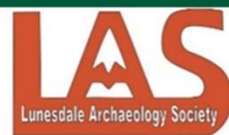


A Report on Earthwork and Geophysical Surveys at Gamelands Stone Circle for the Westmorland Dales Landscape Partnership

Project Archive Report



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Gamelands Project – Westmorland Dales Landscape Partnership

A Report on Earthwork and Geophysical Surveys at Gamelands Stone Circle for the Westmorland Dales Landscape Partnership



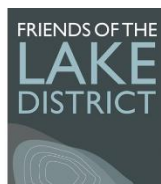
By Dr Douglas Mitcham
Community Heritage Officer

November 2023

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Historic Environment, YDNPA, Yoredale, Bainbridge, Leyburn, DL8 3EL



WESTMORLAND DALES



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The main text was produced by Dr Douglas Mitcham (YDNPA Community Heritage Officer). Section 14.1 was written by Dr Jackie Hooley with additional notes in italics added by the main author.

Cover image: Volunteers and YDNPA staff undertaking the survey of Gamelands using a plane table.

Please note if printing that this document contains A3 size pages (pp 32, 33 & 34) in the appendices.

Gamelands was one of a number of cultural, geological and natural heritage projects undertaken by the Westmorland Dales Landscape Partnership funded by the National Lottery Heritage Fund



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1 Summary

Gamelands is an embanked stone circle, located between the villages of Orton and Raisbeck in Cumbria (figure 1). The *Gamelands* project was undertaken as part of the Westmorland Dales Landscape Partnership (WDLP), funded by the National Lottery Heritage Fund. The WDLP was led by the Friends of the Lake District, with the YDNPA a project partner and responsible for delivering a number of the archaeology and heritage projects. The aim of the Gamelands project was to conduct non-invasive surveys to enhance our understanding and place the monument in a wider landscape context, whilst engaging local volunteers and providing opportunities to learn heritage skills and take part in the work (see Mitcham 2020). The fieldwork comprised a new earthwork survey of the monument, ¹a photogrammetry survey, as well as geophysical surveys by both Lunesdale Archaeology Society and a professional contractor. The project was led by Dr Douglas Mitcham, the YDNPA's Community Heritage Officer.

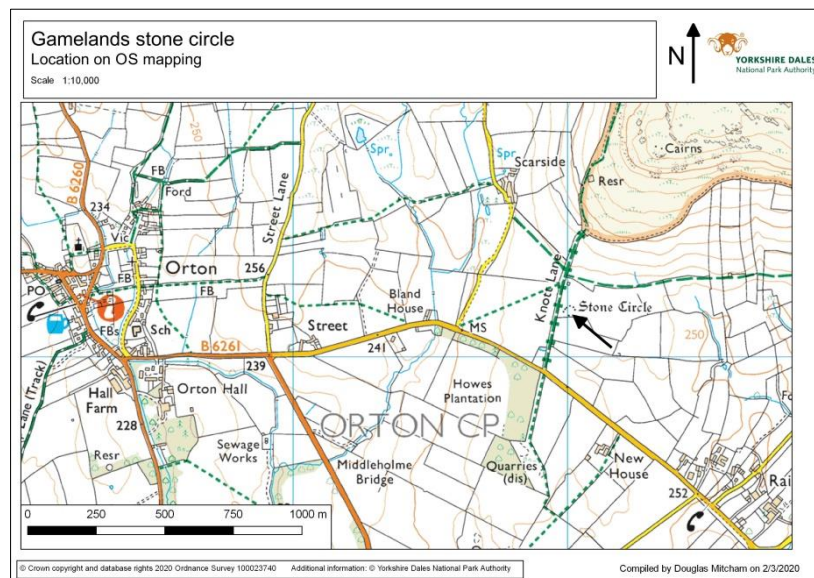


Figure 1: Location map showing Gamelands stone circle (indicated by the arrow) near Orton.

2 Background

Due to the impact of the global pandemic and the resulting government restrictions that were imposed in March 2020 and subsequently, delivery of the Gamelands

¹ A ground based photogrammetry survey of the monument was attempted but proved unsuccessful – the resulting model having a number of errors and holes – it is thought this was partly due to the large areas of grass and vegetation between the stones which the software struggled to stitch correctly. The limited space around some sides of the monument also restricted the possible angles for photographic views and are another likely source of error. An aerial based method might be more suitable at the site.

project was severely impacted. This caused lengthy delays to the project being completed and led to the fieldwork being postponed. It also impacted the levels of participation as the fieldwork had to be done under varying rules and restrictions when possible², limiting numbers and any wider publicity while it took place. The contractor was able to carry out the magnetometry survey in April 2020, but the other elements had to be postponed. This led to the necessary section 42 licence for conducting geophysical surveys on a Scheduled Monument having to be extended, for which an extension was applied for and duly granted by Historic England. The earthwork survey of the stone circle was undertaken by volunteers in autumn 2020 led by the YDNPA Community Heritage Officer, along with the first area of resistivity survey undertaken by volunteers from Lunesdale Archaeology Society. The photogrammetry survey was also undertaken at this time. Further survey work was undertaken in spring 2021 led by YDNPA staff with volunteers and two further areas of resistance survey were also done at this time by volunteers from Lunesdale Archaeology Society.

3 Historical and geographical context

3.1 Overview and geographical context

Gamelands, which is described as ‘Gamelands embanked stone circle’ by its list entry is located at NY6400208164 in Cumbria, Eden (district authority) in the Parish of Orton (figure 1). The site is a Scheduled Monument (number 23631, list entry number 1011138). A section 42 licence was applied for and granted to the author for the geophysical surveys which was subsequently extended to November 2021. Gamelands is located within a large field enclosed by a drystone wall, which crosses the edge of the monument. The area was used for livestock grazing and silage production at the time of the geophysics by the contractor in April 2020, but the management of the area of the stone circle subsequently changed with the southern end of the field being divided off and removed from this usage by the time the earthwork survey and further geophysical survey work started in autumn 2020. The area is now being managed as a wildflower meadow with occasional grazing, as part of another WDLP project led by Cumbria Wildlife Trust. The site is in private ownership. The area was under an Environmental Stewardship Scheme at the time of the fieldwork. The YDNPA consulted Natural England, who advised that as the works were non-invasive in this case it would not be necessary to apply for an MTA (Minor/Temporary Adjustment) from the RPA (Rural Payments Agency). The underlying bedrock is the Ashfell Sandstone Formation, with a superficial deposit of Devensian Till covering the area (BGS Geology of Britain viewer, accessed 27th February 2020).

² All government restrictions that were in place at the time of the fieldwork were followed and additional health and safety measures as per revised YDNPA risk assessments were implemented to manage the new risks associated with Covid-19.

3.2 Gamelands stone circle – site history and previous works

Gamelands is listed on the YDNP HER as MYD62346 and is described as ‘Gamelands Embanked Stone Circle’, a large stone circle comprising circa 43 stones which despite the removal of some stones is still largely complete (YDNP HER MYD62346) (Figure 1 & Figure 2). The circle is said to be formed of rounded boulders of which few are upright and it notes two large gaps in the circle. The record also notes that the stones appear to be set into a bank, but suggests on the southern side this bank extends beyond the circle itself and might be related to the field wall. The gap on the western side is said to be closed by the same bank which then meets the wall at a right angle.

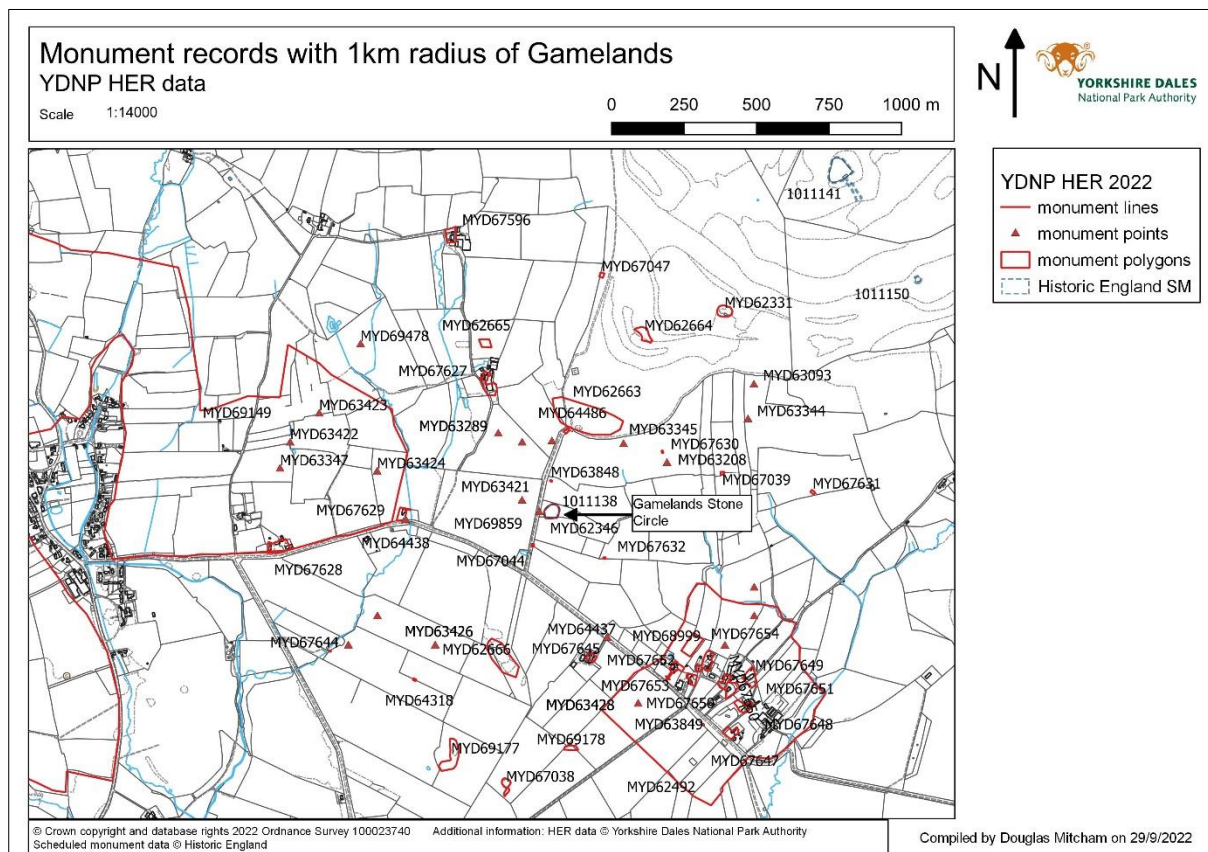


Figure 2: HER monument data within a 1km radius of Gamelands.

Gamelands is a Scheduled Monument which was first designated in 1938 from which the following details are summarised (number 23631, list entry number 1011138, Gamelands Embanked Stone Circle – National Heritage List for England). The list entry adds further detail, including noting the monument is situated immediately to the south of the limestone upland ridge called Knott. The site is described as

comprising 40 large and three smaller stones, all fallen and all of Shap Pink granite, apart from one which is limestone (figure 3). The stones are said to be of varying circumference (between 1.9m-3.8m) enclosing an area circa 43m east-west and 38m north-south and set into a slight bank 2.5m wide and circa 0.2m high. None of the stones are said to be above 0.9m in height. A 4m wide gap which looks over land falling away to the south east is suggested as a possible entrance, whilst it is noted the stones on the southern side are on slightly higher land. The list entry classifies Gamelands as a large irregular stone circle, noting it is the only complete example of an embanked stone circle in Cumbria (although a few stones have been removed). The list entry also highlights that as part of a rarer group of large irregular stone circles, with just 45 examples known of this form out of 250 known stone circles in England (these comprising a ring of at least 20 upright stones), Gamelands is of both regional and national significance.

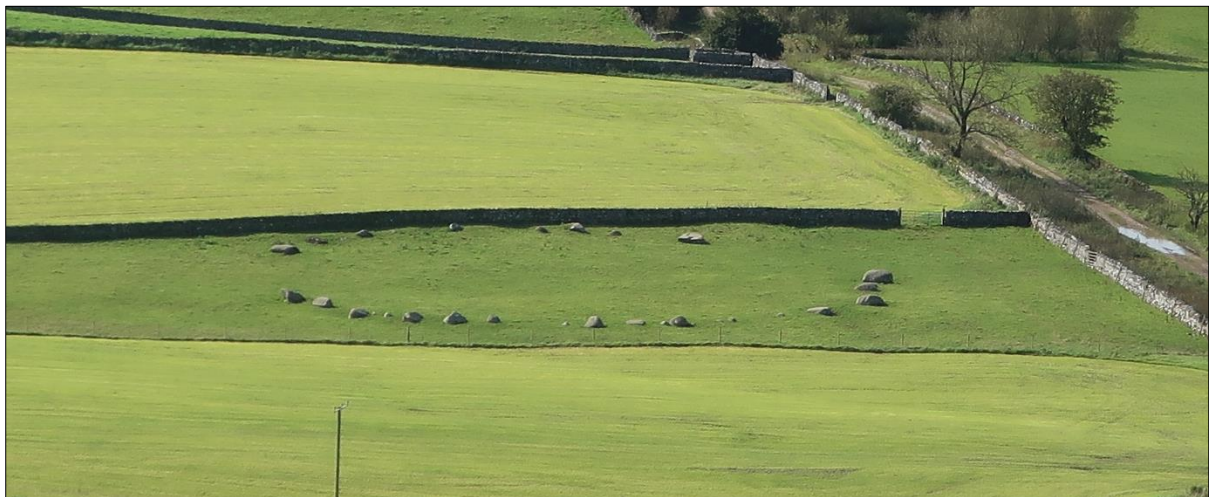


Figure 3: View of Gamelands stone circle from the limestone ridge to the north of the site, facing south. The two main gaps in the circumference of the circle are clearly evident. Image taken by Douglas Mitcham (© YDNPA).

The stone circle at Gamelands was first surveyed in 1880, but mention of the site in an earlier 1849 publication indicates that it was known by the mid-19th century (Mannex 1849: 182-183). It was briefly mentioned as 'Gamelins' by Simpson in 1863, who notes its similarity to Long Meg & Her Daughters with the exception of Gamelands not having a long upright stone (Simpson 1863: 443). Simpson also notes several of the stones had been 'broken up and destroyed', but that their location was still evident and the circumference of the site was still easily recognisable (1863: 443-444). The site was not discussed in the *History of Westmorland and Cumberland* published in 1777, with later writers commenting that this was a strange omission given that one of its authors lived nearby (Nicolson and Burn 1777; Ferguson 1883: 184; Clare 2007: 105). This suggests it may not have been recognised at this time, although the omission could also have been deliberate, perhaps for reasons that are no longer apparent.

The site was first surveyed in 1880 by John B Harvey of Maryport and later published by F. Bland and then R.S. Ferguson (Bland 1881; Ferguson 1883). Ferguson organised the survey at the request of the latter who funded the work, which also included detailed measurements of the individual stones (Ferguson 1883: 183). Ferguson also records the previous removal of stones, some of which were blown up and others rolled over and buried in pits dug for the purpose (1883: 183). This is said to have taken place circa eighteen years before the time of the survey, when the field was ploughed with riggs running through the circle itself (Ferguson 1883: 183). It is also clear that excavation took place during the 1880 works, apparently led by an attempt to prove if the site had been covered with a cairn, to search for internments and any further buried stones (ibid: 183-184). No record is presented of the extent or location of these interventions but they did produce 'two bits of worked flint' on which no further information is recorded (Ferguson 1883: 184). A freestone slab was also discovered and this is shown on the survey plan as lying next to stone twenty nine (ibid: 184). This suggests that excavation took place around some of the surviving stones, whilst it is also likely that apparent gaps in the circumference would have been an obvious target. Ferguson interpreted this stone slab as possible evidence of a cist, suggesting it was moved from the centre at the time of the prior ploughing of the site (ibid: 184).

Some of the same individuals were active in the excavation and survey of other sites in Cumbria, including another stone circle at Leacet Hill where more detail about their activities is given. This work included both excavation in the central area of the circle as well as round its circumference, finding evidence of a charcoal deposit with calcinated bone and reddened stone fragments in the centre, as well as five urns containing cremations, a food vessel and 'incense cup' near or beneath the stones of the circle (Robinson and Ferguson 1881: 76-78). They also found a smaller arc of five stones, within the circle which are shown on the plan, but which they dismissed as of more recent origin or as accidental, although no reason is given (ibid: 76). The central charcoal deposit is also marked on the plan, shown as a 2ft square, as are the location of the urns near the stones. It is not clear if the charcoal deposit was actually square in extent and it is possible the plan might indicate the excavation of something akin to a square test pit, rather than the true extent of this charcoal deposit. This information is pertinent here as given that some of the same people also undertook the work at Gamelands only a few months later in September 1880 (Leacet Hill was investigated in March 1880) it is highly likely that a similar strategy was followed during the survey and excavation at Gamelands.

Another area upon which Ferguson speculates is to the origin and potential meaning of the name '*Gamelands*'. Ferguson suggests the name may actually have been '*Gamelislands*' – and might refer to Gamel-de-Penington, who was the first known Lord of the Manor of Orton during the reign of Henry II in the 12th century (1883: 185). Ferguson simply states, "one theory is that...", but does not give a source for

this idea. It is possible therefore the name Gamelands as applied today is simply a corruption of this – although the present author can offer no further evidence to corroborate this assertion.

It should also be noted Ferguson highlights confusion in prior sources in that the site of the stone circle, or the name 'Gamelands' was seemingly associated with a description of another nearby burial cairn (or 'tumulus') by Whelan in 1860, who also refers to this as being at 'grantlands' (Ferguson 1883: 184; Whelan 1860: 762-3). An earlier source dating to 1849 also refers to the fact that a tumulus is located at Gamelands about a mile to the east of Orton but the description makes clear this was a cairn built of loose stone and not the stone circle (Mannex 1849:182). It is likely this was Castle Folds Round Cairn (MYD62344), which is circa 1.4km north east of the stone circle. The same source also refers to the remains of what might have been a druidical temple, interestingly stating this is "in a field called Gamelands" (Mannex 1849: 182). In the others opinion, this latter reference to a 'druidical temple' probably refers to the stone circle that is known today as Gamelands. The fact that in the mid-19th century the field itself was referred to as Gamelands also suggests that the name was applied to the wider area and not just the stone circle with which it has become associated today. If Fergusons suggestion of the theory about the name Gamelands deriving from land belonging to Gamel-de-Pennington is correct – it would make sense that it applied to the wider area rather than just the stone circle. This also might account for the apparent confusion referred to by Ferguson regarding earlier sources – in that the name may have been associated with the wider area, hence descriptions of other monuments in the area being described as at Gamelands.

More recently Clare has studied Gamelands and made a number of important observations regarding its landscape context. First that the site is located at a natural route centre and at a point visible for some distance (Clare 2007: 105). Clare also questions Fergusons interpretation that the freestone slab adjacent to stone 29 was part of a former cist disturbed from the centre, as he notes the presence of cists adjacent to stones at other circles (ibid: 105). In the present authors opinion this stone should also be considered as a possible remnant trigger or packing stone which is a common feature of most forms of stone settings. Alternatively, it could have been a displaced stone from the circle, perhaps from between stones 29 and 30 where there is an apparent gap. Clare notes there is no obvious sign of ploughing, but does highlight subtle traces of a low bank and slight lynchets or hollows to the north of the site (2007: 106). Clare also argues that the circle was quite deliberately built with its southern arc abutting and partly enveloped in a low but steep slope, now topped by a wall which was preceded by a bank (ibid: 106). This slope was interpreted as a tributary of a palaeochannel which is evident to the east of the site, with the implication that the stone circle was deliberately constructed around it, something which Evans also argued previously (Clare 2007: 107; Evans 2005: 174). Ferguson and Clare both note a hollow in the centre of the circle which

Clare suggests is a valley head, who also argues the circle may have been constructed around a spring (ibid: 107; figure 4). This would explain as Clare notes, why the flat ground immediately west of the site was not utilised (ibid: 107).



Figure 4: General view of Gamelands stone circle during the earthwork survey, facing south west. The subtle linear hollow, interpreted previously as a palaeochannel at a valley head around which the circle is constructed (see Clare 2007: 107) is visible as a subtle topographic feature. This runs from the tripod towards the left centre of the image, with the ground either side slightly sloping down towards it.

A potentially significant lithic scatter is also known to exist in the field now containing Gamelands stone circle. This has been subject to collection episodes and fieldwalking multiple times. Collection has been undertaken by a local flint collector previously and in 2019 after the field was ploughed prior to reseeding and also by Lunesdale Archaeology Society around the same time. The former has kindly passed a copy of his digital archive for deposition in the YDNPA HER, which notes some diagnostic finds from the field at Gamelands including Mesolithic and Neolithic material. Clare also notes nearby finds including flints, volcanic tuff fragments (including some polished) and two pot sherds indicating nearby activity of possible late Mesolithic and Neolithic date (2007: 105). All of this points to the presence of a significant focal point of prehistoric activity in the vicinity of Gamelands and the possibility of this including both Mesolithic and Neolithic activity. The YDNPA HER records two groups of flint finds in the adjacent field west of Gamelands, including a leaf shaped arrowhead and edge damaged blades, as well as cores, waste flakes, scrapers, knives and bladelets (MYD63421). A flint knife was also found immediately west of Gamelands recently (MYD69859). As far as we are aware at the time of the fieldwork no modern excavations have been conducted at the stone circle and to the best of our knowledge no geophysical prospection had previously been attempted at

the site. Since the project fieldwork was completed, a watching brief was undertaken on cable undergrounding works within the corridor of the adjacent Knott Lane. This encountered no archaeological material (Peters 2022).

3.3 Wider context and HER data

3.3.1 *Mesolithic, Neolithic and Bronze Age*

In terms of wider historic context, there are circa ten other monument records on the YDNP HER within a 1km radius of Gamelands which are shown on figure 2. The majority of these are prehistoric in date, comprising lithic scatters or lithic finds, which as mentioned previously have been recovered both from the field containing Gamelands and from other fields in the area nearby (e.g. Cherry and Cherry 1987). A summary of these prehistoric records are shown in table 1. They are largely of Neolithic or Bronze Age date, although some Mesolithic finds are also present. For example, lithic finds from Scarside Farm included a group of Neolithic material with some diagnostic pieces such as three Petit-Tranchet-Derivative (PTD) arrowheads, whilst a further two areas of scatter were also recovered again containing some diagnostic Neolithic material including two further PTD arrowheads as well as knives, scrapers, cores, blades and microliths (MYD63289; Cherry and Cherry 1987). These finds were regarded as being of Neolithic and Late Neolithic character by the finders, whilst the microliths likely derive from Late Mesolithic activity. Some of the finds from the vicinity of Gamelands itself have already been mentioned, but HER record MYD63241 also records a leaf shaped arrowhead, edge damaged blades, cores, scrapers, blades, knives, retouched pieces and debitage. The details of the other scatters and finds on the YDNP HER are listed in table 1 and in general they comprise lithic material which was regarded as being of Neolithic or Late Neolithic date, with some earlier Mesolithic and some Early Bronze Age material also present. Whilst a scatter from Bland House was characterised as of Late Neolithic to Early Bronze Age date (MYD63424). Some other evidence of diagnostic Bronze Age material is present within the finds from around Raisbeck, for example, with an Early Bronze Age plano-convex knife (MYD63428). This evidence does suggest a significant concentration of prehistoric activity taking place in the wider landscape around Gamelands stone circle.

Table 1: Lithic data on YDNP HER

MYD No	Name	Record Type	Site Type	Date
MYD62346	Gamelands Embanked Stone Circle, Orton	MON	EMBANKED STONE CIRCLE -2350--701 FINDSPOT -500000-42	Prehistoric
MYD62664	Knott Cairns, Orton	MON	CAIRN 0-0	Prehistoric ?
MYD63289	Flint Finds, Scarside Farm, Orton	MON	FINDSPOT -500000-42 FLINT SCATTER -500000-42	Prehistoric
MYD63421	Flint Finds, Gamelands, Orton	MON	FLINT SCATTER -500000-42	Prehistoric
MYD63422	Flint Finds, Street, Orton	MON	FLINT SCATTER -500000-42	Prehistoric
MYD63423	Flint Finds, Street Lane, Orton	MON	LITHIC WORKING SITE -10000--4001	Prehistoric
MYD63424	Flint Finds, Bland House, Orton	MON	FLINT SCATTER 1066-1539 FLINT SCATTER -500000-42	Prehistoric
MYD63426	Flint Finds, Howes Plantation, Orton	MON	FLINT SCATTER -500000-42	Prehistoric
MYD63428	Flint Finds, Raisbeck, Orton	MON	FLINT SCATTER -500000-42	Prehistoric
MYD69859	Flint knife	FS		Prehistoric

Any other examples of sites or monuments certainly dated to the Early Neolithic or Neolithic in general are rare in the immediate vicinity of Gamelands, although the two large round cairns discussed below could have pre-Bronze Age origins (e.g. MYD62343 and MYD62344). The nearest known site of possible Early Neolithic or Neolithic date is the Howe Robin hilltop enclosure located circa 2.6km to the north west, with a diagnostic Early Neolithic leaf shaped arrowhead and other lithic finds having been recovered from its vicinity (MYD62869; Brown 1996; Cherry *et al.* 1985).

There are a few other known nearby prehistoric monuments or features that are likely to be either of Bronze Age, or broadly Late Neolithic to Early Bronze Age date, although none are securely dated. A possible cup marked stone, that might be of Bronze Age date has been previously identified at Castle Folds (MYD63499). Knott Cairns (MYD62664) comprises two cairns recorded situated circa 600m to the north east of Gamelands which overlook the site although no further details are given. A larger cairn which is also a scheduled monument situated on the south facing slope of Orton Scar is located circa 1.5km north east of Gamelands, known as Castle Folds Round Cairn (MYD62344; SM1011150). The site was excavated by William Greenwell in the 19th century who discovered a male inhumation burial in a rock cut grave buried with a chert implement, as well as three further secondary burials, two of which were in stone lined graves, whilst these additional burials were interpreted as being 'Anglian' and apparently later in date, dating from the mid-5th to 11th centuries AD (Greenwell 1877: 394-395; MYD62344; SM1011150). Greenwell recounts that no artefacts were found with them, although they were found close to the surface of the mound and on the sides, comprising three graves containing the prone inhumation burials of a male, female and a child (Greenwell 1877: 395). Sunbiggin Farm Round Cairn (MYD623443) further to the east on Great Asby Scar was also excavated by Greenwell who encountered human and animal remains, including remains from three individuals from within a cist, whilst a chisel made of

metamorphic rock and other human remains were found in the vicinity of the cist (Greenwell 1877: 394-395; MYD623443; SM1011149). Animal remains from ox, goat and deer were also encountered within the cairn and Greenwell suggested it had already been excavated or disturbed when he investigated the site (MYD623443; SM1011149). Both cairns are assigned Bronze Age dates on the YDNP HER.

More recent work has also focused attention on the occurrence of stone settings within YDNP, that have hitherto either been dismissed or gone unrecognised, receiving little previous focus of study. A systematic survey of limestone pavements around the Ingleborough massif identified one hundred and twenty-eight features, comprising both single upright stones, as well as groups and lines of stones, many of which may have associations with nearby cairns (Johnson 2020: iv). Another survey of limestone pavements in Westmorland and in the western half of the YDNP, identified a further twelve examples of possible stone settings (Dougherty *et al.* 2021: 58). Whilst not all of those identified by these surveys may be prehistoric features and it is possible some of them could be of later date, it is likely that a significant majority of them are prehistoric monuments. They are similar in character to stone settings known elsewhere in the U.K. and are likely to be of broadly Neolithic or Bronze Age date (see Gillings 2015; Mitcham 2017 & 2019). Several of these stone settings are located on the limestone pavement at Knott, in the vicinity of Castle Folds, to the north of Gamelands (Dougherty *et al.* 2021: 14). These are yet to be added to the YDNP HER.

3.3.2 *Iron Age/Romano British*

Nothing is recorded on the HER within 1km of Gamelands. However, circa 1.5km to the north east on Great Asby Scar, there is an enclosed settlement known as Castle Folds which is described as of Romano-British date, which also comprises a Medieval shieling (MYD62332, SM1011141).

3.3.3 *Early Medieval and Medieval*

There are no known Early Medieval records on the HER within 1km of Gamelands, although it is possible the secondary burials discussed above that were excavated by Greenwell at Castle Folds Round Cairn may date from this time (MYD62344; SM1011150). There are several Medieval records within 1km. This includes a Medieval shieling at Castle Folds, circa 1.5km to the north, the remains of the Medieval Village of Raisbeck (MYD62492) circa 600m to the south east, as well as Medieval field systems and boundaries surrounding the Medieval settlement of Orton, which extend to circa 600m east of Gamelands. Whilst not included within the HER record for Raisbeck, the pattern of fields and boundaries shown on modern OS mapping to the north west and west of the present settlement strongly suggest that the area of former field systems associated with the Medieval village extended over

a wider area in these directions. Again whilst not recorded on the HER, the Environment Agency 1m LiDAR data suggests that cultivation traces and boundaries associated with former field systems underlie the present stone walled boundaries that characterise the area into the present (figure needed). Some of these field systems and cultivation traces could be of Medieval date, as well as reflecting activity into the Post-Medieval period. This extends across the area including into the field containing Gamelands stone circle. Finally, the scheduled site of a Medieval grange of 14th century date associated with the Friary of Conishead, near Ulverston, is located circa 1.3km north of Gamelands (MYD62457, SM1007636).

3.3.4 Post Medieval to Modern

A small number of later features that are largely of Post-Medieval date are also listed on the YDNP HER in the vicinity of Gamelands. These include a lime kiln of circa 19th century date (MYD64486) and an area of Post-Medieval quarrying (MYD62663) at the northern end of Knott Lane. The record for MYD62663 describes two areas of quarrying and notes each is associated with its own lime kiln. These kilns are presumed to be the 19th century kiln MYD64486 immediately south of the quarrying, and another kiln to the south east (MYD63345) about which little information is recorded on the HER. A ruined building is also situated on a platform in the north west corner of the field containing Gamelands (MYD63848). The latter has one partially surviving wall with a stone lintel above a doorway that may be of early to middle 19th century date (MYD63848). No interpretation of the building is given on the HER record but it is likely to be the remains of a former field barn. Several other field barns are located in nearby fields including MYD67630, MYD67632 and MYD67039 (figure 2). A Post Medieval sheep fold is located to the south of the site, adjacent to the walled boundary of Knott Lane (MYD67044).

The southern end of Knott Lane terminates at another area of quarrying, some of which is recorded on the 1st and more of it on the 2nd edition OS mapping suggesting it was active in the 19th century (MYD62666). No HER record exists for Knott Lane itself. Although given its very straight course connecting two areas of post medieval quarrying (MYD62663 and MYD62666), one of which is also associated with two lime kilns, these sections may well be associated with the quarrying and lime production as an industrial trackway of post medieval to 19th century date. It is unclear if it may also fossilise part of an earlier route. Modern PROW's continue in both north and south directions from either end of Knott Lane, following more sinuous and curving routes.

4 Methodology for earthwork survey

A hybrid method using both traditional plane table and electronic survey with an RTK GPS unit was used during the survey work. Prior to surveying some of the earthwork features a walkover survey was conducted, marking the tops and bottoms of all the

slopes to be measured in using coloured pin flags. The survey of the stones was undertaken by volunteers led by the YDNPA Community Heritage Officer at a scale of 1:100 using a plane table method (figure 5). This was done using an alidade rule, fabric tape, spirit level, plumb bob and ranging pole following current guidelines (RCAHMS 2011; Jamieson 2017 and Pearson 2018). A single survey station was established in the centre of the stone circle with the plane table levelled and aligned over the survey station using a plumb bob and spirit level. A series of reference objects were then plotted using fixed hard detail, to allow the table to be relocated and oriented correctly during subsequent days of the fieldwork. The relative angle of the points of hard and soft archaeological detail to the survey station were sighted and plotted as rays using an alidade rule. This was aligned on a ranging pole set at the point of detail and along the pin marking the survey station. Points of detail were then located by measurement with a fabric tape along the rays from this point. This method was used to survey the stones and the northern end of feature 4. The survey was plotted onto plain permatrace with a hard leaded drawing pencil using an alidade rule and scale ruler.



Figure 5: Volunteers and YDNPA staff undertaking the plane table survey.

Control was supplied electronically using a Leica GS-08+ Smartrover RTK GPS with real time correction capability. The corners and outlines of the stones, field walls and fence lines, gate posts, survey station and all of the earthworks were surveyed with the RTK GPS unit. The RTK (Real Time Kinematic) link was used at all times during electronic survey work, giving an accuracy of circa 5mm for horizontal and 10mm for vertical measurements respectively. The RTK GPS data was exported from the unit

and imported into QGIS for plotting and editing. The field drawing was georeferenced using the RTK GPS data in GIS (Geographic Information System) software and a 1:100 scale map image produced and exported ready for digitising and enhancing. The latter was done using the vector drawing software Inkscape v. 0.92.3. The georeferencing was carried out using QGIS Essen v. 2.14. This allowed the measured plane table survey to be fully georeferenced and located in relation to Ordnance Survey mapping. A printed draft of the survey was produced and checked against the earthworks on the ground during a subsequent visit, with hachures added to the additional earthworks that were purely surveyed using electronic methods.

5 Methodology for geophysical survey

Geophysical prospection was carried out using resistivity and magnetometry techniques. A magnetometry survey was commissioned by YDNPA which was undertaken by Phase Site Investigations Ltd in April 2020 the results of which are not covered by this report. This work was reported on separately by the contractor and the full technical details and results can be found in their report (Whittingham 2020).

The resistivity survey was undertaken by volunteers from Lunesdale Archaeology Society (LAS) under the direction of the YDNPA Community Heritage Officer (figure 6). This focused on a targeted area incorporating the stone circle (see appendix 6 section 14.2, figure 69). The resistivity survey was done with the LAS owned bespoke resistance frame set to single twin mode. The probe separation was 1m with gain set to 1. A system of 20m grids was established across the site using fabric tapes and ranging rods using triangulation to establish them from primary baselines. Data was collected at a sampling resolution of 1m intervals along traverses spaced 1m apart and walked in the 'zig-zig' traverse pattern. Data was downloaded at the end of each survey session from the instrument's data logger and processed by LAS using Excel workbooks provided by Snuffler Geophysics Software on a portable computer. A technical note regarding the processing and image plots is reproduced in appendix 4 – technical note on processing and georeferencing of resistivity survey data. Control was supplied electronically with the grid surveyed in using the same Leica GS-08+ Smartrover RTK GPS with real time correction capability. The grid was therefore fixed in relation to the Ordnance Survey base mapping. The final results plots were georeferenced using QGIS Essen 2.14.8 and 3.22.11-Białowieża and the RTK GPS data used to locate them onto OS mapping (see Appendix 5 – Resistivity survey results).



Figure 6: Volunteers from Lunesdale Archaeology Society undertaking resistivity survey.

6 Results of a new earthwork survey of Gamelands stone circle

The measured earthwork survey recorded twenty-eight features, along with forty-three stones, with the majority, although not all, corresponding to those recorded on the original 1880 survey. The 1880 survey only recorded the stones themselves, a short section of the adjacent wall and three hollows which were assumed to be former stone locations (Ferguson 1883: 182). None of the other earthworks were recorded in 1880 and the new survey has produced a detailed drawn record of these for the first time. Clare had previously described the banks in the vicinity of the circle (2007: 106). The banks described by Clare c.50m to the north were not recorded, however, nor was anything in the field to the south. The latter was inaccessible due to vegetation growth at the time of the survey. The survey plans are located in Appendix 1 – YDNPA earthwork survey plans of Gamelands stone circle. A catalogue with a description of the features recorded by the survey is reproduced in appendix 2 – gazetteer of features, with photographs in appendix 3 – survey images.

6.1 Gamelands stone circle – southern arc from stone 1 to 20

The YDNPA survey recorded 43 stones arranged in an irregular circle, some of which are isolated whilst others appear to form groups or clusters around larger stones, with two apparent gaps (section 11, appendix 1: figure 7 and figure 8). The majority of the stones are Shap Pink Granite, whilst stone 19 is a limestone slab. Several of the small stones were noted as possibly a different lithology, likely sandstone. Stone 28 was also observed to have a distinctive geological formation on

its surface that is highly visible from within the site (appendix 3: figure 53; see section 8.6). The monument today is an irregular oval shape and has been impacted by the removal of stones and stones potentially falling over – although there is no evidence to indicate if all the stones were actually originally upright. Rather than forming a perfect circular arc, it is best described as two irregular oval arcs, giving the site a squashed appearance – although there is no reason to assume it would have been a perfect geometric circle to start with (figure 46). The two gaps are located in the south west and south east quadrants of the monument.

Starting at stone 1 (using Ferguson's nomenclature³) and moving in an anticlockwise direction, stones 1-6 (appendix 3: figure 40 (stones 1 & 2), figure 41 (stones 3 & 4), figure 42 (stones 5 & 6)) 10-12 (appendix 3: figure 43 (stone 10), figure 44 (stone 11),) & 14 (appendix 3: figure 45 (stones 11 to 14)), 17-18 & 20 (appendix 3: figure 47 (stones 17-19, A), figure 48 (stones 17 & 18), figure 50 (stones 17-20), figure 51 (stone 20) remain at the site and appear to have survived largely unchanged and in the same positions as shown in the 1880 survey. However, some clear differences are apparent from the 1880 survey (appendix 1: figure 9⁴). No 7, noted as three 'fragments' south of stone 6 in 1880 have now all disappeared. It is unclear if they have since been removed or have simply become buried, but no trace of them was apparent. An erosion hollow is now evident around stone 6 (F5; appendix 3: figure 14). Another significant change is the disappearance of the two hollows noted as sockets (No's 8 and 9) as shown on the 1880 plan in the south west quadrant of the circle, between stones 7 and 10 (appendix 1: figure 9). No trace of these features could be located on the ground. Similarly, stone 13 is also no longer present.

Stones 15 and 19 appear to have been displaced or moved since 1880. Stone 15 appears to have shifted slightly to the north east, although this could be a result of either surveying error, or the distorting effect of georeferencing the original plan image using GIS and electronic survey data. Whilst stone 16, shown as two fragments in a hollow in 1880, have both disappeared. Instead, a larger hollow of a different shape is now apparent in this location (F23; appendix 3: figure 33). A second crescent shaped hollow has appeared on its eastern side (F22; appendix 3; figure 32). This is adjacent to Stone 'A', a stone that was not shown on the 1880 plan and may have been exposed since by erosion (figure 58). Its position along the arc of the circle and the fact it is well embedded strongly suggest it is part of the stone circle. A second small stone 'M' was recorded to the south of stone A that is possibly sandstone which again was not shown on the 1880 plan. Three further small stones, one of sandstone, were recorded outside the southern arc of the circle during the YDNPA survey (stones 'C', 'D' and 'B' (figure 59)). Stones 'B' and 'C' are perhaps more likely to be debris related to the wall which has seen rebuilding, straightening

³ Numbering the stones and hollows from 1 to 40 in an anticlockwise direction

⁴ Figure 9 shows features and stones recorded in 1880 that are no longer present overlain on the YDNPA survey.

and movement slightly further to the south since the 1880 survey. Stone D, embedded within bank F4 on its east facing side at the south end of F4 was not recorded in 1880 (figure 60). It also seems to be outside the arc of the circle, as indicated by the hollows No8 and No9 on the 1880 survey (figure 9). It is unclear what stone D represents, as to whether it is part of the prehistoric setting and *in situ* or now displaced (figure 61). Stone 19, the single large limestone slab, appears to no longer be located in the same position or orientation as per the 1880 plan (appendix 1: figure 9; appendix 3: figure 49). Stone 19 is undoubtedly still present, but appears to have been displaced or turned over, shifting its position slightly further north east since 1880. Again, whilst a minor discrepancy in its position could be down to either surveying error or the effect of georeferencing on the 1880 image, the fact stone 19 now appears to have turned over compared to its 1880 orientation is much harder to explain as an error. Finally, along the southern arc of the monument, stone 21, noted as buried in 1880 is no longer traceable, although an irregular shaped oval hollow is now present in this location (F21; appendix 3: figure 31), suggesting subsequent disturbance by excavation or livestock. The gap in the south eastern quadrant between stone 20 and 23 now spans a distance of c.16m.

6.2 The northern arc – stones 23 to 40

The stones forming the northern arc of the circle seem to have survived rather more unscathed, although not entirely. Stones 23, 24, 25 (figure 25 and figure 26), 26 (figure 52), 27 (figure 24), 28 (figure 53), 29 (figure 54), 30, 31, 32 (figure 55), 33, 34, 35, 36, 37 (figure 56 (stones 35-37)), 38 (figure 57), 39 and 40 are all still in place and appear to be in the same positions as shown on the 1880 survey (appendix 1: figure 8). However, change is still apparent from the 1880 survey, as well as new details not recorded previously. Six stones (labelled no 22), noted as fragments by Ferguson and shown surrounding the southern half of stone 23 have since disappeared (appendix 1: figure 9). Two small stones only just visible above the turf were found tucked against the eastern side of stone 23 (appendix 3: figure 62). Whilst it is at best unclear, it is thought these are buried stones that may reflect packing around stone 23, rather than any of the stones shown as No 22 in 1880, which appeared to be considerably larger in size. Erosion hollows are now evident around stones 23 (F20; appendix 3: figure 30), 24 (F19; appendix 3: figure 29), 25 (F16), 27 (F15), 31 (F13; appendix 3: figure 22), 33-35 (F11), 39 & 40 (F9; appendix 3: figure 18) and 1 (F7; appendix 3: figure 16) (appendix 1: figure 8). It is unclear if these have occurred since 1880. Only the two 'sockets' in the south west quadrant and a hollow around the two fragments labelled as no 16 were shown on the original survey. It would be curious if the hollow at no 16 was surveyed but others were omitted. Although given the time during which it was done in the late 19th century and the lack of record of their other activities and excavation at the site, it may be that other slight hollows were simply not thought worthy of record. It is likely however that erosion hollows have been forming at the site through the activities of livestock for as long as animals have been kept in its vicinity, over hundreds if not thousands of

years. Further small stones not shown on the 1880 survey are now evident adjacent to stones 23 ('E' & 'F'), 24 ('G'), 25 ('H', appendix 3: figure 63) and 28 ('I', appendix 3: figure 64) with three further small stones near to stone 34 (L, K & N; appendix 3: figure 20, figure 66, figure 68). One of the latter (L) is sandstone and a third thin slab of stone north of stone 33 (J) is only just showing above the turf (figure 20, figure 65). Stone N is a small stone that is hidden between stones 33 and 34 (figure 68).

6.3 Gamelands stone circle – banks and other features

The new survey also uncovered evidence of other features not recorded in 1880, beyond the stones and erosion hollows discussed above. The scheduling record notes that the stones were set into a bank 2.5m wide and up to 0.2m high (list entry number 1011138; MYD62346). The latter idea may have arisen as a result of the bank to the south which partly envelops the stones on the southern side of the site. However, some slight evidence that may further corroborate the classification of Gamelands as an embanked stone circle was identified.

Whilst they are difficult to identify on the ground, in a number of places around the northern arc of the circle there are what are here interpreted as slight traces of a bank which appears to follow the arc of the circle (F6, F8, F10, F14, F17 and F18; see section 11, appendix 1: figure 8). The clearest examples are F8 (appendix 3: figure 17), F10 (appendix 3: figure 19) and F14 (appendix 3: figure 23, where it was possible to define one or more breaks of slope and to plot the bank slopes partially or entirely with hachures. The shape of the break of slope of F14 on its southern side is interesting, in it appears to outline a partial hollow between stones 29 and 30, which could be a former stone socket or erosion hollow. If it does indicate a former stone location, it could have been the original position of the 'freestone flag' recorded on the 1880 survey adjacent to stone 29 (Ferguson 1883: 184). In other areas the evidence was unclear or more ambiguous, with further slight traces that could only be shown as an outline of a slightly raised area (F6; appendix 3: figure 15) or as breaks of slope (F17 (figure 27) and F18 (figure 28)). The uncertain break of slope line to the north east of F17 is interpreted as the top edge of another erosion hollow. Whilst the casual visitor would be forgiven for not being able to recognise these very subtle traces, their positions and orientations in relation to the stones would suggest they are consistent with being interpreted as the slight remaining traces of a bank. This is likely to be directly related to the stone circle, supporting its interpretation as an embanked stone circle. The intermittent nature of these traces around the circle is likely to have resulted from its truncation and erosion over time, both by historic ploughing and livestock erosion over the centuries which have largely removed or obscured the former bank. Given this, the apparent rounded terminal end to F10 is thought to be a result of this erosion and truncation rather than reflecting a deliberately constructed end.

A single feature was identified within the northern half of the circle, which comprised a very slight raised area (F12; appendix 3: figure 21). This was difficult to see or define and could only be shown in outline. Its interpretation is discussed further in section 8.5.

6.4 Banks and features outside the stone circle

As noted by Clare, the broad bank was also recorded (F24-F27 and F28) on the southern side of the circle which partly envelops the stones, although reading their relationship is difficult (2007: 106). The bank is partially visible on the north side of the present drystone wall field boundary, and underlies this later wall. Whilst clear evidence of the relationship between the bank and the stones proved difficult to find, the suggested interpretation here is that bank F24-27 is likely to post-date the stone circle and has partially enveloped and buried the southern arc of the circle (appendix 3: figure 34 (F24), figure 35 (F25), figure 36 (F26), figure 37 (F27)). Some of the stones remain partially buried, for example stone 12, and the apparent emergence of stone A since 1880 through erosion also supports this conclusion. The form of the east-west bank F24-F27/F28 is varied along its length, with distinct upstanding sections (F26-F28) with a narrow flat top and some evidence of distinct and possibly deliberately constructed end terminals with gaps between these sections. The gaps between F27 and F26, and between F27 and F28 (appendix 3: figure 39) have slight scarps that were distinct and may suggest either truncations or former entrances or gates in a former field system pre-dating the present drystone wall boundary. The east-west bank F24-F28 may reflect an earlier field system boundary defined by a bank perhaps topped with a hedge and could be of Medieval to Post Medieval date.

A second bank (F4) (noted as 'B' by Clare 2007: 106, fig 52a) was also recorded running on a north – south orientation from a distinct mound (F3) at the western end of the bank F4 towards stone 6 (appendix 3: figure 13 and figure 14). No clear evidence of any continuation of F4 further north away from the circle could be found on the ground, although it may simply have been removed by erosion and agricultural activity – with this short section being left, perhaps being protected by its proximity to the stones. A section of its northern end has probably been removed by the erosion apparent around stone 6 (F5). The central section of bank F4 has been much reduced between sections A-A and B-B and is difficult to trace on the ground. This could be a result of agricultural activity and the ploughing through the circle related by Ferguson (1883: 183; Clare 2007: 106). The possible traces of the former bank of the monument discussed in section 6.3 were in places present on both the inside and outside of the stones, suggesting the stones were either set into the centre of a curving bank, or that this bank was built up around them. If F4 was part of the original bank of the stone circle, one might expect its line to curve and run through the location of the hollows or sockets shown on the 1880 survey, perhaps continuing towards stones 10 and 11, but the survey suggests otherwise. The very straight course of bank F4, together with the fact that the two sockets or probable

stone locations on the 1880 survey are actually located to the east of F4, imply it is more likely to post-date the stone circle and is less likely to be related to the prehistoric monuments primary use or construction. Stone 6 may simply have later been used as a convenient marker, as one of the larger stones, upon which to align F4.

Understanding the relationship between the bank F24 and mound F3 was again very difficult to observe, these now appearing to join together, although the profile of mound F3 is distinct from the bank and is of slighter greater height (figure 12). The north-south bank F4 appeared to terminate just before reaching the mound F23, although this slight gap could have been caused by later truncation. The mound itself is circa 5m in diameter and clearly pre-dates the drystone wall which overlies it. It is well turf covered and is not obviously of recent origin or a result of collapsed wall material. It is unclear if the mound F23 predates the boundary bank F24 or if they are contemporaneous, although the distinct profile of the mound could imply a pre-existing mound was incorporated into or used to establish the line of and potentially the western terminus of the boundary bank F24. Similarly, the relationship of the mound F3 to the stone circle is unknown, as is the identification of F3, which for example could reflect a prehistoric cairn, or a clearance cairn that might be prehistoric or much later in date.

Finally, two slight curvilinear ridges (F1 and F2) were recorded in the south west corner of the field, to the south west of the monument (appendix 3: figure 10 and figure 11). These were very slight and their form appears distinct from the other banks recorded during the survey. The eastern end of F1 appears to be eroded or truncated away, likely through erosion by traffic and livestock passing through the nearby gate into the adjacent field. There is no known recent evidence of a feature in the corner of this field, although other fields in the area do occasionally have small pens or enclosures in their corners along Knott Lane. A modern field gate exists in the wall to the south of F1. It is thought that F1 and F2 are related, reflecting the remnants of a small enclosure or pen that is associated with the relict field system boundaries of which F24-F28 form part. These are likely to be of Medieval or later date. F1 and F2 are not thought likely to be related to the prehistoric monument.

7 Results of resistivity survey of Gamelands stone circle

The results plots of the resistivity survey and a summary table of the anomalies are shown in appendix 5 (figure 75, figure 76, figure 77 and figure 78; table 4) and a technical note about the data processing, results plots and ground conditions are shown in appendix 4. The clearest resistance anomalies are the clusters of very high and high resistance readings which coincide with the circumference of the stone circle (1-7, 8-9, 10; appendix 5: figure 77). These reflect both the surviving stones of the circle themselves, as well as the possibility that there may be further buried

stones, packing stones or remnant stony bank material around or between them. Stone sockets might be present containing packing material, which would give the areas around the stones higher resistance readings. Further smaller visible stones were present around some of the circles stones and these are also reflected in these raised readings around the stones.

Two areas of very high resistance readings, forming a large curvilinear anomaly (11) and a smaller separate response (12) to the west of it, along with (53) (another raised resistance arc) in the northern half of the circle are noteworthy (appendix 5: figure 77). It is not clear whether these are entirely archaeological, but they suggest greater concentrations and spreads of stone may be present in this area. These could be archaeological features and may suggest internal features or divisions within the northern half of the circle – (11) is particularly distinct and of high resistance suggesting a concentration of stone. Anomaly (11) appears to curve around and partly encircle a smaller, irregular shaped raised resistance anomaly (54), suggesting a greater likelihood they reflect archaeological features. Another vaguely linear raised resistance band (containing some more discrete higher resistance areas, 13 & 14) is present to the south of this, running from the edge towards the centre of the circle (appendix 5: figure 77). Two smaller more discrete low and very low resistance anomalies are present within the circles northern half, (15) and (30) (appendix 5: figure 77). Anomaly (15) is more ill-defined and might represent a pit, hollow, scoop, or a slight natural depression and is located immediately north of (13) & (14). Anomaly (30) is larger more clearly defined, measuring around 7m long and 5m wide. This could be an archaeological feature, for example a very large pit, scoop or hollow. Alternatively, it could represent the disturbance or removal of material by the 1882 excavations. Little detail is recorded of their activities, but a freestone slab found by digging was located next to the right hand end of this anomaly, adjacent to stone 29 (Ferguson 1883: 184). A very slight mound (F12) was visible immediately south west of this feature (30) and whilst it was difficult to identify as either man made or natural, it may represent the remnant of a spoil heap.

Four smaller raised resistance anomalies (16-18, 57), which lie beyond the circumference of the circle to the south east of it may reflect smaller buried stones. Whilst these could reflect stones that have been disturbed, moved from the circle and buried, or additional unknown stone locations, they may also reflect natural stone and be entirely fortuitous (appendix 5: figure 78). These smaller responses sit within a broad, fairly irregular band of slightly raised resistance readings (19) which runs through the southern half of the survey area broadly from east to west (appendix 5: figure 77). This may reflect areas of remnant bank material within the circumference of the circle, or material which has slumped from the field bank situated immediately south of the circle and which partly envelops the stones in this area. However, this band coincides with neither where it continues beyond the circle

to the east. It is uncertain if the latter is a geological feature or another, separate feature of archaeological origin. Its large size and irregular edge may suggest this is a geological or geomorphological feature, at least in part. A discrete high resistance anomaly is also partially visible on the far eastern side of the survey (20), within the former raised resistance band (19) (appendix 5: figure 77). A weak linear magnetic anomaly was identified in the location of 20, and it is possible that these are related (Whittingham 2020). Beyond the eastern end of anomaly (19) there is a small raised resistance anomaly (21) which may be a further continuation of (19). Another small raised resistance anomaly (22) is located to the south of 21 and it is unclear if this is of archaeological origin (appendix 5: figure 77).

There are a number of low resistance anomalies which also merit discussion. A large curvilinear low resistance anomaly (40, including 24, 25 & 26) crosses the eastern half of the survey and heads into the central area of the circle. The sinuous curving form and large size of this anomaly would suggest that at least part of it is likely to be of natural or geomorphological origin. It is noteworthy however that a distinct right angled linear anomaly is visible within this broader feature in the centre of the circle, measuring circa 3-4m in width and measuring circa 10m x 7m which has very straight edges. This may well indicate an area of excavation from the 1880 investigations. The larger feature (40) also contains three discrete areas of very low resistance (24, 25 & 26), which may reflect hollows or depressions within this that are considerably wetter than the surrounding area where water accumulates (appendix 5: figure 77). Alternatively, it is possible the smaller of these two (24 & 25) could reflect archaeological features, such as pits or again - the remnants of trenches or pits from the 1880 excavation. The largest (26) is 13m long and circa 5m wide, which forms an oval shape. Although it sits within a larger low resistance anomaly (40), which has an irregular extension heading north towards stone 23. It is considered more likely (26) is a natural feature, such as a wetter area of a palaeochannel. Although it could be an archaeological feature such as a pit, or later disturbance caused by excavation. The irregular protrusion forming part of (40), heading towards stone 23, could have been caused by the 1880 excavations, or perhaps erosion around stones 23 (recorded on the earthwork survey) and 24. Anomaly (40) is interpreted as a hybrid of natural and anthropogenic features, potentially reflecting both the 1880 excavations and potentially wetter areas of a palaeochannel. Another low resistance linear anomaly appears to run alongside the north east quadrant of the circle (27, 28; appendix 5: figure 77). The latter appears to correspond to another palaeochannel which is visible in the EA 1m LiDAR data. Alternatively, the short linear section of this, at 1.5-2m in width and given its alignment, could be consistent with a ditch associated with the stone circle. However, although the extent of the data is limited there is no clear evidence this continues further around the circle, especially to the west of the circle. These responses may simply reflect wetter areas of a palaeochannel in this area or later drainage features. A more discrete, more oval shaped very low resistance anomaly (28) may be a continuation of (27), or perhaps reflect a larger pit or scoop.

A number of low resistance anomalies (32-37) are evident along the western side of the survey area (appendix 5: figure 77). Several of these are large and of slightly irregular oval (33) or crescent shape (35), which may suggest these could be tree throw pits. Low resistance anomaly (34) is very small and may simply reflect a wetter area of the erosion hollow around stone 6. Anomaly (35) is adjacent to the stone circle and could also be a quarry pit for bank material or part of a ditch, perhaps reflecting a wetter area if such a feature existed. A narrow linear trend which is evident forming part of (33) and (35) running north-south may actually reflect a field drain which is located in this area and truncates both (33) and (35). The drain also likely truncates anomalies (36) and (37), which may actually be part of the same wider low resistance response. The slightly irregular shaped low resistance anomaly (37) may also reflect the drain. Low resistance anomaly (32) sits within an area where there is a surviving earthwork bank that is very flattened and eroded away, although the earthwork extends beyond this anomaly and does not appear to correspond with it completely – it may instead represent an underlying feature. This could be a hollow, pit or scoop or simply reflect an area of wetter ground or another tree throw pit. Several small raised resistance anomalies are also present in the data on the western side of the survey area, with (46) & (47) being difficult to interpret given they are right on the edge of the survey areas. Anomaly (46) partly coincides with the southern end of the earthwork bank F4, although it continues beyond it to the west. The other, raised resistance anomaly (47) may reflect material derived from the short earthwork bank F2, or suggest this feature is larger than the visible earthwork. Anomaly (42) is similarly difficult to interpret because of its location on the edge of the survey area but does have a distinct edge where visible. Another small but discreet raised resistance anomaly (56) is located just west of the circle and between the two larger low resistance anomalies (33 & 35) – given its small size it is difficult to tell if this is archaeological or simply reflects naturally occurring stone.

Looking at the eastern side of the survey area a broad oval low resistance anomaly (38 & 39) is partially visible but appears to extend outside of the survey area, which has a very low resistance core (appendix 5: figure 77). This may reflect a natural hollow or area in which water accumulates such as a spring and this area was observed to be wetter with boggy ground. Although it does appear at least on the side that is visible within the data to have a regular shape, this may partially be the result of a land drain, which could have truncated (28) and (38). This may have originally formed part of a wider feature, such as part of the palaeochannels forming the valley head. Low resistance anomaly (45) is again only partially visible and appears to be distinct from (38/39) but both could also reflect wetter areas within a wider feature. It should be noted that there is a possibility that another drain runs through this area although its line is not very clearly evident in the resistance results.

The most interesting anomaly on the eastern side of the survey is a crescent shaped raised resistance anomaly (44), which may be related to another arc of raised

resistance to the south and might form a distinct feature (appendix 5: figure 77). The latter band of raised resistance forms the eastern end of the previously described raised resistance band (19), although its shape facing (44) appears to mimic it. This suggests these may be two halves of a distinct feature that is broadly circular or oval in shape with a hollow centre. Although it is unclear if the southern half of this feature is a continuation of, or a separate feature from the wider raised resistance band (19). Two small low resistance areas (51 & 31) are located inside these trends (the eastern end of 19 and 44). Whilst it is not clear if these are archaeological, they could be pits or hollows. If (44) and the eastern end of (19) do form a distinct feature it appears to have breaks in its circumference on its east and west sides. The raised resistance signature suggests this could be a spread of stone with an open centre and it is possible this could be a prehistoric feature, such as a ring cairn, or a remnant of a round cairn. Although only further investigation could confirm this. It could also be a later feature unrelated to the prehistoric monument. For example, related to the Medieval and Post Medieval field systems in the area. Of course, it could also relate to the 19th century destruction of parts of the site and the supposed burial of stones by rolling them into pits and stone debris from them being blasted or broken up (Simpson 1863: 443-444; Ferguson 1883: 183).

With regard to the southern half of the stone circle, there are a number of slight, discreet raised resistance anomalies (41, 43, 49, 50 & 52; appendix 5: figure 77). Of these, (41), (43), (49) & (52) might represent slight spreads of dispersed stone debris, or pits or hollows with stony fills, with varied readings characterising these anomalies. These are quite different to the very high resistance readings evident for example around areas of the stone circles circumference or other possible high resistance features. They may be either archaeological or natural.

Finally, the earthwork bank which is present along the southern edge of the site (F24-27) occurs in an area of mostly lower resistance readings with a few isolated higher spots, suggesting these banks are largely of earthen construction (appendix 5: figure 78). Whilst a few of the individual high spots may correspond to stones of the circle in this area. Although the bank is only partially within the survey area so no firm conclusion can be given, with the survey clipping the edge of it and areas of slumping and erosion rather than its core. But it does appear the bank is reflected by a low resistance band along the southern edge of the survey area, which may also suggest it is having a masking effect over part of the high resistance readings around the southern part of the stone circle (appendix 5: figure 78). A discrete mound (F3) to the south west of the circle which is partially beyond the survey area certainly did feel quite stony under foot during the work however, although its core is outside the geophysical survey data. Two hollows recorded in 1880 on the south western side of the circle as former stone sockets are not particularly evident in the data as discreet anomalies, but their very small size may make them difficult to detect; although they do sit within a low resistance area (eastern edge of 29/32; appendix 5: figure 77). A

very low (29) and a broader low resistance anomaly (32) partially coincide with bank F4, suggesting it is primarily of earthen construction. The very low anomaly is difficult to interpret given the slight upstanding bank it sits within and its irregular shape, and it may simply reflect an underlying natural feature that is wetter than the surrounding area. Or it could reflect that this area of the bank was retaining more moisture than the broader anomaly (32) in which it sits. A smaller area of high resistance partially coincides with the southern end of F4, suggesting a concentration of stone in this area, but which extends further to the west beyond the bank.

It should also be noted the ground conditions were fairly wet at the time of the first survey in October 2020 and only the immediate area of the stone circle itself was considered viable to survey using resistivity at this time as the wider area was too wet (see appendix 4: section 14.2). Ground conditions were a bit drier during the 2021 fieldwork and allowed the geophysics to extend more widely around the monument.

8 Discussion

This section will discuss an assessment of the condition of the site, the identification of bank traces and their significance, the relationship of the stone circle to other banks and features, the context of the site in relation to the palaeochannel, possible evidence of the 1880's investigations and additional features around the circle.

8.1 Condition assessment

Gamelands stone circle appears to be in a stable condition and no evidence was encountered suggesting any recent damage occurring or impacting the scheduled area. The details of the site as encountered during the surveys in 2020 and 2021 in general seem to match with the official listing description (SM1011138). The exact number of stones present that were judged likely to be part of the monument, was counted from the new survey as being 42. The difference of one from the circa 43 on the scheduling record and the YDNP HER record is not necessarily significant. This may simply reflect differences in which stones are counted and what was visible at the time – and the new survey has demonstrated that there are now other stones present not shown on the 1880 survey, that may have emerged or been exposed since. What is beyond doubt is that the monument's condition has deteriorated and changed further since the time of the 1880 survey – although it is unclear as to when this took place. Much of it is likely to be historic damage that is not recent and could well predate the scheduling of the site. Up to thirteen stones which were shown on the 1880 survey have either been since removed or further displaced, or have become buried and can no longer be traced (see Ferguson 1883: 182 (figure 9).

Moving anticlockwise around the circle this includes No 7 (three fragments south of stone 6), No 16 (two fragments in a possible hollow), No 21 (single stone noted as buried), No 22 (six fragments around stone 23) and the 'freestone flag' adjacent to stone 29. It also appears that stones 15 and 19 may have been moved or displaced since 1880, with a possibility stone 19 has been turned over. The new electronic survey data corresponded well with the 1880 survey and suggested the 1880 survey is impressively accurate. Whilst a surveying error in the original work cannot entirely be ruled out, this seems unlikely. Most of the other stones at the site tied up very well with the new survey data and as a result a georeferencing error as the cause also seems less likely, although again, is difficult to rule out entirely. The conclusion favoured here is that it does reflect some level of displacement or disturbance of these stones since 1880. The two sockets or hollows labelled as no 8 and 9 on the 1880 survey have likely since naturally silted up, perhaps infilling with material eroding or slumping from the adjacent bank F4, although they could have been deliberately filled in to improve access to the interior.

8.2 Significance of possible prehistoric bank traces

The earthwork survey did reveal potential evidence supporting the original classification of the site as an embanked stone circle, concentrated on the northern half of the site. Although these traces of the bank are slight and it was only through working at the site over a period of time that they became apparent. No clear evidence was found at the southern side which is obscured by what is likely to be a later bank. Their intermittent nature is likely a result of erosion and the impact of historic ploughing, which Ferguson noted had taken place previously with the riggs running through the circle (1883: 183). The resistance survey also identified high resistance anomalies around the circumference of the circle, which would be consistent with the remnants of a stony bank, stone spreads, packing stones or further buried stones. Neither the resistance survey or the magnetometry survey revealed any convincing evidence of a ditch around the circle (See Whittingham 2020).

8.3 Other earthworks, features and their relationship to the stone circle

Keeping in mind the difficulties of observing clear relationships between the banks F24-F27/F28 and F4, with both the mound F3 and the stone circle noted in section 6.3, the interpretation favoured here is that both banks (F24-F27/F28 and F4) most likely post-date the stone circle. The bank has subsumed or partially buried the stones in places and the fact that a stone not visible in 1880 seems to have emerged since (labelled 'A') probably due to erosion again suggests a later bank covering the southern side of the site. It is argued here that the stone circle, and possibly the mound F3 (although its identification and date are uncertain), have been used as

visible landscape features and incorporated into the construction of later field boundaries to help define their course. With the stone circle and adjacent mound, forming a possible corner junction within a later field system. There is no dating evidence for these banks at present but they are most likely to be Medieval or Post-Medieval, suggesting an earthwork and hedge boundary that preceded the construction of the drystone wall boundary. At present there is no firm evidence of prehistoric field systems in the immediate vicinity, but it is possible the bank boundaries may have been established earlier or may have followed a previously established boundary.

8.4 Landscape context

The results of the resistance survey provide support to previous interpretations of the landscape context of Gamelands, highlighting its careful siting in relation to a palaeochannel at a valley head and possibly a spring (Evans 2005: 174; Clare 2007: 107). The curvilinear low resistance anomaly running through the circle from east to west from the centre, possibly within a broader low resistance trend running through – is suggestive of a watercourse or palaeochannel. This can be seen in the EA LiDAR data which clearly shows this channel as one of several tributary branches which heads towards the stream of Rais Beck.

8.5 1880's investigations

The new earthwork survey and the resistance survey may help shed some light on the activities of the 1880 survey and especially the excavations, of which there is little detailed record other than a brief mention (Ferguson 1883: 184). The resistivity survey shows a small, quite rectangular low resistance anomaly in the centre of the circle which could be an 1880 excavation trench. Another low resistance anomaly on the inside of the circle, adjacent to stone 29 could also be an 1880 excavation area, given that Ferguson implies that two flints and the freestone slab next to 29 may have been found by digging (Ferguson 1883: 184). Between these two areas in the northern half of the site lies F12 on the earthwork survey and this slight raised area could be a remnant of a spoil heap from the 1880's.

8.6 Geophysical anomalies and additional features?

The resistance survey encountered evidence in the form of high resistance anomalies in the northern half of the circle that could be internal features, although it is unclear if these are archaeological or geological in origin. A circular high resistance feature to the east of the stone circle (14 & 19) is perhaps the best candidate for an archaeological feature, that could be associated with the stone circle although clearly its date and identification are unknown. It could reflect a cairn, or ring cairn, or of course be a later feature that might be related to the possible

Medieval field system. The magnetometry also detected a partial weak circular anomaly to the north west of the site, although it was considered of uncertain origin (Whittingham 2020: 9). Given the earthwork survey also recorded a mound to the south west (F3) of the circle, this implies that the immediate area around the circle is highly archaeologically sensitive. Whilst there is uncertainty about the identification and dating of these three features or anomalies, it is possible all three could be prehistoric features that may be associated with the prehistoric monument. The potential presence of natural features like tree throw pits to the west of the stone circle is interesting given a findspot for a flint knife is also located in this area, and with the presence of a multi period lithic scatter in the wider field. The deposition of Mesolithic and Neolithic lithics and occupation debris in tree throw pits is well recognised in the wider region, for example at Stainton West, and an Early Neolithic occupation deposit including pottery, lithics and cereal grain was recovered from tree throw pits at Holbeck Park Avenue, Barrow in Furness (Myers and Stallibrass 2021, NWRF; Evans *et al.* 2018). Whilst if some of these larger features are quarry pits, they could be associated with the construction of the bank of the stone circle, the field banks or the later field walls.

Finally, the earthwork survey suggested that several of the smaller stones (next to stone A and stone 34) now evident around the circle were potentially of a different lithology to the other stones, possibly sandstone. These were different to both the shap pink granite which comprises most of the stones or the single large limestone slab (stone 19). The inclusion of different kinds of stone into the fabric of prehistoric monuments such as Gamelands stone circle is likely to be deliberate and of significance in understanding such sites. Likewise, the inclusion of stone 28 (shap pink granite) with a distinctive geological formation on its surface facing into the circle is again likely to reflect a deliberate choice and that meant something to the builders of the monument. This is clearly visible from within the circle and was likely both carefully chosen, sited and oriented. Perhaps this was because these natural marks imbued it with a particular significance for inclusion within the monument, or to the community that created and used the stone circle.

9 Conclusion

The new earthwork survey has allowed a condition assessment to be made, as well as a detailed appraisal of changes to the monument since the first detailed record made in 1880. It has also revealed a number of new details about the site, including a stone that may have emerged since 1880 and possible traces of bank into which the stones were originally set, supporting the interpretation of the site as an embanked stone circle. The geophysics have also uncovered further supporting evidence of the possibility that the stone circle was carefully constructed around a watercourse or spring, and the resistivity data combined with the earthwork survey have potentially shed new light on the extent of the 1880's investigations.

The Gamelands WDLP project has also engaged and trained volunteers in carrying out archaeological field survey and geophysical survey, as well as providing new information about the site which has been able to inform the development of onsite interpretation by the WDLP scheme. This will provide a lasting legacy enhancing the experience of future visitors. Finally, it is intended to submit an article to the Transactions of the Cumbria Antiquarian and Archaeological Society on the results of the project to further disseminate the results and to provide a longer term legacy for the Gamelands WDLP project. This will bring together the earthwork and geophysical survey data results more fully including the magnetometry survey and compare the results. A copy of the report will be deposited in the YDNPA HER along with the project archive, as well as a full sized version of the survey drawings.

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11 Appendix 1 – YDNPA earthwork survey plans of Gamelands stone circle

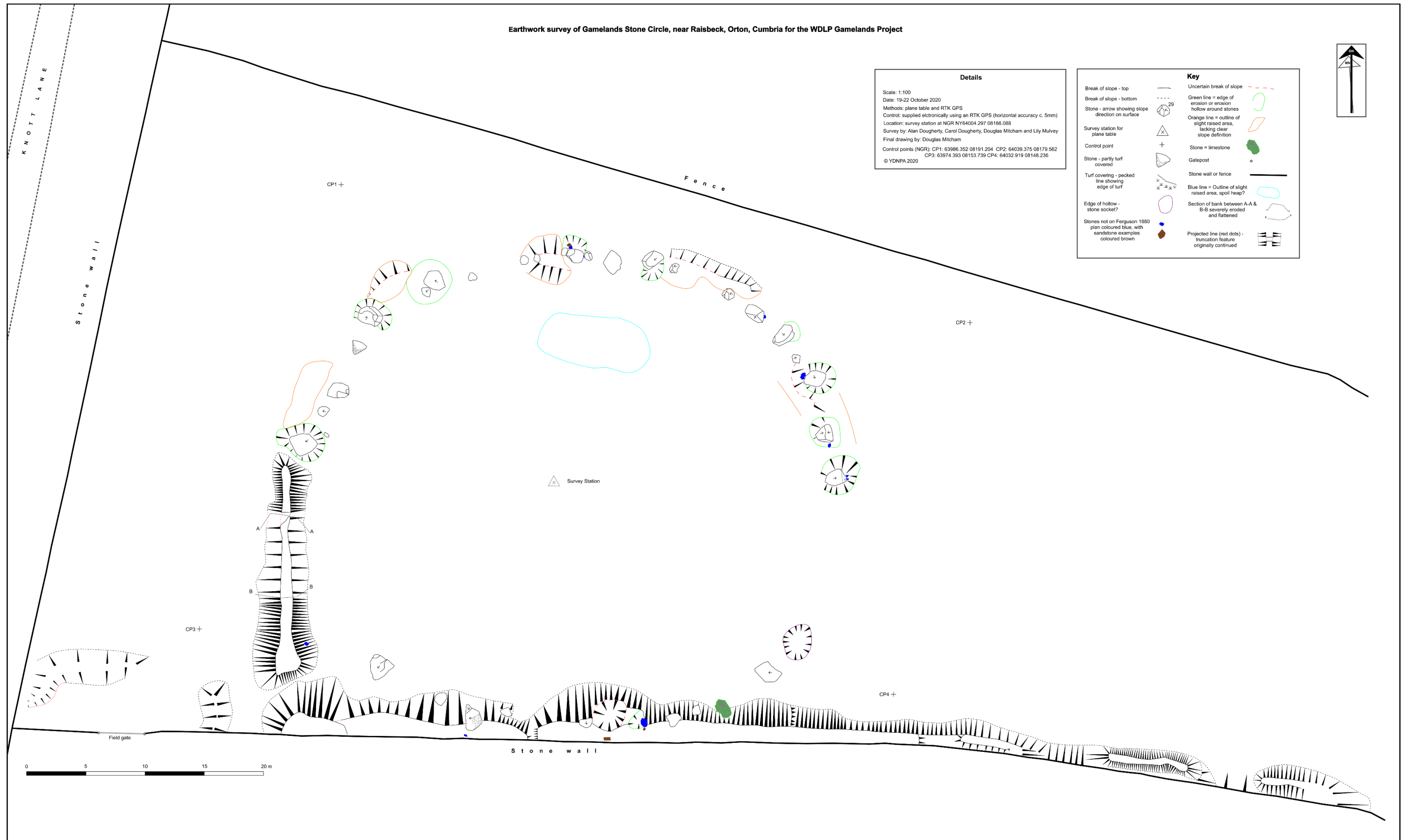


Figure 7: Earthwork survey of Gamelands stone circle. Note – plan has been reduced in size to 33% of the original which was drawn at 1:100. ©YDNPA.

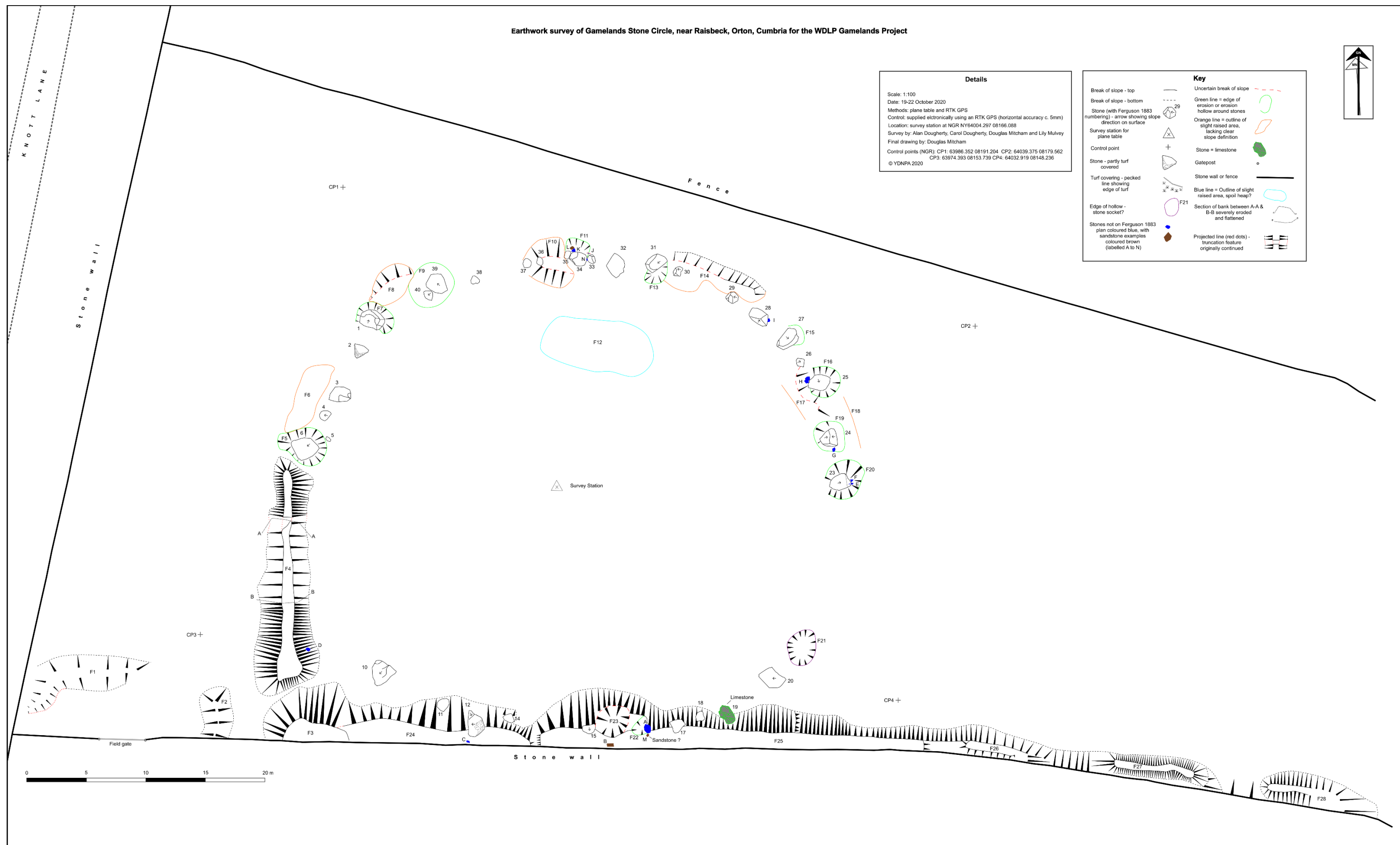


Figure 8: YDNPA survey of Gamelands stone circle with annotation. Note – plan has been reduced in size to 33% of the original which was drawn at 1:100. ©YDNPA.

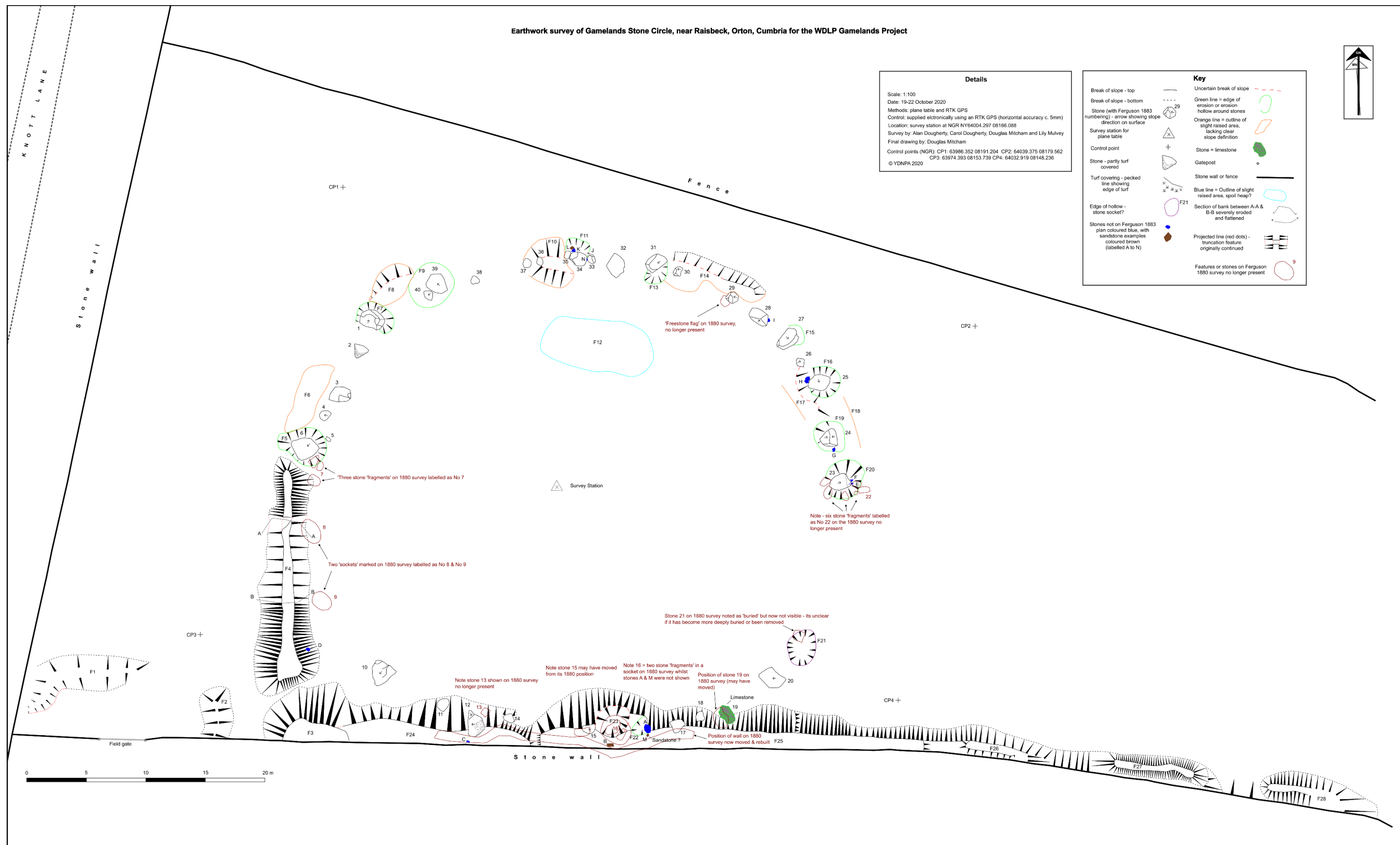


Figure 9: YDNPA annotated survey of Gamelands stone circle included additional features recorded on the 1880 survey that have since changed or disappeared. Features from the 1880 survey were redrawn from a georeferenced version of the plan originally published in Bland 1881 and Ferguson 1883. Note – plan has been reduced in size to 33% of the original which was drawn at 1:100. Outlines of 1880 features redrawn from Ferguson 1883, all other data is © YDNPA.

12 Appendix 2 – Gazetteer of features

The survey feature gazetteer is presented in table 2 below.

Table 2: Gazetteer of features recorded during the earthwork survey. Feature numbers reference the plan shown in figure 8. Photo numbers refer to the files in the project archive, whilst the report figure numbers reference this report. New height measurements for the stones were not recorded, but are published in Ferguson 1883.

Feature No	Description	Photo Numbers	Report Fig Numbers
F1	Short length of slight curvilinear bank circa 10m in length, 0.9m wide and 0.2m high. Unclear what this is, it may be modern and related to disturbance around the present field entrance gate.	4583, 4584, 4586-88	Fig 10
F2	Short length of very slight curvilinear bank, c. 0.2m high, 2.6m wide and 4.1m long.	4583	Fig 11
F3	Raised mound, with slightly irregular profile and plan form, c. 0.3-0.4m high, 4.5m (north-south) and c.6.9m (east-west). Unclear if this is just a continuation of F28 with further material dumped on top of it, or a separate mound which F28 joins. No confident interpretation of this relationship could be made.	5147, 5149, 5150, 3891, 4578, 4579, 4580,	Fig 12, 34
F4	Slight linear bank circa 20m in length, of variable width from c.5.5m to 3m, and circa 0.20-0.30m high. with a regular profile and flat top. The central section is significantly reduced in height and flattened out compared to rest of the feature.	3884-3890, 4572-4578	Fig 13, 14
F5	Erosion hollow around stone 6 circa 4.2m by 3.1m and c. 0.1m deep.	4572	Fig 14
F6	Slight raised area circa 6.4m long, c. 2m wide and c.0.10m high, lacking a clear slope definition or profile.	2651-2653	Fig 15
F7	Slight erosion hollow partially surrounding stone 1, circa 3.2m by 1.6m and only a few centimetres deep.	4266	Fig 16
F8	Slight raised area, with a slope facing outwards, possibly following the line of the stone circle. Could be a slight bank remnant circa 4m long by 2.7m wide with little surviving height.	2655	Fig 17
F9	Area of erosion and surface poaching around stones 39 and 40, no significant hollow is evident, measuring circa 3.98 by 3.3m and only a few centimetres deep.	4593	Fig 18
F10	Slight raised area with slopes on the inside and outside of the circle. This feature was slightly more defined with a possible top, but was still subtle. A possible bank remnant. Measuring circa 4.2m wide by 4.4m long and only a few centimetres in height.	2657-2659	Fig 19
F11	Erosion hollow on the north side of stones 35 and 34. Measuring c. 2m long by 1.2m wide and only a few centimetres deep.	4599	Fig 20
F12	A very slight ridge or mound, lacking clear definition of slopes. It was difficult to define, but seemed distinctly different to the lay of the ground within the circle. A slight hollow area was noted north of F12, but it was not possible to define its extent clearly. F12 may be a spoil heap from the 1880 excavation. Measures 9.5m long by c. 4.3m wide and only a few centimetres in height.	4545	Fig 21
F13	Erosion hollow to the south of stone 31. Measures circa 1.2m (north-south) and 1.7m (east-west) and only a few centimetres deep.	4601	Fig 22
F14	A short section of slope, most clearly defined on the outside of the circle which appears to follow the circle round. On the inside of the circle it lacks clear definition. Its absence around part of stone 29 may be the result of the 1880 excavation, who record that they found a freestone slab against 29 by digging. The shape of the break of slope of F14 on its southern side is interesting, in it appears to outline a partial hollow between stones 29 and 30, which could be a former stone socket or erosion hollow. If it does indicate a former stone location, it could have been the original position of the 'freestone flag' recorded on the 1880 survey adjacent to stone 29 (Ferguson 1883: 184). Measures 8.1m long and is of variable width, from 3.2m to circa 2m and no more than 0.2m in height.	2660-2662	Fig 23
F15	Slight area of erosion around the eastern side of stone 27, measuring c.1.7m long, c. 0.5m wide and c. 0.1m deep.	4609	Fig 24
F16	Erosion hollow around stone 25, measuring c.2.5m north-south, c. 2.4m east-west and only a few centimetres deep.	3916	Fig 25, 26
F17	Two breaks of slope on the inside of the circle. The innermost could be a remnant of the bottom edge of a bank and appears to follow the arc of the circle round. This measures circa 3.5m long. The adjacent curvilinear break of slope, east of the former, which forms a top, may be part of another or earlier erosion hollow which has formed around stone 25 and measures circa 4.8m long, with a gradual slope circa 1m long dropping to the east towards stone 25.	3880	Fig 27
F18	A slight break of slope which may be a remnant of a bank edge on the outside of the circle, which appears to follow the arc of the circle. The break of slope was measured for a distance of c. 4.5m. It might therefore be related to F17 - a possible trace of an inner edge of the bank.	3866	Fig 28

Feature No	Description	Photo Numbers	Report Fig Numbers
F19	Very slight erosion hollow to the north west of stone 24, with slight surface poaching evident around it. Measures circa 2.5m east-west, c.2.5m north-south and a few centimetres deep.	4611	Fig 29
F20	Erosion hollow around stone 23. Measures c. 3.2m north-south and c. 3m east-west. The eastern half of which fills with water and is around 20cm deep.	4612	Fig 30
F21	A slight oval hollow with a flat base, measuring c.2.4m east west, c.3m north-south and c.0.1m deep. The 1880 survey recorded a stone on one side of this feature which is now absent or completely buried. This is likely to be a former stone socket or erosion hollow for a now lost stone.	3920, 5145-5146	Fig 31
F22	A partial hollow in the earthwork bank, with a stone labelled as A by this survey at its eastern edge. The form of F22 as a partial, c-shaped hollow suggests it is an erosion hollow. F22 measures c.1m east-west and c. 1.5m north-south and is no more than 0.1m deep. A smaller stone (M) was located on the southern side of stone A, noted as being sandstone. A larger adjacent hollow west of F22, labelled as F23 may be the result of the disturbance and removal of the missing stones of the no 16 pair.	4526	Fig 32
F23	A slight circular hollow between stone 15 and F22, measuring 2.7m east-west, c.2.6m north-south, circa 0.1 to 0.2m deep. F23 may be the result of disturbance which would account for the loss of the stone pair labelled as no 16 on the 1880 plan. Neither of these stones were found at the time of the present survey.	4521, 4526	Fig 32, Fig 33
F24	A short section of earthwork bank on the south western side of the stone circle. Measures c.15m long, c. 1.5-2m wide and c. 0.2m high. Part of the bank, the southern sloping side is located on the other side of the drystone wall and could not be accessed at the time of the survey due to crop and vegetation growth on the south side of the wall. It is likely this is the same boundary feature as F25, F26, F27 & F28.	5147-5148	Fig 34
F25	A section of an earthwork bank, partially visible on the northern side of the drystone wall. F25 is Likely part of the same feature as F24, F26, F27, F28. F25 measures c.32m in length and varies in width from circa 1m to 2m and circa 0.2m in height.	5142-5144	Fig 35
F26	A short section of bank, measuring c. 4.7m long, 1m wide and c. 0.2m high, noticeably raised in profile compared to the rest of the boundary bank. Likely part of the same feature as F24, F25, F26, F28.	5140	Fig 36
F27	A short section of bank, measuring c. 2m wide, 10m long and circa 0.2m high, with a slightly raised and more distinct profile compared to the rest of F25. Both sides of F27 were visible to the north of the drystone wall, showing that it diverges from the present route of the drystone boundary wall at this point. Eastern end of the bank forms a rounded terminal, suggesting a deliberate end to it, where its profile meets the main bank F25. Western end of F27 had a rounded terminal but with a longer length of slope.	5141, 5136-5138	Fig 37, 39
F28	A short section of earthwork bank measuring 10m long, c.2.6m wide and 0.2m high, partially visible on the north side of the drystone wall. F28 appears to curve on its eastern side, turning south east. The western end has a neatly rounded terminal and is situated next to a gap in the line of the probable former field boundary, in which sits a slight scarp - this likely marks a former entrance or gateway.	5133-5136	Fig 38, 39
Stone 1	Sub circular granite boulder, segment like in shape. Measures 2.04m long by 1.53m wide. Associated with erosion hollow F7.	3882, 3883, 3923, 4266, 4592, 4593	Fig 16, 40
Stone 2	Sub triangular shaped stone, sub angular form, granite, partially buried. Visible area measures 1.30m long by 0.63m wide. Full width of stone felt under the turf measures 1.16m.	3882, 3883, 3923, 4592, 2651	Fig 40
Stone 3	Sub rounded granite boulder, measures 1.70m long by 1.37m wide. Adjacent to possible bank trace F6.	3882, 3883, 3923, 4590, 4591, 2651	Fig 41
Stone 4	Sub angular granite, round shape in plan with a straight edge on its eastern side. Measures 0.88m long by 0.79m wide. Adjacent to possible bank trace F6.	3882, 3883, 3923, 4589, 4590, 4591, 2651	Fig 41, 32
Stone 5	Sub angular shaped granite, lying flat and well embedded in the ground, not protruding above the level of the ground. Measures 0.45m long by 0.31m wide.	3882, 3883, 3923, 4589, 4591	Fig 41, 32
Stone 6	Larger sub rounded granite boulder, with a rounded kite shape in plan, measuring 2.4m long by 1.99m wide. Associated with erosion hollow F6.	3882, 3883, 3884, 3885, 3886, 3887, 3888, 3889, 3923, 4572, 4573, 4574, 4577, 4589, 4591	Fig 41, 32
Stone 7	Three fragments on 1880 survey south of stone 6 - not located in 2020 or 2021 - presumed lost or completely buried.	4577	Fig 32
No 8	Socket on 1880 survey - no visible trace in 2020 or 2021.	4577	

Feature No	Description	Photo Numbers	Report Fig Numbers
No 9	Socket on 1880 survey - no visible trace in 2020 or 2021.	4577	
Stone 10	Larger granite boulder with sub triangular shape in plan, lying recumbent 1.82m wide by 2m long.	3877, 3883, 3884, 3886, 3888, 3889, 3890, 3892, 4575, 4576, 4577, 4578	Fig 43, 46
Stone 11	Granite boulder with sub rounded shape in plan, lying recumbent. Measures long 1.12m by 0.92m wide.	3877, 3883, 3884, 3890, 3893, 3904, 4575, 4576, 4577	Fig 44, 45, 46
Stone 12	Sub angular granite boulder with a sub triangular shape in plan, lying recumbent, partially buried and turf covered on its eastern side. The northern end narrows to a more pointed shape, with its northern end roughly on the centre of the arc of the circle between stones 11 to 14, whilst the southern end of the stone protrudes out well beyond this arc. On this basis, it is possible stone 12 was originally upright and has fallen to the south. It was shown in its current position in 1880.	3877, 3883, 3884, 3890, 3893, 3904, 4575, 4576, 4577	Fig 44, 45, 46
Stone 13	Shown adjacent to the north eastern side of stone 12 in 1880, but was not located in 2020 or 2021. It is presumed now lost or buried.	3877, 3883, 3884, 3890, 3904, 4575, 4576, 4577	
Stone 14	Rounded stone, granite, with a sub triangular shape in plan. Measures 1.03m wide by 0.75m long.	3877, 3883, 3884, 3890, 3893, 3904, 4575, 4576, 4577	Fig 45, 46
Stone 15	Sub rounded granite boulder with a crescent like shape in plan, lying at an angle leaning south. Measures 1.14m by 0.71m. Recorded position in 1880 appears to have been circa 0.76m further west. It is unclear if this is a result of either surveying error, the impact of georeferencing the 1880 plan image using GIS, or the displacement of stone 15 to the east since 1880.	3877, 3883, 3884, 3890, 3904, 4521, 4576, 4577	Fig 33, 46
Stone 16	Two stone fragments in a hollow shown on the 1880 survey - neither were located in 2020 or 2021 and are presumed now lost or buried. A now considerably larger hollow recorded as F23 was located suggesting the disturbance or removal of the two stone fragments since 1880.	3890, 3894?, 3904, 4410, 4576, 4577	Fig 47, 58, 67
Stone 17	Sub angular granite boulder, of irregular shape in plan. Measures 1.36m by 1.26m.	3890, 3894, 3895, 3896, 3904, 4576, 4577	Fig 47, 48, 50
Stone 18	Sub rounded granite, lying flat and well embedded in the ground. Measures 0.90m by 0.78m.	3894, 3895, 3896, 3904, 4576, 4577	Fig 47, 48, 50
Stone 19	A larger sub rounded limestone boulder which is lying flat, with a slightly irregular, but broadly rectangular shape in plan. The visible surface of the limestone is highly distinct from the rest of the stones, which is pot marked with solution holes. Measures 1.71m long by 1.07m wide. The current position and orientation of stone 19 appear at odds with the 1880 survey and it may have moved to the north east, been rotated by 180 degrees, or even turned over since 1880. Whilst its possible a surveying error or issue caused by the georeferencing of the 1880 plan in GIS could be the cause, the fact the adjacent stones positions corresponded well between the 1880 and current survey imply the possibly of it being moved or displaced since as being more likely.	3894, 3896, 3897, 3898, 3899, 3900, 3901, 3904, 4576, 4577	Fig 47, 49, 50, 51
Stone 20	Sub rounded granite boulder, of slightly irregular sub-rectangular shape in plan. Measures 1.37m wide by 1.92m long.	3896, 3902, 3903, 3904, 3905, 4576, 4577	Fig 31, 50
Stone 21	Sub rectangular fragment noted as buried in 1880 - not located in 2020 or 2021. This is presumed now lost or buried. A slight sub oval shaped hollow, F21 is now evident in this location suggesting a former stone location and the likely disturbance and removal of stone 21 since 1880.	4576, 4577	
Stone 22	Six stone fragments located around stone 23 on the 1880 survey - not located in 2020 or 2021. These are presumed now lost or buried.	3910, 3911, 4576, 4577	
Stone 23	Sub rounded granite boulder, with a distinct lean to the north east and a sizeable erosion hollow F23. Measures 1.82m long by 1.43m wide. Overhangs stone E. Sat within erosion hollow F20.	3881, 3905, 3906, 3907, 3908, 3909, 3911, 3913, 3914, 4576, 4577, 4612	Fig 30

Feature No	Description	Photo Numbers	Report Fig Numbers
Stone 24	Sub angular granite boulder with a sub triangular shape in plan. Measures 1.57m long by 1.54m wide. Stone A is adjacent to its southern side. Associated with erosion hollow F19.	3881, 3905, 3906, 3907, 3912, 3913, 3915, 4576, 4610, 4611	Fig 29
Stone 25	Sub rounded granite boulder with a sub rectangular shape in plan. Stone H is adjacent to its western side. Measures 2m long by 1.41m wide. Associated with erosion hollow F16.	3881, 3905, 3907, 3916, 3917, 4576, 4607, 4608, 4612	Fig 25, 26, 52, 63
Stone 26	Smaller sub rounded granite boulder with an irregular sub rectangular shape in plan. Measures 0.75m by 0.86m.	3881, 3905, 3907, 3916, 3920, 4576, 4605, 4606, 4608, 4609, 4612	Fig 25, 26, 52
Stone 27	Sub rounded granite boulder with a trapezoidal shape in plan. Measures 2.1m by 1.32m. Associated with erosion hollow F15.	3881, 3905, 3907, 3916, 3918, 3919, 4576, 4603, 4605, 4608, 4609, 4612	Fig 23, 25, 26, 52, 53
Stone 28	Sub rounded granite boulder with a sub rectangular shape in plan. Stone is upright and forms a pyramidal shape. A visually distinctive geological formation is evident on its southern face, comprising a series of crossing lines which face into the stone circle and are visible when standing inside the circle. Measures 1.89m by 1.12m. Stone I is located adjacent to its east facing side.	3881, 3905, 3907, 3916, 4576, 4602, 4603, 4604, 4609	Fig 25, 53, 64
Stone 29	Sub rounded granite boulder with a sub rounded shape in plan. Measures 0.95m wide by 1.05m long. A freestone flag was noted adjacent to its western side on the 1880 survey but no trace of this was found in 2020 or 2021. It is presumed now lost or buried. Adjacent to bank trace F14.	3881, 3905, 3907, 4576, 4602, 4603, 4611, 2660, 2661, 2662	Fig 23, 53, 54
Stone 30	Small sub rounded granite boulder with irregular shape in plan. Measures 0.9m long by 0.66m wide. Sat within bank trace F14.	3881, 3905, 3907, 4601, 2662, 2663	Fig 22
Stone 31	Sub rounded granite boulder with sub rectangular shape in plan. Measures 1.76m by 1.15m. Associated with erosion hollow F13.	3881, 3882, 3905, 3907, 4601, 2663	Fig 22
Stone 32	Sub rounded granite boulder lying flat, just proud of the ground surface, with a sub rectangular shape in plan. Measures 2.05m by 1.03m.	3881, 3882, 3905, 4600, 2663	Fig 55
Stone 33	Sub angular granite boulder with a sub rounded shape in plan. Measures 0.75m by 0.67m.	3881, 3882, 3905, 4298, 4597, 4598, 4599, 4600	Fig 20, 55, 68
Stone 34	Sub rounded granite boulder with an irregular sub rounded shape in plan. Measures 1.44m by 1.15m. Associated with erosion hollow F11.	3881, 3882, 3905, 4298, 4597, 4598, 4599, 4600	Fig 20, 55, 68
Stone 35	Sub rounded granite boulder with a sub rectangular shape in plan. Measures 0.71m by 0.51m. Associated with erosion hollow F11.	3881, 3882, 3905, 4596, 4597, 4598, 4599, 2657	Fig 20, 56
Stone 36	Sub rounded granite boulder with a sub rounded shape in plan. Measures 0.75m by 0.53m. Sat within bank trace F10.	3881, 3882, 3923, 4596, 4597, 2657	Fig 56
Stone 37	Rounded granite boulder with a sub rounded shape in plan. Measures 0.78m by 0.71m. Sat within bank trace F10.	3881, 3882, 3923, 4596, 4597, 2657	Fig 56
Stone 38	Rounded granite boulder with a sub rounded irregular shape in plan. Measures 0.76m by 0.73m.	3881, 3882, 3923, 4594, 4595, 2655	Fig 17, 57
Stone 39	Rounded granite boulder with a sub rounded shape in plan. Measures 1.90m by 1.63m. Associated with erosion hollow F9.	3881, 3882, 3883, 3923, 4593, 4595, 2655, 2656	Fig 17, 18
Stone 40	Small rounded granite boulder with a sub rounded shape in plan. Measures 0.96m by 0.72m. Associated with erosion hollow F9.	3881, 3882, 3883, 3923, 4593, 4595, 2655	Fig 17, 18

Feature No	Description	Photo Numbers	Report Fig Numbers
Stone A	A small sub rounded granite boulder lying flat and not protruding above turf level. Stone A is not shown on the 1880 survey and appears to have emerged since through erosion of the bank which partly envelops the stones on the southern side of the circle. Its position along the arc of the circle strongly suggests it is part of the stone circle. Sat within erosion hollow F22.	3894, 4410	Fig 47, 58, 67
Stone B	Small rectangular stone slab of brown coloured sandstone, located south of F23 and immediately north of the stone wall. This was loose on the surface and likely derives from walling stone. It is not thought to be related to the stone circle. Not shown on 1880 survey.	3878	Fig 59
Stone C	Small rectangular stone south of stone 12 and immediately north of the stone wall. It is thought this is more likely to derive from walling material and is probably unrelated to the stone circle. Not shown on 1880 survey.	3883	
Stone D	Buried stone partly protruding through the turf at the southern end of F4. It may have been buried by bank F4 or form part of this feature. It is unclear whether stone D is related to the stone circle. Stone D is Not shown on the 1880 survey. Its position is to the west of the two hollows on the 1880 survey which likely indicate the former arc of the circle in this area. It could be a displaced stone, or reflect the edge of the former stone circle bank, or simply form part of F4.	4248, 4578	Fig 60, 61
Stone E	Small thin stone slab on the east side of stone 23, which partially overhangs stone E. Possibly a packing stone or trigger. Not shown on 1880 plan.	3906, 3907, 3908, 3910, 3911, 3914	Fig 62
Stone F	Small rounded stone adjacent to the east side of stone 23, immediately north of stone E.	3906, 3907, 3908, 3910, 3911, 3914	Fig 62
Stone G	Small stone adjacent to stone 24, not shown on 1880 plan.	4611	Fig 29
Stone H	Smaller stone adjacent to stone 25 on its western side. Not shown on 1880 survey.	4607	Fig 52, 63
Stone I	Small stone adjacent to the eastern edge of stone 28.	4604	Fig 64
Stone J	Small and thin edge set stone slab, immediately north of the area between stones 34 and 33. Not shown on 1880 survey.	4297, 4599	Fig 20, 65
Stone K	Small triangular shaped stone, immediately north of the area between stones 35 and 34. Not shown on 1880 survey. Sat within erosion hollow F11.	4293, 4599	Fig 20, 66
Stone L	Small stone, noted as sandstone, next to stone K on its northern side, located north of stones 35 and 34. Not shown on 1880 survey. Sat within erosion hollow F11.	4293, 4599	Fig 20, 66
Stone M	A smaller stone located on the southern side of stone A, noted as being sandstone. Not shown on 1880 plan.	4410	Fig 67
Stone N	Small stone between 33 and 34 - recorded on YDNPA survey. Not shown on 1880 plan.	4298	Fig 68

13 Appendix 3 – Survey Images

Table 3 shows the photographic record with photo numbers referencing the project archive and figure numbers referencing those reproduced in this report. The figures in sections 3.1 to 3.3 show survey features ordered by feature number (e.g. F1, F2 etc.) followed by the stones of the circle as per the 1880 survey numbering (e.g. stones 1-40, Ferguson 1883), then the newly recorded stones labelled from A to N.

Table 3: Photographic record of survey features and surviving stones.

Photo No	Feature numbers	Photo description	Date	Rep Fig No
3861	N/A	Working shot of YDNPA staff and volunteers doing the plane table survey of Gamelands.	19/10/2020	
3862	N/A	Working shot of YDNPA staff and volunteers doing the plane table survey of Gamelands.	19/10/2020	
3863	N/A	Working shot of YDNPA staff and volunteer measuring in soft detail during plane table survey.	19/10/2020	
3864	N/A	Working shot of YDNPA staff and volunteers - sighting and measuring in soft detail.	19/10/2020	
3865	N/A	Working shot of YDNPA staff and volunteers doing plane table survey.	19/10/2020	
3866	F18	Working shot of YDNPA staff and volunteers doing plane table survey. F18 is also visible, a slight break of slope that may be a bank remnant.	19/10/2020	Fig 4, 28
3867	N/A	Working shot of YDNPA volunteer plotting at plane table.	19/10/2020	
3868	N/A	Working shot of YDNPA staff and volunteers doing plane table survey.	19/10/2020	Fig 5
3869	N/A	YDNPA staff sighting using an alidade rule.	19/10/2020	
3870	N/A	YDNPA staff drawing a ray line.	19/10/2020	
3871	N/A	Close up of plane table drawing.	19/10/2020	
3872	N/A	Volunteers and YDNPA staff measuring in one of the stones.	19/10/2020	
3873	N/A	View of field drawing partially completed.	19/10/2020	
3874	N/A	View of plane table and drawing equipment.	19/10/2020	
3875	N/A	View of plane table and partially completed field drawing.	19/10/2020	
3876	N/A	Working shot of YDNPA staff using an RTK GPS.	21/10/2020	
3877	Stones 10-15 per 1880 survey	General view of southern side of stone circle showing stones 15, 14, 12, 11 and 10 from left to right.	21/10/2020	Fig 46
3878	Stone 'B'	General view of stone 'B'. A possible sandstone slab found immediately south of the circle but which is not thought to be part of it. It more likely derives from walling material. Stone not shown on 1880 survey.	21/10/2020	Fig 59
3879	N/A	Working shot - YDNPA staff doing an RTK GPS survey.	21/10/2020	
3880	F17, stones 23-32	Working shot - YDNPA staff doing an RTK GPS survey. Also shows stones 23-32 and F17 in background.	21/10/2020	
3881	Stones 23-40 as per 1880 survey.	General view of northern side of stone circle.	21/10/2020	
3882	Stones 1-6, 31-40 as per 1880 survey.	General view of north west side of stone circle, working shot.	21/10/2020	
3883	Stones 10-15, 1-6 and 39-40, as per 1880 survey. Stone C.	General view of south west side of stone circle, working shot. Stone C is just visible to the west of stone 12 on the left side of the image.	21/10/2020	
3884	F4, stones 6 and 10-14 as per 1880 survey.	General view of south western side of stone circle, with bank F4 in centre.	21/10/2020	
3885	F4, stone 6.	View of bank F4 on south west side of stone circle, facing south west.	21/10/2020	
3886	F4, stones 6 and 10 as per 1880 survey.	General view of bank F4 facing south west.	21/10/2020	

Photo No	Feature numbers	Photo description	Date	Rep Fig No
3887	F4, stone 6.	View of bank F4 facing south west.	21/10/2020	Fig 13
3888	F4, stones 6 and 10.	View along bank F4 facing south west.	21/10/2020	
3889	F4, stones 6 and 10.	General view along bank F4 facing south.	21/10/2020	
3890	F4, stones 10-17.	General view of bank F4 facing south east.	21/10/2020	
3891	F3	View of F3, a slight mound which may be part of F24. Bank F4 heads towards this feature but appears to terminate just before reaching it.	21/10/2020	
3892	Stone 10	View of stone 10, facing south west.	21/10/2020	Fig 43
3893	Stones 11, 12, 14.	View of stones 11, 12 and 14 facing south.	21/10/2020	Fig 44, 45
3894	Stones 19, 18, 17 and A	General view of stones 19, 18, 17 and stone A, from left to right, facing south.	21/10/2020	Fig 47
3895	Stone 17, 18.	Close up view of stone 17, with stone 18 visible to the left, facing south.	21/10/2020	Fig 48
3896	Stones 20-17.	General view of stones 20, 19, 18 and 17 on south east side of stone circle, facing south east. The ranging rods are in front of stone 19, notable for being a different lithology - limestone.	21/10/2020	Fig 50
3897	Stone 19	Close up view of stone 19, showing detail of weathering and solution holes in the limestone. Facing south west.	21/10/2020	
3898	Stone 19	A second close up view of stone 19, showing detail of weathering and solution holes in the limestone. Facing south west.	21/10/2020	Fig 49
3899	Stone 19	Close up view of stone 19, showing detail of weathering and solution holes in the limestone. Facing south east.	21/10/2020	
3900	Stone 19	Close up view of stone 19, showing detail of weathering and solution holes in the limestone. Facing north east.	21/10/2020	
3901	Stone 19	Close up view of stone 19, showing detail of weathering and solution holes in the limestone. Facing south east.	21/10/2020	
3902	Stones 20 and 19	View of stones 20 and 19, from left to right, facing south east. The difference in lithology of stone 20 on the left, which is Shap Pink Granite, with stone 19 on the right, which is limestone, is evident.	21/10/2020	
3903	Stone 20	View of stone 20, facing south east.	21/10/2020	Fig 51
3904	Stones 20-11	General view along southern side of the stone circle, with stones 20 to 11 visible.	21/10/2020	
3905	Stones 20, 23-35.	General view across northern side of the stone circle with stones 20, 23-35 visible. Facing north west.	21/10/2020	
3906	Stones 23, 24, E, F	Close up of stone 23 facing north. The base of stone 24 is just visible behind.	21/10/2020	
3907	Stones 23, 24-31, E, F	View of stone 23, facing north west. Stones 24 to 31 are visible in the background.	21/10/2020	
3908	Stones 23, E, F	View of east facing elevation of stone 23, facing west.	21/10/2020	
3909	Stone 23	Lower angle view of east facing elevation of stone 23, facing west.	21/10/2020	
3910	Stones E & F	Close up of two small stones (E & F, stones 22?) lying adjacent to stone 23 which were plotted on the YDNPA survey. These may correspond to some of the 6 fragments which were recorded around stone 23 on the 1880 survey and labelled collectively as stone 22 - although those shown on the 1880 survey are larger and not in the same place as E & F.	21/10/2020	Fig 62
3911	Stone 23, stone 22?	View of north facing elevation of stone 23, facing south. One of the stone 22 group is visible to the left of stone 23.	21/10/2020	
3912	Stone 24	East facing elevation of stone 24, facing west.	21/10/2020	
3913	Stones 24 and 23	View of north facing elevation of stone 24, facing south east. Stone 23 is visible behind.	21/10/2020	
3914	Stones 23, E, F	General view of stone 23, facing south west.	21/10/2020	
3915	Stone 24	General view of stone 24, facing west. A smaller stone is visible to the left of stone 24 which was marked on the YDNPA survey.	21/10/2020	
3916	Stone 25, stones 26-28	General view of stone 25, showing its south facing elevation. Stones 26, 27 and 28 are visible in the background. View facing west.	21/10/2020	Fig 25
3917	Stone 25	View of stone 25, facing north west. Stones 26 to 40, and 1-6 are visible behind. Coloured flags mark the edges of erosion hollows around some of the stones, as well as areas of slight surviving bank or breaks of slope possibly associated with a former bank.	21/10/2020	Fig 25, 26

Photo No	Feature numbers	Photo description	Date	Rep Fig No
3918	Stone 27	General view of stone 27, facing south west. Stones 26 and 25 are visible to the left, with a smaller stone between which is not marked on the 1880 plan. This has been added to the YDNPA survey.	21/10/2020	
3919	Stone 27	North east facing elevation of stone 27, view facing south west.	21/10/2020	
3920	F21, stones 20-17 & A	Working shot of volunteers undertaking resistance survey. F21 and stones 20-17 and A also visible.	22/10/2020	Fig 31
3921	N/A	Working shot of volunteers undertaking resistance survey.	22/10/2020	
3922	N/A	Working shot of volunteers undertaking resistance survey.	22/10/2020	
3923	Stones 36-40, 1-6.	General view of the northern half of the stone circle, facing west. Stones 36-40 and 1-6 are visible.	22/10/2020	
3924	N/A	Working shot of volunteers undertaking resistance survey.	22/10/2020	Fig 6
3925	N/A	Working shot of volunteers undertaking resistance survey.	22/10/2020	
4278	Stone D	Detail view of stone D, facing north east.	05/11/2020	Fig 61
4293	Stones K & L	Detail view of stones K and L. Facing south west.	05/11/2020	Fig 66
4297	Stone J	Detail view of stone J, facing south west.	05/11/2020	Fig 65
4298	Stone N, 33 & 34	Stone N - a small stone located between stones 33 (bottom) and 34 (top), not recorded on the 1880 survey. Facing west.	05/11/2020	Fig 68
4578	Stone D, F4	General view of stone D. Context of stone D, a buried stone partly protruding through the turf at the southern end of F4. It may have been buried by bank F4 or form part of this feature. It is unclear whether stone D is related to the stone circle and it was not shown on the 1880 survey. Facing south.	05/11/2020	Fig 60
4410	Stones A & M	General view of stones A and M. Stone A is shown in the centre, with stone M below it. Facing north.	05/11/2020	Fig 58, 67
4521	Stones 15-20, F23	General view of stones 15-20 and F23, facing east.	05/11/2020	Fig 33
4545	F12	General view of F12 - a slight raised area in the northern half of the circle. This feature is very difficult to see and the white dashed line marking its extent in the image can only be an approximation; its extent may continue slightly off the right side of the image. Facing south.	05/11/2020	Fig 21
4266	F7, stone 1	Slight erosion hollow around stone 1, F7. F7 is difficult to see but is partially visible to the left of stone 1 (centre, left). View facing south east.	05/11/2020	Fig 16
4572	F4, stone 6.	View showing the northern end of feature 4, a slight bank which appears to terminate before reaching stone 6. The slight erosion hollow around stone 6 is just visible. View facing south west.	05/11/2020	Fig 14
4573	F4, stone 6.	View showing the northern end of feature 4, a slight earthwork bank. The feature is very subtle and does not show well in the image. Facing south west.	05/11/2020	
4574	F4, stone 6.	View showing the northern end of feature 4, a slight earthwork bank, facing north east.	05/11/2020	
4575	F4, stones 10-14.	View facing south east along feature 4 which runs across the centre of the image towards a slight raised area of ground visible in profile against the drystone wall.	05/11/2020	
4576	F4, stones 10 to 29.	View facing east showing feature 4 which although difficult to see, runs from left to right across the centre of the image. The ranging rods are on top of the feature. Part of the arc of the stone circle, from stones 10 to 29 are visible behind.	05/11/2020	
4577	F4, stones 6-23	View looking across the northern half of the stone circle, facing north north east. Feature 4 crosses the image and is indicated by the two ranging rods in the foreground.	05/11/2020	
4578	F4, F3, stone 10.	View facing south south east along feature 4 towards feature 3, a slight raised area of the bank, F24, F25 etc. which runs along the line of the wall.	05/11/2020	
4579	F3	General view of F3, a distinct mound forming part of the bank running along the line of the wall.	05/11/2020	Fig 12
4580	F3	Close up view of F3, a distinct mound forming part of the bank running along the line of the wall.	05/11/2020	
4581	N/A	View of modern field drain immediately west of the stone circle - visible in the grass as a narrow stripe which is more brown/yellow than the surrounding vegetation.	05/11/2020	
4582	N/A	View facing north showing the line of a modern field drain to the west of the stone circle.	05/11/2020	
4583	F1	View of slight curvilinear bank F1, facing south west. It is unclear if this is archaeological in origin or to do with more recent activity - some fine gravel is visible in the image which may reflect material put down in the field entrance in an area that is visibly quite wet.	05/11/2020	Fig 10
4584	F1	View of slight curvilinear bank F1, facing south west. Some fine gravel is visible in the image which may reflect material put down in the field entrance in an area that is visibly quite wet.	05/11/2020	

Photo No	Feature numbers	Photo description	Date	Rep Fig No
4585	N/A	View of patch of fine stone on the south west side of the stone circle, facing north.	05/11/2020	
4586	F1	General view of the area to the west of the stone circle. The patch of fine stone and the modern field drain running away from the waterlogged area are evident.	05/11/2020	Fig 11
4587	F1	General view of part of F1. Facing west.	05/11/2020	
4588	F1	Partial view of F1 facing south west.	05/11/2020	
4589	Stones 6, 5, 4.	East facing elevation of stone 6. Stones 5 and 4 are evident in the centre and right of the image.	05/11/2020	Fig 42
4590	Stones 4-3.	East facing elevation of stones 4 and 3. Part of stone 5 is visible on the far left. View facing west.	05/11/2020	
4591	Stones 6, 5, 4, 3.	East facing elevation of stones 4 and 3. Part of stone 6 is visible on the far left. Stone 5 is visible on the ground, embedded in the grass, centre left. View facing west.	05/11/2020	Fig 41
4592	Stones 2 and 1.	East facing elevations of stones 2 (left) and 1 (right). View facing west.	05/11/2020	Fig 40
4593	Stones 1, 40 and 39.	South east facing elevation of stones 40 (centre, left) and 39 (centre, right). Stone 1 is partially visible on the left hand side of the image.	05/11/2020	Fig 18
4594	Stone 38	Stone 38, view facing north.	05/11/2020	Fig 57
4595	Stones 40, 39, 38.	General view of stones 40, 39 and 38 (from left to right). Facing north west.	05/11/2020	
4596	Stones 37, 36 and 35.	View of stones 37, 36 and 35 (from left to right). Facing north.	05/11/2020	Fig 56
4597	Stones 37, 36, 35, 34 and 33).	View of stones 37 to 33 (from right to left) facing north.	05/11/2020	
4598	Stones 35, 34 and 33. The edge of stone 32 is just visible on the right hand side of the image.	View of south facing elevation of stones 35, 34 and 33, facing north. Two smaller stone fragments shown on the YDNPA survey are hidden behind the left hand side of the largest central stone (number 34).	05/11/2020	
4599	Stones 33, 34, 35, J, K, L.	North facing elevations of stones 33, 34 and 35. Two smaller stones (L&K) are evident embedded in the grass with the one nearest the camera (L) noteworthy for being sandstone - a different lithology to most of the stones. The latter two are not shown on the 1880 survey.	05/11/2020	Fig 20
4600	Stone 32, 33 and 34.	View facing north of stone 32. Stone 33 and part of stone 34 are visible on the left of the image.	05/11/2020	Fig 54
4601	Stones 31 and 30.	View facing north showing the south facing elevations of stones 31 (left) and 30 (right). F13, an erosion hollow on the south side of stone 31 is also visible.	05/11/2020	Fig 22
4602	Stone 29, 28.	View facing north showing the south facing elevation of stone 29. The edge of stone 28 is visible on the far left of the image.	05/11/2020	Fig 54
4603	Stone 28, 29, 27.	View facing north east, showing the south east facing elevation of stone 28. Note the unusual formation visible in the Shap Pink Granite, forming several lines crossing this face of the stone - this is thought to be a natural geological formation - but one which is very visually prominent when visiting the site. The edges of stones 29 and 27 are visible on the left and right sides of the image.	05/11/2020	Fig 53
4604	Stones 28, I	View showing small stone I next to the eastern side of stone 28, facing north.	05/11/2020	Fig 64
4605	Stone 27, 26.	View facing north, showing the south facing elevation of stone 27. Stone 26 is partially visible to the right.	05/11/2020	
4606	Stone 26.	View of stone 26 facing north east. Stones 27 and 25 are partially visible on the left (27) and right (25), as well as an additional small stone in front of stone 25 on the right hand side.	05/11/2020	Fig 24, 52
4607	Stones 25, H	View of stones 25 (the larger of the two) and H facing north east, showing the south west facing elevation. The second smaller stone (stone H) is not shown on the 1880 survey.	05/11/2020	Fig 63
4608	Stone 25, 26, 27.	View of the south east facing elevation of stone 25. Stones 26 and 27 are evident behind, along with the small stone next to 25 which is not shown on the 1880 survey. The erosion hollow F16 is within the image but not especially visible.	05/11/2020	
4609	Stone 27, stones 26 & 28	North east elevation of stone 27, view facing south west. Stones 28 (top right) and 26 (top, centre left) are partially visible. Feature 15, a partial erosion hollow is visible around the side of the stone facing the camera.	05/11/2020	
4610	Stone 24	View of the east facing elevation of stone 24, facing west.	05/11/2020	
4611	Stones 24, G	View of the south facing elevation of stone 24, with a second small stone (Stone G) just visible in the turf in front of it. The latter is not marked on the 1880 survey.	05/11/2020	Fig 29

Photo No	Feature numbers	Photo description	Date	Rep Fig No
4612	Stone 23, F20.	Wider view of stone 23, showing F20, a slight erosion hollow which is partially waterlogged in the image. Stones 25-27 are visible in the background. View facing north west.	05/11/2020	Fig 30
5130	N/A	Working shot - volunteers undertaking resistance survey.	11/05/2021	
5131	N/A	Working shot - volunteers undertaking resistance survey.	11/05/2021	
5132	N/A	Working shot - volunteers undertaking resistance survey.	11/05/2021	
5133	F28	South facing view of feature 28 - short earthwork bank, part of a longer boundary.	12/05/2021	
5134	F28	South facing view of feature 28 - short earthwork bank, part of a longer boundary.	12/05/2021	
5135	F28	South east facing view of feature 28 - short earthwork bank, part of a longer boundary.	12/05/2021	Fig 38
5136	F28 and F27	South facing view showing the ends of features 28 (left) and 27 (right) and the apparent gap between - banks are sections of a longer earthwork boundary.	12/05/2021	Fig 39
5137	F27	South facing view of F27 - distinct raised section of bank, which is part of a longer earthwork bank boundary.	12/05/2021	Fig 37
5138	F27	West facing view of F27 - distinct raised section of bank, which is part of a longer earthwork bank boundary.	12/05/2021	
5139	N/A	Working shot - volunteer placing ranging rods.	12/05/2021	
5140	F26	South facing view of F26 - short section of raised bank, which is part of a longer earthwork boundary.	12/05/2021	Fig 36
5141	F27	East facing view of F27 - distinct raised section of bank, which is part of a longer earthwork bank boundary.	12/05/2021	
5142	F25	South facing view of F25 - Section of bank, south of stone 20, forming part of a longer earthwork boundary.	12/05/2021	
5143	F25	Close up view of F25 - south facing, part of a longer earthwork boundary.	12/05/2021	
5144	F25	South west facing view across part of F25.	12/05/2021	Fig 35
5145	F21	West facing view of F21, a shallow sub circular hollow north east of stone 20. Disturbance from moles is evident.	12/05/2021	
5146	F21?	East facing view of F21? F21, a shallow sub circular hollow north east of stone 20 is difficult to identify in this view. Disturbance from moles is evident.	12/05/2021	
5147	F24, F3	View west along F24, from stone 12, forming part of the longer earthwork boundary. F3, an earthen mound, is visible in the distance.	12/05/2021	Fig 34
5148	F24	View south east along F24, part of the longer earthwork boundary.	12/05/2021	
5149	F3	View east along the north side of the drystone wall, showing the earthen mound F3.	12/05/2021	
5150	F3	View facing south of earthen mound F3.	12/05/2021	
2651	F6, stones 2,3 & 4	South east facing view of slight slope scarp F6 on the outside of the circle, with stones 2, 3 and 4 visible from left to right.	12/05/2021	
2652	F6, stones 2,3 & 4	View facing north west of F6, slight slope scarp on the outside of the circle. Stones 2, 3 and 4 are visible on the right hand side, with another stone in the background.	12/05/2021	Fig 15
2653	F6	Close up view of F6 facing north west.	12/05/2021	
2655	F8, stones 38, 39 & 40	Slight slope scarp F8 on the outside of the circle, with stones 38, 39 and 40 visible at centre left.	12/05/2021	Fig 16
2656	Stone 39	General view of north west arc of the stone circle, looking towards Knott. Stone 39 is visible at top centre, right.	12/05/2021	
2657	F10, stones 35-37	North west view from within the circle of F10, a possible bank remnant, with stones 37, 36 and 35 visible from left to right.	12/05/2021	
2658	F10, stones 34-40, 1-4, 6	View facing south west along the inside arc of the stone circle from stone 34, showing a view along part of F10.	12/05/2021	Fig 19
2659	F10	Repeat of shot 2658.	12/05/2021	
2660	F14, stone 29	View facing north west, looking along F14, a subtle slope scarp on the outside of the arc of the stone circle. Stone 29 is visible in the left, centre foreground.	12/05/2021	Fig 23
2661	F14, stone 29	Oblique view facing west of F14, a subtle slope scarp on the outside of the arc of the stone circle. Stone 29 is visible at centre left.	12/05/2021	
2662	F14, stones 29 & 30	Oblique view facing north east of F14 from within the stone circle. The ranging rods are located between stones 30 (centre, left) and 29 (centre, right).	12/05/2021	
2663	F13, stones 30-32	North facing view showing stones 32, 31 and 30 (from left to right) from within the stone circle. Erosion hollow F13 is just visible to the south east of stone 31.	12/05/2021	
2664	F12?	General view of the northern half of the stone circle, facing north west, from within the circle. This view looks over the area of F12 which is a very slight feature that is not clearly visible in this shot.	12/05/2021	
2665	N/A	General view of area to the north east of the stone circle. This is area was noticeably quite wet underfoot during the first batch of survey in 2020. A coloured stripe in the grass running to the right of the ranging rods may reflect a later field drain.	12/05/2021	

Photo No	Feature numbers	Photo description	Date	Rep Fig No
2666	N/A	General view of area to the north east of the stone circle, that was quite wet during the original 2020 survey. Another field drain may be reflected by a linear in the grass.	12/05/2021	
2667	N/A	General view of the area to the east of the stone circle, showing part of the geophysical survey grid which is indicated by the red grid peg, facing south east.	12/05/2021	
2668	N/A	General view of the geophysical survey grid to the east of the stone circle, facing north west.	12/05/2021	
2669	N/A	General view of the area to the north east of the stone circle, with a possible field drain indicated by a green stripe in the grass running from the centre towards the top right hand corner of the image.	12/05/2021	
2670	N/A	General view of the area to the north east of the stone circle, with a possible field drain running to the right of the ranging rods towards the top left hand corner of the image.	12/05/2021	
2671	N/A	General view of the area to the east of the stone circle, with part of the geophysical survey grid visible.	12/05/2021	

13.1 Survey feature images



Figure 10: View of slight curvilinear bank F1, facing south west. It is unclear if this is archaeological in origin or to do with more recent activity - some fine gravel is visible in the image which may reflect material put down in the field entrance or a more recent disturbance.



Figure 11: Short length of very slight curvilinear bank F2. Facing north west.



Figure 12: General view of F3, a distinct mound forming part of the bank running along the line of the wall. Facing south.



Figure 13: View of bank F4 facing south west.



Figure 14: View showing the northern end of F4, a slight bank which appears to terminate before reaching stone 6. The slight erosion hollow around stone 6 (F5) is difficult to see. View facing south west.



Figure 15: View facing north west of F6, slight slope scarp on the outside of the circle. Stones 2, 3 and 4 are visible on the right hand side, with another stone in the background.



Figure 16: Slight erosion hollow around stone 1, F7. F7 is difficult to see but is partially visible to the left of stone 1 (centre, left). View facing south east.



Figure 17: Slight slope scarp F8 on the outside of the circle, with stones 38, 39 and 40 visible at centre left.



Figure 18: F9, an area of erosion and surface poaching around stones 39 and 40, although no significant hollow is evident.



Figure 19: View facing south west along the inside arc of the stone circle from stone 34, showing a view along the south facing side of F10, interpreted as a bank remnant.



Figure 20: North facing elevations of stones 33, 34 and 35. Two smaller stones (L&K) are evident embedded in the grass within erosion hollow F11, right of centre. The stone nearest the camera (L) is noteworthy for being sandstone - a different lithology to most of the stones. Stone J is also just visible within the white oval. The latter three stones are not shown on the 1880 survey. View facing south.



Figure 21: General view of F12 - a slight raised area in the northern half of the circle. This feature is very difficult to see and the white dashed line marking its extent in the image can only be an approximation; its extent may continue slightly off the right side of the image. Facing south.



Figure 22: View facing north showing the south facing elevations of stones 31 (left) and 30 (right). F13, an erosion hollow on the south side of stone 31, is also visible.



Figure 23: View facing north west, looking along F14, a subtle slope scarp on the outside of the arc of the stone circle. Stone 29 is visible in the left, centre foreground.



Figure 24: North east elevation of stone 27, view facing south west. Stones 28 (top right) and 26 (top, centre left) are partially visible. Feature 15, a partial erosion hollow is visible around the side of the stone facing the camera.



Figure 25: General view of stone 25, showing its south facing elevation. Stones 26, 27 and 28 are visible in the background. View facing west. F16, a slight erosion hollow around stone 25 is evident.

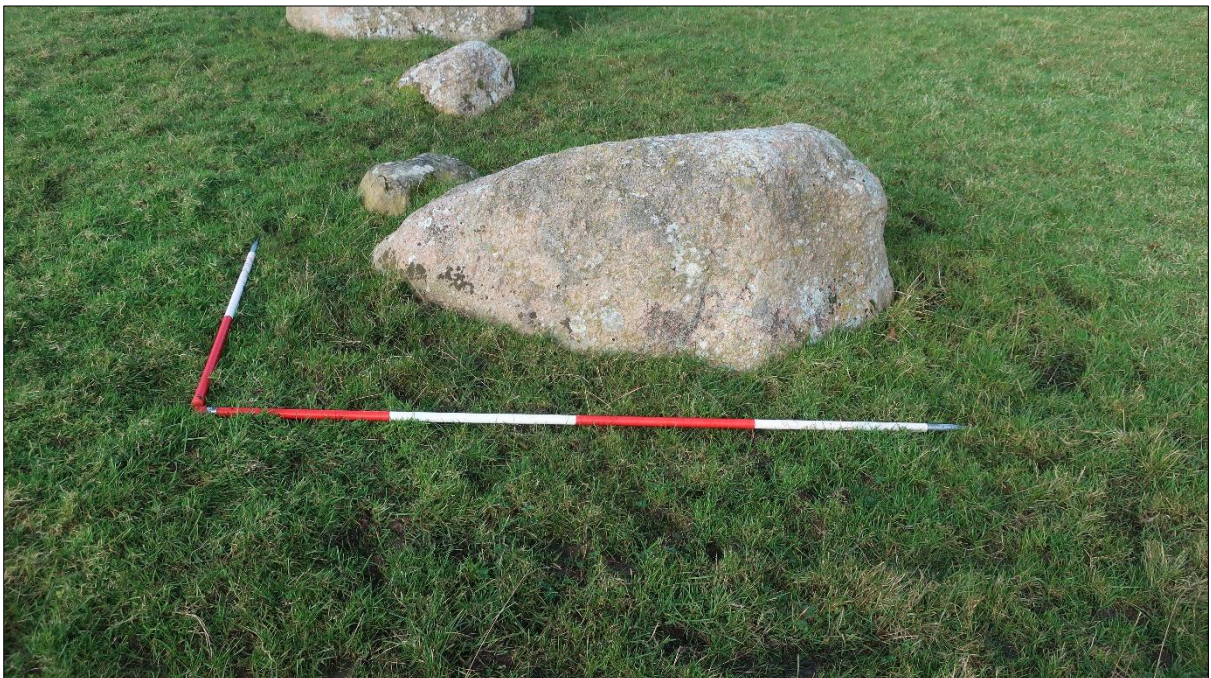


Figure 26: View of the south east facing elevation of stone 25. Stones 26 and 27 are evident behind, along with the small stone next to 25 which is not shown on the 1880 survey. The erosion hollow F16 is within the image but not especially visible.

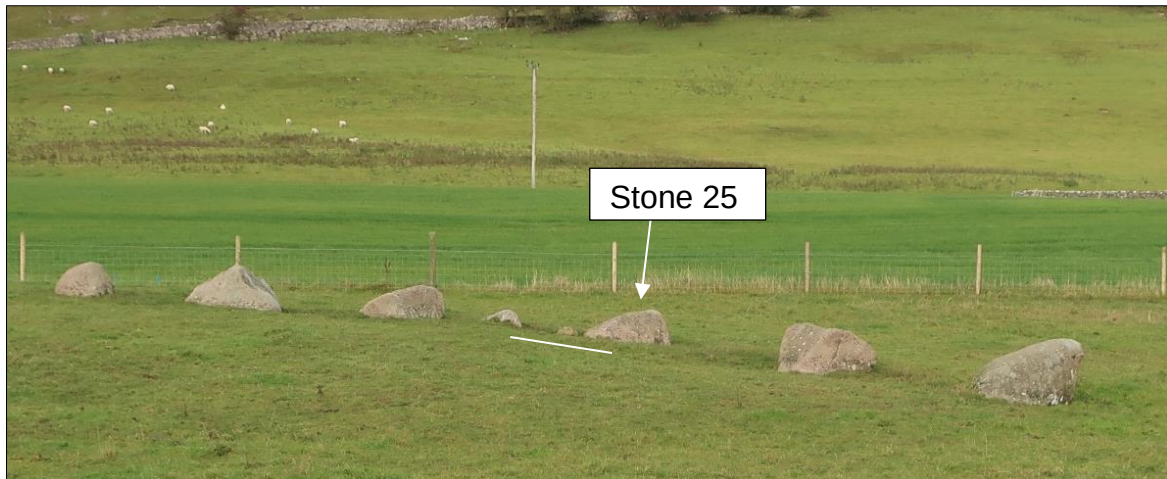


Figure 27: F17, two breaks of slope on the inside of the circle. The innermost break of slope is marked by the white line, whilst the second break of slope is between this and stone 25. The innermost could be a remnant of the bottom edge of a bank and appears to follow the arc of the circle round. The adjacent curvilinear break of slope, east of the former, which forms a top, may be part of another erosion hollow which has formed around stone 25.



Figure 28: F18, a slight break of slope (marked by the white line) which may be a remnant of a bank edge on the outside of the circle, which appears to follow the arc of the circle. It might therefore be related to F17 - a possible trace of an inner edge of the bank, on the inside of the circle.

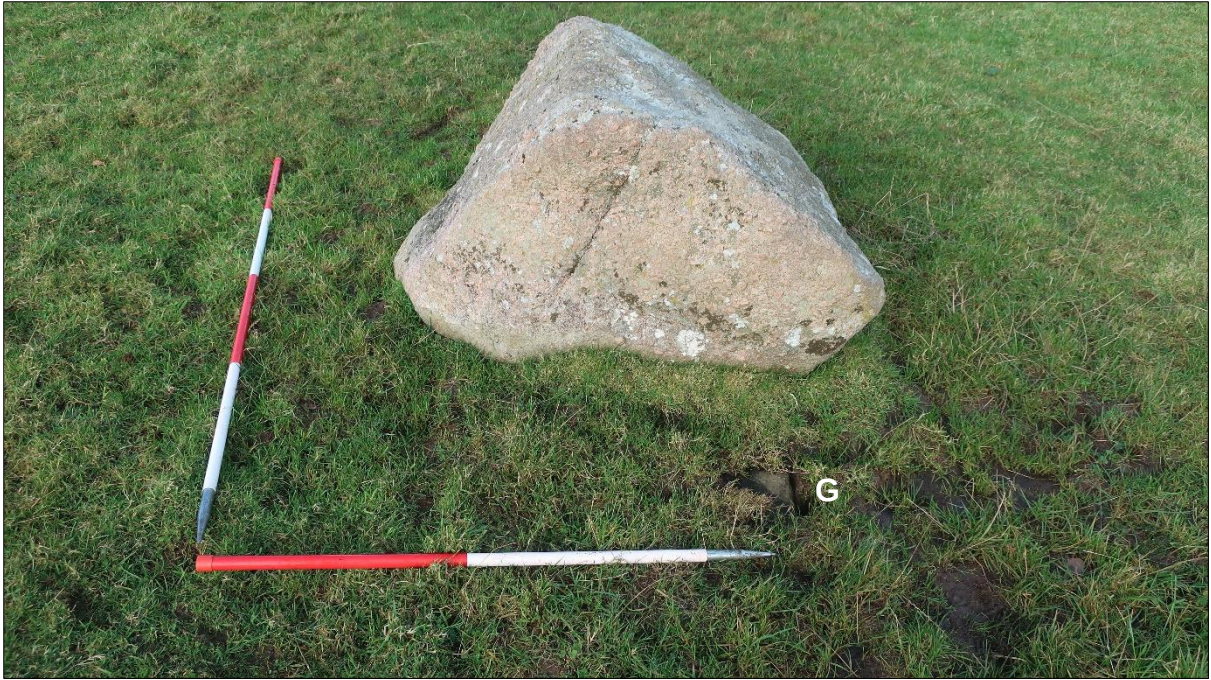


Figure 29: View of the south facing elevation of stone 24 and erosion hollow F19, with a second small stone (Stone G) just visible in the turf in front of stone 24. The latter is not marked on the 1880 survey.



Figure 30: Wider view of stone 23, showing F20, a slight erosion hollow which is partially waterlogged in the image. Stones 25-27 are visible in the background. View facing north west.



Figure 31: F21, a slight oval hollow with a flat base (marked by the dashed white oval) near to stone 20. The 1880 survey recorded a stone on one side of this feature which is now absent or completely buried. This is likely to be a former stone socket or erosion hollow around a now lost stone. The fabric tapes visible were being used to layout the geophysical survey grid. Facing south east.

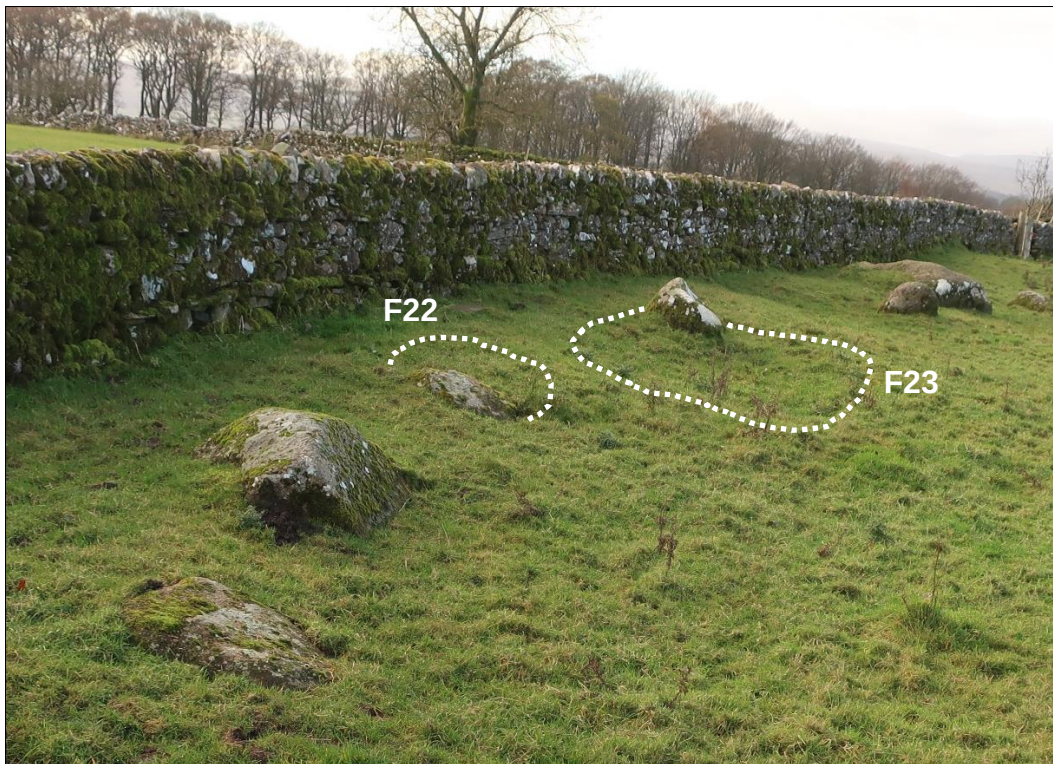


Figure 32: F22 (white dashed line), a partial hollow in the earthwork bank, with a stone A at its eastern edge. The form of F22 as a partial, c-shaped hollow suggests it is an erosion hollow. A smaller stone (M) was located on the southern side of stone A, noted as being sandstone. F23 is also clearly visible as a broad oval hollow.

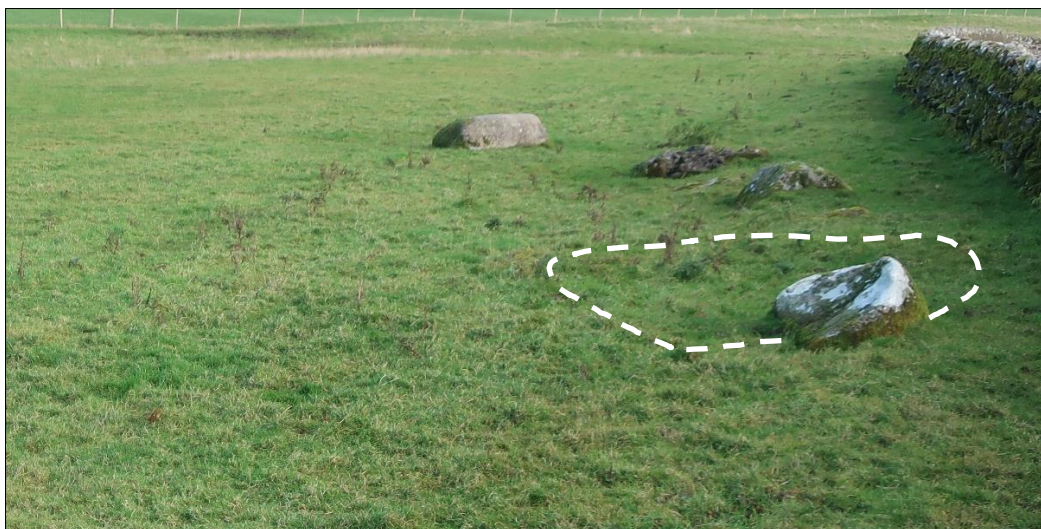


Figure 33: F23 (white dashed line), a slight circular hollow between stone 15 and F22. F23 may be the result of disturbance which would account for the apparent loss of the northern most larger stone of a pair labelled as no 16 on the 1880 plan.



Figure 34: View west along F24, from stone 12, forming part of the longer earthwork boundary. F3, an earthen mound, is also visible in the distance.



Figure 35: South west facing view across part of F25 – an earthwork bank evident on the north side of the wall.



Figure 36: South facing view of F26 - short section of raised bank, which is part of a longer earthwork boundary.



Figure 37: South facing view of F27 – a distinct raised section of bank, which is part of a longer earthwork boundary.



Figure 38: South facing view of F28 – a short section of earthwork bank, forming part of a longer boundary.



Figure 39: South facing view showing the ends of features 28 (left) and 27 (right) and the apparent gap between. The banks are sections of a longer earthwork boundary.

13.2 Stones recorded in 1880



Figure 40: East facing elevations of stones 2 (left) and 1 (right). View facing west.



Figure 41: East facing elevation of stones 4 (centre) and 3 (right). Part of stone 6 is visible on the far left. Stone 5 is visible on the ground, embedded in the grass, centre left. View facing west.



Figure 42: East facing elevation of stone 6 (centre left). Stones 5 (centre, foreground right) and 4 (right) are also visible.



Figure 43: View of stone 10, facing south west.



Figure 44: Stone 11 (right), view facing south. Stone 12 is also visible (left).



Figure 45: View of stones 11 (right), 12 (centre) and 14 (left) facing south.



Figure 46: General view of southern side of stone circle showing stones 15, 14, 12, 11 and 10 from left to right. Facing west.



Figure 47: General view of stones 19, 18, 17 and stone A, from left to right, facing south.



Figure 48: Close up view of stone 17, with stone 18 visible to the left, facing south.



Figure 49: A close up view of stone 19, showing detail of weathering and solution holes in the limestone. Stone 19 is unusual in being the only limestone stone of the circle. Facing south west.



Figure 50: General view of stones 20, 19, 18 and 17 (from left to right) on the south east side of stone circle, facing south east. The ranging rods are in front of stone 19, notable for being a different lithology - limestone.



Figure 51: View of stone 20, facing south east.



Figure 52: View of stone 26 facing north east. Stones 27 and 25 are partially visible on the left (27) and right (25), as well as an additional small stone (H) in front of stone 25 on the right hand side.

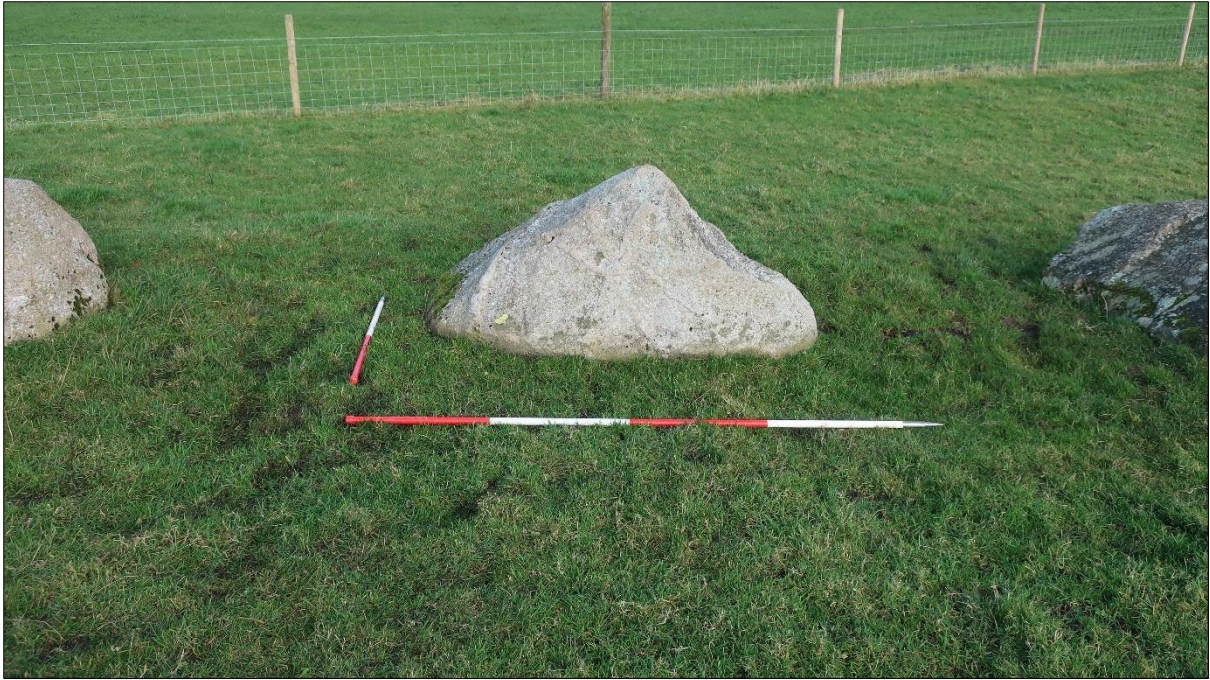


Figure 53: View facing north east, showing the south east facing elevation of stone 28. Note the unusual formation visible in the Shap Pink Granite, forming several lines crossing this face of the stone - this is thought to be a natural geological formation – but one which is very visually prominent when visiting the site. The edges of stones 29 and 27 are visible on the left and right sides of the image.



Figure 54: View facing north showing the south facing elevation of stone 29. The edge of stone 28 is visible on the far left of the image.



Figure 55: View facing north of stone 32. Stone 33 and part of stone 34 are visible on the left of the image.



Figure 56: View of stones 37, 36 and 35 (from left to right). Facing north.



Figure 57: Stone 38, view facing north.

13.3 Stones A to N – recorded by YDNPA survey



Figure 58: Stone A is shown in the centre, with stone M below it. Facing north.



Figure 59: General view of stone 'B'. A sandstone slab found immediately south of the circle but it is not thought to be part of it. It more likely derives from walling material and is of similar size to slabs used in the stone wall. Stone B is not shown on the 1880 survey. Facing south.



Figure 60: Context of stone D (white oval), a buried stone partly protruding through the turf at the southern end of F4. It may have been buried by bank F4 or form part of this feature. It is unclear whether stone D is related to the stone circle and it was not shown on the 1880 survey. Facing south.



Figure 61: Detail view of stone D, facing north east.



Figure 62: Close up of two small stones marked with white ovals (E & F) lying adjacent to stone 23 which were plotted on the YDNPA survey. These may correspond to some of the 6 fragments which were recorded around stone 23 on the 1880 survey and labelled collectively as stone 22 - although those shown on the 1880 survey are larger and not in the same place as E & F. Facing north.

Note - for stone G see figure 29.



Figure 63: View of stones 25 (the larger of the two) and H facing north east, showing the south west facing elevation. The second smaller stone (stone H) is not shown on the 1880 survey.



Figure 64: View showing small stone I (white oval) next to the eastern side of stone 28, facing north.



Figure 65: Detail view of stone J, facing south west.



Figure 66: Detail view of stones K and L. Facing south west.

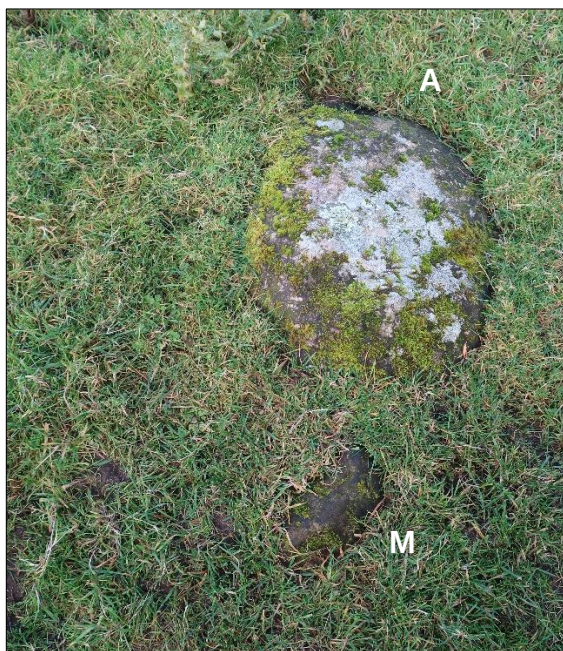


Figure 67: Stone M, a small stone to the south of stone A. Facing north.



Figure 68: Stone N - a small stone located between stones 33 (bottom) and 34 (top), not recorded on the 1880 survey. Facing west.

14 Appendix 4 – technical note on processing and georeferencing of resistivity survey data

14.1 Gamelands resistivity data processing

By Dr Jackie Hooley

⁵Note: the following applies to the first batch of resistance survey undertaken in 2020 (area A on figure 69).

14.1.1 2020 resistivity survey – area A

The resistivity equipment used by LAS is an MM resistivity, model 216M, with bespoke frame with probes set 1m apart. The readings are stored automatically in memory as they are collected and are secure even if the unit is turned off or the batteries removed. The downloaded data is read into an excel spreadsheet and copied into the first of 2 excel workbooks provided by Snuffler geophysics software. The first workbook uses a macro to reformat the corrected data into the correct array for processing by the second workbook. Snuffler is free software and is quite old and, by modern standards, quite basic and time consuming. However, it has the big advantage of being quite transparent in operation and allows for simple manual correction of any errors before processing.

In the Gamelands case the 5 quadrats in area A were very similar in max, min and range values, so required very little post processing. The data (in this case still essentially the raw data) was then processed to produce a greyscale picture of each quadrat in turn. These were pieced together in the correct orientations.

The greyscale macro allows either linear or log scale plots to be produced. The latter accentuates the lighter, low resistivity areas (figure 70 and figure 71).

The majority of the effort in data processing is in correcting the raw data. While LAS members have had a lot of experience with the equipment, errors during operation are inevitable and cannot be corrected in the field. Common problems are spurious readings, where the probes record a reading before being pushed in (double beep alerts the operator), missing end of row markers or, in the case of the Gamelands site, missing points due to rocks preventing insertion of probes. LAS has developed a robust methodology for recording errors as they occur in the field so that they can be simply corrected with confidence in the data later. There were very few errors in the data for this survey.

Quadrat 4 was an odd shape, with a small block cut out at the south end but the software requires rectangular blocks. To accommodate the odd shape, zeros were added into the data file at the correct row ends. In addition, the equipment failed in row 28, part way through the row. It was turned off and the batteries changed. Once restarted, a number of points were taken again. This was clearly recorded at the time

⁵ Additional notes shown in italics in appendix 6 were written by the author of the main report.

and it was possible to see, in the data, where the errors occurred and piece together correct data for the row.

The reference probes were moved 3 times but the data across the site was reasonably consistent. By adjusting the maximum and minimum for the greyscale plots it was possible to produce plots needing no additional edge matching.

Commentary on data corrections:

Quad 1

6th end of row missing. Added in.

Quad 2

Row 11 and 12 - marked missing points are stone. Nominal 5000 value put in to ensure black in grayscale

Row 19 - missing point. After comparison with points each side the last point was duplicated.

Row 23 - missing point. After comparison with points each side the first point was duplicated.

Row 25 - 0 value at the start – left in.

Quad 3

Row 15 - extra point. After careful comparison with each side point 6 appeared to be an anomaly so removed.

Quad 4

Row 4 - 3 points missing. After comparison with each side missing points assumed at the end (the lower edge of the quadrat) and 0 values added.

Row 5 - 2 points missing. As above 0s added at the beginning.

Row 6 - extra EOR within the data in error. Deleted.

Row 16 - 0 in data at beginning. Left in.

Row 20 onwards - only 20 points as per the diagram. Zeros inserted at beginning and ends of rows as appropriate.

Row 28 - This was the point where the equipment stopped reading and batteries changed. The first 18 points and last 2 points appeared correct. Data between were duplicated readings and were deleted.

Quad 5

Row 12 - data starts with a zero. Left in place.

Edge matching of greyscale was achieved by assigning maximum and minimum values. Quads 1 and 2 max 1300, min 570. Quads 3 and 4 Max 1390, min 743. Quad 4 max 1500, min 700. The probes were in the same place for 1 and 2, then moved for 3 and 4 and then again for 5 leading to the slight change in the max and min readings.

14.1.2 2021 resistivity survey – areas B and C

The following note applies to the second batch of resistance survey undertaken in 2021 which was processed using the same methods as above (areas B and C on figure 69):

The solid line clearly visible in figure 72 was present in the data. It did have some structure and was not just solid but appeared to be denoting very high resistance. It seems most likely to be a recording error (perhaps a temporary change of gain). A subsequent plot was produced by replacing the suspect data with the average of the points on each side (Figure 73).

Some additional processing was therefore deemed necessary on quad 2 and the author agrees that the two lines of high resistance readings were most likely an error in the data, caused by either a malfunction of the equipment or user error and should be processed out on the final results plot. Both the primary grayscale plot of the data showing this anomalous artefact and the edited plot with this apparent error processed out are reproduced in section 15.2.

14.2 Ground conditions, georeferencing of resistivity images and final combined plots –technical note

By Douglas Mitcham

The geophysics were undertaken by YDNPA volunteers and Lunesdale Archaeology Society in two different periods of fieldwork, with area A surveyed on the 22nd of October 2020 and areas B and C surveyed during Spring 2021 using the same equipment and methods (figure 69). Ground conditions and government restrictions meant that the work had to be done in blocks as and when possible and it was decided to partially overlap the original survey area to ensure no gaps were left between. Due to the survey work being done under differing ground conditions there is an inevitable imbalance in the background readings – it is thought this was caused by the ground being considerably wetter during the survey of area A (leading to widespread areas of very low resistance especially towards the edges of the survey area), compared to areas B and C when slightly drier ground allowed further survey into these areas. In order to balance this out, the display contrast and brightness values for the image layers in QGIS were edited for areas B and C to achieve a best fit and the image used for interpretation of area A was one produced which emphasised the medium and higher readings more – thereby reducing the prevalence of the widespread very low background values. Where the data overlaps between the areas both images were consulted and a best fit achieved for the interpretation drawings. 20m sized grids were laid out by hand using a system of triangulation from baselines laid out with ranging rods with the grid points then surveyed in using an RTK GPS. The surveys were done using the LAS owned bespoke resistance frame with readings taking at 1m x 1m intervals. The results

plots were georeferenced using RTK GPS survey data of the grid points in QGIS Essen 2.14.8, and 3.22.11-Białowieża. The RTK GPS was capable of achieving a horizontal positional accuracy of circa 5mm.

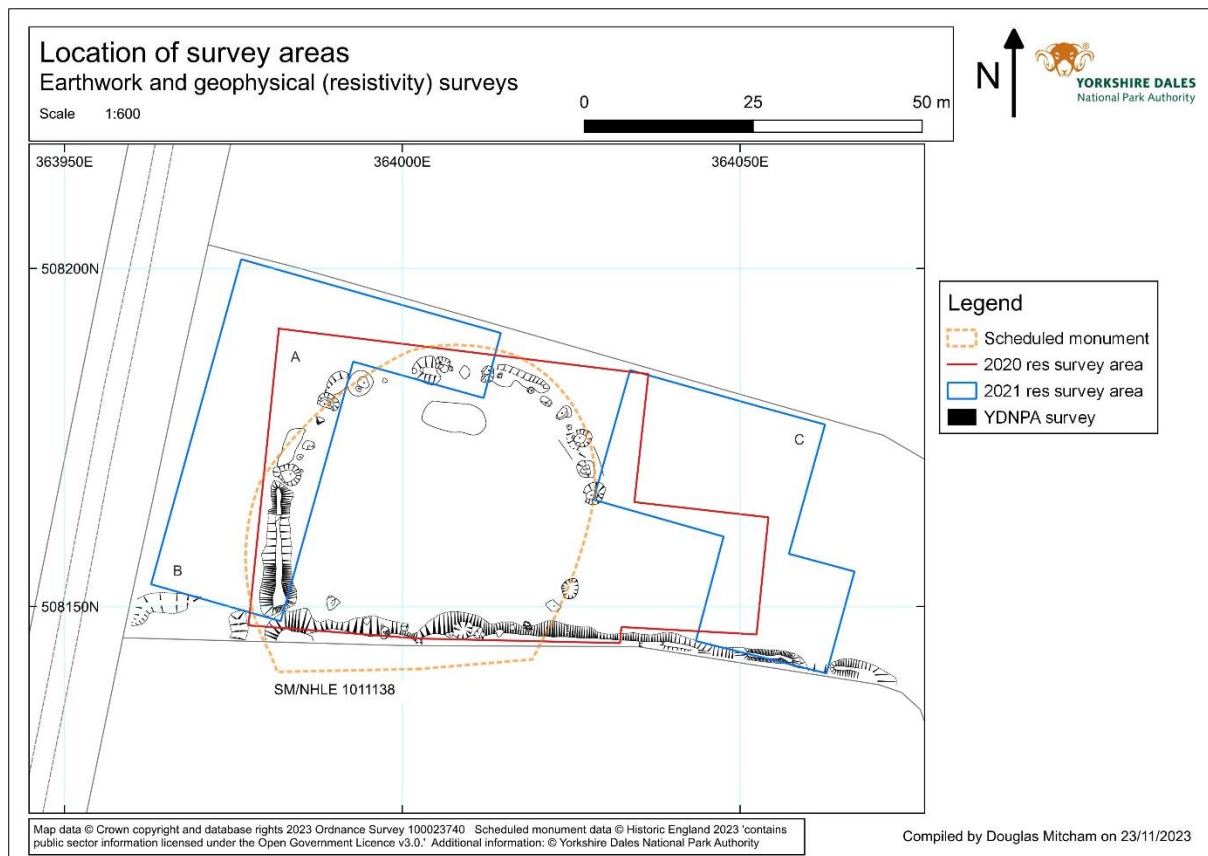


Figure 69: Location map of resistivity survey areas at Gamelands.

15 Appendix 5 – Resistivity survey results

15.1 2020 resistivity survey

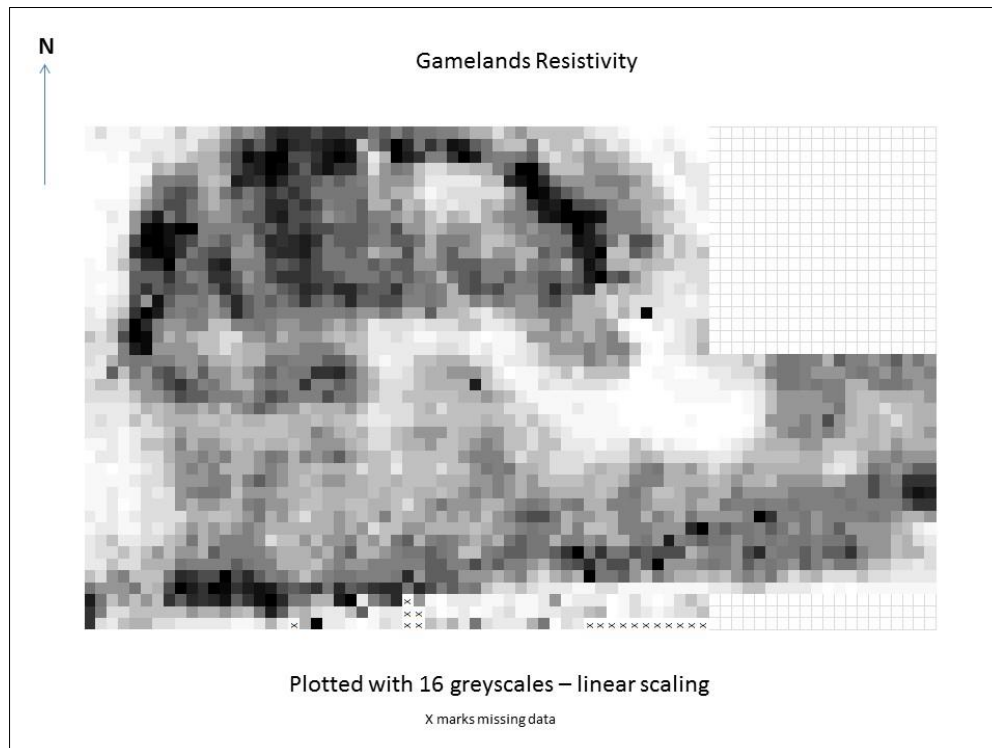


Figure 70: Resistivity survey data of Gamelands area A, shown with linear scaling. Produced by Jackie Hooley.

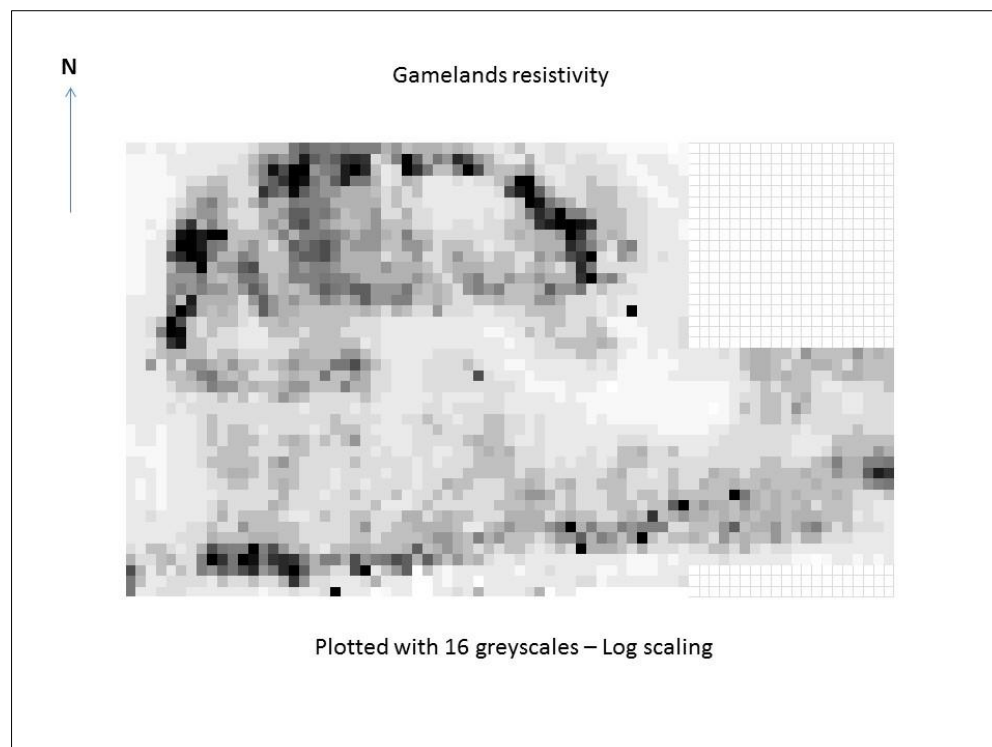


Figure 71: Gamelands resistivity survey data of Area A, shown with logarithmic scaling. Produced by Jackie Hooley.

15.2 2021 resistivity survey

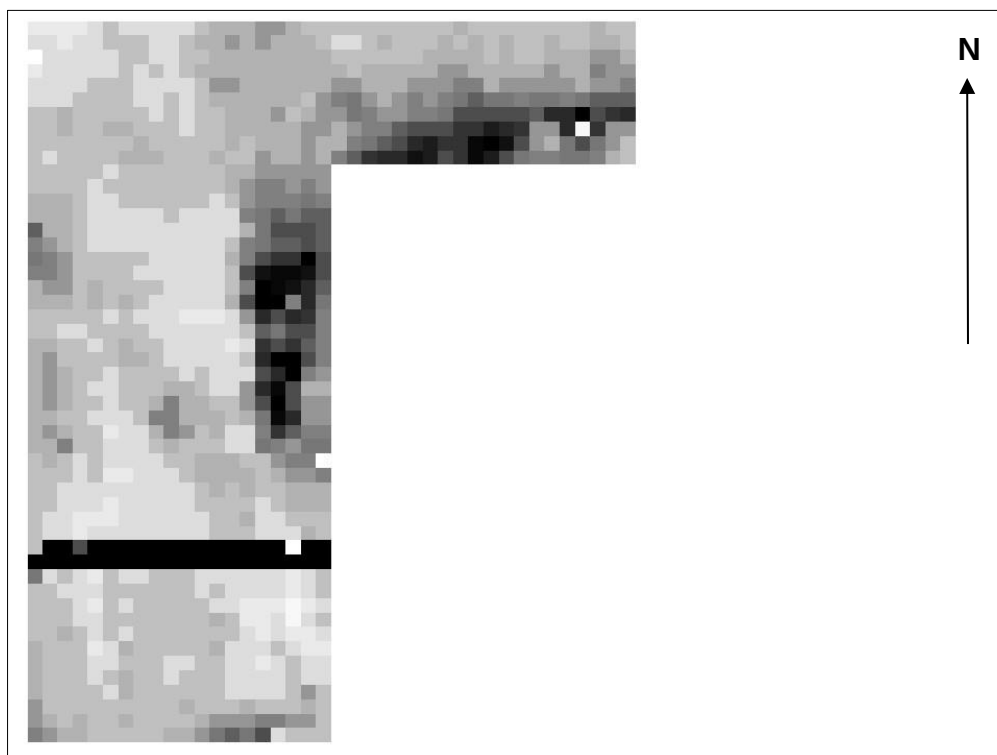


Figure 72: Resistivity survey data of area B, showing the raw data of grids 1-4 with the erroneous data artefact. Produced by Jackie Hooley.

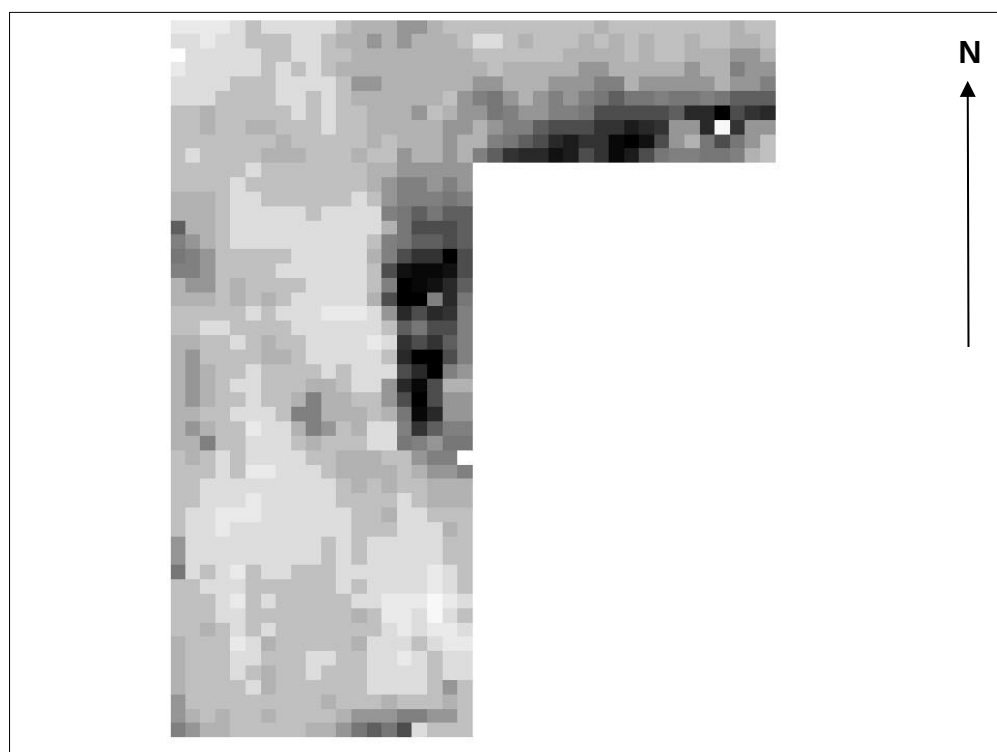


Figure 73: Resistivity survey data of area B, showing grids 1-4 after processing to remove erroneous data. Produced by Jackie Hooley.

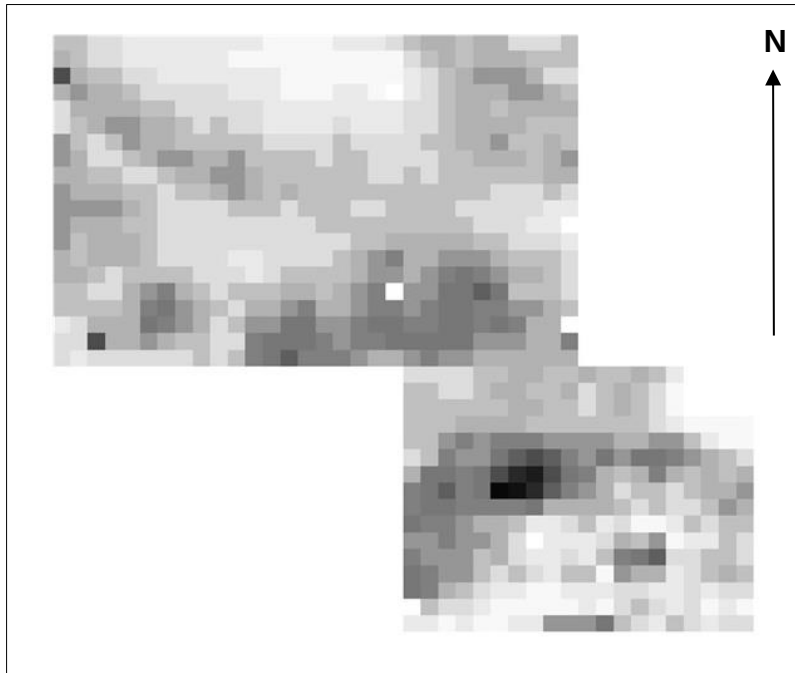


Figure 74: Resistivity survey data of area C, showing the raw data for grids 5-7. Produced by Jackie Hooley.

15.3 Combined and georeferenced resistivity data for Gamelands

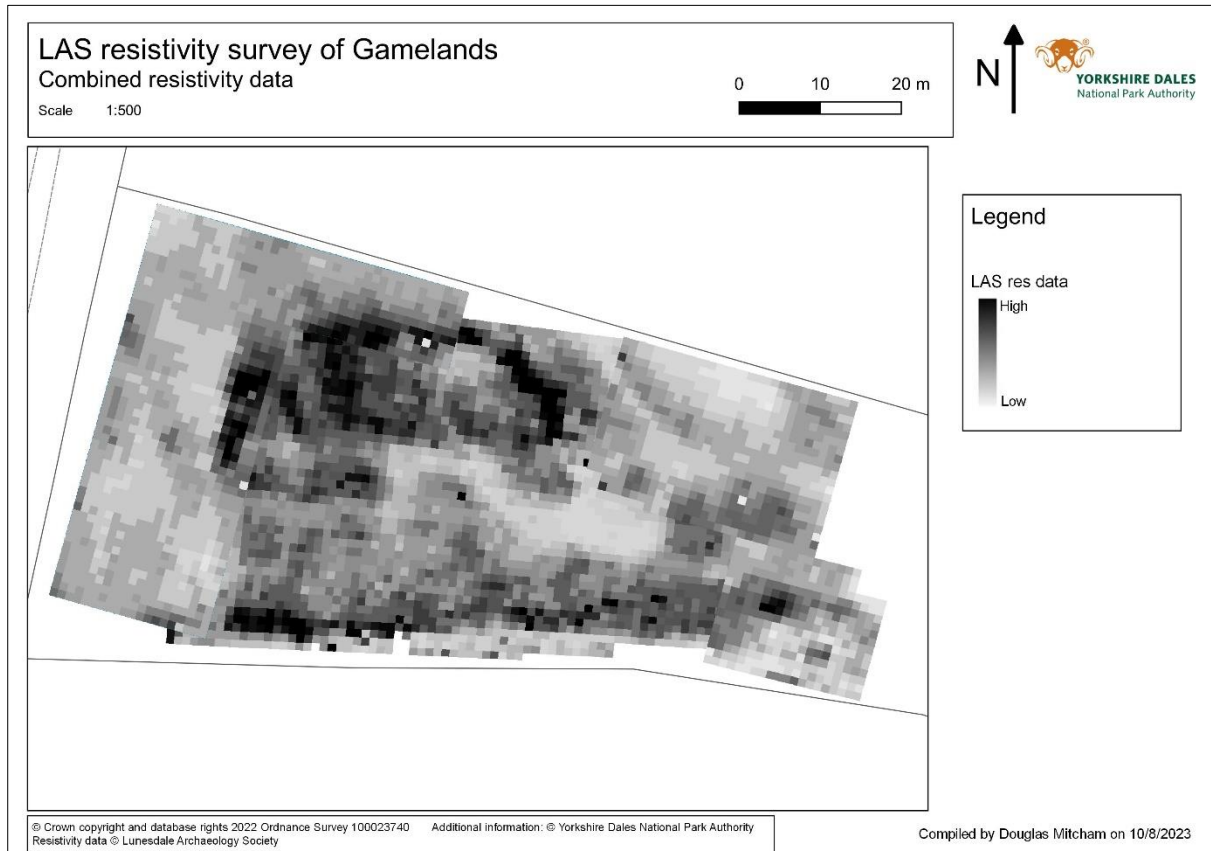


Figure 75: Combined and georeferenced resistivity survey data for Gamelands stone circle.

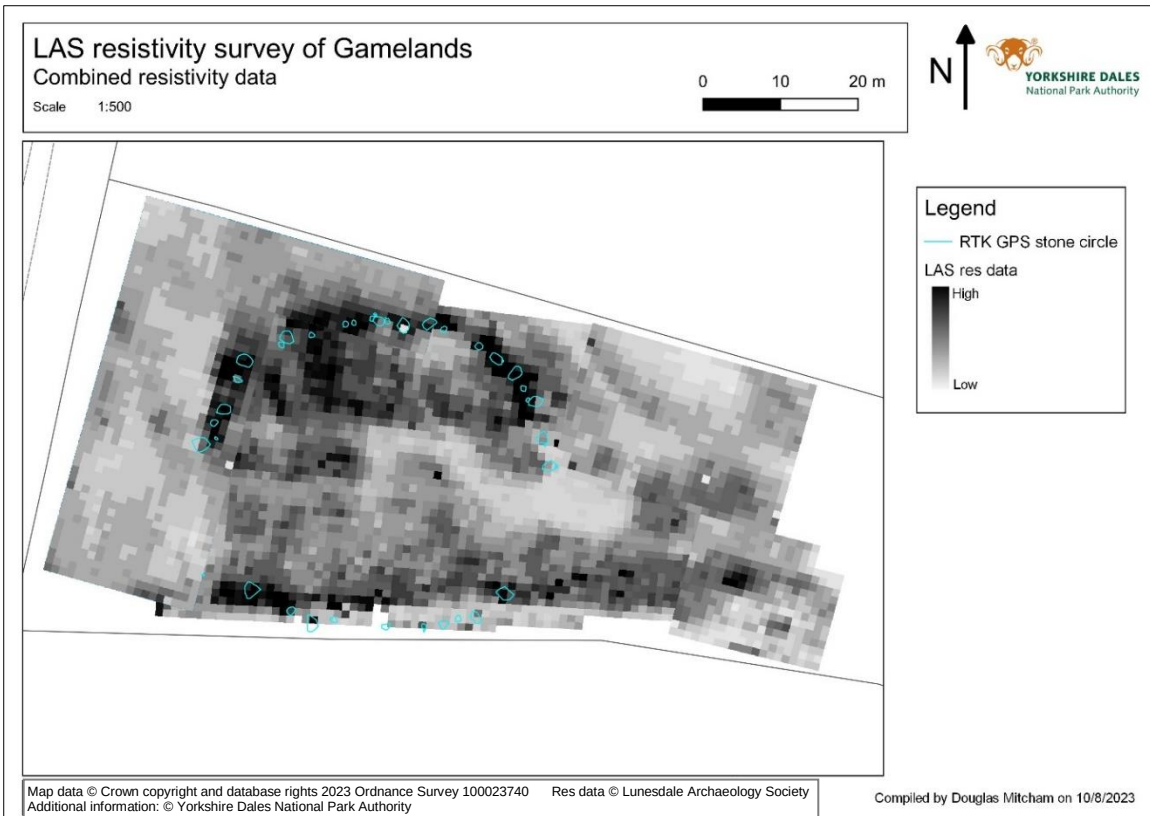


Figure 76: Combined and georeferenced resistivity survey data overlain by the GPS survey data of Gamelands stone circle.

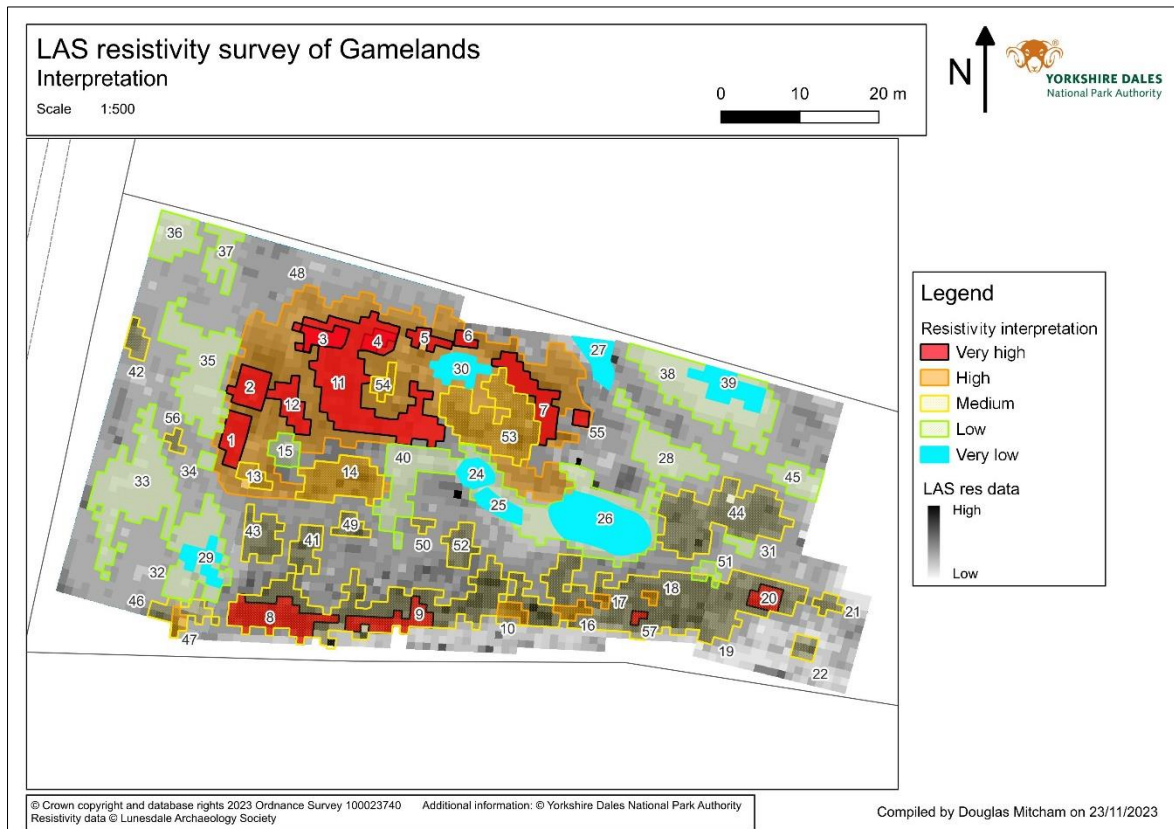


Figure 77: Interpretation drawing of resistivity survey.

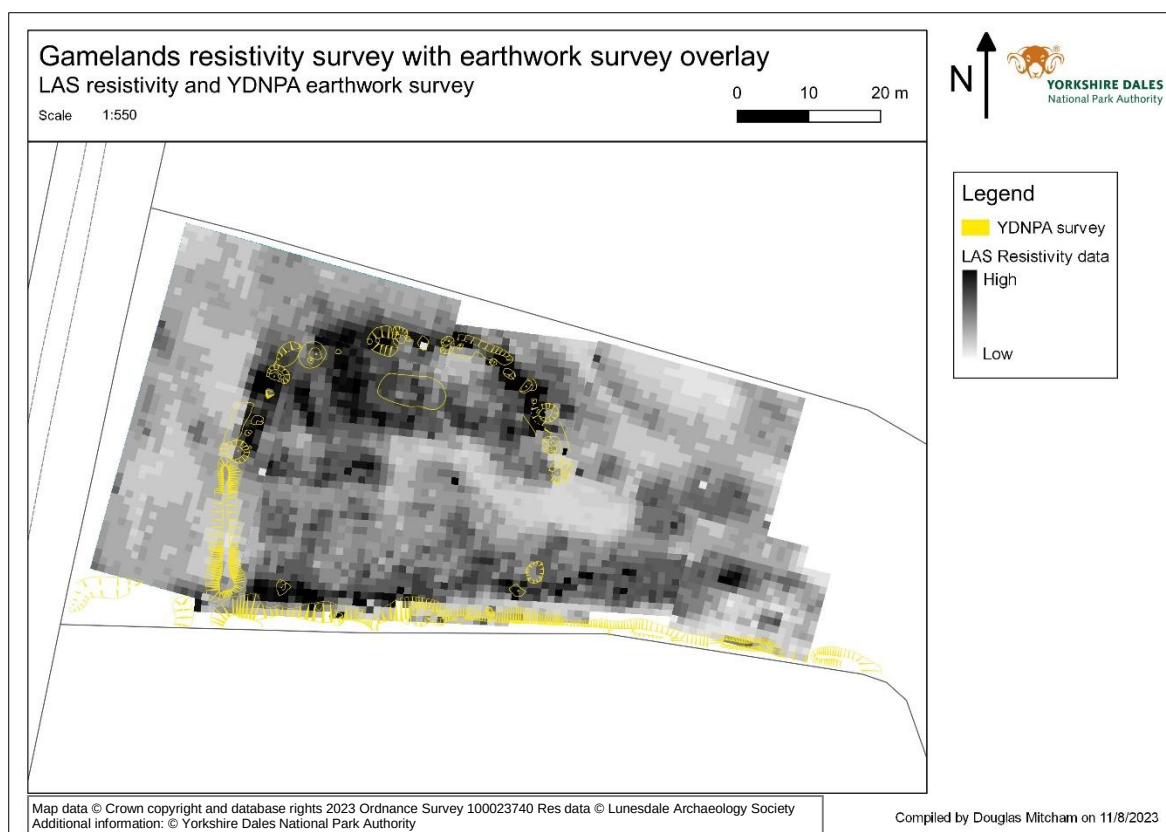


Figure 78: Resistivity survey of Gamelands with earthwork survey overlay.

Table 4: Summary of resistivity survey anomalies and their possible interpretations. Anomaly numbers reference those shown on figure 77.

Anomaly number	Anomaly type (resistance)	Description
1	Very high	Area of very high resistance around stones 3-6. Reflects both high values inserted where existing stones may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank. Likely represents archaeological features.
2	Very high	Area of very high resistance around stones 1-2. Reflects both high values inserted where existing stones may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank. Likely represents archaeological features.
3	Very high	Area of very high resistance adjacent stones 38-39. Interpreted as a stony spread of material perhaps reflecting the former bank, which could also include packing stones or further buried stones. Likely represents archaeological features.
4	Very high	Area of very high resistance around stones 34-37. Interpreted as a stony spread of material reflecting the former bank, whilst some high values reflect existing stones, but may also include packing stones or further buried stones. Likely represents an archaeological feature and anomaly 4 coincides with a slight bank on the earthwork survey. Interpreted as part of the bank associated with the stone circle.
5	Very high	Area of very high resistance around stones 31-33. Reflects both high values inserted where existing stones may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank. Likely represents archaeological features and is interpreted as a stony spread reflecting potential evidence of the former bank associated with the stone circle.
6	Very high	Area of very high resistance around stones 30-31. Reflects both high values inserted where existing stones may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank. Likely represents archaeological features and is interpreted as partly reflecting stones of the circle and a stony spread reflecting potential evidence of the former bank associated with the stone circle.

Anomaly number	Anomaly type (resistance)	Description
7	Very high	Curvilinear band of very high resistance around stones 25-29. Reflects both high values inserted where existing stones may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank. Likely represents archaeological features and is interpreted as partly reflecting stones of the circle and a stony spread reflecting potential evidence of the former bank associated with the stone circle.
8	Very high	Band of very high resistance running through stones 10-11. Reflects both high values inserted where existing stones may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank. Likely represents archaeological features and is interpreted as a stony spread reflecting potential evidence of the former bank associated with the stone circle, as well as partly reflecting stones of the circle.
9	Very high	Band of very high resistance running to the north of stones 14 to A. May reflect a stony spread of material perhaps reflecting the former bank, other internal feature of the stone circle, an area stony debris or conversely simply underlying geology. This may represent an archaeological feature although it is more difficult to interpret. It is possible the earthwork bank to the south of the circle, which may be a later feature enveloping the stones, is having a masking effect on the high resistance feature which may continue towards the stones of the circle. The bank to the south is only just on the edge of the geophysical survey area and seems to be reflected by low values.
10	High	Smaller high resistance anomaly, partly reflecting stone 20 and the area immediately west of it. Area of very high resistance around stones 1-2. Reflects partly existing stones which may have prevented the probes being inserted, as well as packing stones, further buried stones or stony spreads of material perhaps reflecting the former bank or infilling an erosion hollow. Conversely it could reflect geology, although its location within the arc of the circle is suggestive it is more likely an archaeological feature. Likely represents an archaeological feature.
11	Very high	A large broadly C shaped high resistance anomaly which incorporates 3 and 4, and extends into the northern half of the stone circle. The feature is very distinct and it is not clear whether it is entirely archaeological, but suggest a significant concentration of stone may be present in this area, forming a C shaped feature. This could reflect archaeological features and may suggest internal features or divisions within the northern half of the circle, or conversely reflect a concentrated spread of stone debris from prior destruction of stones at the site or later disturbance. The distinct shape of the feature is suggestive it may be archaeological or a result of human activity rather than of geological origin.
12	Very high	Small linear band of high resistance within the circle, to the south east of stone 1. This could reflect an archaeological feature and may suggest internal features or divisions within the northern half of the circle, a spread of stone debris from prior destruction of stones at the site, or even displaced bank material from later disturbance or excavation.
13	Medium	A discrete area of raised resistance south east of stone 6, sat within a broader high resistance band 48 covering most of the northern half of the circle. Could reflect a slight stony spread which may reflect an archaeological feature, although it is unclear if it is archaeological or geological in origin.
14	Medium	Broader area of raised resistance forming a discrete, slightly irregular oval anomaly, within a high resistance band 48 covering the northern half of the circle. Could reflect an archaeological feature such as a stony spread, or be connected to later disturbance and stone destruction at the site.
15	Low	Discrete low resistance anomaly within the circle which might represent a pit, hollow, scoop, or a slight natural depression and is located immediately north of 13 & 14. Could be an archaeological or natural feature, wetter than the surrounding soil.
16	High	Discrete high resistance anomaly south east of the circle. This could reflect stones that have been disturbed, moved from the circle and buried, stone debris from destruction of stones or additional unknown stone locations, but they may also reflect natural stone and be entirely fortuitous. These smaller responses (also including 17 and 18) sit within a broad, fairly irregular band of slightly raised resistance readings (19) which runs through the southern half of the survey area broadly from east to west. It is unclear if the latter is of geological or archaeological origin, or a combination of the two. Where it coincides with the stone circle it may reflect traces of the former bank.
17	High	Discrete high resistance anomaly south east of the circle. This could reflect stones that have been disturbed, moved from the circle and buried, stone debris from destruction of stones or additional unknown stone locations, but they may also reflect natural stone and be entirely fortuitous. These smaller responses (also including 16 and 18) sit within a broad, fairly irregular band of slightly raised resistance readings (19) which runs through the southern half of the survey area broadly from east to west. It is unclear if the latter is of geological or archaeological origin, or a combination of the two. Where it coincides with the stone circle it may reflect traces of the former bank.
18	High	Discrete high resistance anomaly south east of the circle. This could reflect stones that have been disturbed, moved from the circle and buried, stone debris from destruction of stones or additional unknown stone locations, but they may also reflect natural stone and be entirely fortuitous. These smaller responses (also including 16 and 18) sit within a broad, fairly irregular band of slightly raised resistance readings (19) which runs through the southern half of the survey area broadly from east to west. It is unclear if the latter is of geological or archaeological origin, or a combination of the two. Where it coincides with the stone circle it may reflect traces of the former bank.

Anomaly number	Anomaly type (resistance)	Description
19	Medium	A broad, fairly irregular band of slightly raised resistance readings which runs through the southern half of the survey area broadly from east to west. This could to some extent reflect underlying geology. It is unclear if this is partly archaeological, partly also reflecting some traces of the former bank of the stone circle around its circumference where the two coincide. It is also possible the eastern end of 19 may form part of a larger discrete feature on the east side of the stone circle.
20	Very high	A discrete high resistance anomaly on the far eastern side of the survey within the raised resistance band 19.
21	Medium	A discrete raised resistance anomaly just east of the end of raised resistance band 19. Unclear if this is a discrete feature, such as a small stony spread, or a continuation of 19. May be archaeological or geological in origin.
22	Medium	Discrete raised resistance anomaly located to the south of 21. Unclear if this is a discrete feature, such as a small stony spread. May be archaeological or geological in origin.
24	Very low	Discrete oval shaped very low resistance anomaly sitting within a wider low resistance anomaly 40, that itself may partly reflect a palaeochannel. It may reflect a hollow or depression within that is considerably wetter than the surrounding area where water accumulates. Alternatively it could reflect an archaeological feature such as a pit or the remnants of trenches or pits from the 1880 excavation.
25	Very low	Discrete linear very low resistance anomaly sitting within a wider low resistance anomaly 40, that itself may partly reflect a palaeochannel. It may reflect a hollow or depression within that is considerably wetter than the surrounding area where water accumulates. Alternatively it could reflect an archaeological feature such as the remnants of a trench from the 1880 excavation.
26	Very low	Large oval shaped very low resistance anomaly sitting within a wider low resistance anomaly 40, that itself may partly reflect a palaeochannel. It may reflect a natural hollow or depression within a palaeochannel that is considerably wetter than the surrounding area where water accumulates. Alternatively it could reflect an archaeological feature such as the remnants of a trench from the 1880 excavation.
27	Very low	Very low resistance linear anomaly running alongside the north east quadrant of the circle, the northern extent of which is unknown. Along with low resistance anomaly 28, 27 appears to correspond to a palaeochannel which is visible in the EA 1m LiDAR data. Alternatively, 27, as a short linear section of this, at 1.5-2m in width and given its alignment, could be consistent with a ditch associated with the stone circle. However there is no clear evidence this continues further around the circle, especially to the west. These responses may simply reflect wetter areas of a palaeochannel in this area or later drainage features.
28	Low	low resistance anomaly of slightly irregular shape to the east of the stone circle. Along with low resistance anomaly 27, 28 appears to correspond to a palaeochannel which is visible in the EA 1m LiDAR data. These responses may simply reflect wetter areas of a palaeochannel in this area or later drainage features. Likely to be natural features or a result of later drainage.
29	Very low	A very low resistance anomaly of irregular shape which is sat within a broader low resistance anomaly 32. Both partially coincide with earthwork bank F4, suggesting it is primarily of earthen construction. The very low anomaly is difficult to interpret given the slight upstanding bank it sits within and its irregular shape, and it may simply reflect an underlying natural feature that is wetter than the surrounding area, or that this area of the bank is retaining more moisture than the broader anomaly 32 in which it sits.
30	Very low	Broadly oval, slightly irregular shaped very low resistance anomaly, measuring around 7m long and 5m wide. This could be an archaeological feature, for example a very large pit, scoop or hollow. Alternatively, it could represent the disturbance or removal of material by the 1882 excavations. Little detail is recorded of their activities, but a freestone slab found by digging was located next to the right hand end of this anomaly, adjacent to stone 29. Whilst a subtle mound was noticed to the west which could be a spoil heap.
31	Low	Small low resistance anomaly located between two crescent shaped high resistance anomalies (the eastern end of 19 and 44). Whilst it is not clear if 32 is archaeological, it could be a pit or hollow forming part of a wider feature.
32	Low	A broad low resistance anomaly which contains very low resistance anomaly 29. 32 partially coincides with earthwork bank F4, suggesting it is primarily of earthen construction and reflects this archaeological feature.
33	Low	Low resistance anomaly of slightly irregular, oval shape, on the western side of the survey area. These could be natural features such as tree throw pits, or reflect shallow quarrying hollows, either connected to the stone circle or from later activity.
34	Low	Very small low resistance anomaly which may simply reflect a wetter area of the erosion hollow around stone 6.
35	Low	Low resistance anomaly of slightly irregular, crescent shape, on the western side of the survey area. These could be natural features such as tree throw pits, or reflect shallow quarrying hollows, either connected to the stone circle or from later activity. Anomaly 35 is adjacent to the stone circle and could be a quarry pit for bank material or part of a ditch, perhaps reflecting a wetter area if such a feature existed, although the resistance data does not suggest clear evidence of a ditch associated with the circle.

Anomaly number	Anomaly type (resistance)	Description
36	Low	Discrete low resistance anomaly the northern extent of which is unknown as it is located on the edge of the data area. It is unclear if this reflects an archaeological logical or natural feature, such as a hollow or wetter area of ground. It is unknown if this is the end of a larger feature and is therefore difficult to interpret. A field drain runs immediately east of this anomaly between it and anomaly 37, suggesting these may be part of the same response that has been truncated by the drain.
37	Low	Slightly irregular shaped low resistance anomaly. The full extent of this to the north is unclear as it reaches the edge of the survey area. It is unknown if this is the end of a larger feature and is therefore difficult to interpret. It is unclear if this reflects an archaeological logical or natural feature, such as a hollow or wetter area of ground. A field drain runs immediately west of this anomaly between it and anomaly 36, suggesting these may be part of the same response that has been truncated by the drain.
38	Low	Broad oval shaped low resistance anomaly is only partially visible. It's true extent is unclear and may extend outside of the survey area, which also has a very low resistance core (39). This may reflect a natural hollow or area in which water accumulates such as a spring and this area was observed to be wetter with boggy ground. Although it does appear at least on the side that is visible within the data to have a regular shape so it could be archaeological such as a pit or hollow. It could also reflect a wetter area within a broader feature, such as another palaeochannel forming part of the valley head. There is also a possible land drain to the north east of the stone circle in this area visible as a line in the vegetation which may have truncated the southern edge of anomaly 38.
39	Very low	Very low resistance anomaly within broad oval shaped low resistance anomaly 39, which is again is only partially visible. It's true extent is unclear and may extend outside of the survey area. This may reflect a natural hollow or area in which water accumulates such as a spring and this area was observed to be wetter with boggy ground. Although it does appear at least on the side that is visible within the data to have a regular shape so it could be archaeological such as a pit or hollow. It could also simply reflect a wetter area within a broader feature (e.g. 38), or a larger feature such as another palaeochannel forming part of the valley head.
40	Low	A large curvilinear low resistance anomaly (also including 24, 25 & 26) which crosses the eastern half of the survey and heads into the central area of the circle. The sinuous curving form and large size of this anomaly would suggest that it is at least partly of natural or geomorphological origin, although some element of it may define archaeological features. A distinct right angled linear anomaly is visible at the western end of this broader feature in the centre of the circle, measuring circa 3-4m in width and measuring circa 10m x 7m which has very straight edges. This may well indicate an area of excavation from the 1880 investigations.
41	Medium	Discrete raised resistance anomaly within the southern half of the stone circle. May represent slight spreads of dispersed stone debris, or pits or hollows with stony fills, with varied readings characterising these anomalies. Different in character to the very high resistance responses associated with areas around the stones of the circle and within the northern half of the stone circle. They may be of archaeological or natural origin.
42	Medium	Small raised resistance anomaly on the western side of the survey area. Anomaly 42 is difficult to interpret because of its location on the edge of the survey area but does have a distinct edge where visible. Could reflect a discrete feature such as a stony spread, or feature with a stony fill, or simply reflect natural stone. May be archaeological or natural origin.
43	Medium	Discrete raised resistance anomaly within the southern half of the stone circle. May represent slight spreads of dispersed stone debris, or pits or hollows with stony fills, with varied readings characterising these anomalies. Different in character to the very high resistance responses associated with areas around the stones of the circle and within the northern half of the stone circle. They may be of archaeological or natural origin.
44	Medium	A crescent shaped raised resistance anomaly on the eastern side of the survey, which may be related to another arc of raised resistance to the south (eastern end of 19) and might form a distinct feature, possibly with two gaps in its circumference and a hollow centre. Likely to reflect a concentration of stone or stony debris. This could indicate a feature such as cairn or ring cairn, or debris from the known destruction of stones at the site. It could also reflect a later feature, associated with the field system.
45	Low	Low resistance anomaly, only partially visible on the edge of the survey area. It appears to be distinct from 38/39 but both could also reflect wetter areas within a wider feature, such as a palaeochannel forming part of the valley head. Difficult to interpret and could be of archaeological or natural origin. It was noted during the survey there could be another field drain in this area.
46	Medium	Small raised resistance anomaly. Difficult to interpret as the full extent is unknown and located close to the edge of the survey. Anomaly 46 partly coincides with the southern end of the earthwork bank F4, although it continues beyond it to the west. May reflect a slight stony spread. This could be of archaeological or natural origin.
47	High	High resistance anomaly that may reflect material derived from the short earthwork bank F2, or suggest this feature is larger than the visible earthwork. Likely to reflect a concentration of stone or stony spread. It could also be a separate and unrelated feature. It is difficult to interpret as the full extent is unknown and located on the edge of the survey. Likely to reflect a concentration of stone or stony spread. May be of archaeological or natural origin.

Anomaly number	Anomaly type (resistance)	Description
48	High	A broad band of high resistance covering a large portion of the northern half of the stone circle. The concentration of raised or high resistance features within the northern half of the circle is noteworthy and suggestive of a focus of human activity, rather than reflecting underlying geological trends which one would expect to see more broadly across the area and is not confined to the area of the stone circle. The anomaly may reflect the impact of human activity associated with the construction, use and subsequent disturbance and destruction of the stone circle, involving bringing stone and spreading it around the site. Whilst it is possible some element reflects geology, this would require the stone circle to have been perhaps deliberately located in an area of distinct geology, or geomorphological deposits, or that is different to its immediate surroundings.
49	Medium	Discreet raised resistance anomaly within the southern half of the stone circle. May represent slight spreads of dispersed stone debris, or pits or hollows with stony fills, with varied readings characterising these anomalies. Different in character to the very high resistance responses associated with areas around the stones of the circle and within the northern half of the stone circle. They may be of archaeological or natural origin.
50	Medium	Discreet raised resistance anomaly within the southern half of the stone circle. May represent slight spreads of dispersed stone debris, or pits or hollows with stony fills, with varied readings characterising these anomalies. Different in character to the very high resistance responses associated with areas around the stones of the circle and within the northern half of the stone circle. They may be of archaeological or natural origin.
51	Low	Small low resistance anomaly located between two crescent shaped high resistance anomalies (the eastern end of 19 and 44). Whilst it is not clear if 51 is archaeological, it could be a pit or hollow forming part of a wider feature.
52	Medium	Discreet raised resistance anomaly within the southern half of the stone circle. May represent slight spreads of dispersed stone debris, or pits or hollows with stony fills, with varied readings characterising these anomalies. Different in character to the very high resistance responses associated with areas around the stones of the circle and within the northern half of the stone circle. They may be of archaeological or natural origin.
53	Medium	Arc of raised resistance in the north east section of the stone circle. Suggests greater concentrations and spreads of stone may be present in this area. These could be an archaeological feature and may suggest internal features or divisions within the northern half of the circle, spreads of debris from stone destruction or excavation, or reflect natural stone spreads. May be of archaeological or natural origin.
54	Medium	Small irregular shaped raised resistance anomaly, suggested a stony spread or perhaps a stony feature fill, which appears to be partially encircled by, but distinct from, the very high resistance curvilinear feature 11. This suggests the two may be related and form part of internal archaeological features that could be related to the stone circle.
55	Very high	Small very high resistance anomaly immediately east of stone 25. Likely to reflect buried stone, which could reflect a displaced stone from the circle or natural stone. It also be stony debris or fragments from their destruction. Could be of archaeological or natural origin.
56	Medium	Small raised resistance anomaly on the western side of the survey area, west of stone 6 and between anomalies 33 and 35. Could reflect a discreet feature such as a stony spread, or feature with a stony fill, or simply reflect natural stone. May be archaeological or natural origin.
57	Very high	Discrete very high resistance anomaly or irregular shape, south east of the circle. This could reflect stones that have been disturbed, moved from the circle and buried, stone debris from destruction of stones or additional unknown stone locations, but they may also reflect natural stone and be entirely fortuitous. These smaller responses (also including 16 and 18) sit within a broad, fairly irregular band of slightly raised resistance readings (19) which runs through the southern half of the survey area broadly from east to west. It is unclear if the latter is of geological or archaeological origin, or a combination of the two. Where it coincides with the stone circle it may reflect traces of the former bank.