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# Stanton Drew Stone Circles and Avenues, Bath and North East Somerset Report on Geophysical Surveys, July 2017

Neil Linford, Paul Linford, Andrew Payne and Susan Greaney

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# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET REPORT ON GEOPHYSICAL SURVEY, JULY 2017

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SUMMARY

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted over the stone circles and avenues, at Stanton Drew, Bath and North East Somerset, following a request from the English Heritage Trust who manage the site. The aim of the current field work was to complement previous geophysical surveys at the site and assist English Heritage with the production of new interpretation panels for the monument. The vehicle towed caesium magnetometer survey (7.3ha) extended previous, targeted coverage, with a hand held instrument to complement and enhance the wider fluxgate gradiometer results. Magnetic anomalies from the main henge ditch and the concentric pit circles have been confirmed, together with some greater detail of some more subtle responses seen in the previous surveys. While trial GPR surveys have been conducted at the site before, the new high sample density GPR survey (4.7ha) has produced a complementary data set, replicating many of the magnetic anomalies and providing some indication of the depth and survival of the underlying causative features.

CONTRIBUTORS
The geophysical fieldwork was conducted by Neil Linford, Paul Linford and Andrew Payne, with most welcome assistance from Andrew David. Our colleague Susan Greaney (English Heritage Trust) provided useful discussion of the survey results included within the report.

ACKNOWLEDGEMENTS
The authors are grateful to the landowners, Mr and Mrs Young, for allowing access to the site and facilities at the farm for the surveys to take place.

ARCHIVE LOCATION
Fort Cumberland, Portsmouth.

DATE OF SURVEY
The fieldwork was conducted between 10th to 14th July 2017 and the report completed on 13th February 2018. The cover image shows a view of the site from the North East circle towards the village with the Church of St. Mary the Virgin in the distance.

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# INTRODUCTION

Caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted over the stone circles and avenues at Stanton Drew, Bath and North East Somerset (Scheduled Monument List Entries 1007911 and 1007915), following a request from the English Heritage Trust (EHT). The three megalithic stone circles, two avenues and cove at Stanton Drew are well known as an example of prehistoric ritual monuments, with the Great Circle second only in size to the Avebury stone circle. A fluxgate magnetometer survey conducted in 1997 revealed a pattern of concentric rings of post-holes within the Great Circle, later verified through a more targeted hand held caesium magnetometer survey, and subsequent investigation using a range of techniques (David *et al.* 2004; Linford 2005; Oswin *et al.* 2009, 2010). Plans to revise the interpretation of the site led to a request from the EHT for renewed survey, primarily wider coverage using high sensitivity caesium magnetometers, but also to investigate the application of high sample density GPR coverage.

The aim of the geophysical survey was to resurvey the Stone Close field including the Great Circle, North East Circle and Avenue, together with the South South West Circle and any surrounding accessible areas. It was hoped this would better resolve some subtle details from the original data, including the possible suggestion of a NNW avenue within the concentric rings of post-holes, and help assess the survival of the buried remains. The work has been agreed under the Shared Services Agreement and addresses Historic England Action Plan objective 5.6 “Support English Heritage in its care of the National Heritage Collection”.

Well drained reddish coarse loamy soils of the Bromsgrove (541b) association have developed over Triassic Mercia Mudstone (formerly known as Keuper Marl), with some deposits of alluvium along the flood plain of the river Chew (Soil Survey of England and Wales 1983; Geological Survey of Great Britain 2004). The site is down to pasture with short crop grass, interrupted only by the standing stones and the field boundaries. Very heavy rainfall occurred on the first day of the survey which influenced the results of the GPR survey, returning to dry and warm weather for the remainder of the week.

# 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.* 2015). 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 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 ATV and magnetometer electronics also create a slight constant magnetic bias dependent on the direction of travel relative to magnetic north (heading error). To complete the survey between the stones without leaving gaps it was necessary to measure swaths in many different directions so this directional bias was modelled using a representative sample of the data and a heading correction was then subtracted from each sensor's output. The median value of each instrument traverse was then adjusted to zero by subtracting a running median value calculated over a 50m 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 and greyscale images in Figures 5, 6 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 DXG1820 vehicle towed, ground coupled antenna array (Linford *et al.* 2010). 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 60MHz 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 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 0.112m/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 ~0.14m intervals from the ground surface, shown as individual greyscale images in Figures 4, 9, 10 and11. 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 12. 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 [**m1-81**] discussed in the following text superimposed on base OS map data is provided in Figures 12 and 13.

### Stone Close (Figure 12)

There is considerable magnetic disturbance [**m1**] from ferrous fencing, modern land use, and around a fallen tree at [**m2**] and the fenced enclosure of trees at [**m3**]. Numerous smaller ferrous anomalies are scattered across the Stone Close field including within the Great Circle, for example at [**m4**], where these may obscure more subtle archaeological responses. A series of rectilinear negative anomalies [**m5-7**] are interpreted as probable post-medieval field boundaries depicted in 1723 by Stukeley (1776) which have also impinged upon, and possibly entirely truncated, the underlying response from the southern portion of the Great Circle [**m7**].

A tentative group of curvilinear anomalies [**m8**] is better resolved in the current survey and may be associated with the field boundary [**m7**] or, perhaps, represent an enclosure adjacent to the main henge ditch [**m9**] around the Great Circle, comparable to the North and South 'Barrows' at Stonehenge (Field *et al.* 2014). The henge ditch [**m9**] is resolved clearly here as a broad 6-7m wide, near circular anomaly, with an unusually large (~50m) north-east entrance showing squared off (or even concave) terminals, comparable to henges at Avebury, Dowth, Hutton Moor and Thornborough (Harding and Lee 1987; Barnatt 1989; Bradley 1998; Burl 2000; Gibson 2000; Harding 2003).

Remnants of inner and outer bank sections, again comparable with Stonehenge may, possibly, be indicated by the negative anomalies at [**m10**] and [**m11**] partially preserved to the west of the Great Circle and perhaps better resolved in the new caesium data. A narrower negative linear anomaly [**m12**] radiates off the broader negative response at [**m10**] and may represent another field boundary, being on a similar alignment to [**m7**]. Discrete negative anomalies [**m13-16**] found around the circumference of the extant stone settings and the southern ditch terminal [**m17**] may relate to recumbent or buried stones that were not, perhaps, discernible in the previous fluxgate coverage.

The nine concentric circles of closely spaced pits [**m18-26**] are clearly resolved within the Great Circle as a combination of post-settings retained in separate pits or, perhaps, more complete circuits of segmented palisade trenches. Again, [**m18-26**] are best resolved in the northern two-thirds of the Great Circle and confirm the magnitude of response (1.0 to 1.5 nT/m) and diameter of the individual circles (#1.4m) recorded by the original surveys, together with a group of stronger (6-8 nT/m) pit-type responses at [**m27**] and [**m28**] in the centre (*cf* David *et al.* 2004; Linford 2005). The new caesium data enhances the suggestion of an 'avenue' or gap [**m29**] between the rows of posts to the north with, perhaps, larger or better defined pit type responses [**m30**] flanking the edges together with linear negative anomalies. This arrangement is comparable to Mount Pleasant Site IV, which has four 'avenues' in the post-circle roughly in the cardinal directions, although only a single gap between the post circles can be resolved at Stanton Drew (Wainwright 1990).

Four pit-type anomalies [**m31-34**] within the centre of the North East circle, resolved in the previous fluxgate surveys, are detected here with a magnitude of 3-5nT/m in a rectilinear arrangement, together with a pair of smaller, slightly weaker (2-3 nT/m) pit-type responses [**m35**] and [**m36**] immediately to the east (David *et al.* 2004, 352). A positive anomaly [**m37**] is present on the southern arc of the North East circle with some further, more tentative responses clustered around [**m31-34**], and small scale ferrous disturbance in the region of [**m31**]. To the south of the North East circle [**m38**] and [**m39**] may be associated with the avenue of five standing stones heading east from the Great Circle through the entrance gap in the henge ditch [**m9**]. A few isolated anomalies, [**m40**] and [**m41**], of uncertain significance are unlikely to be related to the stone circles as their magnitude of response (8-10 nT/m) suggests the presence of burnt or deeply buried ferrous material.

South South West Circle (Figure 13)

Despite the limited area available to operate a vehicle towed system, and the presence of ferrous disturbance [**m42**], the survey here replicates the previous, more complete, fluxgate coverage and has defined two inner rings of more continuous pit-type anomalies [**m43**] and [**m44**], together with an incomplete outer circuit [**m45**] (cf David *et al.* 2004). These pit-type responses are relatively weak with magnitudes of 0.7-3.0 nT/m for the inner two rings [**m43**] and [**m44**], and 0.8-1.5 nT/m for the smaller sized anomalies found in the outer ring [**m45**]. Four more substantial pit-type anomalies [**m46-49**], of magnitude 3-8 nT/m, form a square arrangement similar to the pits in the North East Circle on the circumference of [**m45**], although [**m48**] coincides in part with a near surface ferrous response. A pair of similar anomalies [**m50**] and, much more weakly defined, [**m51**] are found beyond [**m45**] suggesting an approximate north-east to south-west alignment to the arrangement of [**m46-51**]. It is possible that [**m50**] and [**m51**] form a pair of entrance pits associated with a four post structure defined by [**m46-49**] with a potential NE-SW astronomical solstice alignment, which later develops, or forms part of an enclosed concentric pit circle similar to the Southern Circle at Durrington Walls. However, this orientation is also coincident with the orchard planting shown on the historic mapping (OS Historic County Mapping Series: Somerset 1891-1921, Epoch 2).

Strong responses [**m52**] and [**m53**] towards the centre of the circle are most likely due to ferrous or burnt material and of doubtful significance. There is also a tentative broad linear anomaly [**m54**], although this follows the WSW-ENE orientation of a former field boundary shown by both Stukeley (1776) and the early historic mapping (OS Historic County Mapping Series: Somerset 1843-1893, Epoch 1). A rectangular negative response at [**m55**] may, together with other similar less distinct anomalies, relate to buried or recumbent stone remnants.

Bridge Field (Figure 12)

A considerable amount of disturbance [**m56**] and [**m57**] is found here together with a ferrous pipe [**m58**] and a large stone lined drain [**m59**], both running

WSW-ENE across the field. It is unclear whether this disturbance may, in part, be related to the orchard shown to the south of this area on the historic mapping (OS Historic County Mapping Series: Somerset 1843-1893, Epoch 1). Rectangular areas of strong disturbance [**m60-62**] appear to be associated with filled-in ponds, visible as surface depressions and may be related to 'The Court' manor house. A discrete non-ferrous response [**m63**] in this area may represent a large pit filled with burnt material or, perhaps, a thermoremanent structure made from fired bricks. The survey area is less disturbed to the north and a regular rectilinear arrangement of weak anomalies [**m64-74**] with occasional more strongly resolved elements [**m75**] and [**m76**], is revealed and probably relates to a system of water management associated with water meadows, a network of field drains or washouts from the river Chew marked on the historic mapping (OS Historic County Mapping Series: Somerset 1891-1921, Epoch 2; Greaney forthcoming).

To the south a pair of weak linear anomalies [**m77**] and [**m78**] probably relate to former field boundaries as they share a similar axis to [**m5**], whilst the negative linear response [**m79**] is most likely to be a stone-lined drain or surface channel. A group of pit-type responses [**m80**] found close to the boundary with the Stone Close field may be more significant as it aligns with the potential 'avenue' found in the Great Circle, although the weak linear anomaly [**m81**] is most likely to relate to a former field boundary.

Ground Penetrating Radar survey

A graphical summary of the significant GPR anomalies, [**gpr1-39**] discussed in the following text, superimposed on the base OS map data, is provided in Figure 14.

Stone Close

Significant reflections have been recorded to approximately 60ns before the signal begins to become attenuated. The very near surface data shows the location of paths [**gpr1**] worn through the grass across the site and extensive animal burrows [**gpr2**] within the Stone Close field between approximately 2.5 and 7.5ns (0.14 to 0.42m). A more persistent anomaly [**gpr3**] appears to be related to the animal burrows and extends to approximately 15ns (0.84m) with a diameter of 5m, perhaps suggesting the chamber of a badger sett associated with the former field boundary [**gpr4**] crossing the site. It is unclear whether a subtle linear response [**gpr5**], found between 12.5 and 17.5ns (0.7 to 0.98m) running parallel to [**gpr4**] is a relict field boundary or, perhaps, a more significant anomaly aligned on the centre of the Great Circle. There is further evidence for field boundaries as predominantly low amplitude linear anomalies [**gpr6**] and [**gpr7**], also visible as a distinct topographic lynchets. Whilst both [**gpr6**] and [**gpr7**] align with field boundaries immediately beyond Stone Close, on east-west and north-south orientations respectively, their removal predates the earliest historic mapping (OS Historic County Mapping Series: Somerset 1843-1893, Epoch 1), although [**gpr7**] is recorded in the plan of the site produced by Dymond (1896). Two, presumably plastic water supply pipes [**gpr8**] and [**gpr9**], are found to the east of the Stone Close field, with a spur from [**gpr9**] continuing along the line of the footpath in the field immediately to the south.

The ditch to the south of the Great Circle appears as a low amplitude anomaly [**gpr10**] from 10ns (0.56m) onwards narrowing in width with depth. The response to the ditch is more ambiguous here than in the magnetic data, with the strongest contrast in the radar occurring where the ditch appears to be cut through a localised, more highly reflective geological deposit [**gpr11**]. By a depth of approximately 17.5ns (0.98m) [**gpr10**] is defined by parallel linear anomalies, presumably reflections from opposing faces of the ditch, and a high amplitude response perhaps indicating a differing basal fill. There is some, highly tentative, evidence for a sub-circular anomaly [**gpr12**] with a diameter of ~20m on the course of the ditch found between 17.5 and 45.0ns (0.98 to 2.52m), but it is possible this represents some natural geomorphological variation.

It is of interest to note that [**gpr10**] appears to be better resolved in the near surface GPR data along portions of the ditch circuit where the magnetic contrast is weakest, for example to the south of the Great Circle, and there is little expression of [**gpr10**] to the west to correlate with the highest magnetic enhancement. This variation may well be due to the former field boundary [**gpr6**] together with other, more intriguing, curvilinear ditch type anomalies [**gpr13**] and [**gpr14**] found between 17.5 and 50.0ns (0.98 to 2.8m). Interpretation of [**gpr13**] and [**gpr14**] is difficult and a geomorphological origin seems likely, similar perhaps to [**gpr15**] found further to the south. However, there appears to be some correlation with the short, linear high amplitude anomalies [**gpr16**] and [**gpr17**] leading into the Great Circle from the west, although [**gpr17**] may be associated with part of the field boundary [**gpr6**].

To the north-west the ditch appears from 12.5 (0.7m) as two, parallel low amplitude anomalies [**gpr18**] ~5m apart which have merged together into a single response by approximately 30ns (1.6m). Again, [**gpr18**] would appear to represent the opposing faces of a 'V' shaped ditch section narrowing with depth, resolving into a high amplitude reflector [**gpr19**] persistent in the data from 37.5ns (2.1m). The response to the ditch is variable and complex along its course which hampers a full interpretation. This may, in part, be due to the influence of previous field boundaries and other less readily resolved anomalies, such as the low amplitude linear response [**gpr20**], possibly a later field boundary or path, partially described within the survey area and meeting [**gpr18**]to the north. It is also unclear whether an arc of high amplitude reflectors [**gpr21**] to the south might represent a remnant of an outer bank, and this correlates in part with a negative magnetic anomaly.

The variable GPR response from the ditch may also account for the partial correlation of anomalies corresponding with the concentric rings of post holes revealed by the magnetic survey, but this was not unexpected from the original trial survey with this technique (David *et al.* 2004, Figure 6). A number of discrete high amplitude anomalies [**gpr22-25**] found between 10.0 and 30.0ns (0.56 to 1.68m) appear on the circumference of the Great Circle related to the location of known recumbent stones. Similar discrete anomalies [**gpr26-28**] are found within the interior of the circle, but extend through a more limited depth range between 10.0 and 20.0ns (0.56 to 1.12m) suggesting, perhaps, an association with recent paths, field boundaries or animal burrows.

The first evidence for the concentric rings of post holes appears as low amplitude anomalies [**gpr29**] from between 15.0 and 32.5ns (0.84 to 1.82m) and, unlike the more complete response in the magnetic data, are best defined in the NW quadrant. Whilst [**gpr29**] are initially defined by a series of low amplitude responses, the deeper anomalies, from 40.0ns (2.24m) onwards appear as discrete, high amplitude reflectors (*cf* Figure 8). This suggests the individual post hole pits extend to a depth of at least 1m from the surface, possibly even to beyond 2m where the high amplitude response may represent a compacted layer of stone or gravel at the base of the causative feature. However, this does not fully explain the variation in response between the magnetic and GPR results, as the depth extent of the anomalies suggests truncation through ploughing would be unlikely. Perhaps the post pits imaged by the GPR were constructed with either a deliberate ritual deposition beneath the timber setting, or required a deeper foundation for stability in this area of the monument.

Three low amplitude pit-type anomalies [**gpr30**] are found between 15.0 and 25.0ns (0.84 to 1.4m) in the centre of the North East Circle, with a further high amplitude response [**gpr31**] that appears slightly deeper between 25.0 and 30.0ns (1.4 to 1.68m), but again the magnetic response is far more definitive here. Immediately to the east a pair of high amplitude anomalies [**gpr32**] underlie the raised banks to either side of the former field boundary ditch [**gpr7**] and it is unclear whether a scatter of discrete responses [**gpr33**] are associated with the later enclosed field or with elements of the avenue heading east from the North East Circle.

A curious, low amplitude anomaly [**gpr34**] is found to the south of the Great Circle between 15.0 and 37.5ns (0.84 to 2.1m) and it is tempting to offer an interpretation of a small 'D' shaped enclosure built into the ploughed out bank. However, as there is no corresponding magnetic anomaly and [**gpr34**] occurs in an area with more natural variation of the underlying geology, a more significant interpretation must be treated with caution.

South South West Circle

Significant activity found in the field between Stone Close and the South South West Circle includes a broad linear anomaly [**gpr35**], which is possibly geomorphological or an extension of an original field boundary, and a group of linear anomalies [**gpr36**] which relate to a recently excavated medieval building (Lewis and Mullin 2012,Trench 10). The short low amplitude anomaly [**gpr37**] found immediately to the south seems likely to represent a former field boundary, possibly associated with the “dog legged” field division passing through the South South West Circle shown on the historic mapping (OS Historic County Mapping Series: Somerset 1843-1893, Epoch 1). Other GPR anomalies in this area include a distribution of pit-type anomalies [**gpr38**] and a more curious rectilinear, high amplitude response, [**gpr39**] between 7.5 and 22.5ns (0.56 to 1.26m). There appears to be little correlation between [**gpr38**] and [**gpr39**], and the circular arrangement of pits [**m43-45**] revealed by the magnetic data, indeed it seems more likely that the radar anomalies are associated with the orchard planting shown on the site in the later historic mapping (OS Historic County Mapping Series: Somerset 1891-1921, Epoch 2). An alternative interpretation is that [**gpr39**] is related to known badger disturbance in this field (Lewis and Mullin 2012), although the anomalies here are quite different in morphology to the animal burrows mapped in the Stone Close (cf [**gpr2**]).

## CONCLUSIONS

The vehicle towed caesium magnetometer survey has successfully extended the original hand held coverage to complement the fluxgate magnetometer data from Stone Close and South South West Circle fields. Anomalies from the original survey have been confirmed together with enhanced definition of the gap through the nine concentric pit circles found in the Great Circle, perhaps representing an avenue entering the main henge from the north. The large entrance gap through the henge ditch to the north east has also been more clearly resolved, suggesting squared off terminals at the entrance and, perhaps, a more complete ditch circuit with the apparent break to the south west more likely to represent intervention from a later field boundary. Certainly, historic land use has influenced the magnetic response over the Great Circle with the pit circles more poorly resolved to the south of the henge. The GPR survey does not fully replicate the pit circles shown in the magnetic data, but does suggest that individual post settings are defined by a high amplitude reflector at a depth of approximately 2m from the surface. It is unclear whether this response represents compacted material at the bottom of the post pit or, perhaps more deliberate deposition, and why this appears to survive only in the north east quadrant of the henge as truncation through ploughing to this depth seems unlikely.

The new caesium survey has also enhanced the resolution of the three concentric pit rings found within the South South West Circle. An apparent rectilinear pattern of more strongly magnetised pits is also revealed, perhaps indicating a precursor monument, although previous field boundaries and orchard planting shown on the historic mapping hamper a more confident interpretation.

## LIST OF ENCLOSED FIGURES

*Figure 14* Graphical summary of significant GPR anomalies superimposed over the base OS mapping (1:2500).

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Figure 1

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## Location of caesium magnetometer instrument swaths, July 2017

ST6063




0 90m

1:2500

Caesium magnetometer survey swaths

Geophysics Team 2017

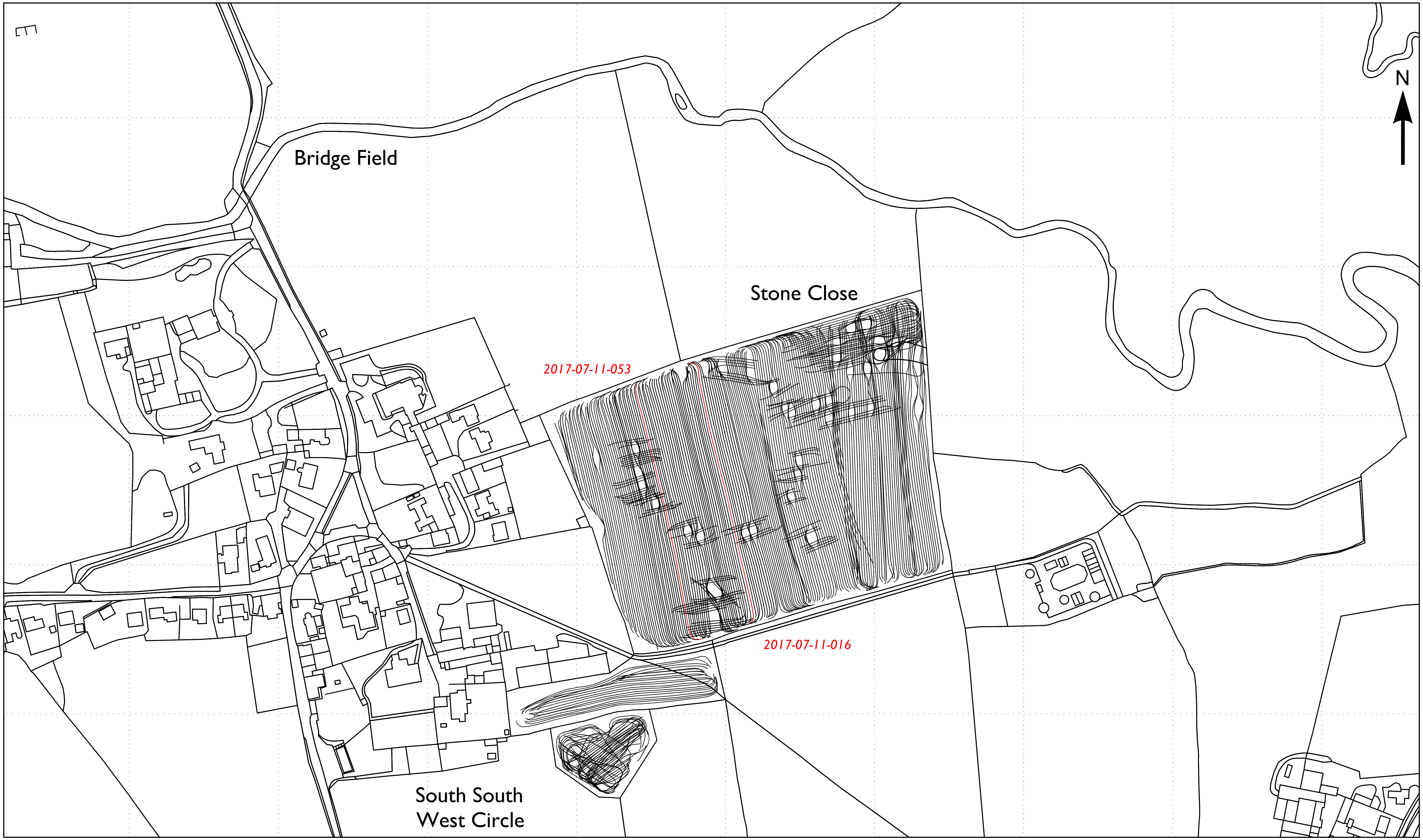
Historic England

Figure 2

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## Location of GPR instrument swaths, July 2017

ST6063






0 90m

1:2500

2017-07-11-016 Location of selected GPR profiles shown on Figure 8

Ground Penetrating Radar survey swaths

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Historic England

Figure 3

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## Location of caesium magnetometer survey, July 2017

ST6063




0 90m

1:2500

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Figure 4

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET
## GPR amplitude time slice between 17.5 - 20.0ns (0.98 - 1.12m), July 2017

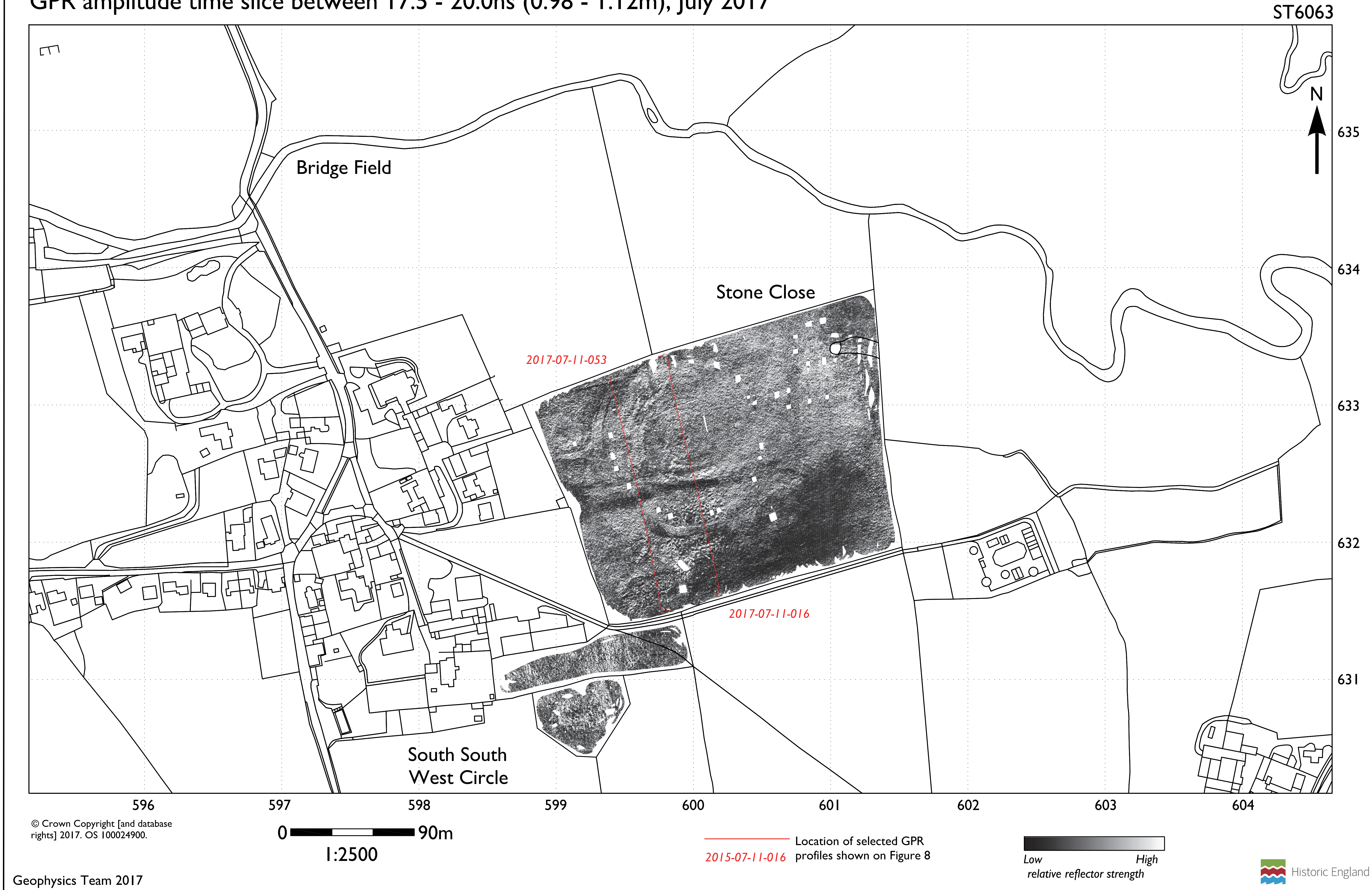




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Figure 5

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## Stone Close and Bridge Field, caesium magnetometer survey, July 2017

Trace plot of minimally processed data

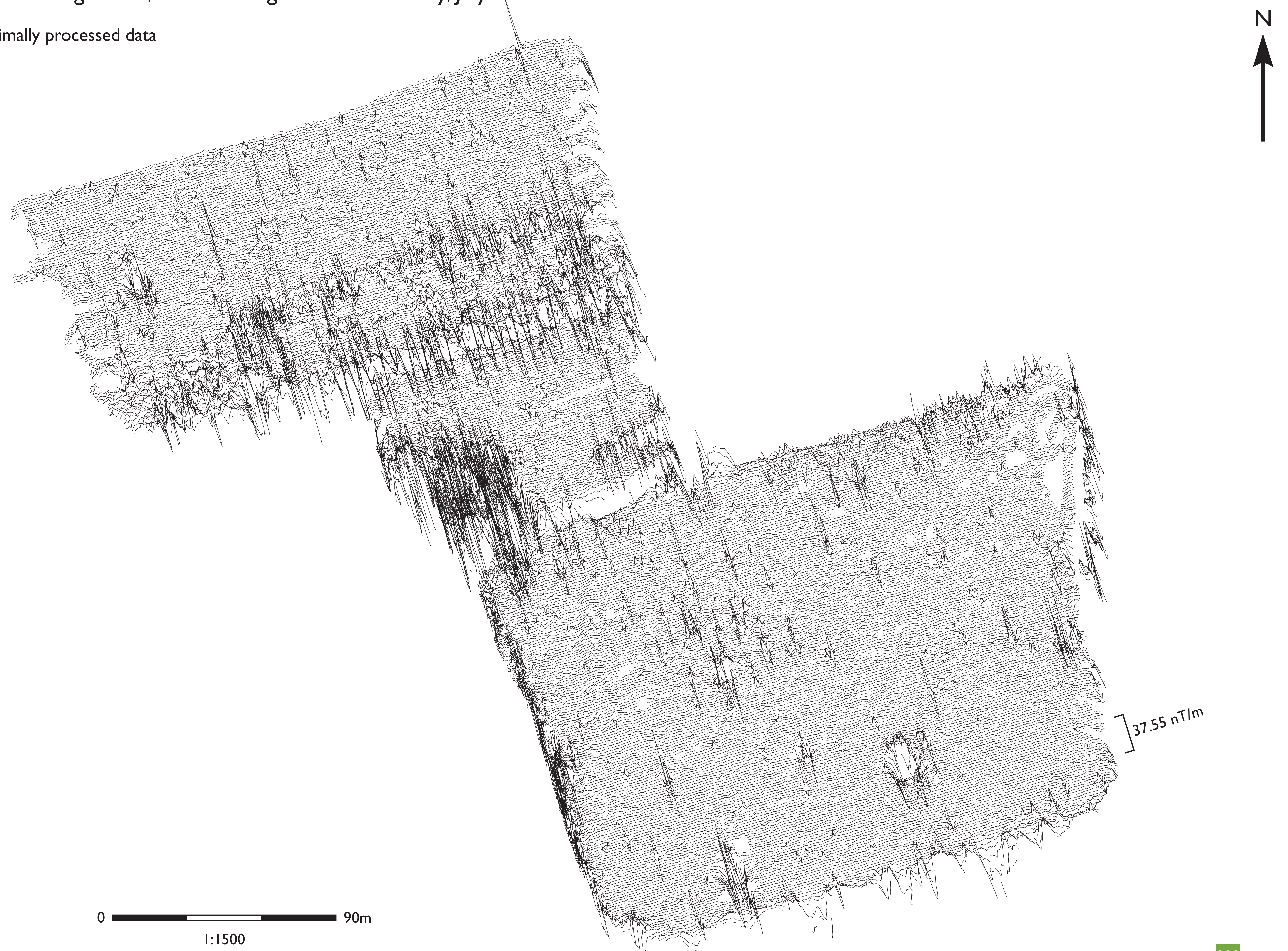


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Figure 6

STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

Stone Close and Bridge Field, caesium magnetometer survey, July 2017

Equal area greyscale image of minimally processed data

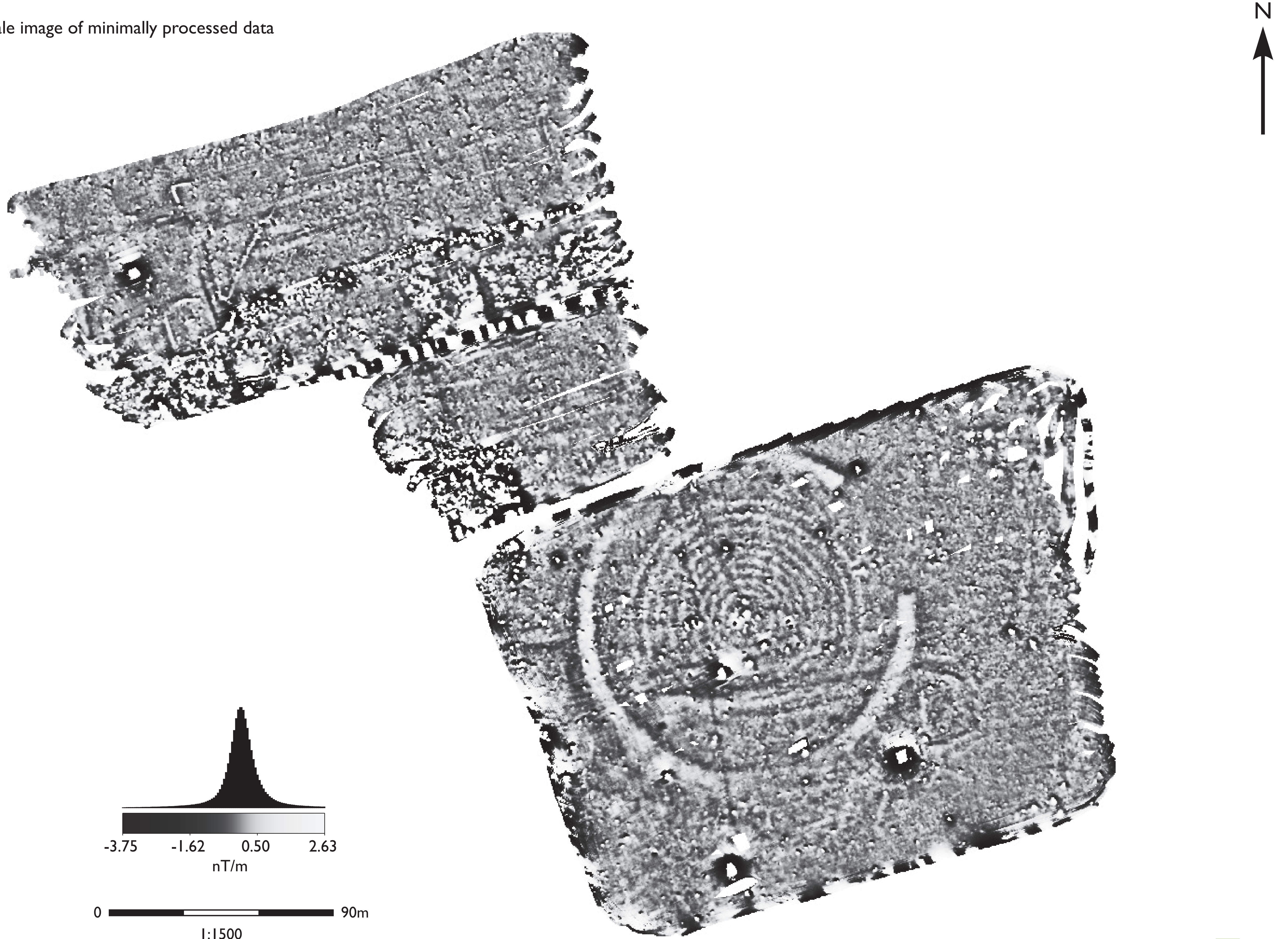


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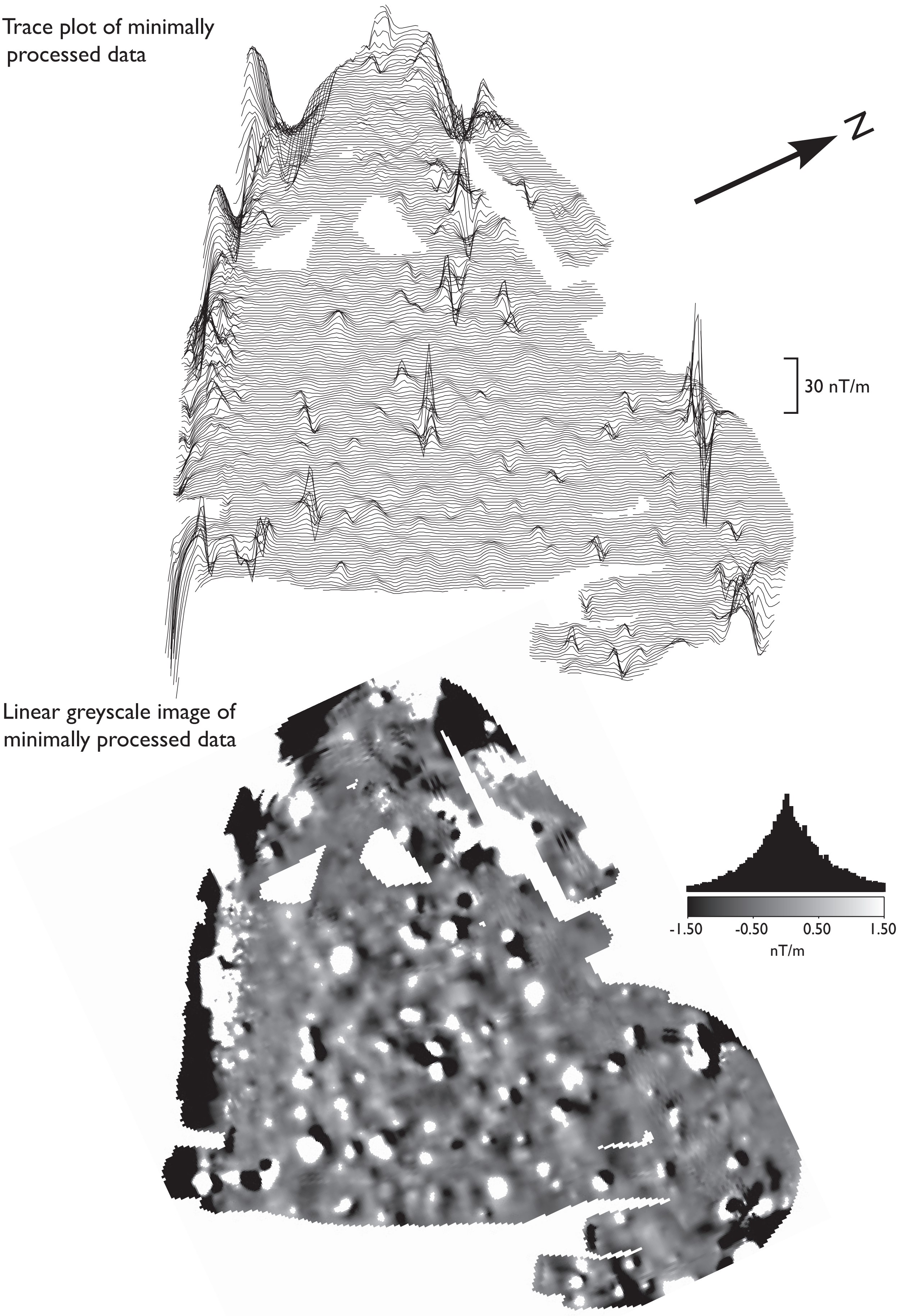
Figure 7

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## South South West Circle, caesium magnetometer survey, July 2017

(A) Trace plot of minimally processed data

(B) Linear greyscale image of minimally processed data

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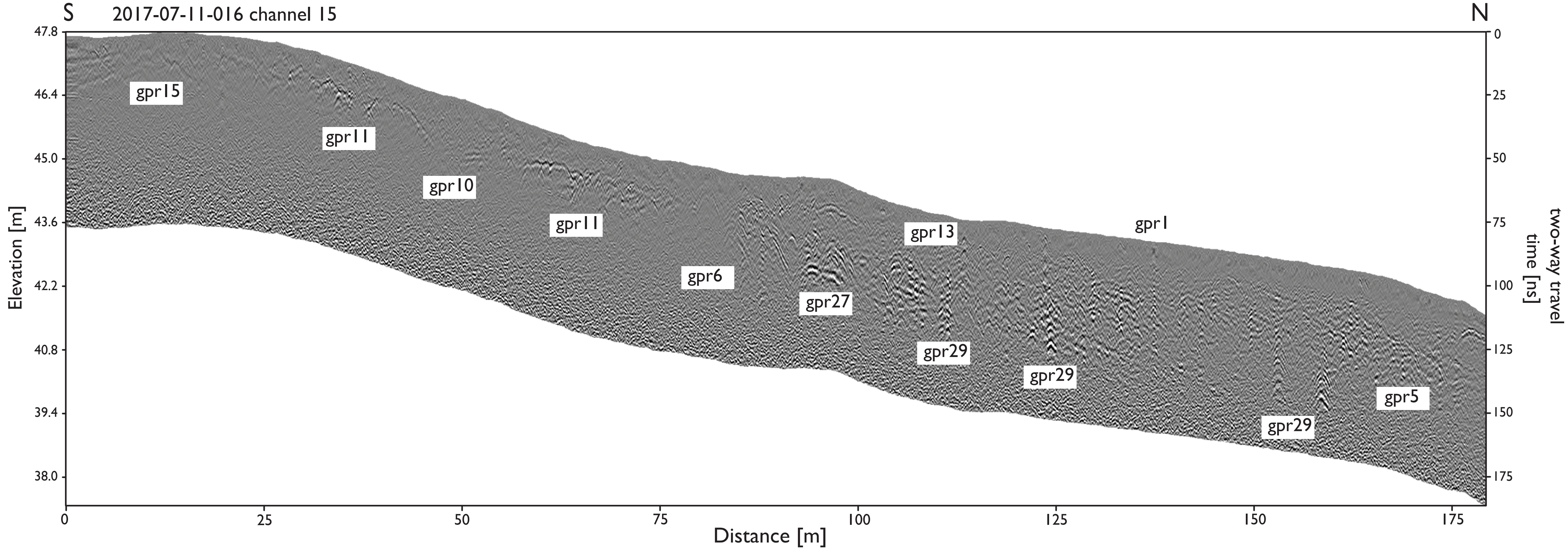
STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

Topographically corrected GPR profiles, July 2017

Figure 8



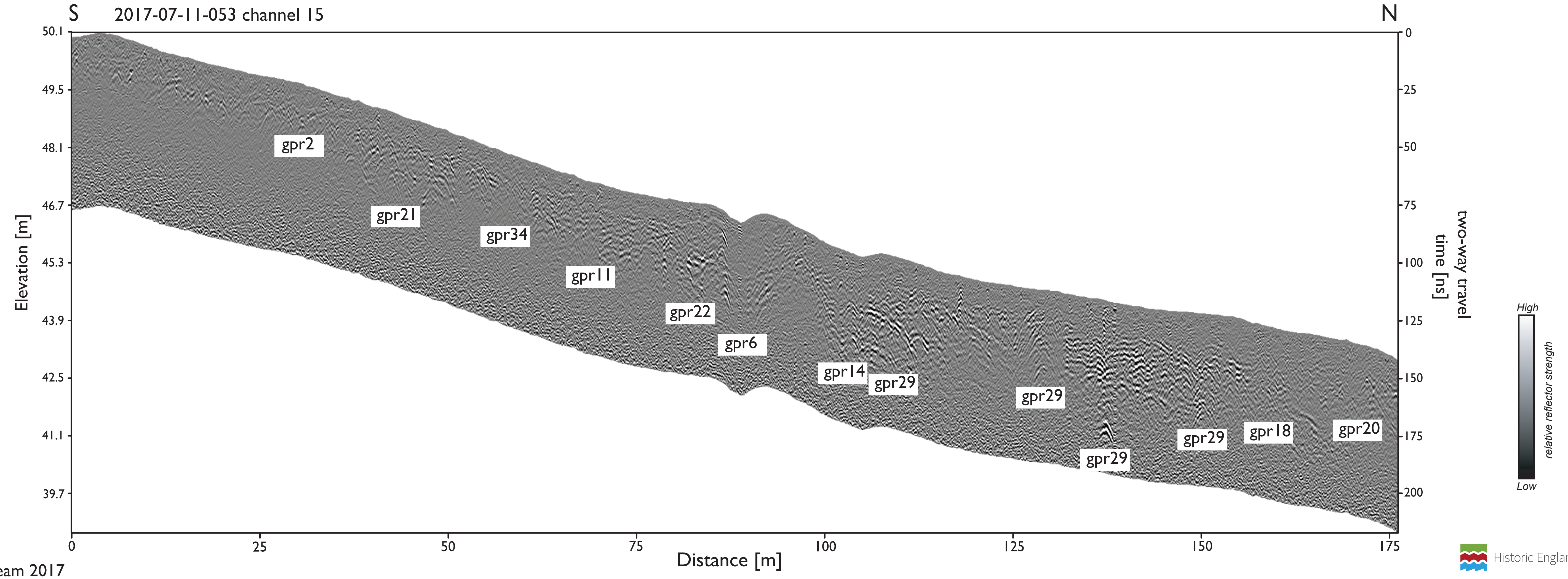




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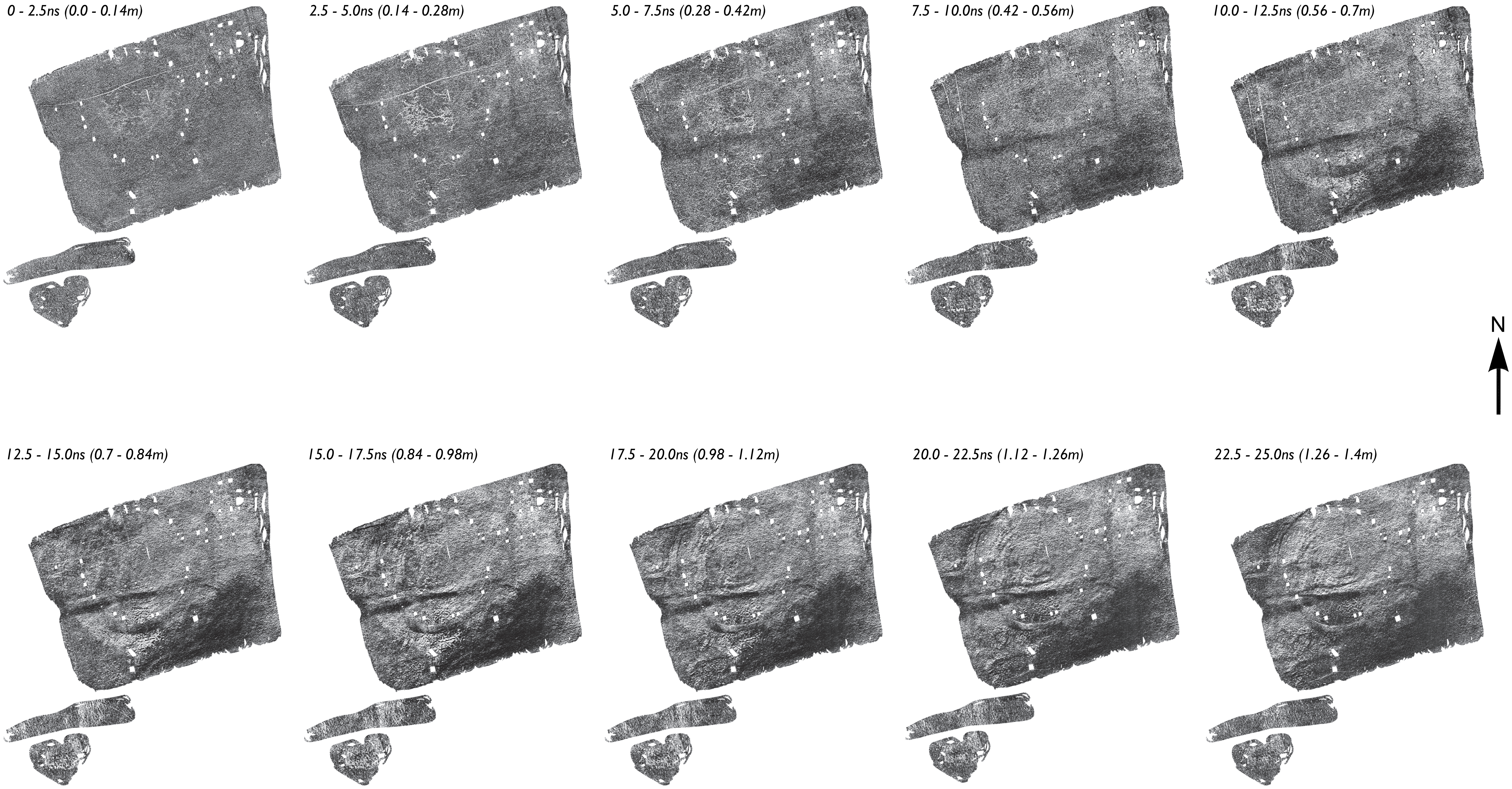
Figure 9

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET
## GPR amplitude time slices between 0.0 and 25.0ns (0 to 1.4m), July 2017




*Low* *High*
*relative reflector strength*

0 90m
1:4000

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Figure 10

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET
## GPR amplitude time slices between 25.0 and 50.0ns (1.4 to 2.8m), July 2017

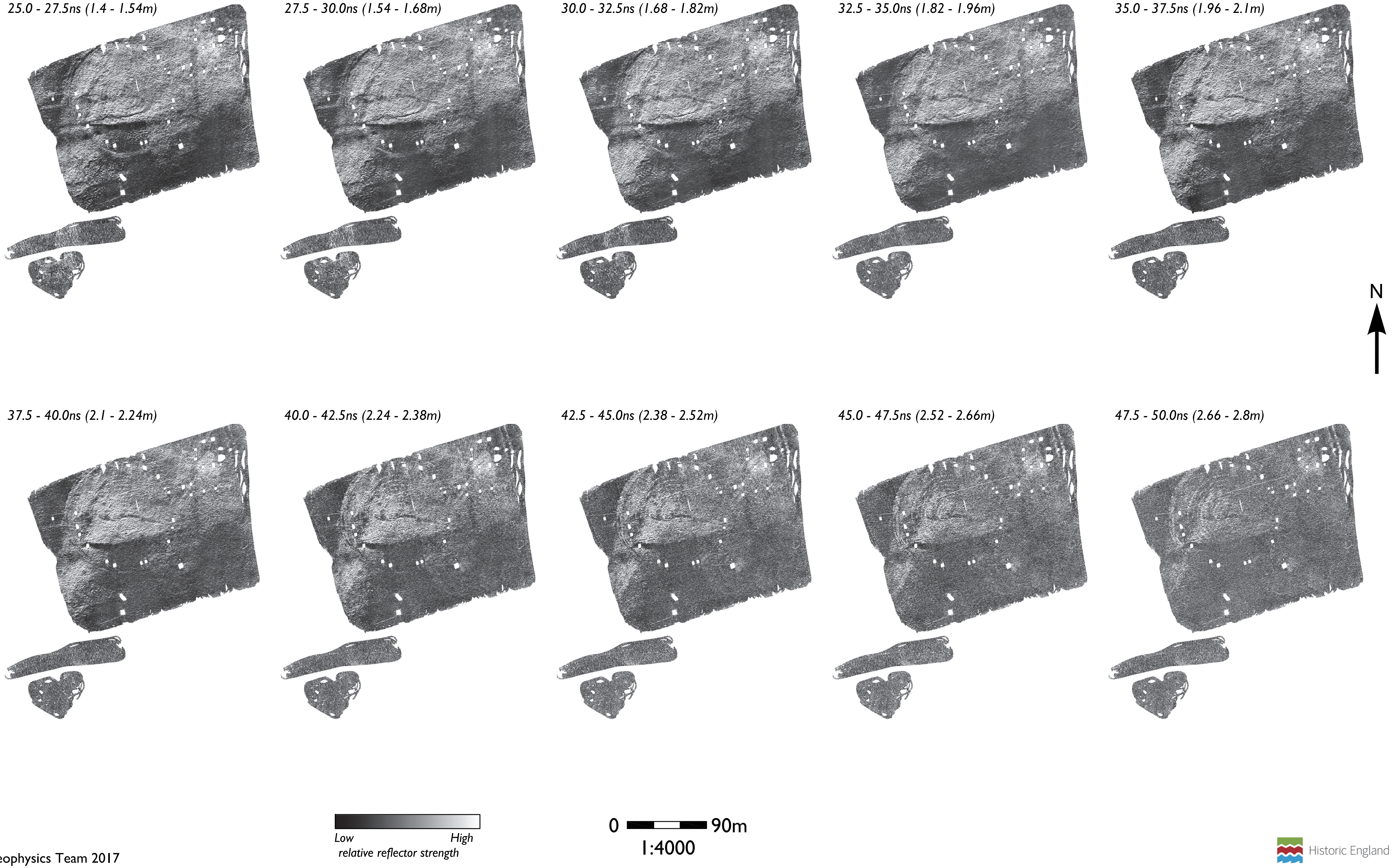


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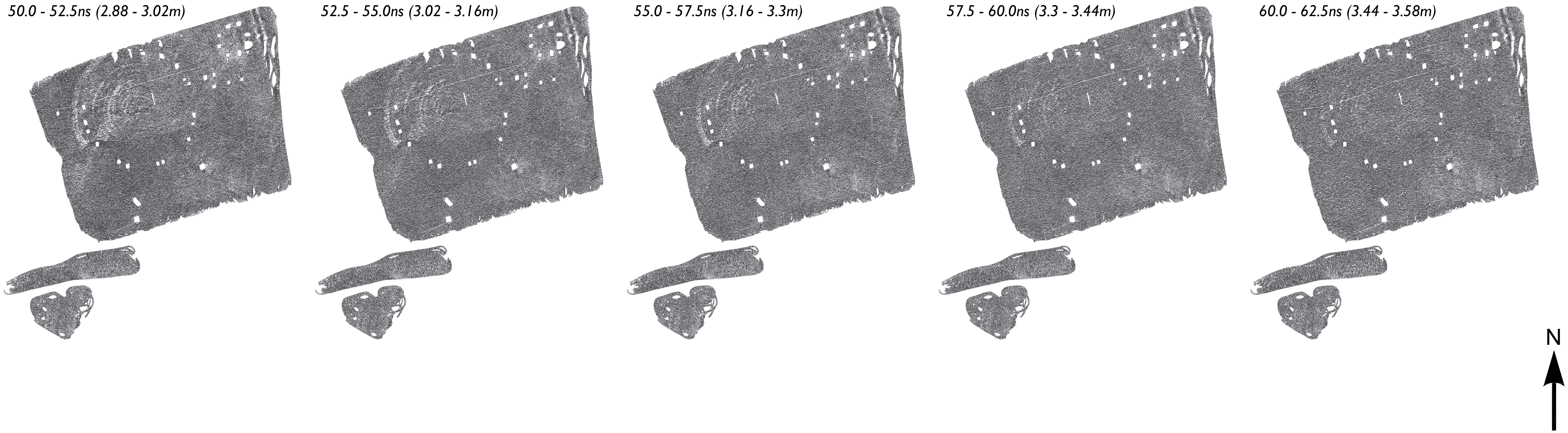
Figure 11

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## GPR amplitude time slices between 50.0 and 62.5ns (2.88 to 3.58m), July 2017




*Low* *High*
*relative reflector strength*

0 90m
1:4000

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# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## Graphical summary of significant magnetic anomalies, July 2017

ST6063




0 90m

1:2500

- positive magnetic
- negative magnetic
- strong positive magnetic
- raised magnetic
- magnetic noise

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Figure 13

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## South South West Circle, graphical summary of significant magnetic anomalies, July 2017

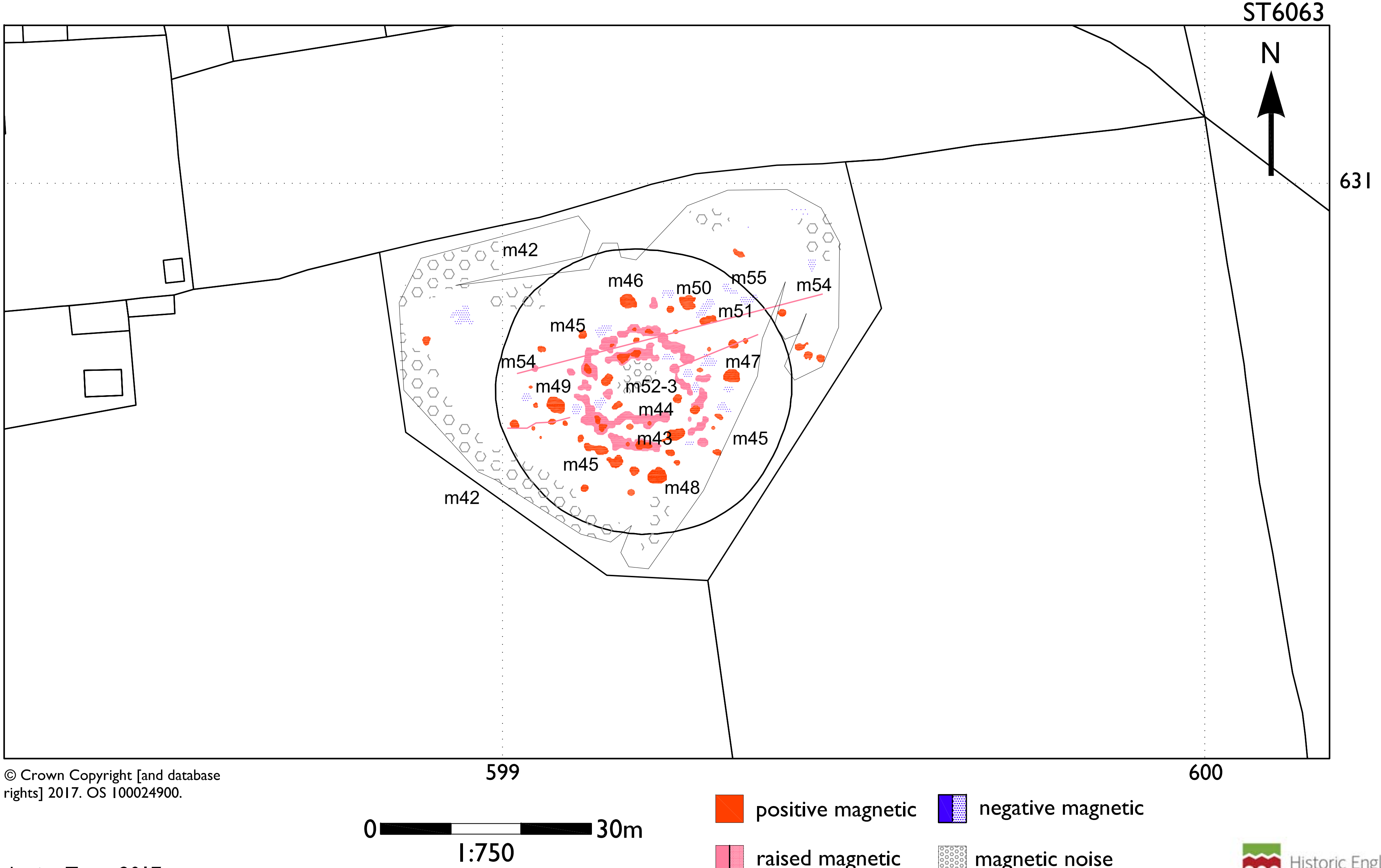




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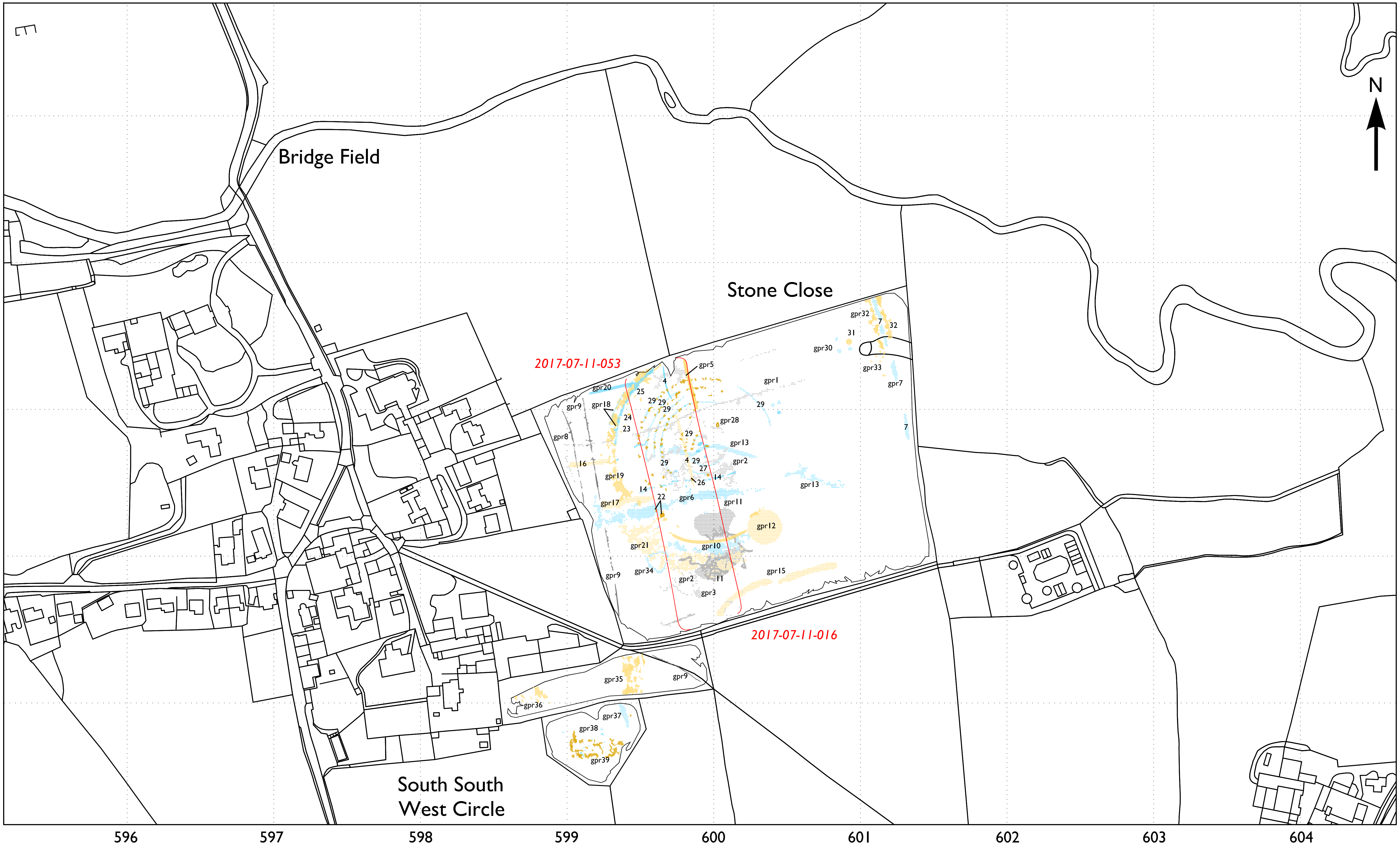
Figure 14

# STANTON DREW STONE CIRCLES AND AVENUES, BATH AND NORTH EAST SOMERSET

## Graphical summary of significant GPR anomalies, July 2017

ST6063






0 — 90m

1:2500

low amplitude reflectors

high amplitude reflectors

anomalies of known or recent origin

2015-21-07-047 Location of selected GPR profile shown on Figure 7

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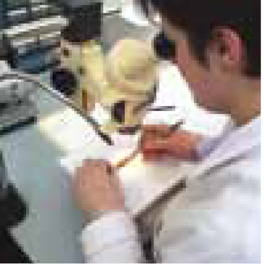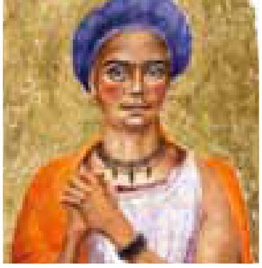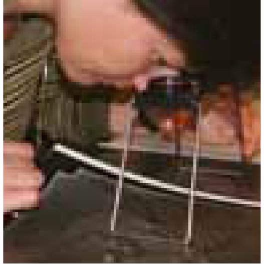

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