The Archaeology of Ancrum: Mantle Walls Project

Geophysical Survey Report
4-7 November 2011

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Sgoil nan Daonnachdan

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Summary

This document outlines the second phase of The Archaeology of Ancrum: Mantle Walls project, involving a detailed geophysical survey of the Mantle Walls area of Ancrum village, Scottish Borders. This took place on 4-7 November 2011, involving a combination of gradiometer and resistivity survey techniques. The gradiometer survey revealed numerous rectilinear anomalies at the crest of the hill which seem to relate to the medieval bishop's palace reported at or near this location since the 18th century. Related linear anomalies may be enclosures or drainage features, and an unexpected byre-like structure was detected in the lower ground. The resistance survey was more limited in scale, but also revealed rectilinear anomalies on a similar orientation to those seen in the magnetic survey. Both techniques show a high level of disturbance to the underlying archaeology, and recommendations for exploratory trial trenching with a view toward protection via scheduling this important monument are offered.

Introduction

The Archaeology of Ancrum: Mantle Walls Project examines the suspected site of a bishop's palace at Mantle Walls, Ancrum. The site is under immediate threat by metal detecting and cultivation. Two site visits by the Scottish Borders Council Archaeology Officer Chris Bowles, one in conjunction with a visit by Rod McCullagh of Historic Scotland, have located worked ashlar masonry blocks on the field margin and evidence of in situ masonry being destroyed by the plough. There is also a large amount of medieval and post-medieval pottery in the plough soil. A two-year project was then devised, and funding was obtained from Historic Scotland in January 2011. The approved programme included several phases of community engagement and investigation, including a full geophysical survey of the site in question, with a view toward obtaining scheduled monument protection.

Topography and geology

Ancrum is located in the valley of the Ale Water, on the edge of the higher ground above the valley of the River Teviot into which the Ale opens to the south (Figure 1). The bedrock of the Ancrum area is Stratheden and Inverclyde Group of Late Devonian sandstones, overlain by Devensian till, with the basin of the Ale Water providing a fertile band of alluvium around which the village is sited. The village itself mainly sits on a spur of glaciofluvial deposits of sand and gravel, ending in the prominence at the east end of the village which is the field now known as Mantle Walls. The site is currently under arable, except for the steeply-sloping east margin of the promontory above the terrace of the Ale (Figure 8).

Location maps

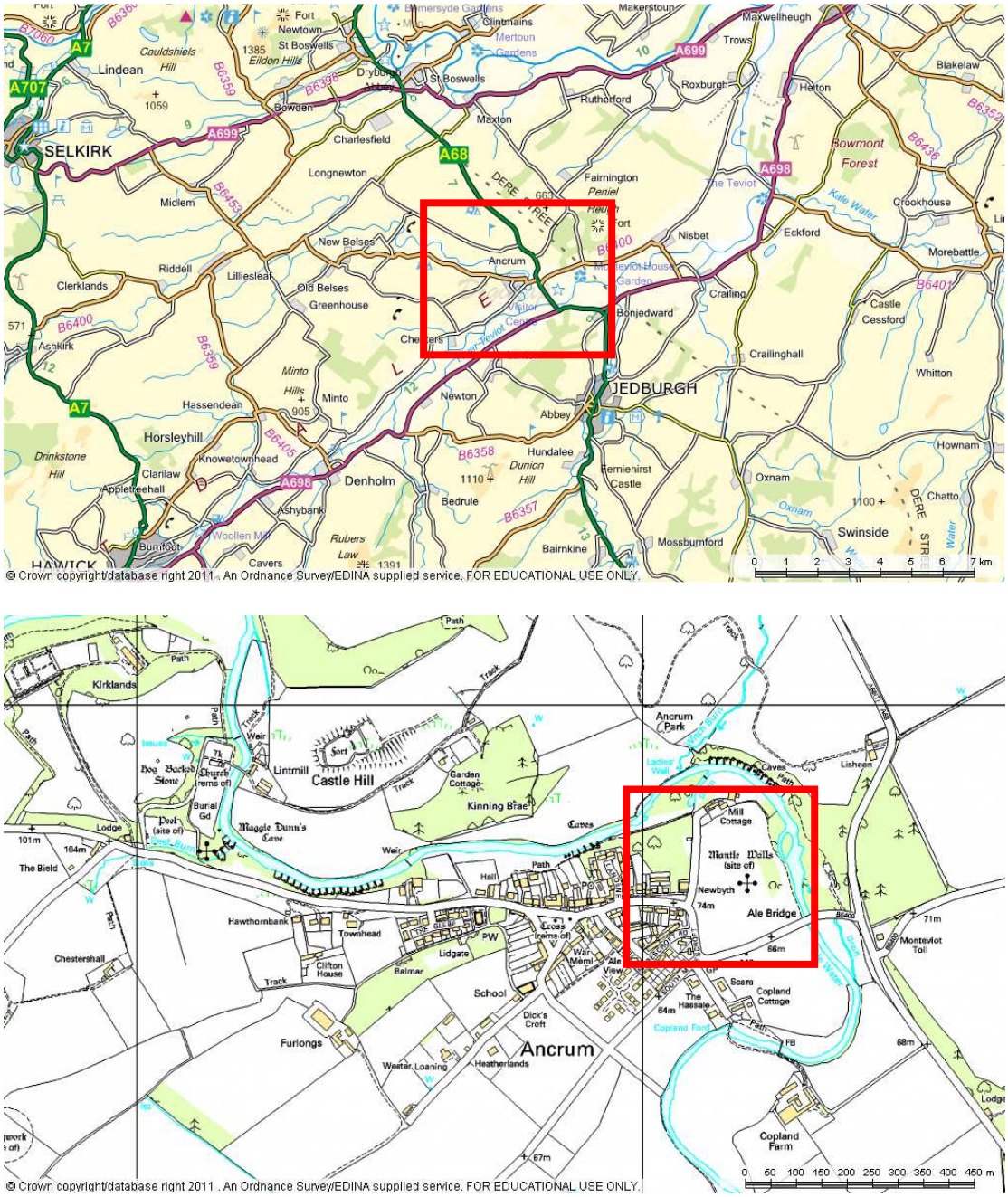


Figure 1: Location maps of Ancrum.

Figure 2: Mathew Stobie's Map c. 1770 showing possible roofless structure at Mantle Walls. © National Library of Scotland.

Figure 3: Ancrum in John Thomson's 1832 Atlas of Scotland: the roofless structure now disappeared, first depiction of the modern bridge across the Ale. © NLS.

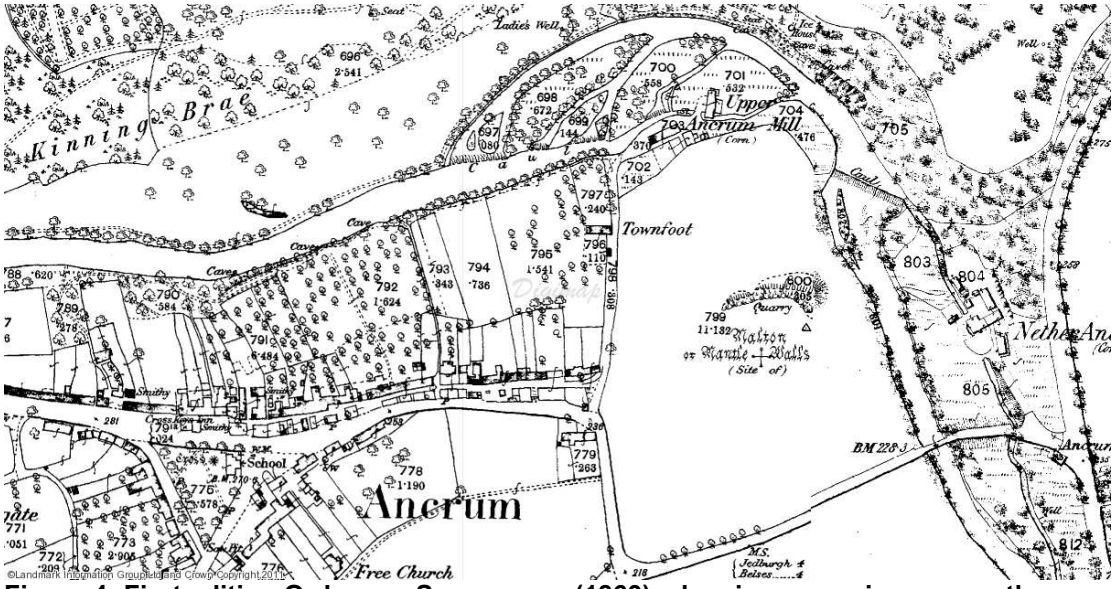


Figure 4: First edition Ordnance Survey map (1863), showing quarrying across the Mantle Walls area. © NLS.

Figure 5: Detail of RAF aerial photograph 106.G/Scot/UK86, taken 10 May 1946, showing rectilinear enclosure cropmark enclosing the summit of Mantle Walls.

Figure 6: Undated oblique aerial view taken by a local photographer showing the possible rectilinear enclosure (source: Chris Bowles/Scottish Border Council).

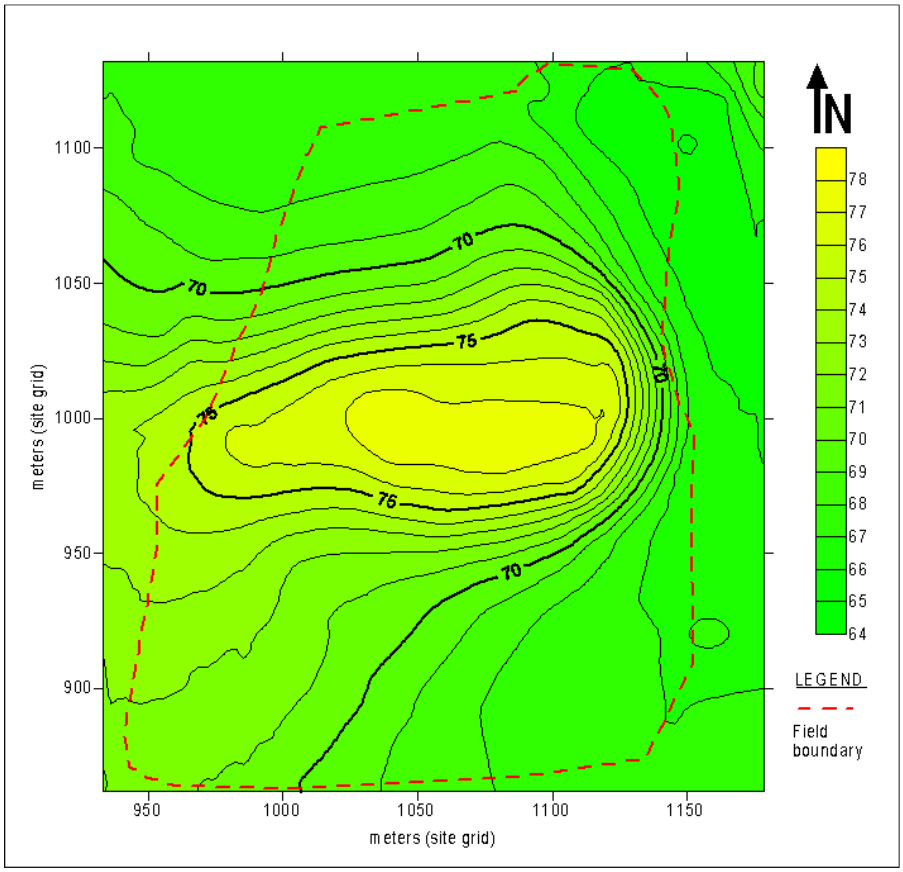


Figure 7: Contour map based on topographic survey led by S Digney.

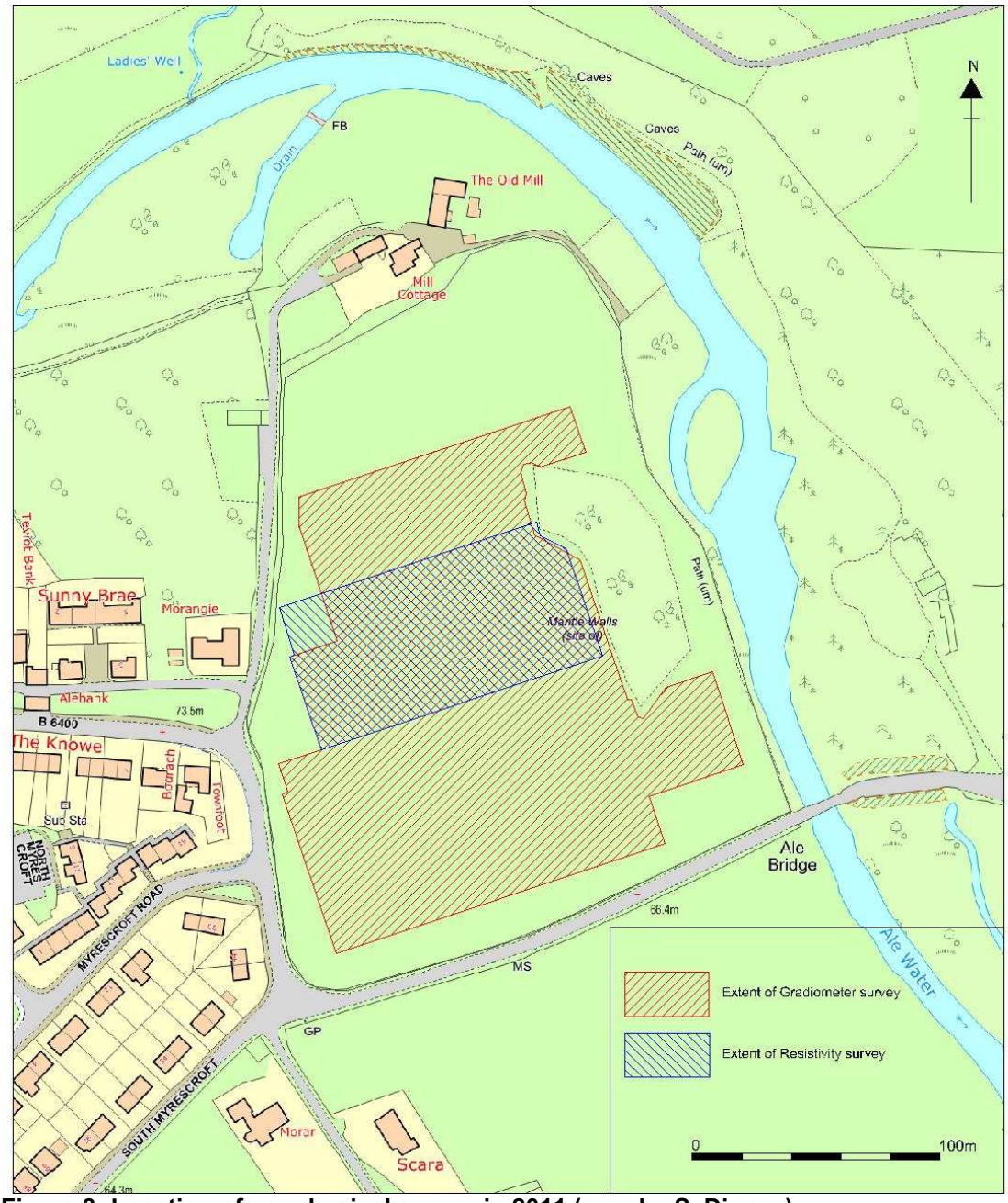


Figure 8: Location of geophysical survey in 2011 (map by S. Digney).

Previous work

The site has long been suspected as the location of a medieval palace for the bishops of Glasgow, first mentioned in 12th and 13th century charters. The earliest account of the physical remains describes a mortared stone edifice with buttresses, measuring 100 yards east to west and 200 yards north to south (Pococke 1760 [1887], 334). Mathew Stobie's map of Roxburghshire in 1770 depicts an unroofed L-shaped structure at the summit of the hill at Mantle Walls which shows that these measurements may have overestimated the surviving remains (Figure 2); it is worth noting that by John Thomas' Atlas of Scotland in 1832, this structure is no longer depicted (Figure 3). The author of the Old Statistical Account entry for Ancrum provides the fullest description of the structure and its fate by the end of the 18th century:

> The most venerable fragment of antiquity in the parish is the Maltan wall or walls, upon a rising ground at the bottom of the village of Ancrum, close to the side of the river, where it turns its course towards the S. E. These walls were strongly built of stone and lime in the figure of a parallelogram, and, ascending on one side from the plain adjacent to the river, were considerably higher than the summit of the hill which they inclose [*sic*]; but are now levelled with its surface, and a small part of them remain." Vaults or subterraneous arches have been discovered in the neighbouring ground, and underneath the area inclosed [*sic*] by the building. Human bones are still found by persons ploughing or digging in the plain at the side of the river, which is an evidence of its having been formerly occupied as burying-ground. (Somerville 1794, 294).

The structure was thus demolished by the 1790s, although it could still be traced on the ground through the 19th century, and the structure was substantially quarried for building stone for the adjacent village (RCAHMS 1956, 57-58). The 1st Edition Ordnance Survey map of the area shows a large quarry running east to west across the summit of the hill (Figure 4).

These early accounts of structures seem to be supported by RAF aerial photographs taken in the early summer of 1946 which show a cropmark of a rectilinear feature enclosing the summit of the rise at Mantle Walls and a possible adjoining enclosure in the lower ground to the south (Figure 5). A recent, undated aerial view from a local photographer taken from a microlight shows this feature even more clearly (Figure 6).

In 2009, Scottish Borders Council was alerted by a member of the public to possible nighthawking taking place at Mantle Walls. According to local informants, there have been a number of artefacts and potentially human remains and burial monuments recovered from the site. One report is that carved stones were removed from the site and thrown into the nearby river. Anecdotal evidence suggests the site has been consistently metal detected over several years since the field came back into cultivation. Neither Treasure Trove Scotland or the Northumberland Portable Antiquities Scheme officer are in receipt of objects from the site. During the current survey, two separate metal detectorists from Ancrum and the surrounding area came to visit the site, reporting years of metal detecting here, but neither mentioned any specific finds. Local informants report nighthawking continued, and possibly intensified, in the weeks following the survey.

On an initial site visit in Spring 2010, masonry was visible on the field margins, and an exposed section of walling was visible on the southern edge of the hill's summit. A number of medieval and post-medieval pottery sherds were identified, as well as heavily eroded bone fragments. On the basis that these could be human remains, Historic Scotland was contacted in the event that the Human Remains Call-out contract could investigate. Rod McCullagh from Historic Scotland attended a site visit in the summer of 2010, and it was felt the bones were the remnants of a sheep burial; the current landowner Stephen Fleming corroborates that various sheep burials have indeed been made in the field.

Small surface finds from the current survey included much modern midden material including fragments of sheep bone, but also various fragments of late medieval green-glazed pottery and at least one fragment of medieval Scottish White Gritty Ware (Ewan Campbell, University of Glasgow, pers. comm.). In addition, a Mesolithic/early Neolithic flint scraper (Dene Wright, University of Glasgow, pers. comm.) was also found near the summit of the hill, attesting a long period of occupation of this site. The small find archive is currently retained at the Archaeology Department, University of Glasgow, pending future study.

A further meeting was held in the Autumn of 2010 at Historic Scotland between Chris Bowles, Rod McCullough, David Caldwell, from the National Museum of Scotland, and Stuart Campbell of Treasure Trove Scotland. A programme of works was devised, and an application for funding made to Historic Scotland, approved in January 2011. The approved programme included several phases of community engagement and investigation. The first phase was the staging of an 'Artefact Roadshow' held in Ancrum Village Hall in May 2011 and jointly attended by Chris Bowles and Stuart Campbell. The purpose was to encourage local residents who might have information or materials from the site to make contact. In the event, no new information came to light about Mantle Walls though artefacts and information about other sites in the area were brought forward. The second phase is the geophysical survey which is the subject of the current report. A third phase, comprising limited test excavation, will be considered pending the results presented here.

Objectives of the geophysical survey

- To assess the nature of structures described in antiquarian literature and shown in aerial photography
- To identify the extent of damage caused to the site by ploughing and metal detecting
- To help target potential trial excavation, with a view towards obtaining scheduled monument protection for the site.

Methodology

The survey took place on 4-7 November 2011. A site grid was established by surveyor Stephen Digney using a Leica TC407 Total Station. 20x20m geophysical survey grids were laid out at the top of the hill and at the lower terraces to north and south, with further grids laid out using measured offsets from tapes. A total of 62 grids were set out, including some partial grids due to space constraints, covering a total surveyed area of approximately 24800m^2 (Figure 8). A combination of gradiometry and earth resistance techniques was applied in turn on this grid system. Each grid was surveyed by walking in a 'zig-zag' pattern, with the first traverse in a N direction.

The gradiometer survey was carried out using a dual sensor Bartington Grad601. Measurements were taken at a .5m traverse interval with a .25m sample interval. The earth resistance survey was carried out using a Geoscan RM15 resistance meter on a PA5 mobile probe array. A twin-electrode configuration was used with mobile probe spacing of 1m; measurements were

taken at a sample interval of 1m by 1m traverse interval. All data was downloaded into GeoPlot v3 software for processing, with further interpretation plots produced using Surfer v8 and AutoCAD. Shade plots of the raw data are presented below; where the results have been further processed for clarity, the various steps taken are summarised in the statistics attached to the image.

Results

Magnetic survey

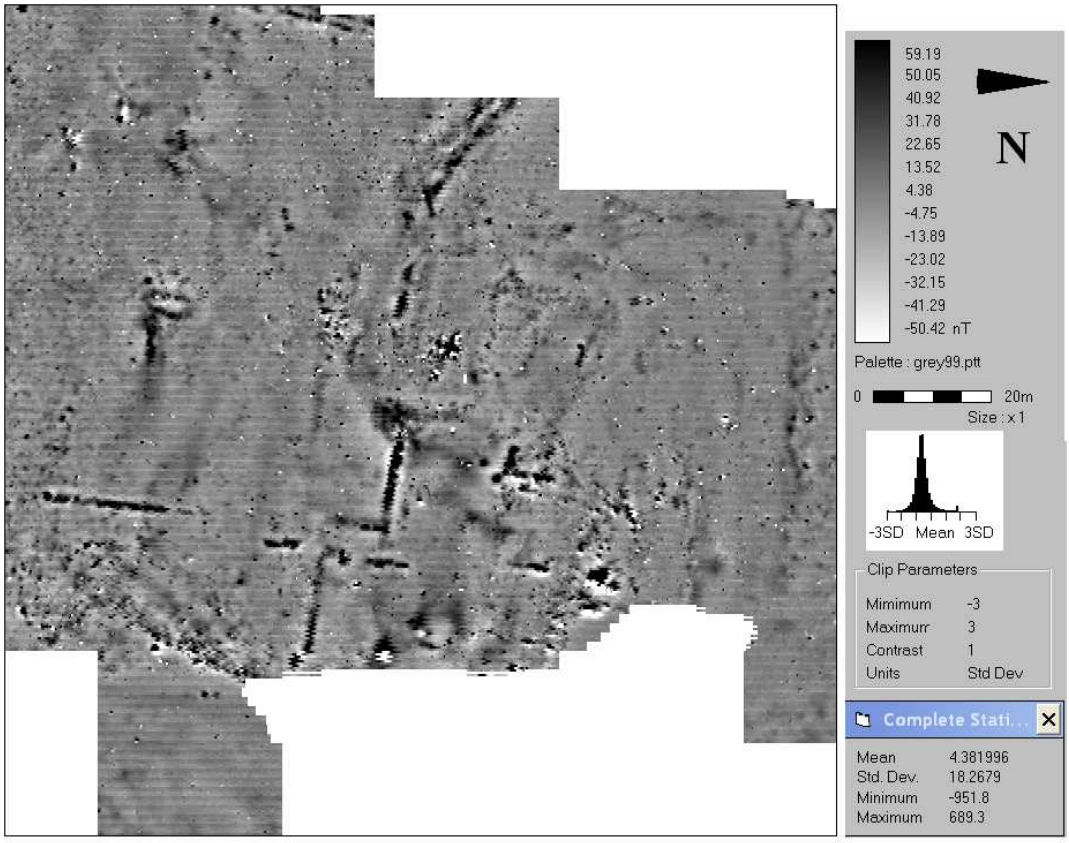


Figure 9: Raw gradiometer survey results.

Figure 10 shows the raw results of the gradiometer survey. Immediately apparent in this overview are a number of rectilinear features at the summit of the hill. Unexpected anomalies occur on the lower terraces to north and south, as well as a number of linear anomalies extending off the western edge of the survey area towards the village. In order to aid interpretation, the survey area will be broken up into five areas, as annotated on Figure 10.

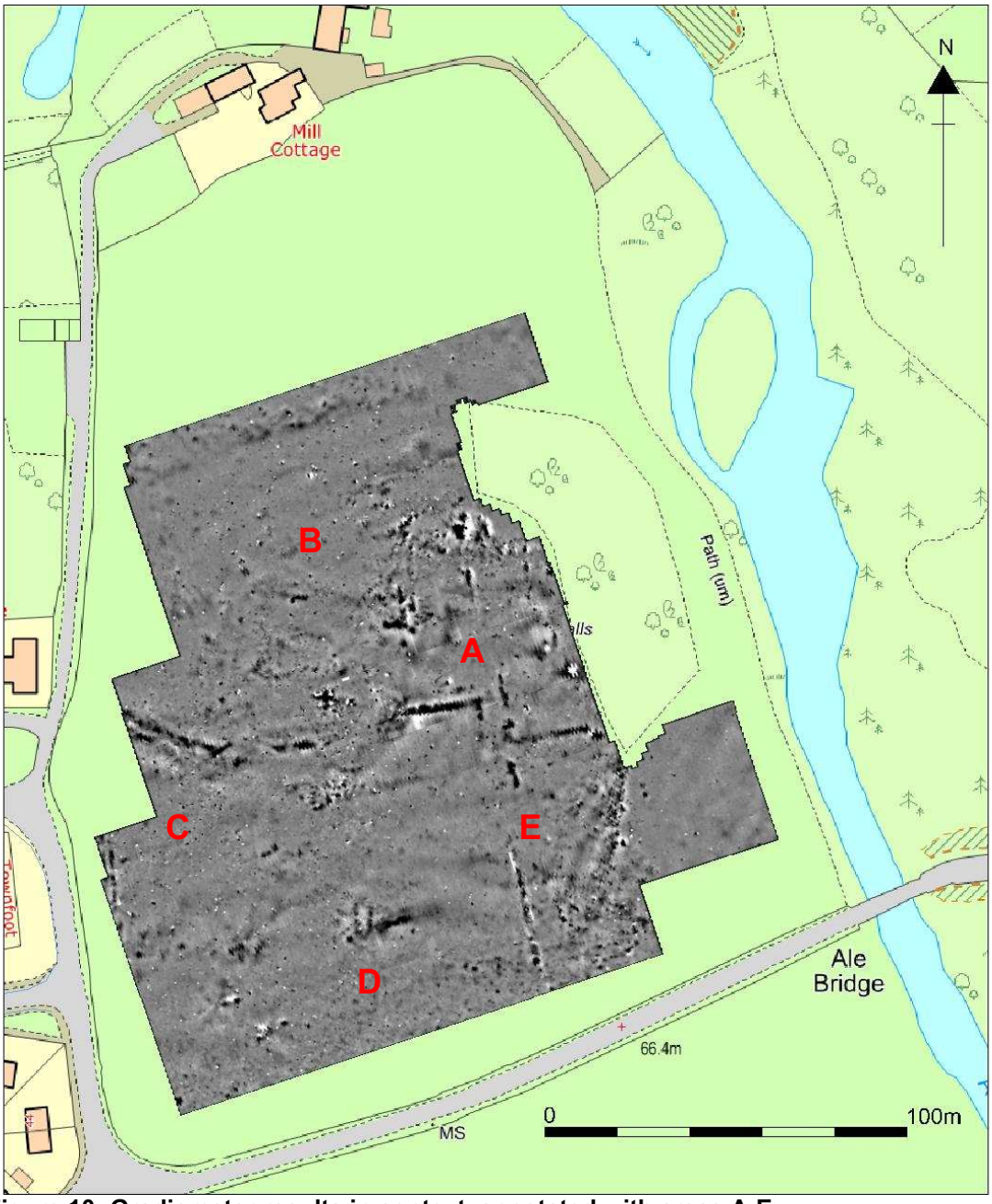


Figure 10: Gradiometer results in context, annotated with areas A-E.

Area A

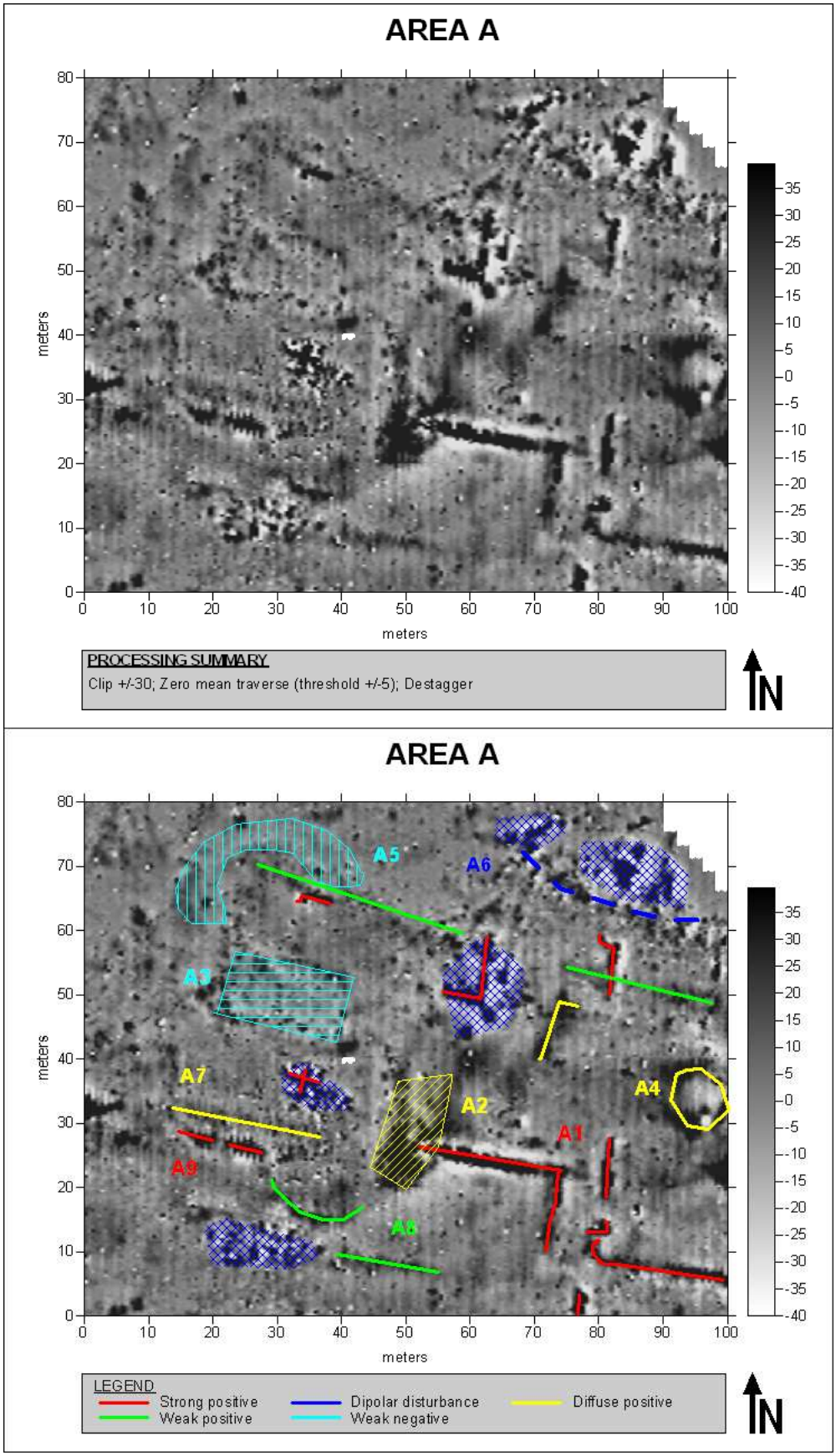


Figure 11: Processed and interpreted results from area A.

It is immediately apparent that the summit of the hill has seen many phases of occupation. There is very little that can be said to be part of a single coherent building plan, and so the processed results have been annotated instead with a description of their magnetic responses. The clearest structural features are the strong positive responses which generally appear as bold linear anomalies, marked in red. The cluster of anomalies marked A1 would seem to be the clearest indication of a structure, perhaps intact masonry foundations. The hook-ended appearance of two of these linears may even suggest the existence of corner turrets or a spiral staircase, but this is speculation only. The polygonal anomaly of A4 encloses a diffuse area of negative readings roughly 8m in diameter, and it is tempting to suggest this is a subterranean chamber, perhaps one of the vaults said to have been encountered in this field (Somerville 1794, 294).

Some diffuse and weak positive linear anomalies, particularly A7 and A8, would appear to be more disturbed or robbed-out remains of the same structure. However, the weak positive linear anomalies picked out in green roughly correspond to the rectilinear cropmark feature recorded on the summit of the hill (Figure 5; Figure 6), and may also be the denuded remains of an enclosure wall or ditch. The highly magnetic linear of A6 would appear to represent a denuded boundary wall, and may also relate to a former enclosure of the summit.

Also notable are the discrete spreads of dipolar disturbance, marked out in blue crosshatching as in A6, found across the summit of the hill. Such anomalies are rare elsewhere in the field (Figure 10), and it is likely they relate to the summit structure. The ‘noisy’ appearance of the readings is characteristic of highly magnetic subsurface features such as areas of burning, and may relate to episodes of demolition. Another possibility is that they are spreads of highly magnetic or mortared stone, and may thus represent debris left from quarrying activity across the summit of the hill as shown on the first edition OS map (Figure 4). It is worth noting that two of these large patches also contain linear anomalies such as those in A1 which may represent the remains of wall foundations, making it more likely that these represent debris from stone robbing activity.

More difficult to interpret are the patches of weak negative response of A3 and A5. A5 is particularly intriguing for its banana-shaped appearance; whatever this feature represents, it has been much disturbed by later phases of activity, which may be giving it a distinctive shape. A3 is a roughly 20x10m rectangular area seemingly enclosed by linear arrangements of high magnetic responses. While A3 is on alignment with the putative summit structures described above, and may suggest an enclosed yard or garden feature, A5 does not obviously relate to these and may represent pre-medieval occupation on the hill.

Linear anomalies A7 and A9 seem to be truncated, ending at the irregular anomaly A2, which appears to have suffered from plough damage. A9 appears is off-axis and may not relate to the structure of A1, instead being part of the linear feature C2/C5 of Area C (Figure 13), described below.

Area B

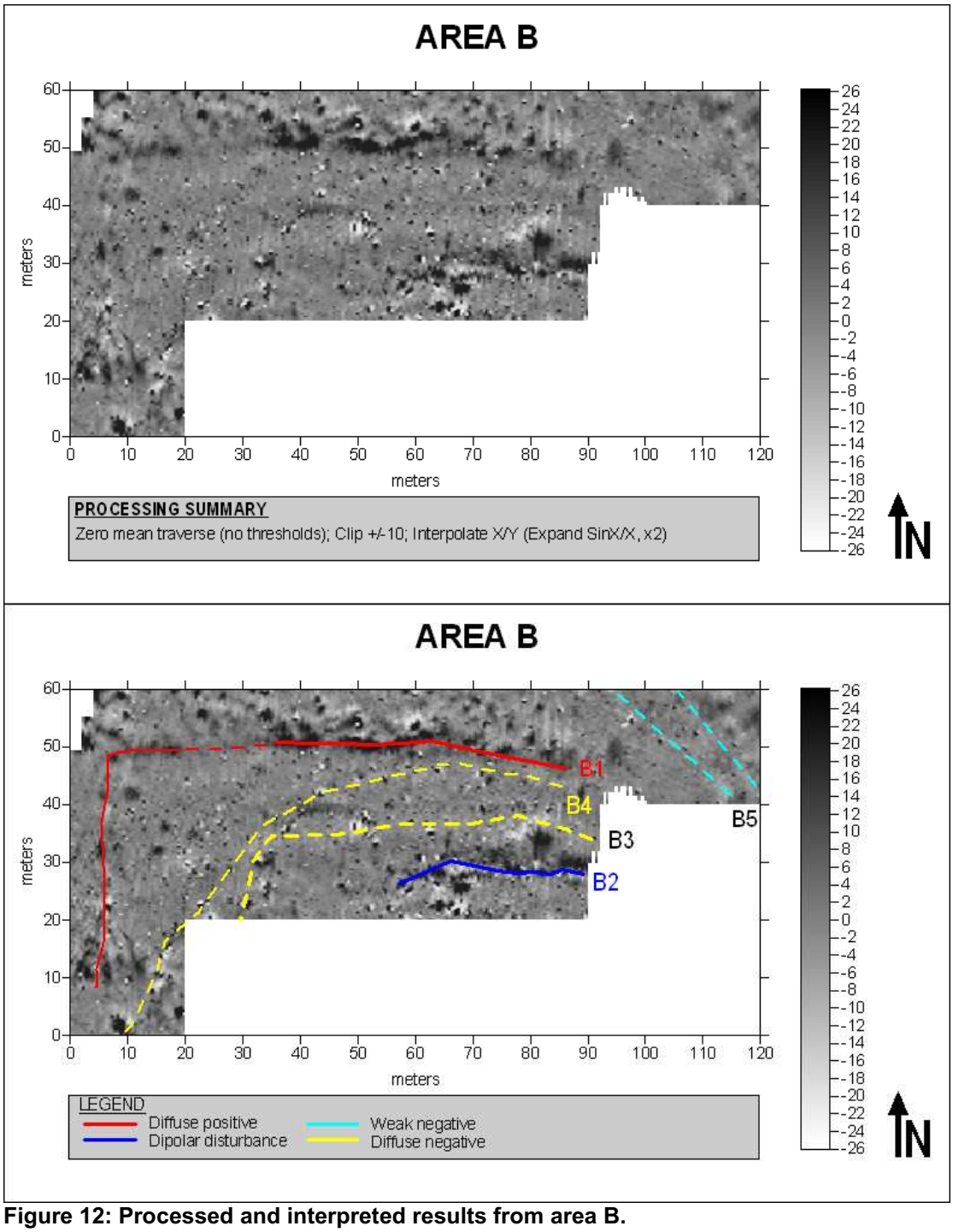


Figure 12: Processed and interpreted results from area B.

The features in area B are intriguing but more difficult to interpret (Figure 12). The RAF aerial photograph (Figure 5) shows a hedgerow or other boundary running east to west across this area, and it may be that one of the linear anomalies, most likely the dipolar response of B2, represents the remains of that. The diffuse negative responses of B3 and B4 may well be spreads of hillwash as this is roughly at the foot of the slope where the field levels out (Figure 7). The diffuse positive response of B1 seems to curve towards the edge of the thicket characterizing the east end of the site, and may preserve

the line of an older boundary. The weak, roughly parallel linears of B5 relate to a modern path beside the Ale Water.

Area C

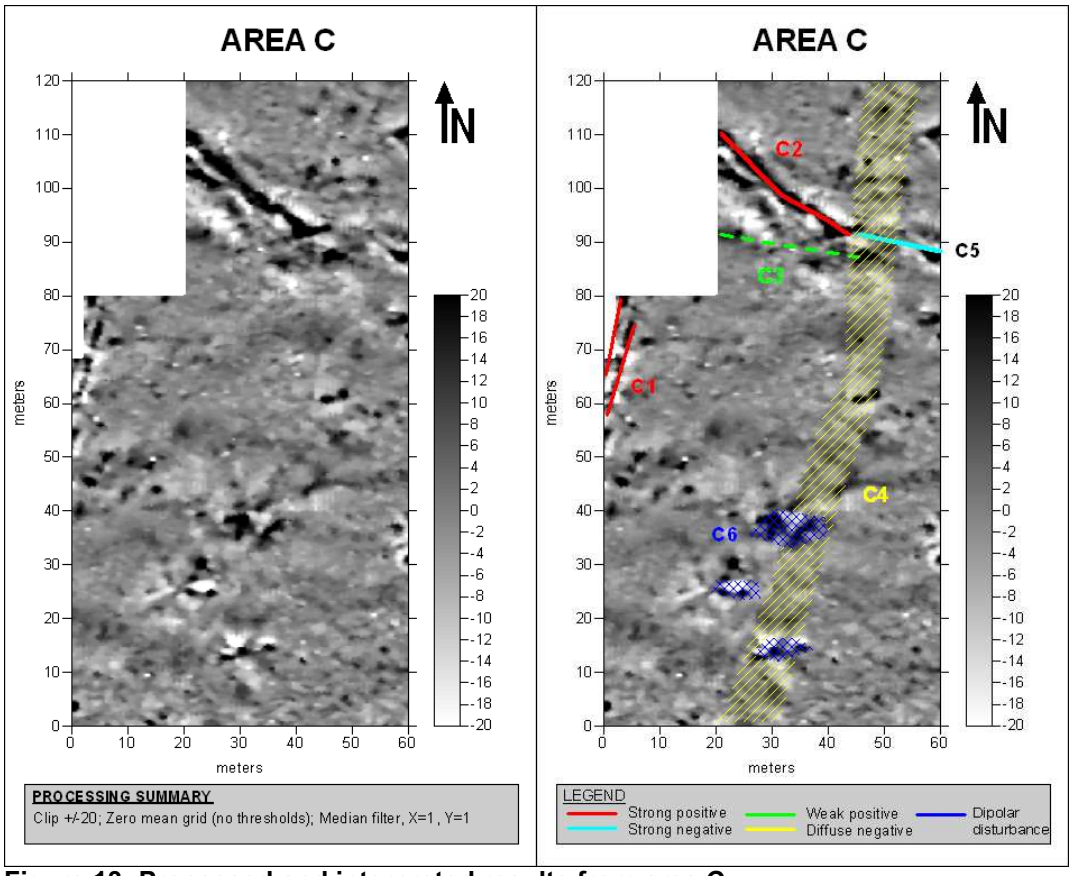


Figure 13: Processed and interpreted results from area C.

The main points of interest in area C are the strong positive linear anomalies encountered in the area (C1, C2). Most prominent is the positive linear C2 which becomes a more diffuse positive linear at C5. This change occurs at the intersection with the ephemeral negative anomaly C4 running roughly north-south across the survey area. Processing also revealed a possible weak positive linear anomaly C3 intersecting with C2 at this point. The strong response of C1 and especially C2 would be consistent with a well-laid path or metalled road; it is interesting that this nearly corresponds with the line of the main road through the village, The Knowe (B6400, Figure 8), and this may show that it formerly extended to the Mantle Walls structures (A9, Figure 11).

The line of C4, a diffuse linear response, is likely to be the disturbance from a service trench for a non-metallic water pipe said to have been dug across the field in the last decade by the current landowner. The discrete patches of dipolar anomaly, marked in blue, along its line may be where this trench disturbed previously extant features. This modern activity would seem to have cut the possible roadway of C2, and further underline the severity of disturbance to the underlying archaeology across the Mantle Walls area.

Area D

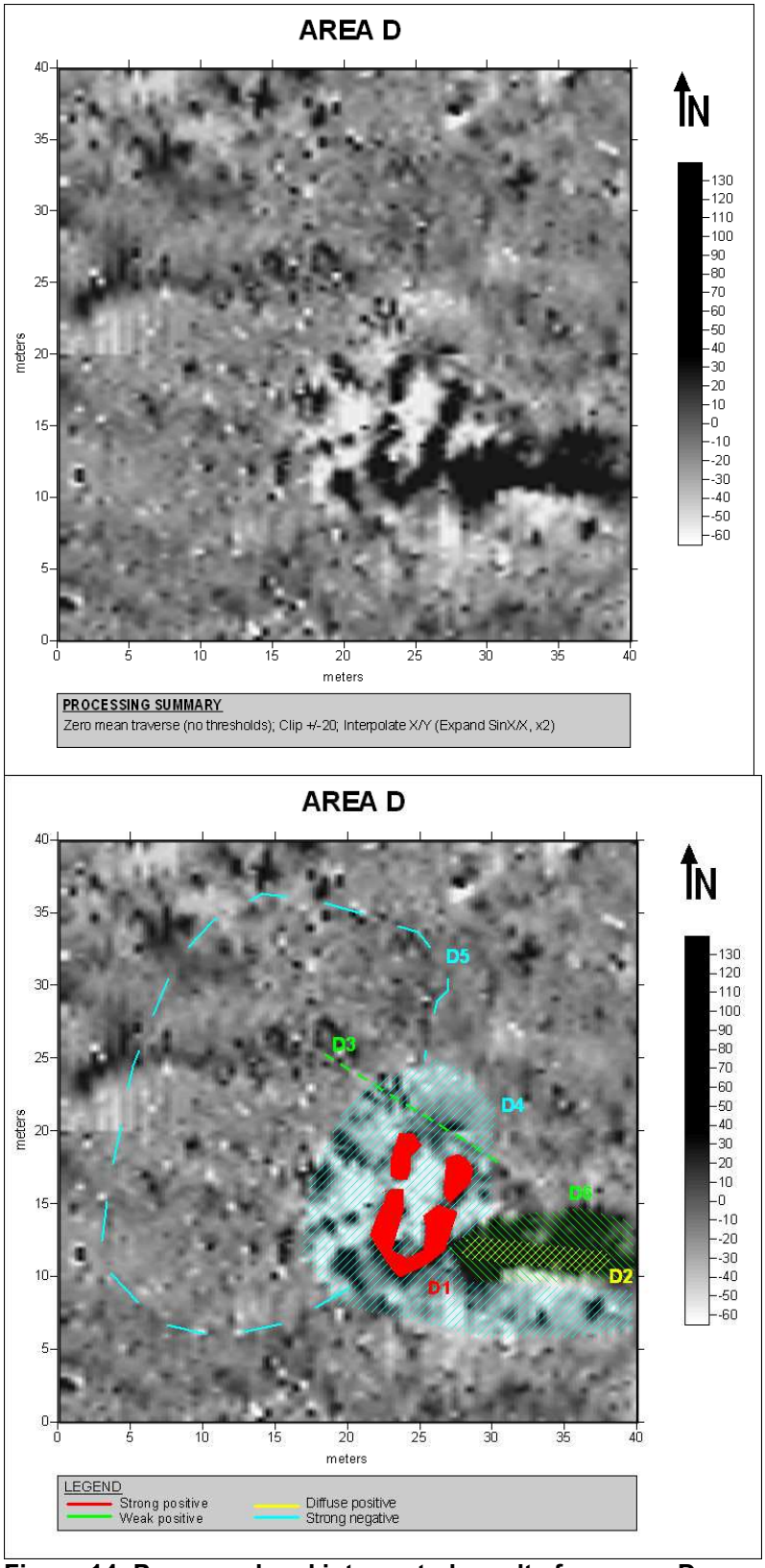


Figure 14: Processed and interpreted results from area D.

An unexpected feature occurred near the break of the southern slope of the Mantle Walls area, characterised by a strong U-shaped positive response D1 surrounded by an area of highly magnetic soil D4. This feature was linked to a

diffuse but strongly magnetic linear response D2 surrounded by a weakly magnetic area D6. Further processing brought to light a possible curvilinear enclosure D5 abutting D1. D1 would appear to be the foundations of a small building, possibly stone-built given the discreteness of the results. If so, it is an open-ended byre-like structure, seemingly without a northern wall, although there is a hint of a constraining feature here, perhaps a fence, marked as D3. If this is a byre or some other farm-related outbuilding, D2 could feasibly be a drainage feature, as this is near the lowest part of the Mantle Walls field (Figure 7) and D2 leads away in the general direction of the Ale Water (Figure 8). D5 would then be an adjoining yard, and the diffuse area of highly magnetic soils of D4 and D6 could be occupation soils spread by ploughing action.

Area E

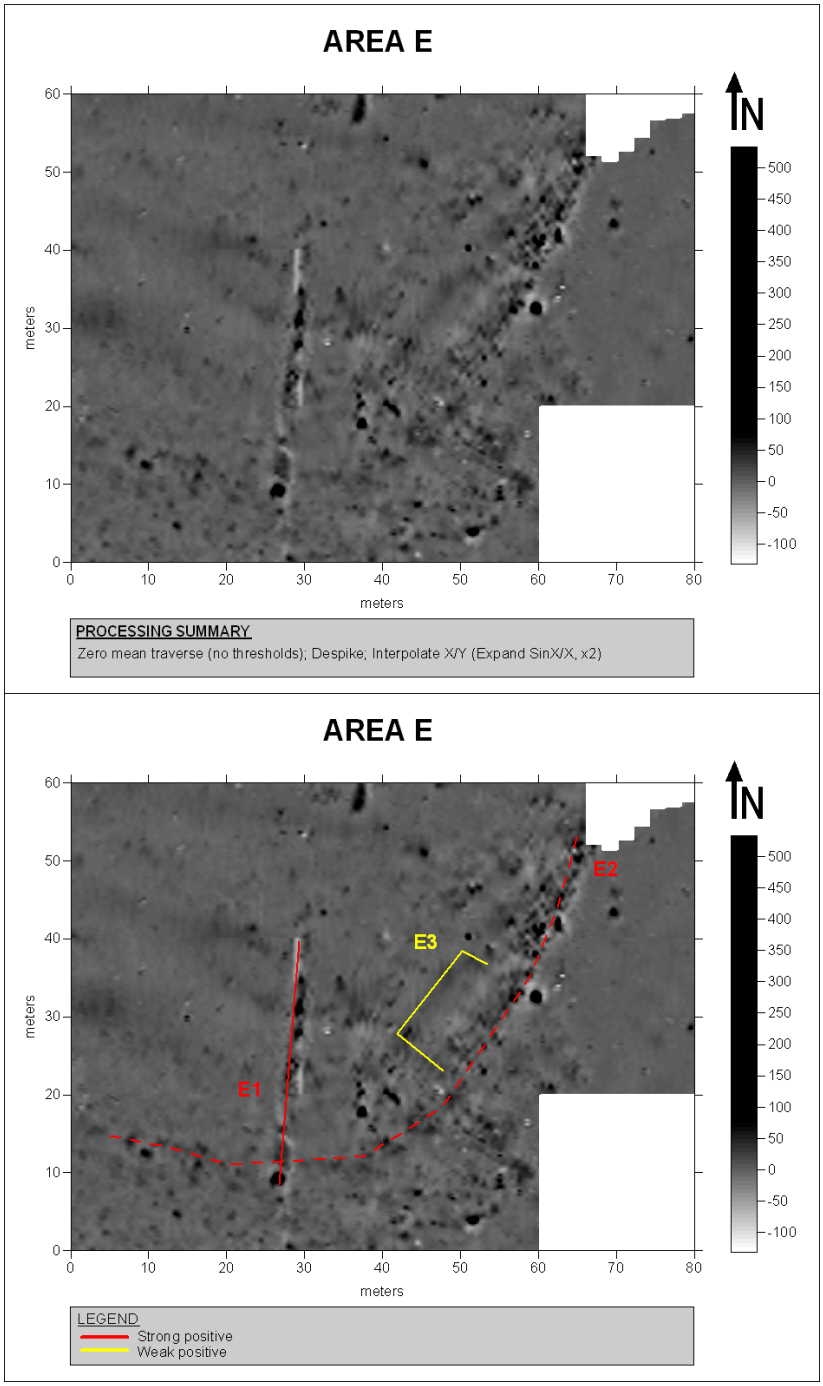
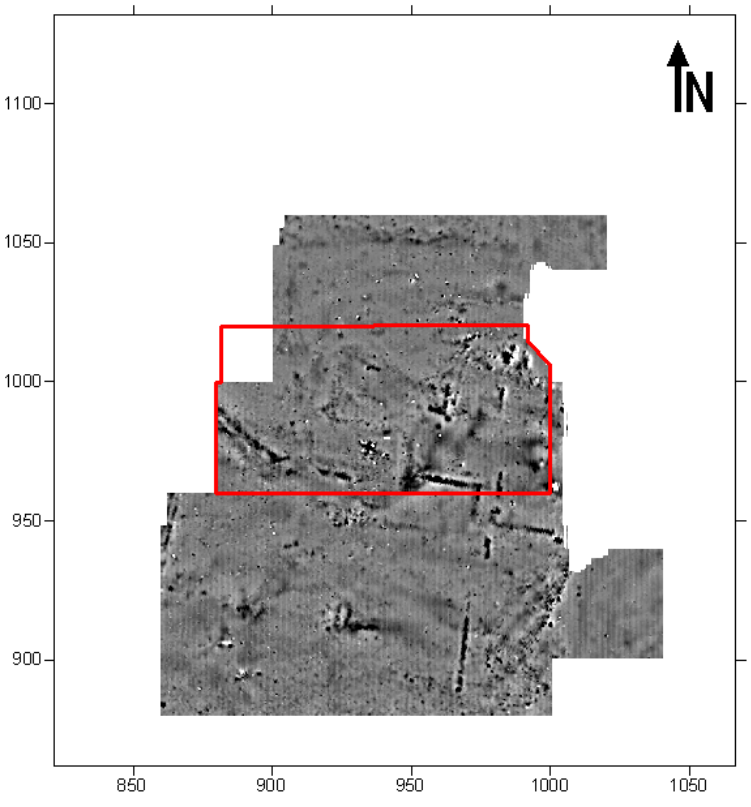


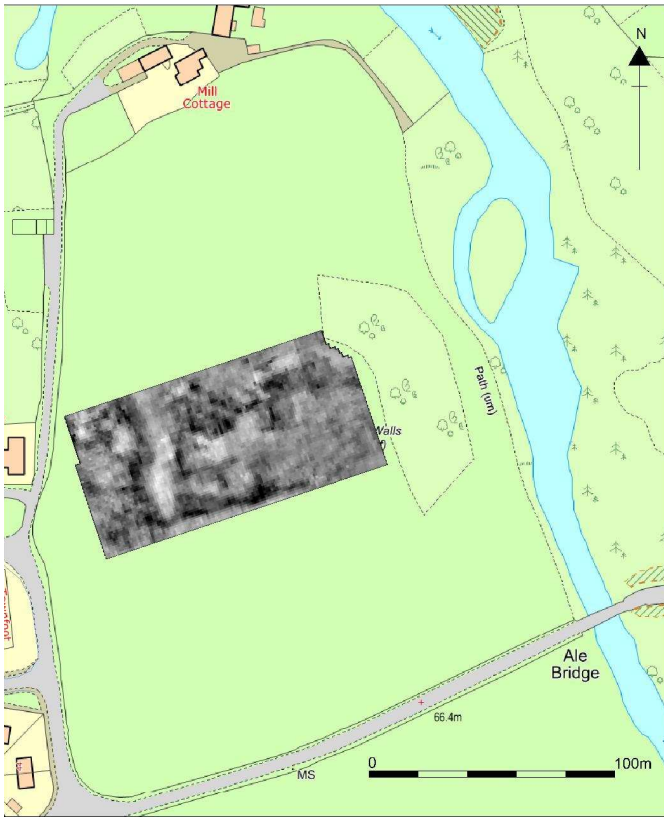
Figure 15: Processed and interpreted results from area E.

Area E showed little coherent evidence for underlying archaeological features except for the long curvilinear positive response E2 and strong linear anomaly E1. E1 seems to overlie E2, and may be a relatively recent field boundary as depicted in the 1946 RAF aerial photograph (Figure 5). The more diffuse E2 seems more reminiscent of a tumbled drystone dyke; it is worth noting the much more muted response to the east of this feature which may indicate different land-use beyond the enclosure. Weakly magnetic responses to either side of E2 may be the remains of demolished structures in this part of the field, possibly related to that seen in area D, but only in one instance (E3) do these cohere into a possible structure.

Earth resistance survey



A



B

Figure 16: A: Location of resistivity survey on gradiometer results. B: Resistivity survey in context.

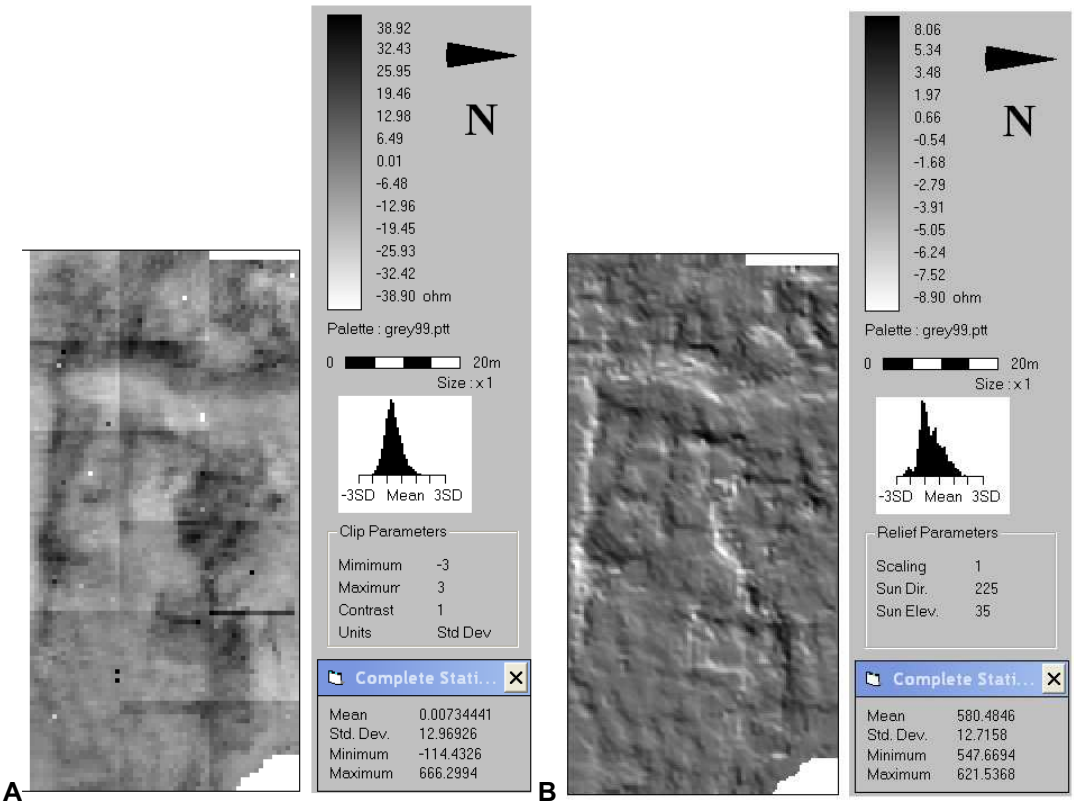


Figure 17: A: Raw resistivity results. B: resistivity results presented as a relief plot.

Due to time constraints, the resistance survey covered a smaller area at a lower resolution than the gradiometer survey (Figure 17A). There was also significant variation between grids, such that significant amounts of edge-matching were required, further reducing the resolution of the results (Figure 17B). In order to ameliorate this, during processing, the data was visualised in a variety of ways, one of the most effective of which was the relief plot (Figure 17C). While the results are less immediately clear than the magnetic survey, certain anomalies correspond well between the two surveys. It is apparent from the relief plot that the resistance survey was also more strongly affected by the underlying geology, making archaeological features harder to distinguish. Irregular anomalies R6 and R13 seem to show the extent of quarrying in the area. Resistivity also reveals the extent to which the possible modern service trench running north-south across the field has disturbed the archaeology (R9). As with the gradiometer survey, the resistivity interpretation presented here isolates anomalies by their electric responses (Figure 18).

Unfortunately, the resistance survey did not cover the entirety of the area with the most diagnostic structural anomalies (A1, area A, Figure 11). R3, The only part of magnetic anomaly A1 picked up by the resistance survey (Figure 18), shows that these features do not show up as clearly with resistance as they did with gradiometry. However, resistivity adds linear features and angled linear anomalies not clearly represented on the gradiometer survey. Crucially, magnetic feature A3 is here shown to be less regular than it seems (R10) and seems to be a palimpsest of features, some potentially pre-medieval.

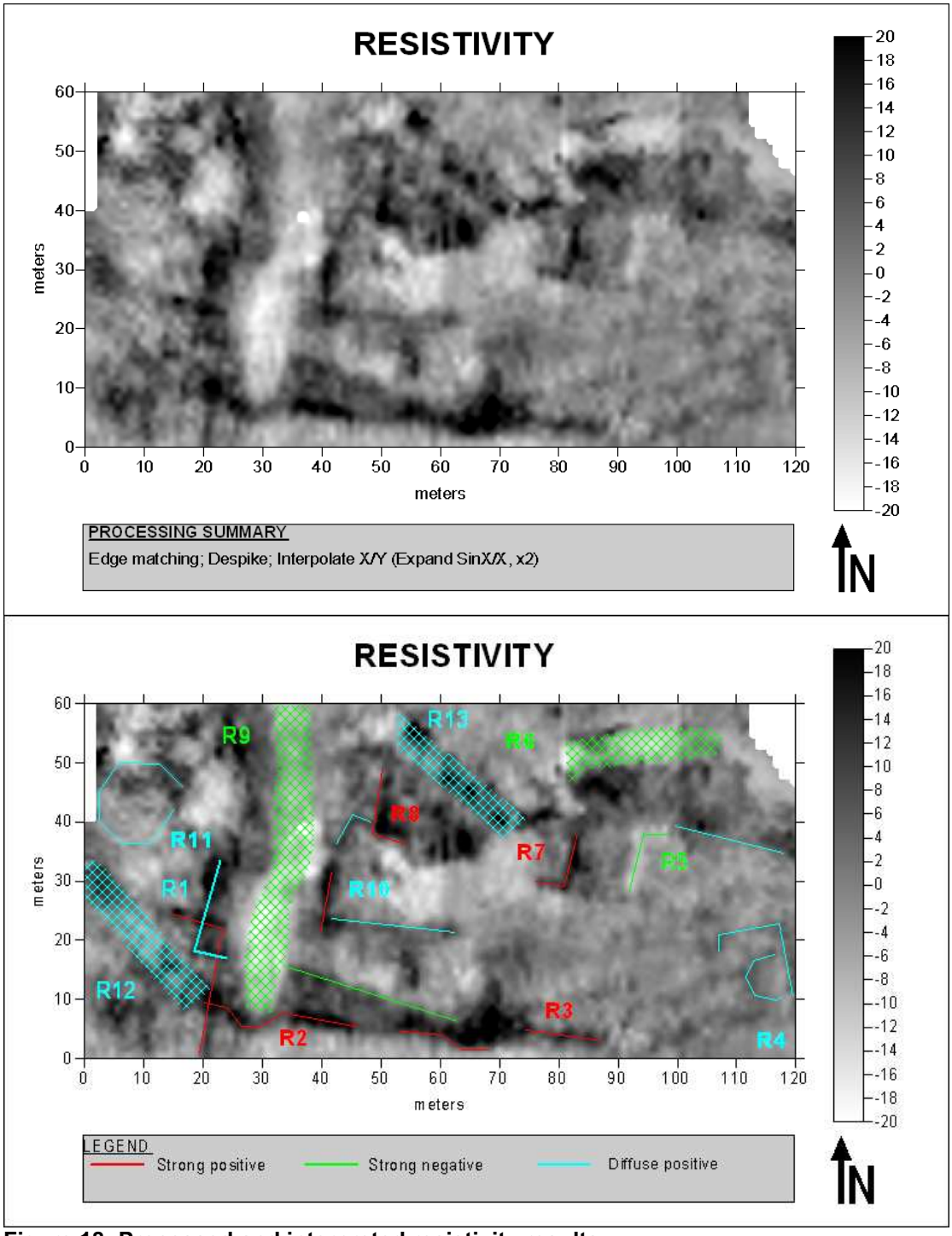


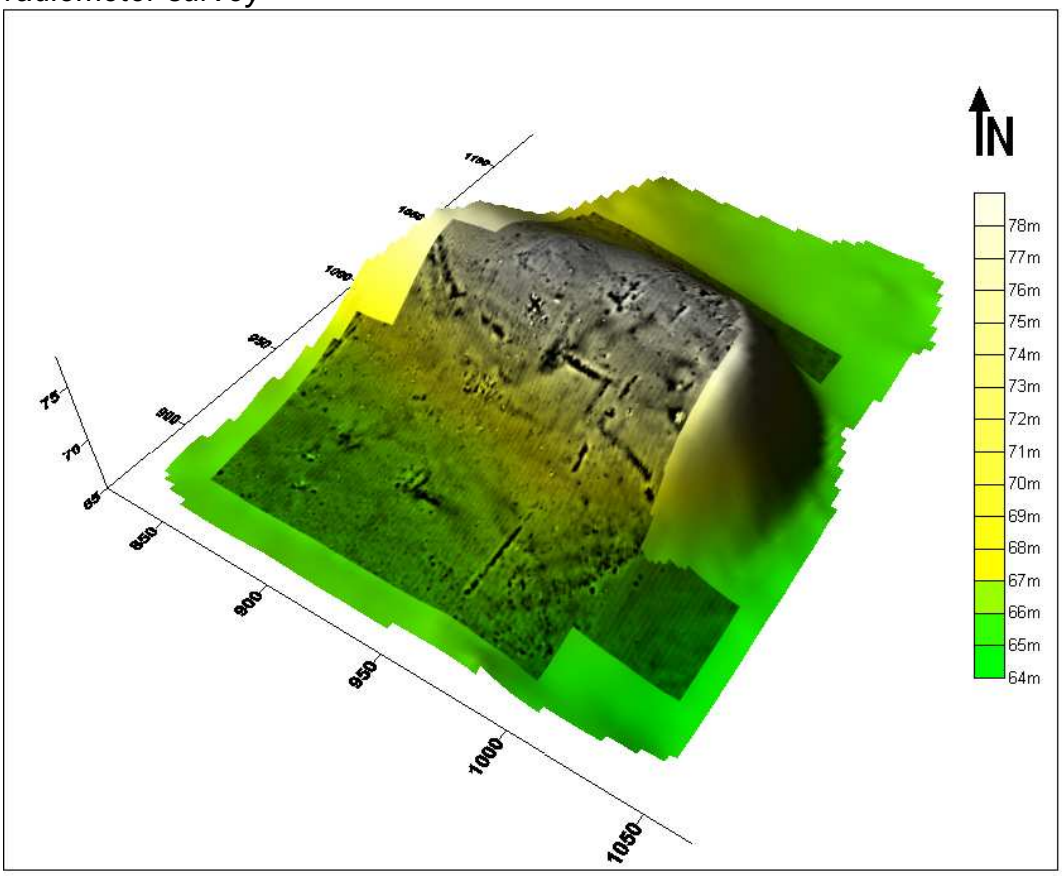
Figure 18: Processed and interpreted resistivity results.

Linear anomaly R2 is clearly shown to be off-axis to R3, which agrees with the interpretation given above whereby magnetic anomaly A9 is potentially distinct from structure A1. However, strong positive R2 is also a very different response to the diffuse R12, which was interpreted as part of linear anomaly C2 in the magnetic survey (Figure 13). R12 is thus potentially not related to R2, and hence it is likely now that A9 is not necessarily a later road as posited earlier. R2 may thus be a different phase of the medieval structures on the summit of the hill, adding complexity and potentially time-depth to the features discovered by this survey.

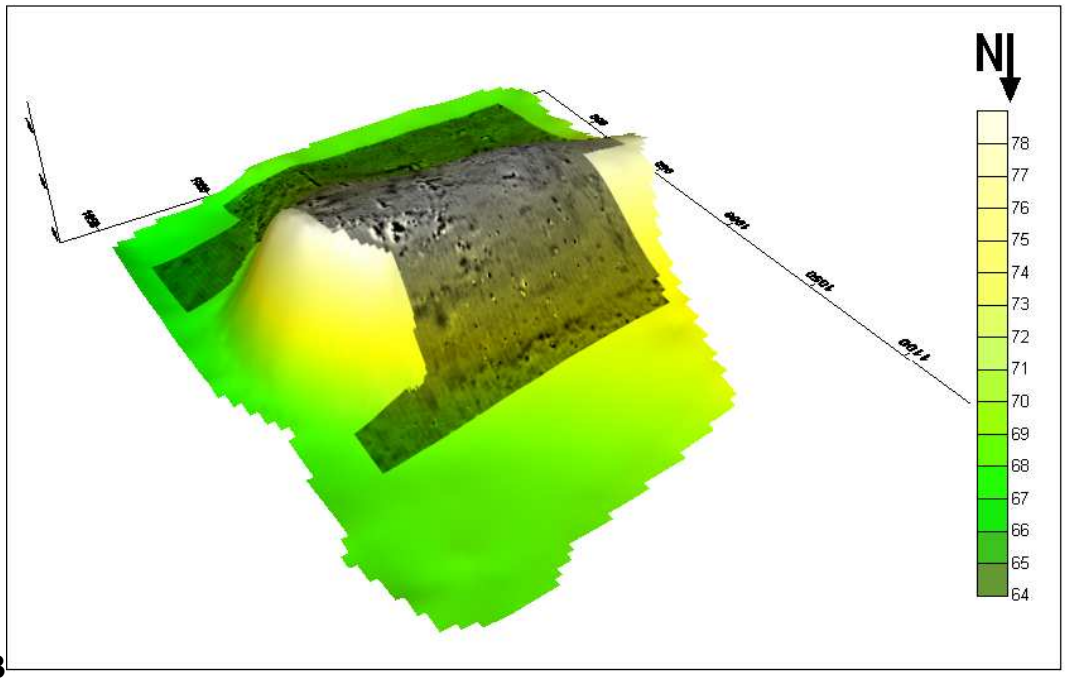
Angled anomalies R7 and R8 would appear to relate to a medieval masonry structure, but this area of the summit is very disturbed. Other new features revealed by resistivity include polygonal feature R11, which is very vague and may be an artefact of intensive processing, and R4. The central element of anomaly R4 corresponds to magnetic anomaly A4, the putative subterranean chamber; resistivity adds some detail to this structure, although its precise nature remains out of reach.

Discussion

Gradiometer survey



A



B

Figure 19: Gradiometer survey results overlaid on a 3D contour model.

The gradiometer survey revealed a palimpsest of features, dominated by what seems to be the footings of a large masonry structure. When the results are displayed on a 3D contour model of the site, it becomes clear that the structure and surrounding features were built predominately on the south-facing slope of the Mantle Walls field (Figure 19). The field boundary on the lower ground to the south of the summit would seem to be following the contours of the hill (Figure 19A), while the more diffuse linear features on the lower ground to the north appear more like hillwash deposits mobilised by plough action collecting at the break of slope (Figure 19B). As is perhaps to be expected, the area occupying the apex of the hill would appear to have suffered from the most quarrying and other disturbance, and the best surviving archaeological deposits would appear to survive relatively intact further down the south slope.

Resistivity survey

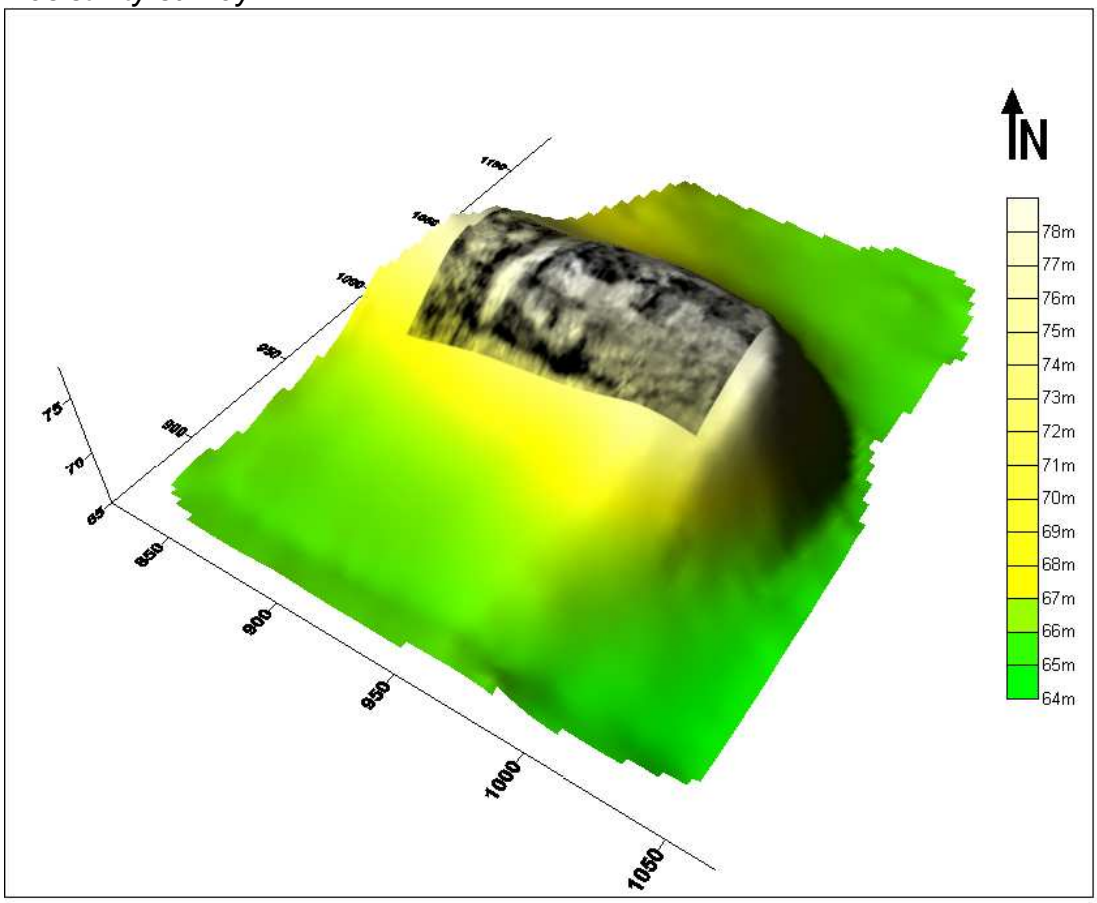


Figure 20: Resistivity survey results overlaid on a 3D contour model.

The resistance survey also revealed a palimpsest of features, most notably the level of modern disturbance to the archaeology. Although the underlying geology obscures the picture here, a modern north-south service trench is clearly visible at the west end of the summit (Figure 20). There are almost no coherent structural anomalies visible in the electrical survey, and only when compared with the magnetic survey can features begin to be interpreted. It would appear that the site would benefit from a higher resolution electrical survey targeting the potential structural features visible in the magnetic data.

Overall interpretation

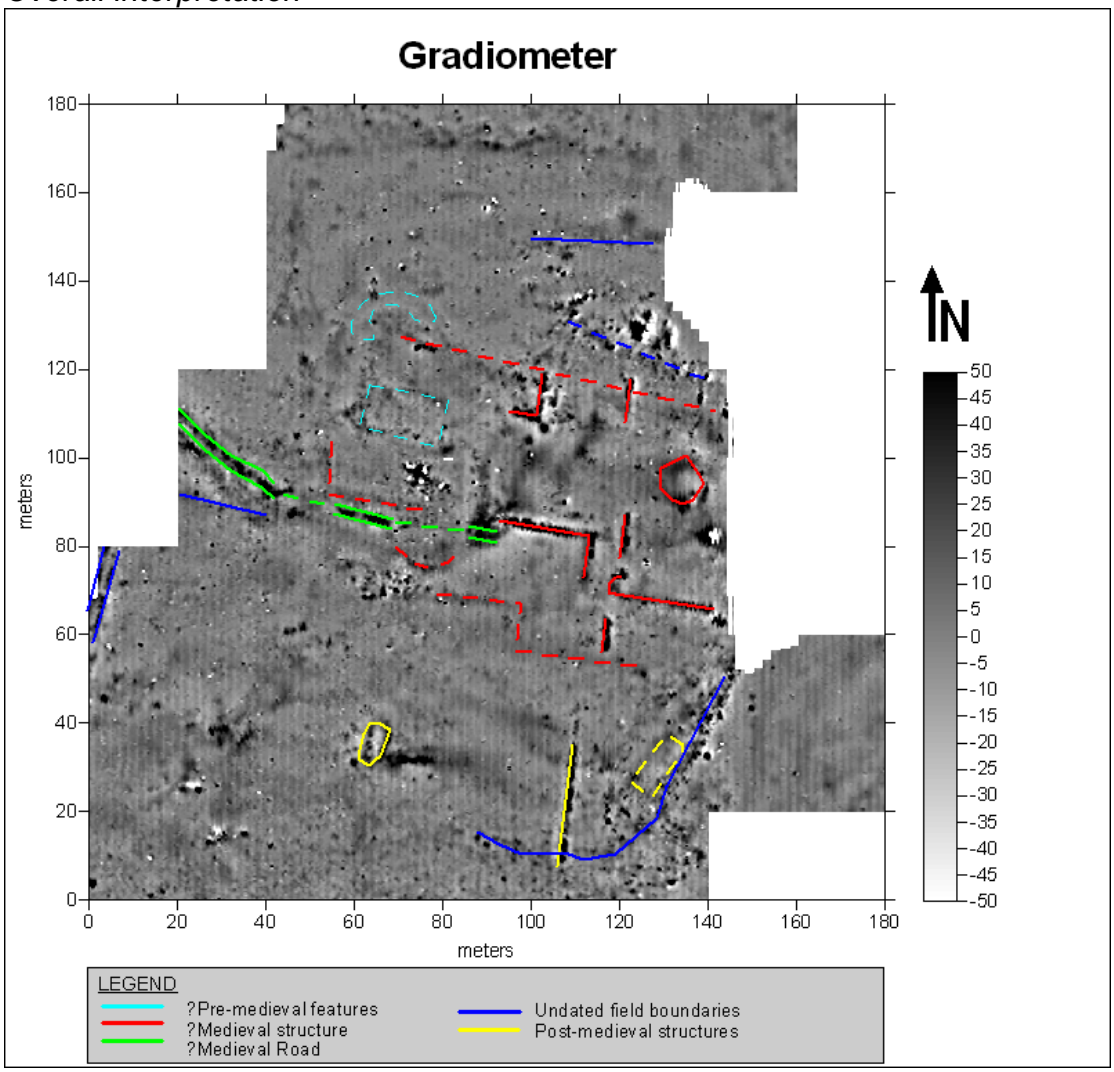


Figure 21: Interpretation of features.

The overall interpretation of the results is based primarily on the magnetic survey due to its greater coverage and resolution. The picture that emerges is of a substantial structure occupying the summit and southern slope of the Mantle Walls field, and a palimpsest of undated field boundaries. There is evidence for a road leading from the modern village to a possible gatehouse, and internal features include what may be a subterranean chamber. Evidence of previous occupation may be apparent in two polygonal features to the west of the main structure, although the resistance survey did not reveal these to be coherent structures, and so this interpretation must be treated with caution. Modern farm buildings also appear on the lower ground to the south of the summit. Finally, the disturbance to the surviving archaeology can be traced by the spreads of diffuse but highly magnetic responses across the summit of the hill.

Conclusions

The results of the 2011 survey were generally positive. This has shown the potential for Mantle Walls to be part of a significant settlement, consistent with reports of a medieval bishop's palace or tower house. Linear anomalies which

appear to be the footings of a substantial masonry structure could preserve architectural masonry which would help date the site. Further, the roads and potential farm buildings have the potential to illuminate something of the history of the modern village of Ancrum. Finally, the survey shows most clearly the threats to the archaeology of this potentially very important site, including modern quarrying and the cutting of service trenches for occupation on the perimeter of the field. Furthermore, reports of nighthawking have continued apace after the end of the present survey, as they have for many years, which would seem to confirm the importance of the surviving archaeological resource, as well as its ongoing depletion.

Recommendations

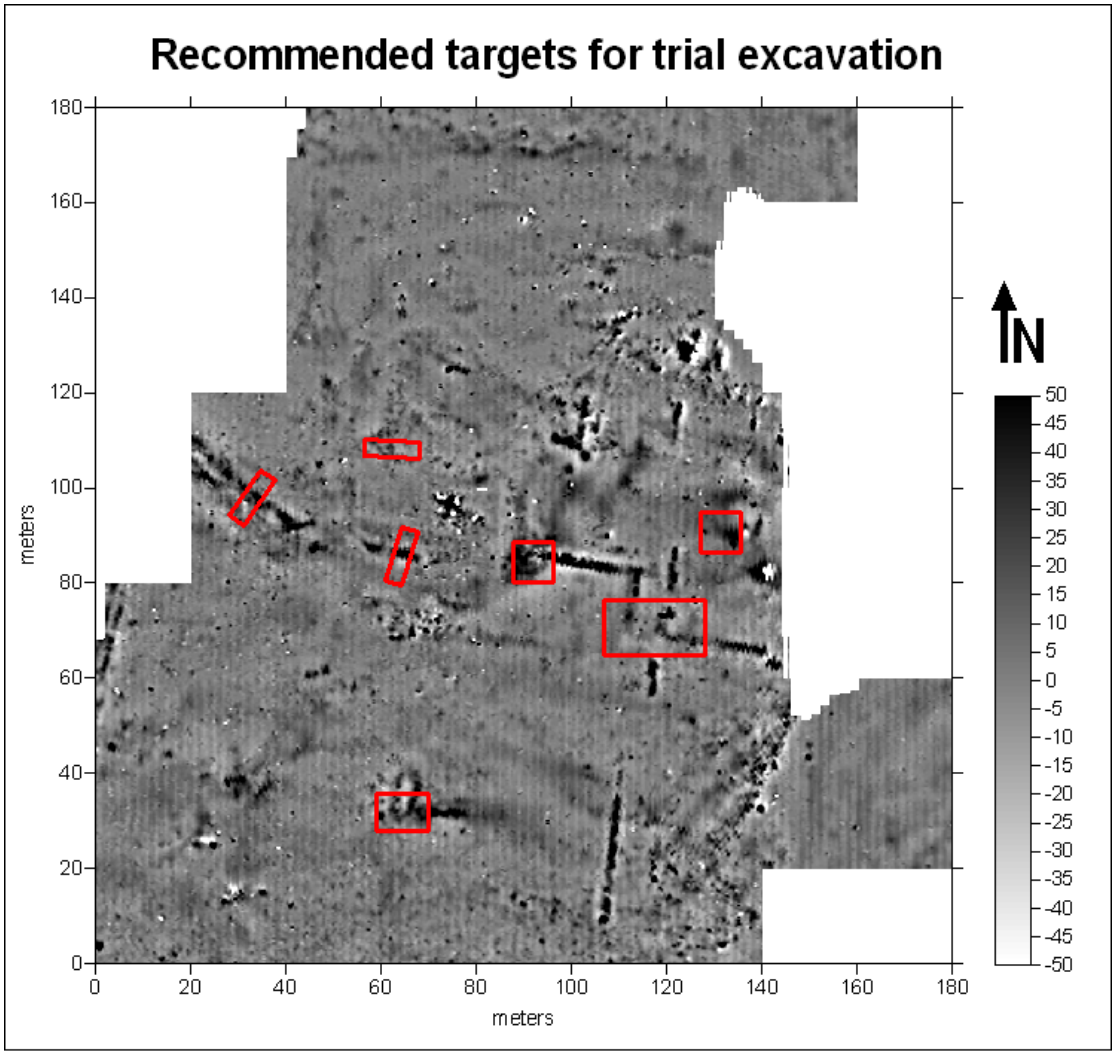


Figure 22: Recommendations for targeted trial excavation.

Following discussion of the results of this survey with Scottish Border Council archaeologist Dr Chris Bowles, the surveyors strongly recommend that the results be verified by keyhole excavation. A tentative plot of the potential areas to be targeted are presented here (Figure 22), each with the dating of specific structural features in mind. Should the structures revealed here prove to be ancient, this report formally recommends that scheduled monument protection should be obtained for this site.

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References

Pococke, Richard (1760 [1887]), *Tours in Scotland 1747, 1750, 1760*, D W Kemp (ed), Edinburgh.

RCAHMS (1956), *The Royal Commission on the Ancient and Historical Monuments of Scotland. An inventory of the ancient and historical monuments of Roxburghshire*. Edinburgh.

Somerville, Thomas (1794). *The statistical account of Scotland, drawn up from the communications of the ministers of the different parishes* vol. 10, J Sinclair (ed), Edinburgh. 289-297.