



Geophysical Survey Report No. 8

**Killyglen
Co. Antrim**

Dr Steven Trick



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1 Introduction

- 1.1 This report presents the results of a third geophysical survey undertaken at Killyglen, Co. Antrim, in early February 2006. Earth resistance and magnetic surveys of land surrounding the mound at Killyglen (SMR ANT 035:022) were carried out in order to further our understanding of the complex of monuments at the site. The survey sought to both compliment and clarify previous geophysical surveys (see CAF GSR Nos 002 and 004), whilst seeking to identify further archaeological anomalies peripheral to the mound.

2 Background

- 2.1 The mound at Killyglen is 5m high and 27m in diameter. It is located on the end of a flat ridge, with the land dropping away sharply to a small stream 50m to the south and southeast. Based on its morphology and landscape setting, it is understood to be a motte of the Anglo-Norman period (see SMR entry). A notable feature of the monument is a deep furrow through the centre, which has almost bisected the mound into two halves. The SMR entry attests to a possible bailey east of the mound, and an oval enclosure around the entire site, apparently visible on aerial photographs. See Figure 1 for a location map, and Figure 2 for a topographic plan of the site.
- 2.2 In the field to the west of the mound is the ruined church of St John of Kilglan, set within a rectangular enclosure. To the west of this are a series of further earthworks which suggest a small settlement of house platforms and enclosures navigated by narrow lanes. The earliest historical reference to the site comes in the 1333 Inquisition held after the death of William de Burgh, Earl of Ulster. Two free tenants and a fortnightly court for external suitors suggest that this may have been part of a small manorial centre (Orpen 1913, 138; Carver and McNeill 2004).
- 2.3 The deep furrow through the mound is a puzzling feature and a subject of debate. The current landowner states that a trackway passed through there within living memory. Relic gateposts in the wall of Moat Farm apparently mark where this track joined Ballymullock Road (S. Moore pers. comm.). First and second edition OS maps (1833 and 1857) depict the mound as a coherent circle, without the detail of the furrow.

3 Previous work

- 3.1 In summer 2004 the mound and its periphery were the focus for a research excavation under the directorship of Dr Tom McNeill of the department of archaeology, Queen's University Belfast. Two trenches were excavated on the summit of the mound and several more west of the mound. Excavation of the mound

uncovered a wall which truncated an occupation layer containing medieval pottery (see Carver and McNeill 2004).

- 3.2 During the 2004 field season, an earth resistance survey was conducted over a 100m x 40m area, west-southwest of the mound with the intention of locating settlement in the zone between the mound and the ruined church. The results were reported in CAF GSR 002. Five anomalies were identified by the survey. Three of these were subsequently excavated, and were confirmed as archaeological features. To summarise, the low-resistance anomalies were found to be foundation trenches or gullies, the high-resistance anomalies were arrangements of boulders and rubble, often located themselves within cut features.
- 3.3 A second resistance survey took place in February 2005 (CAF GSR 004), focusing on areas peripheral to the mound not covered by the first survey, namely along the field boundary west of the mound, and the confined area immediately north of the mound. In comparison to the results of the first geophysical survey at Killyglen, the results of the second survey were less satisfying, and presented the surveyors with difficult material for interpretation. Figure 3 shows the areas surveyed with resistivity techniques during the first, second, and this third session.

4 Geology

The bedrock of the site is white limestone of the Ulster White Limestone Formation. Residual weathering of the limestone over a prolonged period resulted in a deposit of 'clay-with-flints'. Below the white limestone are deposits of sandstones, marl and conglomerate which comprise the Hibernian Greensand Formation. North and west of the site the chalk is overlain by basalt flows (Moore, McSparron and Carver 2004).

5 Survey strategy

- 5.1 This third geophysical survey sought to cover, on the whole, the same ground as the second survey. It was hoped that the results of this third survey would offer themselves more readily to interpretation than did those of the second. Building on the second survey, this survey aimed to cover new ground immediately east of the mound.
- 5.2 In addition to the resistivity survey, a trial magnetometry survey was conducted to determine whether this method was feasible on this site. Magnetic surveys are usually avoided in Antrim due to the predominance of basalt solid geology. Killyglen however lies on a wedge of limestone within the basalt, theoretically making the site more amenable to survey with this method.

6 Survey area

- 6.1 The survey took place between February 7th and 10th 2006. The survey area was green pasture, providing good conditions for survey with both techniques. The weather was generally dry, interspersed with occasional showers, some of which were heavy. Despite the rain, the ground did not become overly waterlogged.
- 6.2 The survey was unable to closely mirror the field northern field boundary due to overhanging branches from the trees which form this boundary. Upstanding patches of dead pasture weeds caused some obstruction problems for the magnetometer sensors.
- 6.3 Where the survey was obstructed by the slopes of the mound, dummy readings were recorded. The eastern edge of the mound is however characterised by a relatively gentle slope, and the resistance survey was able to proceed up this a certain distance.

7 Method

- 7.1 A baseline was set out parallel with the northern field boundary, and a series of 20m x 20m grids were formed from this, using a combination of total station and optical square. The total station was also used to record the position of notable features in the area, house corners, field corners etc, in relation to the grids so the survey area could be placed on the base mapping.
- 7.2 *Resistivity*
- 7.2.1 The earth resistance survey equipment comprised a Geoscan RM15 Resistance Meter. The probe separation was 0.5m, with a traverse interval of 1m and a sample interval of 0.5m. This configuration was chosen to provide finer resolution of results than the previous survey conducted in this area. The grids were surveyed in a zig-zag pattern. Nine grids were surveyed, a number of these were partial grids due to the presence of the mound in the survey area. Figure 4 shows the layout of the resistivity grids.
- 7.2.2 The data were downloaded and processed using Geoplot 3.0s program, by Geoscan Research (Geoscan 2005). The data were interpolated in the direction of traverse to provide a smoother plot. The data were then clipped to 1.5 standard deviations either side of the mean to provide better contrast in the plot, see Figure 5. Some lines of data were removed from the final plot due to the presence of spurious values.

7.2.3 Figure 6 shows the resistance plot overlaid on the base mapping. This figure was generated using ArcGIS 9.1.

7.3 *Magnetometry*

7.3.1 The magnetometry equipment comprised a Bartington Grad601-2 dual sensor fluxgate gradiometer. The traverse interval was 1m and the sample interval 0.25m. The grids were surveyed in a zig-zag manner.

7.3.2 The collected data were downloaded using the Grad601 application and imported into Geoplot 3.0s. The data were clipped to one standard deviation either side of zero to combat iron spiking in the data. A low-pass filter was then applied to smooth the plot, and finally the data were interpolated twice in the direction of traverse in order to bring symmetry to each unit of data. Figure 7 shows the resulting plot.

8 **Results**

8.1 *Resistivity*

8.1.2 Five anomalies of archaeological potential were identified in the resistance plot, these are summarised in Figure 8. These anomalies appear against the non-uniform response of the local geology. The excavation of a number of anomalies identified in the first geophysical survey at Killyglen (Carver and McNeill 2004) provides useful insight into the relationship between anomaly morphology and physical reality.

8.1.3 Anomaly 1 is a low-resistance arc that forms a 'halo' around the mound, c. 8m in width. This is interpreted as a ditch encircling the mound. This corresponds with low-resistance Anomaly 'i' in the first resistance survey at Killyglen (see Moore, McSparron and Carver 2004), located on the south-western perimeter of the mound. Of note in the present survey however is how the low-resistance readings continue up onto the lower slopes of the mound, in particular across the gradual slope on the eastern side. From this it may be suggested that the mass of the mound is comprised of lower-resistance material to the surrounding land. Alternatively, there has been considerable collapse of mound over the perimeter ditch.

8.1.4 Running tangent to Anomaly 1 is the pattern at 2, which is a clear, low-resistance arcuate anomaly. The arc is 4.5m in width, delineating a circular shape 20m in diameter. Anomaly 2 is interpreted as a negative cut feature, possibly a ring ditch. It may be a further defensive measure associated with the main ditch (Anomaly 1). Alternatively, it may represent a foundation trench for an unrelated circular structure.

- 8.1.5 Immediately north-northwest of the centre of the mound is an area of relatively high resistance. Running through this are two linear, low-resistance anomalies (Anomalies 3 and 4), both 1-2m in diameter. These are interpreted as linear ditches or foundation trenches. Their regular linearity and almost perpendicular arrangement might suggest they are bedding trenches for above-ground structures.
- 8.1.6 Anomaly 5 is located on the eastern slope of the mound. It appears as a high-resistance linear anomaly, c.1m wide, against a uniformly low-resistance background. At one end may be a 90 degree turn in the anomaly suggesting it may be the buried footing of a wall. Since it is located adjacent to the limit of the survey area its interpretation must remain tentative.

8.2 *Magnetometry*

- 8.2.1 The magnetometry plot shows that the site was very magnetically 'noisy'. Even with data clipping to reduce the influence of iron-spikes, the dataset carries a large standard deviation. These results suggest that geological processes have left basalt boulders and stones in the subsoil, which are interfering with the equipment. These geological remnants are magnetically strong enough to mask the response from archaeological features. As a result no anomalies with archaeological potential are readily perceptible in the magnetometry plot.

9 **Conclusions and recommendation for further work**

- 9.1 The third resistivity survey at Killyglen successfully identified a number of anomalies which may be of archaeological potential. The survey also covered areas of the field not encountered during previous surveys. Where the survey duplicated areas covered by the second resistivity survey, the readings captured by the present survey are both of higher-resolution, and more readily amenable to interpretation.
- 9.2 The magnetometry survey confirmed the hypothesis that the use of fluxgate gradiometers for on areas of limestone geology which are located between basalt lava flows is not feasible due to remnant basalt boulders and stones in the subsoil. This result was also encountered during a magnetic survey in Bighouse townland, south of Fair Head, also on limestone geology between basalt (see CAF GSR 006). This provides important reference information for geophysicists working in County Antrim and other counties with basalt solid geology.
- 9.3 The surveys and excavations carried out to date at Killyglen provide negative evidence for the presence of settlement peripheral to the mound, and between the

mound and the ruins of the old church. It is suggested therefore that the survey broadens its scope to include the field to the north of the mound, and the field in which the church ruins and associated earthworks are located. With regard to the geophysical anomalies already identified, a number of these are worthy of further investigation. In light of this, two further programmes of work are recommended.

9.4 *Survey*

- 9.4.1 It is suggested that resistivity survey should expand into the field north of the mound to determine if settlement evidence exists here. Additionally, resistivity survey should be conducted in the field around the old church of St John of Kilglen, where the mapping of subsurface anomalies will complement what we currently understand through surface earthworks. Also, a survey immediately east of the mound may determine whether the bailey suggested in the SMR entry exists.

9.5 *Further investigation*

- 9.5.1 Of the anomalies identified with this survey, of particular interest are Anomalies 1 and 2. Anomaly 1 appears to be a ditch encircling the mound, however the break between the ditch, and the mound material is not readily evident in the plot. An investigative excavation trench across the ditch and lower slopes of the mound may clarify this issue. Anomaly 2 is a well-formed circular anomaly, which is possibly related to the mound. A trench spanning both anomalies would help to clarify dating and sequence.

Acknowledgements

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Figure 1. Location map showing position of Killyglen in Northern Ireland. Adapted from Moore, McSparron and Carver 2004, figure 1.

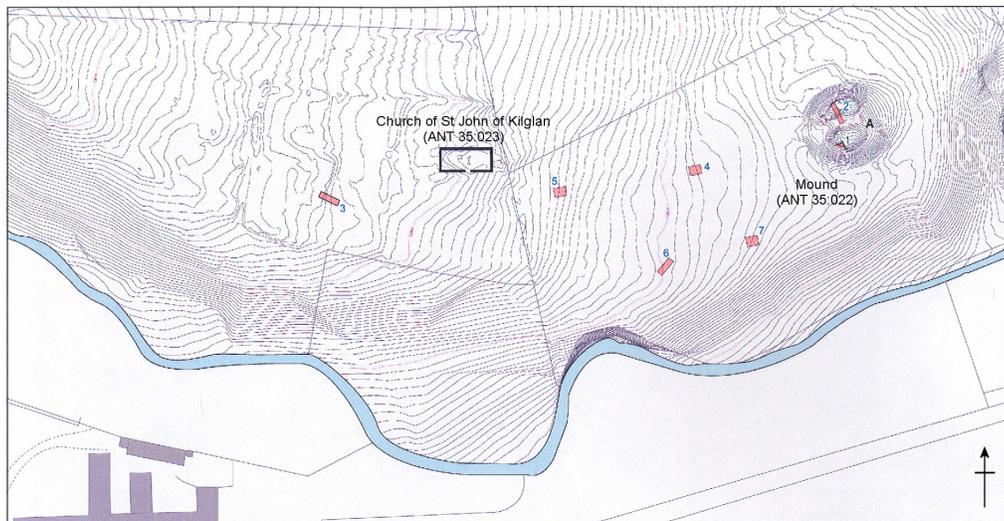


Figure 2. Topographic map of the area encompassing both the mound and old church at Killyglen. Adapted from Moore, McSparron and Carver 2004, figure 3. Pink rectangles mark the areas excavated in 2004. Please see original publication for full key to symbols.

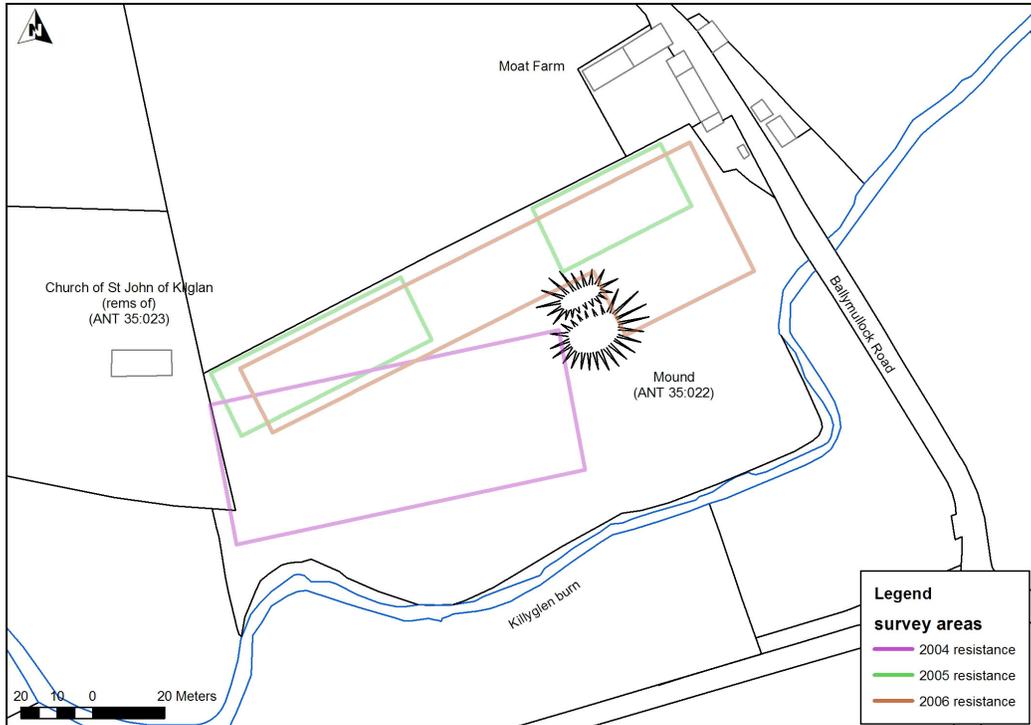


Figure 3. Plan of the areas covered by successive resistivity surveys at Killyglen.

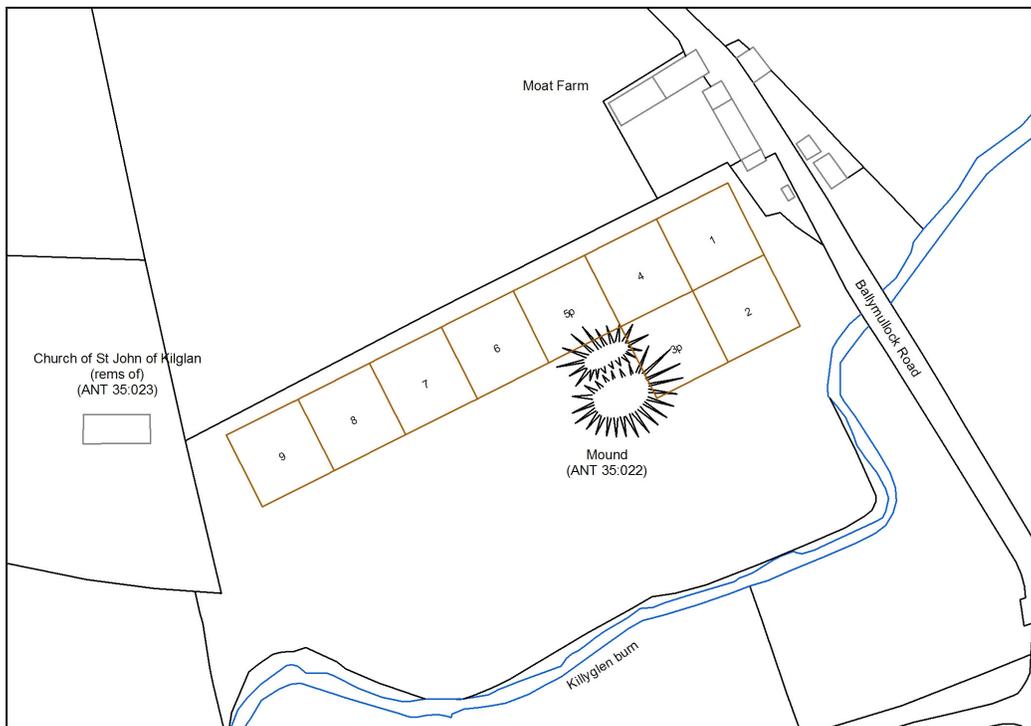


Figure 4. Layout of grids surveyed with resistivity. 'p' = partial grid.

Killyglen, Co. Antrim

Earth resistance survey



a) raw data

b) processed data

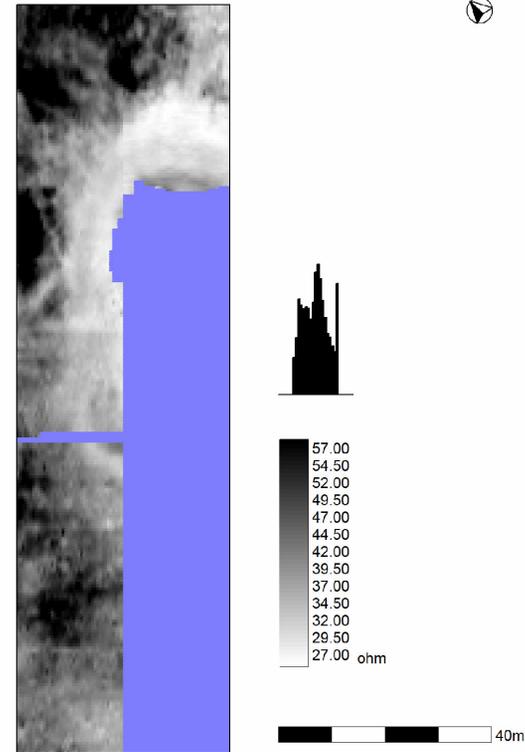
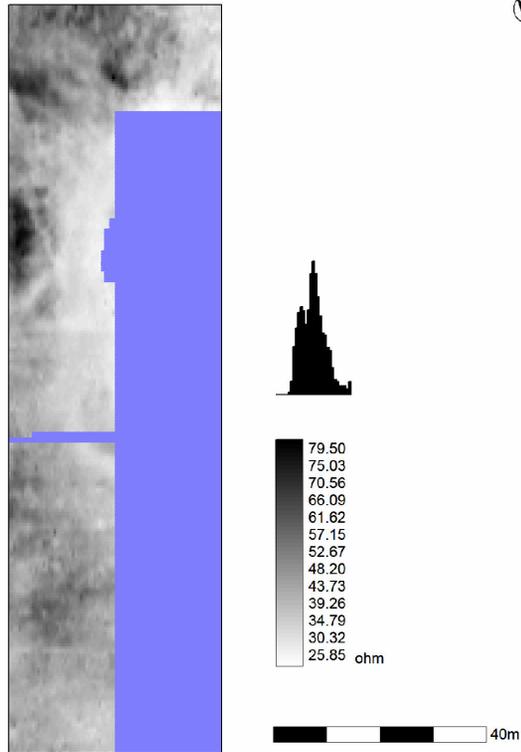


Figure 5. Plot of resistance data, showing a) raw data, and b) processed data. Each plot is accompanied by histogram, colour scale and distance scale.

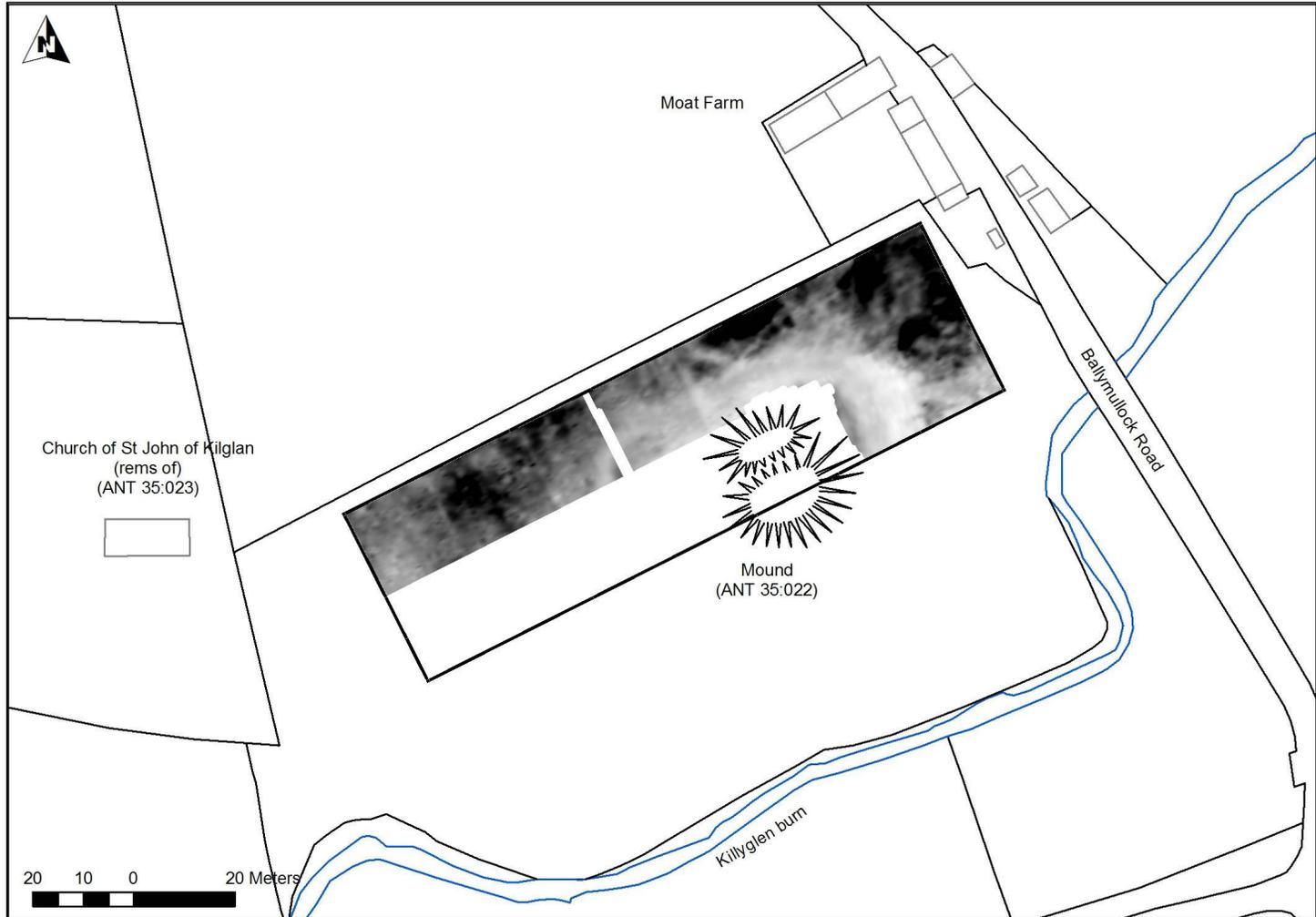


Figure 6. Resistivity plot overlaid on base map.

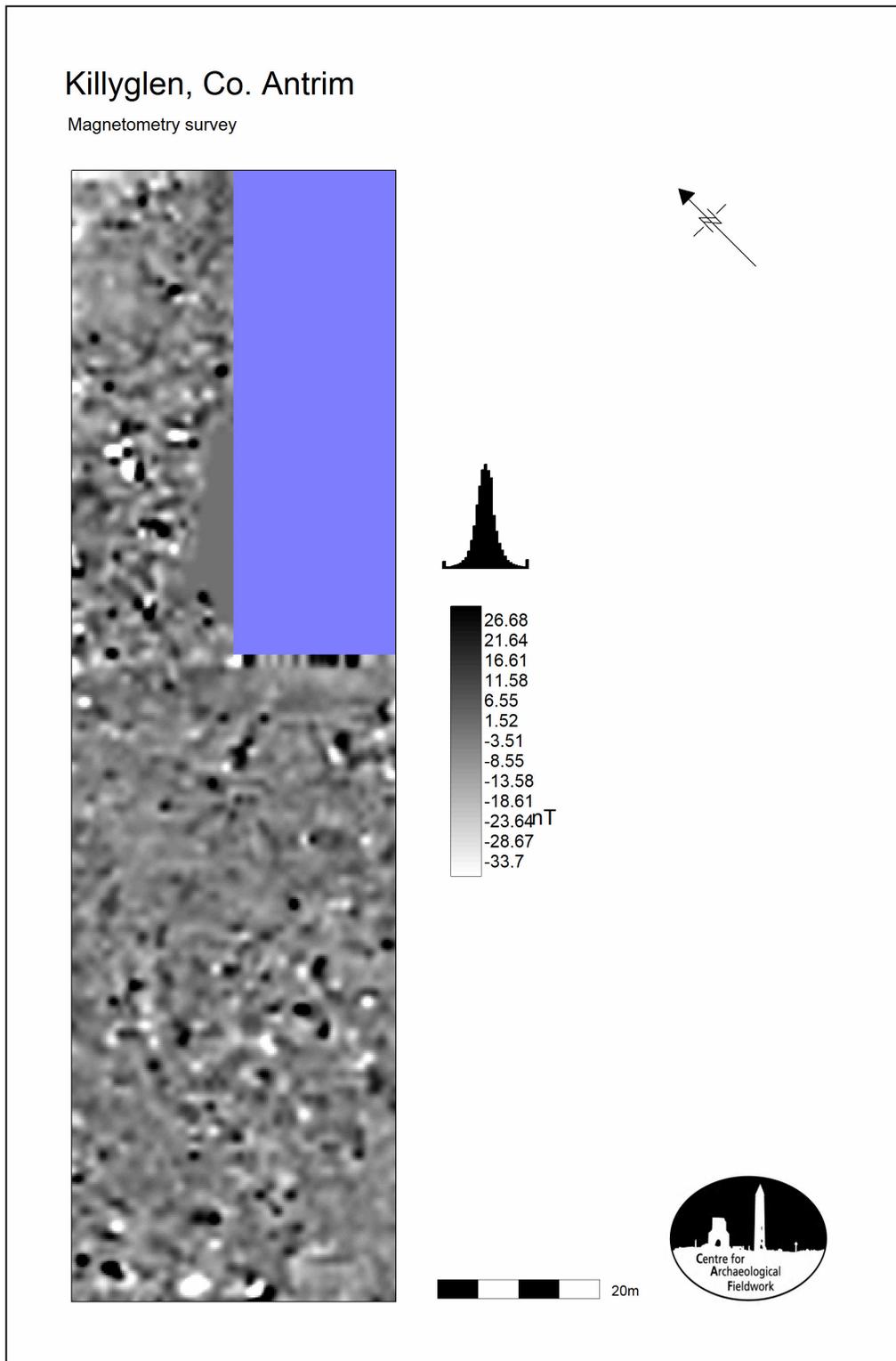


Figure 7. Plot of magnetometry data, showing histogram, colour scale and distance scale.

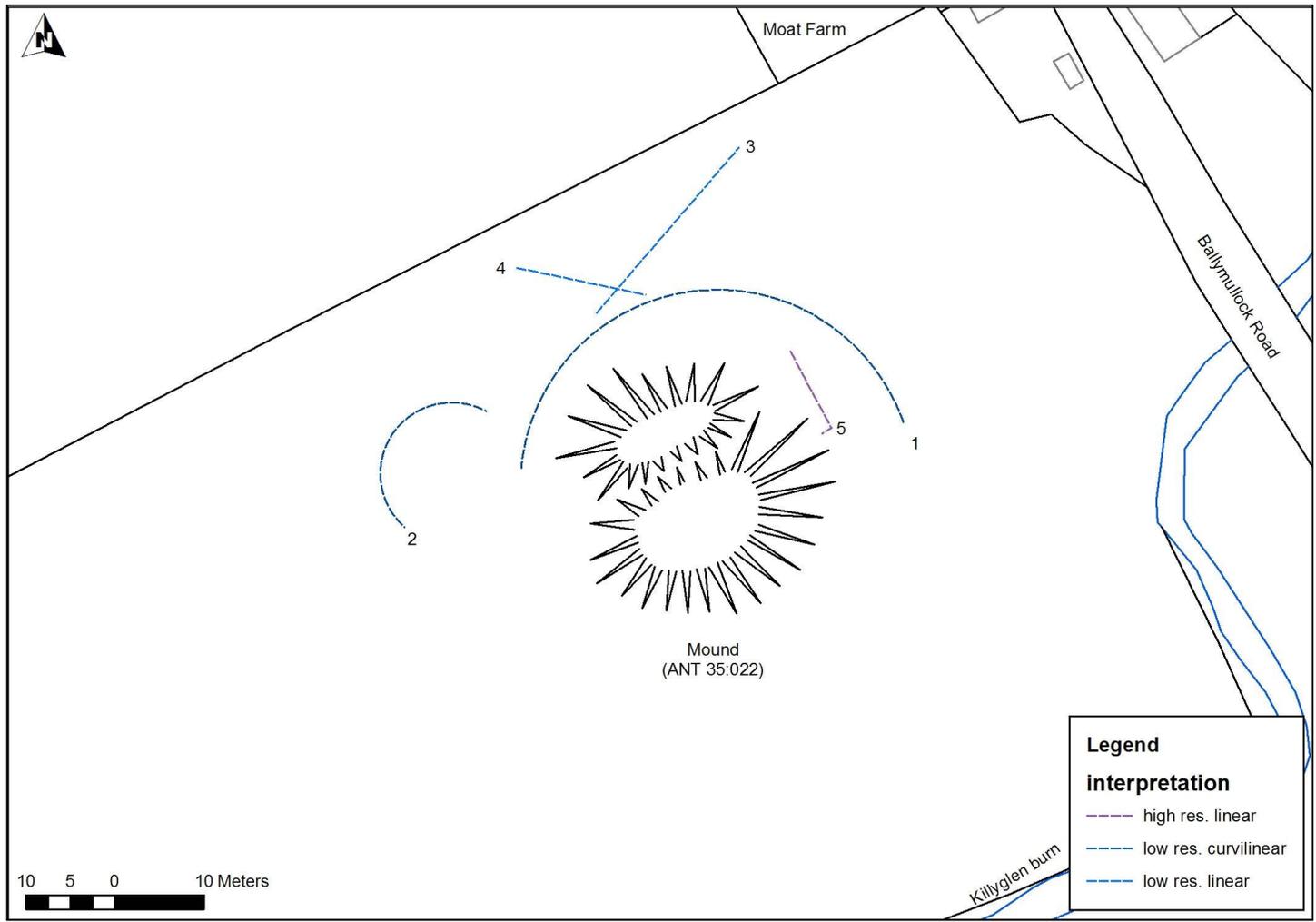


Figure 8. Summary of resistance anomalies discussed in the text.