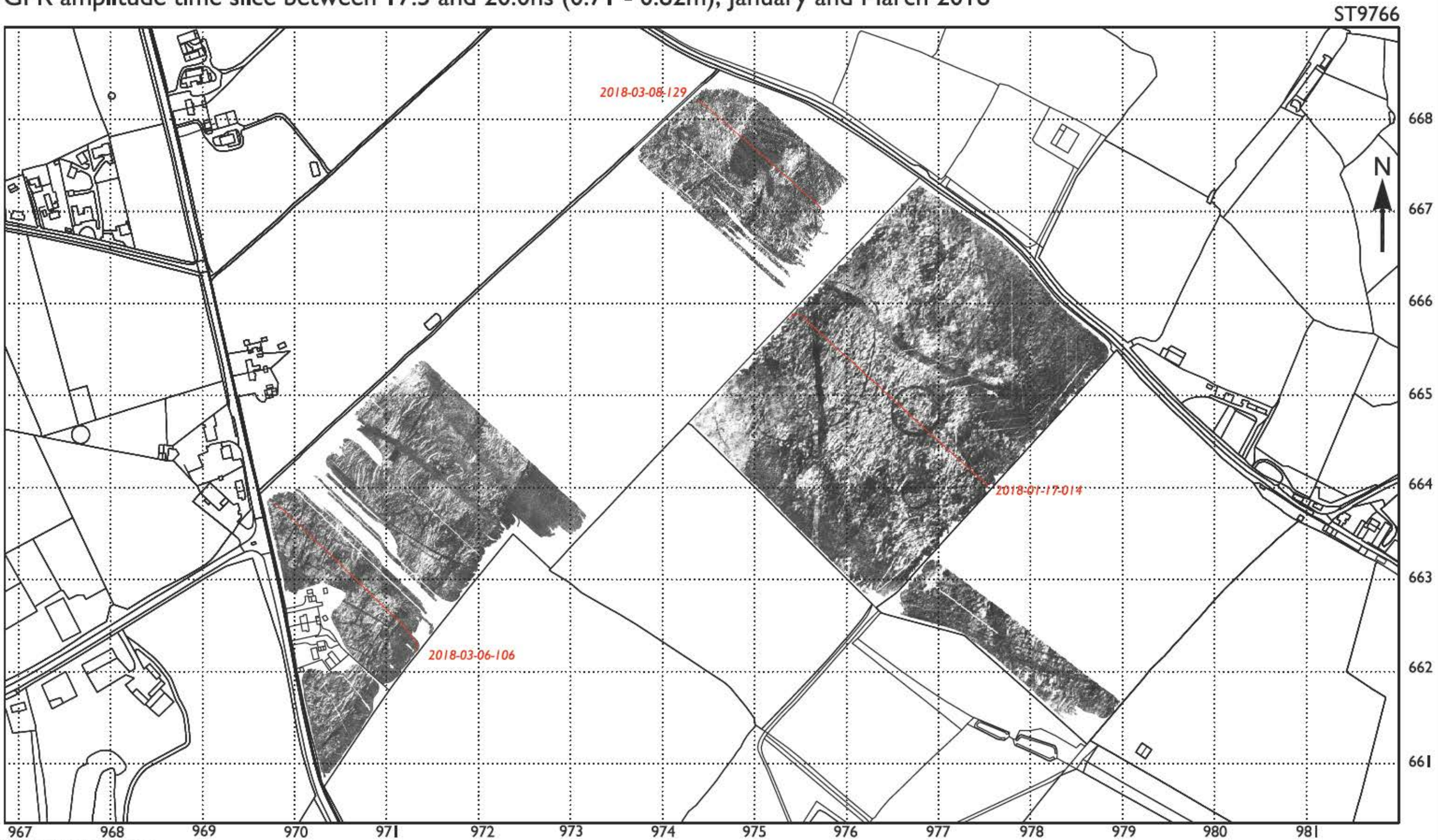
Geophysics Team 2018

Historic England

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Figure 5

GPR amplitude time slice between 17.5 and 20.0ns (0.71 - 0.82m), January and March 2018



0 150m

1:4000

2018-01-17-014 Location of selected GPR profiles shown on Figure 10

Low High
relative reflector strength

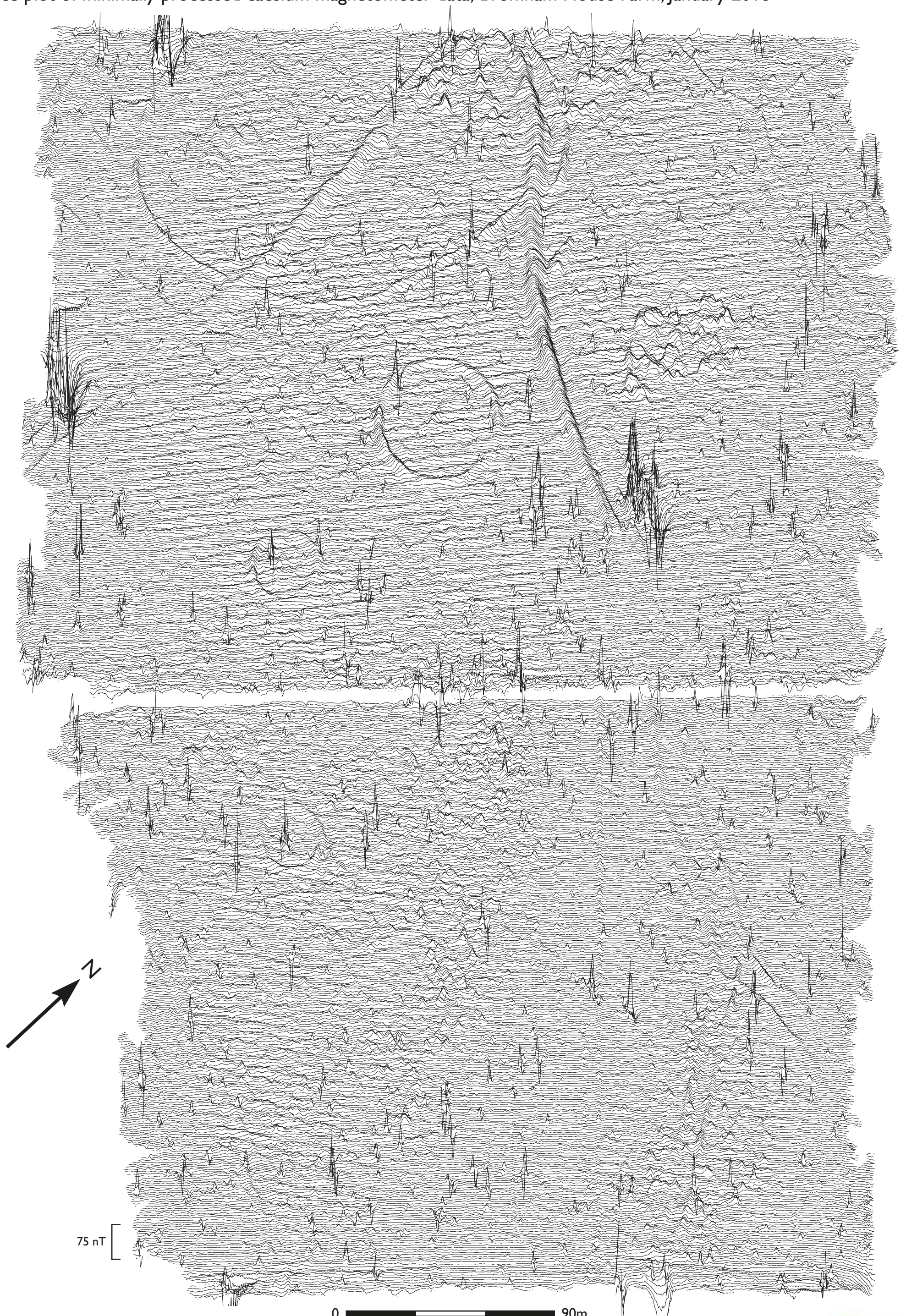
Geophysics Team 2018

Historic England

Figure 6

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Trace plot of minimally processed caesium magnetometer data, Bromham House Farm, January 2018



Geophysics Team 2018

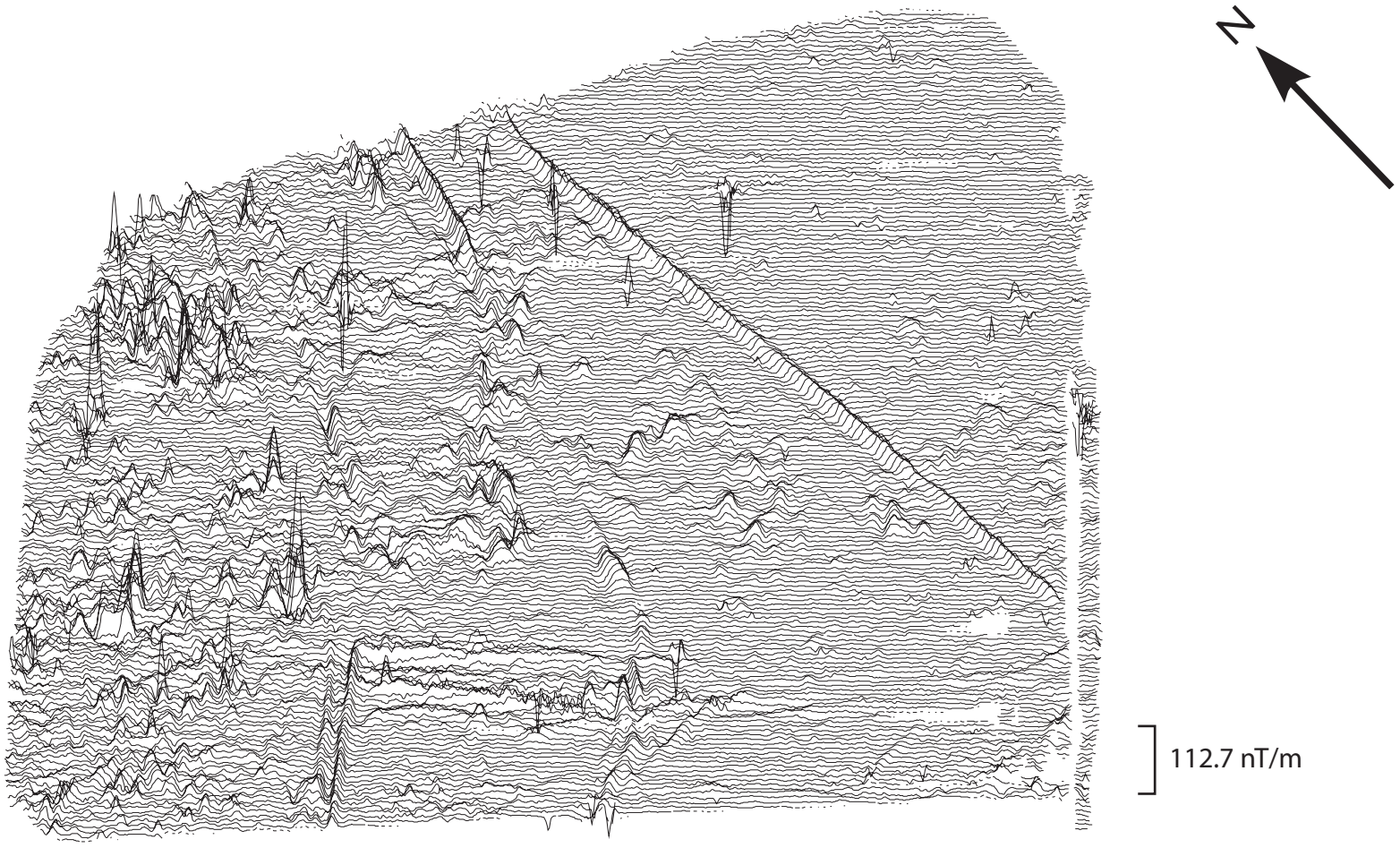
Historic England

Figure 7

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Trace plots of minimally processed caesium magnetometer data, March 2018

(A) Bromham House Farm NW area



(B) Bromham Villa

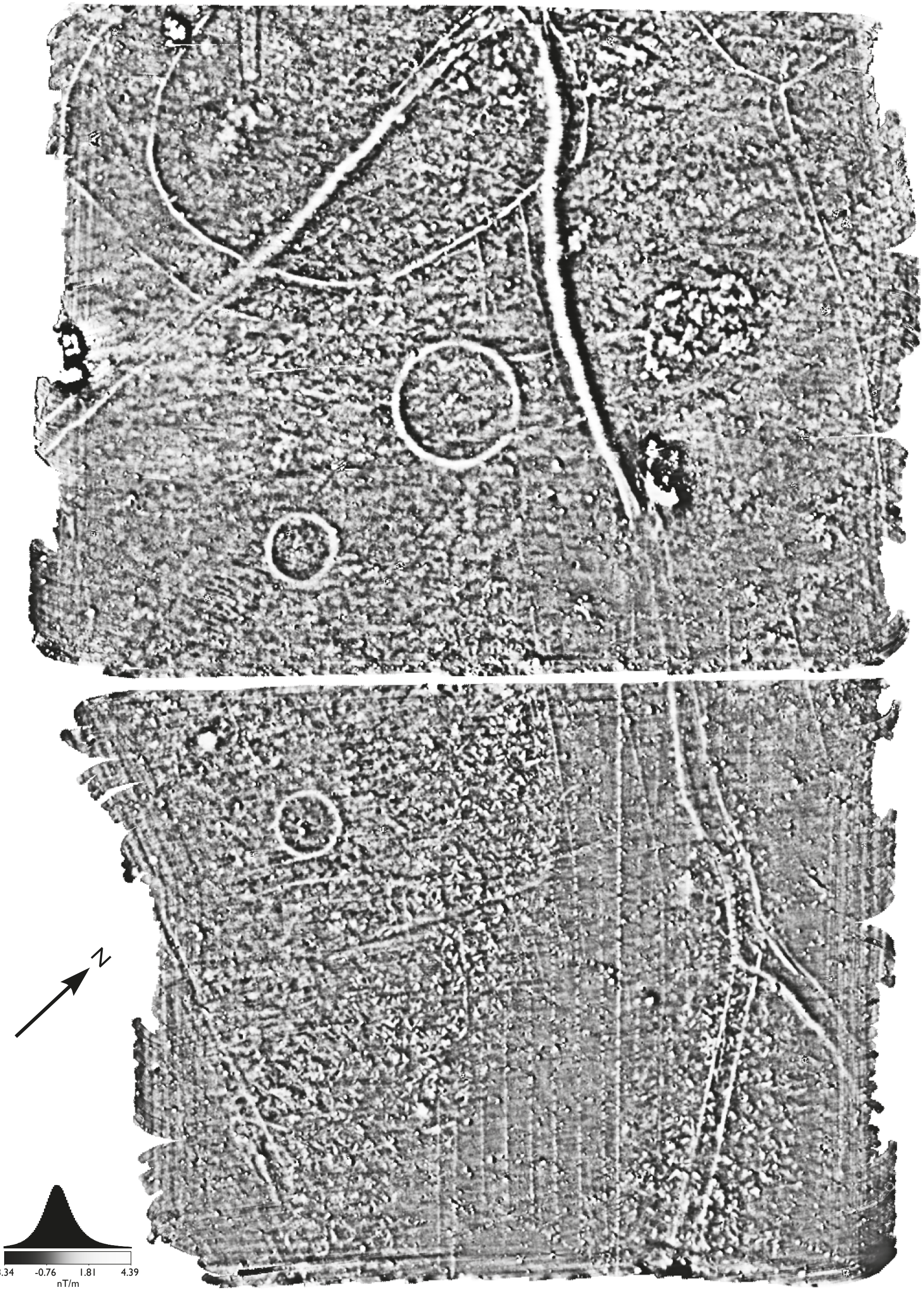
Geophysics Team 2018

Historic England

Figure 8

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Equal area greyscale image of the processed caesium magnetometer data, Bromham House Farm, January 2018



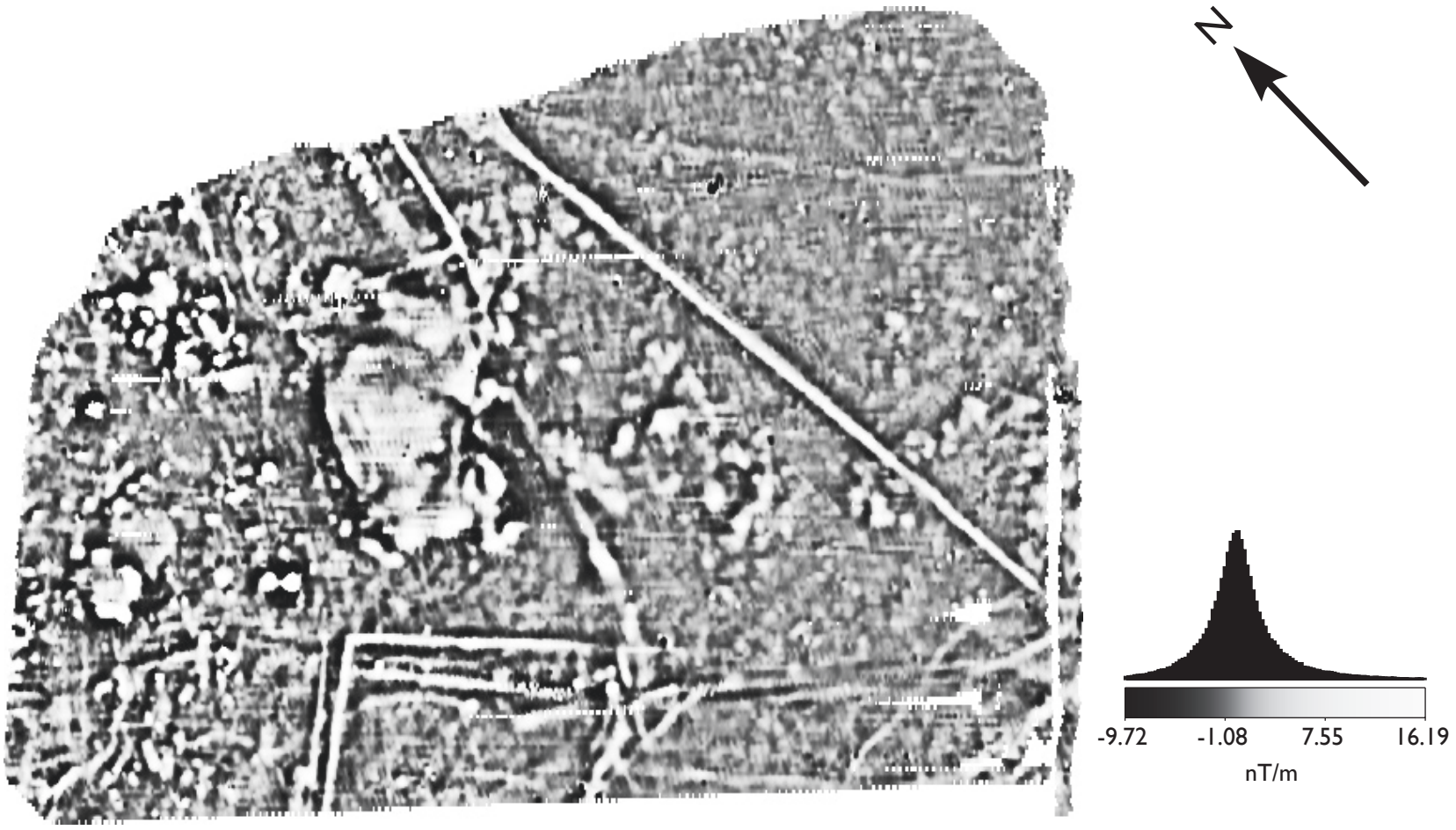
Geophysics Team 2018

Historic England

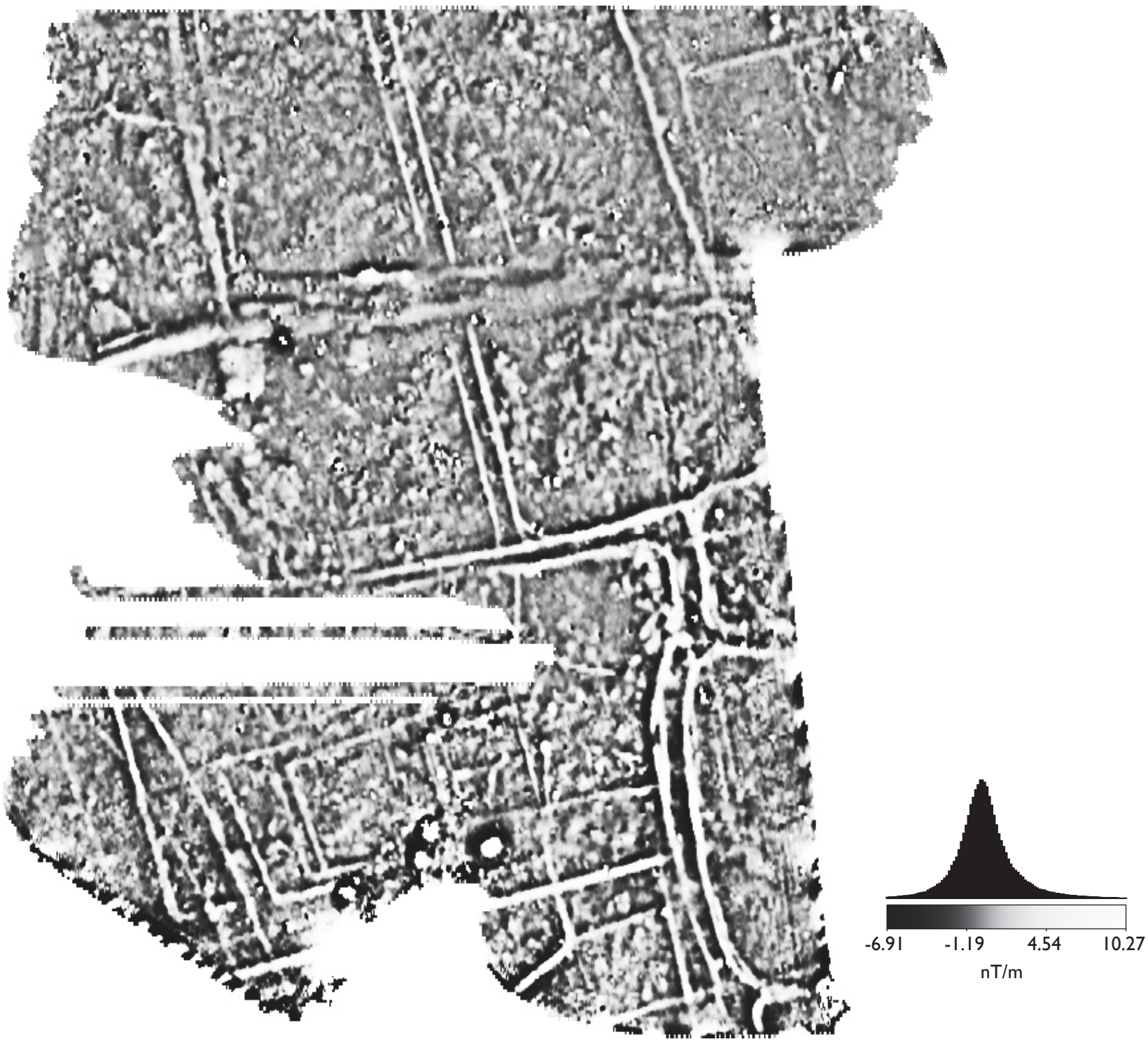
Figure 9

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
Equal area greyscale images of processed caesium magnetometer data, March 2018

(A) Bromham House Farm NW area



(B) Bromham Villa



0 90m

1:1500

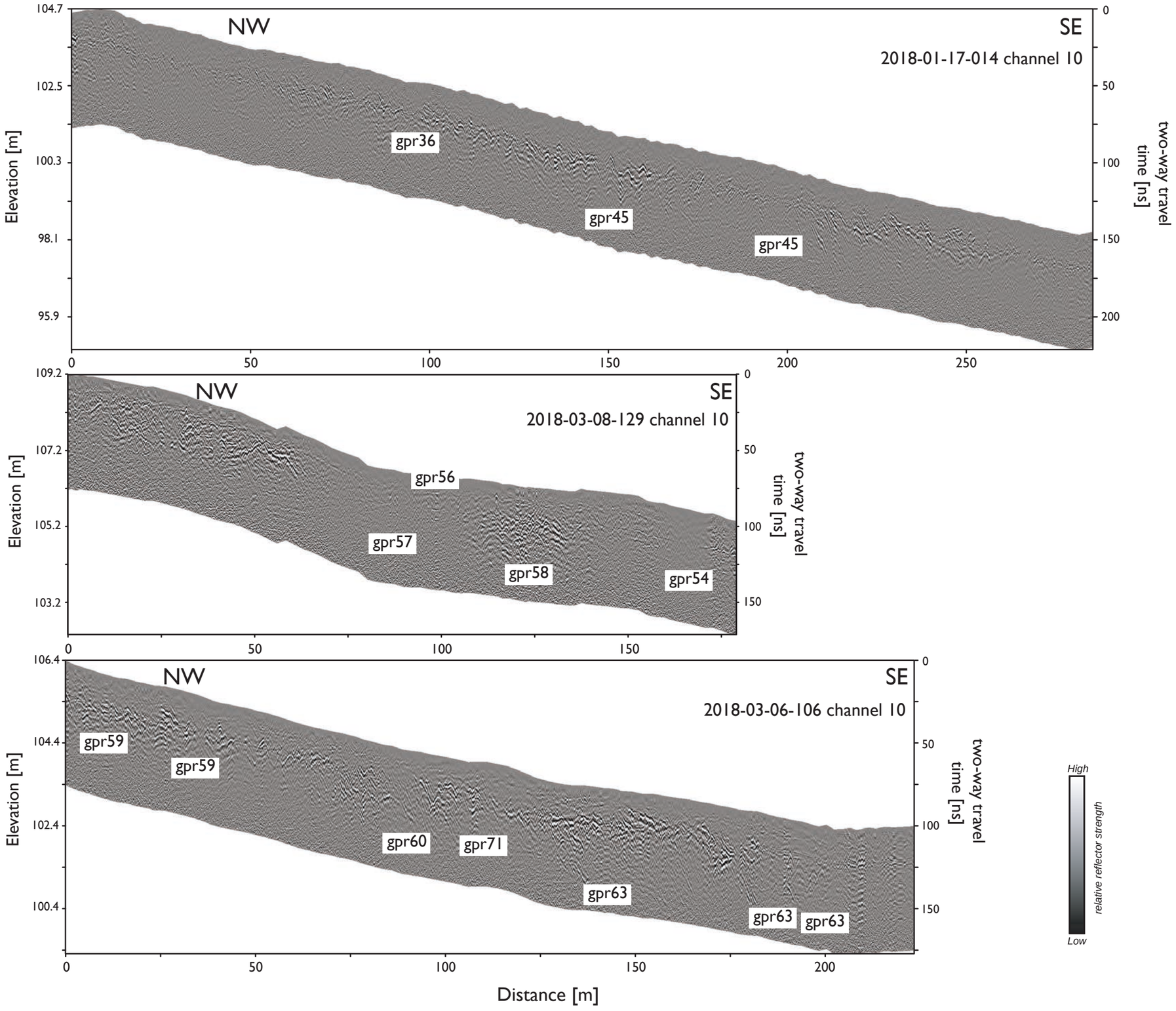
Geophysics Team 2018

Historic England

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Figure 10

Topographically corrected GPR profiles, January and March 2018



Geophysics Team 2018

Historic England

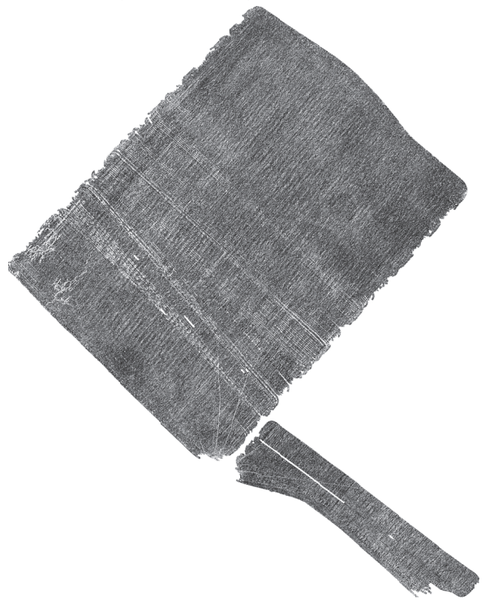
Figure 11

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
GPR amplitude time slices, Bromham House Farm, between 0.0 - 25.0ns (0.0 - 1.1m), January 2018

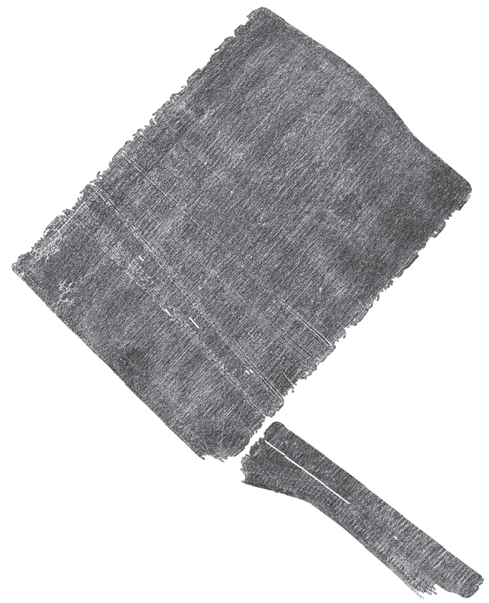
0 - 2.5ns (0.0 - 0.11m)

2.5 - 5.0ns (0.11 - 0.22m)

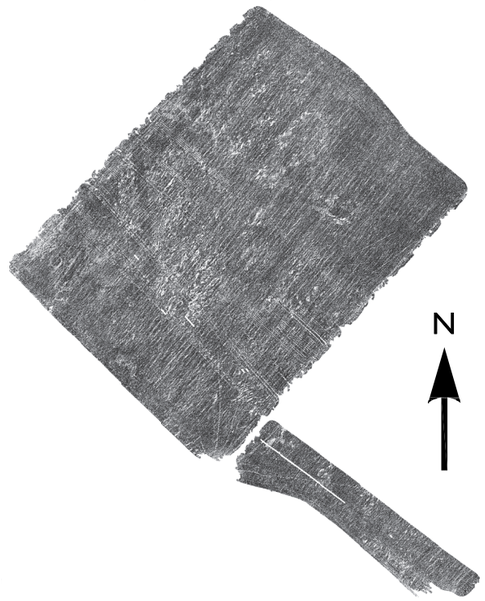
5.0 - 7.5ns (0.22 - 0.33m)



7.5 - 10.0ns (0.33 - 0.44m)



10.0 - 12.5ns (0.44 - 0.55m)



N

12.5 - 15.0ns (0.55 - 0.66m)

15.0 - 17.5ns (0.66 - 0.77m)

17.5 - 20.0ns (0.77 - 0.88m)

20.0 - 22.5ns (0.88 - 0.99m)

22.5 - 25.0ns (0.99 - 1.1m)

Low *High*
relative reflector strength

0 300m

1:6000

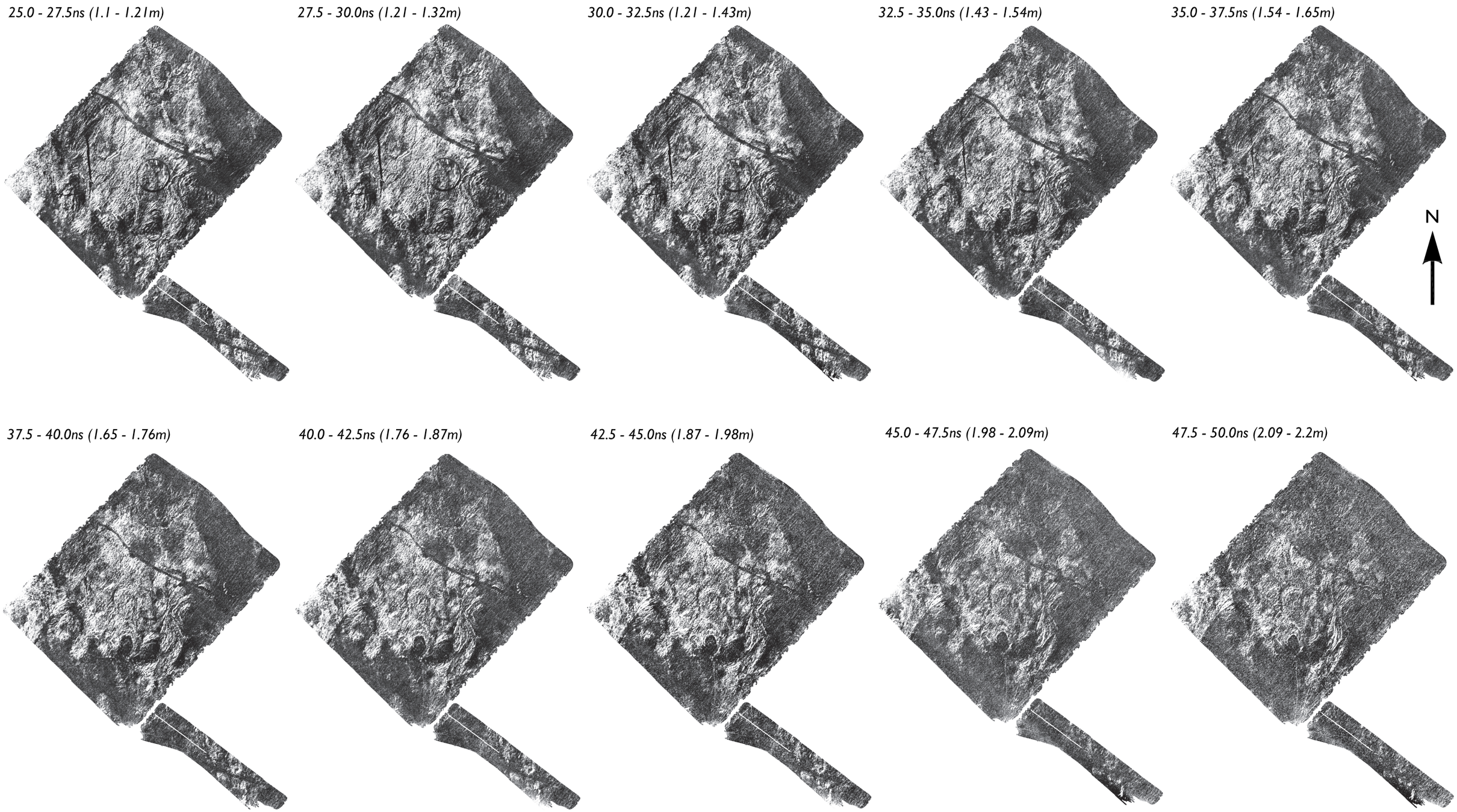
Geophysics Team 2018

Historic England

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Figure 12

GPR amplitude time slices, Bromham House Farm, between 25.0 - 50.0ns (1.1 - 2.2m), January 2018



Geophysics Team 2018

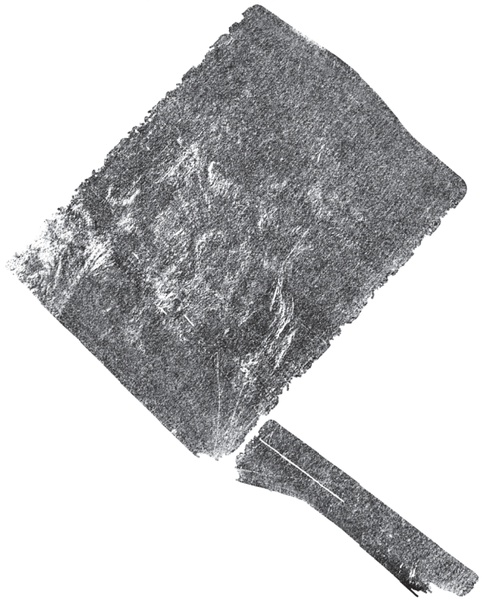
Historic England

Figure 13

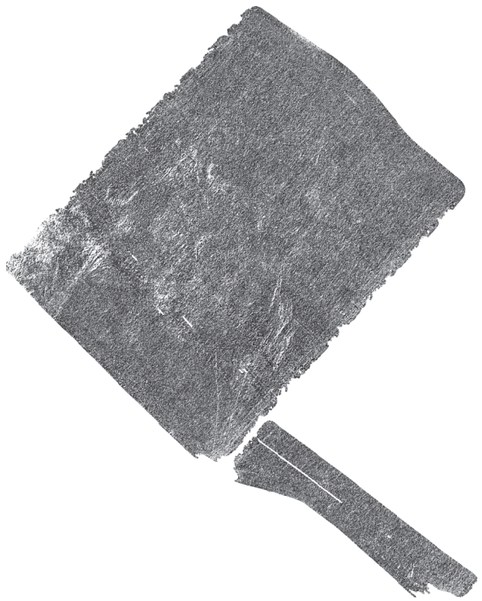
VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
GPR amplitude time slices, Bromham House Farm, between 50.0 - 62.5ns (2.2 - 2.75m), January 2018

50.0 - 52.5ns (2.2 - 2.31m)

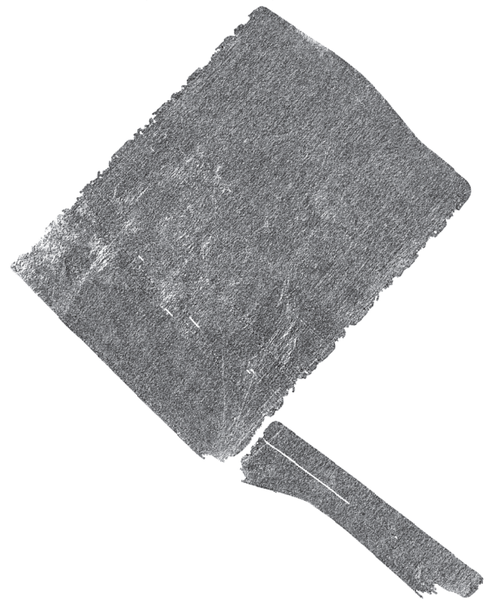
52.5 - 55.0ns (2.31 - 2.42m)



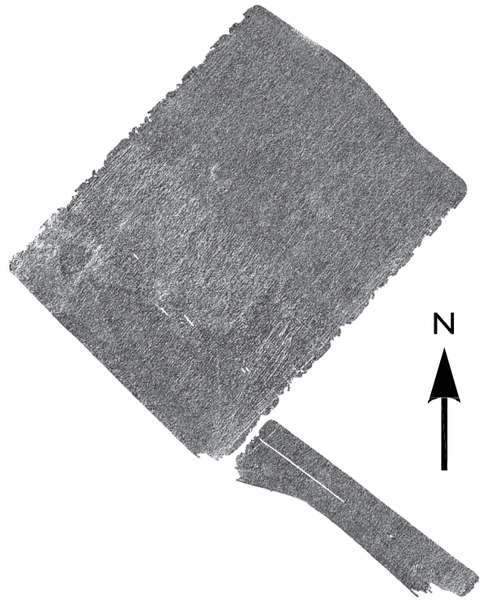
55.0 - 57.5ns (2.42 - 2.53m)



57.5 - 60.0ns (2.53 - 2.64m)



60.0 - 62.5ns (2.64 - 2.75m)



N

Low *High*
relative reflector strength

0 300m
1:6000

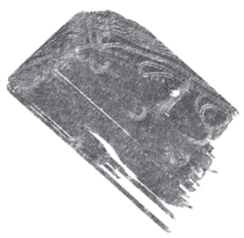
Geophysics Team 2018

Historic England

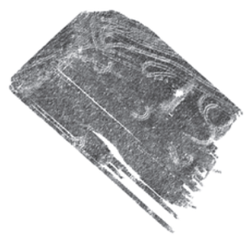
Figure 14

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
GPR amplitude time slices, Bromham House Farm NW Area, between 0.0 - 62.5ns (0.0 - 2.5m), March 2018

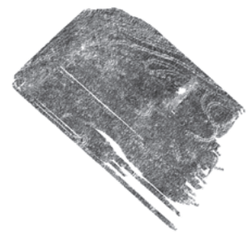
0 - 2.5ns (0.0 - 0.1m)



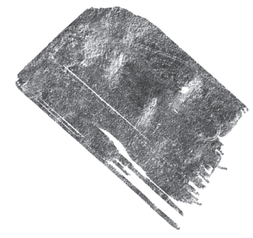
2.5 - 5.0ns (0.1 - 0.2m)



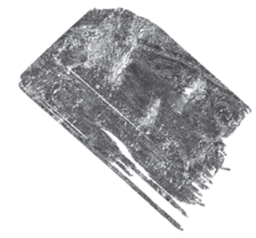
5.0 - 7.5ns (0.2 - 0.3m)



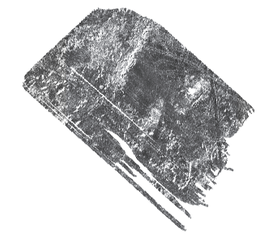
7.5 - 10.0ns (033 - 0.4m)



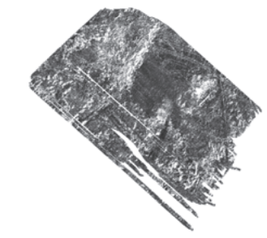
10.0 - 12.5ns (0.4 - 0.5m)



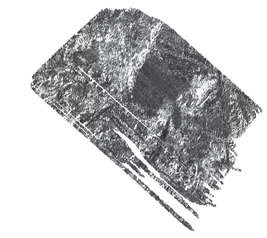
12.5 - 15.0ns (0.5 - 0.6m)



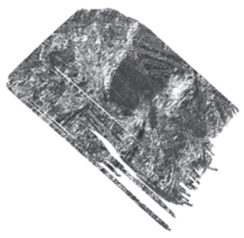
15.0 - 17.5ns (0.6 - 0.7m)



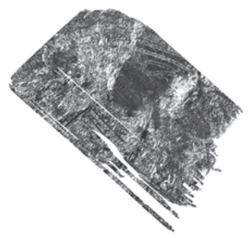
17.5 - 20.0ns (0.7 - 0.8m)



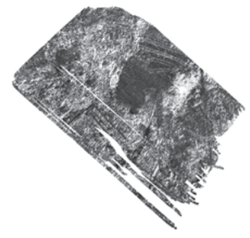
20.0 - 22.5ns (0.8 - 0.9m)



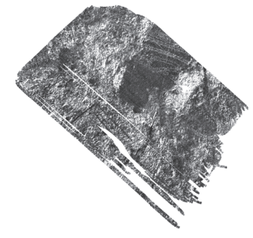
22.5 - 25.0ns (0.9 - 1.0m)



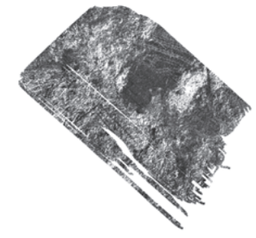
25.0 - 27.5ns (1.0 - 1.1m)



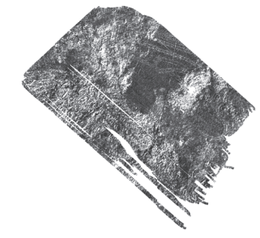
27.5 - 30.0ns (1.1 - 1.2m)



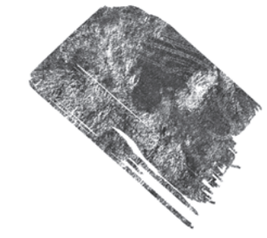
30.0 - 32.5ns (1.2 - 1.3m)



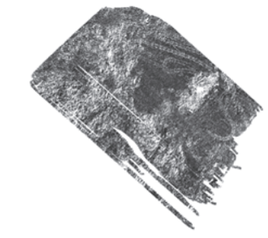
32.5 - 35.0ns (1.3 - 1.4m)



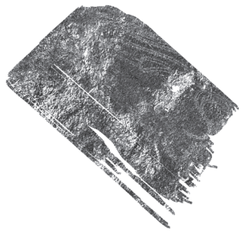
35.0 - 37.5ns (1.4 - 1.5m)



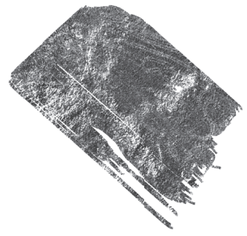
37.5 - 40.0ns (1.5 - 1.6m)



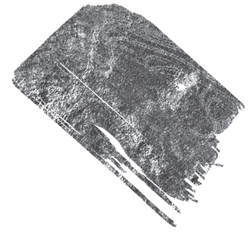
40.0 - 42.5ns (1.6 - 1.7m)



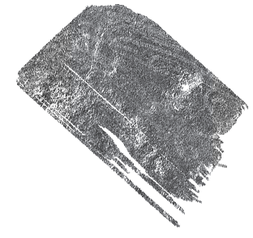
42.5 - 45.0ns (1.7 - 1.8m)



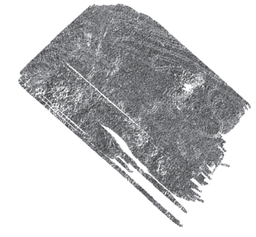
45.0 - 47.5ns (1.8 - 1.9m)



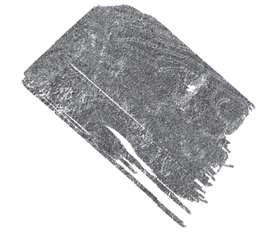
47.5 - 50.0ns (1.9 - 2.0m)



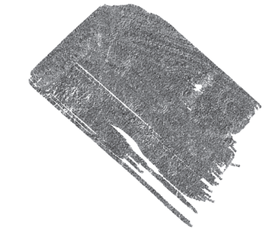
50.0 - 52.5ns (2.0 - 2.1m)



52.5 - 55.0ns (2.1 - 2.2m)

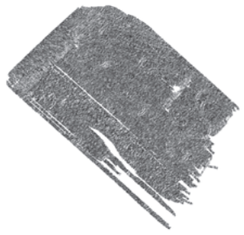


55.0 - 57.5ns (2.2 - 2.3m)



57.5 - 60.0ns (2.3 - 2.4m)

60.0 - 62.5ns (2.4 - 2.5m)



Low *High*
relative reflector strength

0 300m
1:6000

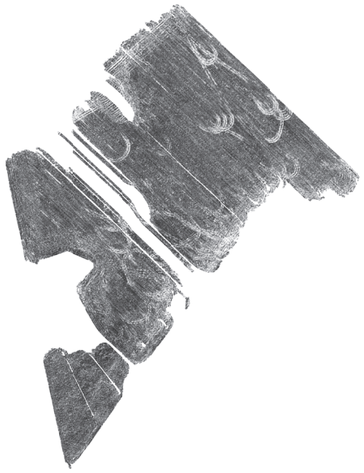
Geophysics Team 2018

Historic England

Figure 15

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
GPR amplitude time slices, Bromham Villa, between 0.0 - 25.0ns (0.0 - 1.0m), March 2018

0 - 2.5ns (0.0 - 0.1m)



2.5 - 5.0ns (0.1 - 0.2m)

5.0 - 7.5ns (0.2 - 0.3m)

7.5 - 10.0ns (0.3 - 0.4m)

10.0 - 12.5ns (0.4 - 0.5m)

12.5 - 15.0ns (0.5 - 0.6m)

15.0 - 17.5ns (0.6 - 0.7m)

17.5 - 20.0ns (0.7 - 0.8m)

20.0 - 22.5ns (0.8 - 0.9m)

22.5 - 25.0ns (0.9 - 1.0m)

Low *High*
relative reflector strength

0 300m
1:6000

Geophysics Team 2018

Historic England

Figure 16

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
GPR amplitude time slices, Bromham Villa, between 25.0 - 50.0ns (1.0 - 2.0m), March 2018

25.0 - 27.5ns (1.1 - 1.2m)

27.5 - 30.0ns (1.2 - 1.3m)

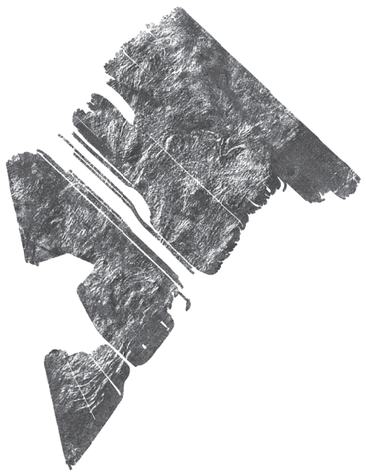
30.0 - 32.5ns (1.2 - 1.3m)

32.5 - 35.0ns (1.3 - 1.4m)

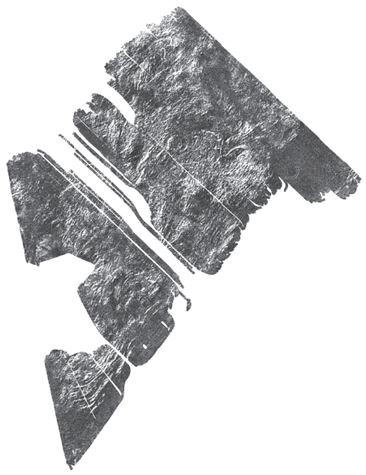
35.0 - 37.5ns (1.4 - 1.5m)

37.5 - 40.0ns (1.5 - 1.6m)

40.0 - 42.5ns (1.6 - 1.7m)

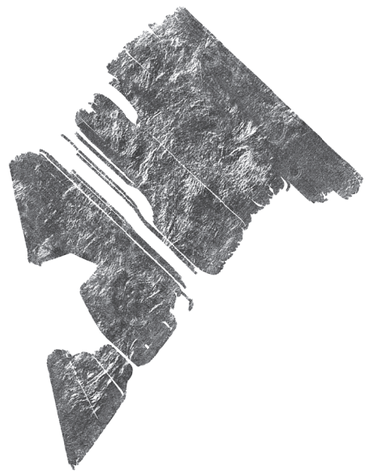


42.5 - 45.0ns (1.7 - 1.8m)



45.0 - 47.5ns (1.8 - 1.9m)

47.5 - 50.0ns (1.9 - 2.0m)



Low *High*
relative reflector strength

0 300m
1:6000

Geophysics Team 2018

Historic England

Figure 17

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
GPR amplitude time slices, Bromham Villa, between 50.0 - 62.5ns (2.0 - 2.5m), March 2018

50.0 - 52.5ns (2.0 - 2.1m)

52.5 - 55.0ns (2.1 - 2.2m)

55.0 - 57.5ns (2.2 - 2.3m)

57.5 - 60.0ns (2.3 - 2.4m)

60.0 - 62.5ns (2.4 - 2.5m)

Low *High*
relative reflector strength

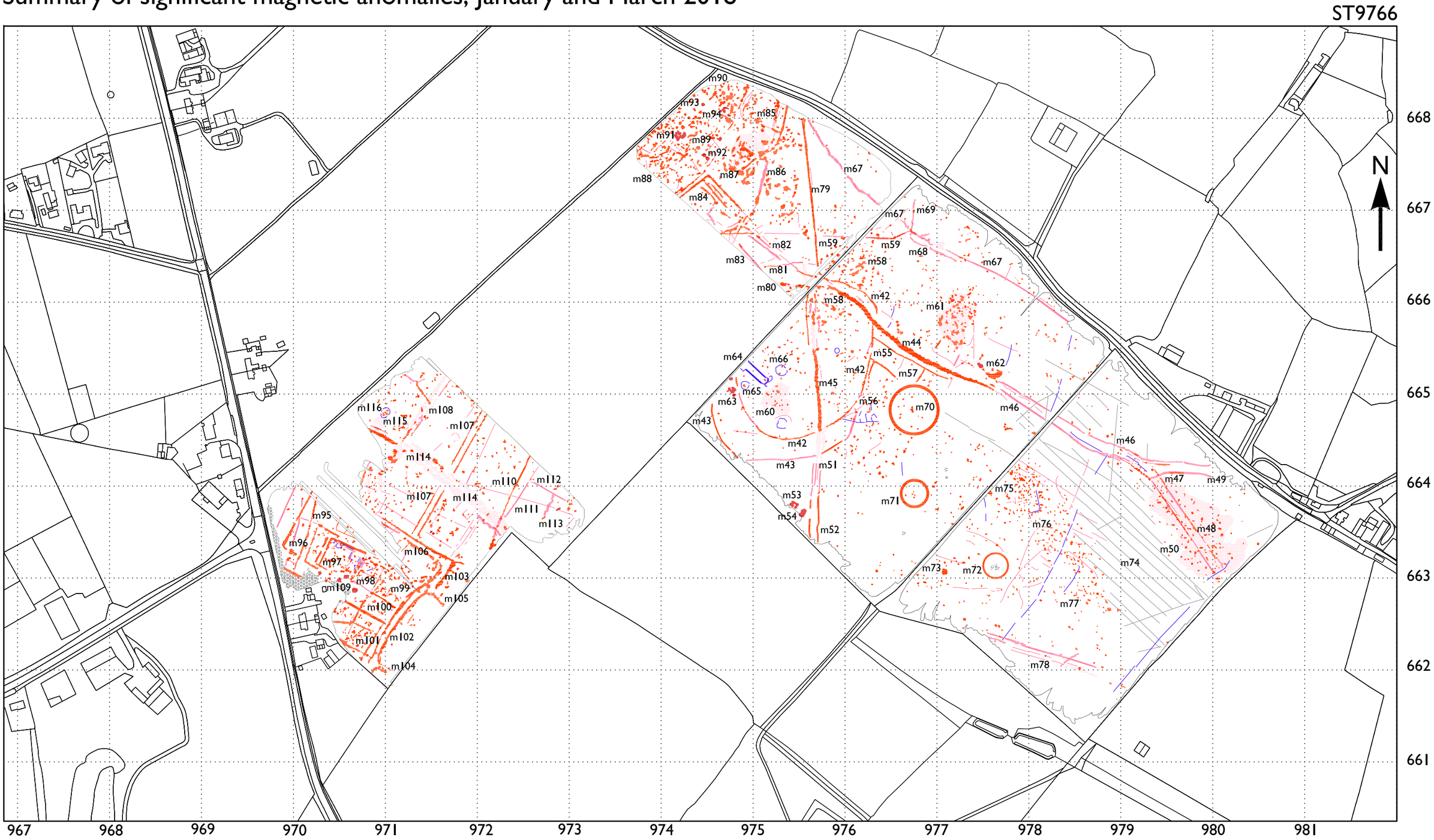
0 300m
1:6000

Geophysics Team 2018

Historic England

Figure 18

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
Summary of significant magnetic anomalies, January and March 2018

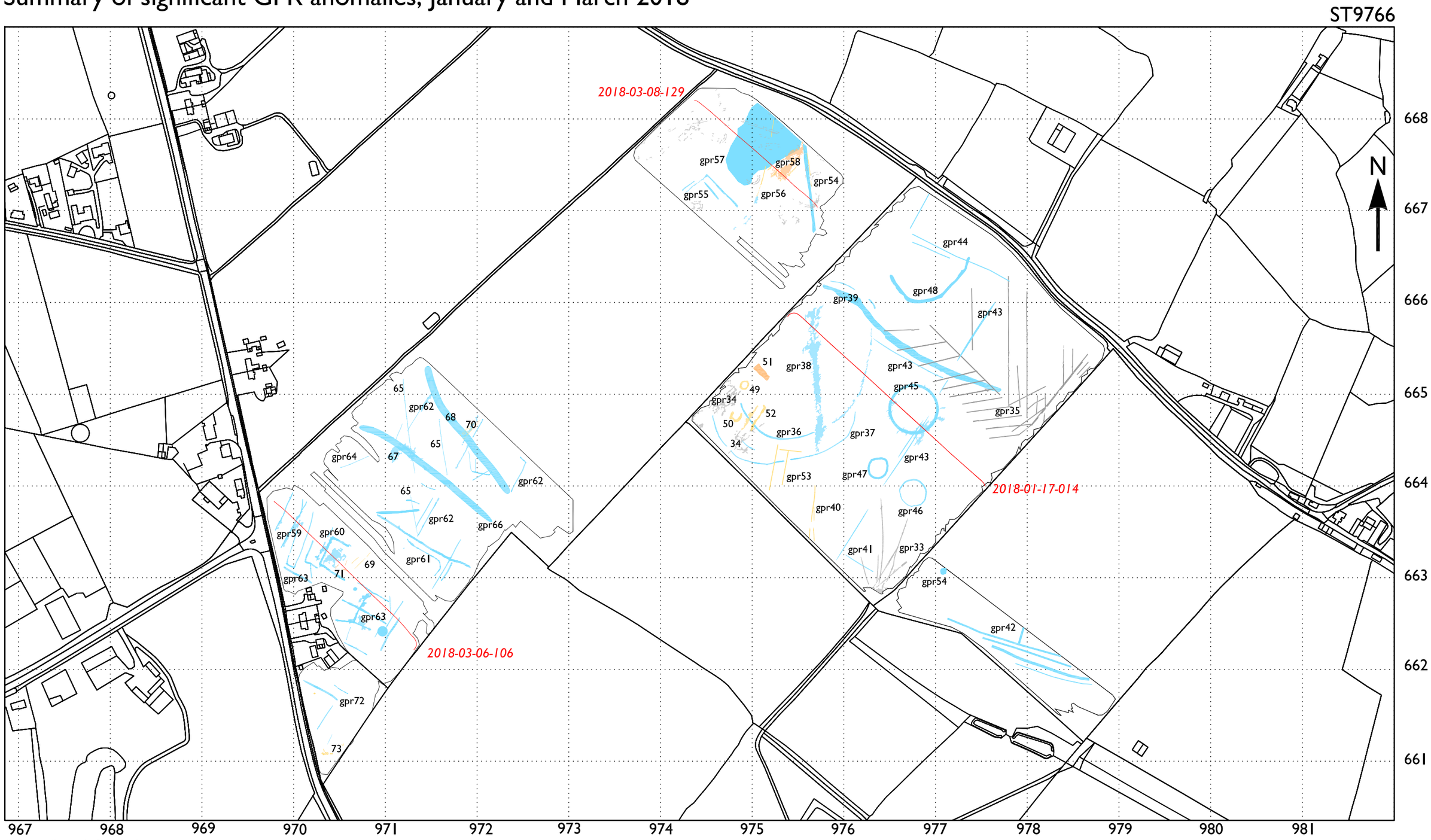


Geophysics Team 2018

Historic England

Figure 19

VERLUCIO AND ENVIRONS PROJECT,
BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE
Summary of significant GPR anomalies, January and March 2018



0 150m
1:4000

2018-01-17-014 Location of selected GPR profiles shown on Figure 10

low amplitude reflectors

high amplitude reflectors

anomalies of known or recent origin

Geophysics Team 2018

Historic England

Figure 20

VERLUCIO AND ENVIRONS PROJECT, BROMHAM HOUSE FARM AND VILLA, BROMHAM, WILTSHIRE

Location of the combined magnetometer surveys, January to March 2018

0 300m

1:5000

Geophysics Team 2018

Historic England

Historic England Research and the Historic Environment

We are the public body that looks after England's historic environment. We champion historic places, helping people understand, value and care for them.

A good understanding of the historic environment is fundamental to ensuring people appreciate and enjoy their heritage and provides the essential first step towards its effective protection.

Historic England works to improve care, understanding and public enjoyment of the historic environment. We undertake and sponsor authoritative research. We develop new approaches to interpreting and protecting heritage and provide high quality expert advice and training.

We make the results of our work available through the Historic England Research Report Series, and through journal publications and monographs. Our online magazine Historic England Research which appears twice a year, aims to keep our partners within and outside Historic England up-to-date with our projects and activities.

A full list of Research Reports, with abstracts and information on how to obtain copies, may be found on www.HistoricEngland.org.uk/researchreports

Some of these reports are interim reports, making the results of specialist investigations available in advance of full publication. They are not usually subject to external refereeing, and their conclusions may sometimes have to be modified in the light of information not available at the time of the investigation.

Where no final project report is available, you should consult the author before citing these reports in any publication. Opinions expressed in these reports are those of the author(s) and are not necessarily those of Historic England.

The Research Report Series incorporates reports by the expert teams within the Investigation& Analysis Division of the Heritage Protection Department of Historic England, alongside contributions from other parts of the organisation. It replaces the former Centre for Archaeology Reports Series, the Archaeological Investigation Report Series, the Architectural Investigation Report Series, and the Research Department Report Series

ISSN 2398-3841 (Print)
ISSN 2059-4453 (Online)