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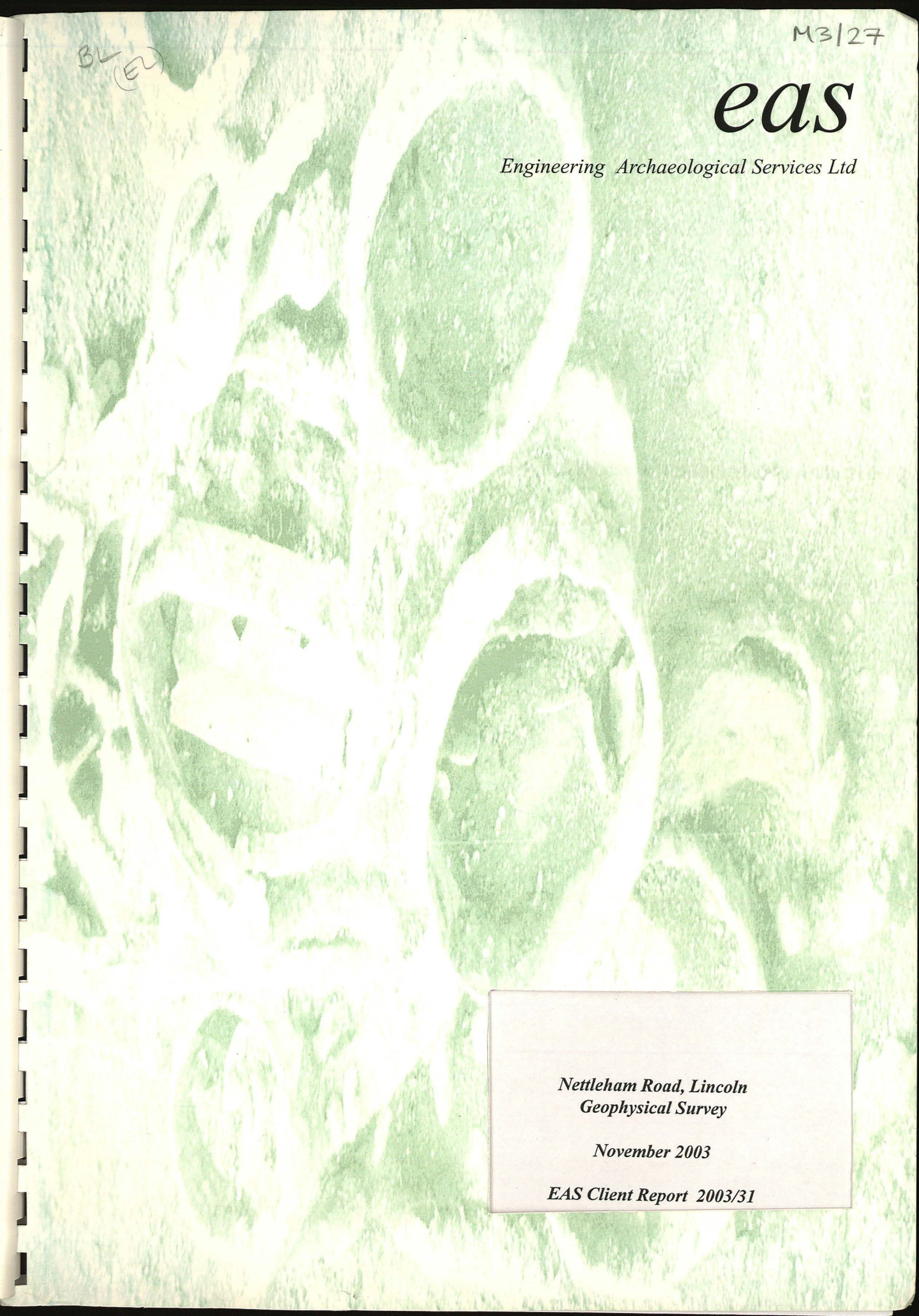
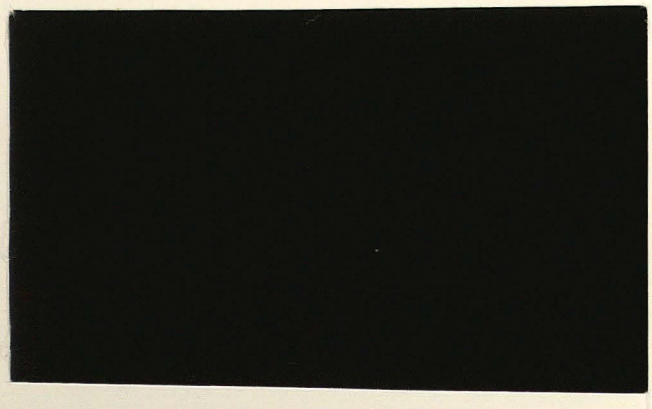
Engineering Archaeological Services Ltd



Nettleham Road, Lincoln
Geophysical Survey

November 2003

EAS Client Report 2003/31



EVENT LI 4744 SOURCE LI 9299 LI 9300 PRN 70068 - PREHISTORIC 70069 - PREHISTORIC 70371 UNDATED 70372 UNDATED

Survey Commissioned
by
M and M Archaeology

Surveyed
by
I.P. Brooks and K. Laws
Engineering Archaeological Services Ltd.

registered in England
№ 2869678

Nettleham Road, Lincoln
Geophysical Survey

November 2003

EAS Client Report 2003/31

CONTENTS

List of Illustrations

Nettleham Road, Lincoln, Geophysical Survey - Introduction:

NGR

Centred on SK 98816 73997

Location and Topography (Figure 1)

The survey area forms a rough triangle with its northern boundary being the A 46 Lincoln Northern Bypass. The southern edge of the survey area was a small stream known as the Roaring Meg. The western end is marked by the back gardens of houses fronting onto Millbeck Drive. The field has a slight plateau running along its northern perimeter which then slopes gently down towards the south and east. At the time of survey the field had been ploughed and harrowed and had a cereal crop which was just showing.

Archaeological Background

It is intended to build a housing development within the field. M and M Archaeology have been appointed to carry out the evaluation of the proposed development and as part of this Engineering Archaeological Services Ltd. were subcontracted to carry out the geophysical survey.

The proposed development is within an area of high archaeological potential, north of the Roman fort and city of Lincoln. The line of the Roman aqueduct is known to approach the proposed development site from the opposite side of the Roaring Meg, and it has been suggested that it continued its line to a possible source to the north of the proposed development.

Initial work on the assessment has also suggested, based on aerial photography, that there may be prehistoric barrows within the proposed development area (Griffiths pers. comm.).

Aims of Survey

To gather sufficient information to establish the location and extent of any archaeological features within the development area and, if possible, to characterise the archaeology located.

SUMMARY OF RESULTS

A large number of potential magnetic anomalies were located which fall into two general groups. Firstly unambiguous magnetic anomalies which show a number of potential archaeological features including a sub-rectangular enclosure, possible field boundaries and possible track way.

The second group are very feint, within the grey scale plot, but would suggest a much higher level of archaeological activity within the proposed development area. Within this group are the locations of the possible barrows recorded in the aerial photographs, together with a number of other circular anomalies which may be further barrows. Six rectilinear anomalies may be the sites of buildings and there are also a number of other linear anomalies which possibly mark field and enclosure boundaries.

The magnetic susceptibility samples taken as part of the survey also show slight concentrations of possible archaeological activity, although these do not always correspond with the anomalies recorded in the Fluxgate Gradiometer survey.

Nettleham Road, Lincoln, Geophysical Survey -Results:

Methods

The Fluxgate Gradiometer survey was undertaken using parts of seventy five 30 x 30 m grid squares laid out as in Figure 2 . Readings were taken at 0.5 m intervals along transects 1 m apart. These transects were walked in a zigzag pattern.

The survey was carried out using a Geoscan FM 36 Fluxgate Gradiometer with a ST 1 sample trigger. Grey Scale and X - Y Plots were produced using Geoscan Research "Geoplot" v. 3.00e.

Survey Results:

Area

The total development area is in excess of 9 Ha, of which 6.5 Ha were subjected to Fluxgate Gradiometer survey. The survey was designed to cover the slight plateau along the northern side of the development area and to sample the proposed line of the extension to the Roman aqueduct.

Display

The results are displayed as Grey Scale Image and as X-Y Trace Plots. Figures 4 - 19. Because of the large size of the survey the area has been divided into seven blocks (Figure 3). Plots of the whole of the survey area (Figures 4 and 12), together with each of the blocks (Figures 5 - 11 and 13 - 19) are given .

Results:

The anomalies recorded in the survey can be divided into two general groupings based on their appearance on the grey scale plots. Firstly there are a series of unambiguous anomalies which are clear and easy to define. Secondly there are a much greater number of feint, or very feint, anomalies which are more difficult to define. These feint anomalies have only been possible to define because of the very quiet background magnetic regime within the survey area. Indeed the survey as a whole is not very magnetically active with the standard deviation on the readings taken being only 1.79 nT. The interpretation of the survey is shown on Figure 20 and summarised on Figure 21.

Dominating the plot is a sub-rectangular anomaly (Figure 20, Anomaly A). This is defined by a linear anomaly enclosing an area approximately 53 x 38 m with a possible entrance along the southern side. This probably sub-rectangular enclosure would appear to contain a number of feint anomalies which may suggest sub-divisions or structures within the enclosure.

On a similar alignment to Anomaly A are two sections of linear anomaly (Anomalies B and C) running approximately NW - SE. These two sections would appear to be linked by a very feint anomaly (Anomaly AT). The other clear anomaly in the eastern half of the survey is a linear anomaly (Anomaly D) running at a slight angle to Anomalies A, AT and C.

In the western half of the survey two parallel anomalies (Anomaly E) run approximately NW SE and possibly define the position of a track way crossing this part of the survey area. Along the southern edge of the survey two further anomalies (Anomalies F and G) were recorded. Whilst Anomaly F is roughly parallel with the line of the Roaring Meg a feint anomaly (Anomaly AG) appears to extent its line away from the modern water course. This may suggest that the anomaly is not related to the modern field system. One further clear anomaly is also located in this part of the survey area. Anomaly G is a short length of linear anomaly running approximately NW - SE. It can be regarded as a possible continuation of Anomaly F.

The remaining anomalies are much feinter and thus their interpretation is considered to be more subjective. Nine circular, or sub-circular anomalies have been defined (Anomalies H - O and Anomaly Q) These have generally been defined by a smoother zone within the grey scale plots. They vary in size between 10 and 22 m in diameter, although the majority are between 10 and 18 m in diameter. Two of these anomalies (Anomalies H and I) would appear to have

Nettleham Road, Lincoln, Geophysical Survey -Results:

rectangular anomalies within the centre of the circular anomalies. It is assumed that these two anomalies are the possible barrows recorded in the aerial photographs, if so then the rectangular anomalies may represent structures within the barrows or areas of later disturbance. The other circular anomalies are also possible barrows, although this interpretation is tentative.

Anomaly Q sits at the north eastern end of a possible large oval enclosure, approximately 82 x 47 m in size, (Anomaly P), although the relationship between these anomalies is not certain. Also within Anomaly P is a rectilinear anomaly (Anomaly R) approximately 15 x 10 m in size. This is crossed by a feint linear anomaly (Anomaly AI) which also crosses Anomaly P and is therefore probably of a different date.

Five other rectilinear anomalies have been defined (Anomalies S - W). Three of these (Anomalies S, T and U) form a rough grouping to the west of Anomaly A. Anomalies S and T are roughly on the same alignment, although Anomaly U is at an angle to the others, possibly suggesting that they may not be contemporary. Anomaly S also contain a circular anomaly within the rectangular enclosure which may suggest some complexity to any archaeological features associated with the anomalies. The rectilinear form and sizes of these anomalies may tend to suggest the possibilities of buildings in this area.

Anomaly V is approximately 30 m to the north west of Anomaly U. It is much smaller than the rectilinear anomalies so far discussed, being only 8 x 5 m in size.

Anomaly W is approximately 18 x 15 m in size with a central rectilinear anomaly 8 x 8 m in size set at an angle to the main anomaly. The alignments of these two anomalies may suggest that they may not be contemporary.

Anomaly AA would appear to be an oval enclosure, 29 x 15 m in size, to the east of Anomaly A. It cannot be directly related to any other anomalies recorded, but it would appear to be on a similar alignment to the feint linear anomalies AB, AC, AK and AU.

Anomaly AL is distinctive discrete anomaly up to 20 nT above the background readings. This would suggest a concentration of magnetic material in this area. The size of the anomaly (approximately 5 x 4 m) would also suggest that this was not the result of modern ferrous materials within the plough zone. Similar responses can be gained from such features as hearths or other high temperature features. Another similar anomaly (Anomaly AS) is larger (12 x 6 m) and reaches values in excess of 200 nT above the background. This anomaly may also be the result of a high temperature feature such as a kiln or furnace.

The remaining linear anomalies (Anomalies X, Y, Z, AD, AH, AM, AN, form no clear pattern, although they tend to be roughly aligned NE - SW or NW - SE. Anomalies AF and AE follow the line of the modern disturbance along the banks of the Roaring Meg (Anomalies AP and AR) and are probably related to modern agricultural practice.

Four roughly parallel anomalies (Anomaly AO) run across slightly clayer areas in the field and possibly represent modern drainage within the field.

Magnetic Susceptibility

It was possible to take soil samples in order to assess the magnetic susceptibility of the soils. It was also possible to obtain a subsoil sample for comparison.

Sample	Volume susceptibility χ_v	Mass susceptibility χ_m
Grid 1	57	59.4
Grid 3	65	66.3
Grid 5	67	71.3
Grid 7	47	50.5
Grid 9	74	79.6
Grid 11	58	62.4
Grid 13	61	66.3

Nettleham Road, Lincoln, Geophysical Survey -Results:

Sample	Volume susceptibility χ_v	Mass susceptibility χ_m
Grid 14	67	65.0
Grid 16	70	72.2
Grid 19	54	59.3
Grid 21	64	70.3
Grid 22	67	63.8
Grid 24	60	61.9
Grid 27	55	55.0
Grid 29	59	62.1
Grid 30	56	56.0
Grid 32	77	83.7
Grid 35	62	63.3
Grid 37	59	64.8
Grid 38	56	59.6
Grid 40	68	77.3
Grid 43	57	57.0
Grid 45	53	54.1
Grid 47	49	48.5
Grid 49	52	52.5
Grid 50	52	52.0
Grid 52	58	65.9
Grid 55	45	44.6
Grid 58	57	56.4
Grid 60	54	60.0
Grid 62	48	51.6
Grid 64	63	63.6
Grid 66	61	68.5
Grid 69	46	47.4
Grid 71	53	63.1
Grid 72	54	56.3
Grid 74	45	48.9
Subsoil	1	0.8

In general, the susceptibilities, as measured, are of moderate levels and there is a large difference between the subsoil and topsoil values suggesting that the conditions were suitable for magnetic survey.

It is noticeable that Grids 5, 9, 16, 21, 32 and 40 have enhanced susceptibility readings. These do not easily correlate with the anomalies recorded in the Fluxgate Gradiometer survey (Figure 21), although they presumably reflect increase archaeological activity in these areas not shown on the plots. The exception to this general pattern is the sample from Grid 32 which contains Anomaly AS. It is also noticeable that the magnetic susceptibility is not raised within Anomaly A, although the enhanced values from Grids 32 and 40 are immediately to the south of the possible enclosure and may suggest the possible disposal of rubbish to the south of the enclosure.

Nettleham Road, Lincoln, Geophysical Survey - Conclusions:

Conclusions

It is a fundamental axiom of archaeological geophysics that the absence of features in the survey data does not mean that there is no archaeology present in the survey area only that the techniques used have not detected it.

A high potential level of archaeological activity is demonstrated by the survey. This, however, can be split into two main groupings. Firstly unambiguous anomalies which includes a probable sub-rectangular enclosure with possible internal structures, a trackway and a number of probable field boundaries.

Beyond this there are a large number of very feint anomalies which are more difficult to interpret. Nine circular anomalies possibly represent a series of barrows or similar features within the study area. Two of these probably relate to cropmarks seen in aerial photographs of the development area. These two also contain rectangular anomalies which may suggest either areas of disturbance or structure within the barrows.

Five rectilinear anomalies possibly represent buildings which it is tempting to correlate with the sherds of Romano-British pottery which were seen in the field whilst the survey was taking place. The anomalies, however are very feint and any interpretation must remain tentative.

A level of industrial activity can be postulated from the two high value anomalies (AL and AS) whilst these high values could be gained from modern metal debris in the ploughsoil the size and nature of the responses would make this unlikely. These anomalies are possibly the result of high temperature activities such as a kiln, furnace or hearth.

Modern disturbance can be seen to be minimal within the survey area. This being limited to the banks of the Roaring Meg and possible modern field drainage in part of the field.

Nettleham Road, Lincoln, Geophysical Survey - Technical Information:

Techniques of Geophysical Survey:

Magnetometry:

This relies on variations in soil magnetic susceptibility and magnetic remenance which often result from past human activities. Using a Fluxgate Gradiometer these variations can be mapped, or a rapid evaluation of archaeological potential can be made by scanning.

Resistivity:

This relies on variations in the electrical conductivity of the soil and subsoil which in general is related to soil moisture levels. As such, results can be seasonally dependant. Slower than Magnetometry this technique is best suited to locating positive features such as buried walls that give rise to high resistance anomalies.

Resistance Tomography

Builds up a vertical profile or pseudosection through deposits by taking resistivity readings along a transect using a range of different probe spacings

Magnetic Susceptibility:

Variations in soil magnetic susceptibility occur naturally but can be greatly enhanced by human activity. Information on the enhancement of magnetic susceptibility can be used to ascertain the suitability of a site for magnetic survey and for targeting areas of potential archaeological activity when extensive sites need to be investigated. Very large areas can be rapidly evaluated and specific areas identified for detailed survey by gradiometer.

Instrumentation:

1. Fluxgate Gradiometer - Geoscan FM36

2. Resistance Meter - Geoscan RM4/DL10

3. Magnetic Susceptibility Meter - Bartington MS2

4. Geopulse Imager 25 - Campus

Methodology:

For Gradiometer and Resistivity Survey 20m x 20m or 30m x 30m grids are laid out over the survey area. Gradiometer readings are logged at either 0.5m or 1m intervals along traverses 1m apart. Resistance meter readings are logged at 1m intervals. Data is down-loaded to a laptop computer in the field for initial configuration and analysis. Final analysis is carried out back at base.

For scanning transects are laid out at 10m intervals. Any anomalies noticed are where possible traced and recorded on the location plan.

For Magnetic Susceptibility survey a large grid is laid out and readings logged at 20m intervals along traverses 20m apart, data is again configured and analysed on a laptop computer.

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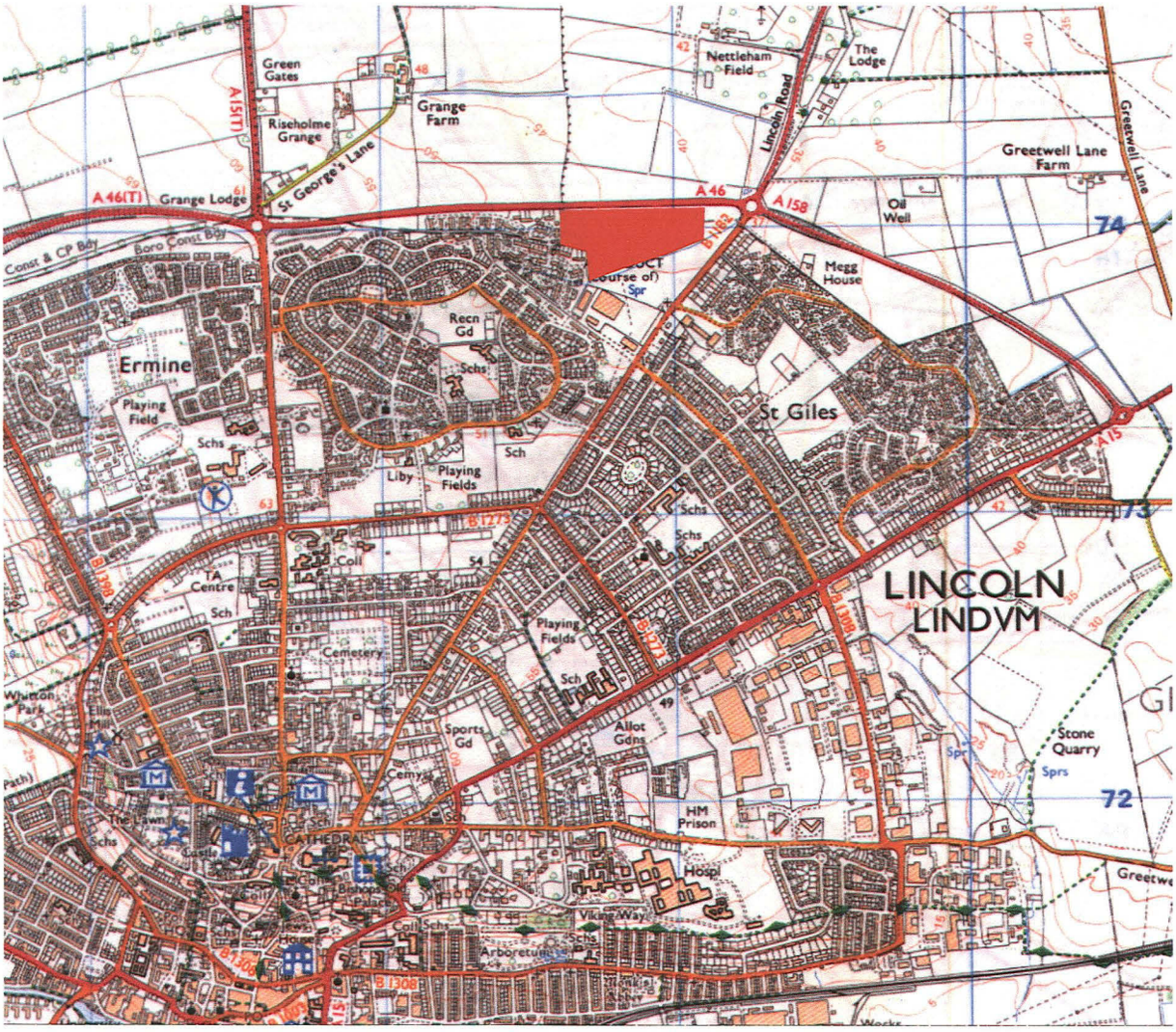


Figure 1: Nettleham Road, Lincoln
Location
Sclae 1:25,000

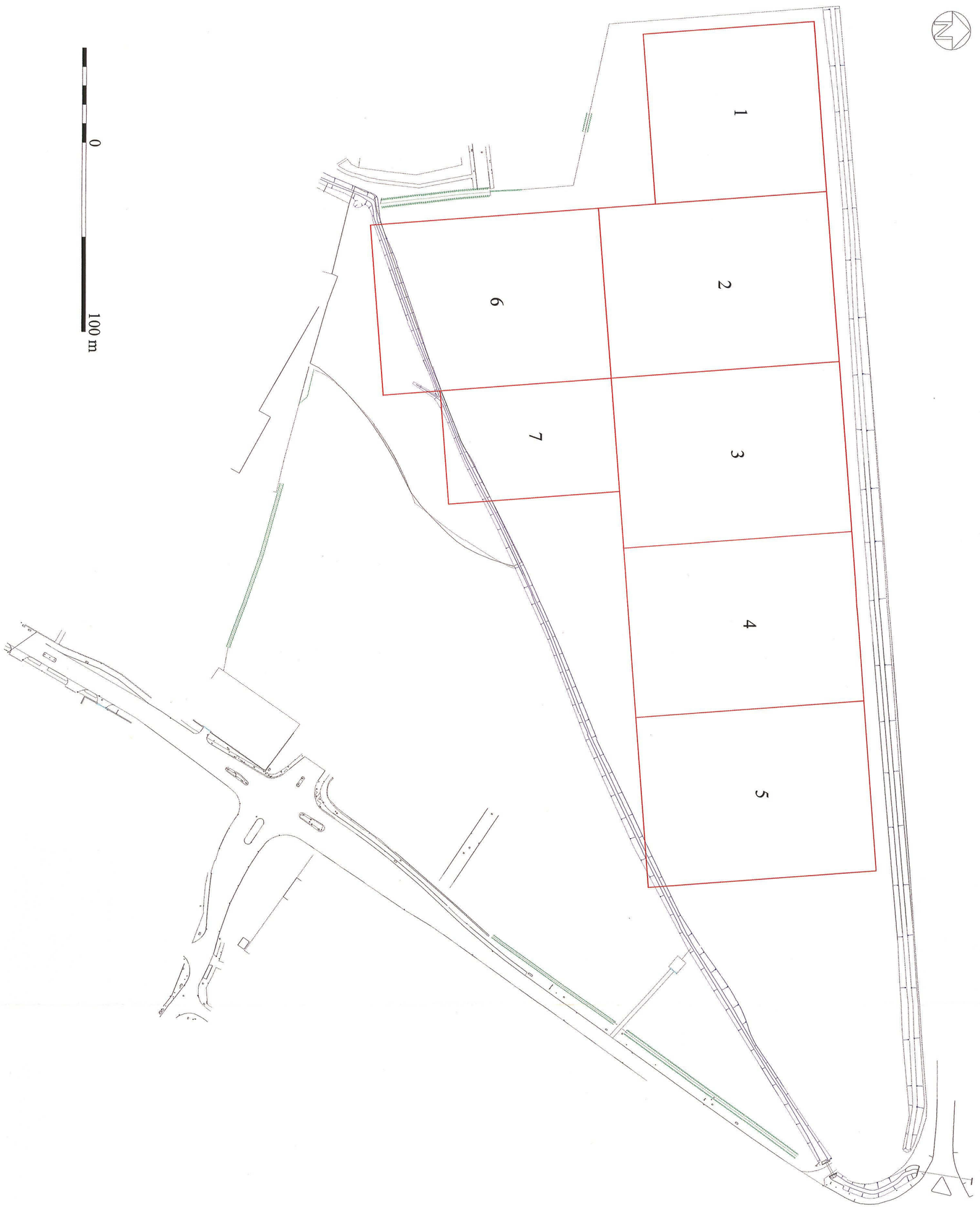


Figure 3: Nettleham Road, Lincoln
Location of the Survey Blocks
Scale 1:2000

Based on a Survey by
Surveyline UK

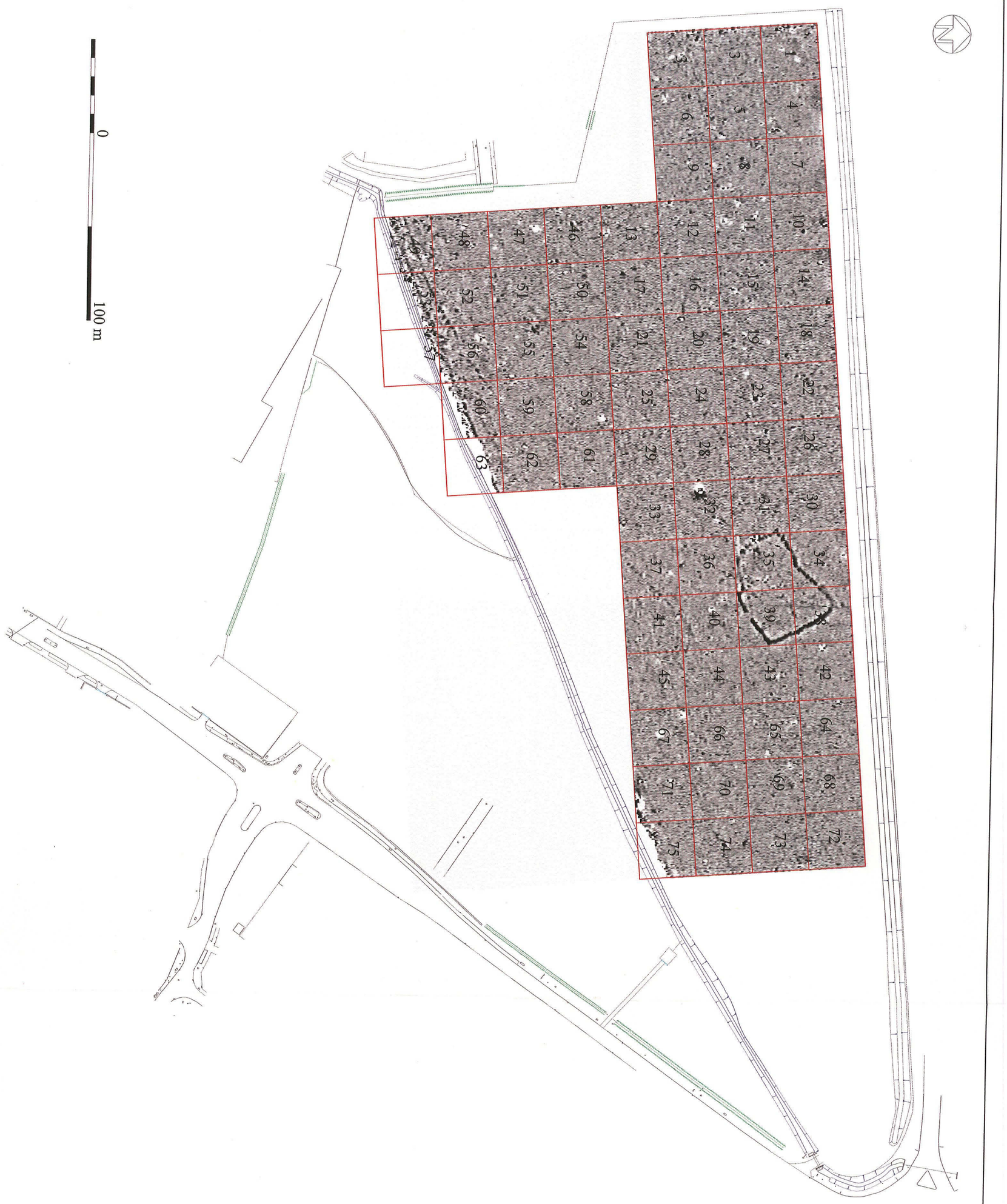
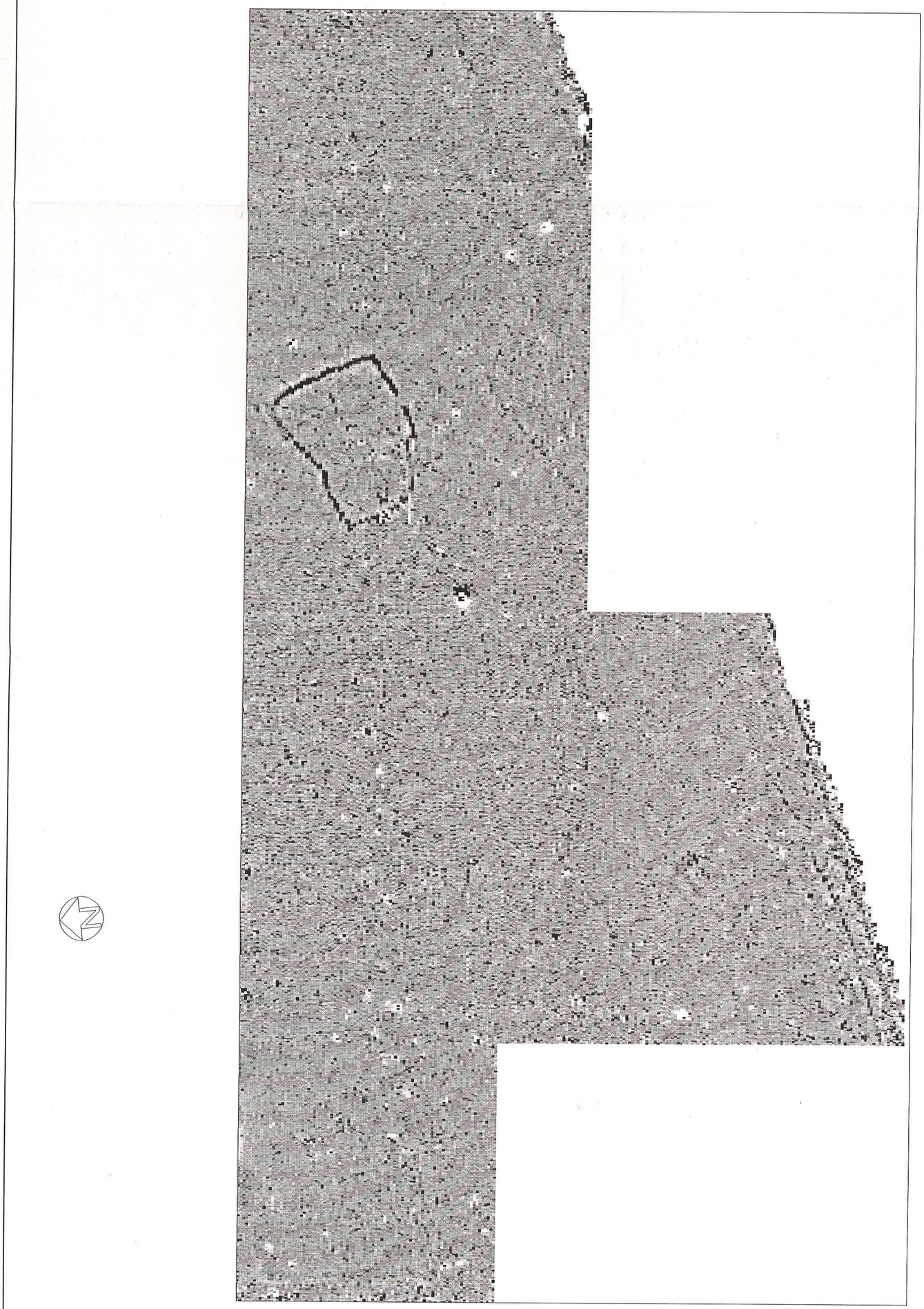


Figure 2: Nettleham Road, Lincoln
Location of the Survey
Scale 1:2000

Based on a Survey by
Surveyline UK

Figure 4: Nettleham Road, Lincoln
Grey Scale Plot of Complete Survey

Scale 1:1500



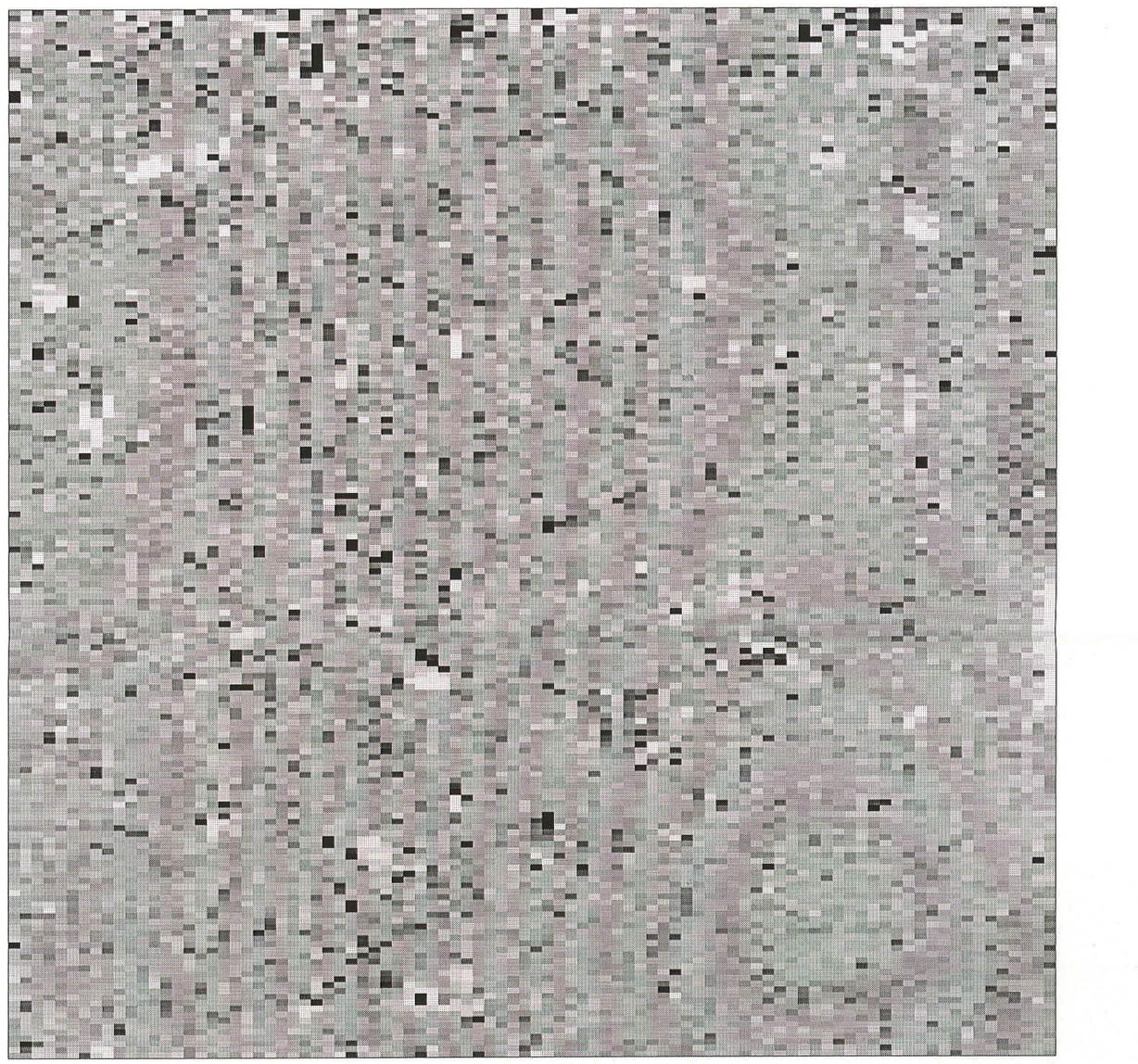


Figure 5: Nettleham Road, Lincoln
Grey Scale Plot of Block 1

Scale 1:500

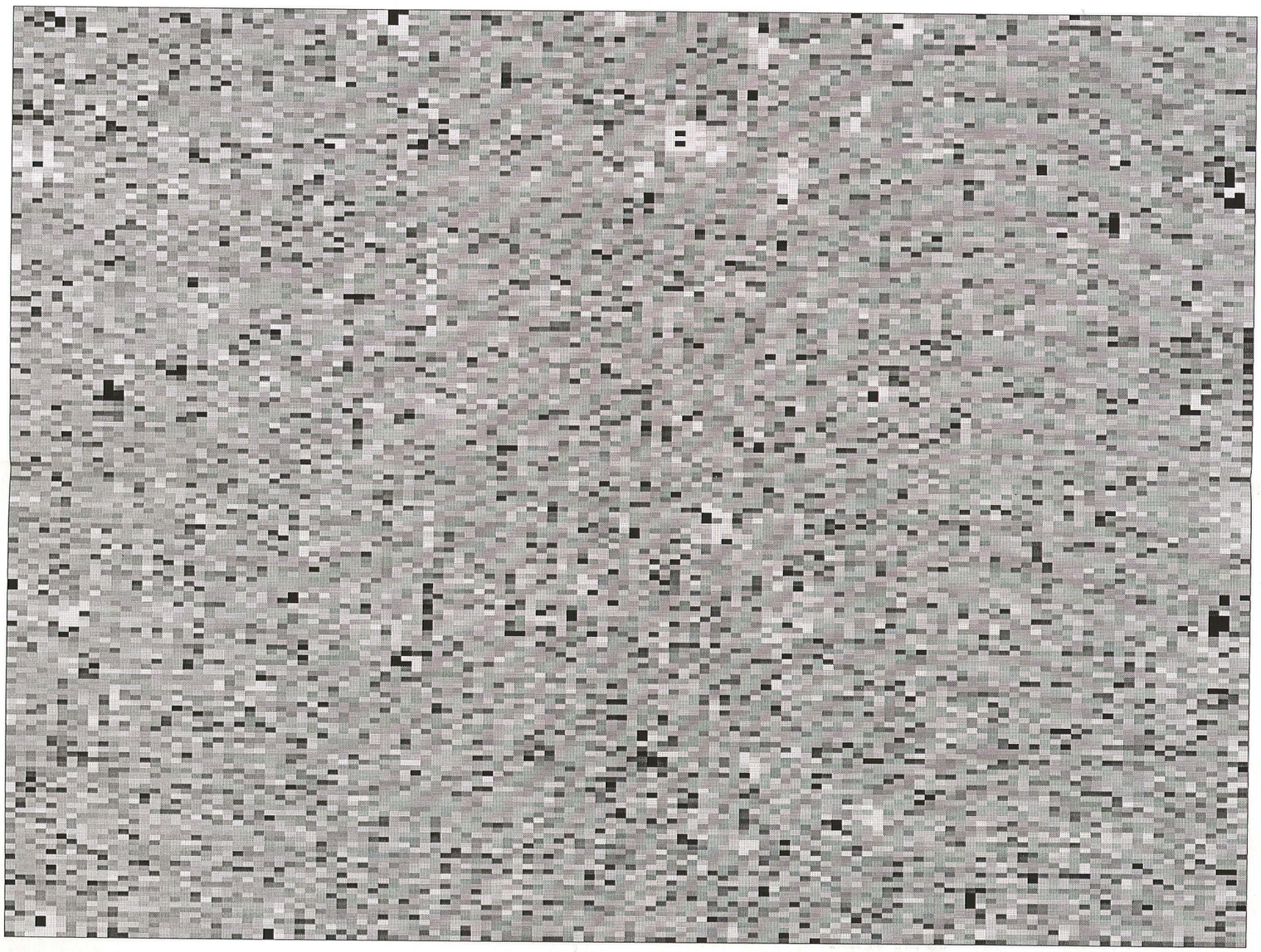


Figure 6: Nettleham Road, Lincoln
Grey Scale Plot of Block 2

Scale 1:500

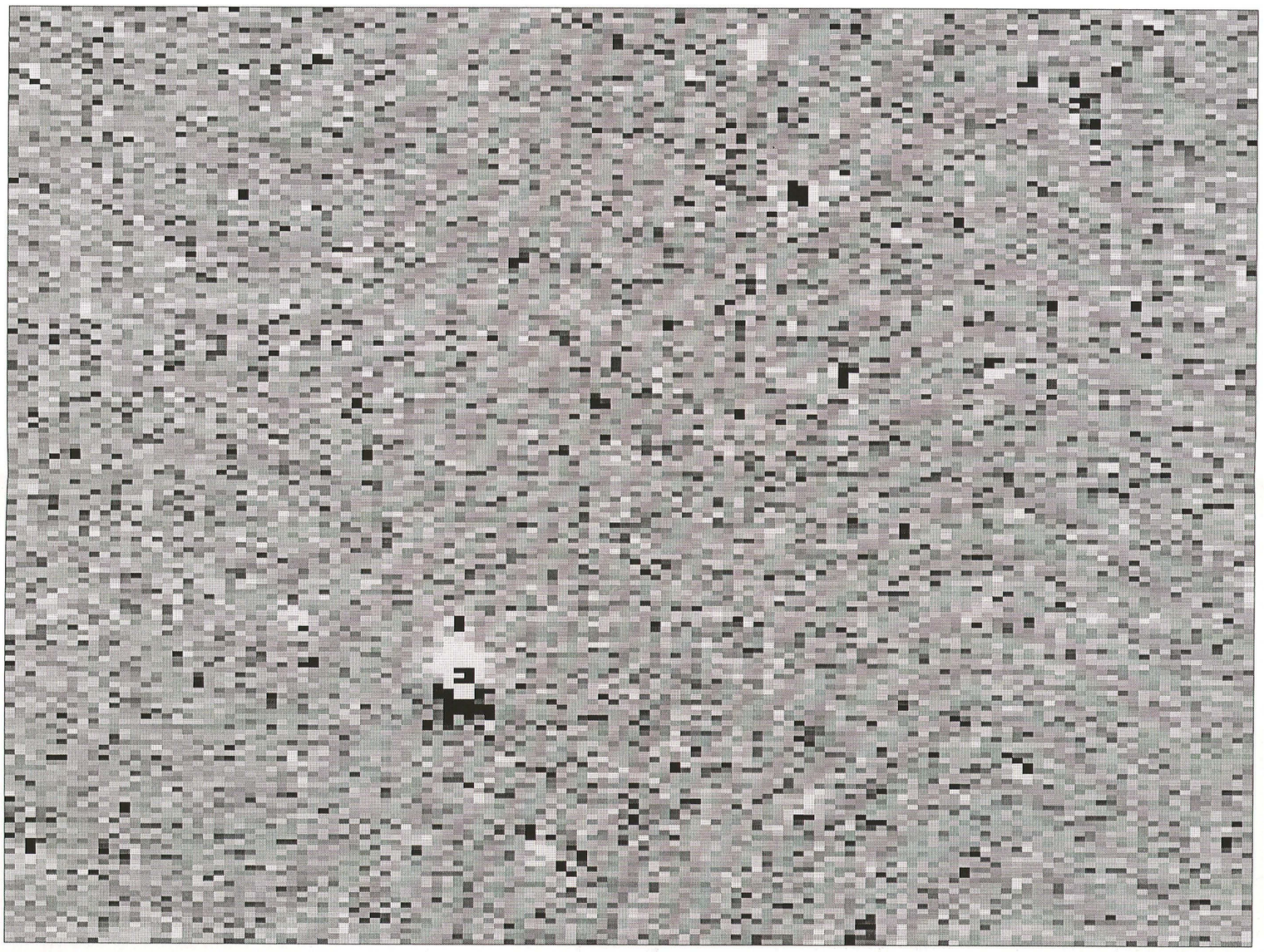


Figure 7: Nettleham Road, Lincoln
Grey Scale Plot of Block 3

Scale 1:500

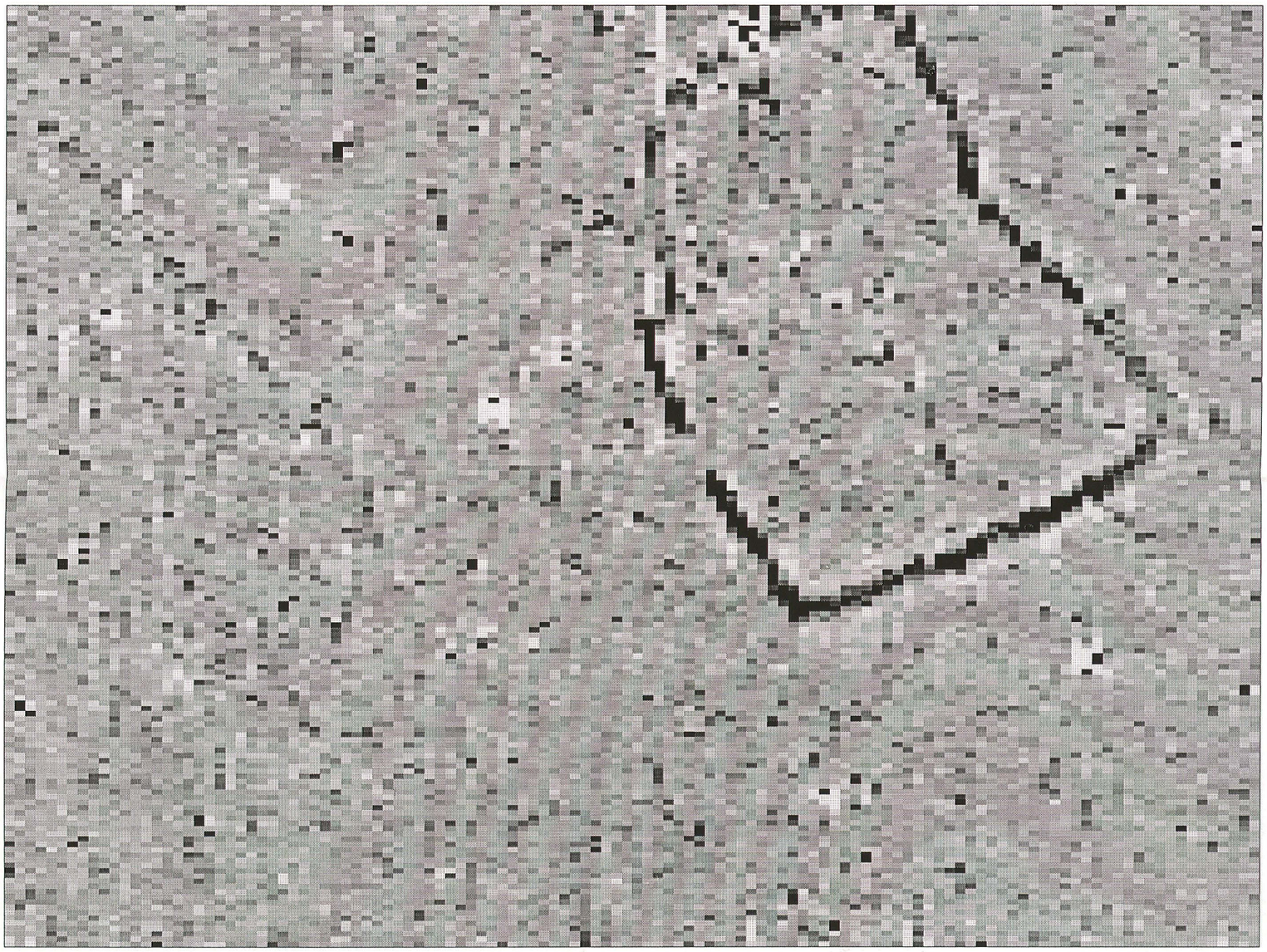


Figure 8: Nettleham Road, Lincoln
Grey Scale Plot of Block 4

Scale 1:500

Figure 9: Nettleham Road, Lincoln
Grey Scale Plot of Block 5

Scale 1:500

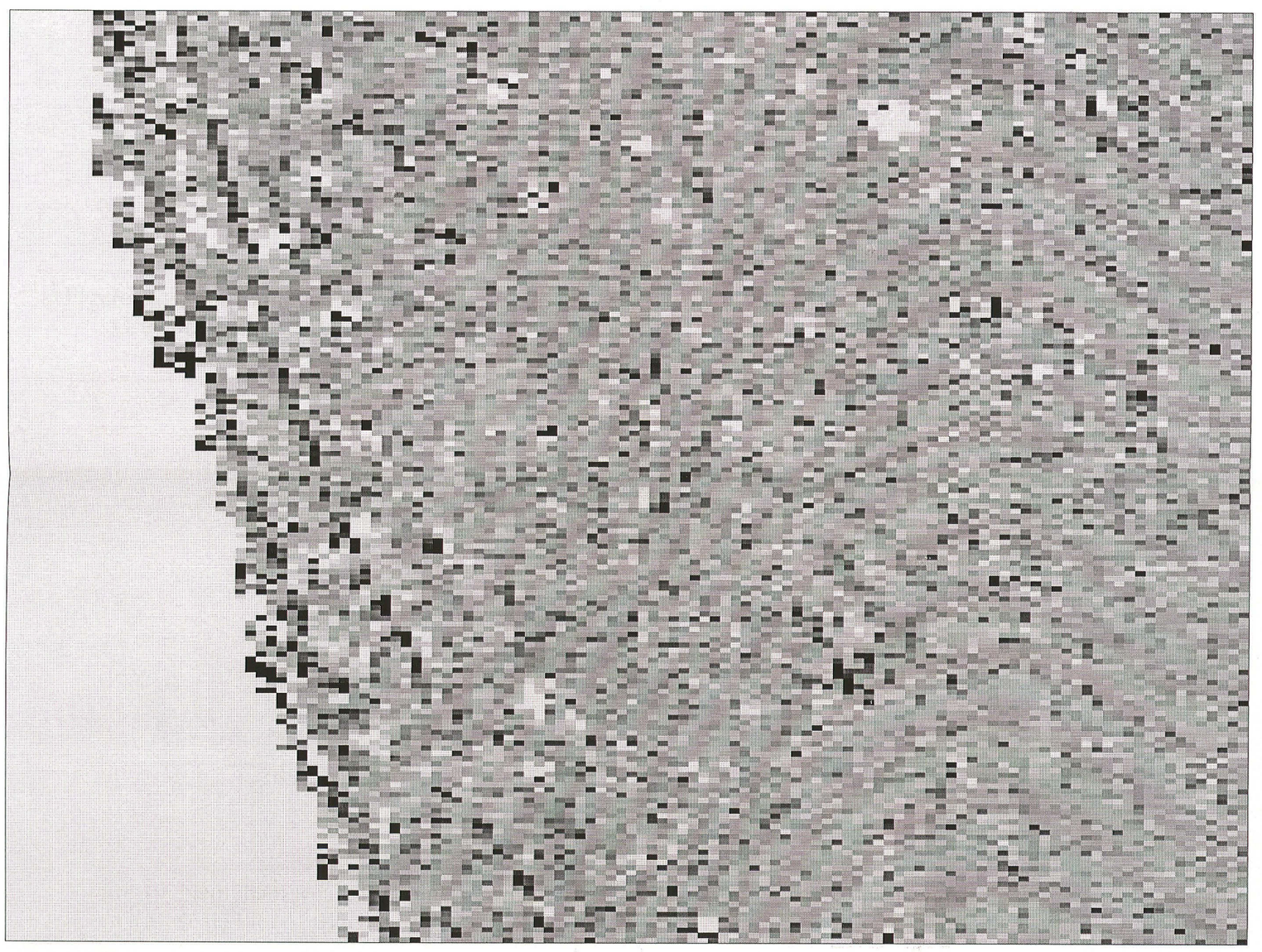


Figure 10: Nettleham Road, Lincoln
Grey Scale Plot of Block 6

Scale 1:500

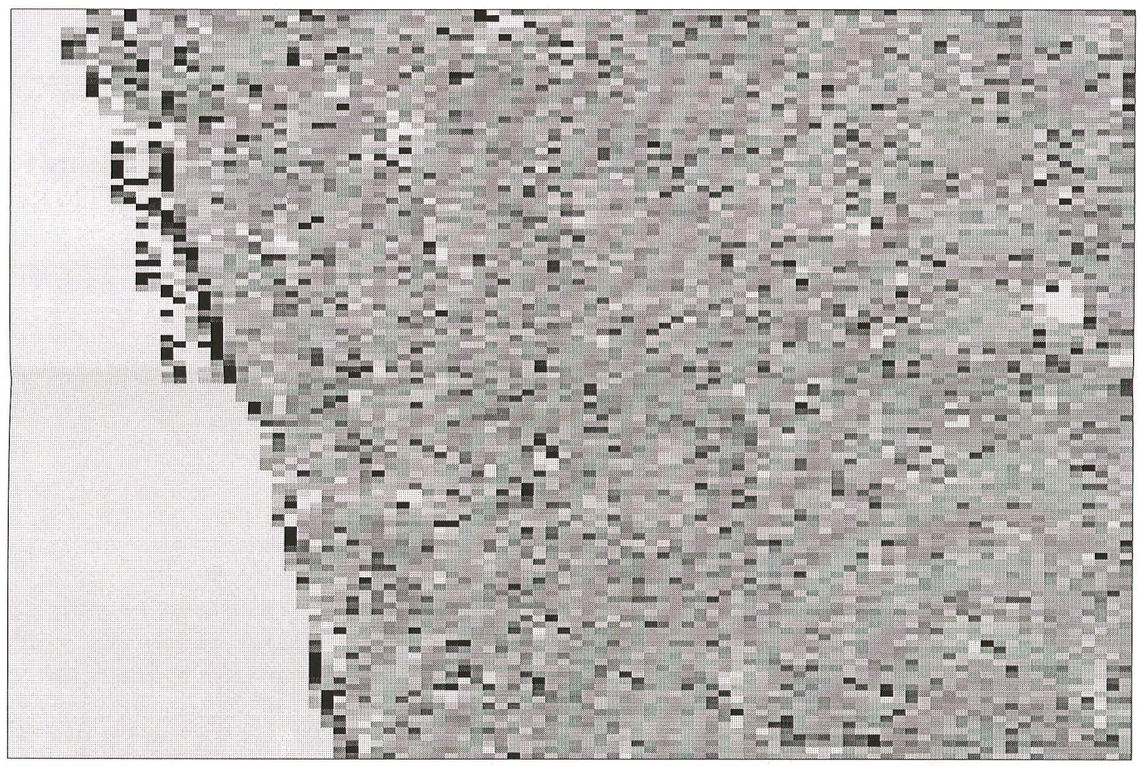


Figure 11: Nettleham Road, Lincoln
Grey Scale Plot of Block 7

Scale 1:500

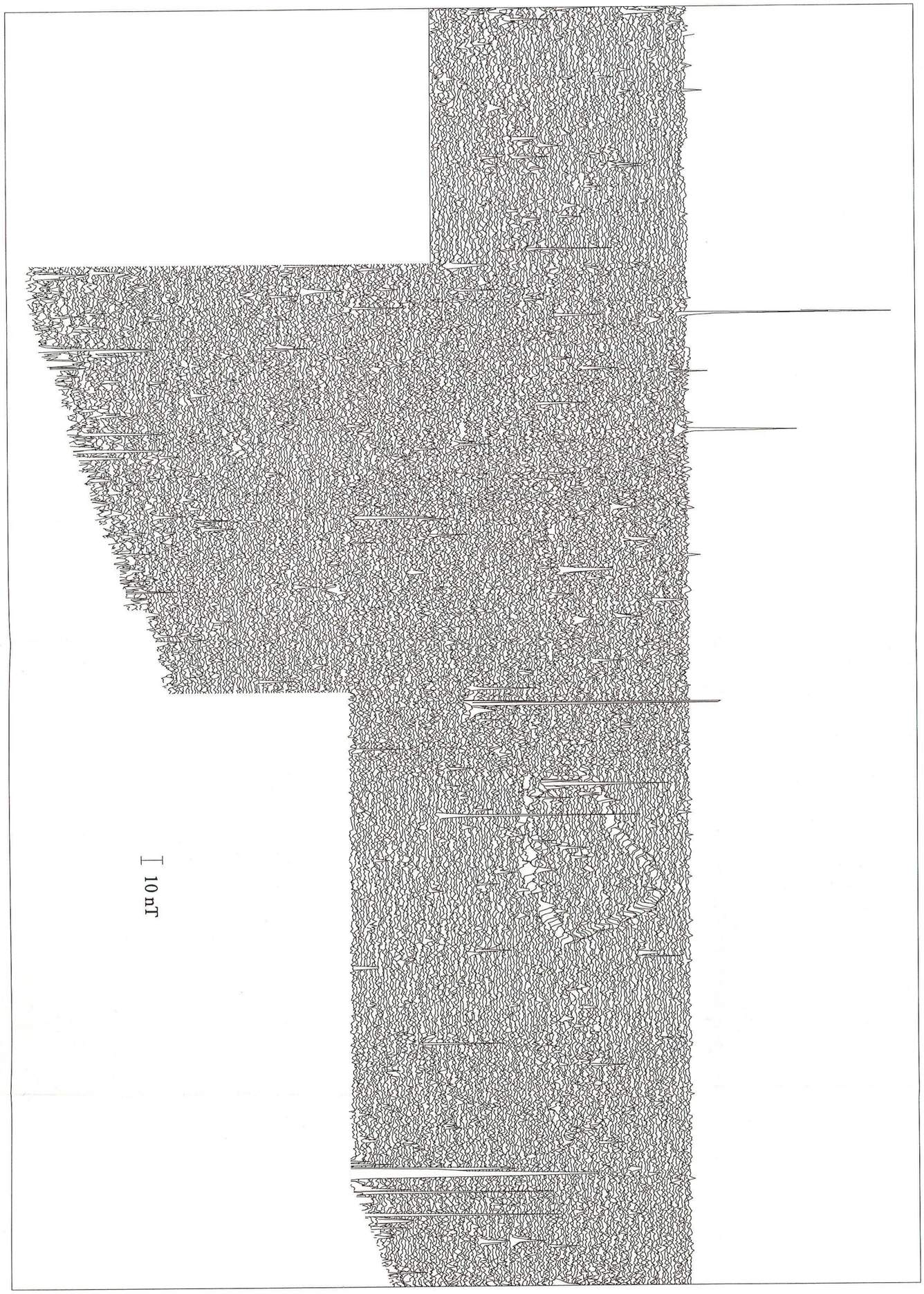


Figure 12: Nettleham Road, Lincoln
X - Y Plot of Complete Survey

Scale 1:1500

10 nT

Figure 13: Nettleham Road, Lincoln
X-Y Plot of Block 1

Scale 1:50

10 nT

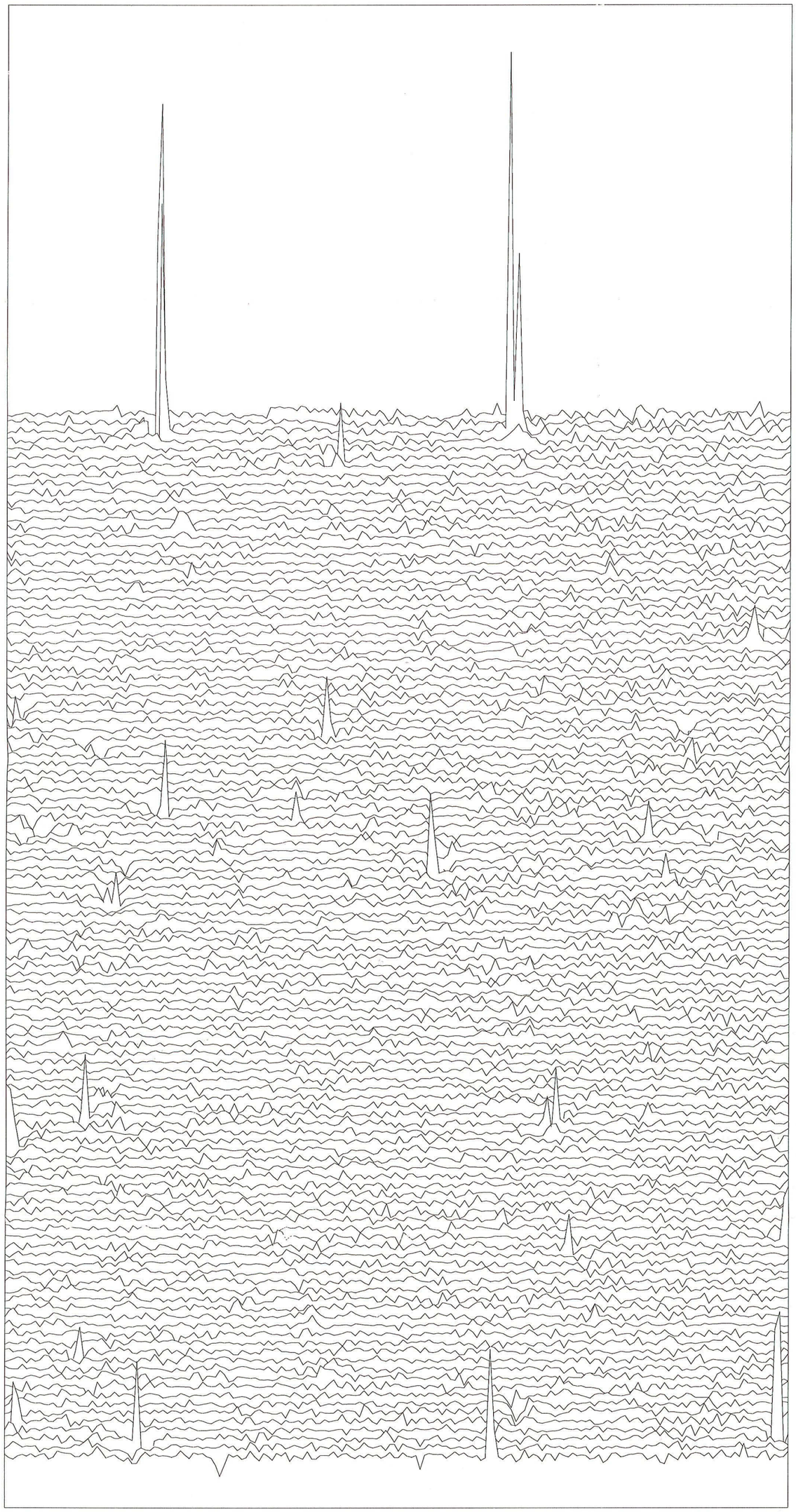


Figure 14: Nettleham Road, Lincoln
X-Y Plot of Block 2

Scale 1:50

10 nT

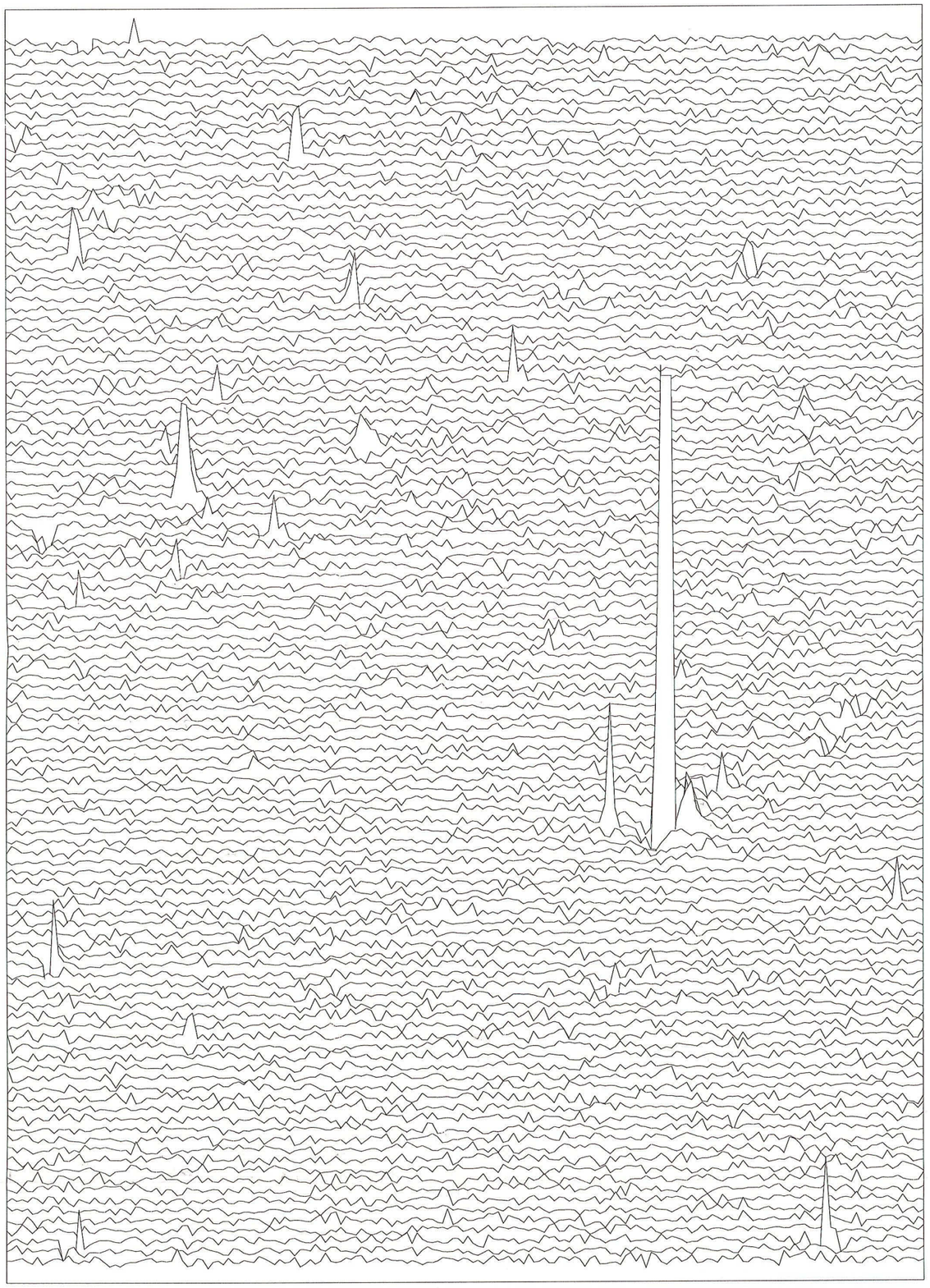


Figure 15: Nettleham Road, Lincoln
X-Y Plot of Block 3

Scale 1:50

10 nT

Figure 16: Nettleham Road, Lincoln
X-Y Plot of Block 4

Scale 1:50

10 nT

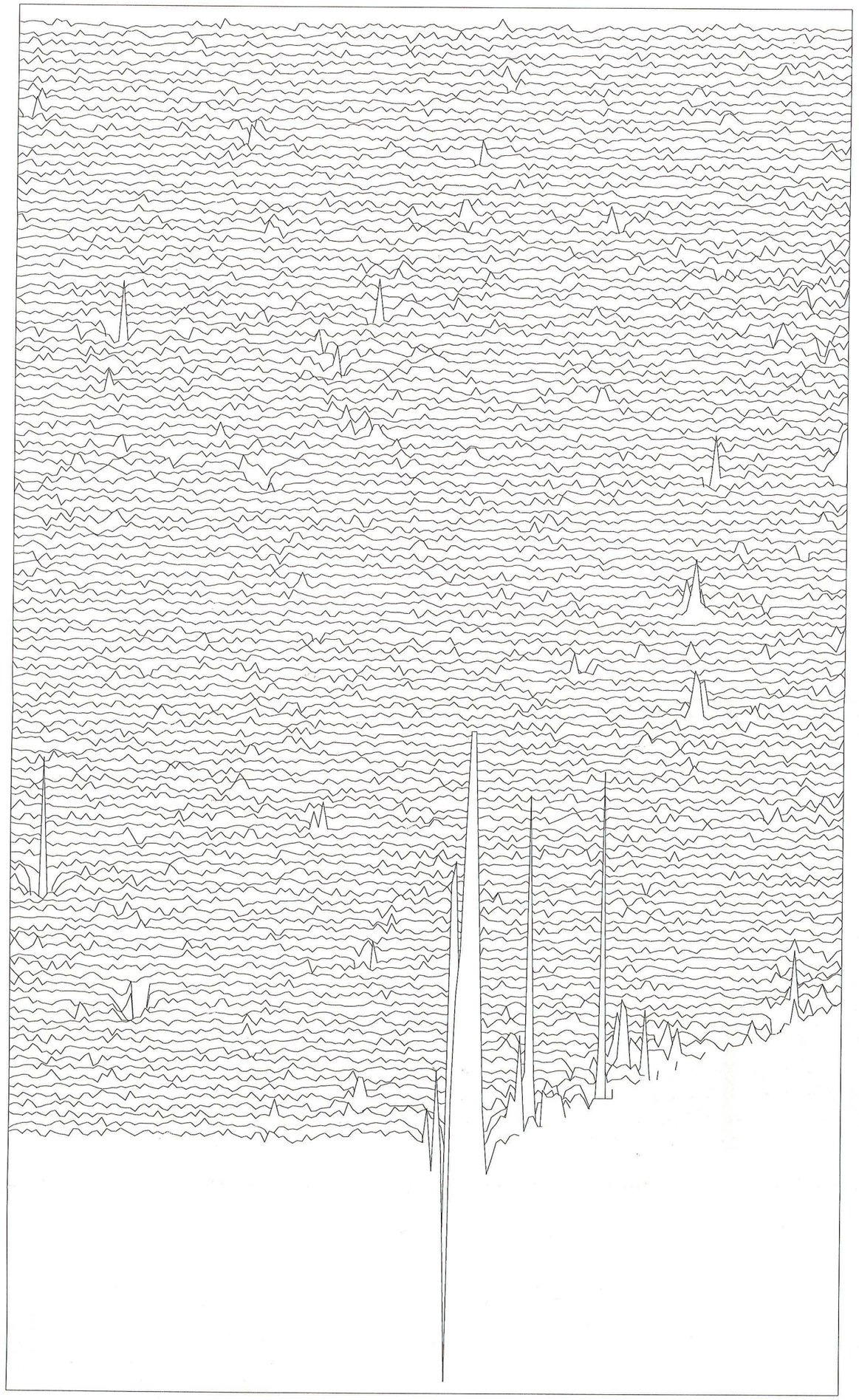


Figure 17: Nettleham Road, Lincoln
X-Y Plot of Block 5

Scale 1:50

10 nT

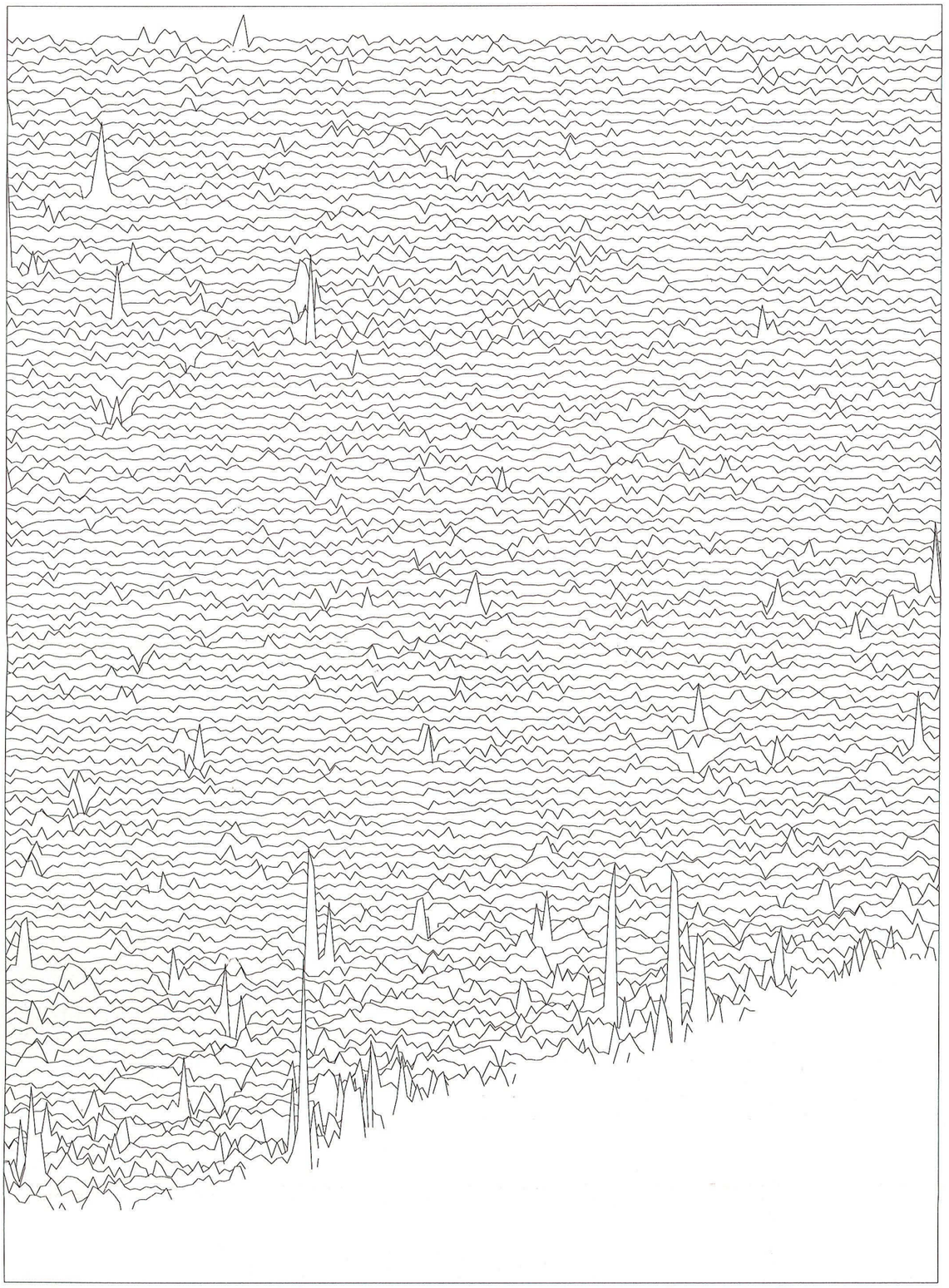


Figure 18: Nettleham Road, Lincoln
X-Y Plot of Block 6

Scale 1:50

10 nT

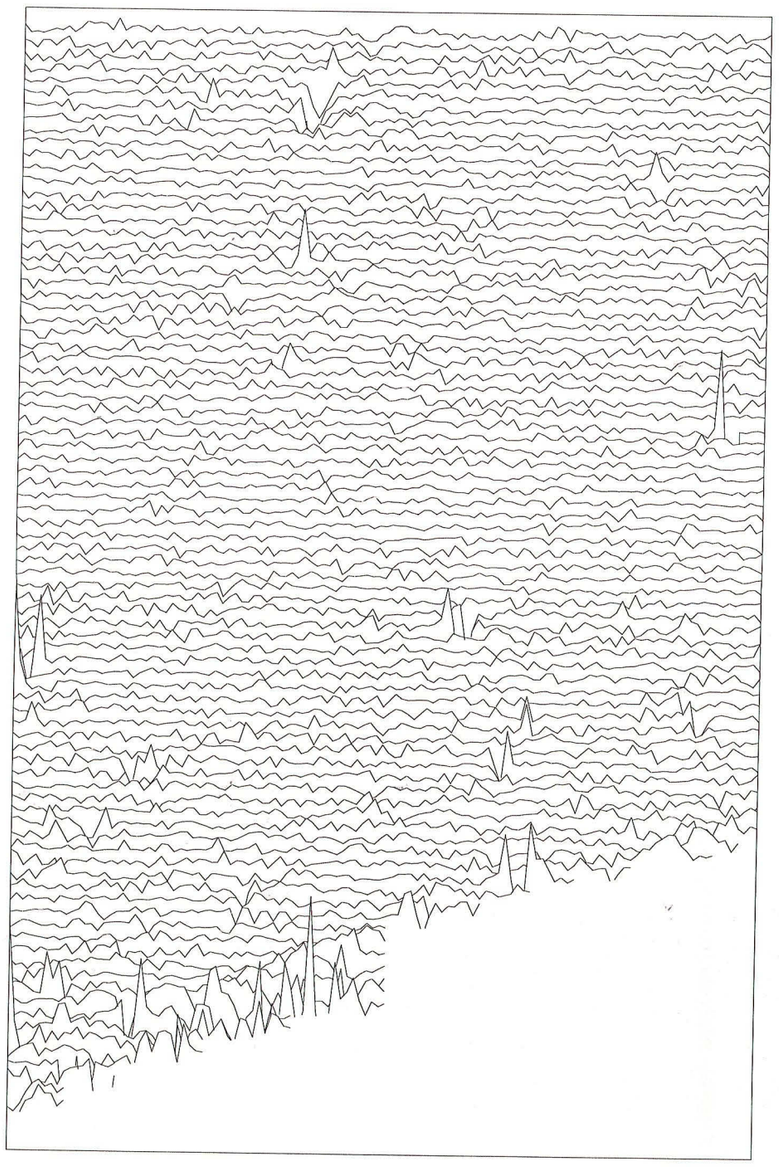
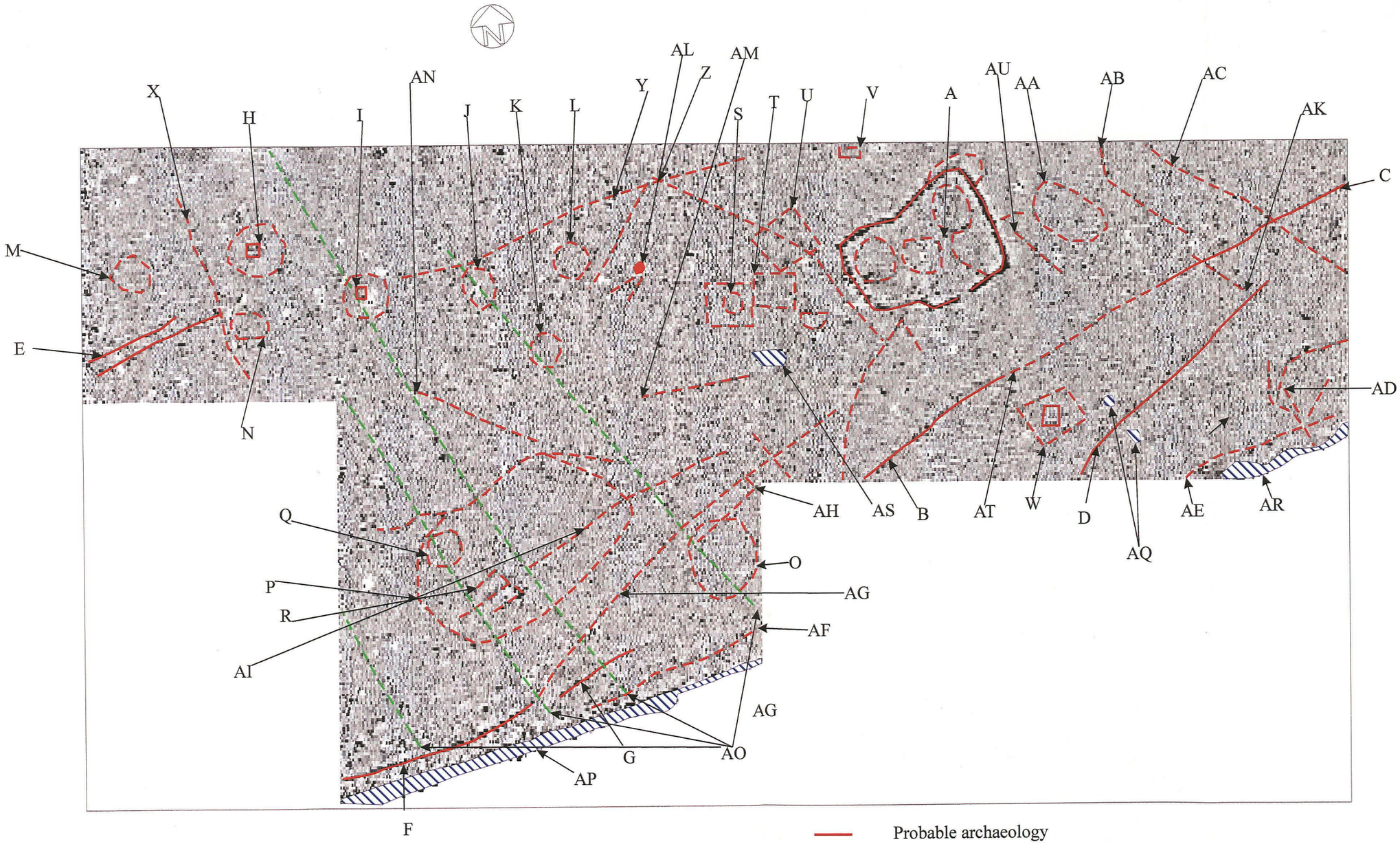


Figure 19: Nettleham Road, Lincoln
X-Y Plot of Block 7

Scale 1:50



Probable archaeology

Possible archaeology

Possible discrete anomaly of archaeological origins

Linear anomaly of possible agricultural origins

Ferromagnetic response

Scale 1:1500

Figure 20: Nettleham Road, Lincoln
Interpretation

Figure 21: Nettleham Road, Lincoln
Summary
Scale 1:2000

Based on a Survey by
Surveyline UK