Historic England

Geophysics

Low Ham Roman Villa, High Ham, Somerset
Report on Geophysical Surveys, July 2018

Neil Linford, Paul Linford, Andrew Payne and Lawrence Rees

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LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET REPORT ON GEOPHYSICAL SURVEY, JULY 2018

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SUMMARY

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted at Low Ham Roman villa, High Ham, Somerset, to address a casework request received from the Heritage at Risk Team in Planning Group South West to map the extent and state of preservation of Roman remains at the scheduled monument. The site has been impacted by extensive badger activity and despite attempts to protect the archaeological deposits these remain at high risk.
The survey also provided an opportunity to assist with the publication of the original excavations of the Roman villa being undertaken by colleagues from the University of Southampton, and to assist the Churches Conservation Trust with the interpretation of the wider post-medieval landscape where the villa sits as part of an Heritage Lottery Fund repair project on the nearby Grade I listed 'Church in the field'. The vehicle-towed caesium magnetometer survey (12.4ha) revealed extensive ranges of buildings associated with the villa arranged around a central courtyard, together with a system of enclosures extending into the fields to the north and south. The GPR coverage (6.9ha) targeted the main villa buildings and badger setts, together with areas surrounding the church and possible site of a post medieval mansion house.

CONTRIBUTORS
The geophysical fieldwork was conducted by Neil Linford, Paul Linford, Andrew Payne and Lawrence Rees (Historic England Placement).

ACKNOWLEDGEMENTS
The authors are grateful to the landowners, for allowing access to the site and facilities at the farm for the surveys to take place, and to colleagues from the University of Southampton for providing useful background information and interpretation of the results.

ARCHIVE LOCATION
Fort Cumberland, Portsmouth.

DATE OF SURVEY
The fieldwork was conducted between 9th to 13th July 2018, with the report completed on 23rd November 2018. The cover image shows a view of the site from the top of the hill above the villa while the survey was in progress with the main badger sett visible in the mid distance.

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CONTENTS

INTRODUCTION

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted at Low Ham Roman villa, High Ham, Somerset, to address a casework request received from the Heritage at Risk Team in Planning Group South West to map the extent and state of preservation of Roman remains at the scheduled monument. The villa (AMIE Monument HOB UID 193640, SAM 1006192) dates from around 200 AD and was rebuilt and extended in at least three phases until 330 AD, with excavations suggesting this was a quite luxurious building towards its final phase including some narrative mosaics one of which is on display in Taunton museum. The site has been the object of some archaeological investigation from the 1940s to 1990s but despite partial excavation and aerial photographic (AP) survey no comprehensive and definitive record has been built up for the monument and any related activity within the same field (Radford 1946; Goodburn *et al.* 1976).

The villa was placed on the High Risk register in 2003 because of disturbance caused by large badger setts and, despite two attempts to exclude the badgers, the burrowing has continued and damage is on-going. A high resolution GPR survey of the whole field was therefore suggested to map the excavated remains and provide a clearer picture of both the extent of the site and the badger activity. GPR was chosen as it has shown potential to detect both near-surface animal burrows and deeper archaeological remains such as wall footings (eg Linford and Payne 2007). A wider area magnetic survey was also deemed useful to provide context to the scheduled remains in relation to the extensive post-medieval landscape (Wilson-North 1998).

While the primary aim of the surveys is to inform management of the monument, it is hoped that they will also help colleagues from the University of Southampton bring the results of the previous excavations to publication, by accurately locating the current site plans and providing a wider understanding of the Roman landscape (R Leech, *pers comm*). The Churches Conservation Trust also raised some additional questions relating to the immediate vicinity of the Grade I listed 'Church in the field' (NHLE List Entry Number: 1346080) to assist with a Heritage Lottery Fund repair project, and help determine the location of the possible site of a post-medieval mansion house at the top of Hext Hill, both investigated by extending the GPR coverage.

Shallow well drained brashy calcareous clayey soils of the Sherborne association (343d) have developed over Triassic Mudstone and Limestone geology of the Westbury formation and Cotham member (undifferentiated)(Geological Survey of Great Britain 1973; Soil Survey of England and Wales 1983). The fields were all in pasture with some surface disturbance due to the badger setts. Weather conditions were very hot and dry with parch marks visible in the field, following a sustained period of drought across the country.

METHOD

Magnetometer survey

Magnetometer data was collected along the instrument swaths shown on Figure 1 using an array of six Geometrics G862 caesium vapour sensors mounted on a non-magnetic sledge (Linford *et al.* 2018). 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 were 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 the 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. The median value of each instrument traverse was then adjusted to zero by subtracting a running median value calculated over a 60m 1D window (see for instance Mauring *et al.* 2002). This operation corrects for any remaining biases added to the measurements owing to the diurnal variation of the Earth's magnetic field. A linear greyscale image of the combined magnetic data is shown superimposed over the base Ordnance Survey (OS) mapping in Figure 3 and minimally processed versions of the range truncated data ($\pm$60nT/m) are shown as trace plots in Figures 5 and 6(A), and as linear greyscale images following the processing discussed above in Figures 6(B) and 7.

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 DXG1212 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 2. 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 8. 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 0.099m/ns was assumed 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 ~0.12m intervals from the ground surface, shown as individual greyscale images in Figures 4, 9, 10, 11, 12 and 13. 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 15. The algorithm uses edge detection to identify bounded 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 [**m1-57**] discussed in the following text superimposed on base OS map data is provided in Figure 14.

Low Ham Villa

The main sub-rectangular double ditched enclosure around the villa ranges has a slanting side to the north [**m1**] forming a sub-rectangular compound [**m2**] and [**m3**] around most of the perimeter, interrupted by the modern field boundary and the badger setts [**m4**]. An entrance gap is found at [**m5**] with a

ditched access approach [**m6**] heading north-east towards the river and is flanked inside the enclosure by two rectilinear buildings, defined by negative anomalies [**m7**] and [**m8**], which enhance parch marks noted by Dewar (Goodburn *et al*. 1976, Fig. 21) and may possibly have functioned as gatehouse structures or service ranges to the main residential villa [**m9-11**]. Both of the buildings [**m7**] and [**m8**] contain thermoremanent anomalies [**m12**] and [**m13**], indicative of fired structures such as hearths, furnaces, ovens or grain-dryers, and perhaps similar to the Grateley Roman villa in Hampshire (Cunliffe and Poole 2008). The building ranges are constructed around a large courtyard [**m14**], which is generally devoid of activity, and suggests a similar layout to other elaborate villa sites (cf Branigan 1976; Allen 1989).

The main villa building ranges [**m9-11**] also contain high magnitude responses associated with fired structures, and are surrounded by weaker anomalies and areas of raised disturbance, for example at [**m15**] and [**m16**], indicative of occupation activity and ceramic building material. A separate complex of buildings [**m17**], possibly a shrine or "garden" courtyard, are found to the north west of the villa range [**m9**].

Further structural remains [**m18**] suggest an extension of the south west range beyond the scheduled area, perhaps associated with a possible conduit [**m19**] (cf [**gpr31**]) from the spring located above the villa to the south. It is, of course, possible that not all of the negative wall-type anomalies, such as [**m18**], are necessarily contemporary and of a single phase of building activity related to the main villa. Some post-Roman building activity, possibly related to the spring-fed water source, may even be represented here.

Negative anomalies on the floodplain to the north-east of the main villa at [**m20**] while suggestive of structural remains have a curious plan and alignment and could, potentially, be related to later activity such as field drains. A ditched enclosure [**m25**] is more closely aligned with the orientation of the villa to the north-west of [**m20**], and exhibits a weak response, possibly influenced by water logged floodplain soils adjacent to the Low Ham Rhyne. Two further weak responses [**m21**] and [**m22**] on the floodplain may, possibly, represent structural remains, together with partially defined groups of buildings on the hillside above the villa to the south at [**m23**], replicating a parch mark, and [**m24**] possibly associated with the spring. A series of large, amorphous anomalies [**m26-29**] may represent a geomorphological response associated with the spring, similar to those recorded at the Roman settlement at Silbury Hill adjacent to the Swallowhead spring (Linford *et al*. 2009). A similar, diffuse linear anomaly [**m30**] appears to follow the course of a terraced lynchet across the villa enclosure continuing into the field to the west, and perhaps may have functioned as a trackway or linear boundary, possibly even an in-filled ditch predating the villa.

A series of three parallel long thin (or "strip") field enclosures [**m31-33**] extend from the main villa complex into the field to the north-west, with their long axis running downslope to the rhyne. There is little evidence of internal activity within the enclosures, other than a probable ditched trackway or droveway entering [**m32**], perhaps suggesting they were used for grazing and securing livestock or for cultivation of crops. Possible evidence for cultivation [**m35**] could, perhaps, be related to the villa settlement although a later origin cannot be discounted. More complex sub-divisions at [**m36**] and [**m37**] within the enclosures may relate to roadside occupation aligned along a possible trackway [**m38**] skirting the northern edge of the villa complex and adjacent to the floodplain, perhaps with a terrace or revetment flood defence [**m39**].

A complex, of small ditched enclosures [**m40-42**] to the north, together with a scatter of pit-type responses, probably represent more than one phase of development bracketing a double-ditched trackway [**m43**] heading north. It is unclear whether [**m40-42**] represents a continuation of the Roman activity or if they are associated with the medieval or post-medieval use of the landscape, although a linear ditch [**m44**] appears to suggest continuity with the villa compound some 150m to the east. The broad linear anomaly [**m30**] also appears to terminate close to [**m43**] and in the immediate vicinity of enclosures [**m40-42**]. Disturbance from a ferrous pipe [**m45**] also crosses this area, possibly indicating more recent use of the spring that supplied the villa. Elements of this activity [**m31-45**] survives as earthworks and may, potentially, be obscured by later phases of the landscape associated with the Hext and Stawell mansions (cf Aston 1978, Fig 3).

The double-ditched enclosure system associated with the villa appears to extend into the field to the south east [**m46**], but is largely lacking any internal activity other than [**m47**] which potentially merges with the drainage channel or conduit [**m18**] and [**m19**] and may represent a further continuation of the leats associated with the spring. A double-ditched rectangular enclosure [**m48**] with a probable entrance break at [**m49**], faces onto a series of broad and narrow linear anomalies [**m50**] possibly representing a trackway along the southern margin of the Low Ham Rhyne floodplain. The trackway [**m50**] extends north towards the entrance of the villa compound at [**m5**], although the association between the two is not entirely clear. There is also partially defined evidence for further field systems, [**m51-53**] potentially associated with eitherthe villa or an Iron Age precursor settlement as well as a very tentative indication of a possible ring-gully [**m54**]. On the upper slopes of the valley a series of parallel leats or stone-lined conduits [**m55**] and [**m56**] of unknown date are, again potentially related to water management from the spring line above the villa. The parallel linear anomalies [**m57**] may, possibly be associated with the post-medieval activity at the site as they appear to be aligned on an avenue approaching the site from the south shown on the 1779 estate map (Wilson-North 1998, Figure 37).

Ground Penetrating Radar survey

A graphical summary of the significant GPR anomalies, [**gpr1-53**] discussed in the following text, superimposed on the base OS map data, is provided in Figure 15.

Low Ham Villa

Significant reflections have been recorded to approximately 30ns (1.49m) before the signal begins to become attenuated, although badger setts found in the main villa field extend beyond 50ns (2.48m). Whilst the response across the site is generally good it has been interrupted in places by the presence of collapsed badger setts [**gpr1**], vehicle ruts [**gpr2**] and other topographic variation over the site. In some places it is also unclear whether the very near-surface response may also be due, at least in part, to a concentration of rabbit burrows [**gpr3**].

There is some evidence for possible field drains [**gpr4**] in the near-surface data between 2.5 and 15.0ns (0.12 to 0.74m) in the lower lying ground adjacent to the river, and these partially replicate negative linear magnetic anomalies. Other linear anomalies here [**gpr5-7**] could also be associated with field drainage and appear on a different alignment to the more significant magnetic responses. One of the broader anomalies [**gpr7**] also appears to follow a distinct break in slope running across the site.

The walls of the structural remains appear from between 2.5 and 27.5ns (0.12 to 1.36m) but are very fragmented in the GPR data compared with the magnetic response, possibly due to the presence of building rubble or spoil from the original excavations. A direct correlation with the excavation plan from 1946-8 of the west wing is complicated by the fragmented nature of the data and the presence of extensive badger setts, although [**gpr8**] and [**gpr9**] would appear to match the dimensions of room 19 and the partially excavated square room immediately to the north. The group of wall-type anomalies to the south of the wing at [**gpr10**] largely replicates the excavated layout of rooms 2 and 11-14, with some slight variation to the alignment. However, the main excavated bath suite rooms, 1 and 4-10, including the location of the Virgil mosaic are far more difficult to ascertain from the GPR response beyond elements of the external walls at [**gpr11**] and [**gpr12**], possibly due to the extensive network of badger setts [**gpr13**] found here. The badger sett [**gpr13**] covers a large area, perhaps partially coincident with the excavation trenches through the Roman buildings (L Rees pers comm; cf Grahame 1908), but reflections from the air-filled tunnels also extend further south to at least 50ns (2.48m) as shown in the profiles on Figure 8.

There is little evidence for the continuation of the west wing to the south of [**gpr10**], although some fragmented wall-type anomalies are found at [**gpr14**] in the vicinity of a collapsed badger sett. A linear anomaly [**gpr15**] runs from room 3 at a slight angle to the orientation of the building range, perhaps a channel leading to a more complex response [**gpr16**], itself possibly a drain down the slope towards the Low Ham Ryhne.

The remains of at least one additional room [**gpr17**] appears beyond the extent of the excavation to the north, together with a group of parallel linear anomalies [**gpr18**]. There is also considerably greater detail and complexity across the apparent north range of buildings [**gpr19-21**] than was previously recognised from either the excavations or aerial photography. Again, the GPR anomalies are rather fragmented here but perhaps suggest multiple phases of construction with, for example, deeper wall footings [**gpr19**] of a room between 12.5 and 25.0ns (0.62 to 1.24m) apparently with an apse to the north. The offset trenches shown on Dewar's plan of the excavations appear to correlate with a 5m x 16m room forming part of a larger structure [**gpr21**] to the north-east, slightly off an orthogonal alignment with respect to the west wing. It is unclear whether the group of anomalies [**gpr20**] and [**gpr21**] form part of the same building and may even, possibly, be associated with the post-medieval activity at the site as they appear to be aligned on an avenue approaching the site from the south shown on the 1779 estate map (Wilson-North 1998, Figure 37).

Three additional buildings are suggested by fragmented structural anomalies [**gpr22-24**] found to the east, although these appear discrete from each other rather than forming a more continuous wing, and both [**gpr22**] and [**gpr23**] have more shallow foundations which do not extend beyond 17.5ns (0.87m). The more substantial building [**gpr24**] appears to be associated with a diffuse response [**gpr25**], immediately to the west, and perhaps also the course of the drain [**gpr16**] from the west wing of the villa. Considered together with the other structural remains [**gpr22-24**] suggest a layout surrounding a central courtyard, although this area is largely dominated by a diffuse anomaly [**gpr26**], perhaps indicative of a deliberately metalled surface which obscures the identification of any more significant responses. An annular sub-circular anomaly [**gpr27**] is also found here with a central low amplitude response 1m in diameter which may, perhaps, indicate the location of the excavated well.

Beyond the villa enclosure [**gpr28**] correlates with a small building known from parch marks together with other possible fragmented structural remains at [**gpr29**] and [**gpr30**], although these may also be associated with the badger sett [**gpr13**]. A linear anomaly [**gpr31**], possibly a leat carrying water from the spring down the hill, is also expressed as a visible earthwork and may not, necessarily, be contemporary with the Roman activity (Figure 8). Other more diffuse anomalies, such as [**gpr32**], are likely to represent a geomorphological response to the water flowing from the spring (cf [**m26-29**]). Some more

diffuse high amplitude anomalies [**gpr33-5**] are also found on the lower lying ground, but these are difficult to interpret confidently as evidence for further structural remains.

Some extant earthwork banks close to the ryhne are replicated as high amplitude responses [**gpr36**] in the field to the south of the villa, with further linear anomalies [**gpr37**] on the higher ground, visible as parch marks at the time of the survey, possibly associated with leats from the spring. A more diffuse high amplitude anomaly [**gpr38**] appears to have some rectilinear elements suggestive of structural remains, although this is a highly tentative interpretation.

Low Ham Church

Two linear anomalies cross the lower terrace immediately to the west of the church and appear to coincide towards the wall running along edge of the road, possibly a former path [**gpr39**] from the church to Old Manor Farm, and a second path or service trench [**gpr40**] heading towards the original farm out-buildings. A further rectilinear near-surface response [**gpr41**] between 5.0 and 20ns (0.25 and 0.99m) could, perhaps, be part of a former garden design. Other more amorphous areas of high amplitude response [**gpr42**] are possibly related to the main trackway running up through the terraces.

A number of fragmented wall-type anomalies [**gpr43-46**] are found on the first raised garden terrace, although these are only partially described within the current survey area. The most substantial of these [**gpr43**] appears to run parallel to the imposing wall built by Stawell through the terraces to the east and is either associated with this or, perhaps more likely, demarcates part of the original garden boundary. There is an apparent alignment between [**gpr43**] and a fragment of wall shown on the OS mapping to the north, now obscured beneath a silage clamp, but possibly part of the Stawell mansion. A more tentative rectilinear anomaly [**gpr47**] appears to share the same alignment, although this is perhaps too limited in extent to suggest a more definitive interpretation. The confined area of disturbed ground available for survey immediately to the east of the church produced few discernible anomalies, although the high amplitude response [**gpr48**] does, possibly, respect a north-south boundary suggested by [**gpr47**]. More targeted survey in this area, perhaps after some temporary clearance of farm machinery, may well help elucidate the anomalies found here.

Some broad, more diffuse anomalies [**gpr49**] become apparent from approximately 45ns (2.23m) onwards following a north-east alignment and most likely represent a response to the underlying geology.

The near-surface data is influenced by the presence of rubble spreads [**gpr50**] visible on the surface of the tracks crossing the site and at the gates between fields. There is also a persistent ringing response [**gpr51**] over the site of the presumed Nissen hut (Wilson-North 1998, Figure 38) and a near-surface linear anomaly [**gpr52**] possibly associated with a searchlight emplacement from World War II (AMIE Monument HOB UID 1416056). The most significant anomaly would appear to be a wall [**gpr53**] shown on the 1779 map of Low Ham Estate by Samuel Donne, aligned with the main axis of the terraced gardens, and apparently surviving slightly closer to the surface to the north. No trace has been found in the area surveyed here to suggest the presence of structural remains associated with an earlier site of the Hext mansion.

CONCLUSIONS

Both the magnetometer and GPR surveys have successfully enhanced the known evidence of the Low Ham Roman villa, with the negative response to walls in the magnetic data proving exceptionally clear to the extent that fragmentary plans of complete building ranges can be discerned. Despite the impact of the badger activity, which the GPR confirms extends to quite a considerable depth over a wider area than the surface evidence suggests, it is clear that the Roman buildings previously only partially known from excavation and aerial photography continue beyond the currently designated area. Comparison of the combined data sets demonstrates a good correlation with the excavation plans of the west wing, and potentially suggests a location for the later building remains recorded by Dewar to the north. The magnetic survey has also revealed a wider landscape of field systems, trackways and enclosures beyond the villa complex in the adjacent fields, with some suggestion of precursor Iron Age settlement activity. Likely evidence for water management associated with the active spring located immediately above the villa has also been discerned, although the results suggest this may relate to an extended period of use including recent ferrous pipes.

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LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Figure 1

Location of caesium magnetometer instrument swaths, July 2018

ST4328

N

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289

288

287

286

Field 2

Field 1

Field 3

433 434 435 436 437 438 439 440

0 150m

1:2500

boundary of current scheduled area

Caesium magnetometer survey swaths

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LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Location of GPR instrument swaths, July 2018

Figure 2

ST4328

N

2018-07-27-030

Low Ham Church

2018-07-24-078

2018-07-24-049

2018-07-24-048

2018-07-24-161

2018-07-25-172

Hext Hill

Low Ham villa

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290

289

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287

286

433 434 435 436 437 438 439 440

0 150m

1:2500

2018-07-24-048 Location of selected GPR profiles shown on Figure 8

Ground Penetrating Radar survey swaths

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LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Location of caesium magnetometer survey, July 2018

Figure 3

ST4328

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Field 2

Field 1

Field 3

-3.86 -1.01 1.85 4.71
nT/m

433 434 435 436 437 438 439 440

0 150m

1:2500

boundary of current scheduled area

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Figure 4

GPR amplitude time slice between 12.5 and 15.0ns (0.62 - 0.74m), July 2018

ST4328

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Low Ham Church

Hext Hill

Low Ham villa

2018-07-27-030

2018-07-25-172

2018-07-24-078

2018-07-24-049

2018-07-24-048

2018-07-24-161

0 150m

1:2500

2018-07-24-048 Location of selected GPR profiles shown on Figure 8

Low High

relative reflector strength

Geophysics Team 2018

Historic England

Figure 5

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET
Caesium magnetometer survey, July 2018

Trace plot of minimally processed data from Fields 1 and 2

Geophysics Team 2018

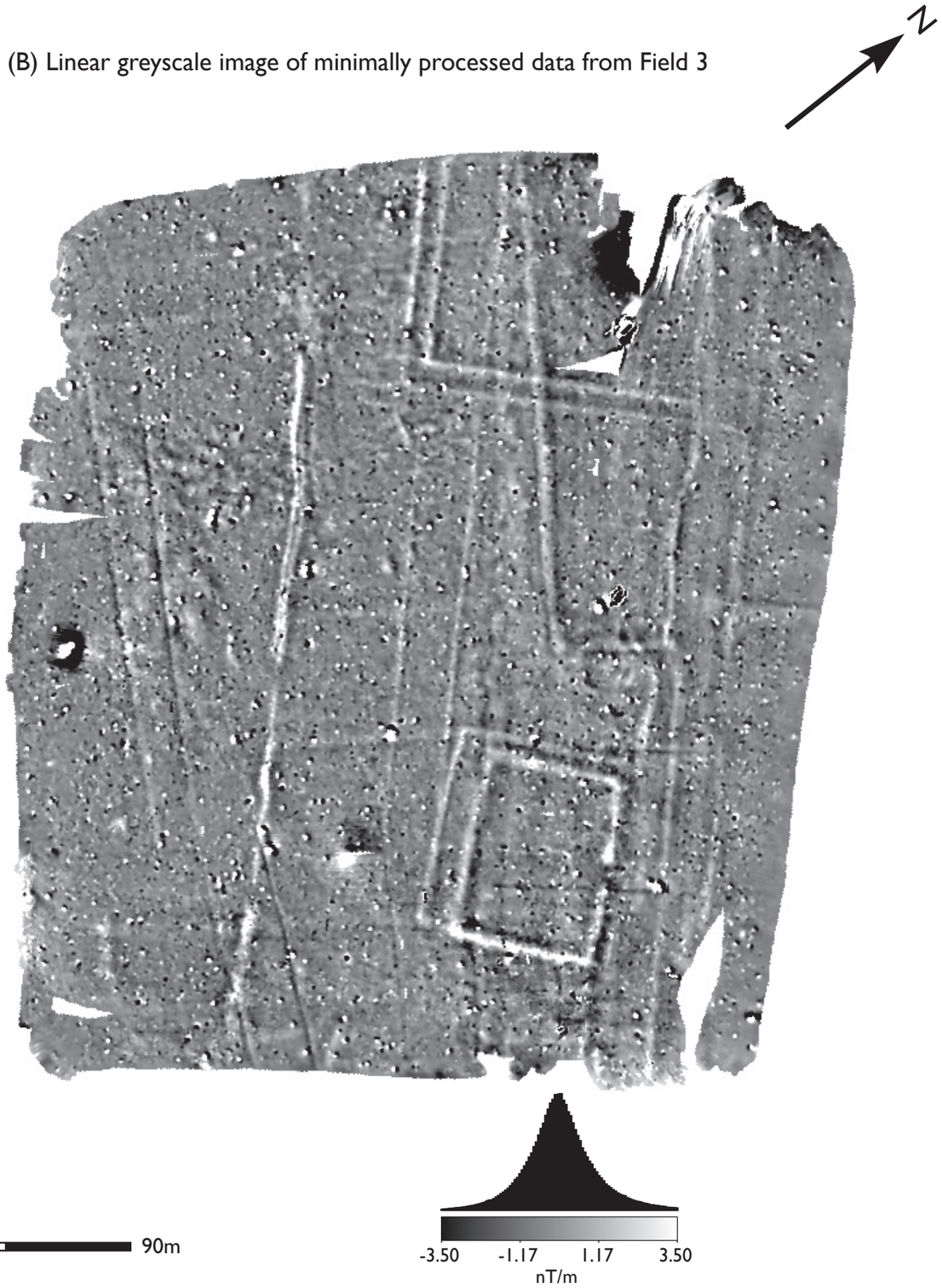
Historic England

Figure 6

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET
Caesium magnetometer survey, July 2018

(A) Trace plot of minimally processed data from Field 3

(B) Linear greyscale image of minimally processed data from Field 3



0 90m

1:1250

Geophysics Team 2018

Historic England

Figure 7

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET
Caesium magnetometer survey, July 2018

Linear greyscale image of minimally processed data from Fields 1 and 2

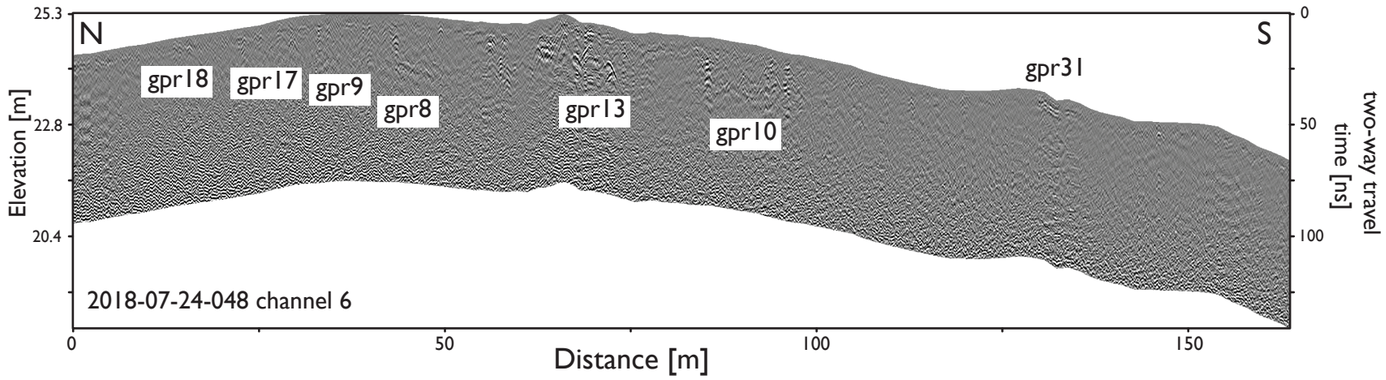
Geophysics Team 2018

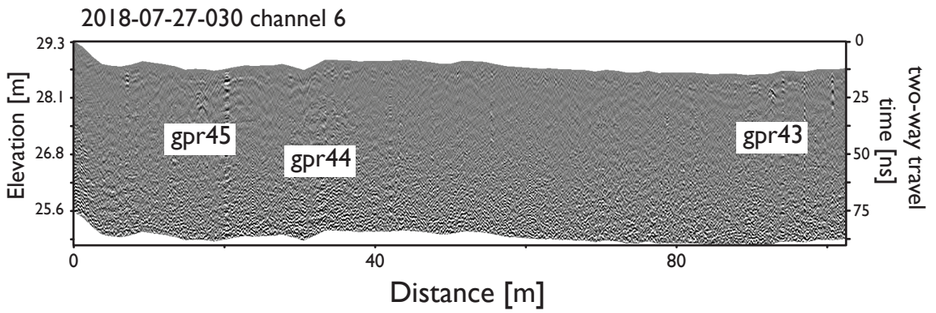
Historic England

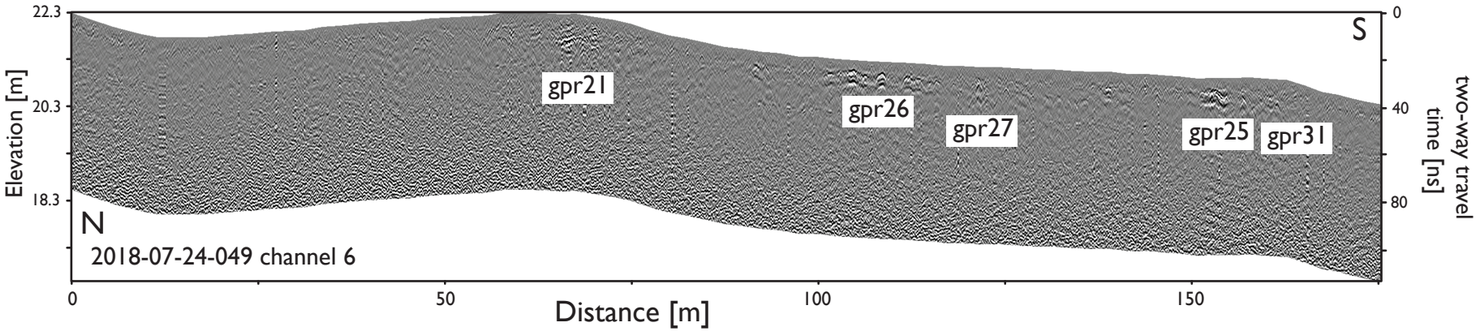
LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

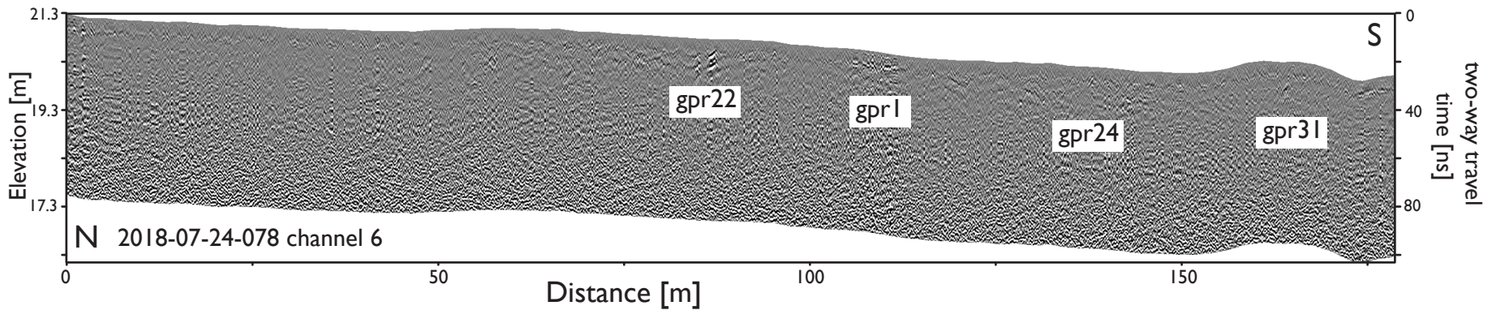
Figure 8

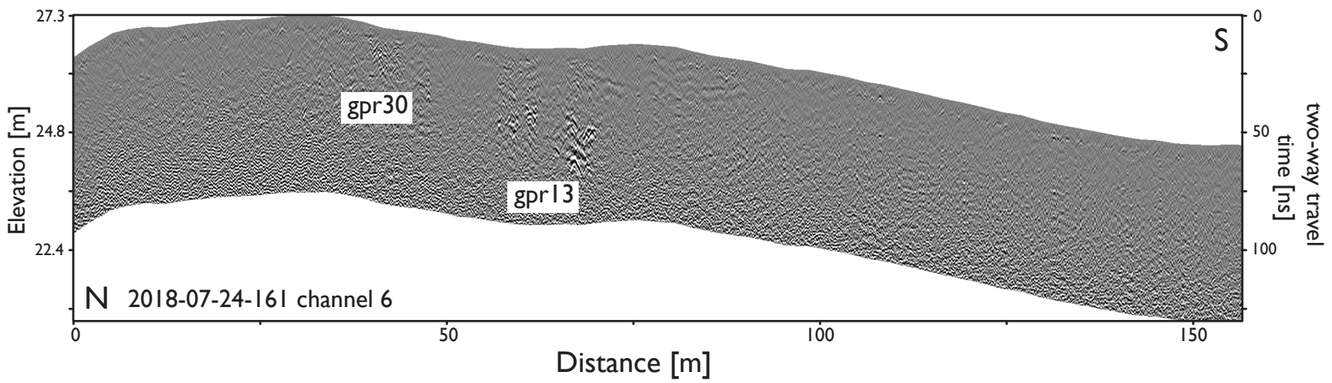
Topographically corrected GPR profiles, July 2018

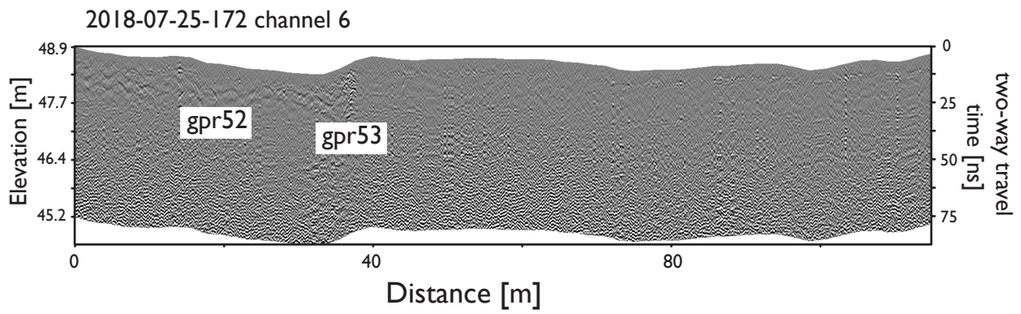












Geophysics Team 2018

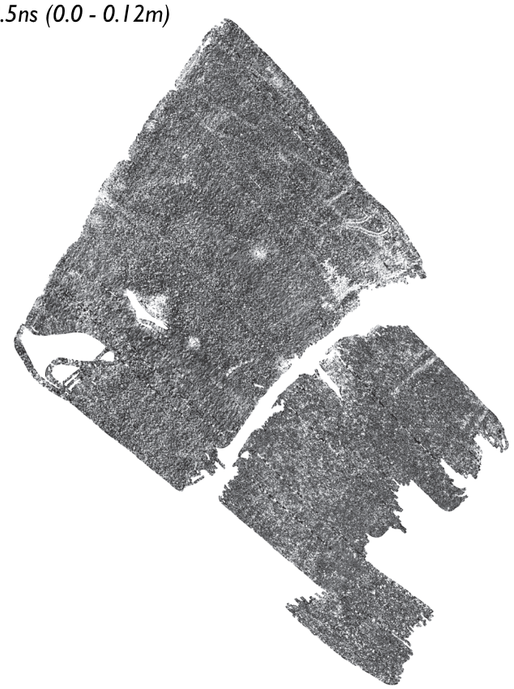
Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Figure 9

GPR amplitude time slices, Low Ham villa, between 0.0 - 20.0ns (0.0 - 0.99m), July 2018

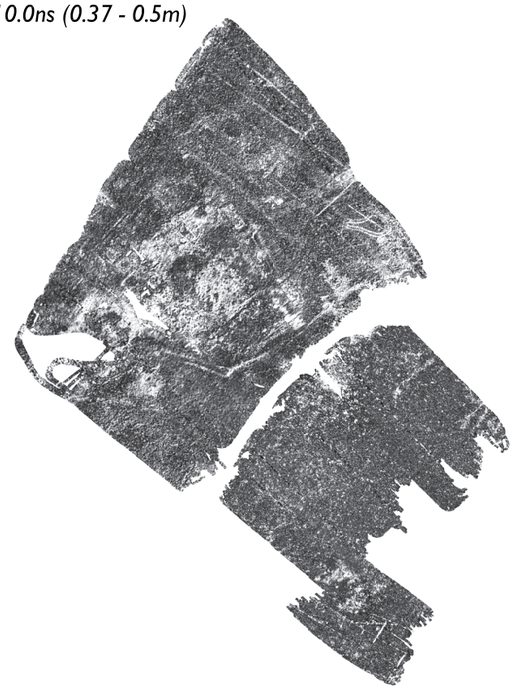
0 - 2.5ns (0.0 - 0.12m)



2.5 - 5.0ns (0.12 - 0.25m)

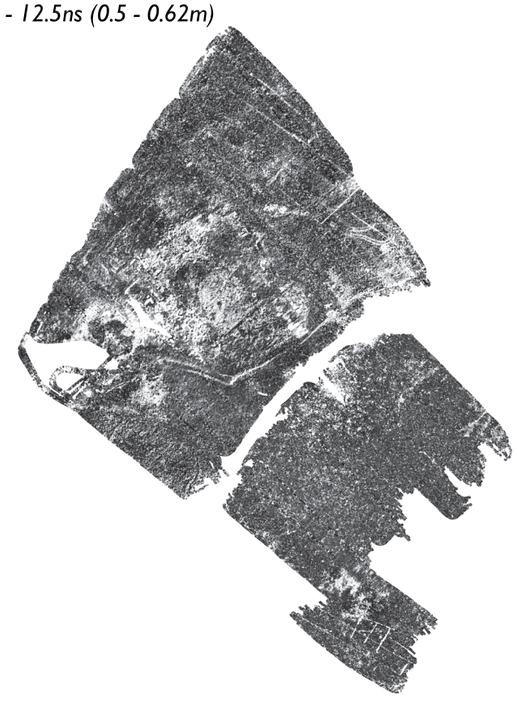
5.0 - 7.5ns (0.25 - 0.37m)

7.5 - 10.0ns (0.37 - 0.5m)

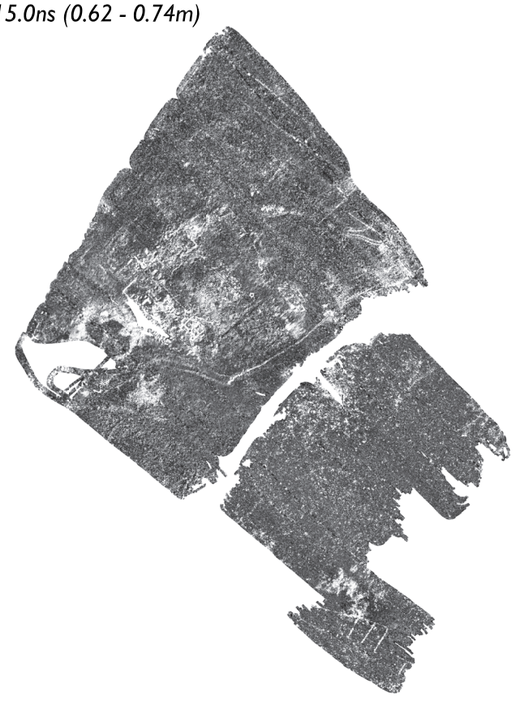


N

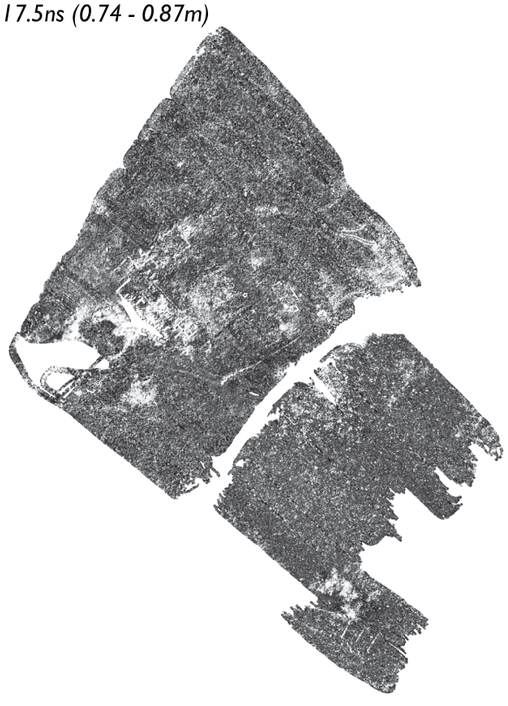
10.0 - 12.5ns (0.5 - 0.62m)



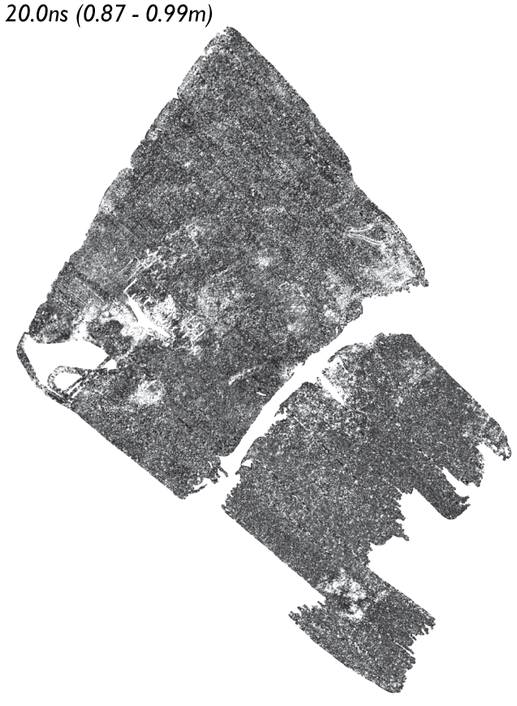
12.5 - 15.0ns (0.62 - 0.74m)



15.0 - 17.5ns (0.74 - 0.87m)



17.5 - 20.0ns (0.87 - 0.99m)



Low *High*
relative reflector strength

0 150m
1:4000

Geophysics Team 2018

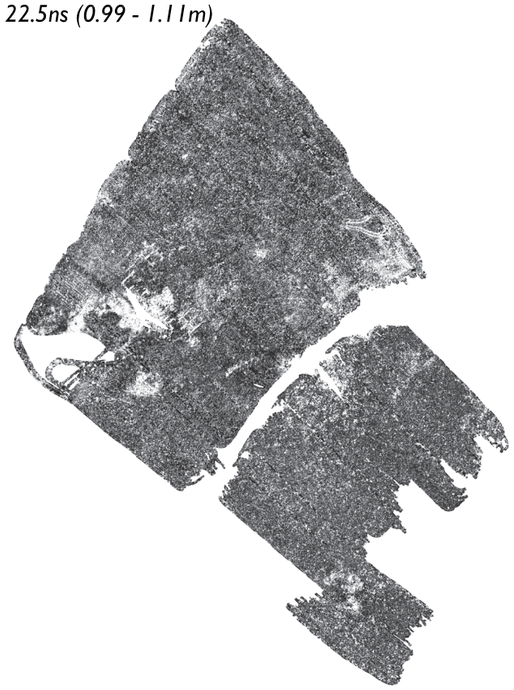
Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

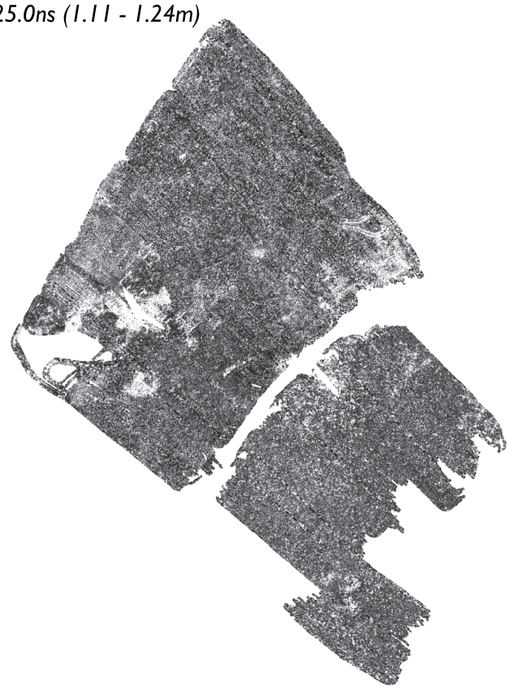
Figure 10

GPR amplitude time slices, Low Ham villa, between 20.0 - 40.0ns (0.99 - 1.98m), July 2018

20.0 - 22.5ns (0.99 - 1.11m)

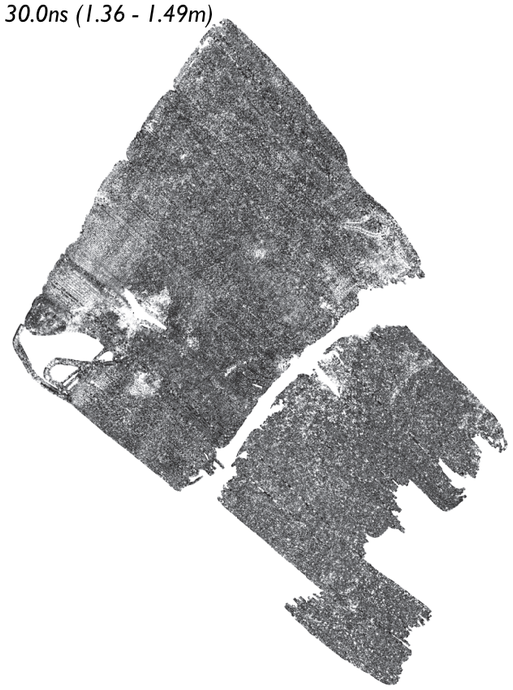


22.5 - 25.0ns (1.11 - 1.24m)



25.0 - 27.5ns (1.24 - 1.36m)

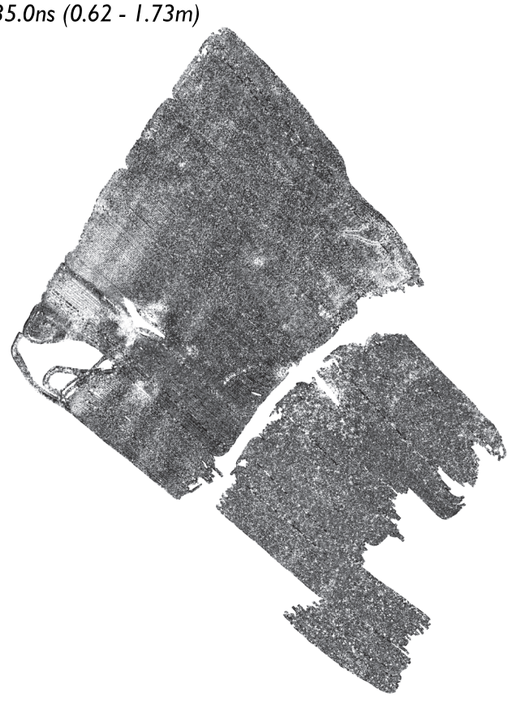
27.5 - 30.0ns (1.36 - 1.49m)



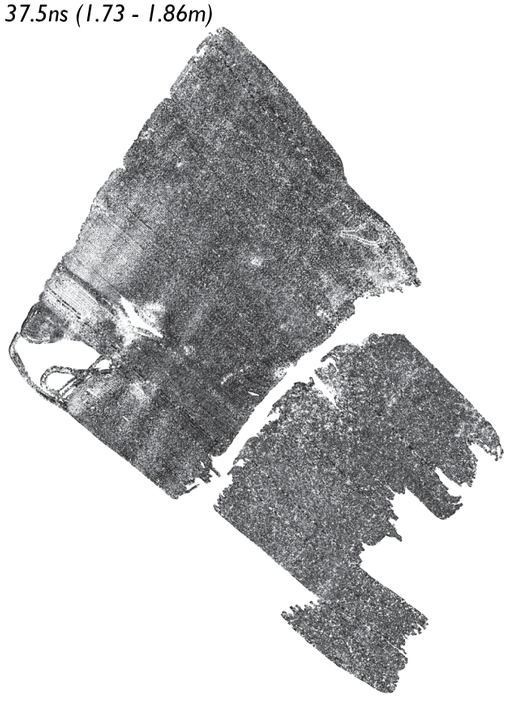
N

30.0 - 32.5ns (1.49 - 1.61m)

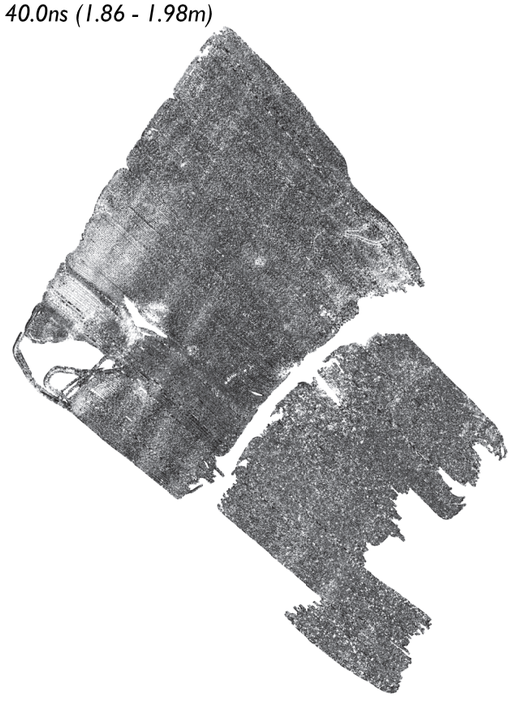
32.5 - 35.0ns (0.62 - 1.73m)



35.0 - 37.5ns (1.73 - 1.86m)



37.5 - 40.0ns (1.86 - 1.98m)



Low *High*
relative reflector strength

0 150m
1:4000

Geophysics Team 2018

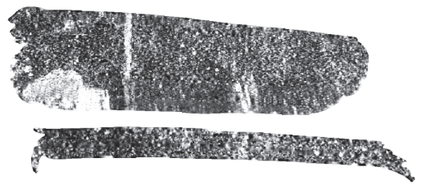
Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

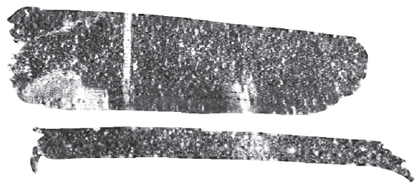
Figure 11

GPR amplitude time slices, Hext Hill, between 0.0 - 40.0ns (0.0 - 1.98m), July 2018

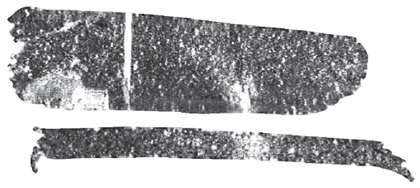
0 - 2.5ns (0.0 - 0.12m)



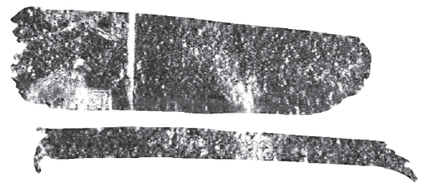
2.5 - 5.0ns (0.12 - 0.25m)



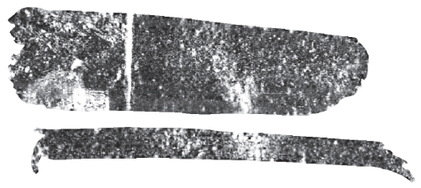
5.0 - 7.5ns (0.25 - 0.37m)



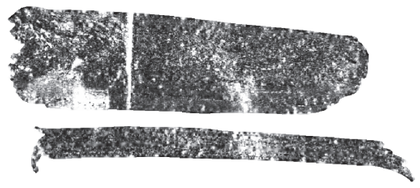
7.5 - 10.0ns (0.37 - 0.5m)



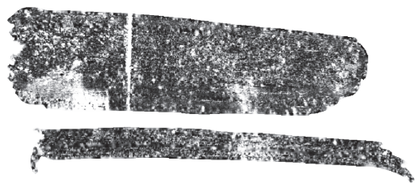
10.0 - 12.5ns (0.5 - 0.62m)



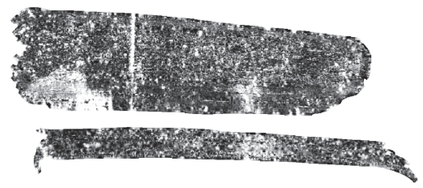
12.5 - 15.0ns (0.62 - 0.74m)



15.0 - 17.5ns (0.74 - 0.87m)



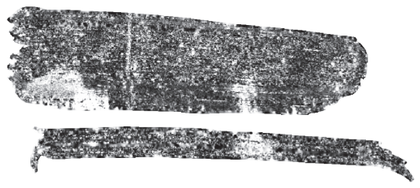
17.5 - 20.0ns (0.87 - 0.99m)



N

20.0 - 22.5ns (0.99 - 1.11m)

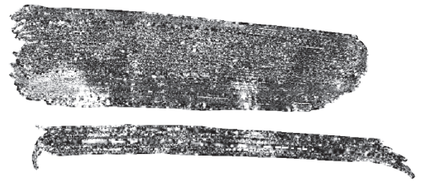
22.5 - 25.0ns (1.11 - 1.24m)



25.0 - 27.5ns (1.24 - 1.36m)

27.5 - 30.0ns (1.36 - 1.49m)

30.0 - 32.5ns (1.49 - 1.61m)



32.5 - 35.0ns (0.62 - 1.73m)

35.0 - 37.5ns (1.73 - 1.86m)

37.5 - 40.0ns (1.86 - 1.98m)

Low *High*
relative reflector strength

0 60m
1:2000

Geophysics Team 2018

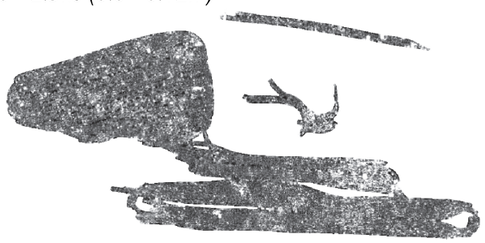
Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Figure 12

GPR amplitude time slices, Low Ham Church, between 0.0 - 40.0ns (0.0 - 1.98m), July 2018

0 - 2.5ns (0.0 - 0.12m)



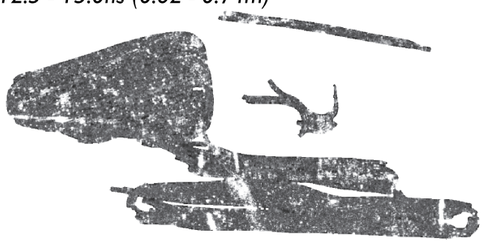
2.5 - 5.0ns (0.12 - 0.25m)

5.0 - 7.5ns (0.25 - 0.37m)

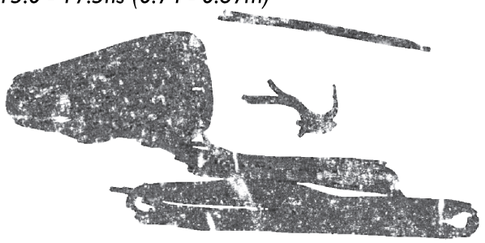
7.5 - 10.0ns (0.37 - 0.5m)

10.0 - 12.5ns (0.5 - 0.62m)

12.5 - 15.0ns (0.62 - 0.74m)



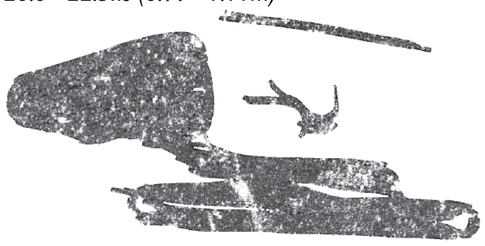
15.0 - 17.5ns (0.74 - 0.87m)



17.5 - 20.0ns (0.87 - 0.99m)

N

20.0 - 22.5ns (0.99 - 1.11m)



22.5 - 25.0ns (1.11 - 1.24m)

25.0 - 27.5ns (1.24 - 1.36m)

27.5 - 30.0ns (1.36 - 1.49m)

30.0 - 32.5ns (1.49 - 1.61m)

32.5 - 35.0ns (0.62 - 1.73m)

35.0 - 37.5ns (1.73 - 1.86m)

37.5 - 40.0ns (1.86 - 1.98m)

Low *High*
relative reflector strength

0 60m
1:2000

Geophysics Team 2018

Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Figure 13

GPR amplitude time slices, Low Ham Church, between 40.0 - 75.0ns (1.98 - 3.71m), July 2018

40.0 - 42.5ns (1.98 - 2.1m)

42.5 - 45.0ns (2.1 - 2.23m)

45.0 - 47.5ns (2.23 - 2.35m)

47.5 - 50.0ns (2.35 - 2.48m)

50.0 - 52.5ns (2.48 - 2.6m)

52.5 - 55.0ns (2.6 - 2.72m)

55.0 - 57.5ns (2.72 - 2.85m)

57.5 - 60.0ns (2.85 - 2.97m)

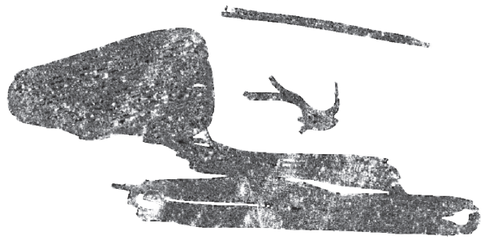
N

60.0 - 62.5ns (2.97 - 3.09m)

62.5 - 65.0ns (3.09 - 3.22m)

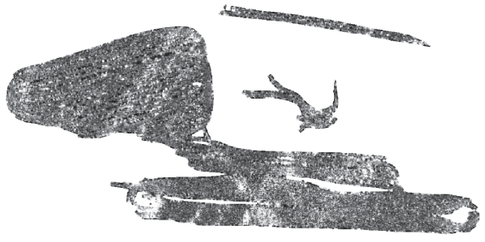
65.0 - 67.5ns (3.22 - 3.34m)

67.5 - 70.0ns (3.34 - 3.47m)



70.0 - 72.5ns (3.47 - 3.59m)

72.5 - 75.0ns (3.59 - 3.71m)



Low *High*
relative reflector strength

0 60m
1:2000

Geophysics Team 2018

Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Graphical summary of significant magnetic anomalies, July 2018

Figure 14

ST4328

N

291

290

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288

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433 434 435 436 437 438 439 440

m43 m40 m41 m38 m39 m42 m44 m43 m39 m45 m36 m30 m44 m38 m37 m25 m44 m31 m35 m30 m30 m32 m20 m33 m2 m17 m1 m6 m34 m5 m21 m7 m9 m12 m8 m30 m22 m45 m14 m3 m13 m15 m23 m4 m16 m10 m26 m11 m4 m27 m19 m30 m24 m3 m18 m28 m47 m46 m29 m50 m46 m47 m57 m54 m50 m51 m49 m52 m48 m53 m55 m56

0 150m

1:2500

positive magnetic
negative magnetic
strong positive magnetic
raised magnetic
magnetic noise

Geophysics Team 2018

Historic England

LOW HAM ROMAN VILLA, HIGH HAM, SOMERSET

Summary of significant GPR anomalies, July 2018

Figure 15

ST4328

N

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2018-07-27-030

2018-07-24-078

2018-07-24-049

2018-07-24-048

2018-07-24-161

2018-07-25-172

gpr1 gpr2 gpr3 gpr4 gpr5 gpr6 gpr7 gpr13 gpr22 gpr23 gpr28 gpr31 gpr32 gpr36 gpr37 gpr38 gpr50 gpr52

0 150m

1:2500

2018-07-24-048 Location of selected GPR profiles shown on Figure 8

low amplitude reflectors

high amplitude reflectors

anomalies of known or recent origin

Historic England

Geophysics Team 2018

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