



Geophysical Survey Report 18

Muckamore Abbey, Co. Antrim





Muckamore Abbey, County Antrim

Geophysical investigations at the site of an Augustinian Priory

SMR No.: ANT 050:076

Grid Ref: J1669 8544

On behalf of

Northern Ireland Environment Agency (NIEA)

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CAF GSR 18

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1.0 Summary

1.1 Site Specific Information

Site Name: Muckamore Abbey

Townland: Muckamore

SMR No.: ANT 050:076

Currently in State Care

Grid Reference: J 1669 8544

County: Antrim

Dates of Survey: 12th-20th December 2011

Surveyors: Sapphire Mussen, Ronan McHugh and Brian Sloan,
Centre for Archaeological Fieldwork, Queens University Belfast.

Size of area surveyed: approx 0.8 hectares

Weather conditions: Inclement, temperatures below freezing

Geology: Solid basalt bedrock with superficial glaciofluvial sheet deposits and till

Current land use: Improved grassland

1.2 Abstract

A geophysical survey of the site carried out in December 2011 revealed a number of definite high resistance anomalies and magnetic responses which appear consistent with 17th-18th century garden paths shown on Ordnance Survey maps. At first glance the resistance results seemed fairly devoid of any other features with homogenous low readings across the site. This is most likely due to the significant depth of topsoil on the site as demonstrated by C.J. Lynn in 1973. However, a number of faint high resistance anomalies presenting probable evidence of the Augustinian priory became clearer as the data was processed. There appears to be a superimposition of anomalies of contrasting resistance levels and areas of magnetic noise which could suggest successive episodes of alteration to the site which would be in keeping with the known history of the site and its immediate vicinity. It is most likely that future excavations of the site would be beneficial to its further investigation.

2.0 Introduction:

This report details the results of an investigative geophysical survey undertaken at the site of Muckamore Abbey, Co. Antrim. It is identified in the Northern Ireland Sites and Monuments Record (NISMR ANT 050:076) as the site of an Augustinian priory of which there are no visible remains. The site now takes the form of an enclosed area of improved grassland of approximately 0.8 hectares, accessed by a modern field gate from a path alongside the Oldstone Road. The site lies a short distance east of a newly built housing development and just south of a bend in the Six Mile Water River (Figures 1 & 2). It is bounded along the western edge by a wooden fence, the rest of the site being circled by a high stone and brick wall, first built to enclose a garden associated with Muckamore House in the 17th-18th century. Excavations in 1973 and 1996 uncovered the substantial remains of the cloister foundations which are now preserved *in situ* approximately 2m below the surface of the Oldstone Road. Results of a geophysical survey in 1996 and extrapolation of the 1973 excavated walls suggest that the Abbey remains extend eastwards into the area now in State Care (Figure 2 & 3). Earth resistance and magnetometry surveys were carried out in this area in December of 2011 to further investigate the extent of these sub-surface remains and provide an archaeological assessment of the site with a view to informing the future management strategy for the site. Section 10 presents a discussion of the results and recommendations for further work are given in section 11.

3.0 Historic background:

- 3.1 It is suggested that the name of Muckamore Abbey is derived from the fertile plain on which it stood (Reeves 1847, 97); the *Maigh Chomair* or *plain of the confluence* referred to in the *Annals of the Four Masters* in a list of plains in Ireland which were cleared during prehistoric times (McKay & Muhr 2007, 15). This confluence is often taken to be between the Six Mile Water and Lough Neagh. McKeown (1938) proposes that it is more likely to be the confluence of the Clady and the Six Mile Water River. The OS memoirs suggest that the name 'Muckamore' originates from *muck airi mor* or the *great field of adoration*, whilst also stating that its origins are not accurately known (Day, English, & McWilliams 1996, 54, 69).
- 3.2 The early history of the site of Muckamore Abbey and its founding date is unknown. There is little written evidence regarding Early Christian activity at the site. It is thought to have been founded by Saint Colman-Elo, a nephew of Saint Colmcille. Saint Colman-Elo was born in the mid-6th century,

around AD555, and it is supposed that the monastery was founded by him at the end of the 6th century between AD585 and AD600 (Reeves 1847, 97). From early times the grange of Muckamore which lies on the south side of the Six Mile Water has always been considered part of the diocese of Connor of which Colman-Elo was bishop at the time.

- 3.3 There is scant reference to the monastery in the annals. The site is not definitely identified until 1183 when 'P.', Prior of Mucmor witnessed a charter of John de Courcy granting lands to the parish of Downpatrick (Gwynn and Haddock 1970, 189). Augustinian rule was introduced when the monastery was refounded as the priory of SS Mary and Colman-Elo in the 12th century (Hamlin & Lynn 1988, 72). The inclusion of Colman in this dedication lends support to the possible existence of an early monastery at the site. The re-founding of the priory was endowed by Anglo-Norman knights; their names and the extent of their donations were recorded in the old charter register by Laurentius, Prior of Muckamore until 1356. Transcripts made by Sir James Ware in 1624 are preserved in the British Museum (McKeown 1938, 65).
- 3.4 The Abbey at Muckamore survived until 1541, when the last Prior, Brian Boye O'Mahanlon, surrendered the Priory (Gwynn & Haddock 1970, 189). A report to the government, dated 3rd December 1564 (Rogers 1938, 34) detailed that the Prior and all the monks were dead and that the land, churches and possessions of the Priory had been passed into the hands of Queen Elizabeth I (Day, English, & McWilliams 1996, 56).
- 3.5 Post-destruction of the Abbey, historic references allude to foundations of almost impossibly huge proportions which may in actuality have been related to 17th-18th century garden walls and paths; "foundations of the priory have been traced 390 yards eastwards along the banks of the river and 160 yards southwards to the graveyard" (O' Lavery 1881, 246). "In forming the garden and in the sinking of the foundations for the engine houses and cutting of watercourses, masses of walls of great thickness and hardness were found" (Day, English, & McWilliams 1996, 70).
- 3.6 According to local tradition, a number of artefacts have been uncovered at the site; the exact details and current whereabouts of these are unknown; "ancient paved roads...coins of silver and quantities of human bones have from time to time been found" (Day, English, & McWilliams 1996, 70). "Several weapons chiefly of brass have also been found there and a great number of querns, flint arrow heads and several brazen bells" (O' Lavery 1881, 247).

4.0 Archaeological Background

4.1 Recent excavations and alterations

4.1.1 1973

In 1973 the site of Muckamore Abbey was excavated prior to realignment of the Oldstone Road. A bad bend in the road following the line of a length of stone walling containing an arched opening was to be straightened and the wall removed. According to local tradition this length of wall was part of the original Abbey buildings. Excavation demonstrated that this section of walling could not have been older than the current garden walls, and was built across the stumps of surviving medieval walls which were constructed on a surface 2m below the present day ground level (*ibid.* 5). The current ground level had been built up when 1m of topsoil was brought in from elsewhere and dumped over the accumulated medieval deposits, presumably in forming the 17th-18th century garden (*ibid.* 5). Prior to this, the lines of the ruined Abbey walls were probably visible and it may have been considered more convenient to cover these foundations with soil and build the ground level up to form the garden rather than go through the trouble of digging them out (*ibid.* 5). The excavation uncovered the substantial remains of the 12th century Abbey complex and was deemed enough to provide a general picture of the claustral plan and layout of the Augustinian Abbey (Figure 3). However, a number of supplementary trenches were opened up in 1974 to check the main dimensions of the buildings and to complete the plan of the remains so far located (Lynn 1974, 10). Numerous finds of pottery, copper alloy and iron objects were found, including silver coins all dating to the late 13th or early 14th century (Dolley, 1974), with the exception of one farthing of John de Courcy dating to 1185 found under the west cloister arcade wall indicating that the buildings were constructed after that date (Lynn 1973, 5). There was no evidence of Early Christian activity on the site.

4.1.2 1974

By 1974, the road works were completed with the new road edge corresponding approximately with the eastern edge of the 1973 test trenches, and the section of garden wall demolished. The current surface of the road is approximately 2m above the level on which the medieval walls rest and these remains will be undisturbed by further excavations (Lynn 1974, 10). The area east of the road (the 2011 survey area; figure 2), was taken into State Care with a view to excavate the east and south domestic ranges of the Abbey if such survive and exposing the remains for public display (DOENI 1983, 76)

4.1.2 1996

In 1996 an excavation and a geophysical survey were carried out prior to a housing development being built on the western side of the Oldstone Road (Figure 3). The excavation was located at the eastern edge of the site of an 18th century beetling mill and later 20th century factory and at the western edge of the survey area currently in Sate Care. All of these buildings had been demolished in preparation for redevelopment prior to excavation commencing (McDonagh 1996). To the north of the trench, large-scale disturbance caused by the construction of early 20th century factory buildings was revealed. In the southern part of the trench an old ground surface with numerous sherds of everted-rim ware pottery was found. Overlying this, at the northern end, were the remains of a collapsed wall corner running north-south and fitting with the layout of the walls discovered in 1973. The width of this wall could not be determined as it ran with the edge of excavation into the Oldstone Road. No evidence of Early Christian activity was discovered (McDonagh 1996).

4.2 Summary phasing

4.2.1 *Pre-12th century*

A shallow U-shaped ditch partially cut into the basalt bedrock was uncovered during excavations in 1996. The only finds from this were fragments of animal bone, and being overlain by other deposits including those associated with the 12th century Abbey it predates construction of the Abbey and may be evidence of earlier occupation of the site (McDonagh 1996, 7). An iron ringed pin, of a type which was in use in Ireland from the 8th-10th century onwards (Fanning 1994), provides the earliest dating evidence. Its retrieval from a 13th-14th century context fails to provide definite evidence for Early Christian activity at the site. However, its association with disarticulated human bones found within the same layer suggests that it may originate from a disturbed burial of Early Christian date.

4.2.2 *12th-16th century*

Both the 1973 and 1996 excavations uncovered evidence of the Augustinian Priory's construction and occupation, which involved levelling the ground surface to natural subsoil and laying a levelling layer prior to the building of walls. Excavation showed that there were no apparent foundation cuts for the walls which were constructed with a rubble core of redeposited subsoil, stones and mortar which was then faced with large roughly dressed stones. Chalk particles interpreted as mortar waste, iron nails, floor tile fragments and sherds of everted-rim ware were found in a layer interpreted as part of the Abbey's primary construction phase (McDonagh 1996, 9). Disarticulated

human bones, not thought to represent a primary burial came from a north-south running gully alongside the section of wall excavated in 1996. Dating evidence comes from finds of silver coins, glazed medieval local pottery and everted-rim ware, all dating to the 13th-14th century (McDonagh 1996). An 1185 farthing of John de Courcy from a shallow feature running under the west cloister arcade indicates that the Abbey buildings were constructed after this date (Lynn 1973, 5).

4.2.3 *15th-16th century destruction phase*

The destruction phase of the Abbey or later collapse of the church was represented by two stony deposits concentrated in the vicinity of the church corner exposed in 1996. The 1973 excavation revealed no definite evidence of collapse suggesting that the Abbey had been abandoned and the stones robbed for use elsewhere (McDonagh 1996). It was found that much of the collapse layers had been removed for the laying of a later cobbled surface and red-brick walls.

4.2.4 *17th-18th century post destruction phase*

Some time after destruction of the Abbey a general levelling up of the area with sandy clay to a maximum depth of 0.7m occurred (McDonagh 1996, 15). A high wall of basalt blocks was then constructed with a 0.3m base layer of stony clay. This was built, presumably to enclose part of the 17th-18th century gardens associated with Muckamore House which lies to the southeast, and forms the present day boundary of the site. Tightly packed cobbled surfaces with wheel ruts, and stone and mortar built walls were uncovered during the 20th century excavations. This primary activity after the general levelling of the site is associated with the construction of an 18th century beetling mill (McDonagh 1996, 16).

4.2.5 *19th-20th century*

The 1996 excavation confirmed that red brick walled areas and buildings associated with a factory stood on the site prior to the current housing development. Red brick walls were first added to the beetling mill in 1949 and these cut through many of the later deposits associated with the Abbey. A cobbled platform was set within the confines of some of the red brick wall divisions, which were reused and added to when a fur curing factory with concrete foundations and structures took the place of the old beetling mill in 1965. The cobbles were likely reused from earlier destroyed surfaces. The cobbled surface was covered by a thin levelling layer of blue clay which was then covered by a concrete floor.

5.0 Cartographic evidence:

- 5.1 Despite the relatively poor quality of the cartographic material available, features which prove important to the interpretation of the survey data are still quite obvious. Figure 4 presents extracts from the OS 6-inch maps from 1833 to 2011, illustrating the site of Muckamore Abbey.
- 5.2 The survey area is marked as the 'site of Muckamore Abbey' on Ordnance Survey maps from 1857 onwards. Prior to this, on the 1833 first edition, 'Muckamore Abbey' is only marked at the location of Muckamore House, southwest of the survey area, with 'Beetling Mills' (relating to the beetling mills which once stood west of the survey area) marked at the survey area. Muckamore House continues to be labelled 'Muckamore Abbey' on OS maps until 1963. The OS Memoirs also name Muckamore House as 'Muckamore Abbey' (Day, English, & McWilliams 1996, 62). This may be due to the habit of large houses of the 17th and 18th centuries in adopting the names of well known local historic landmarks or sites.
- 5.3 Various features and paths associated with the 17th-18th century gardens of Muckamore House are shown to occupy the site of Muckamore Abbey on the Ordnance Survey maps from 1833 to the mid-1960's. With the exception of one or two additions, the cartographic evidence suggests that these paths remained mostly unchanged since their creation (Figure 4).
- 5.4 The layout of mill buildings west of the site goes through a number of changes, presumably coinciding with changes in their ownership and use through the 19th and 20th centuries. Some unidentified buildings, possibly small sheds, appear and disappear from around the edge of the survey area and the road layout remains largely unchanged until 1974 when the Oldstone Road is straightened.

6.0 The Survey Site:

- 6.1 Situated between the village of Muckamore and Antrim town, the survey area is a roughly triangular field of improved grassland currently in State Care (Figure 2). It occupies approximately 0.8 hectares with fairly featureless topography, gradually sloping downwards from south to north and from east to west, towards the south bank of a meander in the Six Mile Water River. The general focal point at the top of this slope is an old access archway and gate incorporated almost centrally in the stone wall running along the southern edge of the site. The arch and gate are reached by ascending four stone steps from the site (Figure 5).
- 6.2 The enclosed area sits at the junction of Seven Mile Straight and the Oldstone Road with the latter running along its western edge. It is bounded along this edge by a wooden fence and along all other sides by a high stone and brick wall, which presumably formed part of a 17th-18th century walled garden which once occupied the site. It is currently accessed by a modern field gate from the path alongside the Oldstone Road. A short distance west of the site, directly across the road, is a newly built housing development with an access route (Figure 2) and the site of the 1996 investigation (McDonagh 1996). The only current use of the site seems to be by local residents in order to exercise their dogs.
- 6.3 At the time of the survey, the site was under uncut winter grass and the edges of the site were difficult to traverse, being overgrown with nettles and brambles. A number of almost indiscernible impressions or gullies were visible towards the north end of the field and were presumed to be remnants of watery features associated with the proximity of the site to the riverbank. The underfoot conditions grew boggy towards this end of the site. A prominent ground feature of the site is a ridge of hard ground approximately 1.5m in width running directly from the previously mentioned central archway towards the northernmost corner of the site.
- 6.4 Aside from the 17th-18th century high garden walls which run surround all but the western edge of the site, and a couple of the paths of the garden visible as 'crop marks' in the ground leading to the two archways within the garden walls, there are no visible remains of archaeological significance within the enclosed area. A graveyard (NISMR ANT 050:077) and a mound (NISMR ANT 050:078) lie approximately 140m to the south southwest of the site. The OS memoirs date the oldest inscription in the graveyard to 1717 (Day, English, & McWilliams 1996, 70).

7.0 Survey specific information:

7.1 Details of equipment and methodology employed;

Survey type	Earth Resistance	Magnetometry
Instrumentation	Geoscan RM15 resistance metre and MPX15 multiplexer	Bartington Grad 601-2 fluxgate gradiometer
Probe/sensor configuration	Parallel twin (3-probe)	Twin sensor
Probe/sensor spacing	0.5m	--
Grid size	20m x 20m	20m x 20m
Traverse interval	0.5m	1m
Sample interval	0.5m	0.25m
Traverse pattern	Zig-Zag	Zig-Zag
Spatial accuracy	Grids set out using a Leica TPS 705 series total station	Grids set out using a Leica TPS 705 series total station

7.2 The Survey:

- 7.2.1 The survey grid (Figure 6) was set out to cover the entire area with divisions of 20m using a Leica TPS 705 series total station on the 12th December 2011. Time constraints imposed by working during the minimal light conditions of mid-December meant that surveying gridded areas of a larger size would not have been feasible. For the actual survey two techniques were employed: Earth resistance from the 12th to 16th of December and magnetometry on the 19th and 20th December.
- 7.2.2 The earth resistance survey was carried out using a Geoscan RM15 meter and MPX15 multiplexer. All grids were surveyed at a traverse interval of 0.5m and with a probe spacing of 0.5m. The results of the resistance survey are graphically presented in figures 7-10 and an interpretation of these results is given in table format (Table 1), which should be read in association with figure 11 which gives an interpretative illustration of the resistance survey data.
- 7.2.3 The magnetometry survey was conducted over the same gridded area using a Bartington Grad 601-2 fluxgate gradiometer with a sample interval of 0.25m. The results of the magnetometry survey are graphically presented in figures 12-16 and an interpretation of these results is given in (Table 2), which should be read in association with figure 17 which gives a simplified illustration of the magnetometry survey interpretation.
- 7.2.4 A brief discussion of the survey results is outlined in section 10 and recommendations for further work based on the findings are set out in section 11.

8.0 Table 1; Earth Resistance Survey results

Code	Description	Interpretation
r1a-d	Linear high resistance anomalies of fairly regular width (approximately 1.5m); r1a and r1b run from east to west across the southern half of the site. r1a bisects the field on a north northwest-south southeast alignment. r1d runs around the edge of the site approximately 8m from the wall which bounds the site from the east corner through to the north, before being truncated by the modern road and path development in the northwest and returning again in the western corner of the site.	These anomalies fairly accurately coincide with 17 th -18 th century garden paths depicted on maps of the site from 1833 to 1967 (Figure 4). r1a and r1b are the earliest to appear in the cartographic records. The latter disappears from OS records after 1963. r1c and r1d are depicted from 1857 onwards. Two stone arches set into the walls surrounding the site correlate to the ends of the two earliest paths (r1a and r1b) confirming a relationship between the paths and the surrounding wall.
r2	Linear high resistance anomaly approximately 1.5m in width and 42m in length. Runs north northwest-south southeast, roughly 18m west of and parallel to r1a.	Given its similarity in width and almost identical alignment to r1a, it is most likely another garden path which appears only on the 1857 OS map (Figure 4b).
r3	Possible high resistance linear feature approximately 35m in length and 1.5m in width running north northwest-south southeast, lying roughly 18m to the east of, and parallel to r1a.	Given its similarity in width and almost identical alignment to r1a, it is most likely another garden path which appears only on the 1857 OS map (Figure 4b). Appearing much fainter than r1a and r1b, it may have been heavily truncated or at a lower lying level beneath the topsoil.
r4	Linear high resistance anomaly running east-west with a possible southwards return at the eastern end. Approximately 6m in length.	Probable evidence of masonry foundations of buildings associated with the 12 th century priory. They broadly display the same alignment as the previously excavated Abbey walls and may form part of the east range.
r5	Linear high resistance anomaly running east-west with possible southwards returns at both ends. Maximum dimensions approximately 6m east-west and 4m north-south. Runs along the same latitude and approximately 2m east of r4.	
r6	Linear high resistance anomaly running east-west with a southwards running return at its western end. Maximum	

	dimensions approximately 4m east-west and 3m north-south. Follows same alignment as r4 and r5 but about 1m further south. Lies about 6m east of r5.	
r7	Linear high resistance anomaly, about 2.5m in length and running east-west. It lies roughly 3m east of r6 along the same latitude.	Probable evidence of masonry foundations of buildings associated with the 12 th century priory. They broadly display the same alignment as the previously excavated Abbey walls and may form part of the east range.
r8	Linear high resistance anomaly, approximately 18m in length and running east-west, parallel to r4 and r5 with a separating distance of about 5m.	
r9	Linear high resistance anomaly, approximately 7m in length, running east-west parallel to r6 and r7 and 9m to the east of r8.	
r10	Roughly east-west aligned linear area of high resistance lying at the north end of the site almost parallel to r4-r9. Approximately 12m in length and 2.5m in width.	Possibly geological but may be evidence of masonry rubble associated with the foundations of the 12 th century priory. Although it is poorly defined, it resides on roughly the same alignment as the previously excavated Abbey walls and may form part of the east range.
r11	Amorphous area of high resistance aligned roughly east-west and disappearing beyond the western edge of the survey area. Approximately 8m in length and 2-3m in width.	
r12	Amorphous area of high resistance running roughly northeast-southwest. Maximum dimensions of 9m by 6m.	Poor definition suggests a geological response but the vague alignment and proximity to other features also suggest a possible artificial feature.
r13	Linear high resistance feature running along r2. Approximately 13m in length and 4m in width.	May be evidence of a built structure or masonry rubble; however its alignment and overlapping nature with r2 suggest that it may be spread from the latter.
r14	Sub-rectangular area of high resistance situated about 15m from the site entranceway, and measuring at a maximum of about 12m across.	The indefinable nature of the area makes it difficult to determine whether this is an artificial feature, in which case it may be masonry rubble or cobbling associated with a phase of building on the site.

r15	Area of high resistance running north-south with maximum dimensions of 12m by 6m, situated between r1b and r1c at the southwestern corner of the site.	Possible evidence of bedrock, or masonry rubble.
r16	Area of high resistance approximately 10m in length and 4m in width running north-south between r1b and r1c.	Possible evidence of bedrock or masonry rubble.
r17	Linear high resistance anomaly extending northwest to southeast, perpendicular to the current fenced edge of the site. Approximately 15m in length.	Possible artificial feature, perhaps the remnants of a northeast to southwest aligned phase of building activity on the site. The date of which cannot be certain and is not cartographically recorded.
r18	High resistance rectilinear anomaly running northwest-southeast. Situated about 15m from the site entrance and measuring approximately 9m by 9m. Comprises of an area of poorly defined high resistance, with a definite line of higher resistance running along one side, northeast-southwest.	The fairly definite linearity of this feature could indicate masonry foundations with the central area indicating rubble. May be part of a northeast-southwest aligned phase of building activity on the site. Overlaps and appears to obscure 'garden paths' which is suggestive of activity of a later date but this cannot be certain. Evidence of structures later than the paths is not cartographically recorded.
r19	Faint high resistance linear feature about 10m in length, running northeast-southwest, parallel to r18.	May be part of a northeast-southwest aligned phase of building activity on the site, the date of which cannot be certain and is not cartographically recorded. Runs parallel to r18 and may represent an associated feature or outer wall.
r20	Amorphous high resistance anomaly situated approximately 10m from the site entranceway aligned roughly northeast-southwest with a maximum length of 5m.	May be geological but could also be suggestive of masonry foundations or rubble. On same alignment as a possible northeast-southwest aligned phase of building activity on the site, the date of which cannot be certain and is not cartographically recorded.
r21	Small square high resistance feature, approximately 1m by 1m. Encloses an area of lower resistance.	May be an incidental feature of the data processing stage. May be evidence of a structure from a phase of building on the same alignment as the Abbey but it is not cartographically recorded.
r22	Narrow high resistance linear feature (less than 0.5m), running roughly north-south, measuring approximately 12m in length.	May represent a minor path or furrow from the 17 th -18 th century garden features which occupied the site.

r23	Narrow, undefined line of high resistance running from the gate in the southern wall to a point along the north-eastern edge of the site.	May be evidence of underground pipework, wiring, or part of an old irrigation system. Running mainly along the line of the faint anomaly r3 which may have been destroyed in the laying of any possible pipework.
r24	Area of high resistance at northernmost edge of site. Truncated by modern fence.	Cut off by the modern edge of site, its position at the end of the current standing wall may indicate rubble associated with the demolition of the adjoining boundary wall prior to alteration of the roadway in 1973-4. It may also represent masonry rubble from the demolition of a shed built against the northernmost corner of the boundary wall (Figure 3 & Figure 4e).
r25	Area of high resistance north of the current site entranceway. Maximum dimensions of 5m by 8m.	May present evidence of cobbling or masonry associated with the south range of the 12 th century priory, the walls of which were partially uncovered no more than 6m to the northeast in 1973 (Figure 3). Could also be indicative of material associated with the development of the adjoining road and path.
r26	Amorphous area of high resistance extending approximately 2m east from the site entranceway.	The site entrance is stony and has not been built up with topsoil, hence the greater likelihood of higher readings. r1b runs to this point but it cannot be certain whether it extended into this area-it is not shown to do so on any of the OS maps (Figure 4).
r27	Amorphous area of high resistance in the south-western corner of the site, midway between the entranceway and the western end of the southern wall. Extends approximately 5m from the western edge of the site and meets r1d.	Position in relation to a buildings depicted on early Ordnance Survey maps (Figure 4) may be indicative of associated masonry rubble.
r28	Amorphous area of high resistance in south-western corner of site along the southern wall, extends 12m west-east and 8m north-south.	Could also present evidence of rubble from the western edge of the garden wall.

9.0 Table 2; Magnetometry Survey results

Code	Description	Interpretation
m1	Zone of contrasting high/low magnetic noise at the west of the survey area, measuring approximately 40m by 50m.	Probably due to a combination of factors. Magnetic field from the wire fence impinges on the area, while the edge of the zone borders the main road. However, the strong readings extend considerably into the survey area, and there is regularity to the definition of the area. Most likely the strongly positive readings from the zone are mainly due to buried, magnetically enhanced material.
m2	Anomaly formed by two conjoined blocks of positive magnetic readings, measuring 40m by 25m in total.	The strength and regular shape of the anomaly could be indicative of building foundations in this area.
m3	Linear anomalies of positive magnetic values stretching east-west and north-south across the survey area. Linked by a curvilinear anomaly of similar positive magnetic values which follow the walled boundary of the field from east through north (see Table 1; r1a-d).	These anomalies coincide with 17 th -18 th century garden pathways marked on OS maps from 1833 to mid-1960 (Figure 4). The strength of the anomalies suggests the pathways were constructed from material which contrasts strongly with the surrounding soil. Anomalies r1-r3 of the resistance survey (Table 1), correlate with these readings.
m4	Zone of wildly contrasting positive and negative magnetic values at the north-east of the survey area. The zone measures 80m by 35m total.	The area contains curiously geometrical anomalies, but both their strength, and their dipolar qualities suggest they are most likely a response to the basalt bedrock. However, the regular form of the anomalies is unusual and it is possible that they are imaging archaeological features.

10.0 Discussion of survey results:

- 10.2 At first glance, the earth resistance survey presented relatively featureless results with a fairly homogenous background of low resistance with contrasting definite high resistance linear features running across and around the site. The consistency in the background readings was likely a result of the depth of topsoil present. Through further processing, particularly after the application of High Pass Filter to dilute the broad background trends, the fainter resistance anomalies became clearer and presented possible evidence of the 12th century priory amongst other features.
- 10.3 The pathways depicted on Ordnance Survey maps from 1833 onwards were detected quite effectively using both survey methods. The earth resistance survey shows them to better effect, as definite linear features of high resistance running across and around the site (r1-r3). They all present as regular in width and correlate quite accurately with their positioning within the cartographic records. As with the resistance survey, the pathways are imaged by the magnetometry, though not quite as clearly, with the best definition in the southeastern area of the site (m3). Their definition in terms of high resistance readings and positive magnetic response in contrast to surrounding areas suggests that the paths were composed of a contrasting material to the surrounding soil.
- 10.4 Anomalies r4 to r11 of the resistance survey data present the most likely candidates for evidence of the 12th century Abbey complex. Their roughly east-west alignment almost perfectly follows that of the previously excavated Abbey walls. The width of these anomalies appears similar to the widths of the excavated foundations and their positioning within the survey area suggests that they present probable evidence for the eastern and domestic ranges of the 12th century Priory. These features did not appear to be detected by the magnetometry survey where they were doubtless obscured by the strength of the magnetic fields from zones m1 and m4.
- 10.5 The resistance anomalies r12 to r16 represent areas of high resistance which appear too regular to be discounted as purely geological; r12, r13 and r16 are likely to be associated with the 17th-18th century pathways of the site whereas r14 and r15 may possibly represent more promising archaeological evidence of masonry rubble or cobbling. It is also of note that the conjoined block-like area of positive magnetic readings (m2) occurs in the same area as r14-15 and r17 through to r21. The ground surface in this area has been raised appreciably and it is conceivable that the introduced material had a consistently stronger signal than the local soil, accounting for the definition of this anomaly. However, both the strength of the anomaly and its regular shape suggest it may be due to building foundations in this area. In addition the anomaly has a northeast-southwest alignment, replicating r17-r19 of the resistance survey data which supports the suggestion of structural remains in this area. The magnetic readings of this anomaly (m2), are

amongst the most consistent on site (Figures 12-14 chart the relative strength of the readings detected across the survey).

- 10.7 Perhaps the most striking discovery of the gradiometer survey is within the highly magnetised zone in the eastern half of the site (m4). The superimposed, dipolar bands suggest a geological origin for these readings and this remains the most likely interpretation. With the exception of the uncertain anomaly (r23), no obvious archaeological remains were detected by the resistance survey in this area. However, it is of note that this type of magnetic imaging is confined to this zone which is bordered by the quietest magnetic areas within the entire survey area. It may be that this distinction represents an intersection between two geological zones, with the anomaly m4 coinciding with extrusive igneous outcrops. It is of interest that this coincides with an area where the ground rises up and there is a pronounced homogeneity in the resistance levels compared with the rest of the site. This could be an indication of a greater depth of topsoil in this area, in which case it may be that the features which caused the unusual magnetic responses of zone m4 were simply beyond the range of the resistance survey, which had less depth of penetration than the magnetic survey. The flat resistance responses are consistent with the presence of leveling deposits as noted by Lynn in 1973, and the strength of responses to the features (r1-r3, and m3) in both surveys, suggests strongly that these are topsoil features. If the features which produced the strong magnetic responses in these areas are too deep to be detected by resistance survey at 0.5m probe-spacing, an archaeological explanation for some of the anomalies within the zone m4 should not be discounted.

11.0 Conclusion

This survey was undertaken in order to shed some more light on the previous results and expand on the information provided by the 1973 and 1996 excavations and 1996 geophysics results. The 1973 excavations and plans suggested that the southern and eastern portions of the claustral complex would be detected by the surveying methods within the area taken into State Care. Indeed the 2011 magnetometry and resistivity surveys have proven useful in the locating of a number of features whose superimposition is suggestive of a number of phases of activity at the site. The results clearly reflect and reinforce those already gleaned from the 1996 geophysics with the 12th century Priory remains being positioned in the same location as previously noted. It is clear that a further and more complete understanding of the site and the Abbey remains will only be achieved through further and extensive excavation within the State Care area.

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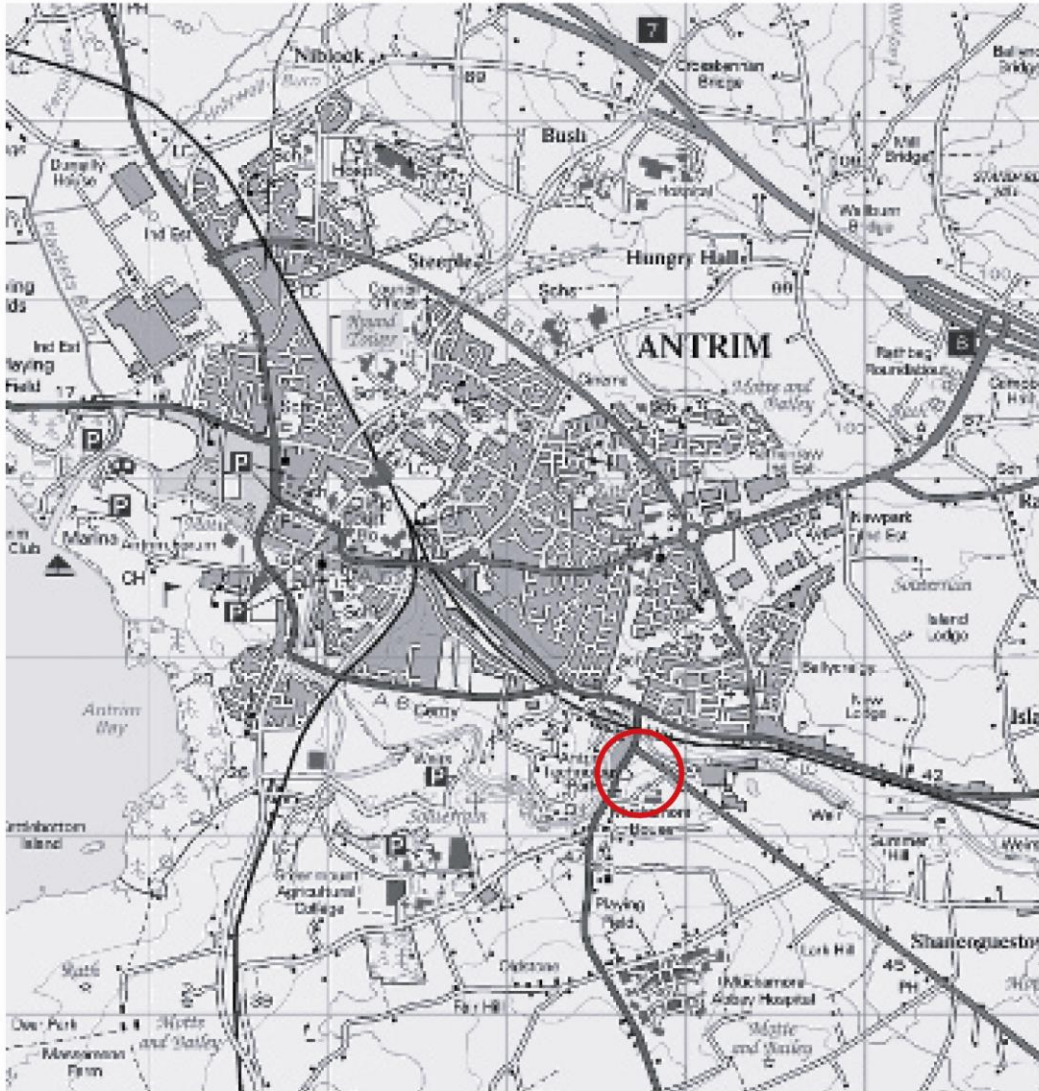
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DETAILS:

Map showing approximate location of site

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FIGURE:

1



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DETAILS:

Location and outline of survey area

PROJECT:

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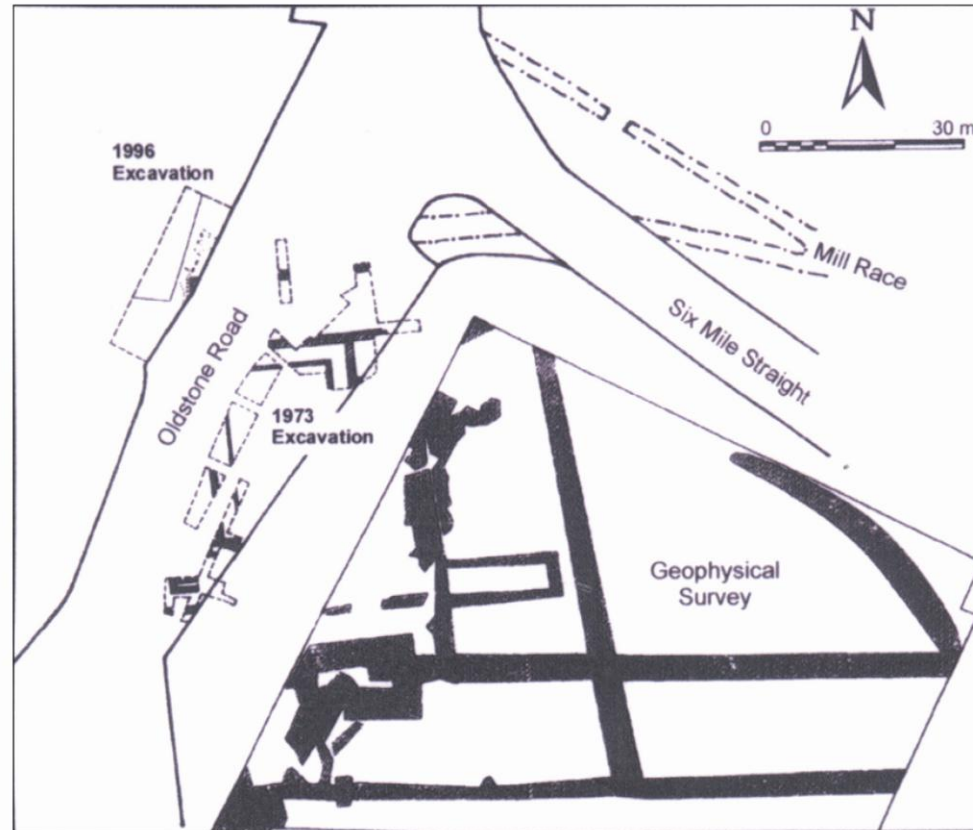
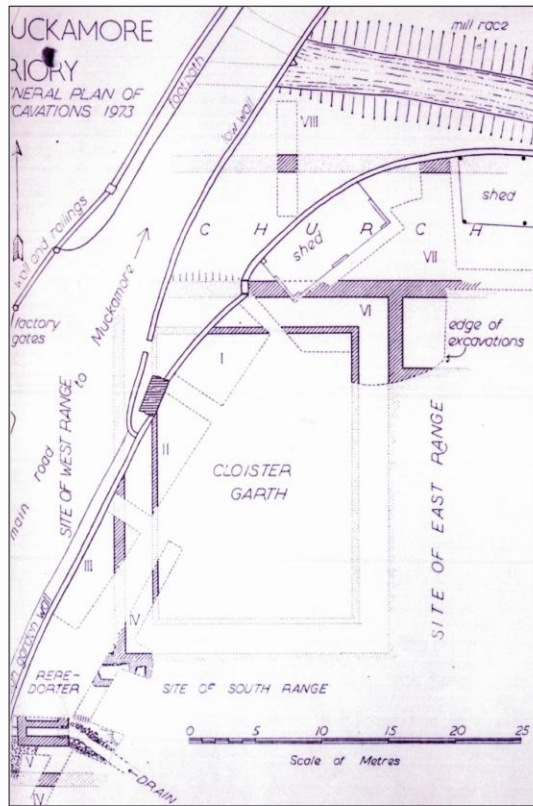


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FIGURE:

2



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DETAILS:

Location and plan of abbey walls according to the 1973 excavations
(SM7/ANT 050:076 Unpaginated)

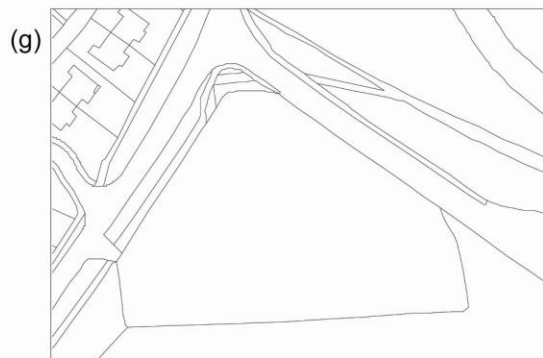
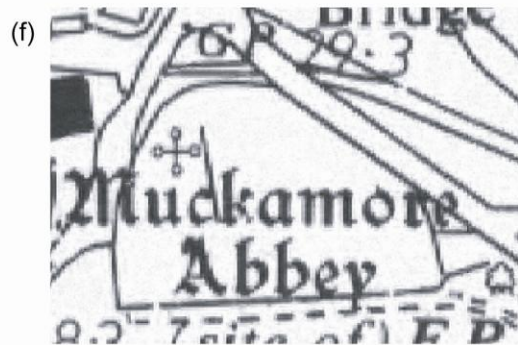
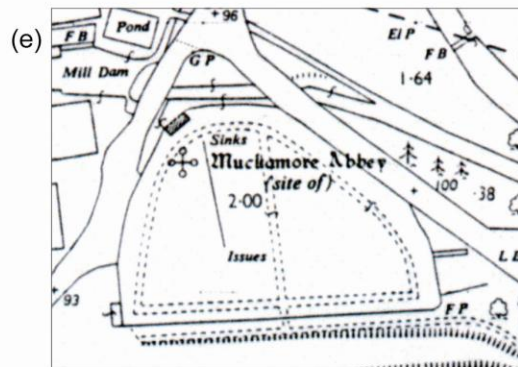
Location and plan of 1996 Geophysics and excavations in relation to 1973 plans
(McDonagh 1996, 5)

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FIGURE:

3



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DETAILS:

Cartographic representations
of the survey area from
1833-2011

- (a); OS 1st edition 1833
- (b); OS 2nd edition 1857
- (c); OS 3rd edition 1902
- (d); OS 4th edition 1963
- (e-f); OS & IG 1963-1967?
- (g); Current grid map (2011)

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FIGURE:

4

(a)



(b)



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DETAILS:

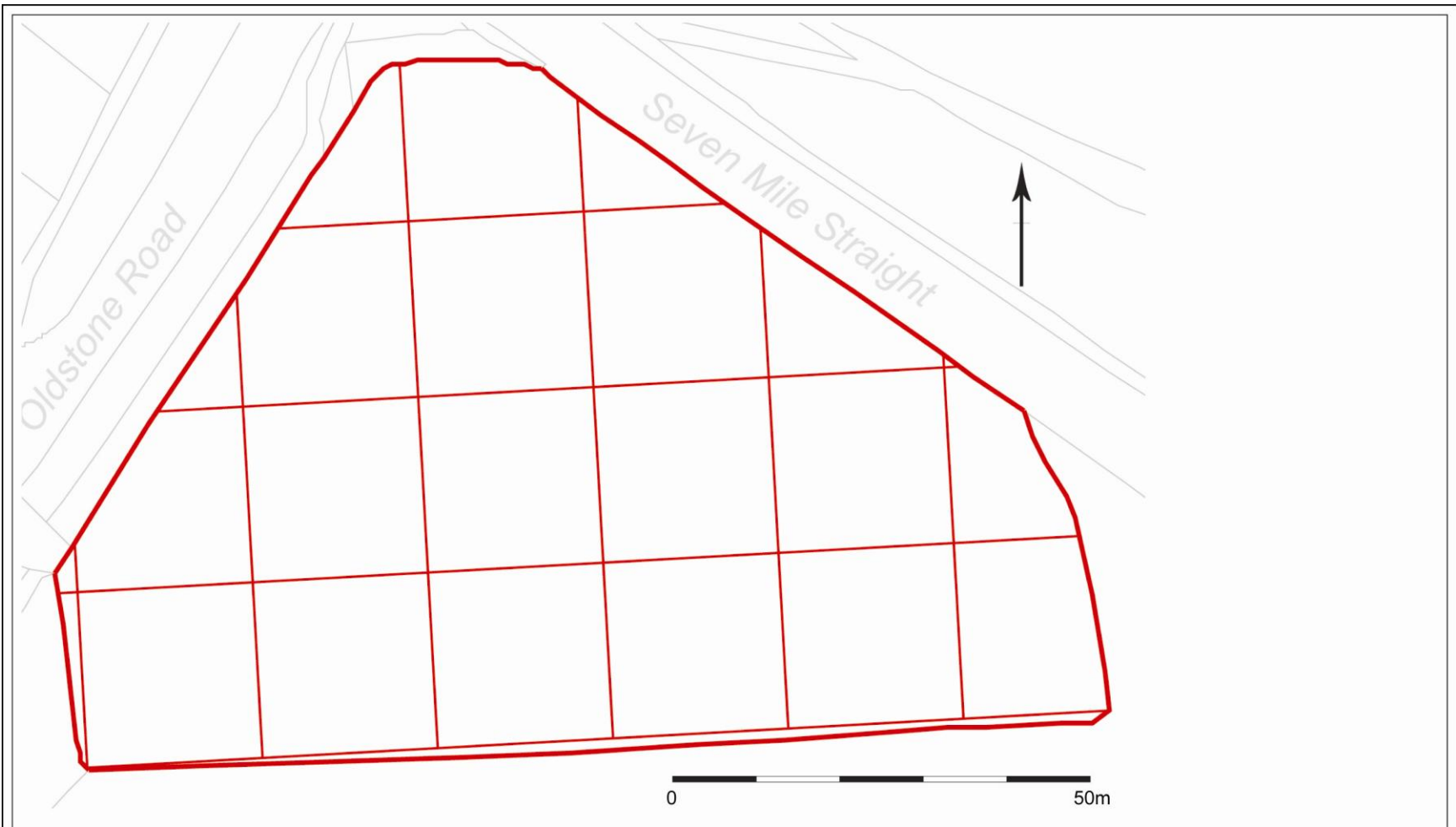
- (a) Photograph of site showing archway and gate in eastern wall of site and gently sloping topography of the area
- (b) Photograph of site showing centrally placed archway, gate and steps in southern wall of site, and the highest point of the site topographically

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FIGURE:

5



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DETAILS:

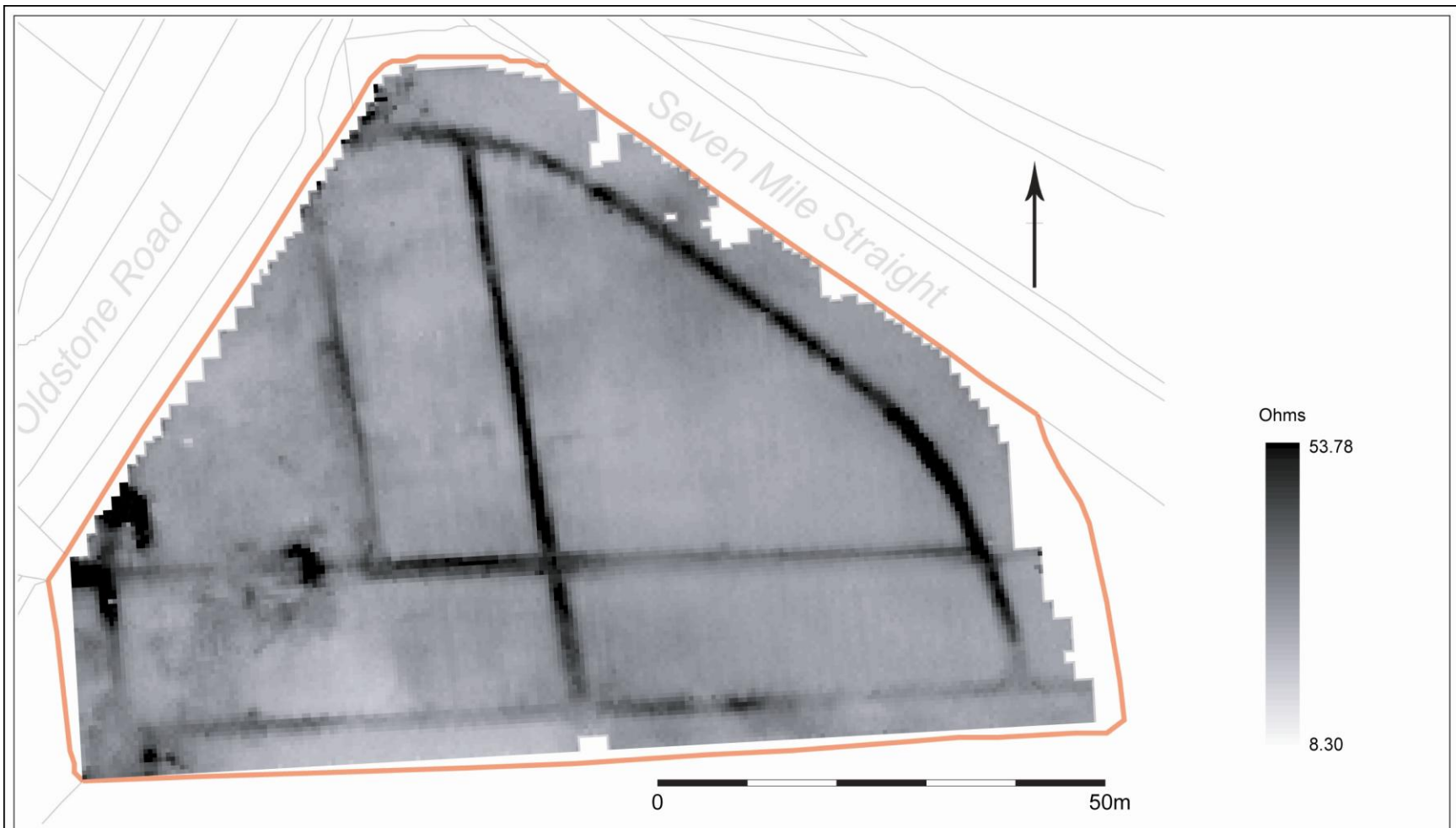
Outline of survey area with grid
(set out at intervals of 20m using a TPS 705 series Leica Total Station)

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FIGURE:

6



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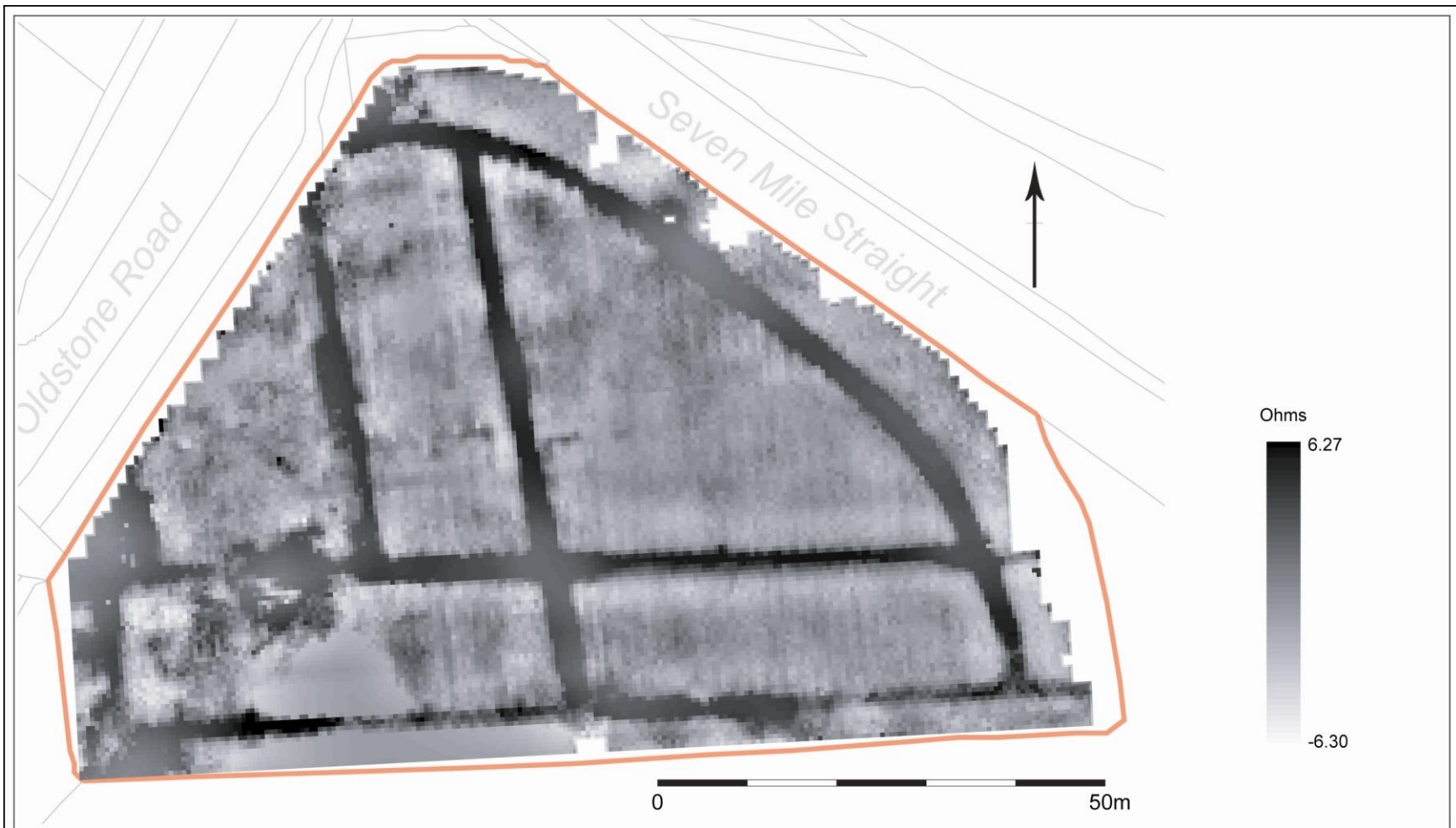
Shade plot of raw resistance data

PROJECT:

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FIGURE:

7



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DETAILS:

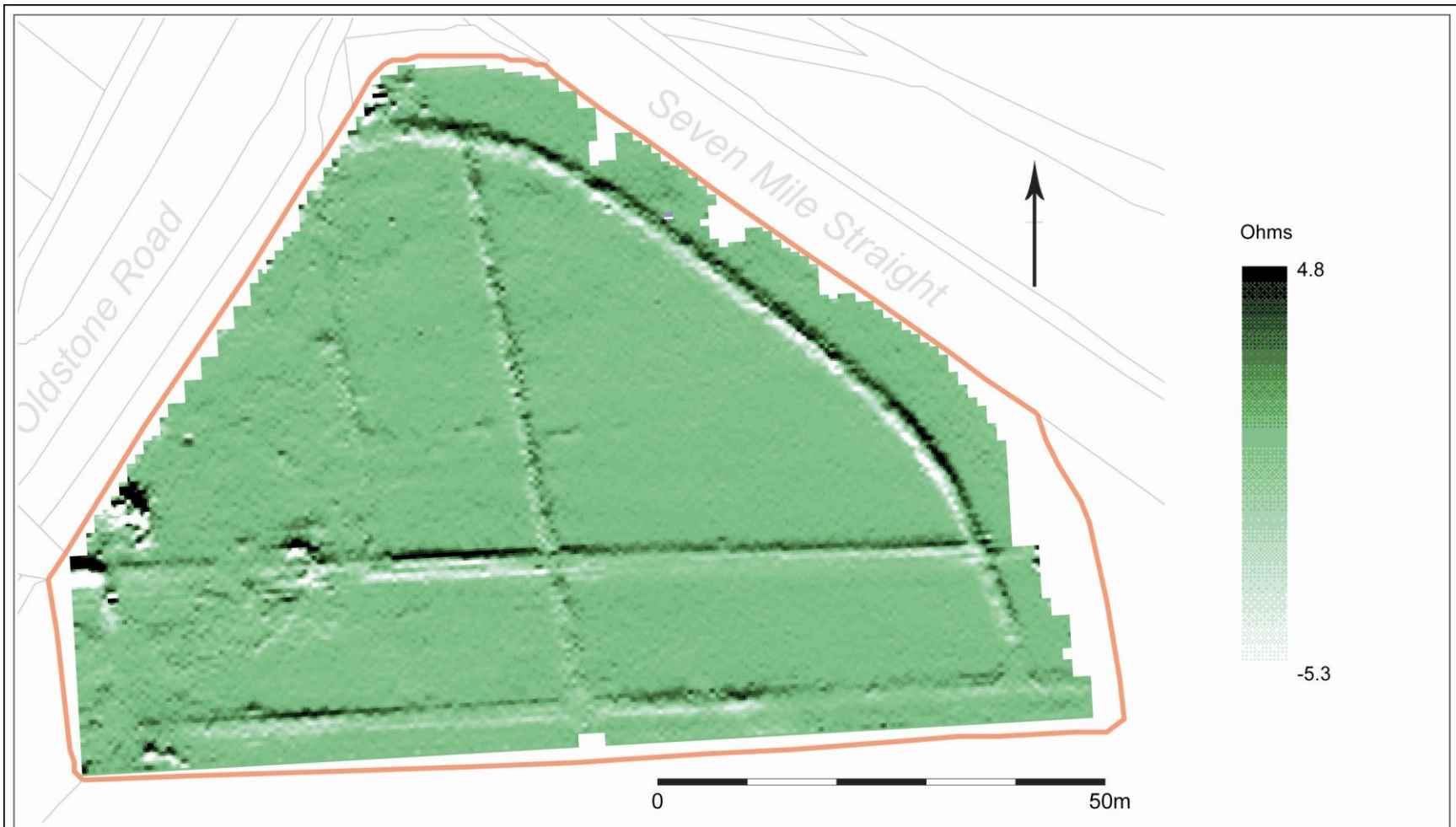
Shade plot of resistance survey data following the application of High Pass Filter. This has the effect of filtering out broad trends and emphasising the detail of smaller and fainter anomalies.

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FIGURE:

8



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DETAILS:

Shade relief plot of resistance data

PROJECT:

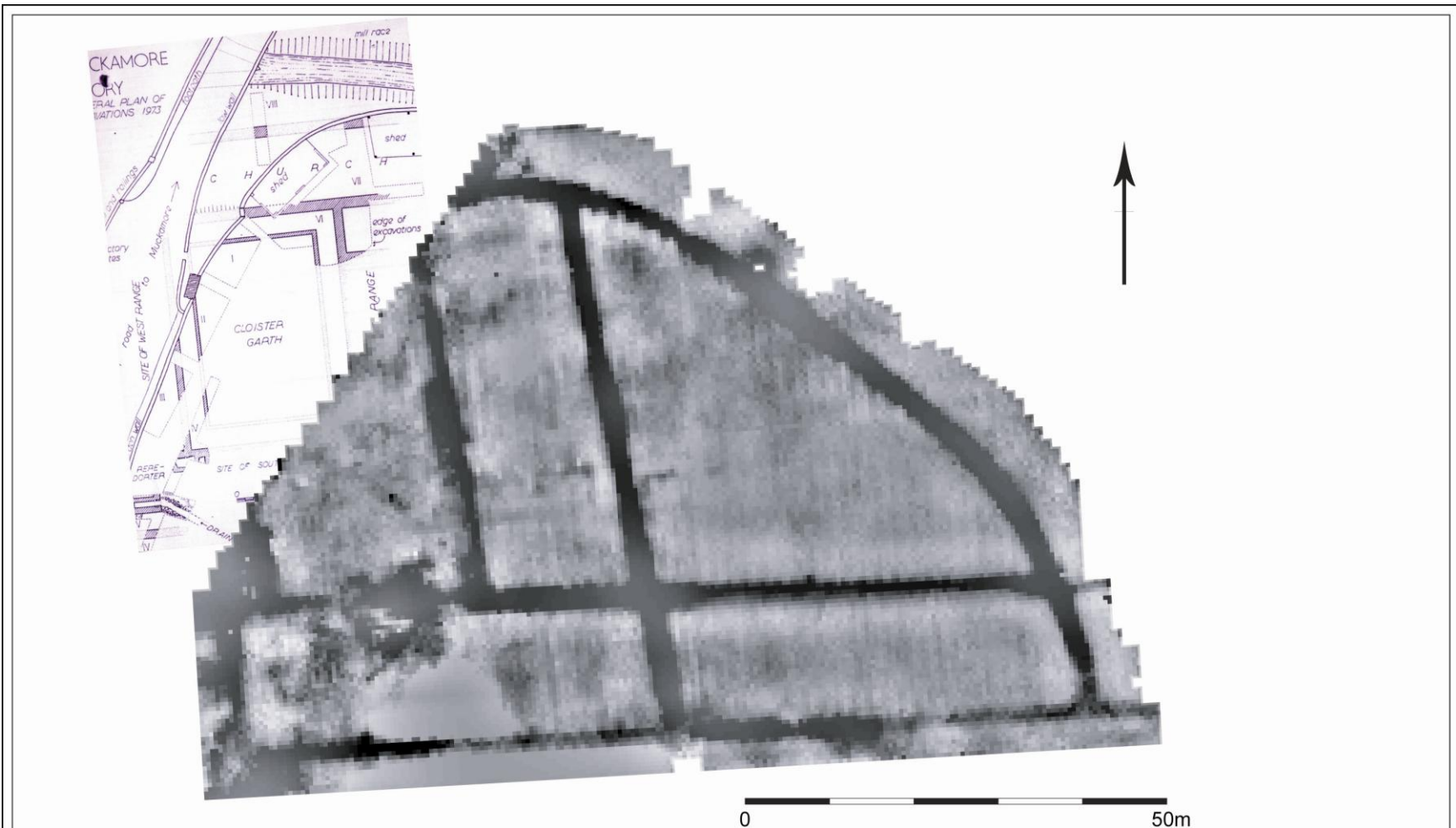
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FIGURE:

9



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DETAILS:

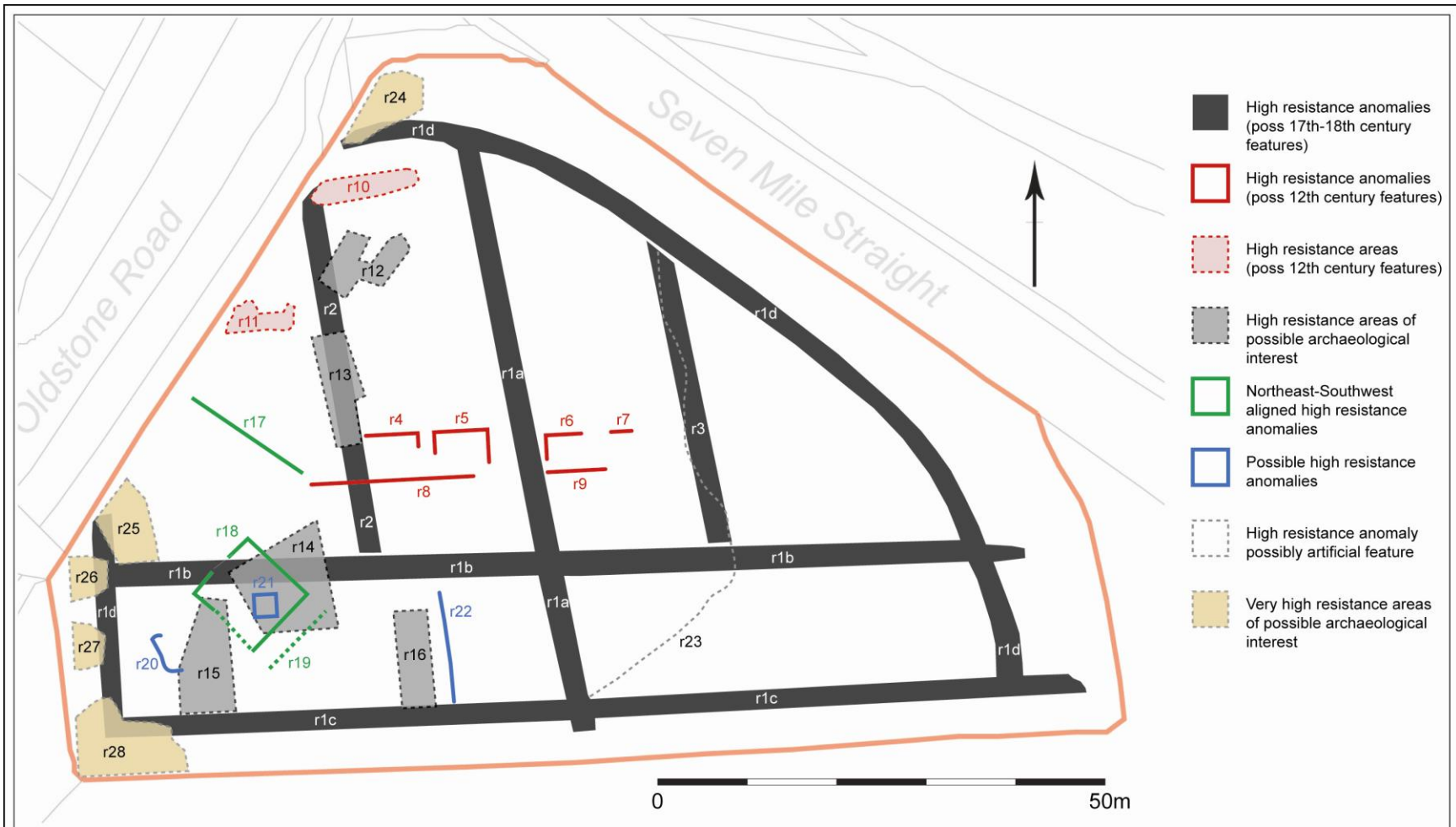
2011 Resistance survey results in relation to abbey walls uncovered during 1973 excavation showing previous road edge and line of old stone wall boundary of site. Locations based on those shown in McDonagh's excavation report of 1996 (see Figure 3)

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FIGURE:

10



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DETAILS:

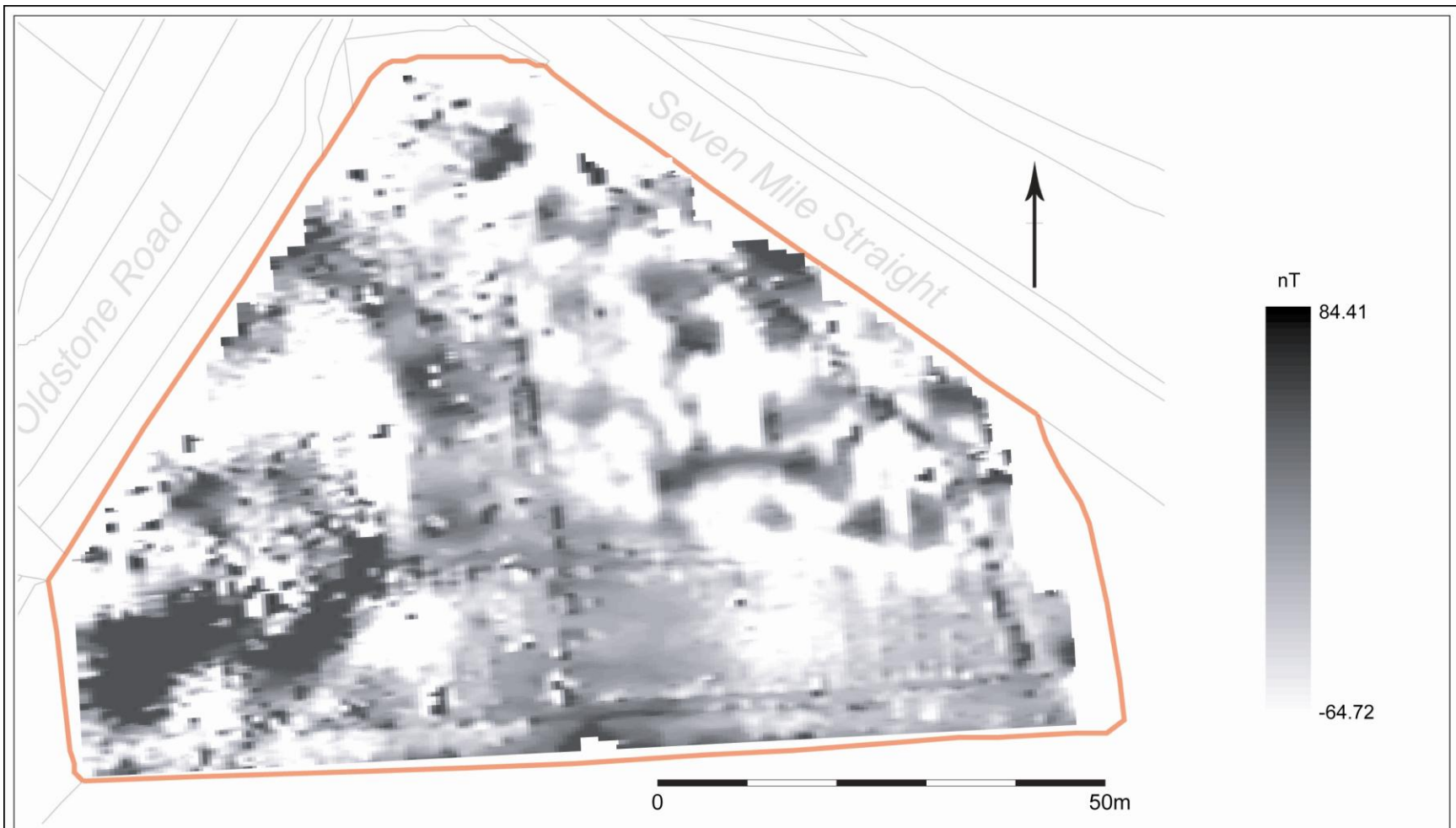
Graphic summary of earth resistance anomalies;
to be read in conjunction with interpretative results given in Table 1 (Section 10.0)

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FIGURE:

11



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DETAILS:

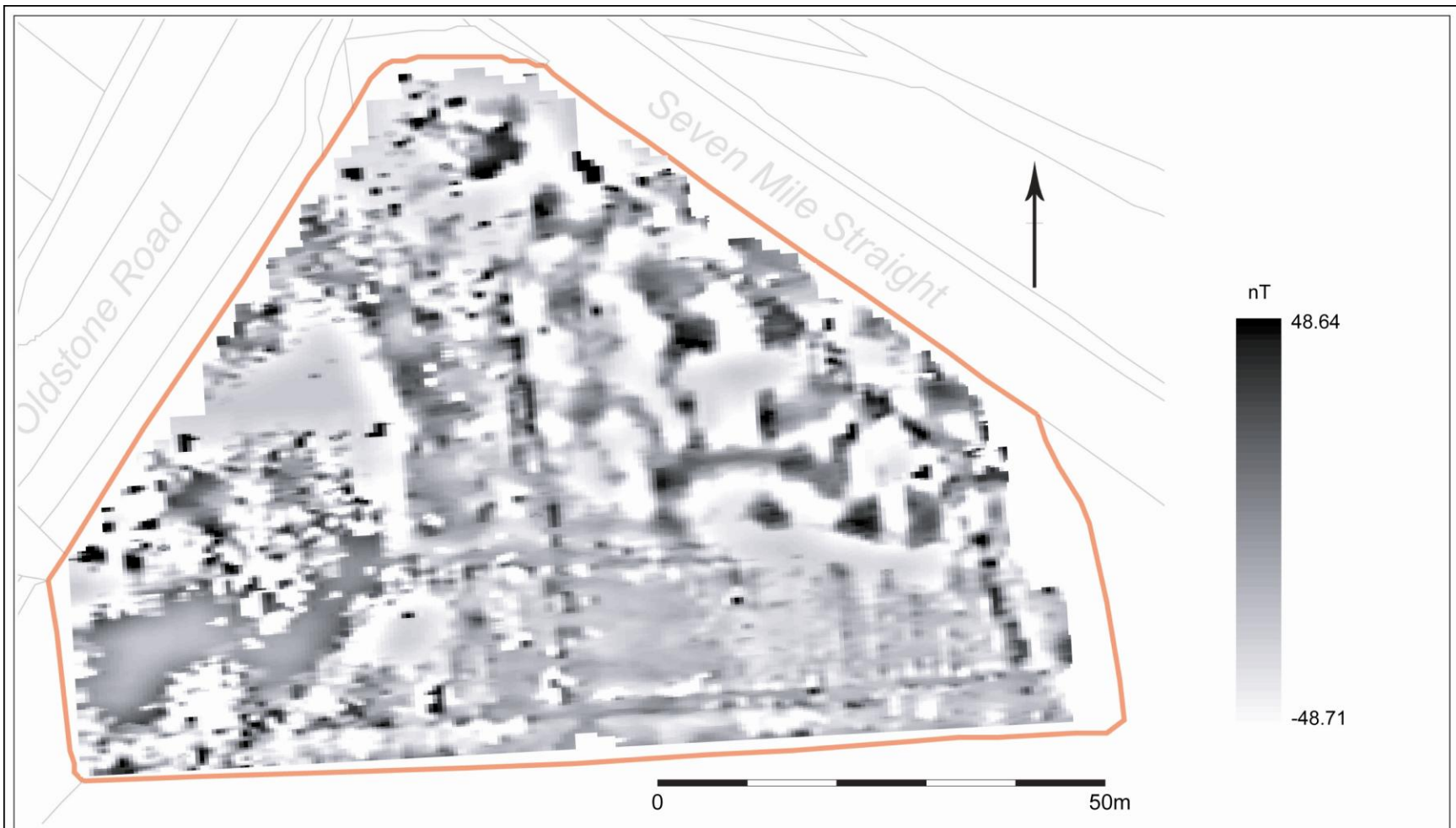
Shade plot of raw magnetometry results

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FIGURE:

12



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DETAILS:

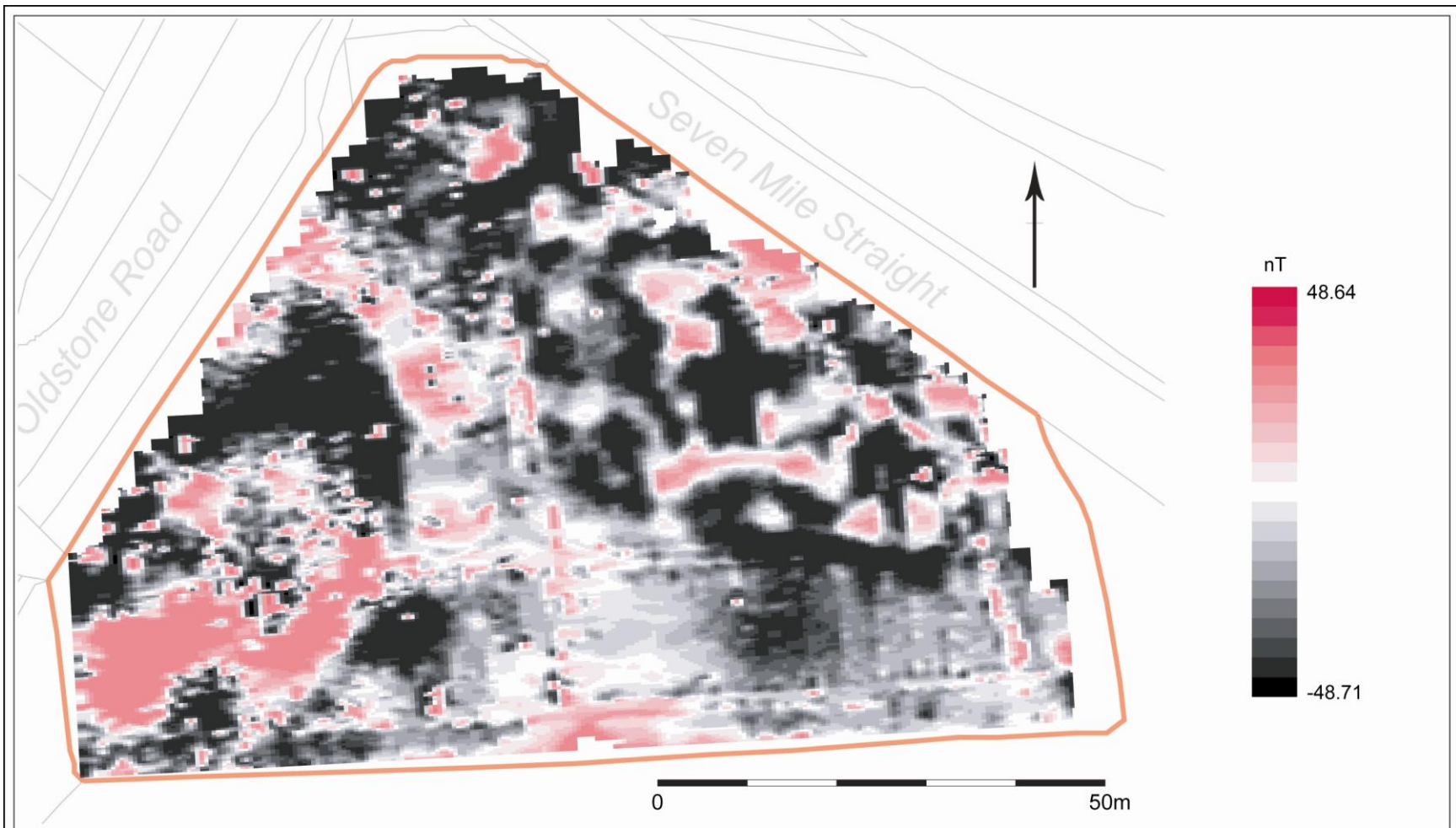
Shade plot of magnetometry data with parameters clipped to enhance detail

PROJECT:

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FIGURE:

13



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DETAILS:

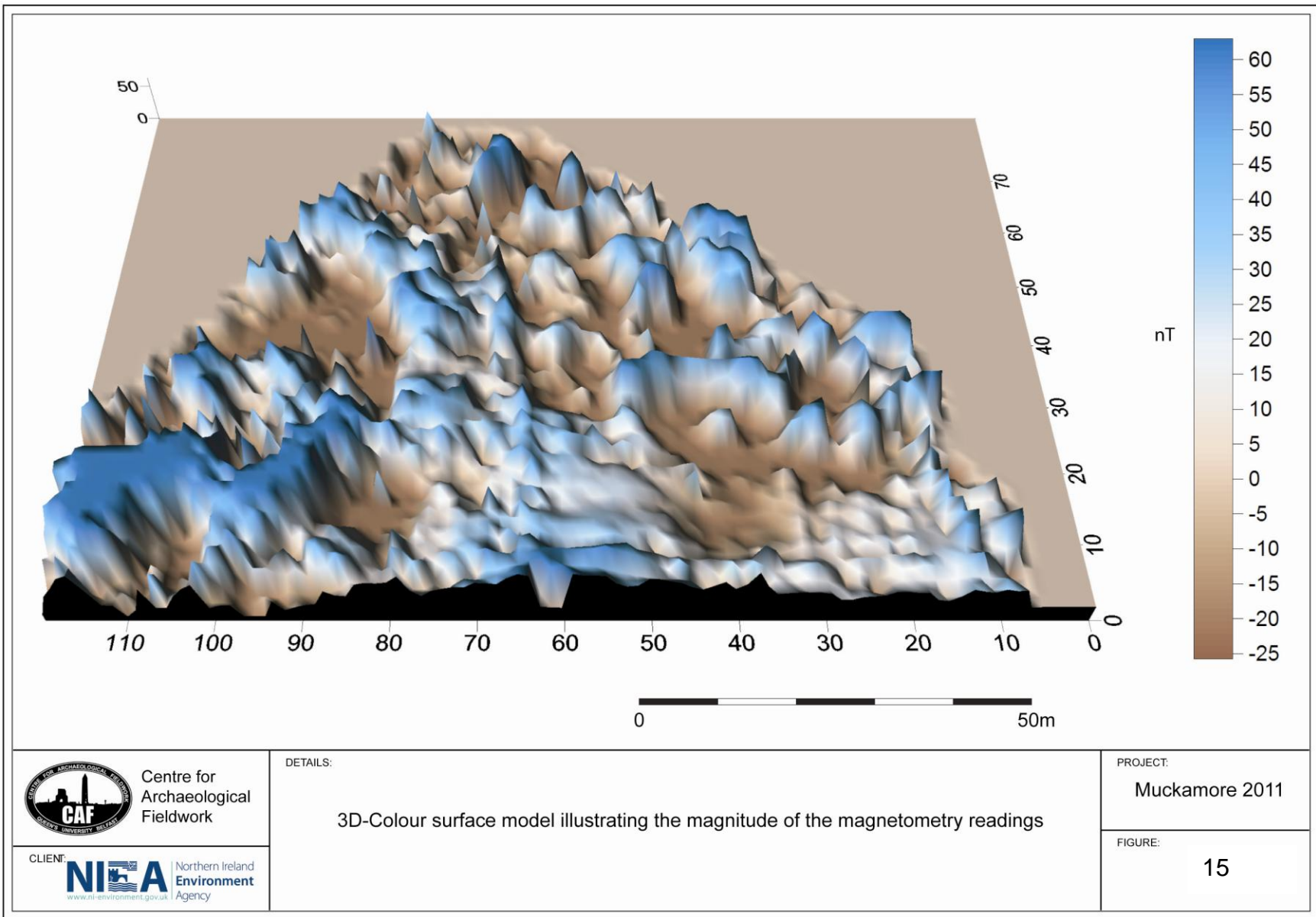
Colour shade plot of magnetometry results with parameters clipped to enhance detail

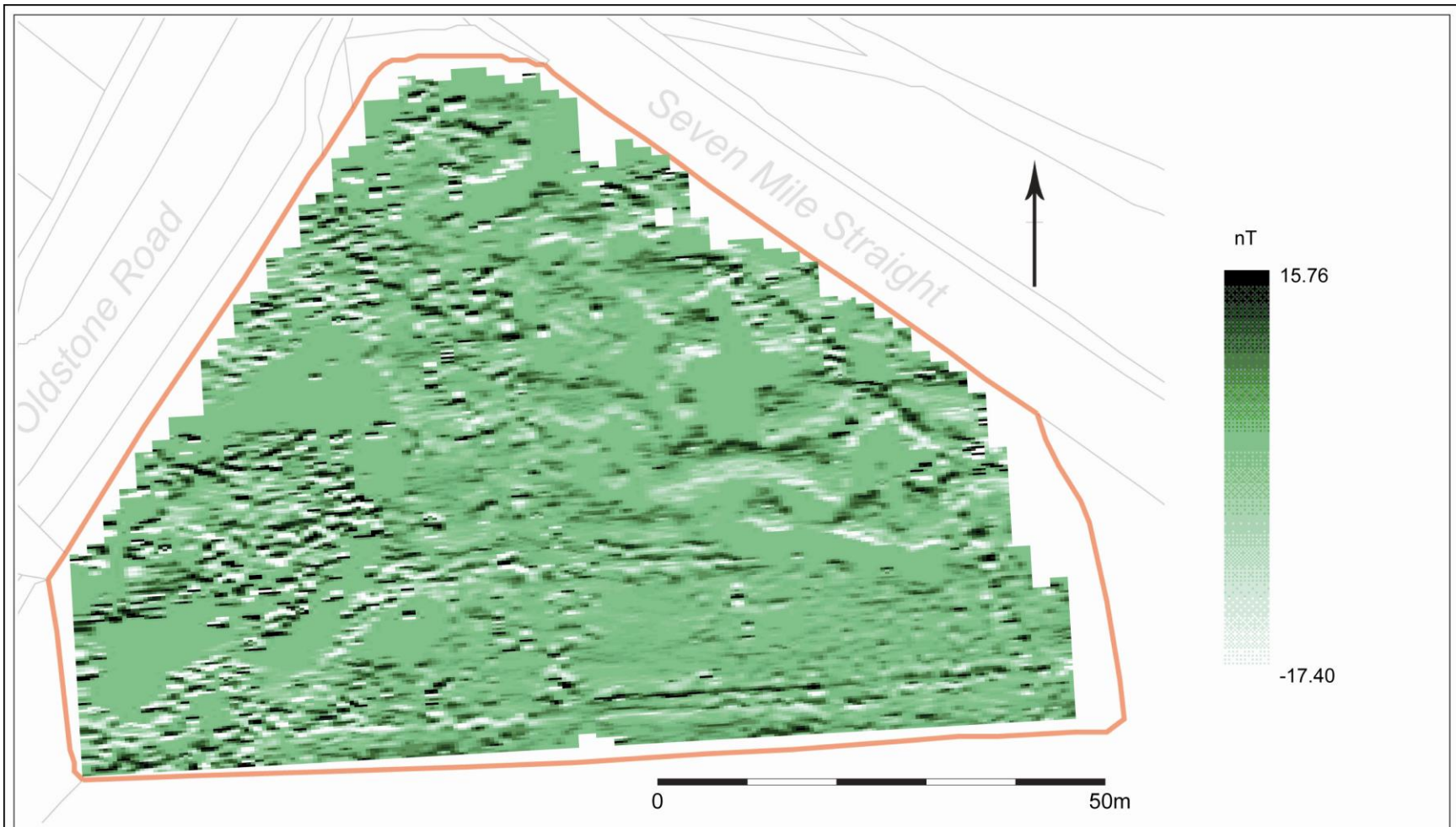
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FIGURE:

14





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DETAILS:

Shade relief plot of magnetometry data

PROJECT:

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FIGURE:

16

