Topographical And Geophysical Survey Prior To Drain Renewal At Kings Norton, Leicestershire (SK 6883 0035).

J. Browning and J. Coward

For: Severn Trent Water Ltd

Checked by Project Manager

Signed: .....**Date:**

Name: .....

University of Leicester
Archaeological Services
University Rd., Leicester, LE1 7RH
Tel: (0116) 2522848 Fax: (0116) 2522614

ULAS Report Number 2004-004

Topographical and Geophysical Survey Prior To Drain Renewal At Kings Norton, Leicestershire (SK 6883 0035)

Contents

An Archaeological Topographic and Geophysical Survey prior to Drain Renewal at Kings Norton, Leicestershire (SK 6883 0035)

Summary

A programme of archaeological work including topographical survey and geophysical survey was carried out by ULAS in January 2003, prior to drain renewal at King's Norton, Leicestershire (SK 6883 0035). The work revealed surviving evidence for changing land use over time, including medieval settlement and post-medieval formal gardens. The latter was confirmed with reference to the 1847 Tithe Map. A subsequent watching brief (ULAS Report 2003-018) was undertaken during excavation of the access holes for the replacement of the existing rising water main. No archaeological deposits were revealed during this work, although the location of the holes largely avoided the main areas of archaeological activity.

Introduction

This document presents the results of topographical and geophysical surveys at Kings Norton, Leicestershire, which were carried out by ULAS in January 2003. The work took place prior to the drain renewal. An archaeological watching brief was undertaken during the works themselves and is described in a separate report (ULAS Report 2003-018). The work was carried out in accordance with the *Brief for pre-construction topographical and geophysical survey and watching brief during construction, King's Norton Rising Mains, Leicestershire* (NUCL 2002). It follows an Archaeological Desk-Based Assessment and Walkover Survey for land at King's Norton, Harborough District, Leicestershire (SK6883 0035) (ULAS Report 2002-043).

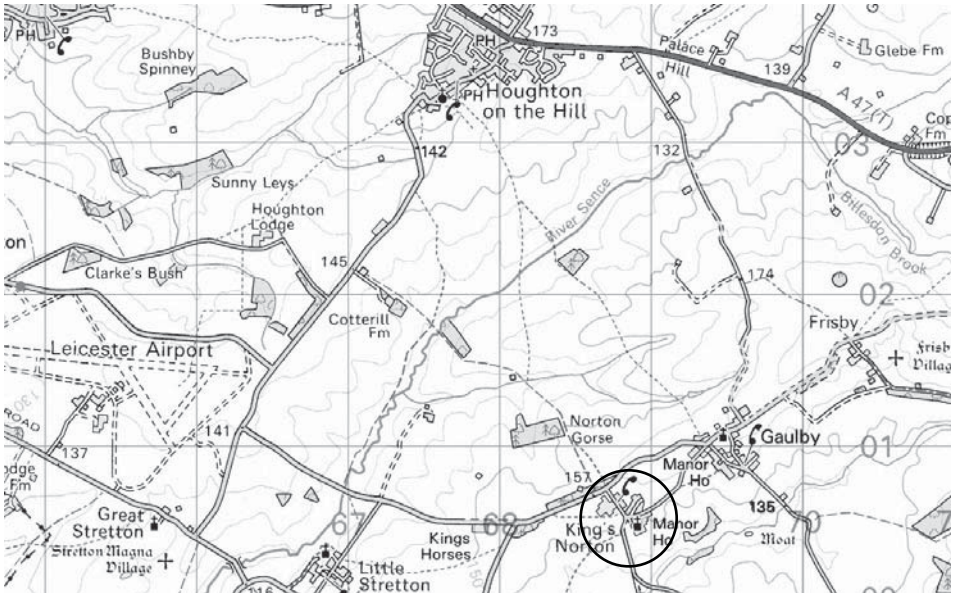


Figure 1: Location map. © Crown Copyright. All rights reserved. Licence number AL 100021186.

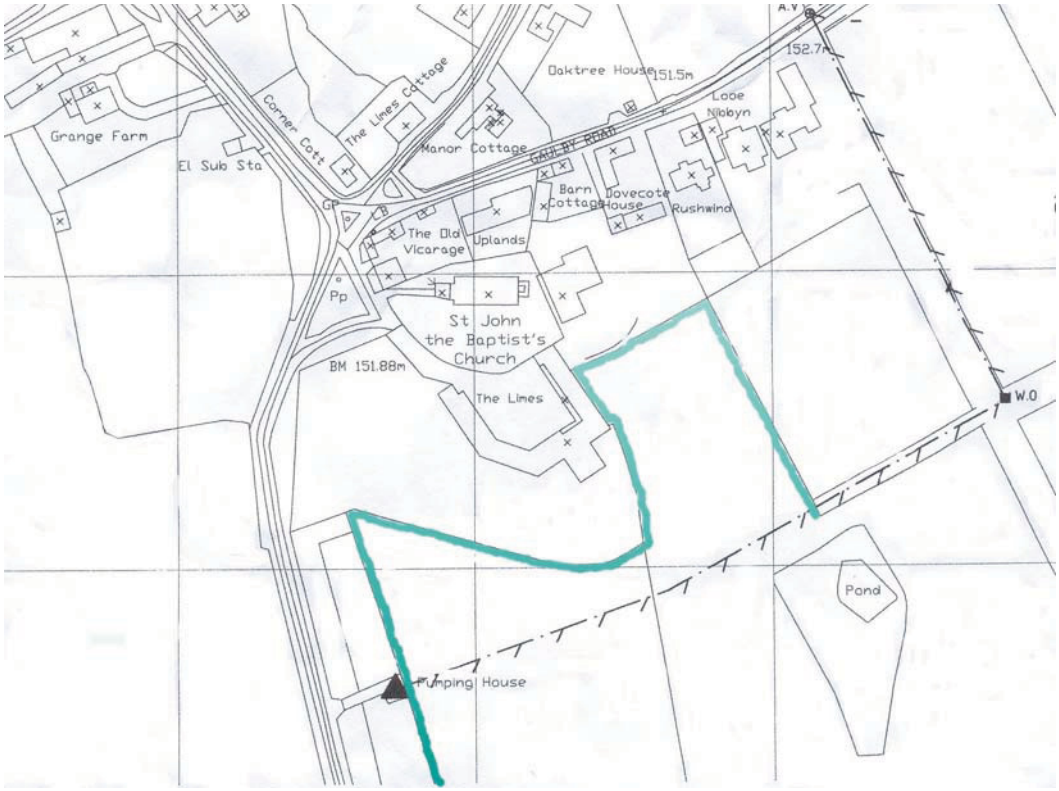


Figure 2: Area of investigation showing route of pipeline and area surveyed. Pick Everard. (NTS).

Historical and Archaeological Background

King's Norton is within Harborough District, south east of Leicester. The village has pre-Domesday origins. King's Norton occurs three times in the Domesday Book but all subsequent estimations of population suggest that it has never been a large village; only 36 people paid the Poll Tax in 1381. In 1563 there were 12 households, 17 in 1676 and only 14 by the early eighteenth century (Ripper 2002, 7). However, earthworks have been recorded to the west, north and northeast suggesting that the village has been much larger than it is currently. During the site visit for the desk based assessment (ULAS 2002), the remains of extant earthworks were observed in fields 1-6. These were thought to represent medieval ridge and furrow and possibly medieval structural remains. The earthworks are located to the south of the church of St. John the Baptist, which was rebuilt in the eighteenth century but has origins in the medieval period. The post-medieval manor house is adjacent to the church but the location of the medieval manor house is suspected to have been in the area affected by the pipeline, to the south of the church.

Geology and Topography

The Ordnance Survey Geological Survey of Great Britain Sheet 141 indicates that the underlying geology is likely to consist primarily of sand and gravel, with possibly some boulder clay along the northernmost extent of the pipeline route. The benchmark on the church at King's Norton is recorded as 151.88 O.D. and the spot heights for the topographical survey were calculated from this.

Topographical Survey

Introduction

An earthwork survey was undertaken in order to record changes in the surface topography. The area chosen for survey encompassed the route of the pipeline within a larger area, in order to provide a context for the features identified.

Methods

The site was surveyed using a Leica TCR 307 Reflector-less Total Station. The height of the survey was tied in using the benchmark defined on the church. Points were taken along the ground at intervals following an informal grid system. The distance between the points was decreased or increased depending on the absence, presence or complexity of the earthworks observed. The results were processed using Applications in Cadd n4ce software from which a surface model was produced (figure 4). A contour plot was produced using ArcView and PaintShop software (figure 3).

Results

The general landscape was one of undulating farmland. The survey took place on quite steeply sloping south-facing land. A height difference of 7m was recorded between the north and the south of the surveyed area. A sketch plan was produced from site sketches and notes and the raw EDM plot, to help elucidate and interpret the earthworks (figure 5). The letters in brackets refer to locations on this plan. An interpretative sketch plan such as this one tends to enhance the appearance of the earthworks. By contrast, very slight topographic changes do not show up at all on the contour plot. The sketch plan together with the surface model and contour plot (figures 3 & 4) illustrate the main natural and man-made features of the study area. The contour plot shows the former field boundary and earthworks at 'E' clearly. It also provides a clear reference to the change in levels across the land, from the highest points in the north to the lowest in the south. The surface model shows the ridge and furrow more clearly together with a former field boundary and the earthworks at 'B' (see below). It also hints at the earthworks at 'E' and 'A'.

Field 2

Ridge and furrow oriented northwest-southeast was clearly visible in the south of field 2 (G). Towards the north of the area an east-west aligned bank, with a shallow ditch to the north (B) appeared to delineate the agricultural area as represented by the ridge and furrow (the remains of medieval strip farming) from an area of possible structural features (A). This area was located south of the post-medieval manor house. A number of ephemeral features were observed, generally consisting of low mounds and slopes but few were distinct. The east-west aligned bank (B) was the most clearly defined feature. A shallow oval depression was observed on top of the bank and a more distinct circular depression was recorded to the north. It is thought that these may be fairly modern in origin and certainly later than the bank. Directly west of the bank was a relatively high mound or platform (C), which continued into field 1. At its highest point this was 146.07m O.D.; approximately 1m higher than the surrounding ground.

Field 1

The ground sloped down on its western side from the mound to a 'plateau', adjacent to the northern fence. A gentle slope reduced the ground level further on the north west of the site (*c.*143.32m O.D). This area was flat, with two very low circular mounds close to the northern fence (D). These were thought to be modern features, perhaps relating to the drain that ran between them. At the western side of the field, a bank enclosed a low area, which formed a triangular shape with the western hedge-line (E). A ditch represented the line of an old hedge boundary. Faint traces of possible north- south orientated ridge and furrow were observed towards the south of the field (G).

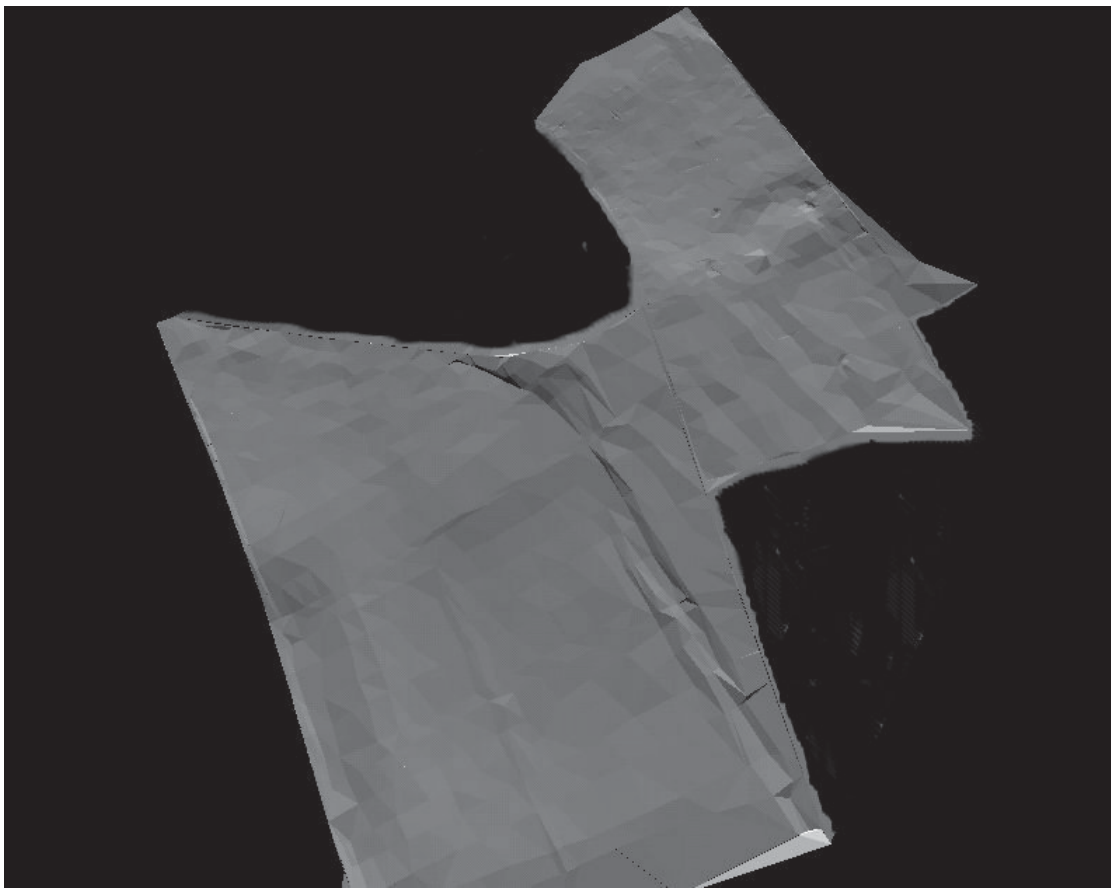


Figure 4: Surface model of the survey. Ridge and furrow and the field boundary ditch can clearly be seen.

Geophysical Survey

Following the topographic survey, geophysical survey was carried out over a 30m corridor centred on the route of the pipeline.

Methodology

A trial gradiometry scan was carried out across the site using a Geoscan Research FM 36 fluxgate gradiometer to test the magnetic response. The gradiometer was heavily affected by presumed underground services, and a scatter of ceramic building material in the north east quarter of field 1 also caused wide fluctuations. In view of this, it was decided to utilise resistivity, which is a technique less susceptible to the sort of interference encountered.

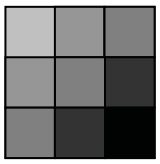
An earth resistance survey was carried out over the site. Earth-fast archaeological features such as ditches and walls tend to have different electrical properties (i.e. resistivity) to the surrounding soil. When an electrical current is passed through the soil, the matrices of the archaeological features may alter the electrical resistance (measured in Ohms, Ω) of the ground. Earth resistance survey allows us to map these changes of resistance laterally over a site to produce a map of subsurface features.
The earth resistance survey was carried out using a Geoscan Research RM15 resistance meter and PA1 twin probe array with a 0.5m probe spacing. Data points were recorded every 1.0m x 1.0m in blocks of 30m x 30m. Data was periodically downloaded to a portable computer in the field for storage and assessment.

A corridor of 30m each side of the proposed line of the new pipe was surveyed, a total of ten 30m by 30m grids. The survey was carried out in January 2003.

Data Processing and Presentation

Following the completion of a survey, processing and analysis took place using Geoscan Research's Geoplot v.3 software. The most typical method of visualising the data is as a *greyscale* image. In a greyscale, each data point is represented by a shade of grey, from black to white at either extreme of the data range

Inset: example of a greyscale plot



A number of standard operations are carried out to process the data, depending on the technique used. The background levels of each grid were matched in order to produce a seamless image. Incidental extreme high and low readings were removed from the data set and replaced with the local mean value. The greyscale image of the survey results then overlaid onto the digital map provided by Severn Trent Water and an interpretative diagram generalised from the results.

Results (figures 6 and 7)

In general, the two fields displayed low to medium resistivity values with the vast majority of readings falling between 10 ohms and 40 ohms. The background mean was roughly consistent across the site, indicating similar geology. A slight drop in background readings in the eastern field was probably caused by rain during the survey of this area. In the following text, the numbers in brackets refer to *figure 7*.

Field 1

A long linear high resistance feature was encountered on the west side of the field, running parallel with the field boundary (1). This appeared to run down slope to a junction and then divide, with a high resistance arm heading southwest, and a lower resistance arm heading off southeast. This may be a drain, or perhaps more likely a water supply with a high resistance lining or cover, for example stone or slate flags. The difference in the resistivity after the branch junction may indicate either a change in depth or a change in construction materials.

In the centre of field 1 is a well defined patch of higher resistivity, with values about 25% above those around it (2). This could represent the site of a building; the higher values indicating buried building debris, or perhaps just compacted subsoil under any floor area.

In the north east corner of the field is a plateau area, with bumpy ground around it. Evidence of brick rubble and debris can be seen on the surface, and it is clear that this area has been disturbed in the relatively recent past. This area shows a complicated response: generally high (as would be expected with building debris) but with two low resistance features within it (3). The first, a very tight linear response of only 1m width, may represent a silted up gully. The other is a broader and more diffuse response with a general orientation of southwest to northeast. It is butted up to a high resistance anomaly on its north side, but less well defined on the south. This anomaly is no lower in resistance than most of the background readings across other parts of the field, and it may be that it is appearing to be anomalous only in contrast to the high readings around it. It could however represent a feature cut through the high response area and then either deliberately backfilled, or silted up naturally.

Conversely, the high resistivity anomaly may have a very well defined edge to the south-east, or have been originally more diffuse, with a later cut feature creating the apparent edge.

Field 2

A well defined area of high resistivity is apparent in the southwest quadrant of the surveyed area (4). The values in this area are between 50% and 100% higher than the immediate surroundings, and this anomaly is a good candidate for the site of a removed building, although no building debris was apparent in the vicinity.

In the northeast quadrant of the survey area there is another high resistance anomaly on the same orientation as the putative building to the southwest (5). This is a well defined rectangle of *c.*20m by 7m, and is also a good candidate for representing a

removed structure. There is a slight low resistance 'halo' around the anomaly, which could represent wetter soil filling footing trenches.

Discussion

This section comprises discussion of the results of both the topographical and geophysical surveys. Reference is made to *letters* denoting features in figure 5, the sketch plan, and *numbers* in figure 7, the greyscale interpretation. The 1847 Tithe map (figure 8) also provides a valuable aid to interpretation.

As a group the earthworks are likely to represent several phases of activity from the remains of medieval settlement to modern alteration and disturbance. The trampling of generations of animals, particularly in inclement weather may have caused other minor alterations. Geophysical survey has located several anomalies which could represent removed buildings, although that is not the only possible interpretation: even the position of old stock pens can give high resistivity readings due to compacted ground.

It is difficult to interpret the low, indistinct features at 'A' (figure 5) but it is possible that they represent denuded structural features or house platforms. Conversely, they may be natural undulations. Geophysical survey was not carried out over this area so no further evidence is available at this time. The 'ditch and bank' complex at 'B' are the most prominent earthworks on the site. The geophysical survey detected a defined rectangle of high resistance (5- figure 7) coinciding with this raised area, indicating the presence of a former structure. If this is the case, the shallow ditch may have a drainage function. Another geophysical anomaly was detected to the south of this feature (4). This high resistance anomaly shows apparent variations within itself: the west, centre, and particularly the east, have higher resistance. This may represent different buildings, differing components of a single building or the effect of agricultural processes (such as ridge and furrow) on any buried debris. If the latter were the case, it would be good evidence that the anomaly represents a feature of early date. The only earthworks recorded in this area were ridge and furrow, which does suggest that the feature causing the geophysical anomaly is likely to be earlier in date. The area immediately to the west (in field 1) also exhibiting higher resistivity (3) and may be associated with the major anomaly (4); they would both be within the original field boundary just west of the present fence-line. The mound recorded in the northeast corner of field 1 and extending into field 2 (C) may represent the remains of another building. It was not possible to see this earthwork in its entirety as the northern part was outside the survey area. However, brick rubble was observed south of this feature as well as high and low resistance anomalies (3).

In field 1, the general earthwork pattern, west of the former field boundary suggests a rectilinear pattern, with areas of higher and lower ground. Particularly clear is a sub-rectangular depression surrounded by a bank (E), close to the eastern boundary, which may represent the remains of a pond. It is on a slightly different alignment to the ridge and furrow and should be considered in conjunction with the earthworks to the north (D). On the extreme eastern edge of field 1, close to the pumping station, a bank runs approximately north-south. Only part of this was visible due to vegetation beyond the site boundary. The result of the geophysical survey indicates the possible presence of a stone drain (1). In the centre of field 1 is a well defined patch of higher resistivity

(2) representing a drier, more compacted area of ground such as buried building debris, or perhaps just compacted subsoil. The 1847 Tithe Map (figure 8) provides plausible interpretation of these features. This shows an area, which field 1 now occupies, laid out in a 3 x 2 rectangular pattern; presumably formal gardens separated by paths. The western-most part is now a copse, which also contains the pumping station. Two rectangles within the area are likely to be ponds. Therefore it seems reasonable that the sunken area at E represents the remains of the southern 'pond'. The geophysical anomaly (2) may be part of one of the paths, which would certainly be areas of more compaction, thereby exhibiting higher resistance. A low ridge observed during the topographical survey and originally thought to be ridge and furrow may represent the earthwork remains of one of these paths. The former field boundary is likely to also be the eastern extent of the formal gardens.

The remains of ridge and furrow are present to the east of the former field boundary. These earthworks were formed by repeated ploughing, using a coulter, share and mouldboard. Although the mouldboard had been in use from late prehistoric times, this type of ploughing equipment was common from the 11th century. From the 16th century onwards fields were turned over to permanent pasture, which has had the effect of 'fossilising' ridge and furrow in the landscape (Astill 1988, 70-71).

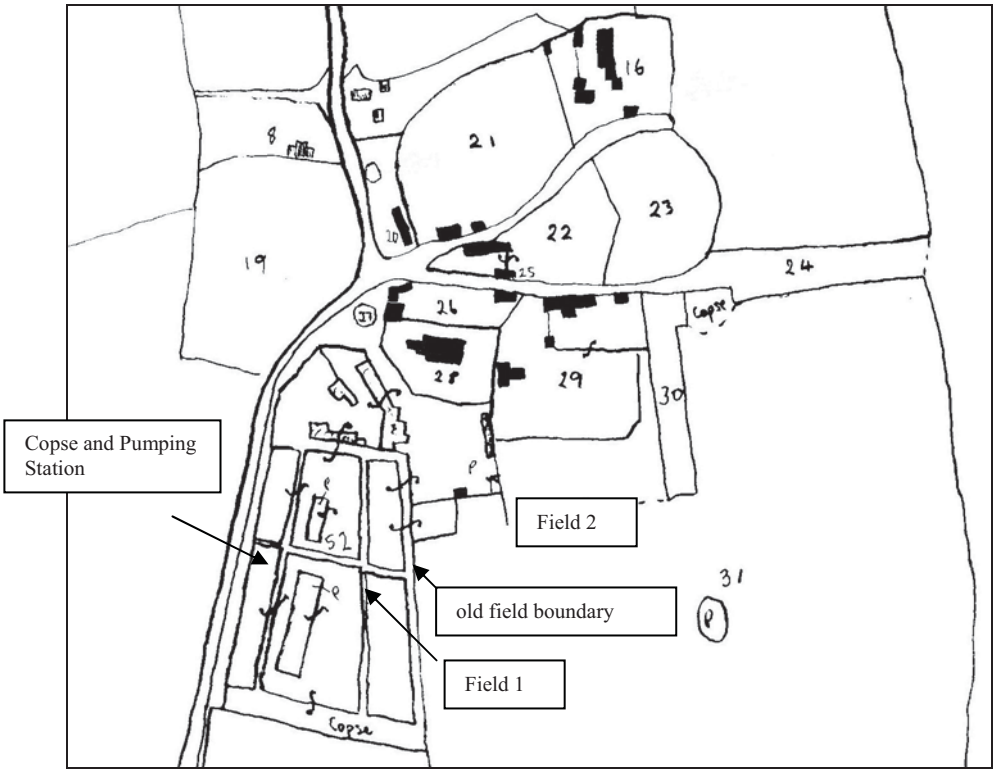


Figure 8: 1847 tithe map of King's Norton, Leicestershire, hand-traced from original at Leicestershire Records Office (S. Ripper)

Conclusion

The use of a combination of topographical and geophysical survey, together with study of the available maps has suggested a chronology of landscape use in the study area. A geophysical anomaly detected in field 2 (number 4- figure 7) appears to be the earliest feature on the site, as it is apparently disrupted by the ridge and furrow. The

ridge and furrow probably represent the next phase of use, when the land was strip ploughed in the medieval period. The other features in field 2, which possibly represent buildings, may also be associated with this medieval phase. At a later date the land was turned over to pasture and boundaries were imposed upon the landscape. Post-medieval changes to the land are demonstrated by a former field boundary (F), with a hedge and ditch that followed the orientation of the ridge and furrow. The next change was the inclusion of a formal garden, east of the road. This is shown on the 1847 Tithe map and corroborated by surviving earthworks and geophysical anomalies. The 1904 Ordnance survey map indicates that the garden had fallen out of use by the twentieth century and the strip of garden closest to the road now contained a copse and the pumping station. Finally the eastern boundary of field 1 was re-located to the east of the earlier one.

References

Challis, K. 2002. *Brief for pre-construction geophysical survey and watching-brief during construction, Kings Norton Rising Mains, Leicestershire.* For Severn Trent Water. Nottingham University Consultants Ltd. Nov. 2002.

Astill, G., 1988 'Fields' in G. Astill and A. Grant (eds) 1988 *The Countryside of Medieval England* Blackwell pp62-85

Clark, A J., 1990 *Seeing Beneath the Soil*, Batsford.

English Heritage 1995 *Research and Professional Services Guideline No 1*, *Geophysical Survey in Archaeological Field Evaluation*.

Gaffney, C., Gater, J.,. and Ovendon, S., 1991 *The Use of Geophysical Techniques in Archaeological Evaluations,* Institute of Field Archaeologists Technical Paper Number 9.

Reynolds, J.M., *1997 An Introduction to Applied and Environmental Geophysics*, Wiley.

Ripper, S. 2002. *An Archaeological Desk-based Assessment and Walkover Survey for Land at Kings Norton, Harborough, Leicestershire*. ULAS Report No 2002-043.

Schollar, I., *1990 Archaeological Prospecting and Remote Sensing (Topics in Remote Sensing 2),* Cambridge University Press.

Acknowledgements

I would like to thank David McKune of Pick Everard and Keith Challis of NUCL for their help and co-operation during this work. The project was managed by Dr. Patrick Clay. Jennifer Browning, Jon Coward and Gavin Speed carried out the fieldwork. Jennifer Browning wrote up the topographical survey and Jon Coward produced the geophysical survey report. This document was compiled by Jennifer Browning.

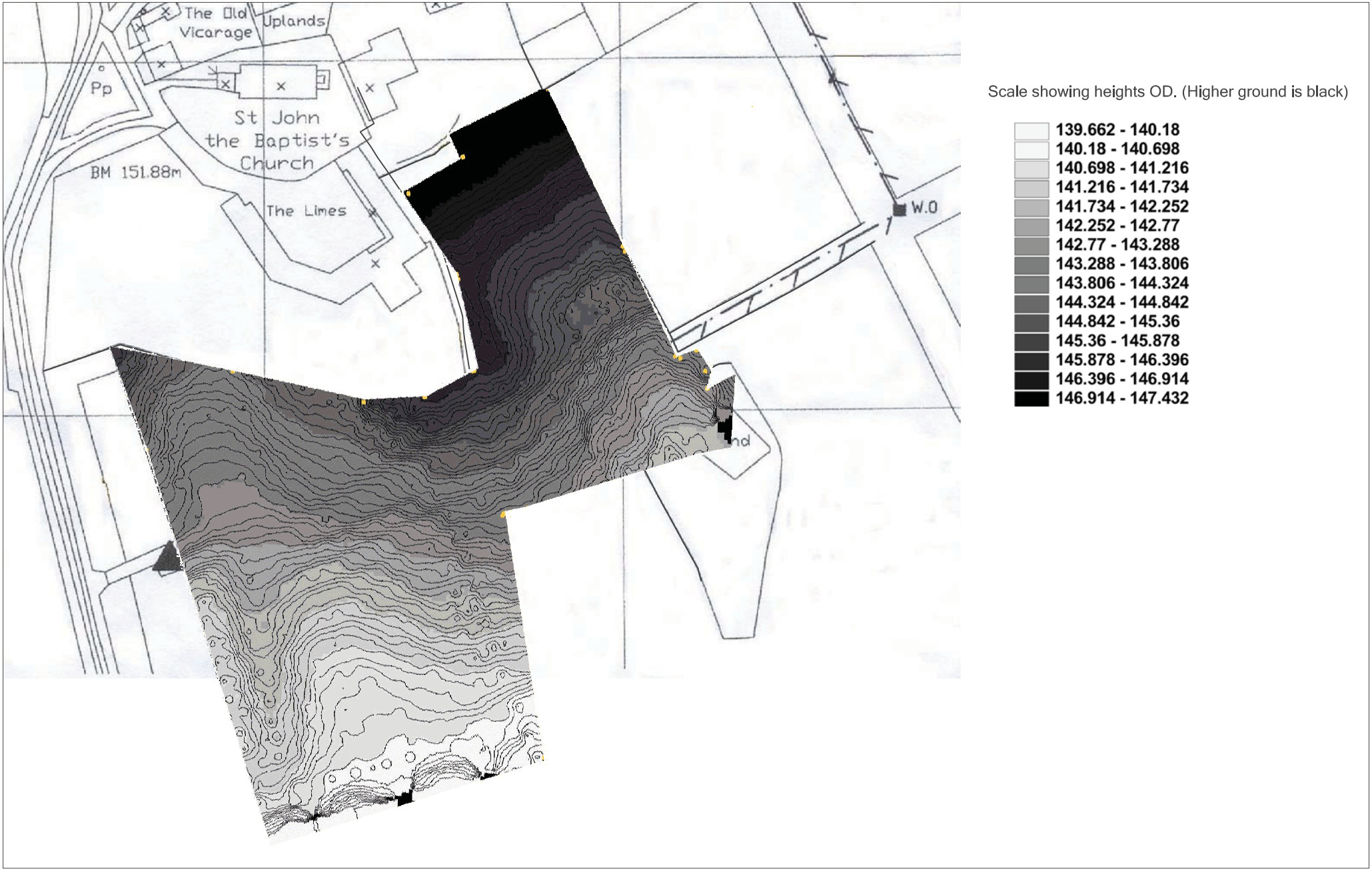


Figure 3: Contour plot, showing results of survey.

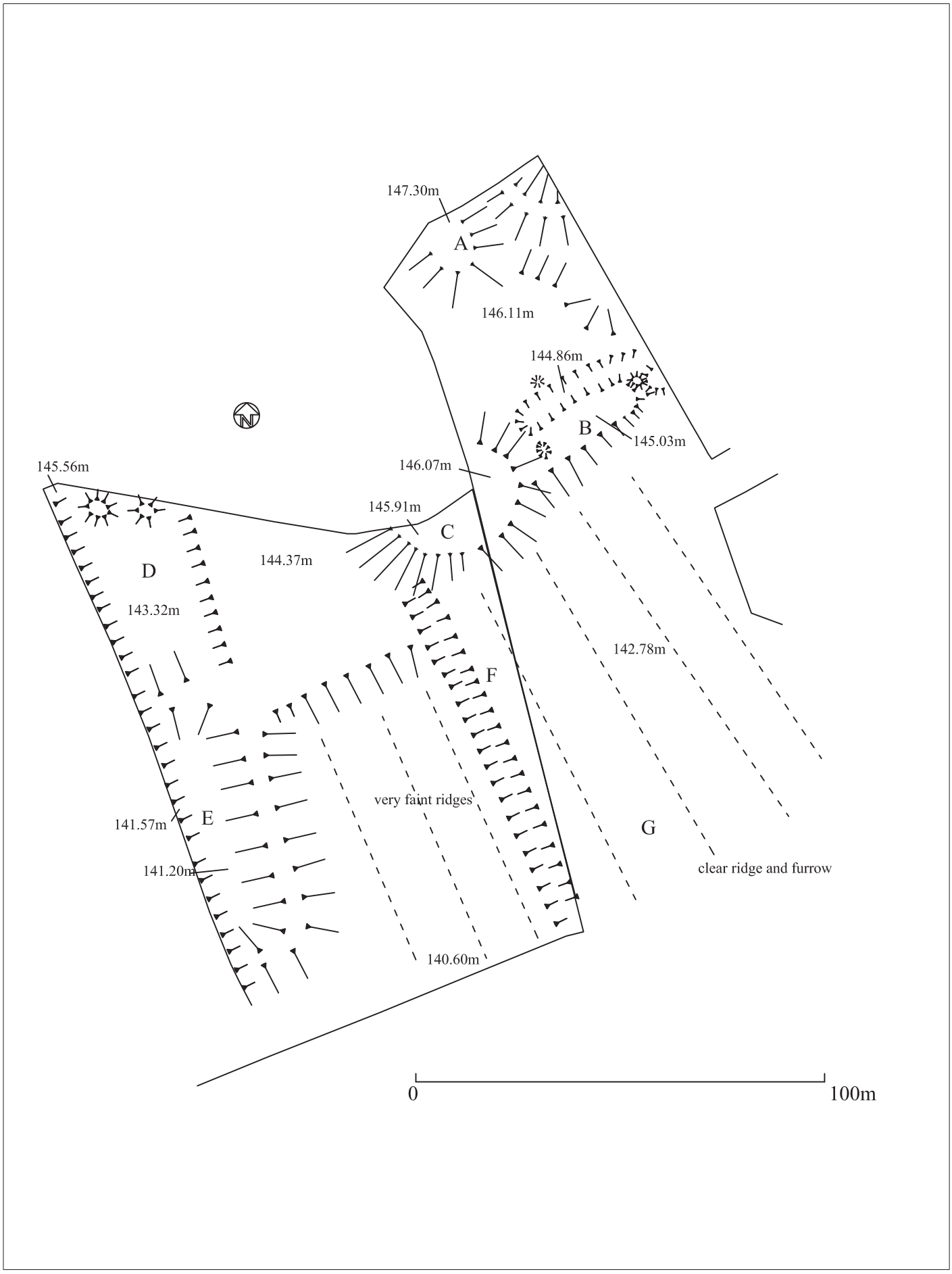


Figure 5: Sketch plan of earthworks, with spot heights. Scale 1:1250

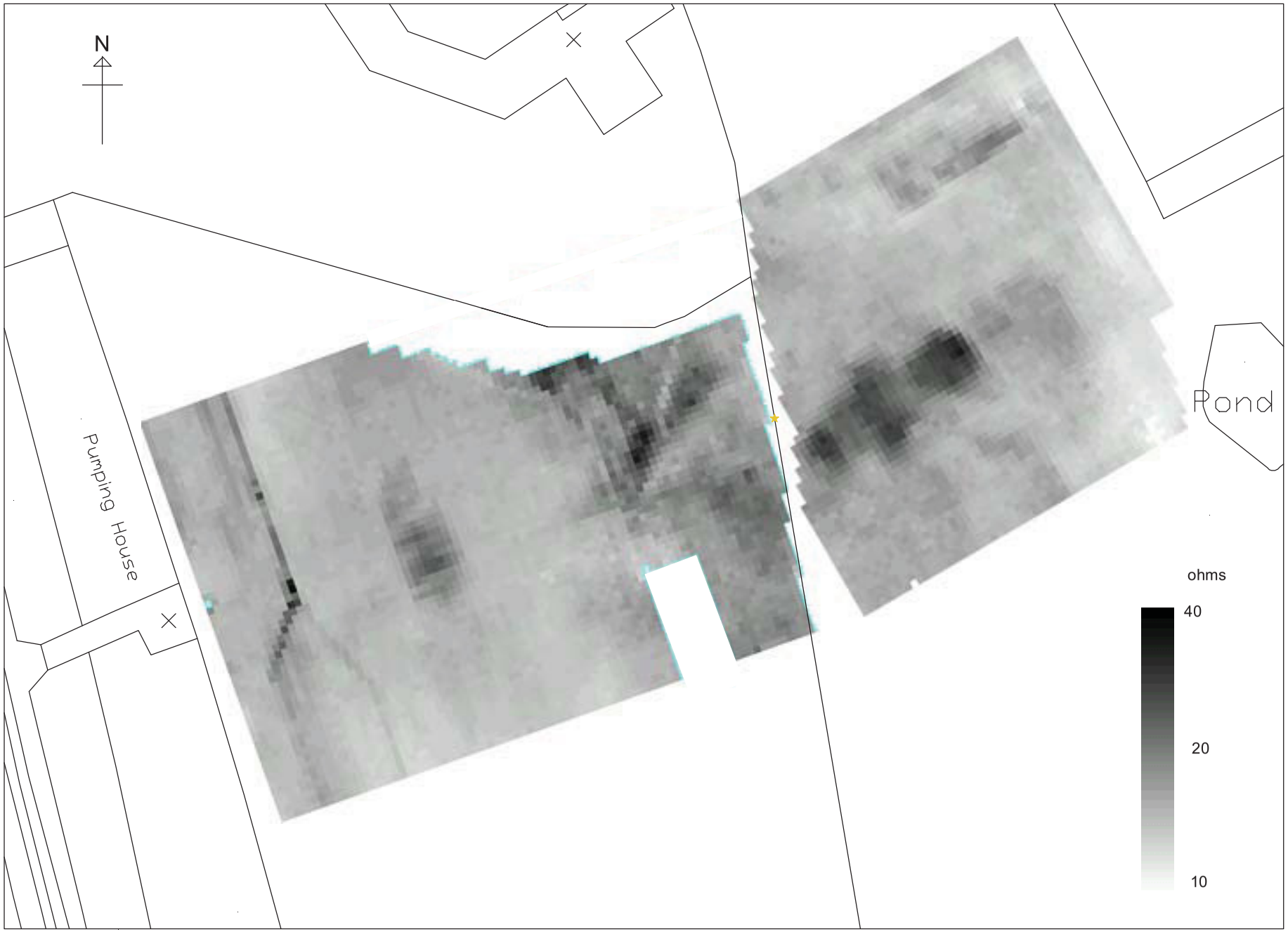


Figure 6: Greyscale Scale 1:750

Figure 7: Greyscale Interpretation Scale 1:750