RPS Planning, Transport and Environment

INDEX DATA	RPS INFORMATION
Scheme Title Wyre Piddle Bypass.	Details Geophys surv.
Road Number	Date
Contractor H+W CC.	
County H+Worcester.	
OS Reference SO 94.	
Single sided ✓ Double sided A3 19 Colour 0	

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GEOPHYSICAL SURVEY REPORT 97/06

WYRE PIDDLE BYPASS

Client:

Hereford and Worcester County Council

NGR SO94

SITE SUMMARY SHEET

97 / 06 Wyre Piddle Bypass, Hereford & Worcester

NGR: SO 968 479 (centre)

Location, topography and geology

The proposed course of the Wyre Piddle Bypass extends northeast from the present B4084 road opposite Furzen Farm. It runs eastward, crossing George lane to the north of Wyre Piddle and rejoins the B4084 at Upper Moor. The work was carried out over a number of arable fields in various states of cultivation. There is a range of soil types prevailing within the road corridor; from east to west these are: typical brown earths; typical calcareous pelosols and stagnogleyic argillic brown earths. The pelosols are formed over Jurassic or Cretaceous clay; the remaining two groups are formed over a parent of river terrace or glaciofluvial terrace drift (SSEW, 1983).

Archaeology

Recent evaluation excavations by **Hereford & Worcester County Council (HWCC)** have identified archaeological remains at two locations along the proposed bypass. One group of features was located to the north of Furzen Farm, at the western extreme of the road corridor. A second and more complex set of archaeological features was recorded 500m to the east of George Lane. In addition, a number of cropmarks have been identified on aerial photographs at Upper Moor, at the western end of the proposed road.

Aims of Survey

A geophysical survey was undertaken as part of an archaeological evaluation being carried out by **HWCC** in advance of a proposed bypass. The work was undertaken using gradiometers in both scanning and detailed survey modes. The aim of the survey was to locate any anomalies of possible archaeological interest. In particular it was hoped that the survey might determine the pattern and extent of the archaeological remains identified by **HWCC** to the east of George Lane.

Summary of Results *

An initial scan with gradiometers was undertaken over the entire length of the proposed road corridor. Responses from ferrous debris was encountered in several places, but few anomalies of potential archaeological interest were identified. Two significant responses were observed, adjacent to the area investigated by **HWCC** trial trenches, to the east of George Lane.

Detailed recorded survey was concentrated in those areas where archaeological features had been recorded by **HWCC** and over the cropmark site at Upper Moor. The gradiometer survey detected a complex of ditch type responses in Area D, to the east of George Lane. The magnitude of the responses recorded in Area D were not of sufficient strength to be detected during the scan. Survey in Area C, over the two scanned anomalies, may have identified two ring ditches. Elsewhere, survey recorded a few magnetically weak trends and isolated pit anomalies tentatively interpreted as archaeological.

*** It is essential that this summary is read in conjunction with the detailed results of the survey.**

SURVEY RESULTS

97 / 06 Wyre Piddle Bypass, Hereford & Worcester

1. Survey Area

1.1 The entire length of the road corridor was investigated with gradiometers in scanning mode. The detailed gradiometer survey, totalling 4ha, was concentrated in six areas, A to F. Areas E and F are adjoining survey blocks but they have different alignments. For ease of display the data from Area D has been reproduced in two parts. However, the results will be discussed as a whole in Section 5. of the report. The location of the survey areas are shown in Figure 1 at a scale of 1:2500.

1.2 The survey grid was set out by **Geophysical Surveys of Bradford** and detailed tie-in information has been lodged with the client.

2. Display

2.1 The results are displayed as X-Y traces, dot density plots and greyscale images. These display formats are discussed in the *Technical Information* section at the end of the text. A list of the figures included in the report precedes the diagrams.

2.2 Figures 1B to 1D are summary greyscale plots produced at a scale of 1:1250. Figures 2 to 13, 16 and 17 are data plots and interpretation diagrams of the results produced at a scale of 1:500. Figures 14 and 15 are a summary data plot and a summary interpretation of the results from Area D at a scale of 1:1000.

2.3 Letters in parentheses in the text of the report refer to anomalies highlighted on the relevant interpretation diagram.

3. General Considerations - Complicating factors

3.1 In general, the ground conditions were suitable for survey; the fields being gently sloping or flat and free of obstructions. However, some had recently been ploughed at the time of the survey. These conditions made steady walking more difficult and contributed to the increased recorded background noise levels.

3.2 The levels of magnetic response will vary between the different soil groups, though all three should be suitable for gradiometer survey. The stagnogleyic argillic brown earths and the calcareous pelosols would tend to give a moderate response. The typical brown earths, as they comprise coarse loams and sands over gravels, may be more problematical. The response from the sands and gravels may interfere with those from any archaeology within the soil.

4. Results of Scan

4.1 The whole length of the road corridor was investigated with gradiometers in scanning mode. It was traversed at intervals of approximately 10 to 15m and the instruments display observed for magnetic variation. The locality of any significant variations was subjected to a more detailed scan to assess their archaeological potential. Anomalies of interest were then marked with a cane for detailed recorded survey.

4.2 In general, the gradiometer scan found the road corridor to be magnetically quiet. A scatter of small scale ferrous anomalies was identified, as well as field drains and pipes. Two pit type responses were detected in the eastern part of the field to the east of George Lane. No other anomalies of archaeological potential were identified.

5. Results of Detailed Gradiometer Survey (Figures 2 to 17)

Area A

5.1 The dominant responses detected in Area A are those produced by two pipes or drains in the eastern corner of the survey area. A large area of disturbance in the southeastern corner is due to an electricity pole and a bracing wire.

5.2 Several other weaker linear trends are indicated on the interpretation diagram. Two of these responses are thought to be due to disturbance caused by backfilled excavation trenches. The excavations revealed features at each end of the survey area, including cremations at the eastern end. However, two very weak anomalies at the western end of the survey block have been interpreted as archaeological.

Area B

5.3 As with Area A, the strongest response is that produced by a pipe running almost the entire length of the survey area.

5.4 A number of anomalies have been interpreted as archaeological and, of these, the short linear anomaly (A) appears to be the more promising. A number of magnetically strong, pit type responses were recorded. It is likely that ferrous objects in the ploughsoil have produced these anomalies. Cremation burials have been recorded nearby in Area A. Such features are not often located by gradiometer survey because cremations tend to be small and produce low magnetic responses. However, an archaeological interpretation for the strong pit anomalies cannot be dismissed.

Area C

5.5 Area C occupied a field that had been freshly ploughed at the time of survey. As a consequence the poor walking conditions have increased recorded background noise levels.

5.6 A cluster of archaeological type responses were recorded in the eastern half of the survey area. Although, the pattern is not absolutely clear the results give the impression of one or possibly two ring ditches (B). These are flanked by linear responses that may represent parts of an enclosure. These anomalies coincide with the two pit type responses recorded during the scan.

Area D

5.7 Excavations by **HWCC** in this area identified numerous ditch features in addition to a circular dwelling. The gradiometer survey confirms the complexity of the archaeology present in this area. The anomalies were not observed during the scan; they had relatively weak magnetic responses and the ploughed condition of the field made scanning difficult.

5.8 The anomalies (C) appear to form an irregular shaped enclosure with evidence of subdivisions or features associated with occupation activity. To the northeast of (C) is a dense cluster of linear responses, aligned approximately north-south (D).

5.9 Although a number of weak linear trends extend across the field, the strongest responses are situated along the northern edge of the survey area. The results suggest that these features occupy part of a settlement focus and that they contain higher levels of magnetically enhanced material. Their location in the corner of the field may have protected them from severe plough damage.

5.10 Several areas of increased magnetic activity are highlighted on the interpretation diagram. These anomalous regions may represent the presence of enhanced material from archaeological features that have been disturbed by ploughing.

5.11 A number of short linear responses in the same orientation as the ploughing and a similar response along the northwestern edge of the survey (E) are interpreted as anomalies produced by recent ploughing.

5.12 A strong ferrous response in the western extreme of the survey area is due to a pipe and/or material forming a modern trackway. Ferrous disturbance along the northern edge of the survey area is due to the adjacent field boundary

Area E

5.13 A series of weak linear trends was recorded in this area, aligned approximately north-south. The majority of these are responses due to surface effects from changes in cultivation and minor tracks. All of the responses are of a magnetic strength that would have made them undetectable during the scan.

5.14 Two linear trends (F) and (G) are considered to be responses from features that have produced cropmarks. Of these, anomaly (G) appears to be the most promising, while (F) may be a due to recent cultivation practices.

Area F

5.15 A single curvilinear anomaly of archaeological interest was recorded along the eastern edge of the survey area. However, it's position adjacent to the field edge suggests that it may be of recent agricultural origin.

6. Conclusions

6.1 The gradiometer scan along the length of the proposed road corridor detected responses from ferrous objects, but few anomalies of possible archaeological significance. Two responses were identified to the east of George Lane, adjacent to an area investigated by HWCC trial trenches.

6.2 Due to the lack of response observed during the scan, detailed gradiometer survey was concentrated in those areas where archaeological features had been located by HWCC and over a cropmark site at Upper Moor. The gradiometer survey detected a complex of ditch type responses in the evaluated area to the east of George Lane in Area D. The magnitude of the responses recorded in Area D were not of sufficient strength to have been observed during the scan. Survey immediately to the west in Area C, over two scanned anomalies, may have detected two ring ditches. Elsewhere, survey recorded a few magnetically weak trends and isolated pit anomalies tentatively interpreted as being archaeological.

Project Co-ordinator: D Shiel
Project Assistants: L Harvey, A Shields C Stephens and D Weston

Start of Survey: 15th January 1997
Date of Report: 14th February 1997

Reference

SSEW 1983. *Soils of England and Wales. Sheet 3, South East England.* Soil Survey of England and Wales.

TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GSB Prospection (GSB)** reports. It should be emphasised that whilst all of the display options are regularly used, the diagrams produced in the final reports are the most suitable to illustrate the data from each site. The choice of diagrams results from the experience and knowledge of the staff of **GSB.**

All survey reports are prepared and submitted on the basis that whilst they are based on a thorough survey of the site, no responsibility is accepted for any errors or omissions.

Magnetic readings are logged at 0.5m intervals along one axis in 1m traverses giving 800 readings per 20m x 20m grid, unless otherwise stated. Resistance readings are logged at 1m intervals giving 400 readings per 20m x 20m grid. The data are then transferred to portable computers and stored on 3.5" floppy discs.

Instrumentation

(a) Fluxgate Gradiometer - Geoscan FM36

This instrument comprises of two fluxgates mounted vertically apart, at a distance of 500mm. The gradiometer is carried by hand, with the bottom sensor approximately 100-300mm from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is conventionally measured in nanoTesla (nT) or gamma. The fluxgate gradiometer suppresses any diurnal or regional effects. Generally features up to one metre deep may be detected by this method.

(b) Resistance Meter - Geoscan RM4 or RM15

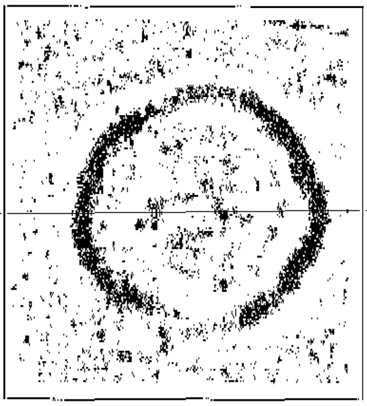
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The "Twin Probe" arrangement involves the paring of electrodes (one current and one potential) with one pair remaining in a fixed position, whilst the other measures the resistance variations across a fixed grid. The resistance is measured in Ohms and the calculated resistivity is in Ohm-metres. The resistance method as used for area survey has a depth resolution of approximately 0.75m, although the nature of the overburden and underlying geology will cause variations in this generality. The technique can be adapted to sample greater depths of earth and can therefore be used to produce vertical "pseudo sections".

(c) Magnetic Susceptibility

Variations in the magnetic susceptibility of subsoils and topsoils occur naturally, but greater enhanced susceptibility can also be a product of increased human/anthropogenic activity. This phenomenon of susceptibility enhancement can therefore be used to provide information about the "level of archaeological activity" associated with a site. It can also be used in a predictive manner to ascertain the suitability of a site for a magnetic survey. The instrument employed for measuring this phenomenon is either a field coil or a laboratory based susceptibility bridge. For the latter 50g soil samples are collected in the field.

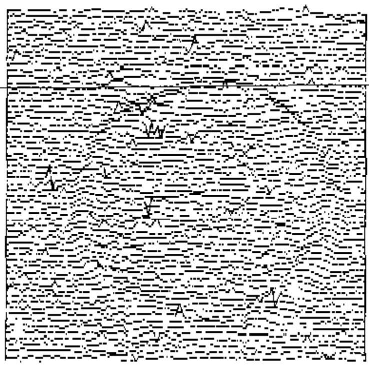
Display Options

The following is a description of the display options used. Unless specifically mentioned in the text, it may be assumed that no filtering or smoothing has been used to enhance the data. For any particular report a limited number of display modes may be used.



(a) Dot-Density

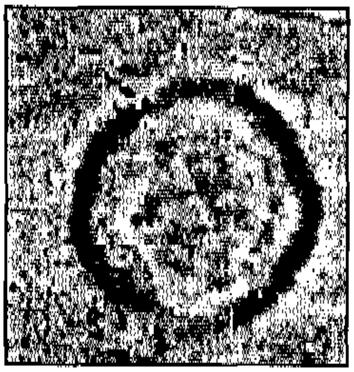
In this display, minimum and maximum cut-off levels are chosen. Any value that is below the minimum cut-off value will appear white, whilst any value above the maximum cut-off value will appear black. Any value that lies between these two cut-off levels will have a specified number of dots depending on the relative position between the two levels. The focus of the display may be changed using different levels and a contrast factor (C.F.). Usually the C.F. = 1, producing a linear scale between the cut-off levels. Assessing a lower than normal reading involves the use of an inverse plot. This plot simply reverses the minimum and maximum values, resulting in the lower values being presented by more dots. In either representation, each reading is allocated a unique area dependent on its position on the survey grid, within which numbers of dots are randomly placed. The main limitation of this display method is that multiple plots have to be produced in order to view the whole range of the data. It is also difficult to gauge the true strength of any anomaly without looking at the raw data values. This display is much favoured for producing plans of sites, where positioning of the anomalies and features is important.



(b) X-Y Plot

This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. Advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the indiviual anomalies. Results are produced on a flatbed plotter.

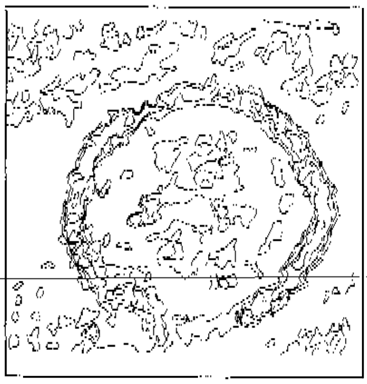
Display Options cont'd



(c) Grey-Scale

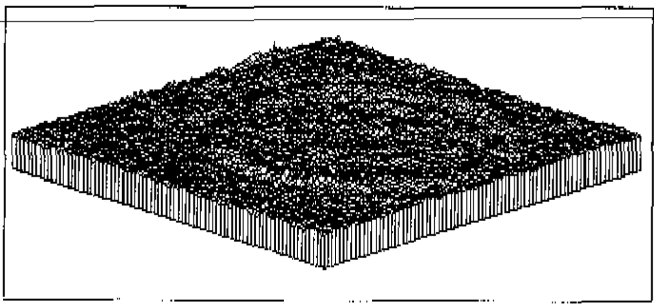
This format divides a given range of readings into a set number of classes. These classes have a predefined arrangement of dots or shade of grey, the intensity increasing with value. This gives an appearance of a toned or grey scale.

Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. While colour plots can look impressive and can be used to highlight certain anomalies, grey-scales tend to be more informative.



(d) Contour

This display format is commonly used in cartographic displays. Data points of equal value are joined by a contour line. Closely packed contours indicate a sharp gradient. The contours therefore highlight an anomalous region. The range of contours and contour interval are selected manually and the display is then generated on the computer screen or plotted directly on a flat bed plotter / inkjet printer.



(e) 3-D Mesh

This display joins the data values in both the X and Y axis. The display may be changed by altering the horizontal viewing angle and the angle above the plane. The output may be either colour or black and white. A hidden line option is occasionally used (see (b) above).

Glossary of terms commonly used in the graphical interpretation of gradiometer data

Ditch / Pit

This category is used only when other evidence is available that supports a clear archaeological interpretation e.g. cropmarks or excavation.

Archaeology

This term is used when the form, nature and pattern of the response is clearly archaeological but where no supporting evidence exists. These anomalies, whilst considered anthropogenic, could be of any age. If a more precise archaeological interpretation is possible then it will be indicated in the accompanying text.

? Archaeology

The interpretation of such anomalies is often tentative, with the anomalies exhibiting either weak signal strength or forming incomplete archaeological patterns. They may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.

Natural

These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions e.g. palaeochannels or magnetic gravels.

? Natural

These are anomalies that are likely to be natural in origin i.e geological or pedological.

Areas of Magnetic Disturbance

These responses are commonly found in places where modern ferrous or fired materials are present e.g. fencelines, pylons or brick rubble. They are presumed to be modern.

Areas of Increased Magnetic Response

These responses show no visual indications on the ground surface and are considered to have some archaeological potential.

Ferrous Response

This type of response is associated with ferrous material and may result from small items in the topsoil or larger buried objects such as pipes. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Glossary (continued)

Ridge and Furrow

These are regular and broad linear anomalies that are presumed to be the result of ancient cultivation. In some cases the response may be the result of modern activity.

Ploughing Trend

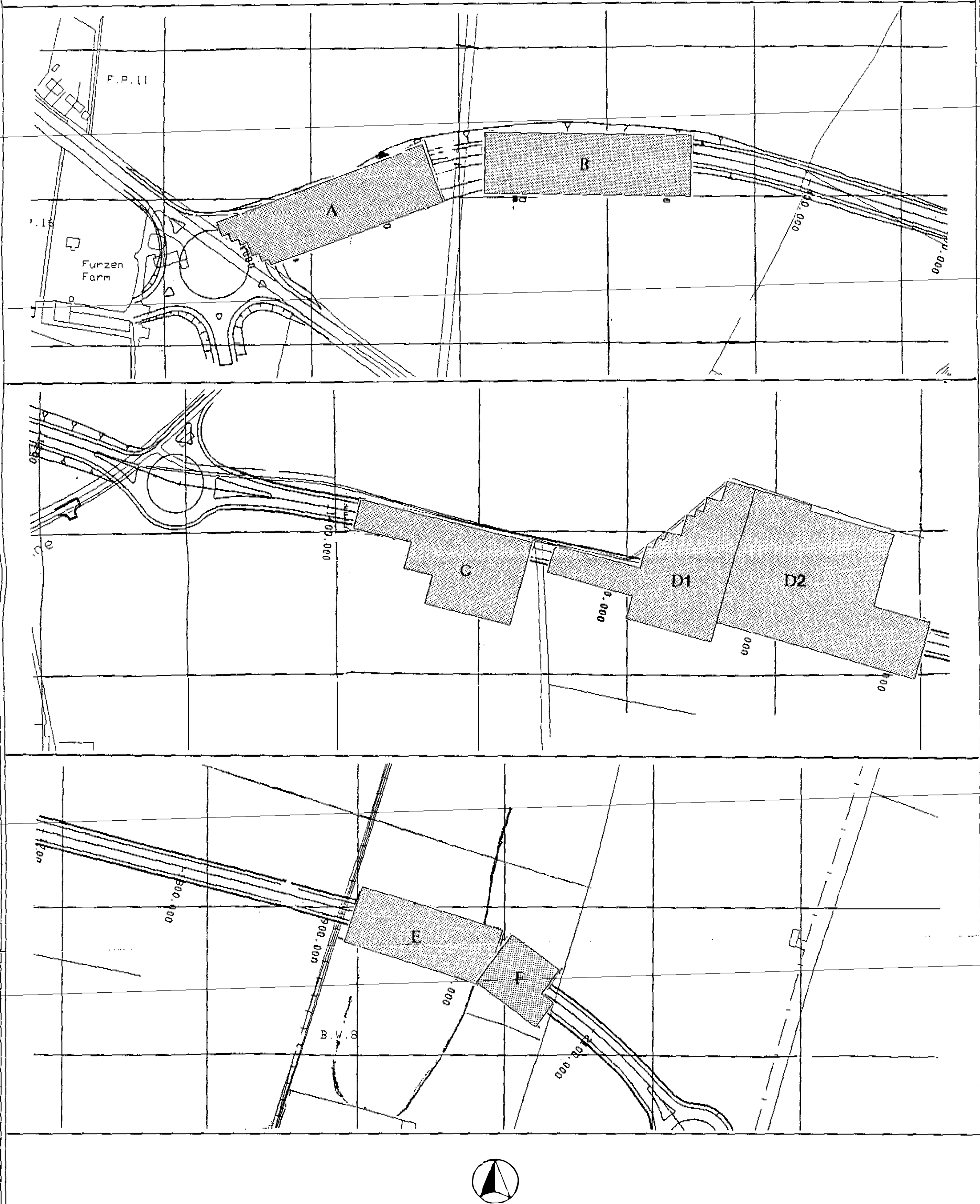
These are isolated or grouped linear responses. They are normally narrow and are presumed modern when aligned to current field boundaries or following present ploughing.

Linear Trend

This is usually a weak isolated linear anomaly of unknown cause or date.

List of Figures

WYRE PIDDLE BYPASS
Location of Survey Areas



1:2500

Figure 1A

WYRE PIDDLE BYPASS
Areas A and B

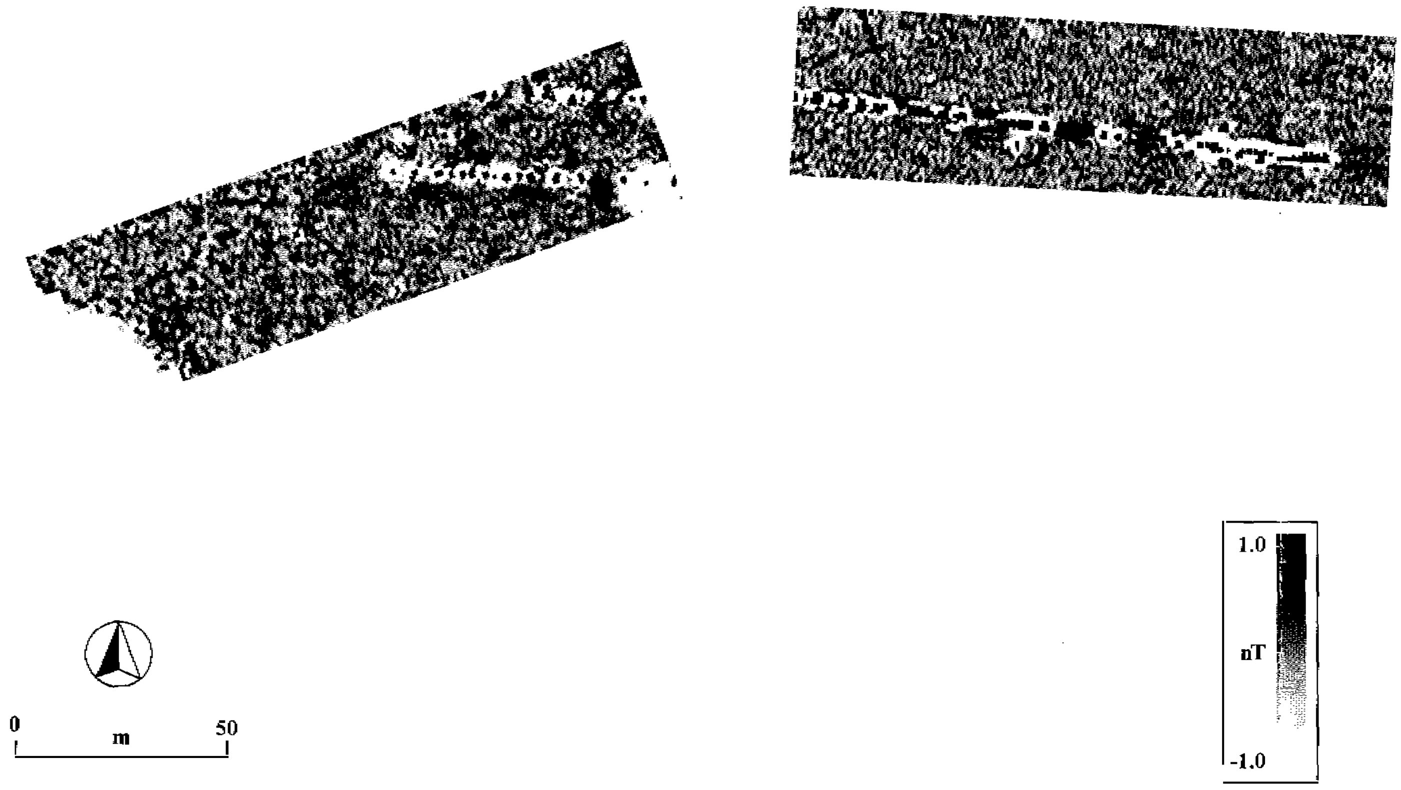


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Figure 1B

WYRE PIDDLE BYPASS
Areas C and D

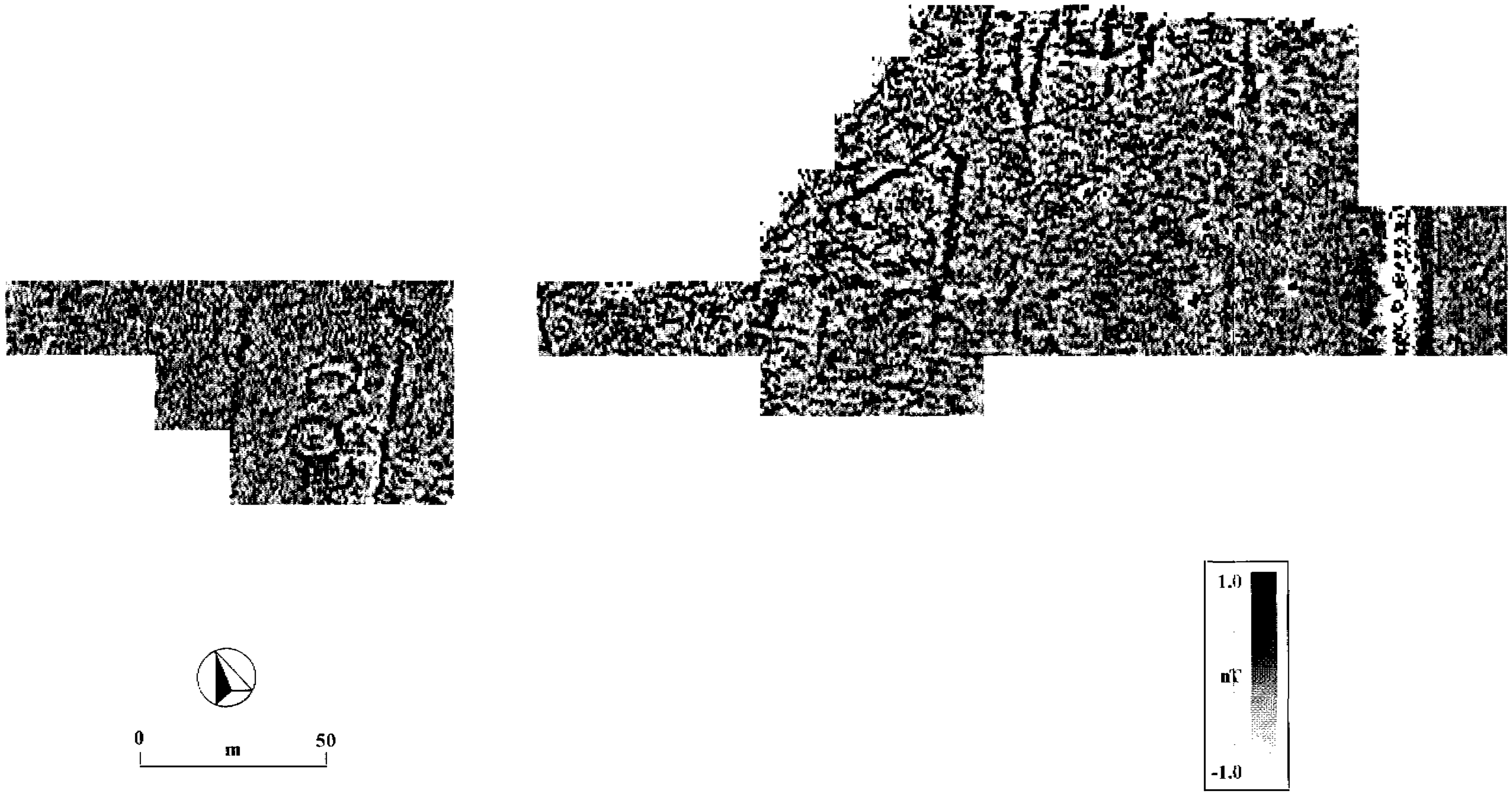

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Figure 1C

WYRE PIDDLE BYPASS
Areas E and F

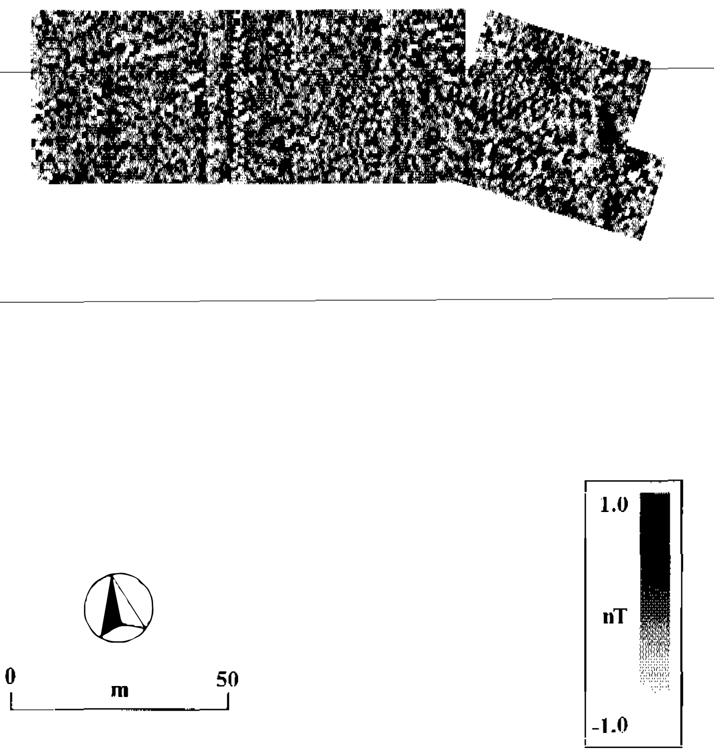


Figure 1D

WYRE PIDDLE BYPASS
Area A

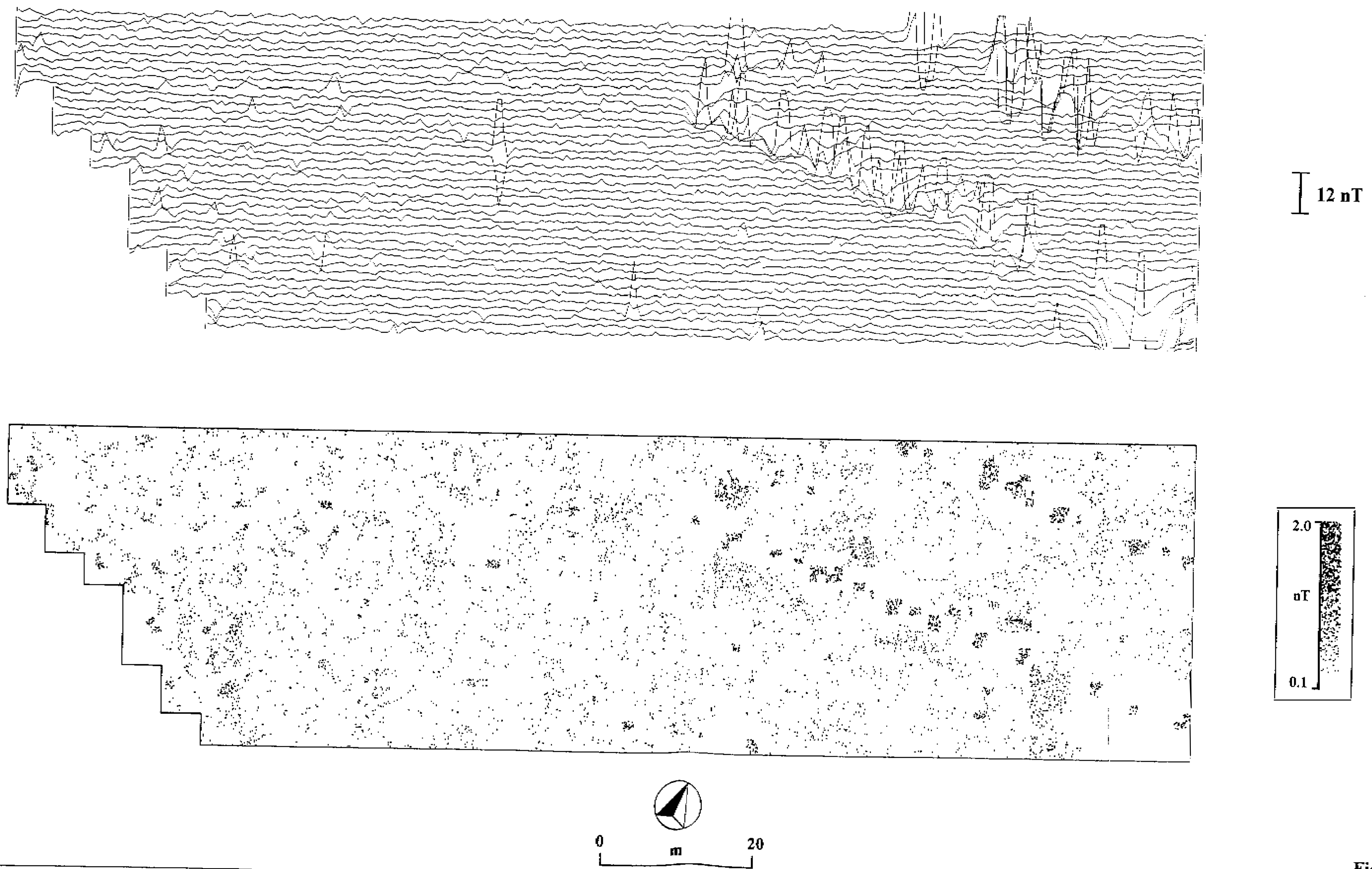


Figure 2

WYRE PIDDLE BYPASS
Area A

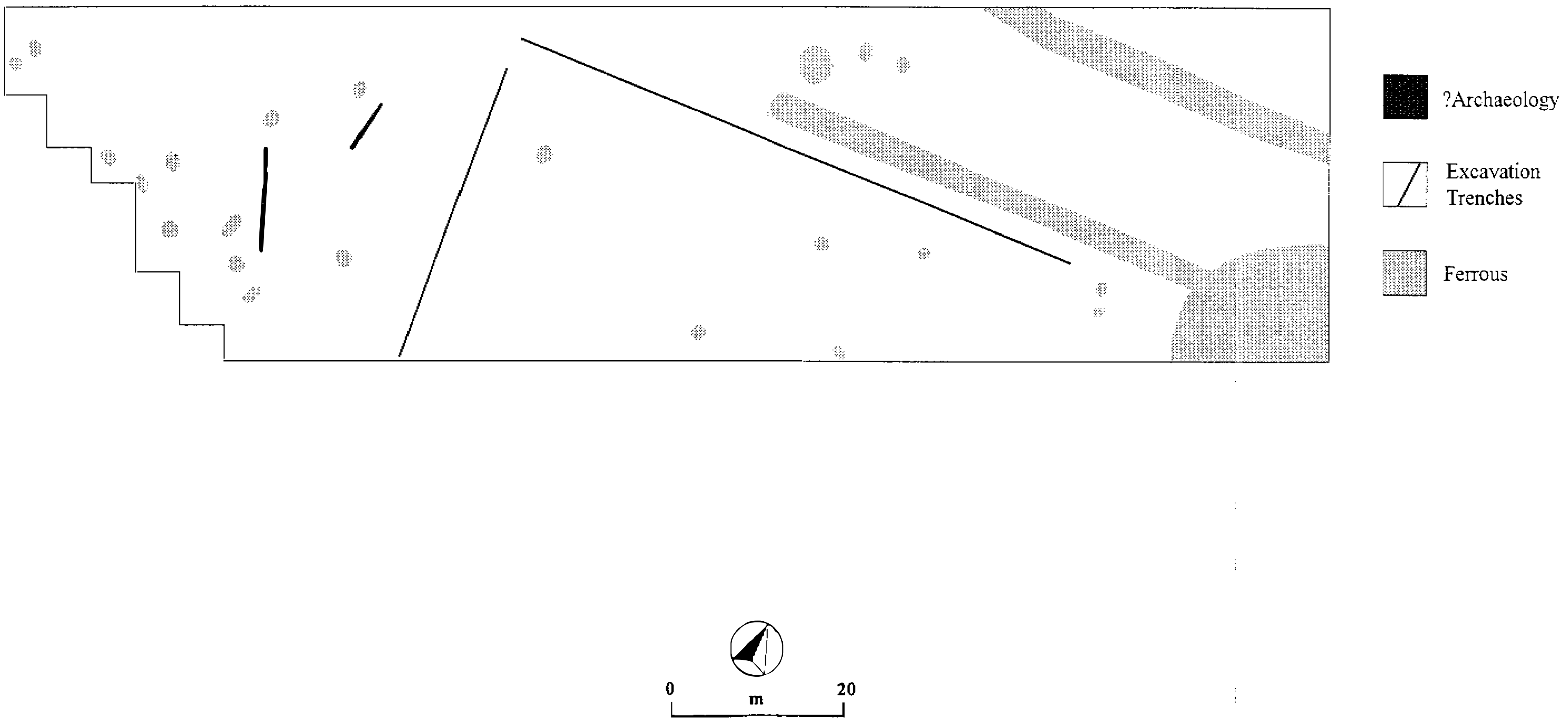


Figure 3

WYRE PIDDLE BYPASS
Area B

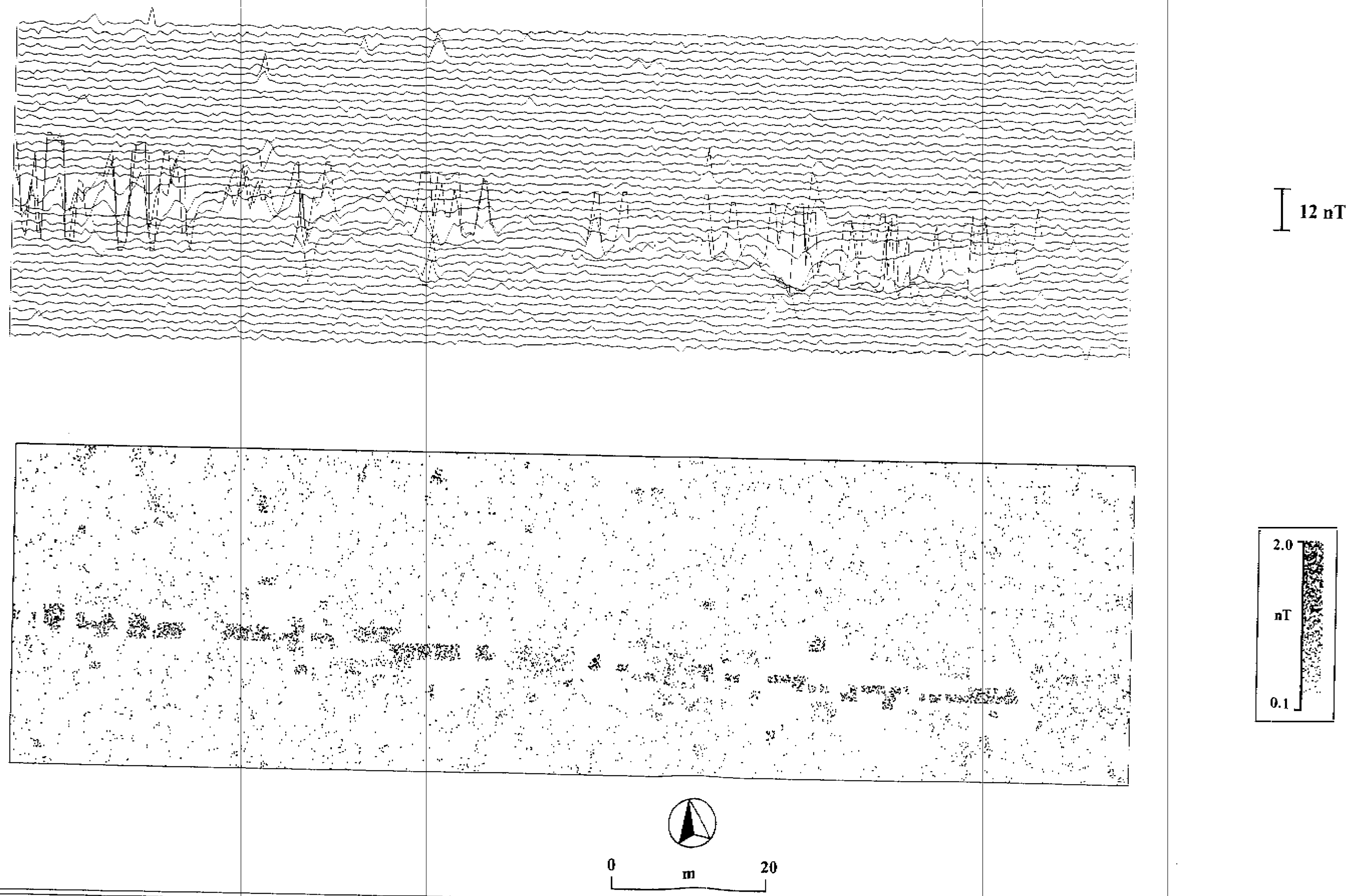


Figure 4

WYRE PIDDLE BYPASS
Area B

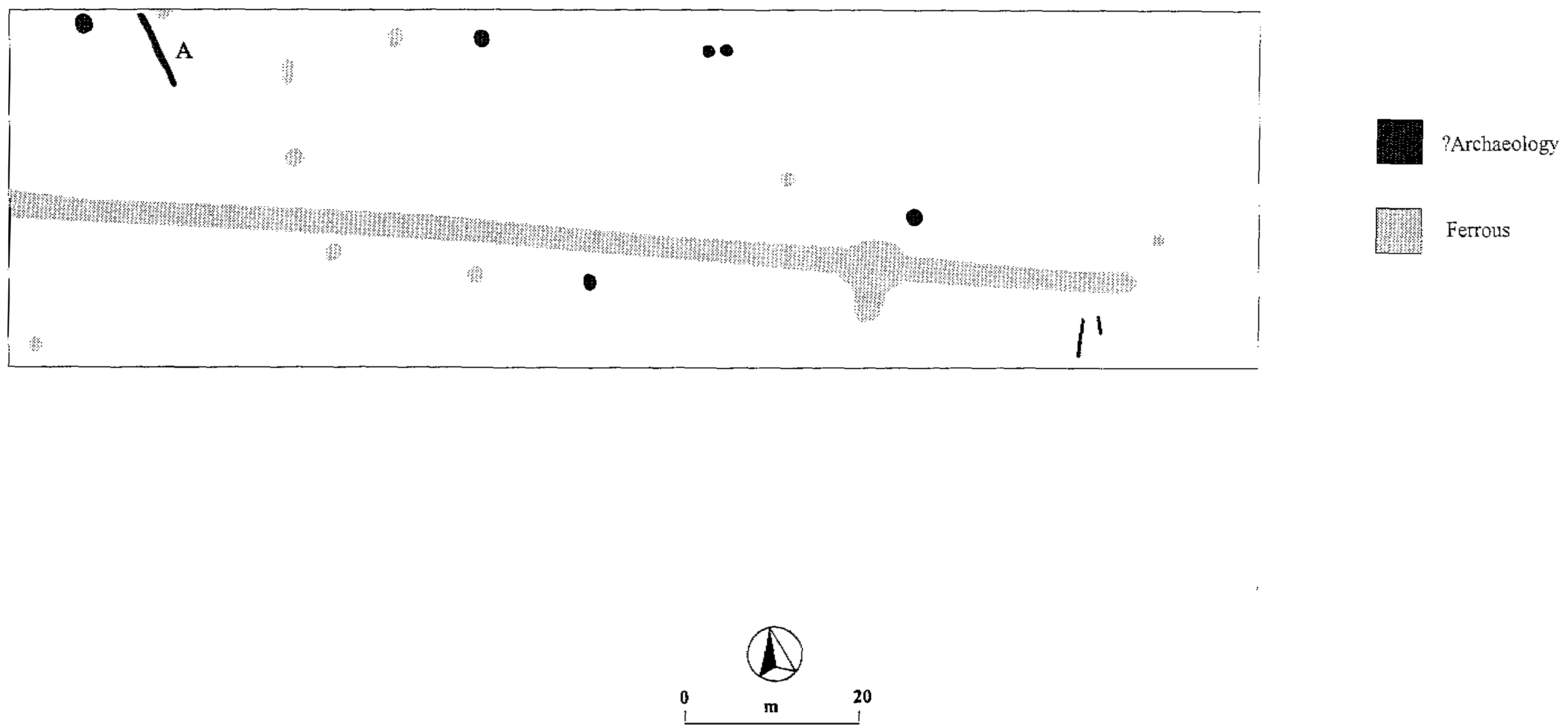
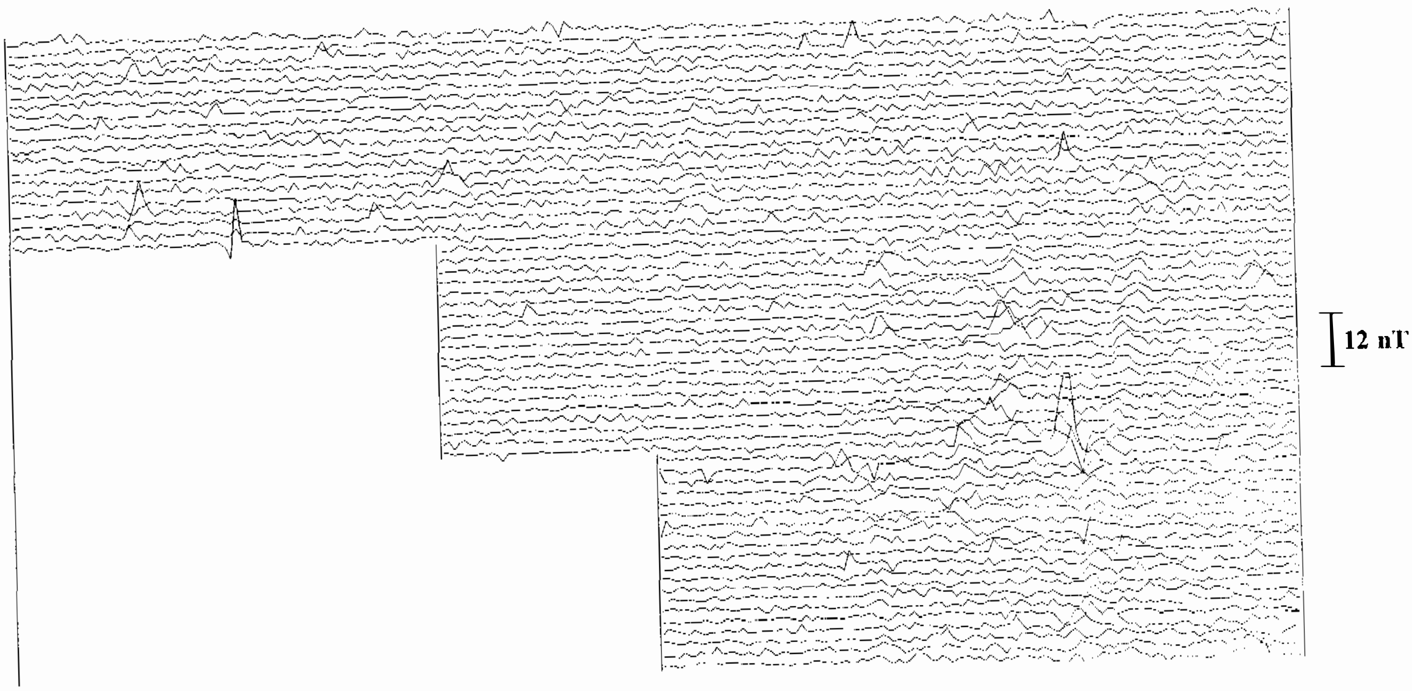


Figure 5

WYRE PIDDLE BYPASS
Area C



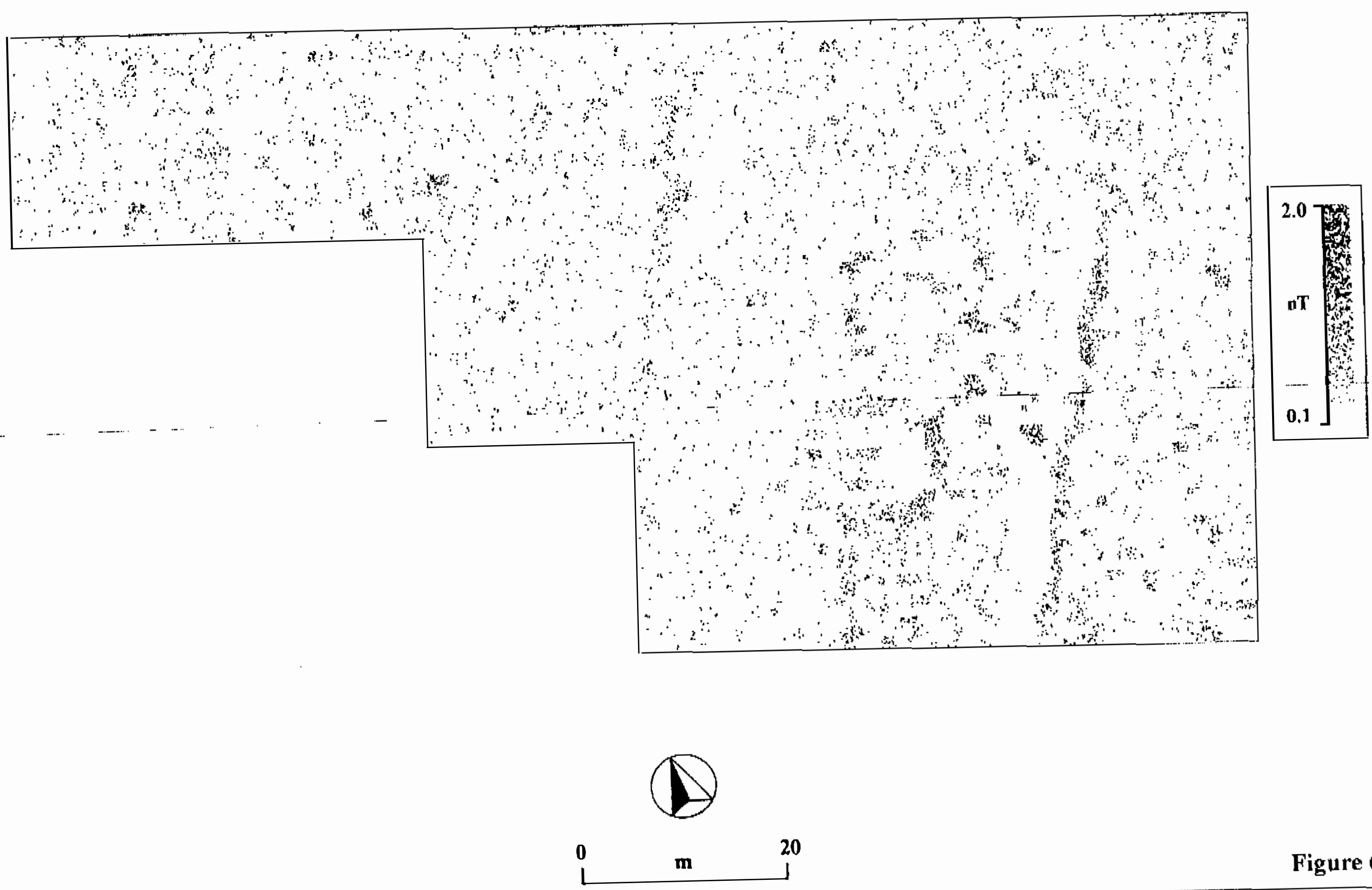


Figure 6

WYRE PIDDLE BYPASS
Area C

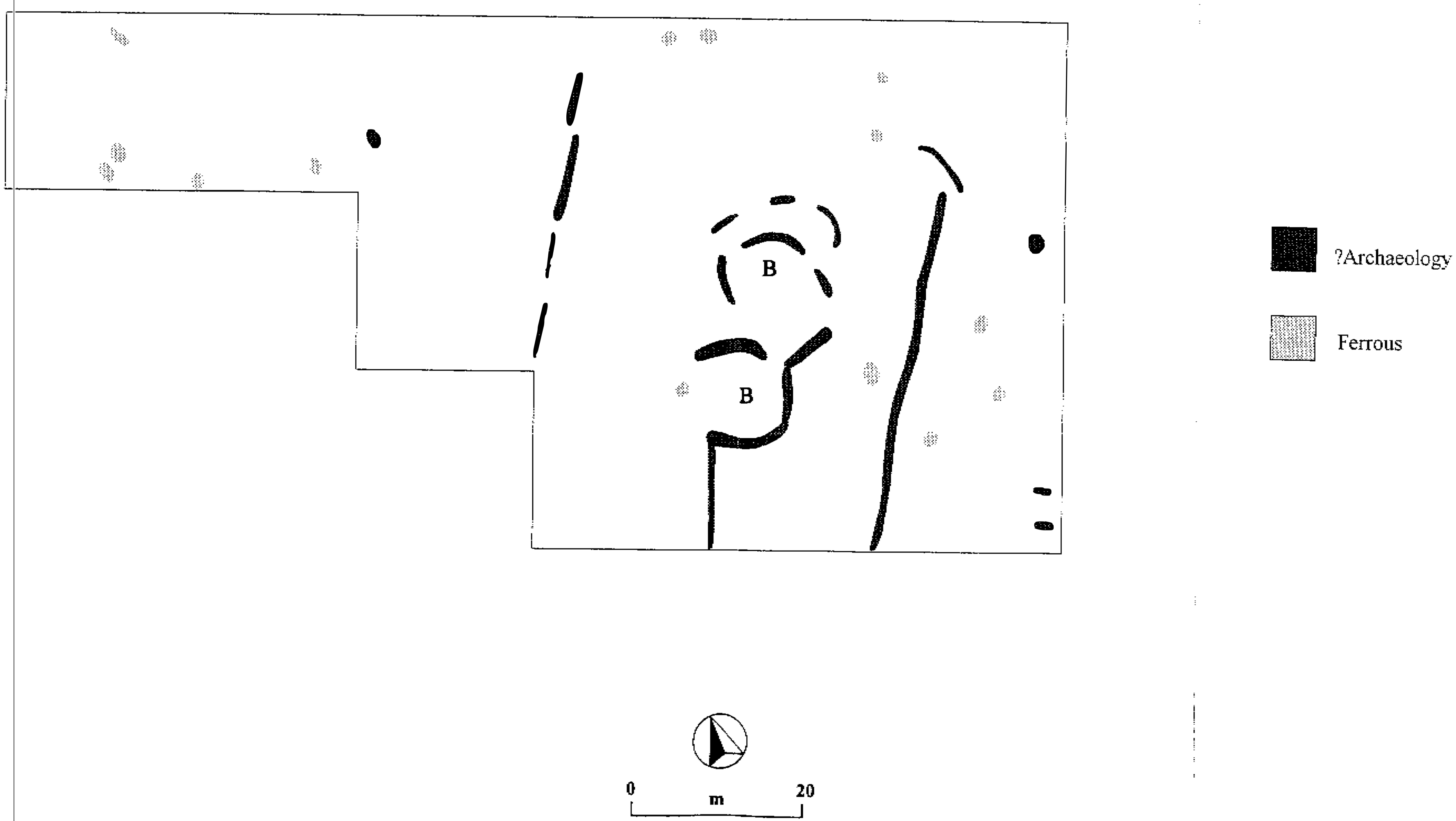


Figure 7

WYRE PIDDLE BYPASS
Area D1

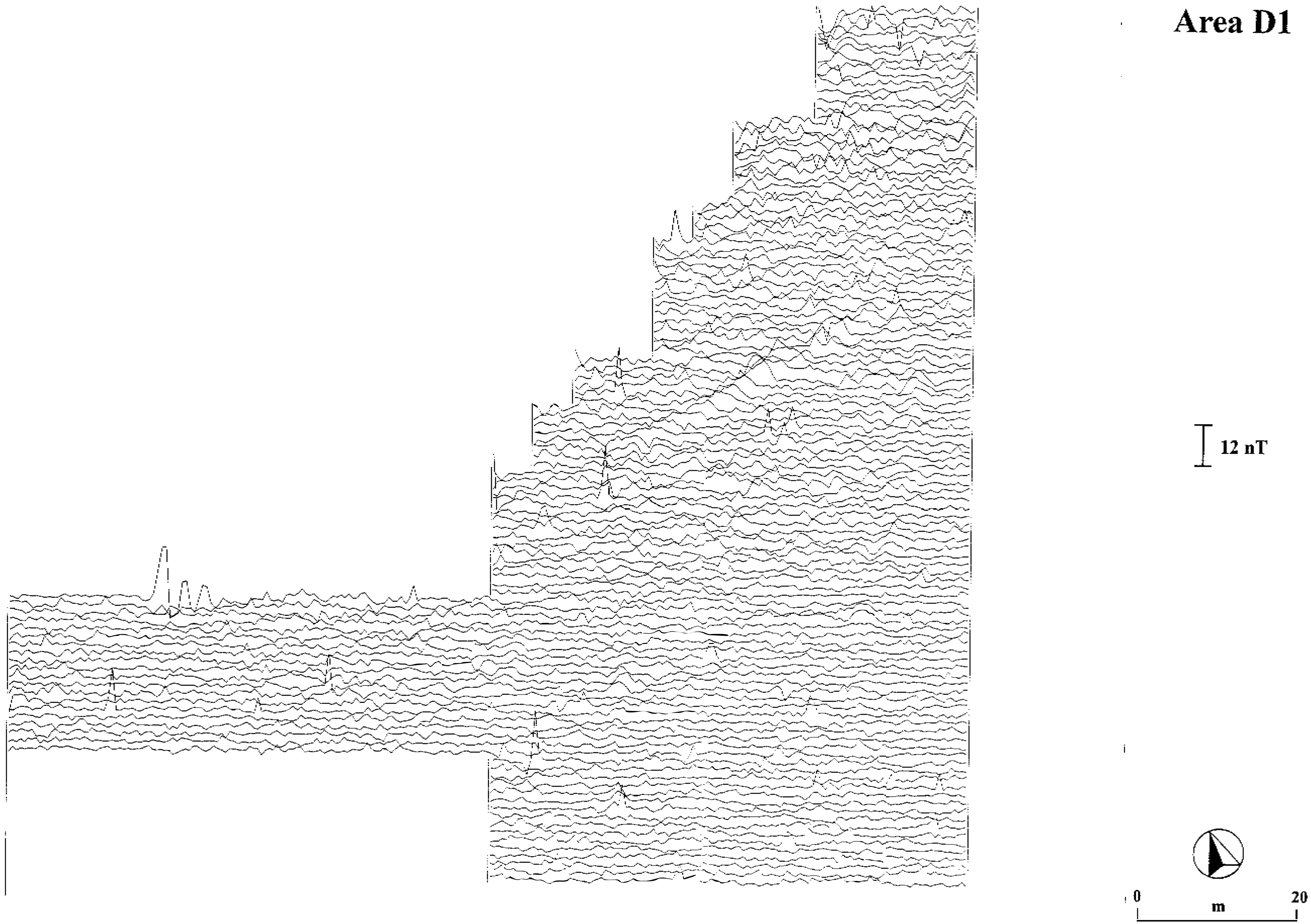


Figure 8

WYRE PIDDLE BYPASS
Area D1

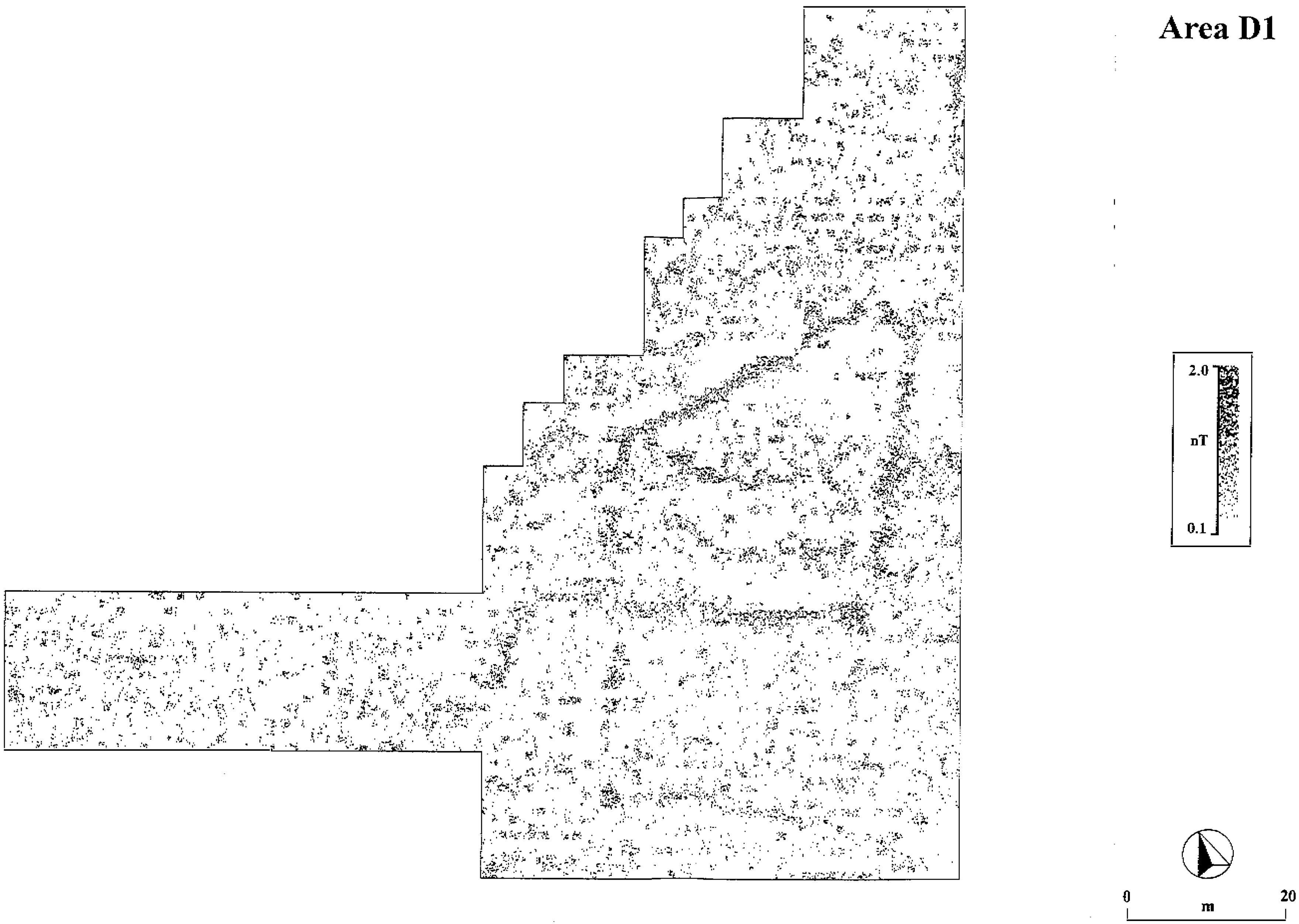


Figure 9

WYRE PIDDLE BYPASS
Area D1

Figure 10

WYRE PIDDLE BYPASS
Area D2

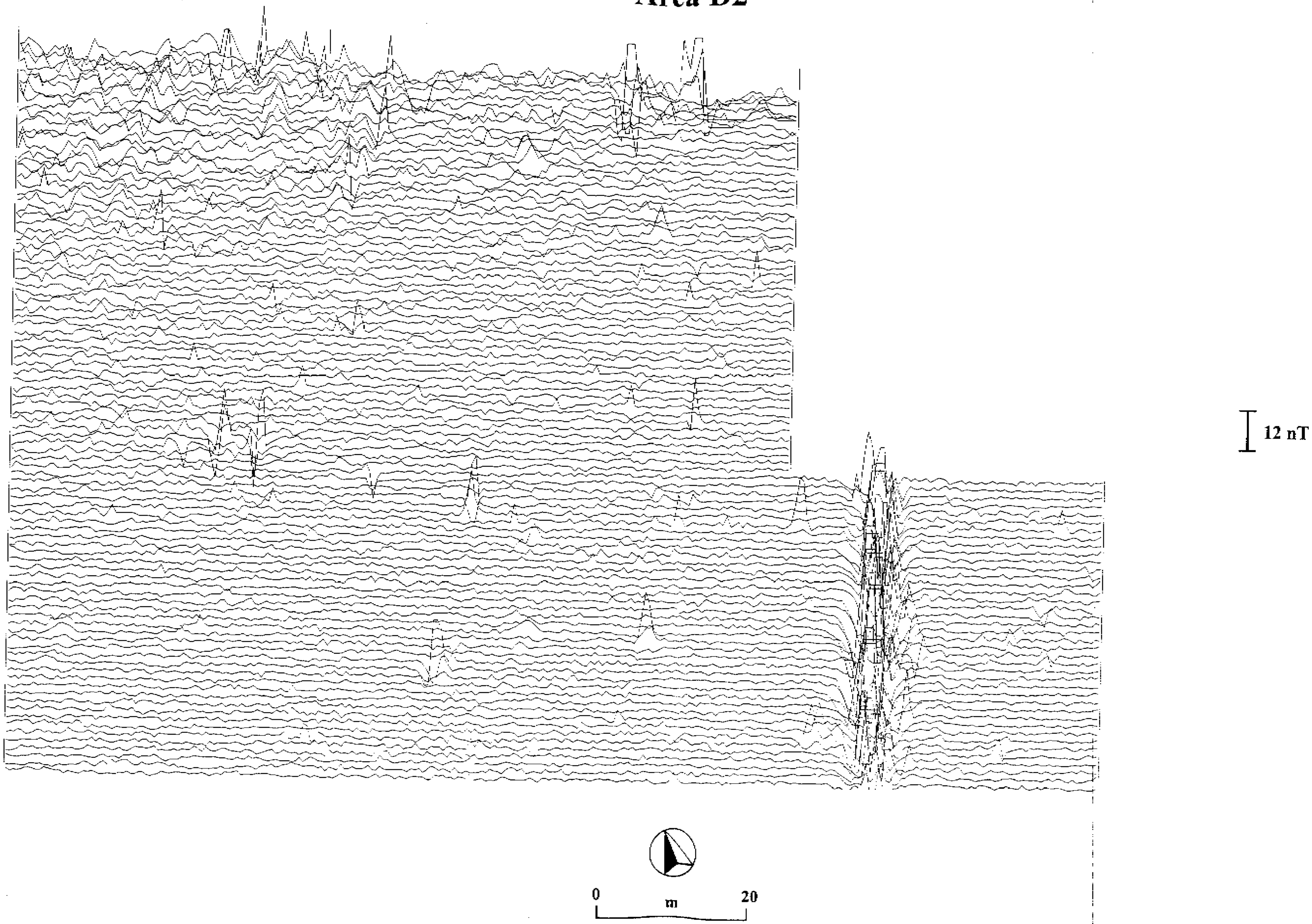


Figure 11

WYRE PIDDLE BYPASS
Area D2

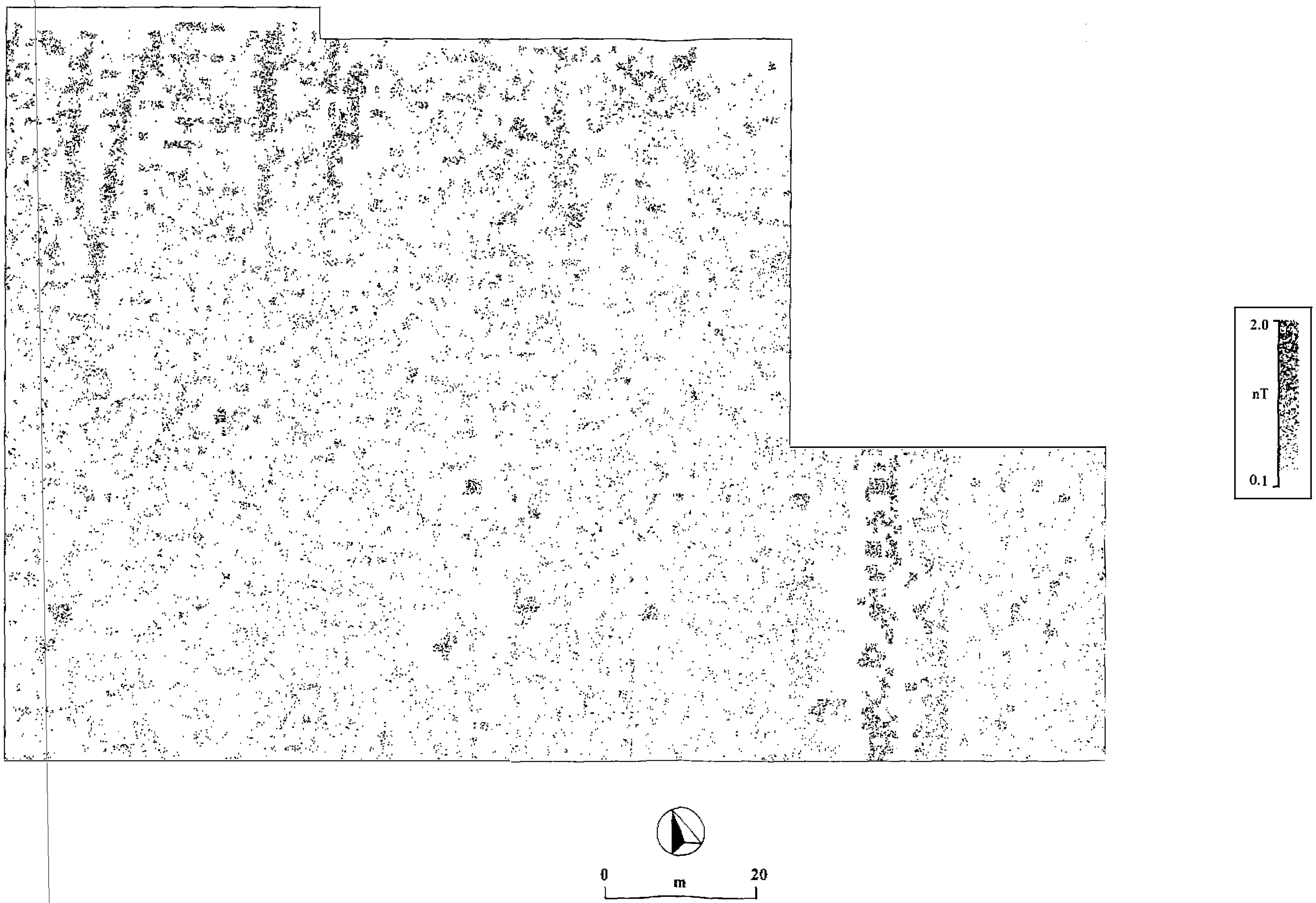


Figure 12

WYRE PIDDLE BYPASS
Area D2

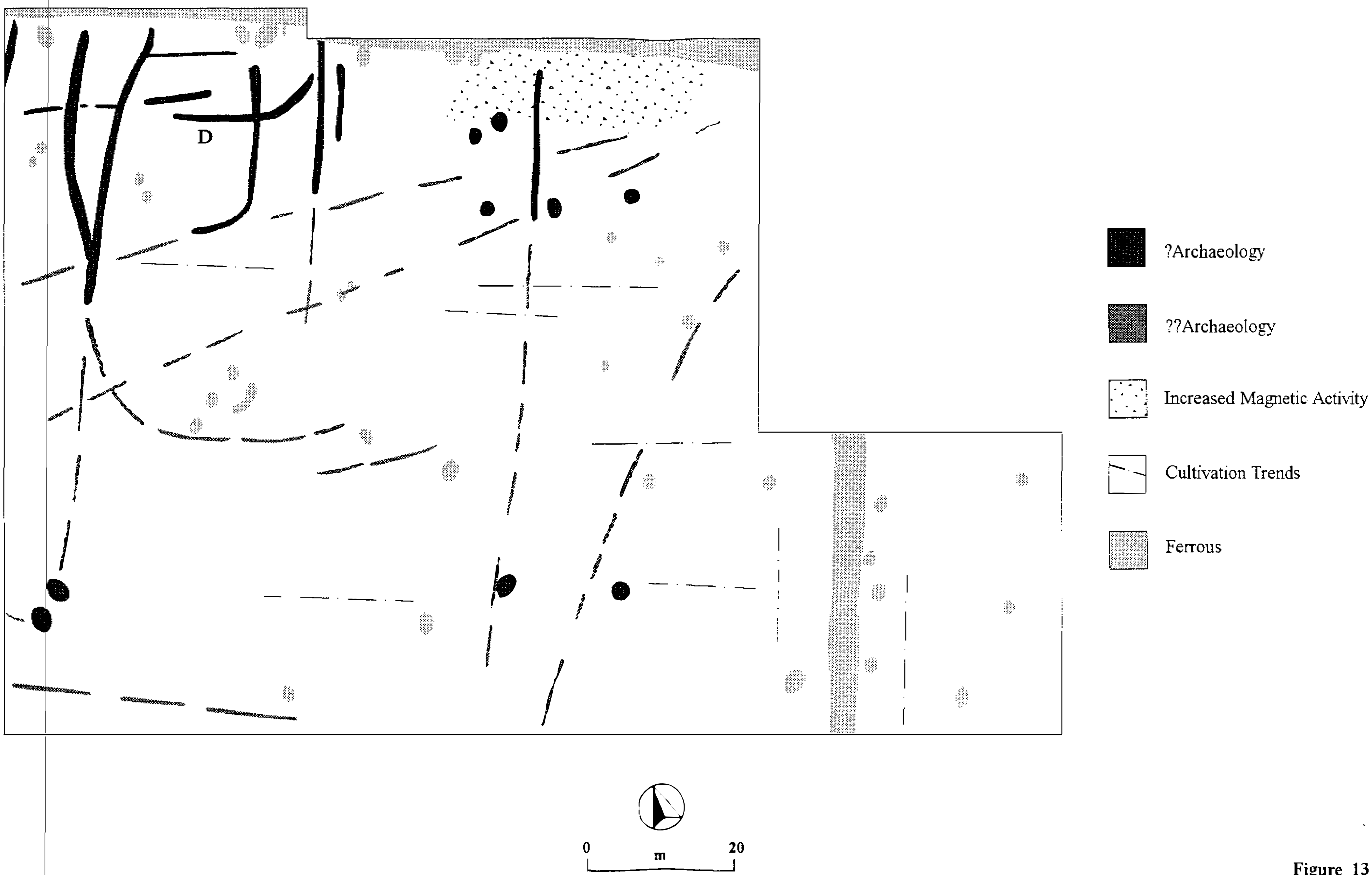


Figure 13

WYRE PIDDLE BYPASS
Area D

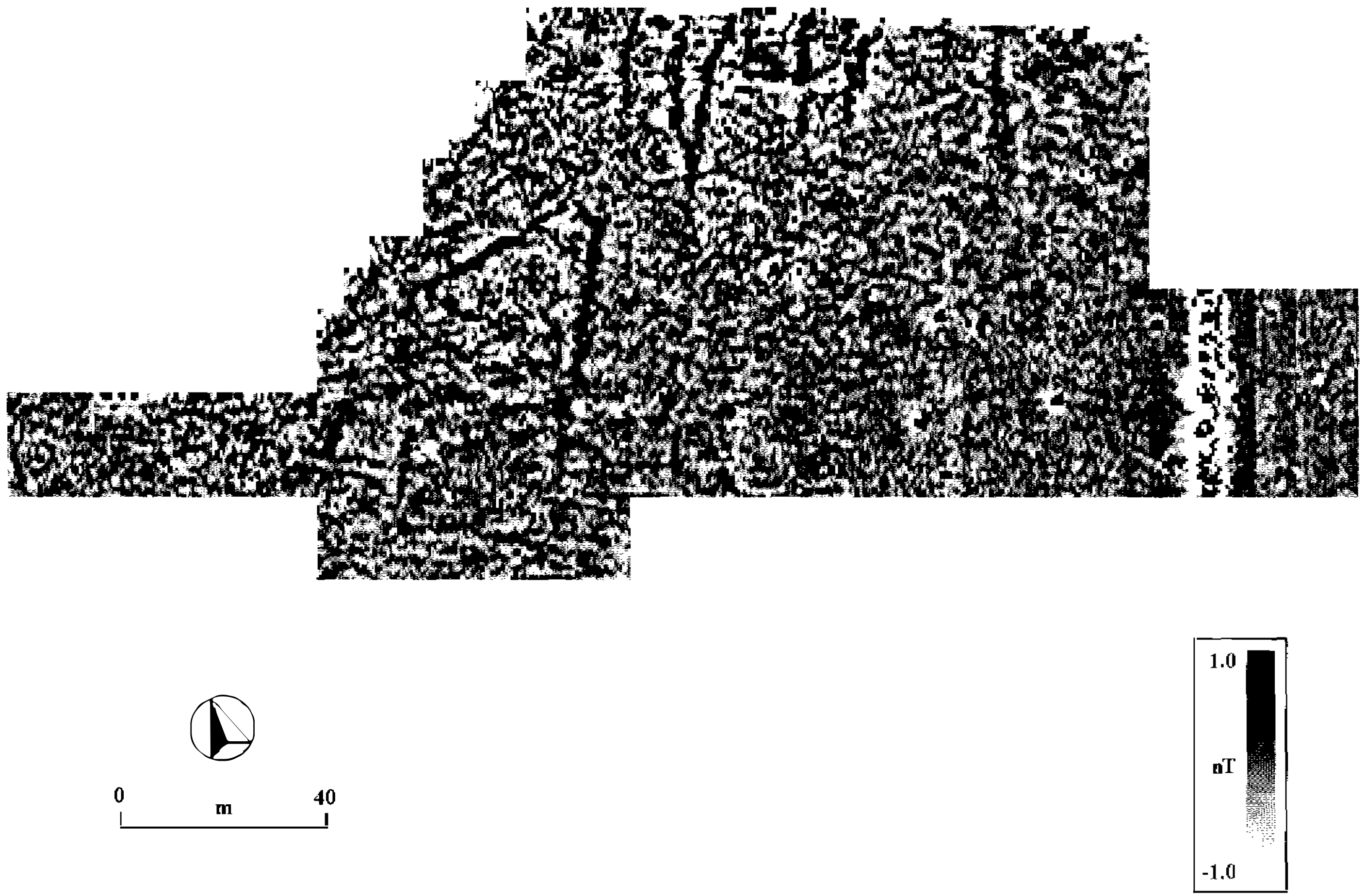


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Figure 14

WYRE PIDDLE BYPASS
Area D
Summary Interpretation

Figure 15

WYRE PIDDLE BYPASS
Area E

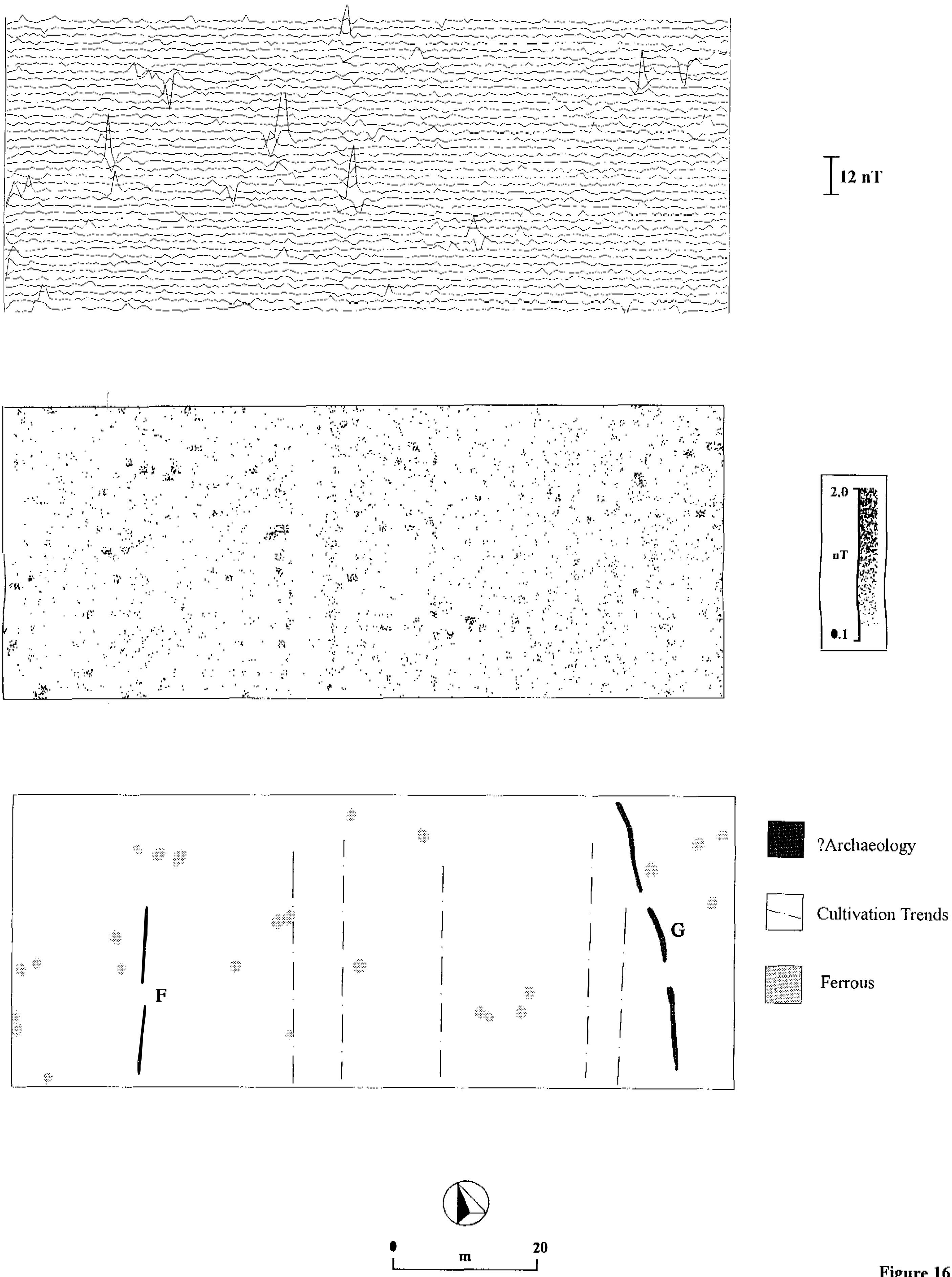

Figure 16

WYRE PIDDLE BYPASS
Area F

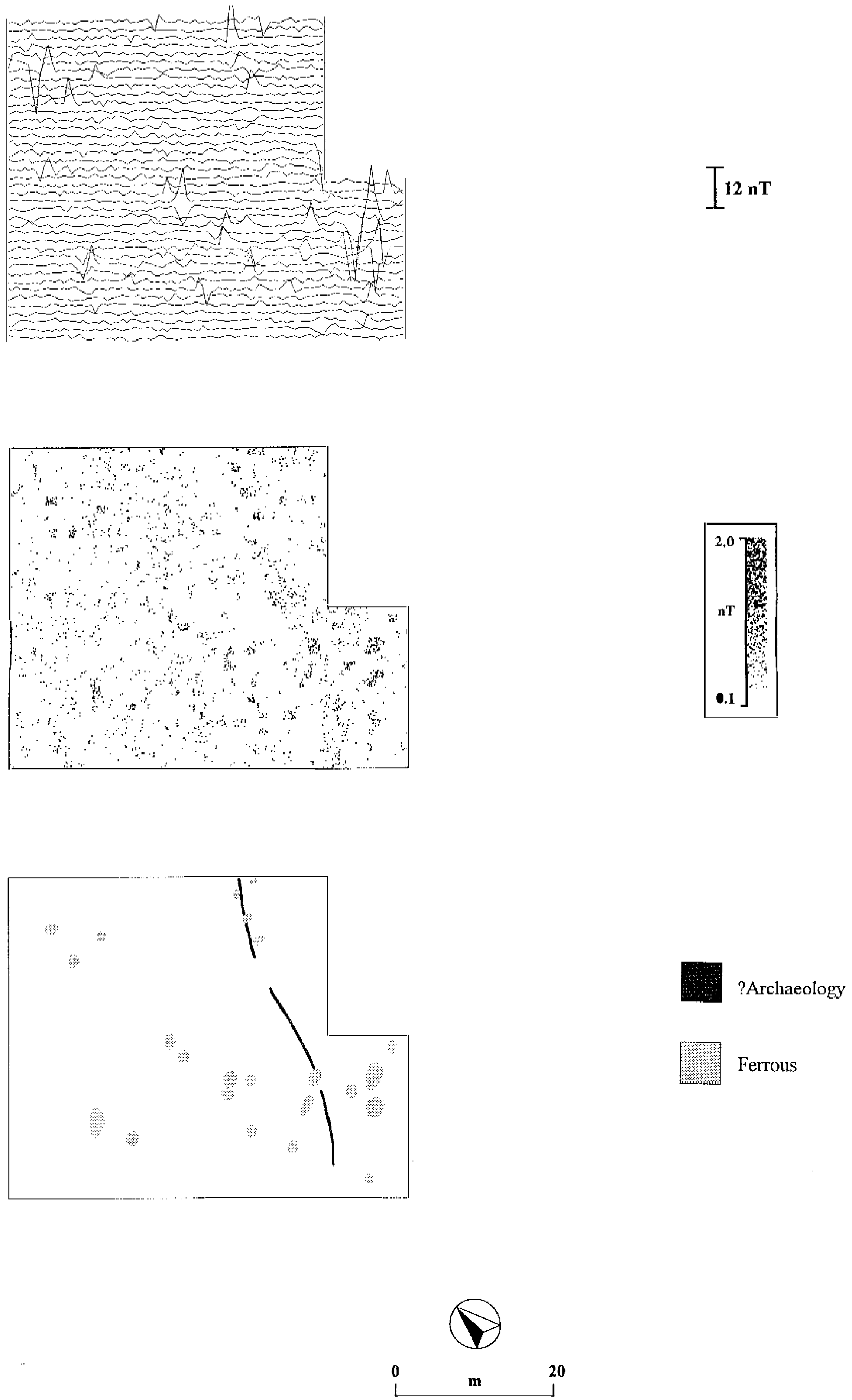

Figure 17