Historic England

Geophysics

Manor Field, Uffington, Shropshire
Report on Geophysical Surveys, August 2021

Neil Linford, Paul Linford and Andrew Payne

Discovery, Innovation and Science in the Historic Environment

Research Report Series no. 52-2021

MANOR FIELD, UFFINGTON, SHROPSHIRE
REPORT ON GEOPHYSICAL SURVEYS, AUGUST 2021

Neil Linford, Paul Linford and Andrew Payne

NGR: SJ 5246 1287

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 at Manor Field, Uffington, Shropshire, to address a casework request received from the Historic England Planning Team, Midlands Regions Group to assess the condition, extent and depth of survival of the ditches and other activity associated with a large Roman camp known from aerial photography and previous excavation during the construction of the A49 road. Vehicle-towed caesium magnetometer survey (30.0ha) revealed anomalies associated with the Roman camp ditches, including discontinuities in the response that may represent offset entrances to both the north and south of the site. Limited occupation evidence was identified within the camp beyond some groups of pits and thermoremanent anomalies. A possible ditched enclosure of uncertain date was also identified immediately beyond the Roman camp to the north. The GPR coverage (16.0ha) corroborated the response to the camp ditches, although the data was partially obscured by the presence of linear anomalies on a similar alignment, possibly due to later agriculture, found across the survey area. Both techniques identified wide networks of land drainage together with a previously known pond and removed field boundaries that, in places, hampered the interpretation of more subtle anomalies.

CONTRIBUTORS
The geophysical fieldwork was conducted by Neil Linford, Paul Linford and Andrew Payne. A transcription of the aerial photographic evidence was kindly provided by Matthew Oakey and information on the findings of the trial trenching by Nigel Baker.

ACKNOWLEDGEMENTS
The authors are grateful to the landowner and tenants, for allowing access to the site and timely baling and removal of the straw to allow the completion of the survey in August 2021.

ARCHIVE LOCATION
Fort Cumberland, Portsmouth.

DATE OF SURVEY
The fieldwork was conducted between 23rd to 27th August 2021, with the report completed on 20th December 2021. The cover image shows the magnetometer survey in progress looking east towards Haughmond Hill in the background (photograph by N Linford).

CONTACT DETAILS
Paul Linford, Head of 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 the site of a temporary Roman camp identified from aerial photography (Welfare and Swan 1995, NRHE Hob Uid 70585) near the village of Uffington to the east of Shrewsbury, Shropshire. The survey was requested by the Historic England Planning Team, Midlands Regions Group to support the possible designation of the site in anticipation of a local authority regional development plan assigning the area for enterprise development. The survey was designed to improve understanding of the surviving archaeological resource and inform subsequent targeted evaluation including: the condition, extent and depth of survival of the ditches of the Roman camp and the presence of any contemporary internal features and was agreed as a Planning Group casework request addressing Historic England Corporate Plan objective 2.1.1 “Know where our heritage assets are: obtain the necessary knowledge about the distribution, character and significance of our historic environment”.

The marching camp at Uffington is one of a number of early Roman camps in the vicinity of Wroxeter known from cropmarks. A rectangular enclosure, 520m by 380m, covers an area of 19ha, and appears on air photographs to have either been extended eastward by a 50m wide annexe adding a further 2.6ha or was subsequently retracted in size. The camp was overlain by a series of field boundaries and ridge and furrow, but the majority now lies in a single arable field west of the A49. During construction of the road in 1989 a small trial trench confirmed two curving 0.65m deep V-sectioned ditches associated with the northern corner of the camp, containing no dating evidence, cut through an earlier, shallower curving ditch also lacking dating evidence but presumed to be prehistoric (Ellis *et al.* 1994, 69-70, Fig 34; Hannaford 1996, 5, see SA124). A plan of the camp based on the then available aerial photographic (AP) evidence was published in Welfare and Swan (1995) and more recent assessment of the AP evidence has been conducted in parallel with the geophysical investigation (Oakey 2021).

The site lies within a bend of the River Severn over Permian and Triassic deposits of Salop Formation Mudstone, Sandstone and Conglomerate overlain by superficial River Terrace Deposits of Sand and Gravel. Local soils are primarily of the Wick 1 (541r) association consisting of deep well drained coarse loamy and sandy soils, locally over gravel but close to the banks of the River Severn these transition to the Conway (811b) association formed of deep stoneless fine silty and clayey soils variably affected by groundwater (Institute of Geological Sciences 1974, 1978; Soil Survey of England and Wales 1983). The field contained short stubble immediately following the harvest with some extant straw bales that were removed during the fieldwork. Weather conditions during the survey were warm and dry but generally overcast with mist and low cloud cover.

METHOD

Magnetometer survey

Magnetometer data were 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 (this distance was lowered to 0.75m for traverses where the power lines crossing the site were low overhead). 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 2.5m to maintain a consistent traverse separation of 0.5m. Navigation and positional control were achieved using a Trimble R8s Global Navigation Satellite System (GNSS) receiver mounted on the sensor platform 1.65m in front of the central sensor and a second R8s 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 (see Linford *et al.* 2018). The median value of each instrument traverse was then adjusted to zero by subtracting a running median value calculated over a 100m 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. For the processed image the dataset was convolved in the Fourier domain with a directional cosine filter to detect and suppress parallel linear anomalies caused by ploughing. Further processing was applied on that part of the dataset in a diagonal rectangular box immediately beneath the overhead power lines. The response of the raised gradient sensor (being closest to the overhead cables) had a Fourier domain upward continuation filter applied to estimate the magnetic anomaly due to the power lines at the position of the ground sensors. This was then subtracted from the ground sensor measurements and fifth order polynomials were then fitted and subtracted from each traverse to remove additional minor perturbations.

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 a trace plot in Figure 5, and a histogram normalised greyscale image following the processing discussed above in Figure 6.

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 R8s Global Navigation Satellite System (GNSS) receiver, together with a second R8s 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 2ms. 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 synthetic profiles from the full GPR survey data set are shown on Figure 7. 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 0.136m/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 ~0.17m intervals from the ground surface, shown as individual greyscale images in Figures 4, 8 and 9. 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 11. 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 [**m1-42**] discussed in the following text superimposed on base OS map data is provided in Figure 10 and a summary of the most substantive geophysical anomalies compared with aerial mapping evidence is shown in Figure 12.

Modern and geological activity

Several patterns of ridge and furrow cultivation are apparent [**m1-5**] concentrated in the northeast of the survey area, together with plough headlands associated with former land partitions and field boundaries [**m6-8**] and numerous sets of field drains. In addition, intense ferrous anomalies have been produced by two electricity pylons in the central area of the survey at [**m9**] and [**m10**] together with a broad linear response [**m11**] from the interconnecting overhead high-tension powerlines. Two further strong ferrous anomalies [**m12**] and [**m13**] suggest foundations of a set of earlier pylons offset to the north.

A former roadway, presumably predating the construction of the current A49, follows an approximately WSW-ENE orientation to the southern side of the field as a noisy response [**m14**], suggesting a surface composed of mixed magnetic material, continuing as a cropmark to the east of the new road (Google Earth aerial photograph also taken in 27th December 1999). Deep furrows associated with the edge of an uncultivated area of land to the west of the survey area have introduced a set of parallel linear negative anomalies at [**m15**] and [**m16**].

Occasional weak patterns of natural soil variation, for example at [**m17**], are likely to be related to river terrace sand and gravel deposits, but in general the underlying geology has not produced a significant contribution to the magnetic survey results.

Archaeological anomalies

The ditches of the Roman camp have been detected as positive linear anomalies to the north [**m18**] and south [**m19**], although the signal varies with sections of stronger magnetic response generally found to the west of the two apparent interruptions indicated at [**m20**] and [**m21**] and thought to represent entrance gaps. Subsequent trial trenching has confirmed the northern entrance gap [**m20**], locating the eastern ditch terminal in the position indicated by the magnetic survey (Baker 2021, Trench 2).

Interference from the overhead powerlines [**m11**] initially obscured the response to [**m18**], but additional processing to reduce this effect has revealed the continuation of the north camp ditch in this region of interference (see Method section and Figure 5 inset).

Some smaller gaps or interruptions in the Roman camp ditches may be present at [**m22**] towards the western end of the north ditch [**m18**], and [**m23**], towards the eastern end of the south ditch [**m19**] although in neither case is this replicated in aerial transcription evidence (Figure 12). An area of disturbance [**m24**] in the north ditch [**m18**] suggests a later intervention, possibly a larger trench cut through the main camp ditch, perhaps to broaden the ditch or for subsequent quarrying. The curvilinear north east corner of the camp enclosure [**m25**] has been found close to the modern A49 with a short continuation of the north ditch [**m26**] on the same trajectory as [**m18**] towards the eastern limit of survey coverage before it is lost due to the modern disturbance from the road. The results confirm the extension or retraction of the camp, also shown on the aerial photography, but the magnetometer data is unable to suggest the relative phasing of the two sets of ditches. A possible south-east corner of the camp has been detected at [**m27**] at the western limit of the survey allowing the overall extent of the camp, without the extension to the east of the A49, to be estimated by projecting the ditches identified in the magnetic data set.

A strongly magnetised slightly curving length of ditch [**m28**] exhibiting peak magnitudes of 20 nT in the south east of the camp interior has also been identified in aerial photography and appears to follow the line of a previous field boundary (Figure 12). While the degree of magnetisation might indicate archaeological significance, subsequent trial trenching suggests it may be the result of iron panning at the interface of the ditch bottom and a gravel layer (Baker 2021, Trench 6). The ditch yielded no finds or dating evidence and while it could possibly originate from earlier prehistoric activity, becoming a relict boundary in the landscape, it may also represent a post-Roman field boundary or drainage ditch.

Possible evidence for a set of outer ditches is found at [**m29**] and [**m30**] discontinuously aligned parallel to the main ditch [**m19**] forming the south side of the camp. It is not clear whether [**m29**] and [**m30**] are contemporary with [**m19**] or whether they represent later field boundaries possibly influenced by the fossilised former outline of Roman camp in the landscape, as also suggested by the aerial photographic evidence (Oakey 2021). Trial trenching revealed [**m29**] to be a broad, fairly shallow, U-shaped ditch perhaps weighting the evidence in favour of the latter interpretation, although no artefacts were evident in its fill (Baker 2021, Trench 5).

Other than [**m28**] there are few signs of surviving archaeological activity within the Roman camp interior, beyond some sparse groupings of possible pits concentrated at [**m31**] and [**m32**] towards the centre and a further group [**m33**] immediately outside the northern enclosure ditch. Possible pit-type responses are present in the north-east portion of the camp but identification here is hampered by significant ferrous disturbance across this area.

An inverted V-shaped pattern of parallel land-drains [**m34**] and [**m35**] are found in the central western part of the camp interior, intersecting at a significant concentration of ferrous material [**m36**] indicative of disturbed ground. Few other significant anomalies are found here, although the western extent of [**m28**] terminates at the southern end of [**m34**] and [**m35**], the location of a corner between two former field boundaries (Figure 12). Further west a rectangular area of bare soil set-aside from cultivation is bounded by deep surface furrows indicated by negative anomalies [**m15**] and [**m16**] enclosing a concentration of localised ferrous disturbance [**m37**].

The numerous patterns of land drains across the site have obscured the identification of significant archaeological activity, for example in the area immediately south of the entrance gap at [**m20**] where there appears to be a suggestion of a smaller irregular ditched enclosure [**m38**] on a different orientation to the Roman camp (cf [**gpr8-11**]). Trial trenching revealed a layer of black ash, clinker and burnt clay overlying a layer of grey plastic clay (Baker 2021, Trench 3). This has been interpreted as a farmer's dump deposit to counteract boggy conditions, so the apparent rectilinear arrangement may be coincidental. Immediately to the north of [**m20**] there is a broad amorphous region of strong positive non-ferrous response [**m39**] associated with further land-drains, possibly related to an in-filled pond presumably dating to the earlier part of the 20th century when the site was still divided into a series of smaller fields (Baker 2021, Trench 4 cf [gpr7]).

A small polygonal ditched enclosure [**m40**], possibly with some sub-divisions, is found to the north of the camp with, in places, a similar magnitude of response to the main camp ditches (Figure 5). The orientation of [**m40**] is more similar to [**m18**] than the weaker patterns of relict ridge and furrow partially detected in this area, suggesting the enclosure may either be associated with the Roman camp or, perhaps, a non-contemporary field system or a stock enclosure.

Former field boundaries to the north and south of the camp known from historic mapping, are replicated as linear ferrous anomalies at [**m41**] and [**m42**] (Welfare and Swan 1995, Fig 137, 1954 Ordnance Survey 6 inch mapping, see also Figure 12).

Ground Penetrating Radar survey

A graphical summary of the significant GPR anomalies, [**gpr1-20**] discussed in the following text, superimposed on the base OS map data, is provided in Figure11 and a summary of the most substantive geophysical anomalies compared with aerial mapping evidence is shown in Figure 12.

The very near-surface data between 0.0 and 5.0ns (0.0 to 0.34m) is dominated by recent vehicle ruts following the harvest and baling of straw from the site [**gpr1**]. More significant anomalies are evident from approximately 7.5ns (0.5m) onwards where a series of both high and low amplitude linear responses [**gpr2**] cross the site on a similar alignment to the ditches of the Roman camp. The Roman camp ditches themselves are replicated in the radar data as low amplitude anomalies, between 15.0 and 22.5ns (1.01 to 1.51m) to the north [**gpr3**], and between 10.0 and 20.0ns (0.67 to 1.34m) to the south [**gpr4**]. It is unclear whether this represents a greater level of overburden to the north, more substantial construction or, perhaps, a better degree of survival. Subsequent trial trenching does tend to suggest greater overburden above the northern ditch (Baker 2021, Trenches 1 and 5). Although the anomaly [**gpr3**] is quite subtle there is some evidence to corroborate the break found in the aerial photography and magnetic survey in the ditch to the north. The discontinuity in [**gpr4**] is more tentative and is possibly due to plough erosion of the apparently shallower ditch to the south.

Many of the linear anomalies [**gpr2**] together with the Roman camp ditches [**gpr3**] and [**gpr4**] share the same approximate orientation as a former field boundary, replicated as a high amplitude response [**gpr5**] known from both aerial photography and historic mapping data (OS Historic County Mapping Series: Shropshire 1923 Epoch 3). It is possible that the ditches of the Roman camp have influenced the position of the presumably later field boundaries, suggesting [**gpr2**] may represent former cultivation marks. Alternatively, it is possible that the linear anomalies are, in part, associated with geomorphological striations and could have been partially reused for constructing the Roman camp. However, the linear crop marks recorded by aerial photography to the east of the A49 appear to be more closely aligned with [**gpr2**] suggesting, perhaps, these do, indeed represent cultivation patterns.

The interpretation is complicated by the network of land drainage across the site [**gpr6**], appearing from between 10.0 and 22.5ns (0.67 to 1.34m), that obscures the identification of subtle anomalies. There is a concentration of drainage in the immediate vicinity of the former pond [**gpr7**] with a series of deeper lying linear anomalies [**gpr8**] from between 15.0 and 32.5ns (1.01 to 2.18m) falling to the north east, possibly a larger collector drain or other service. The low amplitude anomaly [**gpr7**] associated with the former pond appears to extend further to the north in the deeper time slices between 12.5 and 22.5ns (0.84 to

1.34m) and apparently passes through the break in the ditch of the Roman Camp, although as [**gpr3**] continues to a greater depth it suggests the pond was a later feature.

A series of broadly parallel linear anomalies [**gpr9**], again possibly field drains, head north from [**gpr8**] and pass through the ditch of the Roman Camp [**gpr3**]. Further to the north [**gpr9**] passes through two rectilinear anomalies [**gpr10**] and [**gpr11**], that appear between 10.0 and 20.0ns (0.67 to 1.34m), that may possibly represent structural remains although these lie some distance beyond the Roman camp and are more likely, perhaps, to represent further field drains installed in the vicinity of the former pond [**gpr7**].

The deeper time slices between 10.0 and 35.0ns (0.67 to 2.35m) show a possible non-ferrous service [**gpr12**], although the presence of additional, parallel linear anomalies and apparent confluence with [**gpr9**] suggests this, perhaps, may be a further field drain or collector. The ferrous former pylon base at [**m13**] correlates with a small rectangular response [**gpr13**] between 20.0 and 25.0ns (1.17 to 1.68m) to the east, but the similar response [**m12**] lies beyond the GPR coverage to the west.

A series of ditch-type anomalies, for example [**gpr14**] and [**gpr15**], are found in the deeper time slices that do not immediately appear to correlate with any magnetic response. There are also a number of large pit-type anomalies [**gpr16**] together with areas of high amplitude response [**gpr17**], perhaps indicating pockets of natural clay and gravel respectively. The deeper time slices also start to show the linear trends from the underlying geology, but the signal is heavily attenuated at this point and any interpretation remains highly tentative.

CONCLUSIONS

Both the magnetometer and GPR surveys have successfully identified anomalies confirming the survival of the Roman camp ditches known from the aerial photographic record. There is little evidence for internal activity beyond some sparse scatters of possible pit-type and thermoremanent anomalies in the magnetic survey and no obvious structural features or road corridors have been revealed within the camp by either technique. It is possible that some of these putative pits may contain material or environmental evidence associated with Roman occupation that would not, necessarily, be present in the perimeter ditches and so these might warrant further targeted excavation. However, identification of significant anomalies has been partly obscured by networks of land drainage, relict agricultural patterns and removed field boundaries across the site.

Discontinuities in the Roman camp ditches corroborate the aerial photographic record, with the magnetic data suggesting probable entrances to the north and south which appear to be slightly offset to each other similar to other Roman temporary camps such as Bromfield (Welfare and Swan 1995). It is also possible that some of the interruptions in the ditches may be due to post-Roman disturbance, such as construction of later field boundaries, small-scale quarrying or the expansion of the pond known from aerial photography to the north of the camp. The GPR data certainly indicates the presence of a large low amplitude anomaly with associated networks of field drainage in this area, perhaps suggesting the pond passed through the north ditch. However, trial trenching has confirmed a terminal in the Roman defensive ditch at the eastern side of the northern entrance gap suggesting it was an original feature even if later disturbed by drainage works.

A short section of the curvilinear corner ditch evident in the magnetic survey towards the northeast of the camp corroborates the aerial photographic evidence, although the relative phasing of the ditch anomalies is unclear due to the limited coverage within the survey area and absence of any corresponding response within the GPR data. Hence, it is not possible to determine whether the annexe represents a contraction or expansion of the camp from analysis of the geophysical data alone. In other parts of the survey the GPR data corroborates the trial trenching evidence, suggesting that the top of the surviving northern boundary ditch cut lies about one metre beneath the surface while the southern ditch is covered by a lesser depth of overburden, about 0.65 m (cf Baker 2021, Trenches 1 and 5 respectively).

Linear anomalies on a similar orientation to the Roman camp ditches are found across the site and may possibly suggest an outer work to the south or, perhaps, agricultural patterns within later field systems influenced by the location of the camp.

LIST OF ENCLOSED FIGURES

REFERENCES

Baker, N 2021 *'An archaeological evaluation of the Roman marching camp at Uffington, Shrewsbury'*.

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.

Ellis, P, Evans, J, Hannaford, H R, Hughes, E G and Jones, A E 1994 'Excavations in the Wroxeter Hinterland 1988-90: the archaeology of the A5/A49 Shrewsbury Bypass'. *Transactions of the Shropshire Archaeological and Historical Society*, **LXIX**, 1-119. [web page] https://shropshirearchaeologyhistory.files.wordpress.com/2019/09/shropshire-transactions-vol.-69.pdf

Hannaford, H R 1996 *'Salvage Recording During the Construction of the A5 Shrewsbury Bypass'*. Shropshire County Council Archaeology Service Report **98**. [web page] http://www.discovershropshire.org.uk/html/resource/resource:20110503153039.

Institute of Geological Sciences 1974 Shrewsbury, Geological Survey of England and Wales, Sheet 152 Drift. Southampton, The Director General of the Ordnance Survey.

Institute of Geological Sciences 1978 Shrewsbury, Geological Survey of England and Wales, Sheet 152 Solid. Southampton, The Director General of the Ordnance Survey.

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 2018 '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.

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.

Oakey, M 2021 *'Uffington Roman Temporary Camp, Shropshire: Aerial Investigation and Mapping Report'*. Historic England Research Report Series 61-2021.

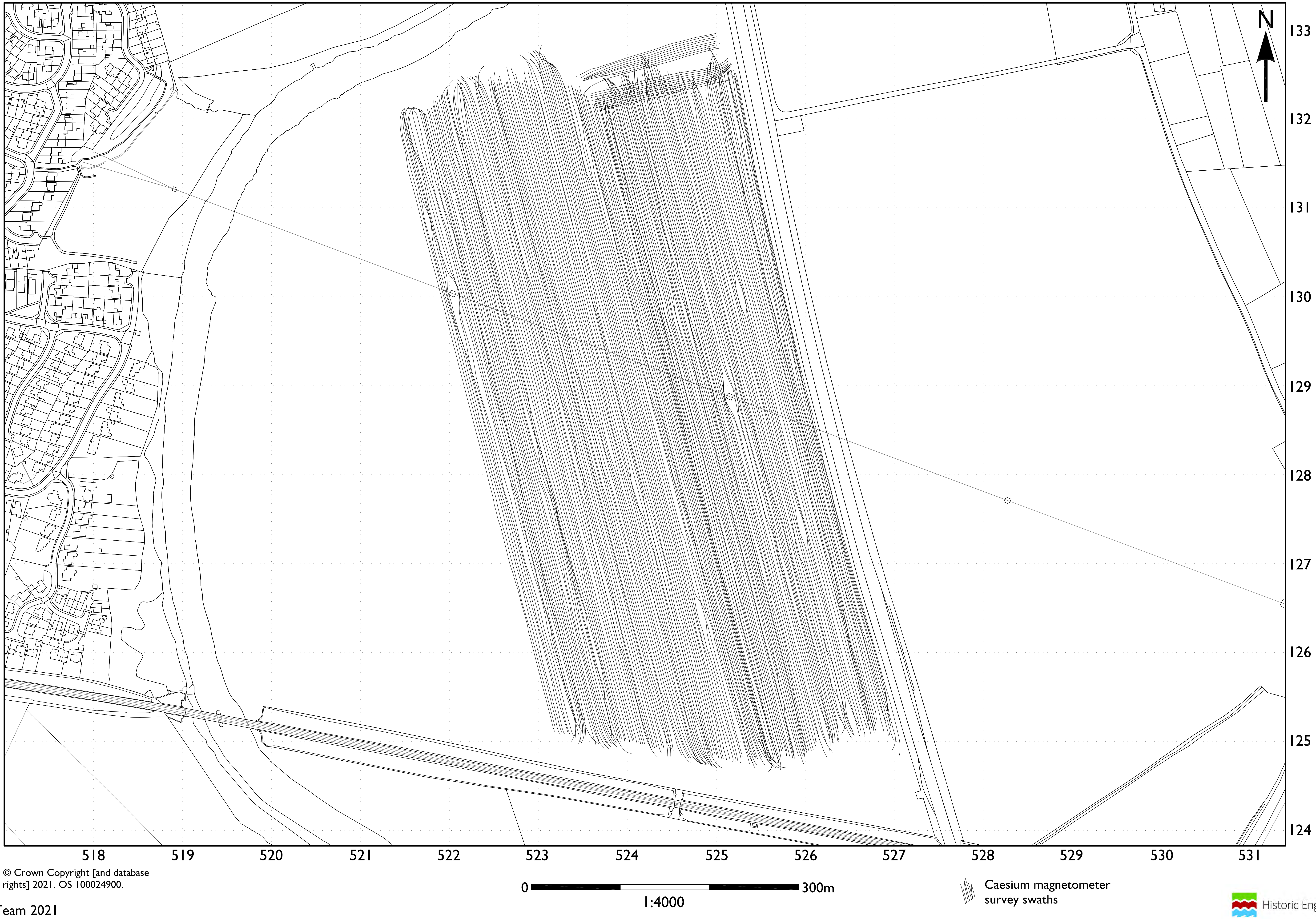
Sala, J and Linford, N 2012 ' Processing stepped frequency continuous wave GPR systems to obtain maximum value from archaeological data sets '. *Near Surface Geophysics*, 10 (1), 3-10.

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.

Welfare, H and Swan, V 1995 *Roman Camps in England, The Field Archaeology*. London, HMSO, Royal Commission on the Historical Monuments of England.

Figure 1

MANOR FIELD, UFFINGTON, SHROPSHIRE
Location of caesium magnetometer instrument swaths, August 2021

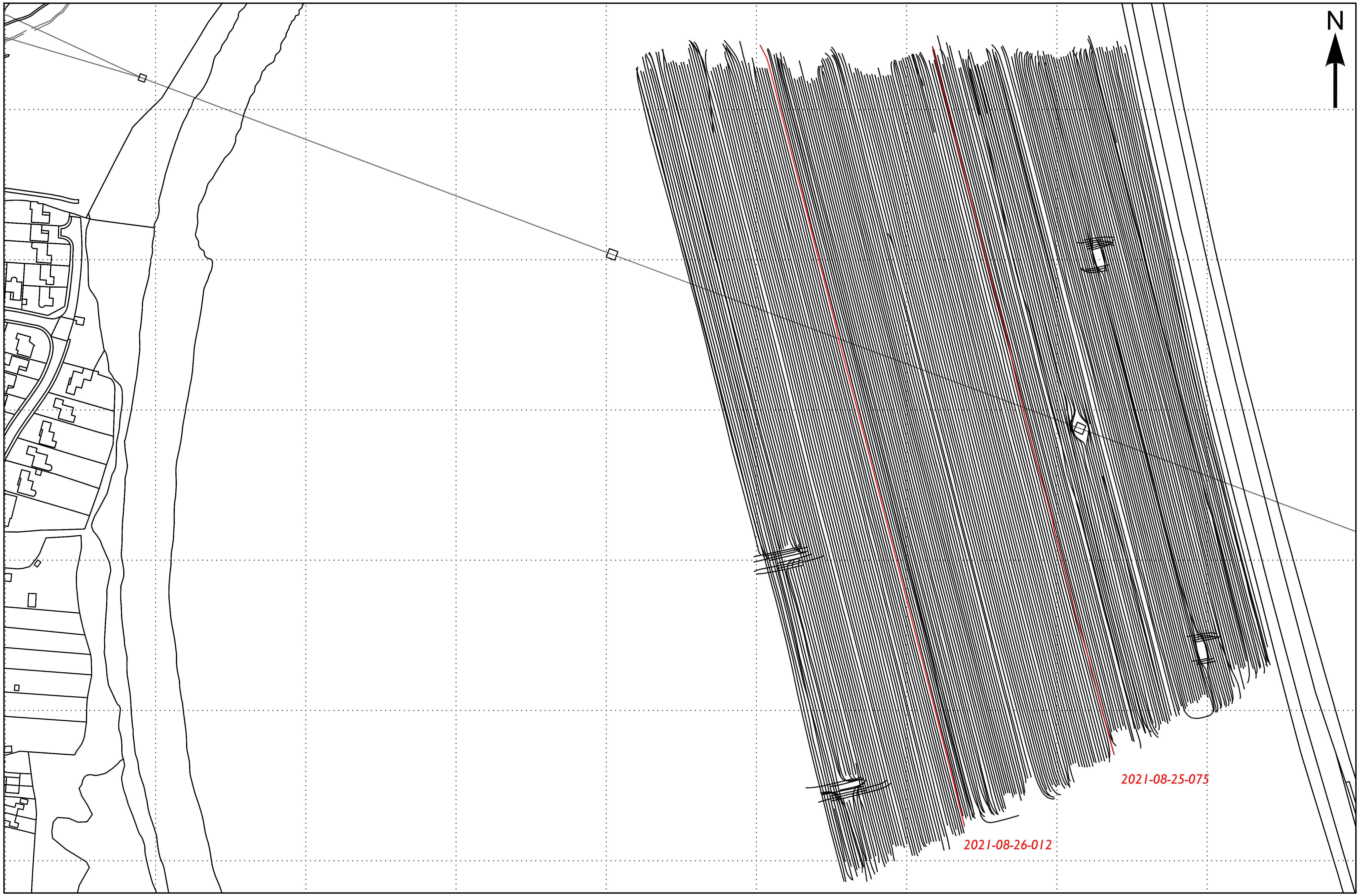


Geophysics Team 2021

Historic England

Figure 2

MANOR FIELD, UFFINGTON, SHROPSHIRE
Location of GPR instrument swaths, August 2021



0 150m
1:2500

2021-08-25-075 Location of selected GPR profiles shown on Figure 7

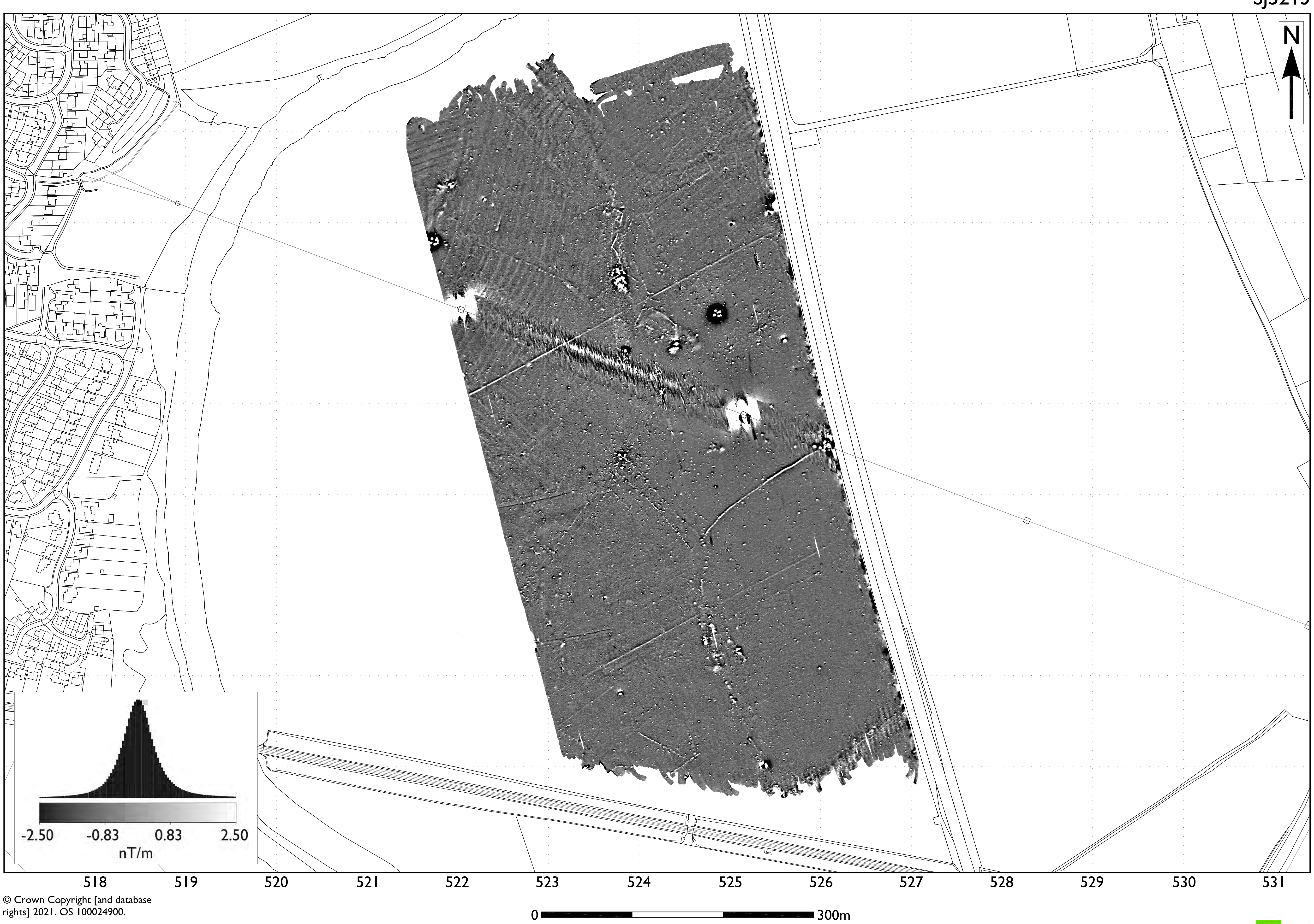
Ground Penetrating Radar survey swaths

Geophysics Team 2021

Historic England

Figure 3

MANOR FIELD, UFFINGTON, SHROPSHIRE
Location of caesium magnetometer survey, August 2021

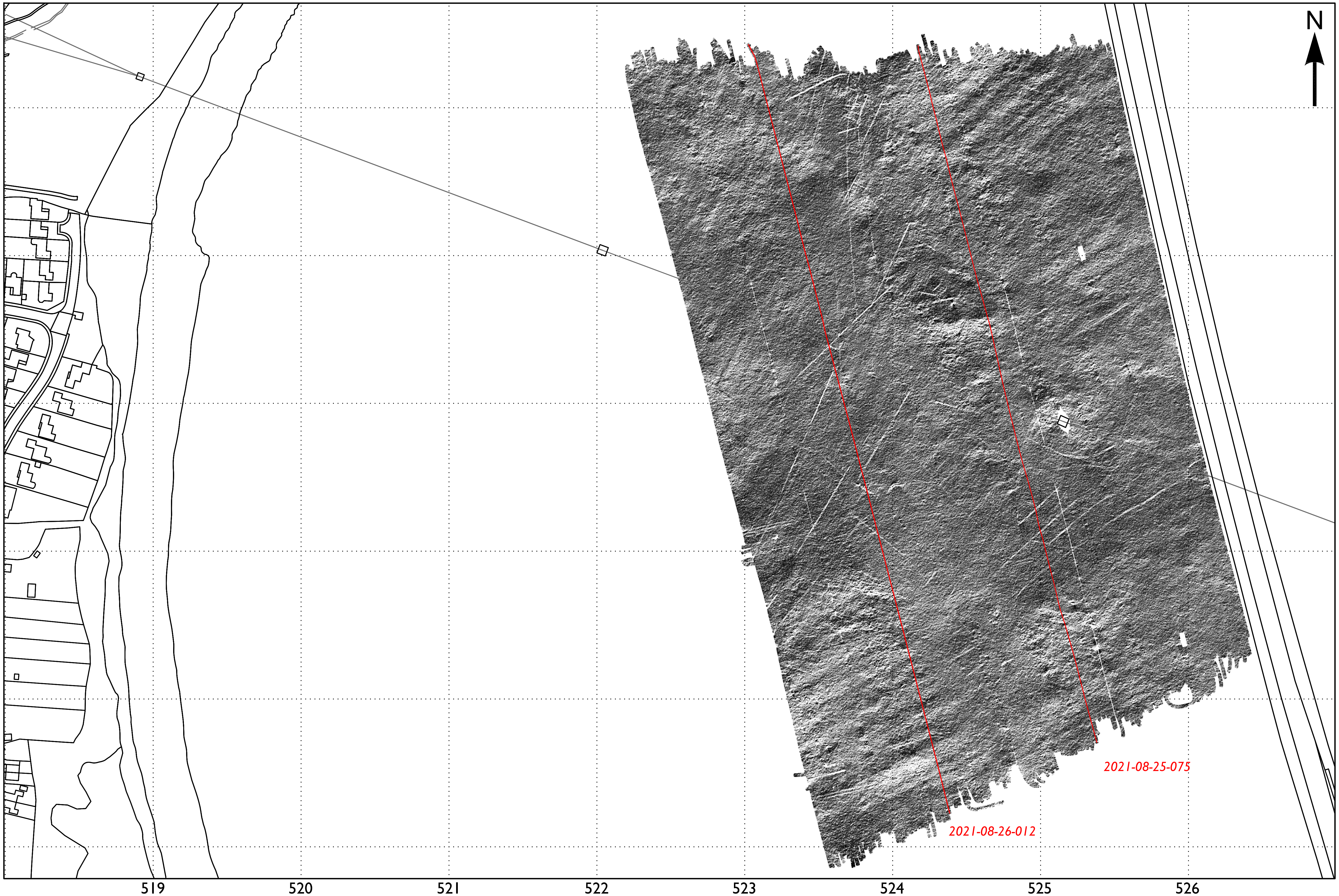


Geophysics Team 2021

Historic England

Figure 4

MANOR FIELD, UFFINGTON, SHROPSHIRE
GPR amplitude timeslice between 15.0 and 17.5ns (1.01 to 1.17m), August 2021



0 150m
1:2500

2021-08-25-075 Location of selected GPR profiles shown on Figure 7

Low High
relative reflector strength

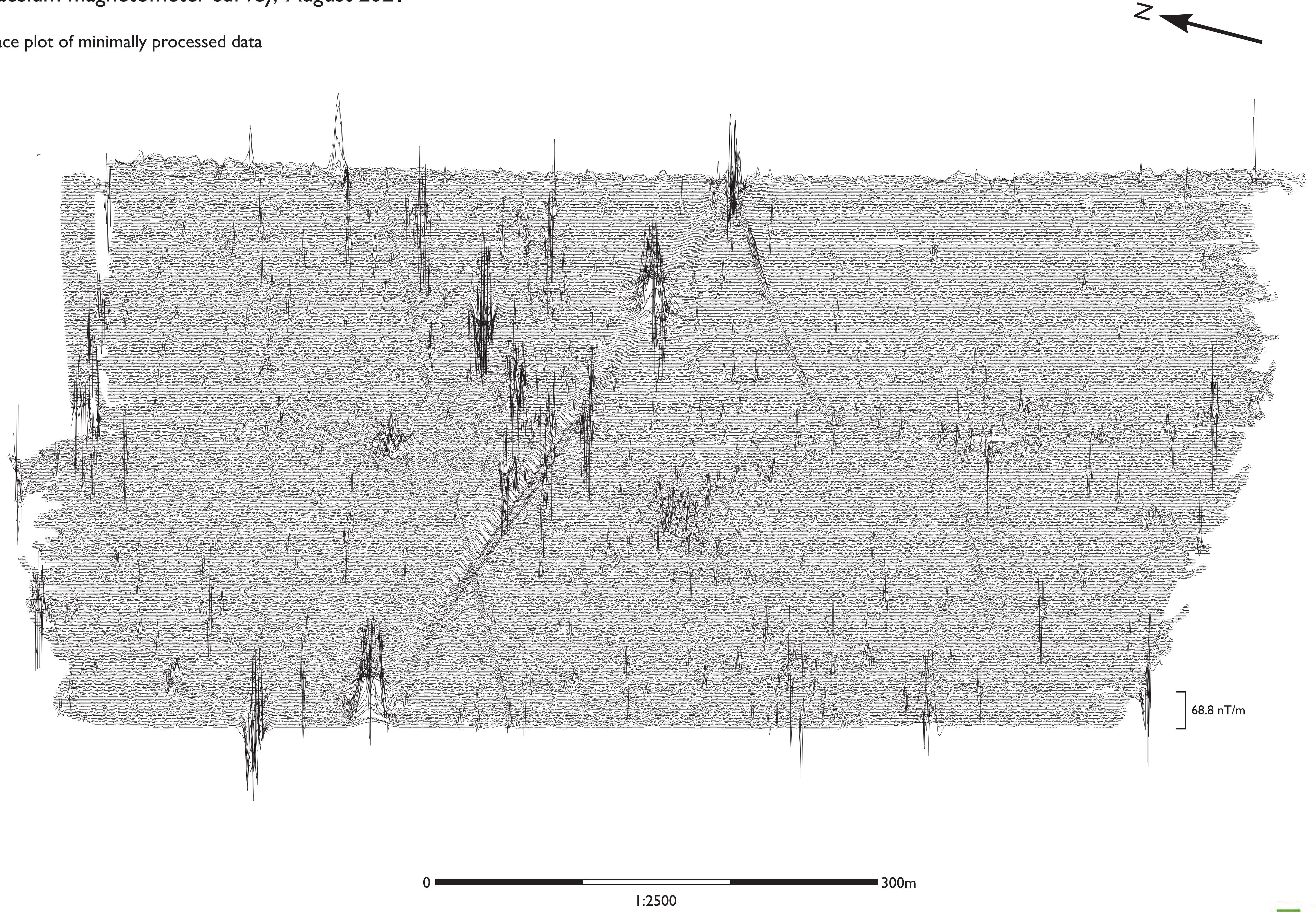
Geophysics Team 2021

Historic England

Figure 5

MANOR FIELD, UFFINGTON, SHROPSHIRE
Caesium magnetometer survey, August 2021

Trace plot of minimally processed data



Geophysics Team 2021

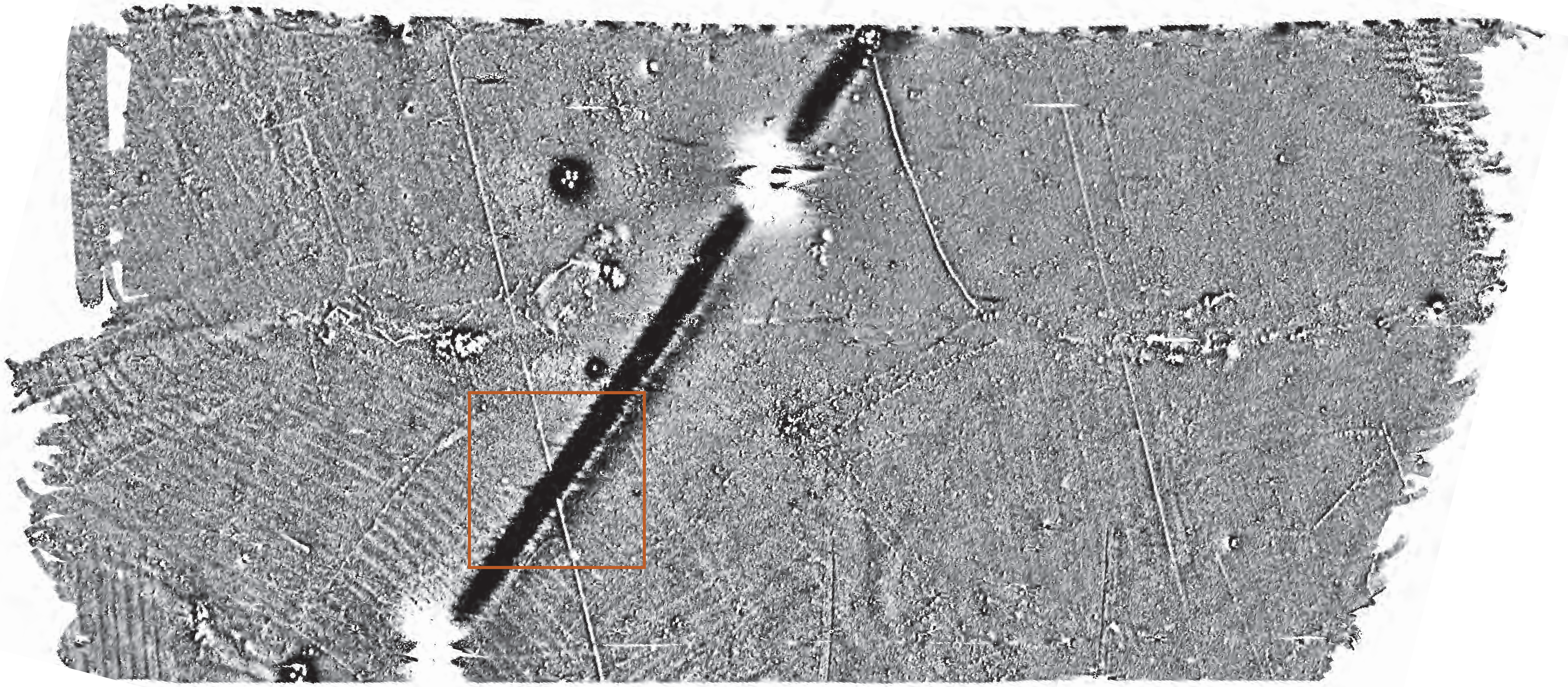
Historic England

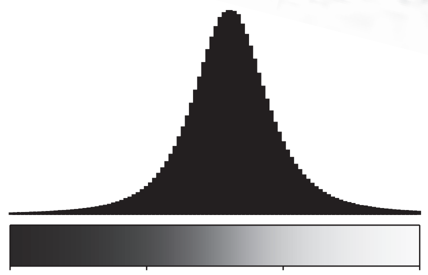
Figure 6

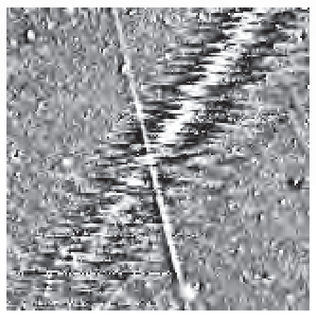
MANOR FIELD, UFFINGTON, SHROPSHIRE
Caesium magnetometer survey, August 2021

Histogram normalised greyscale image of minimally processed data

N







Overhead powerline anomaly suppressed revealing continuation of Roman camp ditch

0 300m
1:2500

Geophysics Team 2021

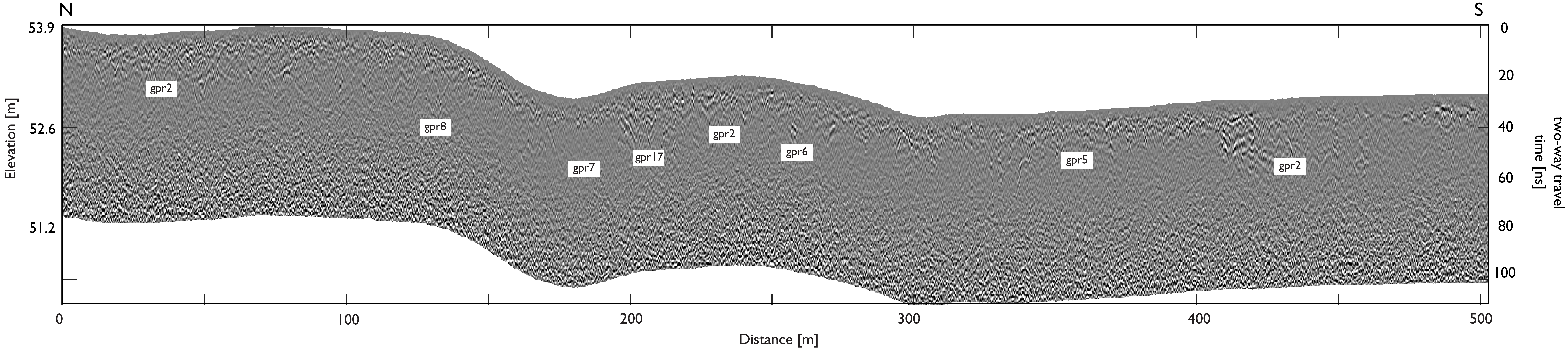
Historic England

MANOR FIELD, UFFINGTON, SHROPSHIRE

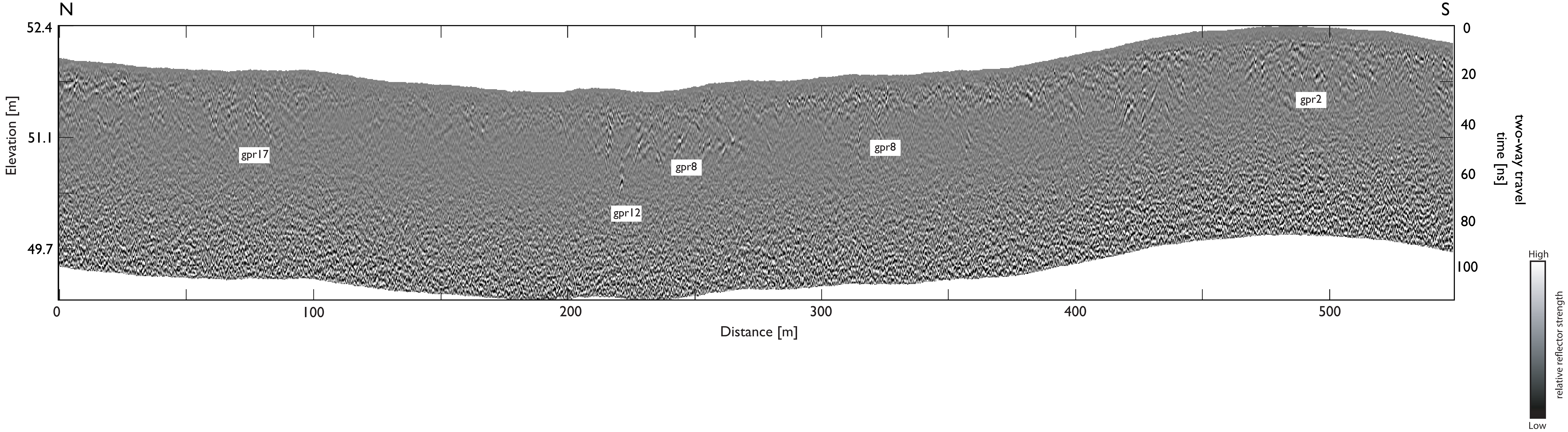
Topographically corrected GPR profiles, August 2021

Figure 7

2021-08-25-075 channel 20



2021-08-26-012 channel 20

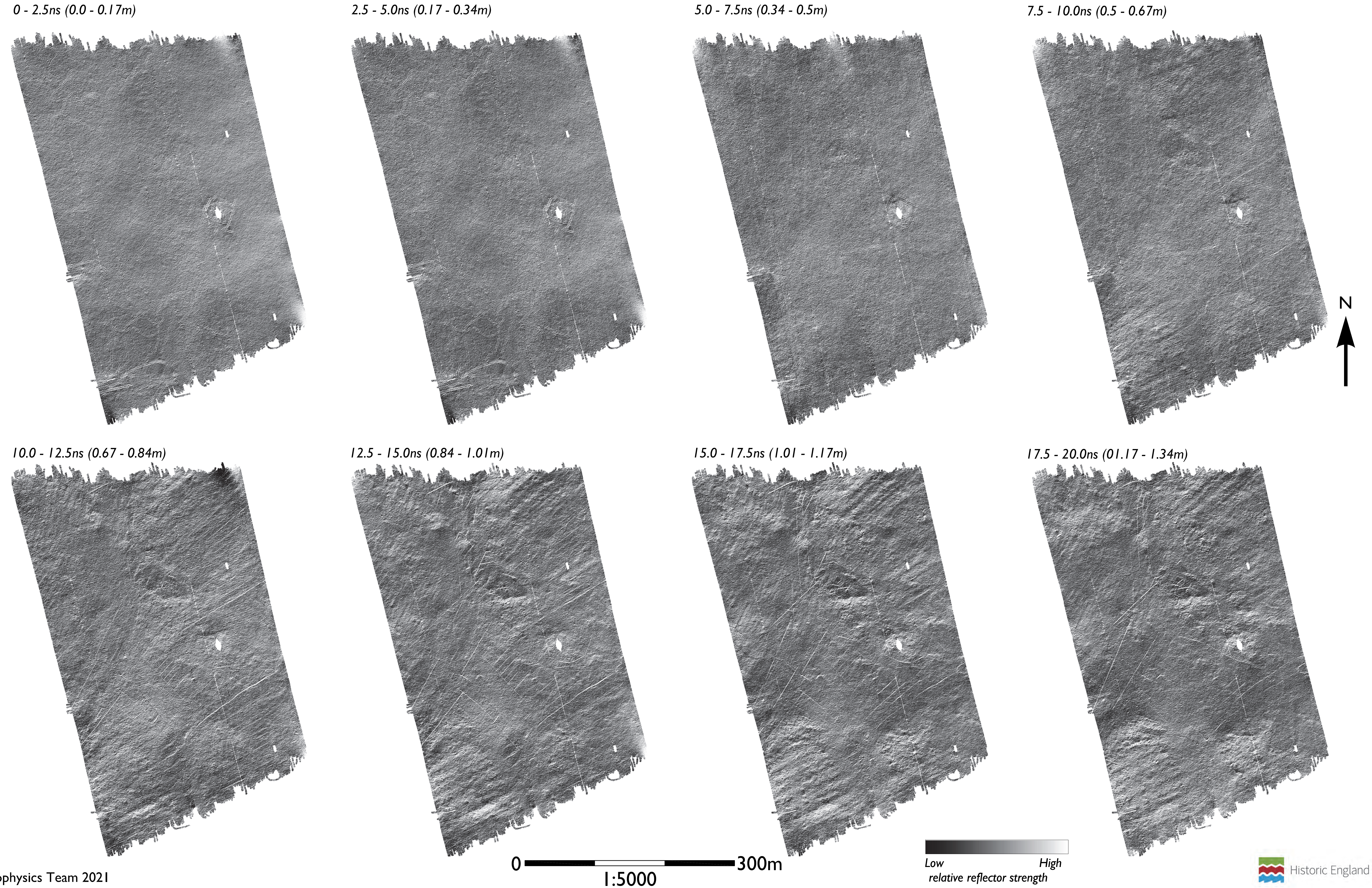


Geophysics Team 2021

Historic England

MANOR FIELD, UFFINGTON, SHROPSHIRE
GPR amplitude time slices between 0.0 - 20.0ns (0.0 - 1.34m), August 2021

Figure 8



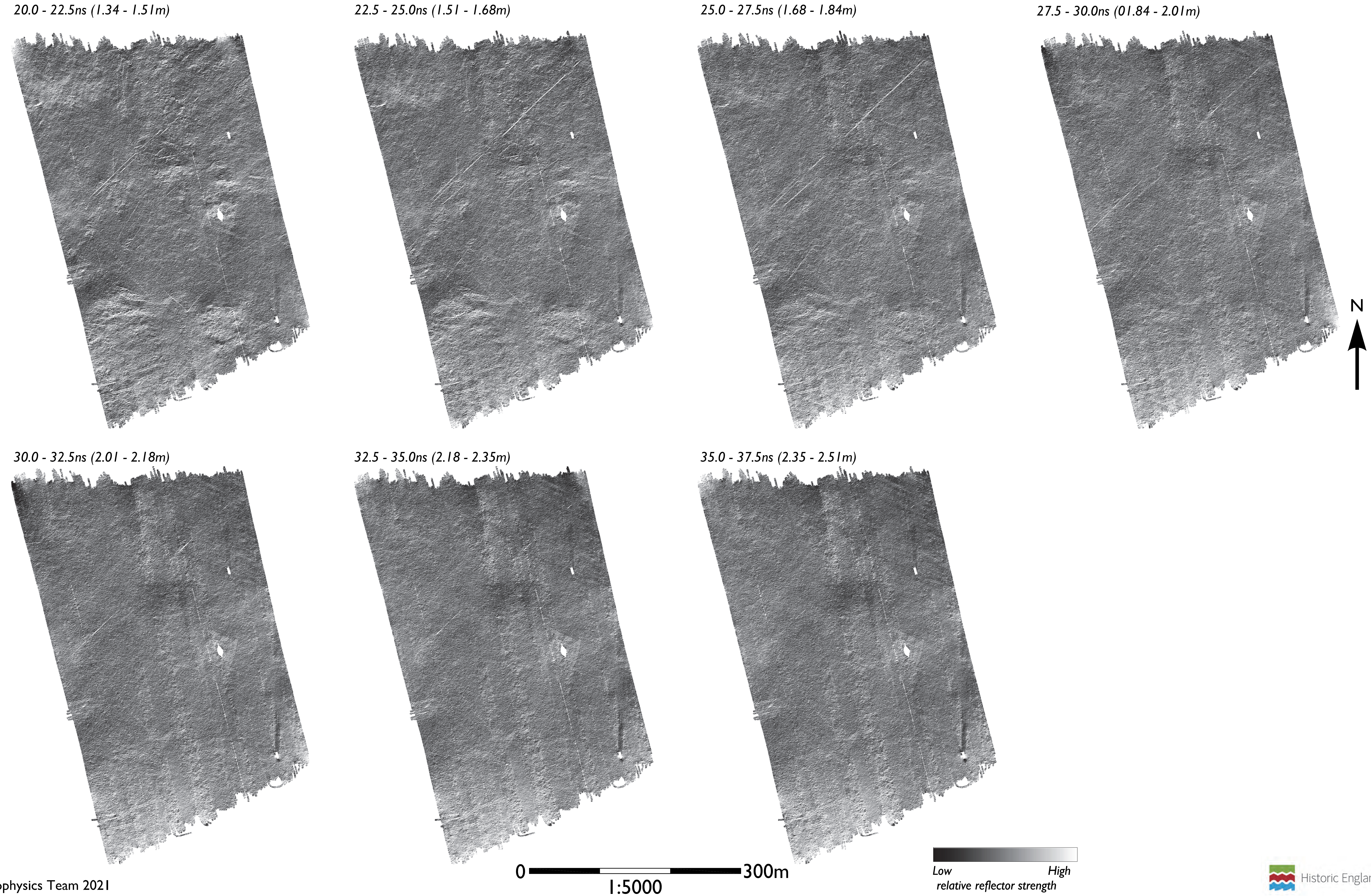
Geophysics Team 2021

Historic England

MANOR FIELD, UFFINGTON, SHROPSHIRE

GPR amplitude time slices between 20.0 - 37.5ns (1.34 - 2.51m), August 2021

Figure 9

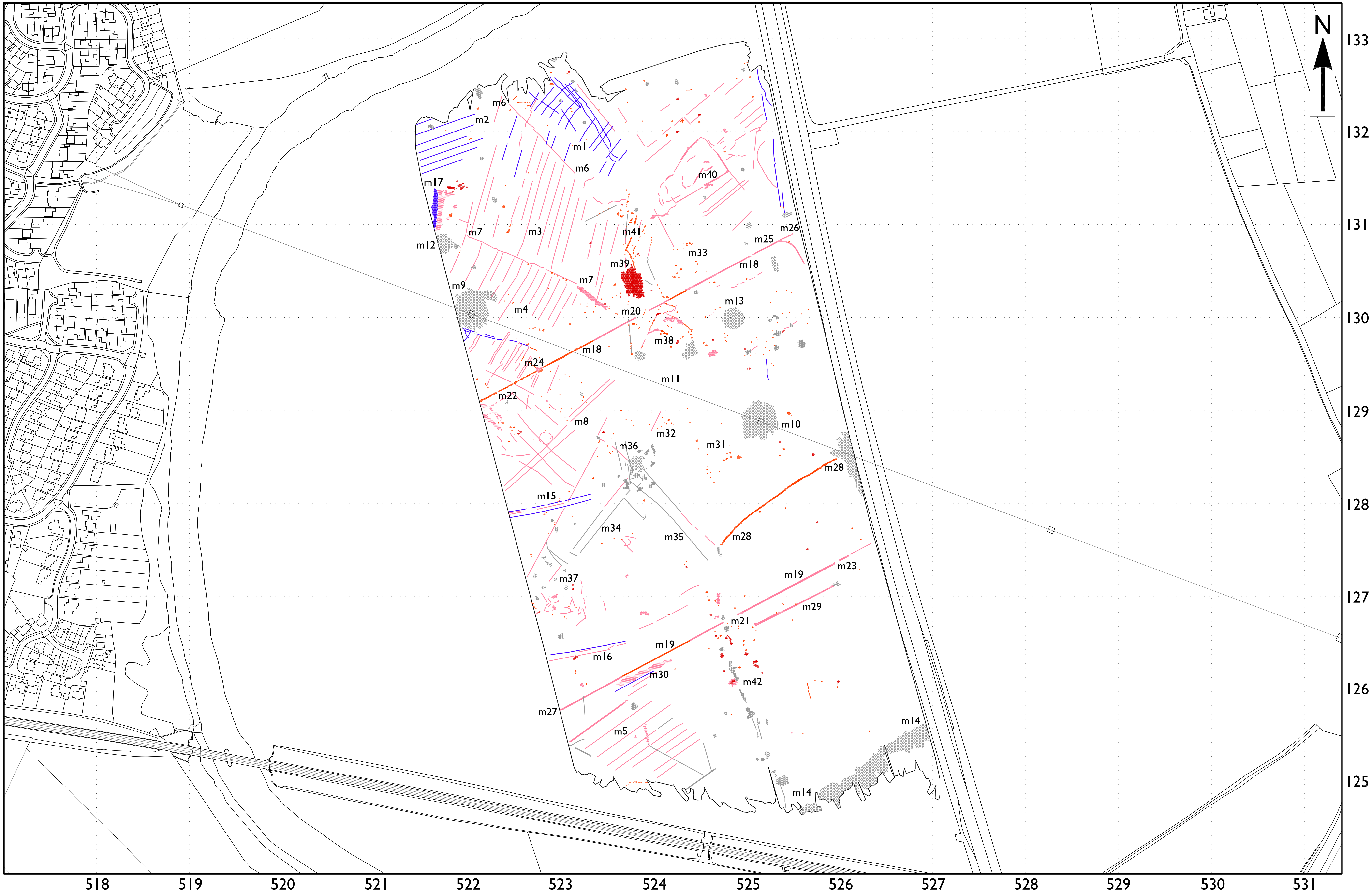


Geophysics Team 2021

Historic England

MANOR FIELD, UFFINGTON, SHROPSHIRE
Graphical summary of significant magnetic anomalies, August 2021

SJ5213



0 300m

1:4000

positive magnetic | negative magnetic | strong positive magnetic
raised magnetic | magnetic noise

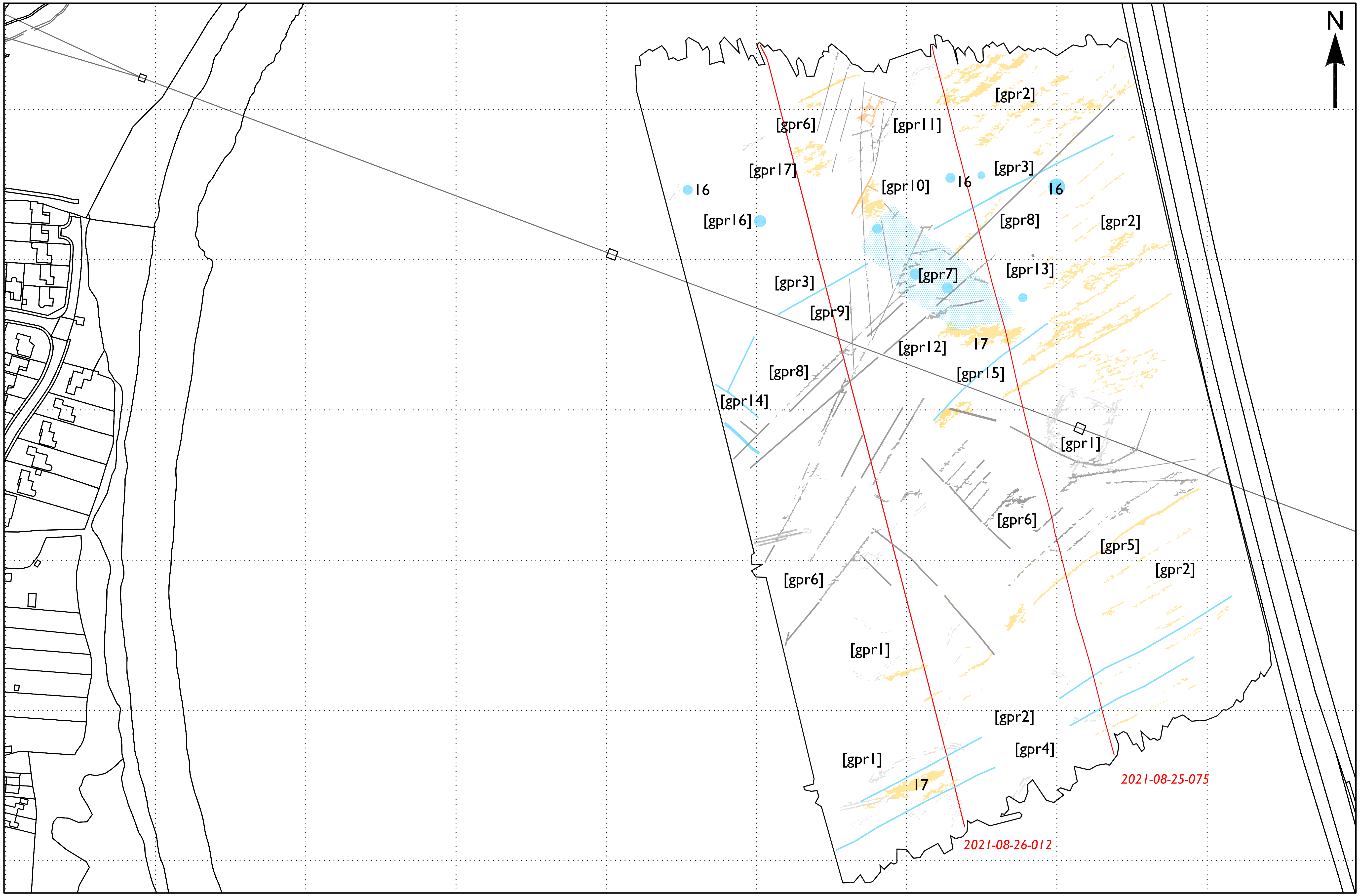
Geophysics Team 2021

Historic England

Figure 11

MANOR FIELD, UFFINGTON, SHROPSHIRE
Graphical summary of significant GPR anomalies, August 2021

SJ5213



0 150m

1:2500

low amplitude reflectors

high amplitude reflectors

anomalies of known or recent origin

2021-08-25-075 Location of selected GPR profiles shown on Figure 7

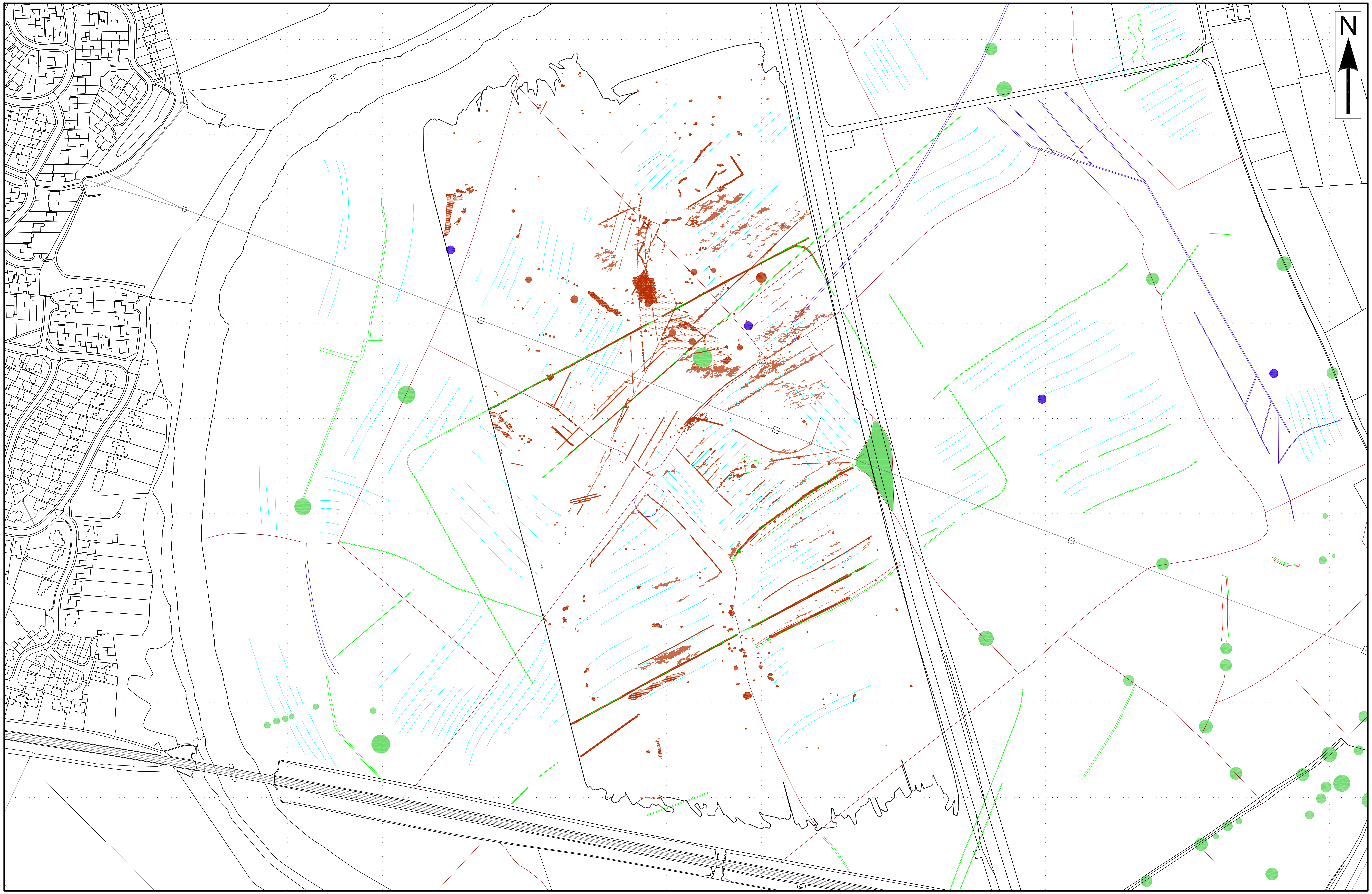
Geophysics Team 2021

Historic England

Figure 12

MANOR FIELD, UFFINGTON, SHROPSHIRE

Aerial mapping evidence superimposed over a summary of substantive geophysical anomalies



0 300m
1:4000

1946 field boundaries
ridge and furrow alignment
Natural
Recent man-made
Bank
Ditch
substantive geophysical anomalies

Geophysics Team 2021

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)