

AVEBURY

Carpenter Cottage, Green Street



*From William Stukeley 3D plan of Avebury showing Carpenter Cottage and the barn
(Bodleian Library MS. Gough Maps 213,308)*

Geophysical Survey

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A Report on a Geophysical Survey and Associated Investigations
Relating to Carpenter Cottage, Green Street, Avebury, Wiltshire
NGR SU 1033 6966

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Summary

In early 2012, a small interest group came together to re-examine the data relating to the Southern Inner Ring of the Avebury henge. As part of this research the existing stones, the stonehole positions, now marked by concrete plinths, which had been erected by Alexander Keiller and depressions that can still be seen the field of the Southern Inner Ring, were re-surveyed using a theodolite and laser measure. This research was cross-referenced and correlated with previous studies, most noticeable of which was that carried out by Isobel Smith and published in her book 'Windmill Hill and Avebury: Excavations, 1925-1939', (1965). In the process of this research it became clear that there was an anomaly in the assertion that the circle originally contained 29 stones. William Stukeley, in his book 'Abury a Temple of the the British Druids with Some Others Described', published in 1743, suggested that the Southern Inner Ring contained 30 stones in its circumference.

In an attempt to resolve this difference, a number of steps were suggested and are now in the process of being actioned. One of these steps was to carry out a geo-physical survey in the rear garden of Carpenter Cottage, with the hope that one or more stones or stonehole positions could be accurately determined. Another step was to re-examine all of the Stukeley material, relevant to Avebury, to see whether further insights could be gleaned that might be helpful in resolving this issue; particularly re-examining all of the material in the light of modern mapping techniques.

The first of these steps was undertaken at the end of March 2014 and the details of the findings form part of this research report document. Unfortunately the results of the geo-physical study are inconclusive, in that they do not clearly show any buried stones or precisely locate the position of one or more stoneholes. However, they do add to our knowledge of the henge and show other interesting features in relation to possible boundary ditches.

In order to make this report more comprehensive, and to set a context to the geophysical survey of Carpenter Cottage, a summation of the recent findings is included here. This comprises, the new survey work, the re-examination of Stukeley's writings and diaries, together with the Alexander Keiller excavation reports.

1 INTRODUCTION

1.1 Location and scope of work

1.1.1 At the end of March 2014 a geo-physical survey was carried out by Jim Gunter, in the rear garden of Carpenter Cottage, which lies within the Avebury henge monument. David Furlong the co-author of this report was in attendance. Jim Gunter's report forms the last part of this document.

1.2 Geology and Topography

1.2.1 The site lies within the village of Avebury that sits upon chalk geology. Carpenter Cottage, which is a Grade II listed building (EH No. 1192984) is located at grid reference NGR SU 1033 6996. The rear garden of the cottage measures some 20 m wide by 34 m long.

1.3 Archaeological and historical background

1.3.1 Carpenter Cottage is part of the village of Avebury, which is situated within a Neolithic henge monument. The outer ditch is broadly circular, with a flattened south-west quadrant and encloses an area of approximately 11.5 ha. The bank is penetrated by four causewayed entrances.

1.3.2 The Avebury henge comprises three stone circles, the largest of which, with a maximum diameter of about 350 m, lies just inside the inner ditch and comprises around 98 stones. Within the henge there are the two smaller inner stone circles, of approximately equal size (102 m diameter), both badly destroyed, which are aligned on a northwest-southeast axis. It is the southernmost stone circle that is the focus of this report, the outer ring of which would have passed through the rear garden of Carpenter Cottage.

1.3.3 Avebury is part of an extensive prehistoric landscape that includes Stonehenge, Windmill Hill, West Kennet Long Barrow and Silbury Hill. World Heritage status was accorded in 1987 under the UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage.

1.4 [Acknowledgements]

1.4.1 The authors would like to thank Dr Nick Snashall and Dr Rosalind Cleal for their help and support for this project and for accessing the Keiller Archives.

2 GENERAL BACKGROUND – PART 1

2.1.1 The Southern Inner Ring of the Avebury henge contains a number of enigmas that primarily relate to the destroyed stones of the northern sector of the circle, which had largely disappeared by the time William Stukeley, visited the site, in the 1720's. The geo-physical survey, carried out in the rear garden of Carpenter Cottage, which is reported here, is a step towards trying to solve some of these enigmas. The survey forms part of a wider study that has as its remit the reassessment of the number and location, of the stones that formed the outer circle, of the Southern Inner Ring. In order to make sense of the results of the geo-physical survey the wider context of the research has been included here. This report therefore is presented in two parts. The first and larger section contains the background

information on the main study and the second section relates specifically to the geo-physical survey carried out at Carpenter Cottage. The intention of the survey was to test whether there was any evidence of buried stones or stone-hole positions, as research suggest that three or possibly four stones might have stood within the curtilage of the property.

- 2.1.2 The development of property along the route of the track that linked the eastern and western causewayed entrances, led to the destruction of the stones in the northern sector of the Southern Inner Ring (SIR). As a policy, within the village, from probably the seventeenth century onwards, stones were systematically toppled and broken up to provide building material.
- 2.1.3 The first person to mention and record the stones was John Aubrey, who visited the site in 1649 (Ucko, et al, 1991, p. 10). Aubrey went on to draw a plan of the henge, which showed the bank and ditch and the three stone circles. In Aubrey's plan most of the stones that fronted, the east-west route through the village are shown as missing, which suggests that even by this time stones had been removed (Ucko, et al, 1991, p. 31). However, most of the information that comes down to us from the past is from William Stukeley, who first visited Avebury [Abury] in 1719 (Piggot, 1985, p. 46) and then subsequently again, each year, through to 1724. During this time he sketched, the stones, surveyed and made notes of the henge and prepared a number of plans. It is this caucus of information that has helped later researchers, uncover some of the past history of the site.
- 2.1.4 Although nothing now remains of these northern sector stones, both historical and modern information is available, which can help locate some of their potential positions with a reasonable degree of accuracy. This in turn helps establish a possible placement of the remaining stones of the ring. Stukeley suggested that there were 30 stones, whilst Gray thought there were 28 or 29 (Gray, 1934, p. 109). Smith, in her book 'Windmill Hill and Avebury: Excavations, 1925-1939', tentatively suggested the latter number of 29 stones and that now has become the accepted figure (Smith, 1965 p. 198). This report will highlight some of the inaccuracies in the previous studies and conclude with an indication of a possible location of the original stones. This is based on two important discoveries.
 - a) The known, or assumed, stone positions for the southern sector of the ring, appear to be deliberately paired either side of a north/south axis line, through the centre of the circle. It has been assumed that this pairing continued in the northern sector of the ring.
 - b) Keiller's research work had uncovered the significant way that the known stones or stone positions marked medieval boundaries. It is therefore probable that these boundaries are still retained in building plots of the properties that face Green Street. We might therefore assume that some of the northern sector stone positions would be found abutting these boundaries.

It will be shown the geophysical survey did not definitively highlight any buried stones, or indicate any stone-holes. Nevertheless, neither did it discount any hypothetical stone positions within the curtilage of Carpenter Cottage. The survey additionally appears to shows a feature, which could be another boundary bank and ditch or building foundations, running broadly parallel to the eastern boundary of the plot, along the circumference of the ring,

which is possibly significant.

3 GENERAL BACKGROUND – PART 2

3.1.1 Site and Location

- 3.1.1 Most of the outer circle stones of the SIR have been destroyed and only five now remain. These are designated by the references, established by Isobel Smith, by a series of numbers starting at 101. The extant stones are nos. 101, 102, 103, 105 and 106. Stone 104 no longer exists, its position being shown by a concrete plinth. Stone positions 107, 108 and 109 were excavated by Alexander Keiller and their positions marked by a concrete plinth. The centre of this circle once contained a huge monolith that was already fallen when Stukeley first visited the site in 1719. He calculated that this originally stood 21 ft above ground. The position of this stone is now marked by the concrete 'Obelisk' marker, which has a GPS reference of 51°-25.682' N, 1°-51.203' W.
- 3.1.2 The south-eastern quadrant of the ring has been subjected to geo-physical survey and the positions of a further ten stones in this sector have been noted. Two of these stones lie outside of the ring and have therefore been discounted from this survey. A number of ground depressions showing either the position of the original stone or the burning pit into which they were tipped, additionally highlight the circumference stone positions. The stone reference numbers for this sector are 122-129.

3.2.1 New Survey

- 3.2.1 The size of the Southern Inner Circle was first measured by William Stukeley c.1720, in which he suggested a diameter of 240 cubits. Stukeley's cubit measured 20.8 inches, which would give a diameter of about 126.8 m. Other more recent surveys have suggested diameters of:
- 99 m – Crocker 1812
 - 98 m – Lukis 1881
 - 102 m – Gray 1912
 - 103.6 m – Smith 1965
 - 103.63 m – Thom 1967

Whilst there is broad congruence between the diameters of Smith and Thom, it was deemed prudent to re-survey the Southern Inner Ring, with theodolite and laser. This work was carried out in 2012 and 2013. Initially, the specific focus was the five existing stones of the Southern Inner Ring, with the intention of assessing the accuracy of their placements and whether the inner, outer or median line of the stones was set to the circumference. Subsequently the concrete plinth markers were also checked along with two depressions in the south-east quadrant, the most important of which related to stone position 122.

- 3.2.2 The survey showed that the five existing stones conformed to an arc radius of 51.34 m (102.68 m diameter) from the centre of the Obelisk, with the circle set to the outer face of the stones. However, closer examination of the figures suggested that probably the Obelisk stone had been erected first and then the arc measurements, possibly by peg and rope, as suggested by Isobel Smith, were taken from the edge of the central stone. This effectively creates a displacement of about 1 m from true centre of the circle. This divergence becomes

more apparent when looking at stones 107, 108 and 109 (now marked by concrete plinths), which are on an arc radius of 52.40 m, to the assumed outer face of the stones, a difference with the existing stones, of just over 1 m. Because of this disparity, it becomes clearer why previous surveys obtained different results, with respect to the diameter of the ring. It is quite possible that the south-east quadrant stones were also on a slightly different arc, established from the side of the central Obelisk stone, although in this case, without knowing the precise location of the stones, it is impossible to be sure.

- 3.2.3 The centre of Stone 101 was measured by theodolite as being almost due south of the Obelisk on an azimuth, to its centre, of 180.5 deg. This can also be confirmed from Google Earth images. This stone position is significant when assessing the ring.
- 3.2.4 The angle between the centre of the depression in the field marking stone 122, to stone 109, marked by a concrete plinth, and to the centre of the Obelisk marker, was measured to be 8° - 45'. The converse angle between stone 109 to stone 122 and to the Obelisk was measured at 8° - 15' showing a difference of 0.5 degrees. From these measurements, it can be shown that stones 109 and 122 lie broadly parallel, within half a degree, to a hypothetical due east-west datum line running through the Obelisk. The distance between the centre of the depression for stone 122 and the boundary fence for Carpenter Cottage was measured as 11.84 m.

4 ISOBEL SMITH - SURVEY

- 4.1.1 Isobel Smith wrote up her account on the excavations carried out with Alexander Keiller in *Windmill Hill and Avebury: an account of the excavations of A. Keiller*. As well as providing a 'tentative' plan of the site, as she imagined it to be, she also made commentaries on the number of stones that might have existed. It is worth recounting what she stated for the Southern Circle.

"The circle appears to have been laid out with a peg and string on a radius of very close to 170 ft., as shown in Fig. 68.....

The spacing of the nine stones and stone-holes on the excavated arc of the circle indicates that the standard interval aimed at was 36ft., as in the Outer Circle. The range variation is as follows:

Stones 101-2 and 106-7	interval	32-33 ft.
Stones 102-3 and 103-4	interval	35-36 ft.
Stones 107-8 and 108-9	interval	36-37 ft.
Stones 104-5 and 105-6	interval	37-38 ft.

Assuming that the average interval of 36 ft. is maintained round the remainder of the circle, and that the estimated radius is approximately correct there would have been a total of twenty-nine stones." (Smith, 1965 p. 198).

- 4.1.2 The figures that Smith presents contain a number of anomalies. The first is why she chose a radius of 170 ft (51.816 m) for the circle. She would have had at her disposal the original measurement figures from the Keiller archives, shown in Fig. 6 (Keiller, 1939). These provide an average radius of 166.46 ft (50.73 m). It can be shown that only one of the stones (109) at 172.65 ft is in excess of her claimed average. It is possible that she would have been aware of

the work of Alexander Thom, whose book published in 1967 on the *Megalithic Sites in Britain* gave a diameter of 125 megalithic yards or 340 ft for the inner circles at Avebury (Thom, 1967, p. 90). However, she makes no reference to Thom's work, so the reasons for her choice must be speculative. From the new survey carried out by the authors and referenced in 3.2.2 above it would seem that Smith opted for the largest possible arc rather than the average. Nevertheless, if we accept Smith's mean figure of 170 ft we can explore further the reasons for her suggestion of a circle of 29 stones.

4.1.3 A circle with a radius of 170 ft would have a circumference of a little over 1,068 ft. If this figure is divided by 36 ft, the claimed average spacing, then the derived number is 29.67. Clearly one cannot have a fraction of stones, so the number had to be rounded either up or down. Smith chose to round this figure down probably on the assumption that this spacing best fitted the evidence she perceived, and also because she chose as her starting point stone 101. As will become apparent, this stone is particularly significant because it is almost exactly due south of the Obelisk (3.1.1). It was from this stone that Smith established her number sequence running clockwise around the circle.

4.1.4 From Google Earth maps and from the theodolite survey these two azimuths can be shown as:

1. Obelisk to stone 109 = 278.15 degrees
2. Obelisk to stone 122 = 81.25 degrees

The difference between these two azimuths is 196.9 degrees, which gives a circumference distance in this sector of just under 584 ft. When this is divided by the 16 stone placements a mean spacing for the stones of 36.5 ft is obtained, which is slightly greater than Smith's claimed average of 36 ft. For comparison Stukeley suggested a spacing of 35ft for stones 101 – 105 on one of his maps (Bodleian Library MS. Eng. Misc.c.533, 53v-4)

This calculated figure of 36.5 ft can be compared with the nominal spacings for a 29 or 30 stone circle and their differences noted:

- 29 stone circle would have a mean spacing of 36.83 ft, - difference < + 0.33 ft
- 30 stone circle would have a mean spacing of 35.60 ft, - difference > - 0.9 ft

As can be seen from these figures the known southern segment of the circle, between stones 109 to 122, provides inconclusive proof on whether the circle had 29 or 30 stones. The figure tips marginally in favour of 29 stones because of the smaller difference between the calculated and mean figures, but not conclusively so. One can extrapolate further by looking at the mean spacings for the northern sector of the circle, which would demand an average increased spacing to 37.65 ft for a 29 stone circle or a decrease to 34.93 ft for a 30 stone circle. The question that needs to be addressed is which of the two is the more likely? Whether the spacing between stones expanded in the northern sector or contracted?

5 WILLIAM STUKELEY - SURVEY

5.1.1 Stukeley visited Avebury on a number of occasions between 1719 and 1724, recording his observations and research in a series of maps, sketches and writings. The problem with his work is the lack of consistence between his maps, which seemed to have been influenced by the different lithographers who worked on them. This creates a problem when looking to

have confidence on what Stukeley observed. Nevertheless by careful scrutiny it is possible to pick out the salient details of his work, with respect to the Southern Inner Ring.

5.1.2 In his Celtic Manuscript Stukeley gives a description of the Southern Circle (Stukeley, 1722, p. 130). This is relevant to this study and is recounted here with commentary by the authors.

1. *Beginning in Pasture 1, entering from the Town Street where on the left hand is a garden wall built (of) the stone that stood in its place.* [This is the position of stone 1 from Keiller's plan and stone 109 in the modern idiom. A concrete plinth erected by Keiller (Smith, 1965) now indicates this placement. The entrance to this pasture must have been in a similar position to the present gate opposite the Red Lion inn. Stukeley here suggests that the stone walling that runs alongside this entrance, which can still be seen today (Fig. 7), was composed of the broken parts of this stone.]
2. *Next to which are two hollow holes the seats of as many Stones of the outer circle of this temple.* [Stones 2 (108) and 3 (107), which were excavated by Keiller (Smith, 1965), are at present marked by concrete plinths.]
3. *Three stones next are fallen but lie not much diminished; by the side of each is growing an ash tree, whence probably the stones were thrown down.* [Stones 4 (106), 5 (105) and 6 (104): there is a discrepancy here between the plan and the description. In the plan trees are shown in front of stones 3, 4 and 5, not 4, 5 and 6. Stones 4 and 5 were re-erected by Keiller (Smith, 1965); stone 6 would appear to have existed, in a fallen state, in Stukeley's time, but has since disappeared.]
4. *The next is standing, of a handsome figure.* [Stone 7 (103) one of the original undisturbed stones.]
5. *Another lies along by the hedge side.* [Stone 8 (102) was re-erected by Keiller (Smith, 1965).]
6. *Entering Pasture 2 the first stone is standing.* [Stone 9 (101) this stone is due south of the Obelisk].
7. *The lodgement of the next is visible and a young ash tree planted in its room.* [Stone 10, which had already gone in Stukeley's day. The ash tree is shown in his plan.]
8. *The next has a little rising above the level of the ground.* [Stone 11, has now gone.]
9. *The next has a great cavity left and a young elm tree planted therein.* [Stone 12: the cavity or depression here can still be seen.]
10. *The next to that is standing.* [Stone 13 has now gone.]
11. *In pasture 3 the first is standing.* [Stone 14 is no longer standing, although its position shows as a possible buried stone on the resistivity survey (Ucko et al, 1991) and has been marked on the NMR plan.]
12. *The 2nd has a hollow.* [Stone 15 also shows as a stone position on the NMR plan (Ucko et al, 1991).]
13. *The next a perfect vacuity.* [Stone 16 similarly shows as a stone position on the NMR plan (Ucko et al, 1991).]
14. *The next to that a very deep hole and great breadth.* [Stone 17 (122): the depression here is also still clearly visible today and was re-measured as part of this study. From stone 1 to stone 17 Stukeley's descriptions matches with the evidence that can be determined from different surveying techniques and their positions can be plotted with

reasonable accuracy. Any changes in the stone count must therefore occur with those stones that once existed in the position of the buildings or rear gardens that front Green Street.]

15. *The next stood by the pails of the garden.* [Stone 18 would have stood close to the present garden fence. This position fits broadly with what has preceded so far, with respect to spacing and is the probable position of this stone as its northern edge would have formed a natural boundary marker for the garden plot.]
16. *In that garden there were two.* [Stone 19 and 20: Stukeley's plan (Fig. 7) and commentary, suggests two stones stood here in the garden of what is now Carpenter Cottage. The cottage itself is not shown, suggesting that at the time of this sketch plan it had not yet been built.]
17. *And two in the barn adjoining; one whereof remains in the floor.* [Stones 21 and 22: The barn is clearly shown in Stukeley's plan (Fig. 7). If two stones existed in the garden then these would be stones 21 and 22. The first is drawn half way down the southern side of the barn and second on the northwest corner. It would seem that one stone had already disappeared, with the other still showing in some form. From the detailing in Stukeley's plans it is not possible to say, which of the two stones might still have existed. Clearly the position of lost stones was not easy for him to determine.]
18. *The next destroyed since last year to build the next house.* [Stone 23: The 1886 OS sheet shows a property over this placement, which has subsequently been demolished. It looks to have been in the rear garden of one of a pair of semi-detached properties shown, in Fig.10, listed as 1 and 2, The Red Houses, Green Street.]
19. *One or two more did lie in the floor of that house.* [Stone 24: There is a slight confusion here as only one stone could have stood in this position, which would have been the same house as that mentioned in 18. The 1886 OS sheet shows a property here that has subsequently been demolished, part of which would have been built over the present curtilages of 1 and 2 The Red Cottages, Green Street]
20. *The next lies now by the Street side under the corner of an house directly over against the inn.* [Stone 25: Almost certainly this is part of the house known as 6 Green Street, which stands opposite the position of the Catherine Wheel Inn, where Stukeley stayed on his Avebury trips. In Stukeley's plans stone 25 is marked at the corner, or in front, of the detached cottage. The original cottage was extended to the east in 1833 so the original position would now be part way along the cottage. Another problem is that the circle's projected circumference indicates that the stone should have been close to its rear wall, not its front. However, a collapsed stone could have extended from the rear to the front of the property with part of its side forming a foundation for the side wall of the original property. This was measured as being 5.25 m (17ft-3"). This stone is also indicated on a plan by A.C. Smith published in 1881 (Smith, 1881). Stone count number 26 is shown as a dot on Stukeley's plan, suggesting that it had already been removed some years earlier.]
21. *The next that was in the garden was destroyed to build the meeting house.* [Stone 27: The garden in front of the Meeting House can be readily identified as it still exists today. Stukeley shows the original building, with a double pitched roof, set close to the rear boundary fence, in the position of the present Victorian extension. The oldest part of

the present chapel must have been built soon after Stukeley's time, which was probably why the stone that stood there had been removed. The possible position of this stone could have been picked up in the archaeological report [Oxford Archaeology, 2002] from the work carried out at the Meeting House in 2002. If so the stone would have been close to the northwest corner of the present main building. What is more likely looking at the archaeological report and the size of the hole is that this was a pit for breaking the stones rather than a stone-hole.]

22. *The next is left in a barn or stable floor.* [Stone 28: Stukeley's comment here suggests that this stone might still have existed in some form in his time. Its position today would be under the middle of the garage of Perry's Cottage.]
23. *The next stood in a garden but now demolished.* [Stone 29: This would have been somewhere close to the middle of the Perry's Cottage garden.]
24. *The last is at present buried in the same garden, which completes our number of 30.* [The position of this stone is shown on Gray's plan dated to 1908 (Gray, 1935), as being on the boundary between Perry's Cottage and the adjoining property to the west. It is possible from Stukeley's comments that these properties were originally one. This stone was also noted by A. C. Smith in 1884 when he states :

"I have also to record that a large stone, which would have occupied a north-western portion in the southern temple, once stood in the garden of Mr Pratt, where a plum tree now stands; and that this stone is recollected by Robert Clements and other inhabitants of Avebury, though it was destroyed years ago." (Smith A.C., 1884 p.142).

Stukeley shows this as a standing stone in his plan in Fig. 7 and not buried as he states in his account.]

6 STONE PAIRINGS

- 6.1.1 The position of Stones 101 – 109 can be confirmed both by their physical existence and from Keiller's excavations, now marked by concrete plinths. The position of stones 122 – 129 has been assessed by geophysical survey and through ground depressions. Fig. 9 shows the correlated position of the stones. The angular relationship of these 17 stone positions can be calculated through Google Earth and are assessed in Table 1. The section coloured blue shows the original nine stones from which Smith made her calculations. The mean angle, from Table 1, is 12.17 degrees, which translates into a distance of 36.11 ft or 11 m.
- 6.1.2 What is also striking about these figures is the variation between the distances, which do not conform to any apparent regularity. Nor incidentally do they correlate with the spacings that Smith suggested. For example spacing 101 to 102 is 35.28 ft not 32-33 ft as Smith claimed.
- 6.1.3 What is consistent however is that the stones would appear to have been deliberately paired on either side of a north-south axis. This is evidenced by the radiating stones on either side of stone 101, which, as already stated, lies almost due south of the central Obelisk stone. The paired relationships are shown in Table 2.

Table 1
Southern Circle - spatial distances

		<u>Degree</u>	<u>Diff - deg</u>	<u>Spacing ft.</u>
Smith's stone number	122	81.25		
	122-123	95.41	14.16	41.83
	123-124	108.58	13.17	39.08
	124-125	120.18	11.60	34.42
	125-126	131.40	11.22	33.29
	126-127	145.68	14.28	42.37
	127-128	158.14	12.46	36.97
	128-129	168.44	10.30	30.56
	129-101	180.74	12.30	36.49
Smith's original	101-102	192.63	11.89	35.28
assessment	102-103	204.62	11.99	35.57
	103-104	216.93	12.31	36.52
	104-105	229.95	13.02	38.63
	105-106	242.12	12.17	36.11
	106-107	254.28	12.16	36.08
	107-108	266.84	12.56	37.27
	108-109	278.68	11.84	35.13
sixteen spaces		Mean	12.17	36.11

Table 1 – Angular position of stones and hole depressions in the Southern Inner Circle

Table 2 shows the paired relationship of stones on either side of, and taken from, stone 101.

<u>Stone</u>	<u>Degree</u>									
122	81.25								97.44	
123	95.41	<i>East</i>							85.33	
124	108.58							72.16		
125	120.18							60.56		
126	131.40	<i>Solstice</i>						49.34		
127	145.68							35.06		
128	158.14							22.60		
129	168.44							12.30		
101	180.74	0							<i>South</i>	
102	192.63							11.89		
103	204.62							23.88		
104	216.93							36.19		
105	229.95	<i>Solstice</i>						49.21		
106	242.12							61.38		
107	254.28							73.54		
108	266.84	<i>West</i>							86.10	
109	278.68								97.94	
		diff	0.41	-1.28	-1.13	0.13	-0.82	-1.38	-0.77	-0.5

Table 2 – Paired Angular position of stones and hole depressions in the Southern Inner Circle

6.1.4 Accepting that there must inevitably be a slightly greater margin of error with the stone hole positions in the south-east sector, because these have not been excavated, the parallels with

the stones in the south-west sector is striking. If the stones had been randomly placed then we would expect a much greater margin of error than the 0.5 degree that we find between stone positions 109 and 122. The paired nature of the stones is shown in Fig. 19

- 6.1.5 It is clear that the stones have not been set out using an equally spaced rope marker. If this had been done then there would have been broadly equal spacing between the stones. That the stones are paired across the circle suggests that some other mechanism must have been used, the most obvious of which would be astronomical. The aligning of a pair of stones to the rise and set position of a specific star, or to the sun at a specific date in the year, could account for this pairing. However, this level of investigation is outside of the scope of this report. It is simply flagged up as a possible explanation.
- 6.1.6 With evidence of pairing for sixteen stones in the southern sector of the ring, it is reasonable to assume that this process would have continued for the positioning of the remaining stones, although this cannot be confirmed definitively.

7 BOUNDARIES

- 7.1.1 Alexander Keiller in his report on the excavations of stone 109, which abuts the garden boundary wall of the most western property stated:

"It appeared very doubtful, prior to excavating whether this stone-hole would be included within the area, or would lie just beneath the brick and stone shed on the north-west limit of the pasture. Fortunately however, the feature required could be entirely excavated, although the wall of the shed was only 2 ft from the sinister edge of the stone hole. This was not wholly fortuitous, however, since this wall originally lay on the line of an old boundary, which had itself been aligned on the side of Stone 1, before its fall. That the medieval boundary ditches were laid out from standing stone to standing stone became abundantly clear throughout the course of the excavations." (Keiller, 1935)

- 7.1.2 The current field boundaries and ditches relating to the Southern Circle are shown in Fig. 11
- 7.1.3 Whilst the present property boundaries have evolved over time, possibly with further subdivisions, it seems reasonable to assume that the edges of standing stones, in the northern sector, would most probably have formed some of the curtilage boundaries between the different properties. This knowledge becomes helpful when assessing the possible stone positions for the northern sector.

8 EXTANT STONES, KNOWN STONE-HOLES, AND ASSUMED PLACEMENTS

- 8.1.1 As mentioned in 6.1.1, stones listed, under Smith's designation, as 101 to 109 are either extant or their holes have been excavated by Alexander Keiller and their positions can be affirmed with accuracy. The position of Stones listed as 122 to 129 have been assumed through geophysical survey and from ground depressions, as well as from historical accounts. Their location can be positioned with reasonable accuracy. This accounts for seventeen stones within the ring.

8.1.2 There are four more possible stone positions in the northern sector of the site that have been noted, either from excavation reports or from historical records, from Stukeley, A. Smith, and Gray. These can be listed as follows:

1. **Stone 121** - Isobel Smith shows this stone straddling the boundary between Carpenter Cottage and the field to the south. However, this is very unlikely to be the case, particularly because of Keiller's assertions about boundaries and from the account by Stukeley, which places the stone, as Keiller would have expected as '*standing by the pails of the garden.*' The most probable position of this stone would be just outside the boundary of Carpenter Cottage, in the southern field side. This would be similar to stone 109. The measured distance to the boundary fence from the stonehole depression 122, of 11.84 m (38 ft – 10") is more than sufficient distance for a stone to have stood within the boundary of the field.
2. **Stone 110** - This stone is referred to in note 5.1.2 (24). Gray shows this stone on the boundary between Perry's Cottage and the adjoining property to the west. If this position is correct then this stone would appear to be paired with stone 121 listed in note 8.1.2-1.
3. **Meeting House Stone** – This stone would appear to be close to the stone Isobel Smith designated as 112. Oxford Archaeologists in their excavation reports note a possible stone hole on the western boundary of the Chapel. The excavation trench would have been just outside the Chapel boundary. The report states:

'Of note was the large pit (33) containing mid-16th century pottery. The pit was exceptionally wide, at 5.35 m, so an explanation that it once held one of the standing stones on the site is a possibility' (Oxford Archaeologists, 2002, p.12).

Stukeley notes a stone within the curtilage of the Meeting House, which was destroyed when the new Chapel was erected. Because of the size of the stone-hole (5m), which Oxford Archaeologists discovered this is more likely to have been the residue of a stone pit, which would have been created when the Meeting House stone was felled. If the edge of the stone determined the western boundary of the Chapel plot then its position can be determined as being just in front and to the western side of the present Meeting House building.

4. **Cottage Stone**, 6 Green Street – The cottage still exists and this stone would relate to the stone that Isobel Smith designated as 114. The Listed Building Register states:

Block of 3 cottages, now 1 house. C17, extended C18 and 1833. Colourwashed sarsen, chalkstone and brick, with thatched roof. Two storeys, 4 bays. Central 2 bays of lobby entry C17 plan, with a half-glazed door under flat canopy. Sixteen-paned sashes to left, and 3-light windows. This building extended first to right by one bay and rear bay forming wing, with boarded door and C19 timber windows. Second extension to left as third cottage, datestone reading: High Street Cottages, 1833. Door blocked and 16-pane and other windows. Roof hipped over both ends bays. (English Heritage Building Grade II, ID 1365948)

The extensions to the original cottage can clearly be seen in the brick and stonework and, on the assumption that Stukeley was correct in the placement of this stone, then its measured position, about 6 m from the eastern edge of the cottage can be assessed (Figs. 13-5).

- 8.1.3 Of the four stones listed in 8.1.2 stone 110 would appear to be paired with stone 121, the field boundary stone. On the assumption that this pairing continued then Stone 112, the Meeting House stone, would be paired with a stone within the curtilage on Carpenter Cottage, and the stone at the rear of 6, Green Street would be paired with a stone at the rear of 1 & 2 The Red Cottages.



Figure 1 - Location Plan of Avebury

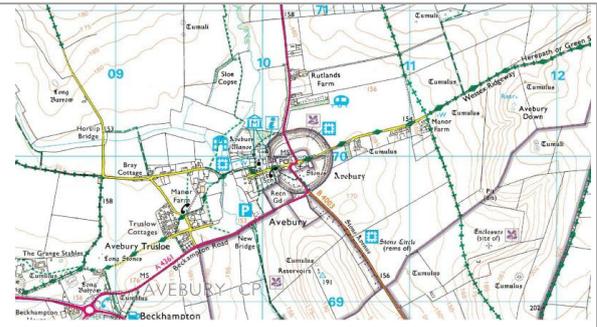


Figure 2 - Site plan of the Avebury Henge OS 1:50000

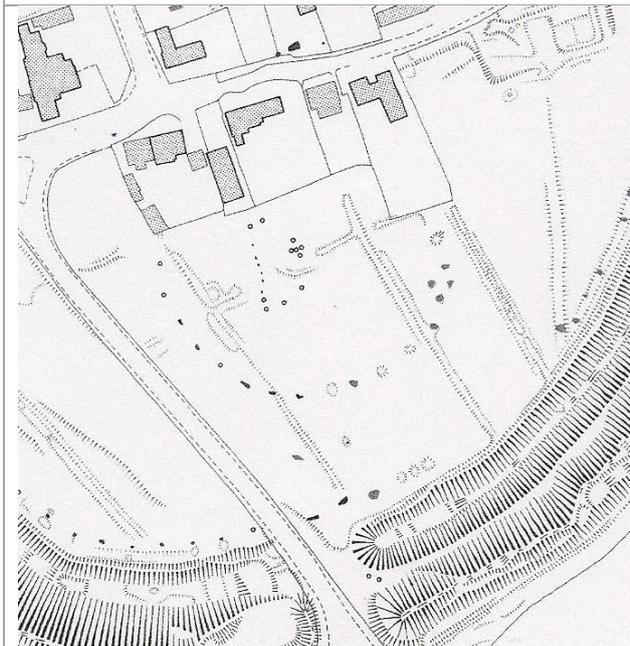


Figure 3 - NMR plan of the Southern Inner Ring

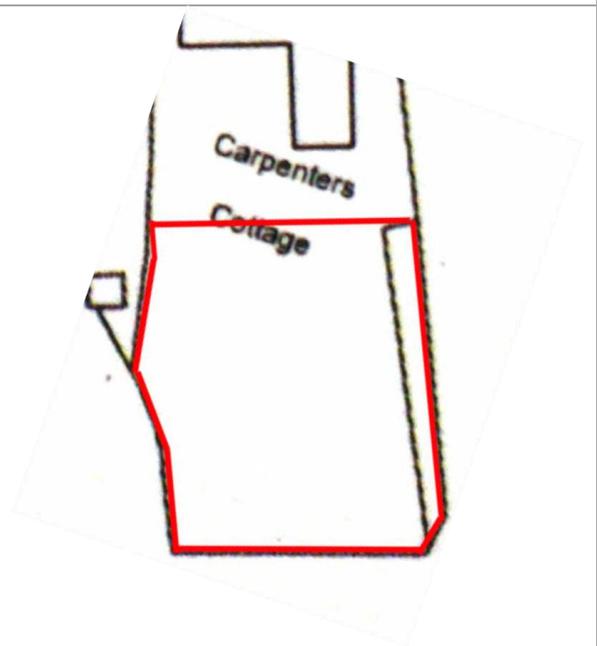


Figure 4 - Survey area of Carpenter Cottage

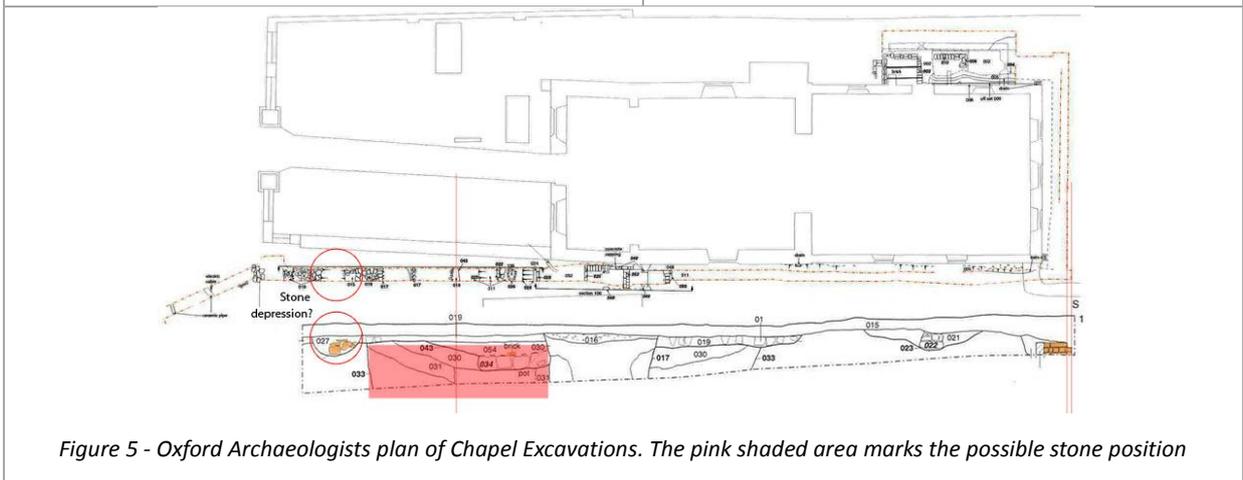


Figure 5 - Oxford Archaeologists plan of Chapel Excavations. The pink shaded area marks the possible stone position

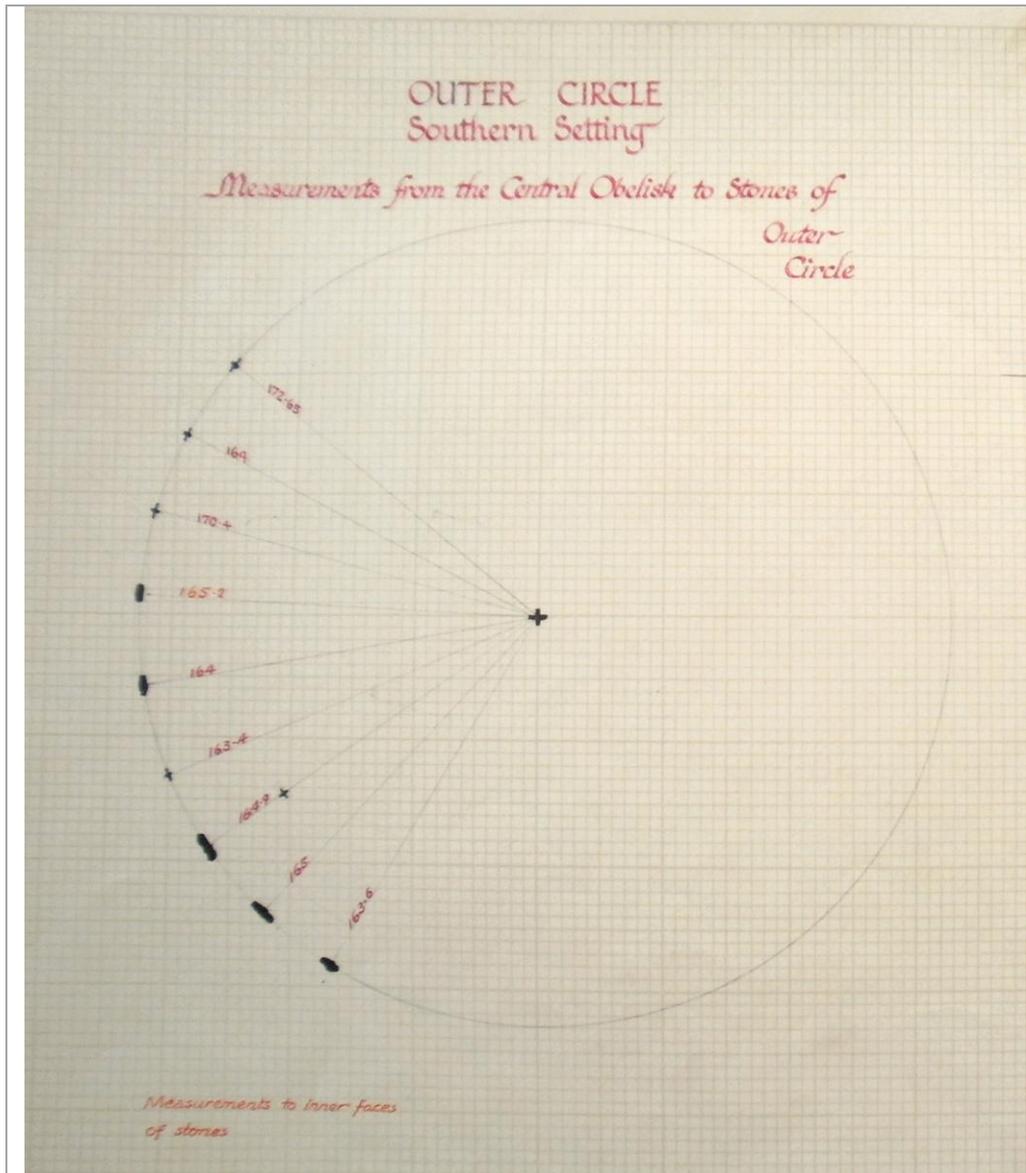


Figure 6 - Keiller Measurements of Southern Inner Ring

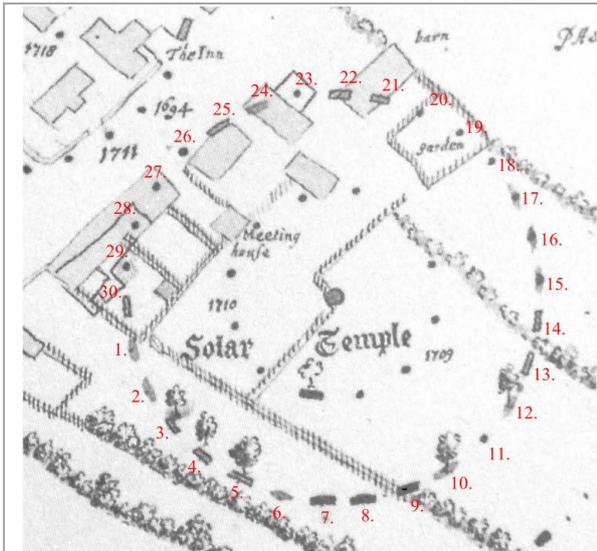


Figure 7 - Stukeley plan of Southern Inner Ring Avebury (Bodleian Library MS. Gough Maps 231, 22)



Figure 8 - Stukeley plan Fig. 7 overlaid onto Google Earth

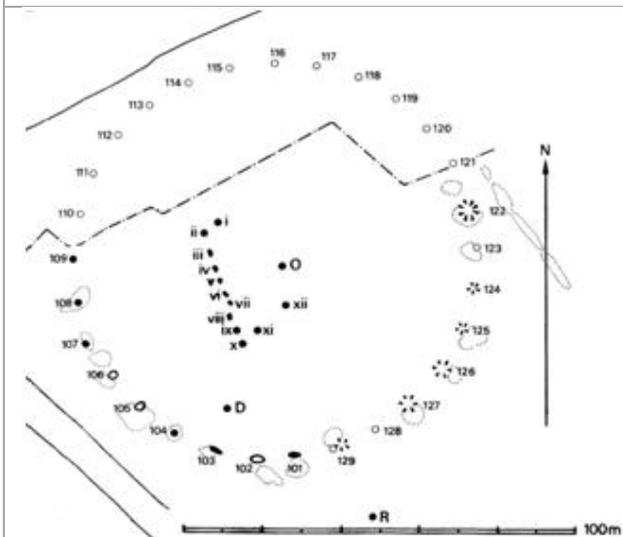


Figure 9 - Isobel Smith plan of Southern Inner Ring with her stone count (Smith, 1965). Note stone 121 straddling boundary

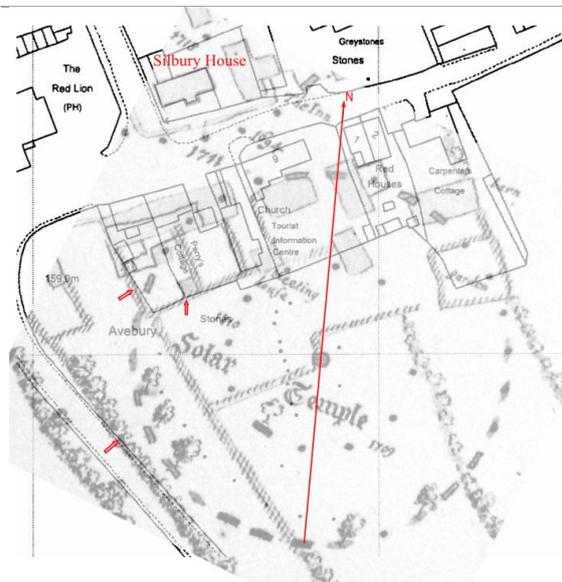


Figure 10 - Stukeley plan Fig.7 overlaid on modern OS sheet, showing North-South axis, and boundary points

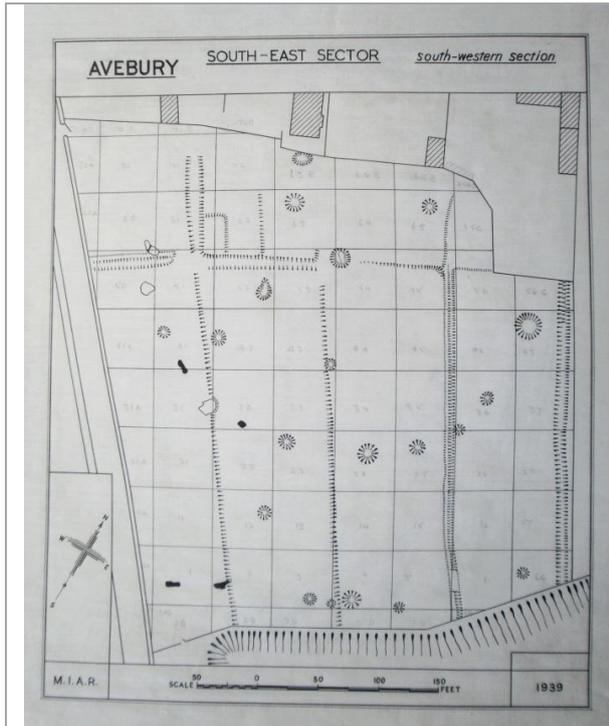


Figure 11 - Field boundaries from the Keiller Archives

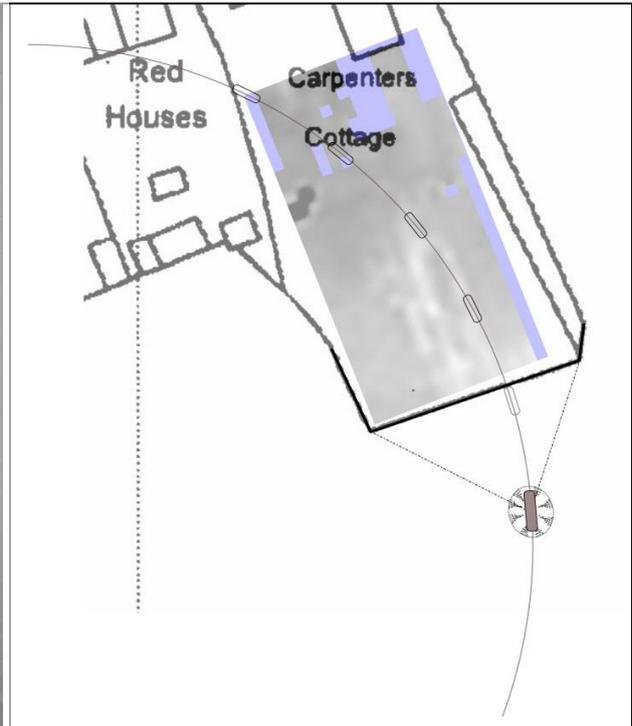


Figure 12 - Geophysical survey of Carpenter Cottage



Figure 13 - Front elevation of 6 Green Street, showing original cottage size



Figure 14 - Detail of front of 6 Green Street, showing front detailing



Figure 15 - Rear of 6 Green Street, showing extension



Figure 16 - The Chapel, Avebury



Figure 17 - Boundary wall adjacent to plinth marker for stone 109



Figure 18 - Geophysical survey in garden of Carpenter Cottage March 2014

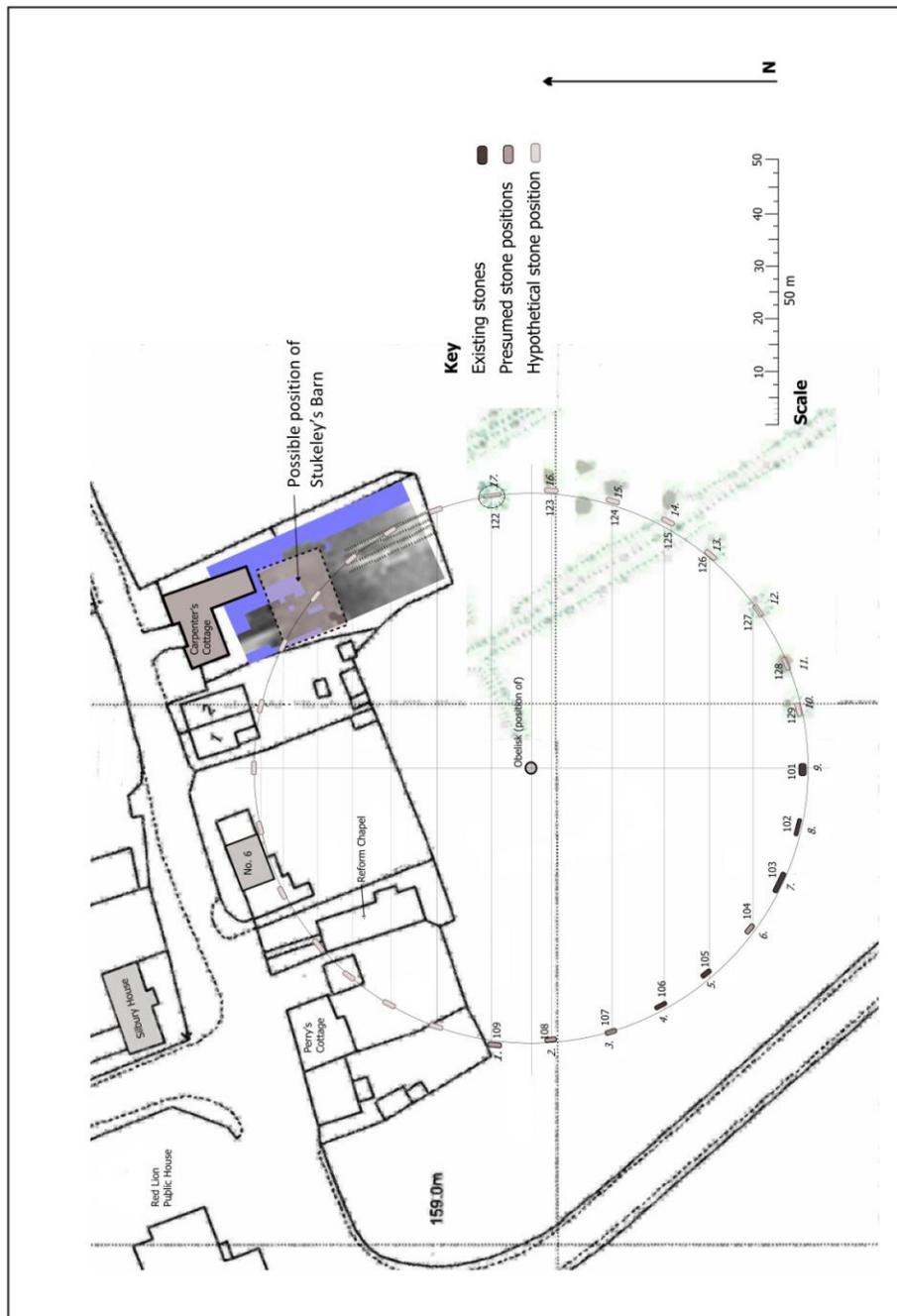


Figure 19 – Geophysical survey in relation to Southern Inner Ring, based on hypothetical Stukeley stone positions

9 Talits Geophysical Survey Report

Geophysical Survey

MARCH 2014

REPORT No. 2011.320

talits

the answer lies in the soil

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Summary

Carpenter Cottage is situated to the east of the High Street/Green Street/A4361 junction at the centre of the village of Avebury. It lies within Avebury Henge (SM28130), one of the most significant monuments within the Stonehenge, Avebury and Associated Sites World Heritage Site. Besides the Henge and its component monuments, the site borders Green Street, a Saxon *herepath*.

TALITS Archaeological Services was commissioned by researcher, David Furlong, to undertake an earth resistance survey of an area of land within the garden of Carpenter Cottage, which straddles the arc of the Southern Inner Circle of the Avebury complex of monuments. In this area the stone circle is no longer extant and the aim was to investigate whether evidence for its path and the number of missing stones could be detected.

Earth resistance data revealed a number of high and low resistance anomalies across the site. Most of these appear to relate to a rectangular structure, although two large low resistance anomalies may be unrelated. The likely positions of “missing” stones on the basis of both a 29 stone circle and a 30 stone circle, had been postulated in advance, however, there was no clear correspondence between the survey anomalies and these estimated positions. They may be due to a number of other explanations, which geophysical survey alone cannot deduce.

Date of Survey

29th March 2014. The survey was carried out by Jim Gunter (BA, MA, PlfA) on behalf of TALITS with help and assistance from David Furlong.

Authorship

This report was compiled and written by Jim Gunter on behalf of TALITS.

Disclaimer

This report has been compiled with all reasonable skill, care and attention to detail within the terms of the project as specified in the Project Design, S42 Licence, National Trust licence and within the general terms and conditions of [Talits](#). No responsibility is accepted whatsoever to third parties to whom this report or any part thereof is made known. Any such party relies upon this report at their own risk.

Location

The village of Avebury, including the site, is 9km west of Marlborough. Carpenter Cottage is at the eastern end of the village, bordering Green Street, which provides access to the Marlborough Downs to the east (**Figure 1**). The garden occupies a rectangular site measuring approximately 34m north to south x 20m, east to west. The National Grid Reference is 410330 169660.

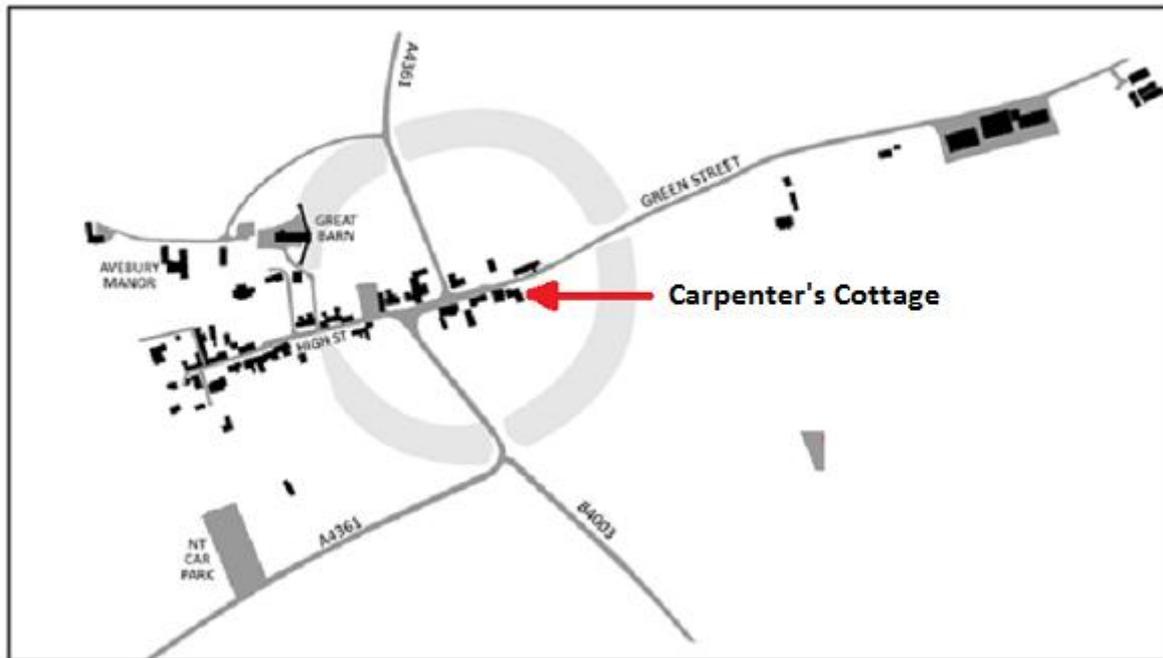


Figure 1: Location of Carpenter Cottage site within Avebury Henge

Topography and Geology

The underlying geology of the built up area of the village, including the site, is valley gravel overlying Lower Chalk of the Cenomanian Grey Chalk Sub-Group (BGS, 1974). The overlying soil across the site is from the Frome association and is a calcareous alluvial gley soil (Soil Survey of England and Wales, 1983). The flat site is situated at an altitude of approximately 160m OD.

The chalk slope of the Downs rise to the east, beyond the village, to a general height of up to 250m AD. A stream called the Winterbourne flows to the west of the village and flows southwards towards Silbury Hill and the River Kennet.

Current land-use was as a garden, mostly laid to grass.

Archaeology

The Avebury complex of sites and monuments was inscribed in 1986 as as part of the Stonehenge, Avebury and Associated Sites World Heritage Site (WHS) in recognition of the particularly rich assemblage of archaeological sites, both visible and buried, which provide a unique record of outstanding human endeavour from Neolithic times and later. It is one of a limited number of areas in southern Britain which have acted as a focus for ceremonial and ritual activities during the Neolithic and Early Bronze Age. Within the Avebury part of the WHS there are some 383 individual sites recorded in the County's Historic Environment Record, of which 166 are protected as Scheduled Ancient Monuments (Pomeroy-Kellinger 2004, 20). In addition to the major prehistoric monuments of the Avebury Henge and Stone Circle, the Avenues, Windmill Hill, Silbury Hill, West Kennet Palisades, West Kennet Long Barrow and The Sanctuary, there are many other sites of

archaeological and heritage importance spanning a timescale from the Mesolithic period through to the Roman, Saxon, Medieval and Post-Medieval periods, making this one of the most archaeologically rich landscapes in the world.

Carpenter Cottage lies almost at the centre of the Neolithic henge monument of Avebury (SM28130). The eastern entrance of the henge is just 60m to the east of the site along Green Street. The Cove, one of the earliest components within the henge, stands approximately 35m to the north of the cottage. The garden of Carpenter Cottage may have constituted part of the north-eastern circuit of the Inner Southern Circle, which today exists only in its southern and western arcs. This stone circle, with a diameter of just over 100m, was originally thought, by Stukeley, to have contained 30 sarsen stones (*Stukeley, 1746*). Archaeologist Isobel Smith, based on her researches with Alexander Keiller, suggested 29 sarsen stones (*Smith, 1965, fig.70*).

Besides being a passage through the henge, Green Street, onto which the cottage faces, is considered to follow the Saxon army road, the *Herepath*, which is thought to pass through Avebury en route between Yatesbury and Marlborough (*Pollard & Reynolds 2002, 225*). The church of Saint James, 200m to the west of Carpenter Cottage, is also an early Saxon Christian foundation believed to date from the 8th century and acted as the central point from which numerous parochia developed to later become the parish churches of the surrounding villages. Fragments of Saxon architecture survive in the structure of the church.

The garden of the cottage is, therefore, in an extremely sensitive archaeological area (**Figure 2**).

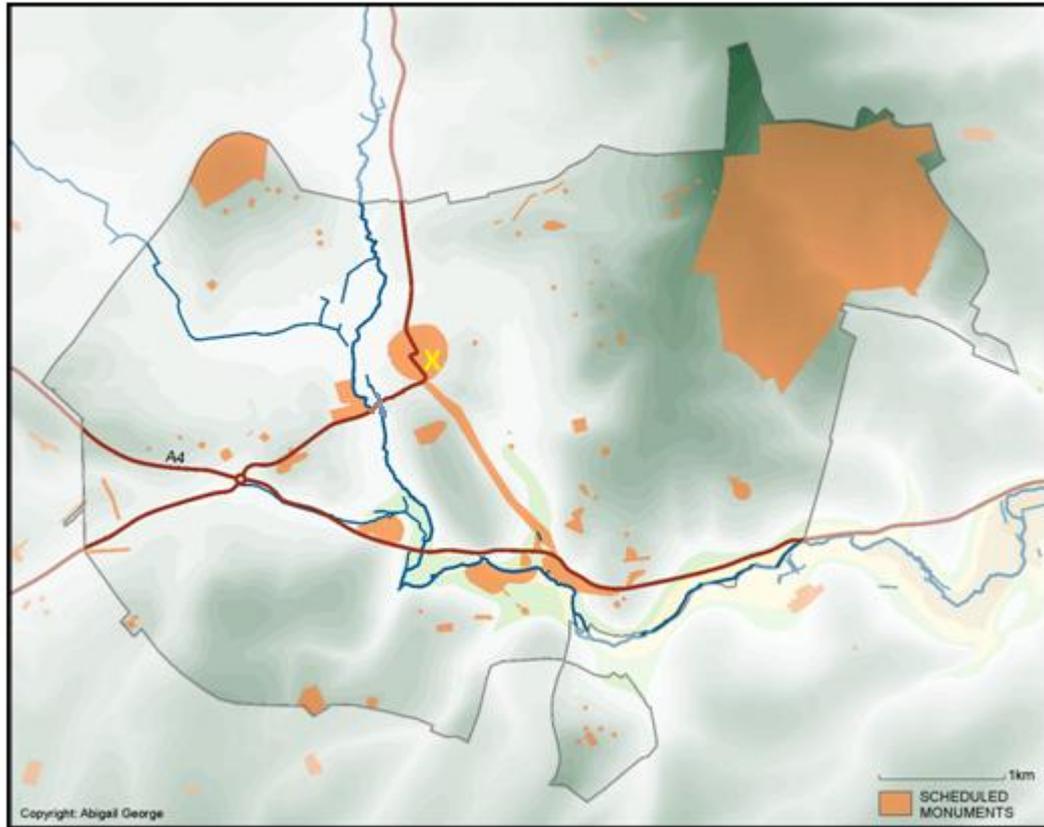


Figure 2: Avebury WHS area and monuments: Carpenter Cottage marked "x"

Legislation

The site stands within an archaeologically sensitive area, being within the Avebury Henge and Stone Circles (SM28130), a major monument within the Stonehenge and Avebury and Associated Sites. The cottage itself is a Grade II Listed Building (entry number 1192984).

A Project Design which set out the proposed Methodology (*see below*) for the works was prepared as the basis for seeking Scheduled Monument Consent. A licence under Section 42 of the Ancient Monuments Act 1979 was obtained from English Heritage. As the site is on land owned by the National Trust a licence from the National Trust Archaeologist, Stonehenge and Avebury WHS, was also sought and obtained. The agreement of the farmer, Tony Farthing, who leases the cottage from National Trust, was also obtained.

Geophysical Survey Aim

The course of the Southern Inner Circle is postulated from the position of some of its stones, which still stand.

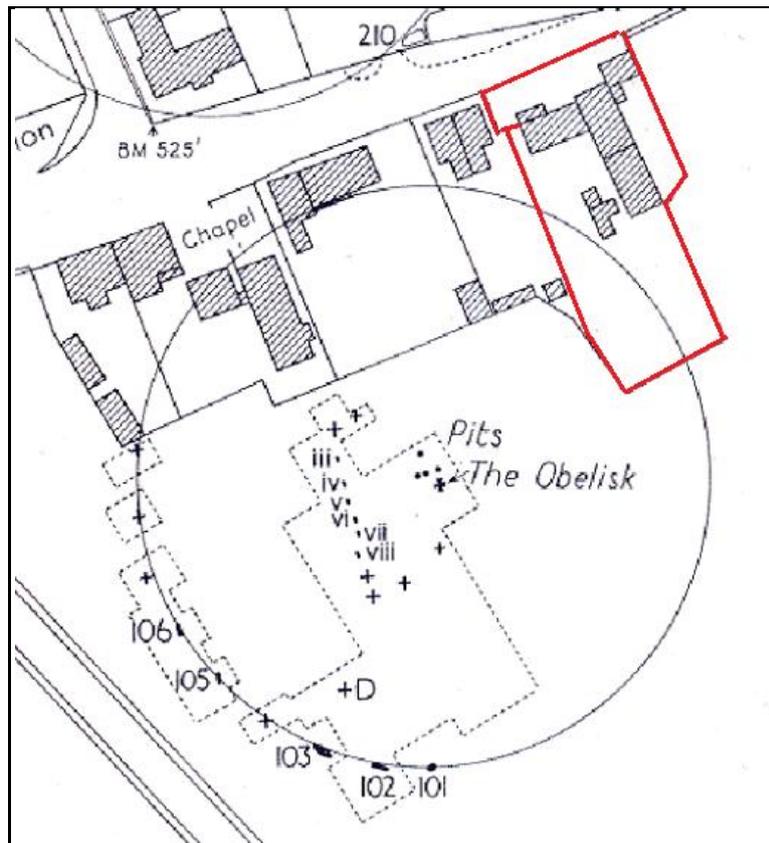


Figure 3: Line of the Southern Inner Circle (after Smith 1966)

However, the known positions of the missing stones or stone holes in the circle produce an anomaly, whereby it is impossible to determine whether this ring originally contained 29 or 30 stones. This can be demonstrated by looking at the angle between the large stone hole depression, which Smith designates as stone 122 (Smith, 1965) and stone hole plinth erected by Keiller, which Smith designates as stone 109 (Smith, 1965). From theodolite survey these two azimuths can be shown as:

Obelisk to stone 109 = 278.68 degrees

Obelisk to stone 122 = 83.94 degrees

The difference between these two azimuths is 194.74 degrees, giving a circumference in this sector of just under 578 ft (176.2m), on the assumption that the radius of this circle is 170 ft (51.81m) (Smith, 1965). Within the surviving arc of stones, 16 stone locations are recorded producing a mean spacing for the stones of 36.11 ft (11m), very close to Smith's average of 36 ft (10.97m).

Comparing this calculated figure of 11m with the nominal spacings for a 29 or 30 stone circle would produce:

- for a 29 stone circle; a mean spacing of 11.22m, a difference of +220mm
- for a 30 stone circle; a mean spacing of 10.85m, a difference of -150mm

These figures provide inconclusive proof whether the circle had 29 or 30 stones.

The objective of the survey was to use non-intrusive geophysical techniques to attempt to answer questions about the course of the Southern Inner Circle and to test the hypothesis that it may have contained either 29 or 30 stones. Whether for 29 or 30 stones, three stone holes should exist within this section of the garden. If the position of only one stone can be confirmed then there is a chance of taking a step to resolve the question of the number of stones (Figures 4 and 5).

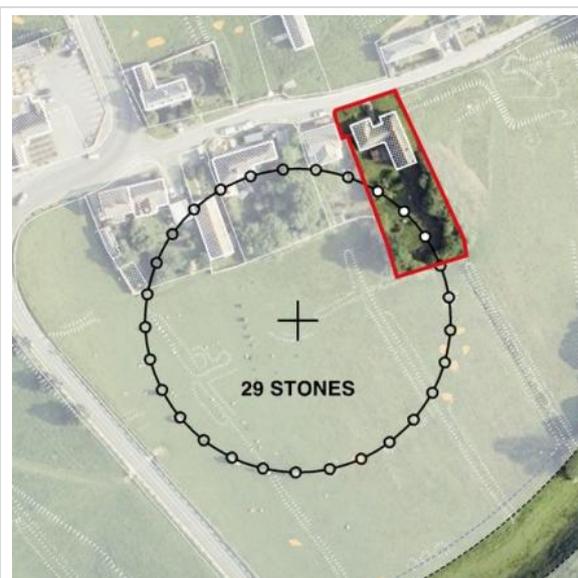


Figure 4 – 29 stones in circle

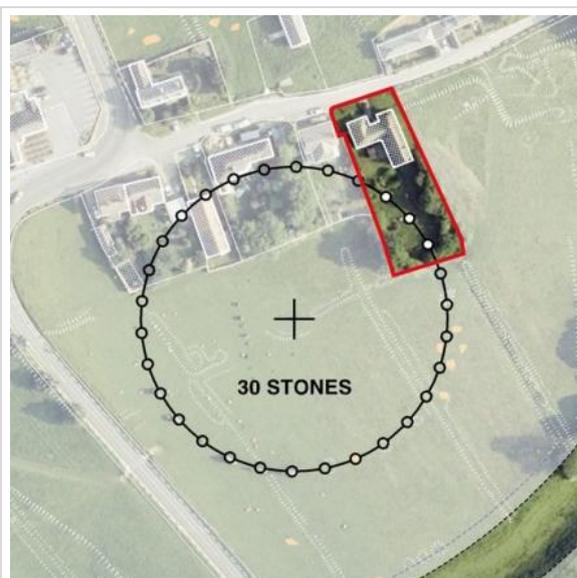


Figure 5 – 30 stones in circle

Earth resistance survey has been found to be particularly effective at locating features such as buried stone or stone pits and had been used with some success along the projected course of the Beckhampton Avenue (Gunter and Roberts 2008, 115) and in locating the true site of the Winterbourne Bassett stone circle (Gunter 2005). The survey and report follow the recommendations set out by English Heritage (2008) *Geophysical survey in archaeological field evaluation*; and the Institute for Archaeologists (2010) *Standard and Guidance for Archaeological Geophysical Survey*.

Methodology

The electrical resistance or resistivity of the soil depends upon the moisture content and distribution within the soil. Buried solid features such as walls are usually more moisture resistant than other features such as the infill of a ditch. A large stone will generally give a high resistance response and the moisture retentive content of a ditch will give a low resistance response. Localised variations in resistance are measured in ohms which is the SI unit for electrical impedance or resistance.

Two 20m x 20m survey grids were set out, occupying practically the whole of the garden of the cottage. The survey was carried out using a Geoscan Research Resistance Meter RM15-D with a mobile Twin Probe array. The standard mobile frame for the instrument has a 0.5m electrode separation, which can give a response to features up to 1m in depth. Measurements were recorded at 1.0m intervals along 1m traverses across the site. Data logged by the resistance meter was downloaded and processed within Geoplot 3.0 software. Both raw and processed data is analysed and displayed within the report.

Results

The Geophysical Survey Data are shown at **Appendix 1** with unannotated Plots of the Raw and Processed Data at **Appendix 2**. Comparisons of the Processed results with the projected stone positions for 29 and 30 stone circles are at **Appendix 3**. A possible Interpretation of Processed Results is given at **Appendix 4**.

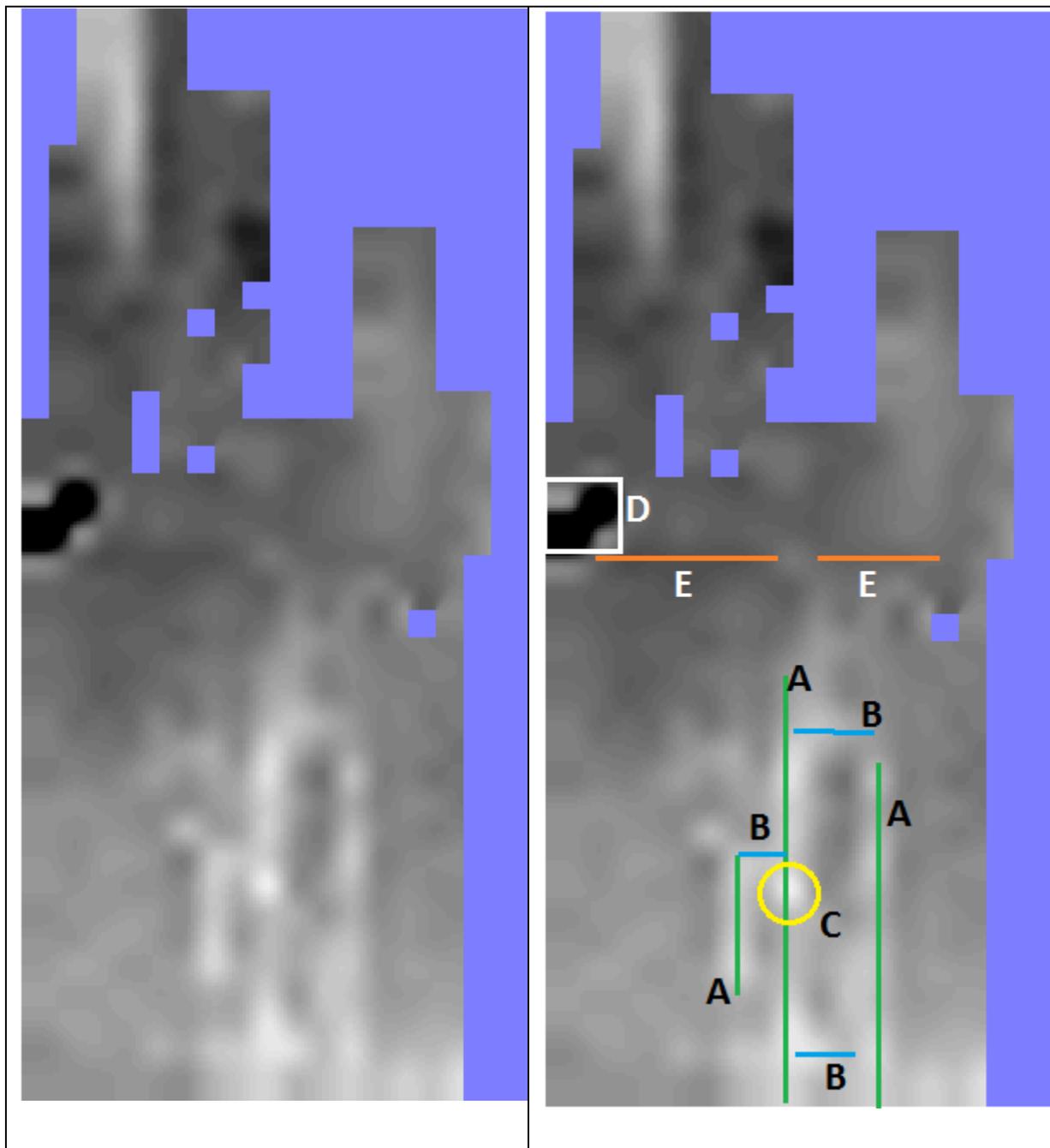


Figure x: x1 features in processed results

x2 highlighted features numbered

A (green) There are three parallel bands of low resistance, each c.850mm wide, running north-south through the central area of the survey area. Two of these create a clear linear feature, approximately 4m across that stretches c.20m north-south through the central and possibly extends southwards into the henge. The third low resistance line, 3m to the west of the long feature, runs parallel to it for a short length of c.5m.

B (blue) In places there appear to be east-west low resistance lines linking all the parallel lines and which also segment this feature.

C (yellow) At a point roughly central along the western arm of this feature there is a much lower resistance patch. This was the lowest resistance reading across the whole survey area. It could signify a deeper hole, but as it along the main feature probably is still related to that feature rather than being a separate object.

D (white) There is a very high resistance area, c.2.5m x 2m, on the western fence-line.

E (brown) A high resistance linear runs from the very high reading area west to east across the centre of the survey area.

Discussion

The low resistance lines (**A**, **B**) form a rectangular feature or features. These could be interpreted as the foundations of a building, although at only 4m and 3m width (and even less internal measurement) this would have created a very narrow structure. The survey did not extend fully to the fence-line to the Henge due to the presence of shrubs/bushes, so it was impossible to be certain that the two longest lines did extend into the henge.

There is nothing visible on the RCHME earthwork survey plan of the Henge (*Figure x*) that might explain these linear features.

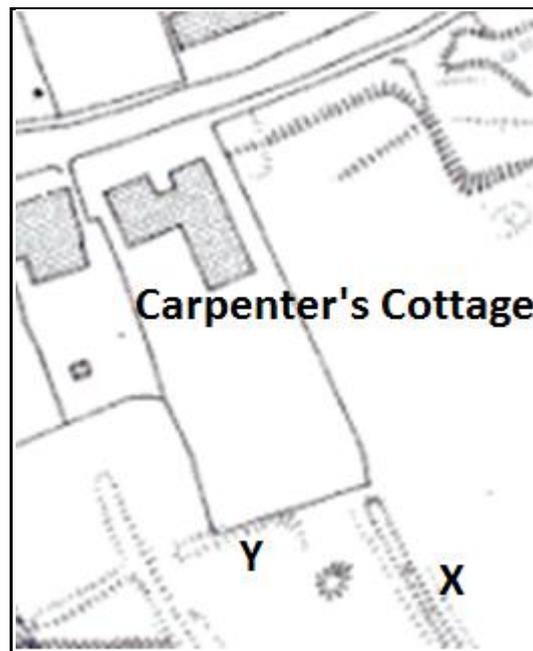


Figure x: extract from RCHME survey

There is a – visible – ridge (**X**) that extends the eastern boundary fence-line of the garden from its SE corner into the Henge. This is too far to the east to relate to the geophysical survey lines.

Another ridge (**Y**) on the RCHME plan forms an inverted L-shape immediately outside the gardens southern fence with the long arm of the L-shape along the fence-line. In the survey plan the long arm effectively terminates the shorter arm apparently cutting off an extension into the garden. However, RCHME did not survey the garden, so the possibility that this mark did lengthen north of the fence cannot be ruled out.

There is nothing shown in this area on Aubrey's 1663 map nor on any other of Stukeley's Avebury drawings or maps.

A building is known to have stood within the garden survey area, appearing on Stukeley's drawing from 1723 (*Figure x*).

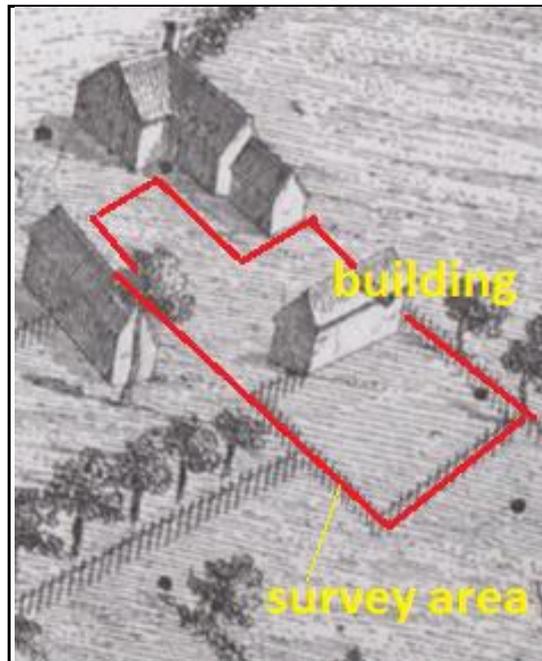


Figure x: Stukeley's 1723 drawing annotated for survey area

This building was on an east-west orientation totally opposite to the geophysical survey feature. It was also set back in a central position within the garden. Its long axis is nearer to the E-W lines (E), indeed its southern wall line may correspond to the images found by the geophysical survey.

As the site has been a domestic garden for many centuries (certainly from before Stukeley's time in the early 18th century), it is also possible that these features relate to a garden structure of some sort. Chickens are currently kept in hutches in the garden and there may have been a more substantial structure in the past for housing hens or animals.

The lowest resistance point (C) in the survey results might represent a hollow or hole that had been filled with material softer than the general chalk bedrock. It would appear to be deeper than whatever created the linear features, hence the lower resistance reading. It was less than 1m in diameter. The comparison of the geophysical survey result with the projected line of missing stones of the Southern Inner Circle (**Appendix 3**) places this "hole" within 2m of the most southerly projected hole on both the 29 and 30 stones circuits.

The very high resistance image (**D**) found at the western central fence-line could reflect the burial of stone, but being so close to the boundary the normal reaction would be to view this as stone clearance from the garden. It was over 5m beyond the northernmost of the projected missing stone positions

Conclusion

No firm evidence was detected by this survey for the location of stones or stoneholes that might have been part of the Southern Inner Circle.

The surviving stones of Circle are all very large, as are those in the Northern Inner Circle. Any buried stone would have caused a correspondingly large area of high resistance in this survey. None was detected. The only result that could be interpreted as stone could only have related to fragment/s of broken stone but was 5m out of position for any projected stone position and was out of alignment with the probable circuit of the stones.

If the stones had been removed the holes marking their positions would have been even larger to allow for a destruction pit to have been created, resulting in a large low resistance area on the geophysical survey results. None was detected. The lowest resistance point in the survey results was near the most southerly projected hole on both 29 and 30 stone circuits of the Southern Inner Circle. But it was small >1m and only near, not AT, the desired point.

It was also impossible to relate any other high or low resistance marks to any known or historically recorded structure. One of the four lines of a building recorded in 1723 by William Stukeley (**Figure x**), may correspond to the linear mark (**E**) but Stukeley's sketch has no scale by which to accurately gauge the building's precise position. The absence of evidence for the other three wall lines, however, would seem to rule out this possibility.

Recommendation

Although no finds or features were identified by this intervention, the area remains one of considerable archaeological interest.

Archive location

All archive material (this report and site notes, plus digital photographs, plans, copy of this report on CD) is deposited with the Alexander Keiller Museum, Avebury.

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Appendix 1 – Geophysical survey data

Raw resistance data

Filename:	CC14
Instrument Type:	Geoscan RM15 (Resistance)
Units:	Ohm
Surveyed:	29 March 2014
Collection Method:	ZigZag
Sensors:	@ 0.50 m spacing.
Survey Size (metres):	800 m ²
Grid Size:	20 m x 20 m
X Interval:	1.0 m
Y Interval:	1.0 m
Background resistance:	75.8 Ohms
Gain:	x10
Current:	1mA
Clip parameters	min -3/max +3/contrast 1
Palette	greyscale 55

Resistance data processing

Filename: cc14\cc14p.cmp

Processes: 4

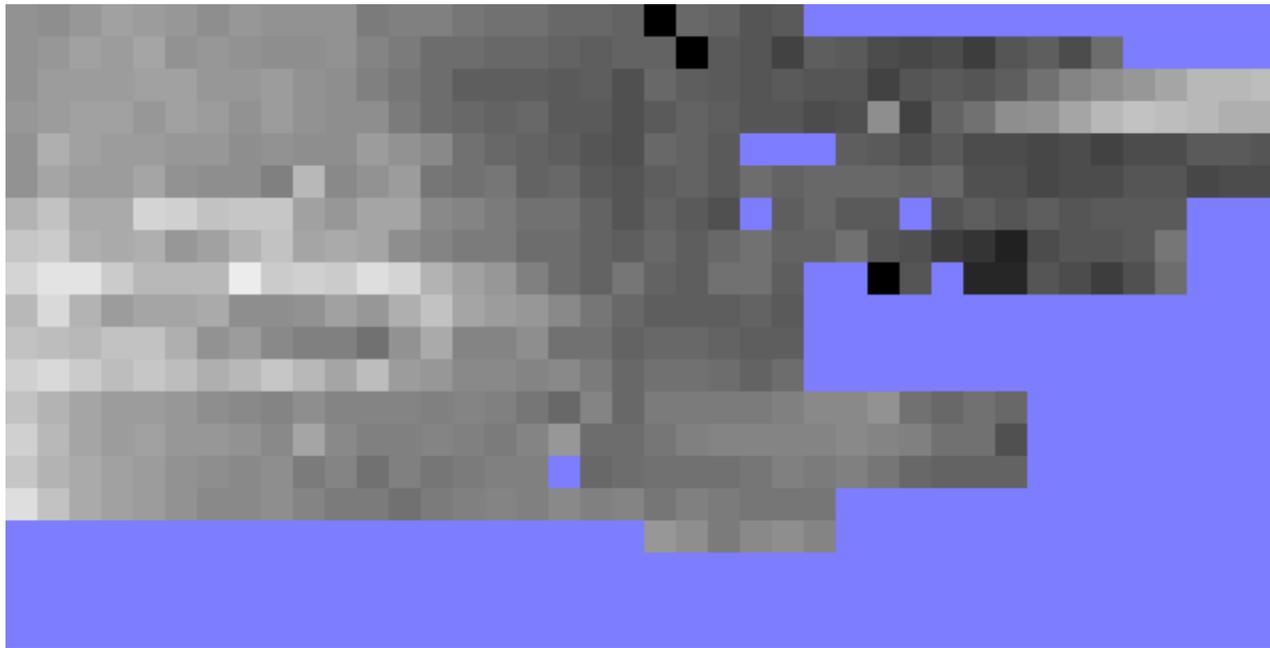
1. Base Layer 20.71 Ohms to 78.70 Ohms
2. Despiking: Threshold: 3.0
3. Low Pass Gaussian filter X radius = 1; Y radius = 1; block off
4. Interpolation:
 - 4.1. Direction X

4.2. Direction Y

4.3. Direction X

4.4. Direction Y final 21.42 Ohms to 77.59 Ohms

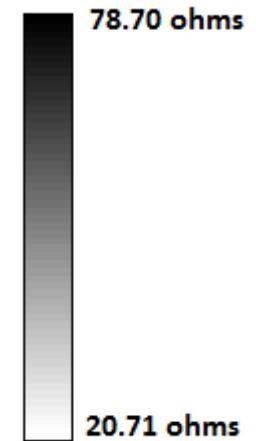
Appendix 2.1: Plot of Raw Data



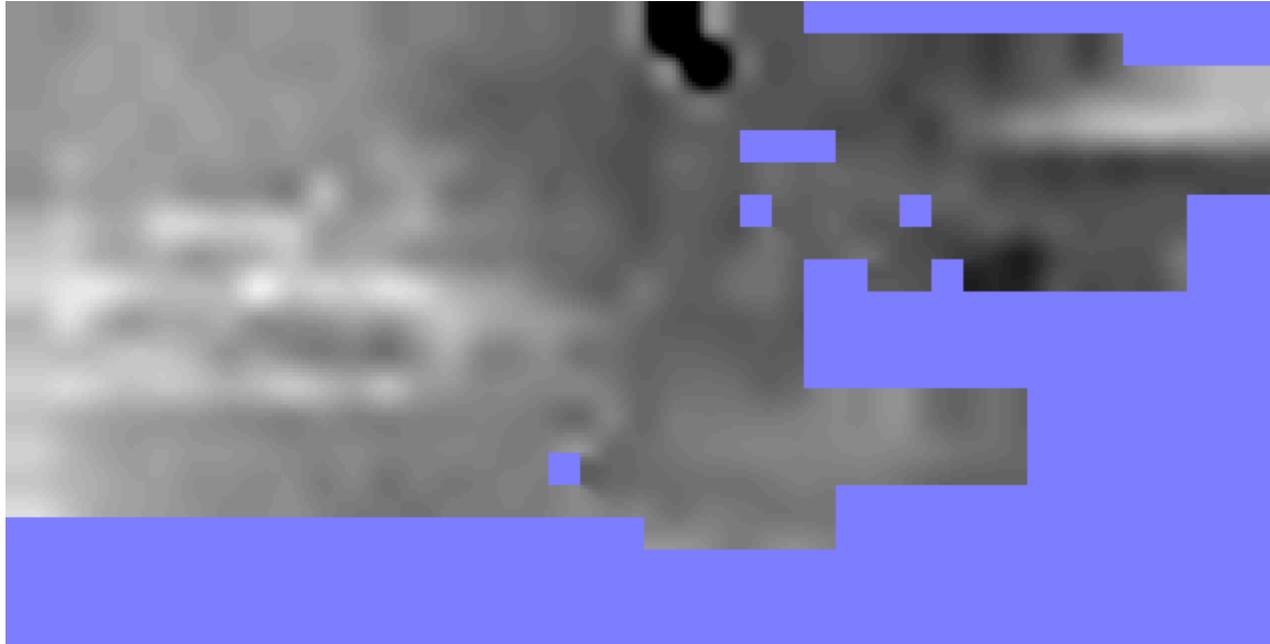
talits
the answer lies in the soil

Avebury Henge
Carpenter Cottage
Geophysical Survey

Greyscale Plot of Raw Resistance Data



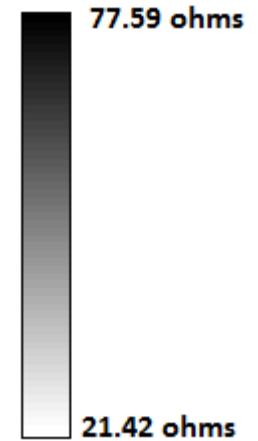
Appendix 2.2: Plot of Processed Data



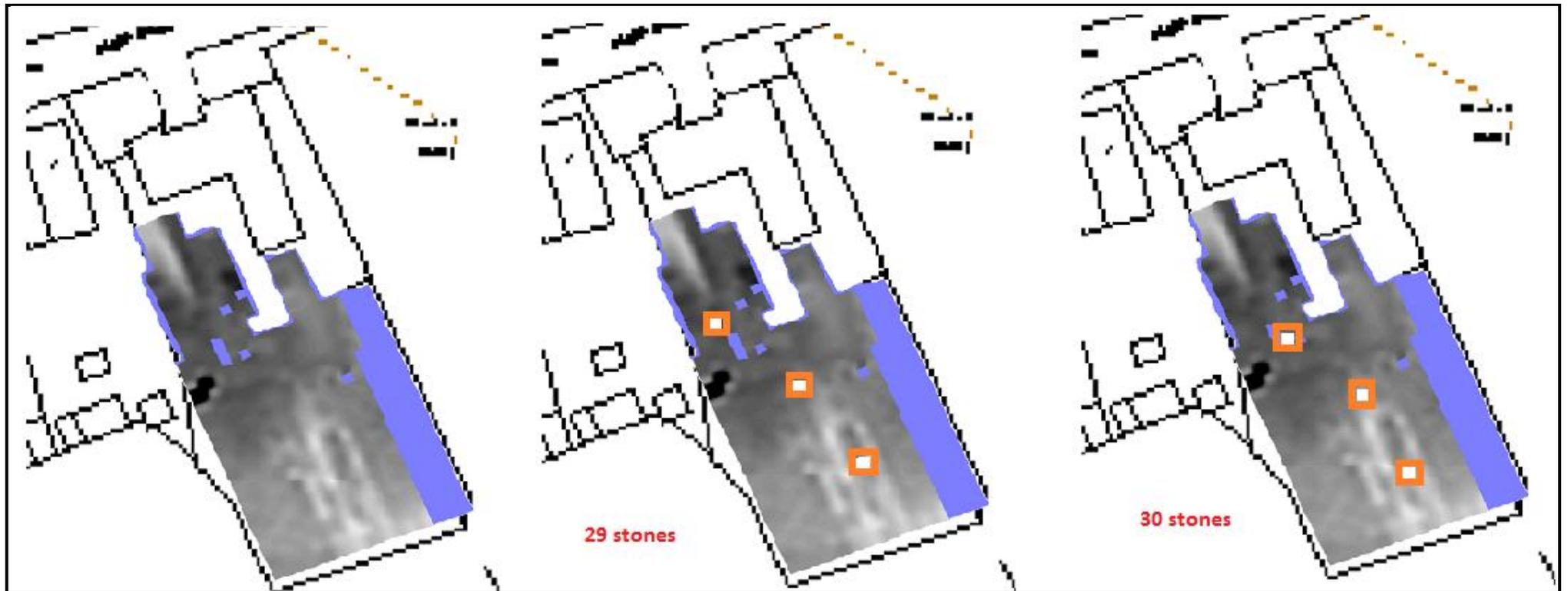
talits
the answer lies in the soil

Avebury Henge
Carpenter Cottage
Geophysical Survey

Greyscale Plot of Processed Resistance
Data



Appendix 3 – Comparison between Results and Projected Stone Positions



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