

THE CLWYD-POWYS ARCHAEOLOGICAL TRUST

*A483 Swansea to Manchester Trunk Road,
Improvement at Four Crosses, Powys*
STAGE 3A: GEOPHYSICAL EVALUATION

CPAT Report No 239

*A483 Swansea to Manchester Trunk Road,
Improvement at Four Crosses, Powys*
STAGE 3A: GEOPHYSICAL EVALUATION

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September 1997

Report prepared for Powys County Council, Dept. of Highways and Transportation

The Clwyd-Powys Archaeological Trust

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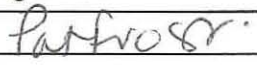
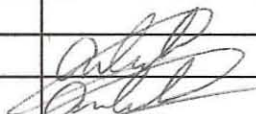
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1 INTRODUCTION

- 1.1 In February 1995 the Contracting Section of the Clwyd-Powys Archaeological Trust (hereafter CPAT Contracts), was invited by the Engineering Consultancy, Department of Highways and Transportation, Powys County Council to prepare a specification and tender for Stages 1 and 2 of an archaeological assessment of a proposed road improvement (centred at SJ 268 186) designed to by-pass Four Crosses in Powys.
- 1.2 The assessment is covered by a Brief (CPAT EVB 136) prepared for Powys Highways Engineering Consultancy by the Curatorial Section of CPAT, acting in their role as archaeological advisors to the Council. Tenders for the assessment were recalled in July 1995 due to the passage of time. The revised CPAT specification and tender was accepted by Powys Highways Engineering Consultancy at the beginning of August 1995. Stages 1 and 2 were carried out in September 1995, and report, which synthesised the results of Stages 1 and 2 was prepared immediately afterwards (Hankinson, 1995. CPAT Report No. 154). The archaeological sites identified during Stages 1 & 2 are identified in Figs A & B (after Hankinson 1995, Figs 2 & 3).
- 1.3 Following the initial stages, and subsequent report, Powys County Council commissioned CPAT Contracts, in May 1997, to carry out Stage 3A of the archaeological assessment, which comprised a geophysical survey of transects within the proposed route.

2 LOCATION, TOPOGRAPHY AND LANDUSE

- 2.1 The proposed route corridor follows a north-south line to the west of the village of Four Crosses and the present A483, from SJ 2676 1824 to SJ 2685 1927, a distance of approximately 1km. For the purposes of this assessment, a 200m wide corridor centred on the indicative by-pass alignment, as delineated on Fig.1, Appendix 1, has been considered.
- 2.2 The corridor varies in elevation between 65m OD and 70m OD, and is situated on an almost level terrace of glaciofluvial and glaciolacustrine origin, just above the flood plain of the Afon Vyrnwy (Thompson 1982, 13).
- 2.3 The geophysical survey covered deep well drained fine loamy soils derived from Palaeozoic sandstone and shale in Areas 1-4. Areas 5-14 covered slowly permeable seasonally waterlogged fine silty and clayey soils derived from Palaeozoic slatey mudstone and siltstone. In all areas, the landuse was pasture (Appendix 1, 3).

3 METHODOLOGY

- 3.1 In July 1997, CPAT contracts commissioned Stratascan of Upton on Severn to carry out the geophysical survey, as part of the archaeological evaluation.
- 3.2 Fourteen areas were examined (Appendix 1, Fig. 1) and the fieldwork was carried out between 29.07.97 and 13.08.97.
- 3.3 Following analysis of the results of a trial survey, using both magnetometer and resistivity on Areas 2 and 10, it was decided that magnetometry was the preferred technique (Appendix 1, 4).
- 3.4 The full results of the geophysical survey form Appendix 1 of this report and a summary is presented in section 5 below.

4 ARCHAEOLOGICAL BACKGROUND

- 4.1 The archaeological background to the area is dealt with in CPAT Report No. 154 (Hankinson 1995), in which the evidence of continuing activity in the vicinity of the proposed route from the Middle-Late Neolithic into the Bronze Age is discussed. Sites identified as being of probable Prehistoric date

affected by the proposed route include the pit alignment PRN 3601/6077 from SJ 2664 1912 to SJ 2690 1913.

- 4.2 Iron Age activity in the area would appear to have been partly agricultural; sites identified by Hankinson (1995, 3) as potentially belonging to this period in the area of Four Crosses include enclosures and field systems.
- 4.3 Prior interrogation of the Powys Sites and Monuments Record (SMR) suggested that the Four Crosses area may have been the location of a Romano-British settlement. Hankinson (1995, 3) refers to the suggestion of a possible Roman road line heading northwards from Four Crosses to Llandysilio, which may survive as sub-surface deposits.
- 4.4 The Dark Age earthwork of Offa's Dyke (PRN 10000; Scheduled Ancient Monument SAM Mg 33) follows the line of the main A483 from Hafod Offa, Four Crosses towards Llandysilio. The sub-circular shape of Llandysilio churchyard (PRN 7608), the "Llan" placename, and the dedication of the church to St Tysilio who apparently lived in the 6th and 7th centuries AD (Pryce 1900 11-12), suggests that the original religious foundation on the site belongs to this period.
- 4.5 Some of the main features of Medieval activity in the area are traces of ridge and furrow cultivation, which were identified within the proposed corridor route during Stage 1 & 2.
- 4.6 Activity in the post-medieval period demonstrates a continuation of unenclosed arable farming, associated with fairly scattered dwellings. The majority of the extant buildings in the route corridor were constructed in the late 18th and 19th centuries.

5 GEOPHYSICAL SURVEY RESULTS

- 5.1 The results of the geophysical survey and the location of features is given in appendix 1. Consequently only a summary of these results is offered here.
- 5.2 Area 1. Centred on SJ 2685 1920
Parcel of land north of Parson's Lane, produced further evidence (M1/10) of the pit alignment PRN 3601, which follows an east/west direction. North of this, in the field south of Church Farm near the boundary with the present A483, a small semicircular feature (M1/3) may be a small ring ditch (Appendix A, Fig.10). The ring ditch appears on the parcel of land marked 8122 on the OS map, which was noted as having "minor undulating earthworks" in 1992 (Silvester 1992, 56). While the pit (M1/3) seems to have no correlation with the 1992 record, the linear feature M1/8 may have. There are three small features, paralleling the line of the present road, within Area 1, which may be also be pits though of unknown date (M1/5 - 7 on Fig. 6).
(Appendix 1, Figs 6-10)
- 5.3 Area 2. Centred on SJ 2680 1897
Parcel of land south of Parson's Lane, revealed several positive curvilinear features, particularly M2/4 and M2/5 (appendix 1, Fig.16) which may be interpreted as ring-ditches. In 1989, cropmarks in the field to the west of these features were plotted from aerial photographs taken at various times since the 1950s (Britnell and Owen 1989, Fig. 1). Only evidence of ridge and furrow was noted during Stage 2 (Hankinson 1005, Site 19).
(Appendix 1, Figs 3, 1-16)
- 5.4 Area 3. Centred on SJ 2680 1887
Several linear features were detected, the most positive image being M3/2, which may continue as a curvilinear feature at it's eastern extent.
(Appendix 1, Fig. 16)
- 5.5 Area 4. Centred on SJ 2685 1882
Rectilinear features (M4/1 and M4/2) along the same axis as those in Area 3 with weaker are identified with possible pit features.
(Appendix 1, Fig. 16).

- 5.6 Area 5. Centred on SJ 2676 1874
Two slightly curving linear features are identified with positive and negative images which suggest banks and ditches (M5/1 and M5/2, Appendix 1, Fig. 16).
Areas 4 and 5 are part of PRN 5022, areas of ridge and furrow cultivation noted on 1947/8 photography.
(Appendix 1, Figs 11-16)
- 5.7 Area 6, centred on SJ 2688 1872 and Area 7, centred on SJ 2678 1865 revealed little evidence to suggest archaeological features
(Appendix 1, Figs 11-16)
- 5.8 Area 8. Centred on SJ 26851865
Parallel linear anomalies (M8/2, appendix 1, Fig. 22), possibly cultivation marks, were identified following the direction of the field boundaries. The small irregular feature M8/3 gave a magnetic response suggesting burning. The less positive features M8/4 may be magnetic debris.
(Appendix 1, Figs 17-22)
- 5.9 Area 9. Centred on SJ 26801855
Parallel linear anomalies (M9/3, appendix 1, Fig. 22) similar to Area 8, but following a north/south axis, were identified. East of these, three anomalies (M9/2) may be further scatterings of magnetic debris as in Area 8. the more interesting features in this area are on the western and eastern extent. A tapered linear anomaly (M9/1, appendix 1, Fig. 22) indicates part of a bank and ditch feature. Evidence of a second bank and ditch feature (M9/5), appears to cross a weaker linear feature (M9/4) at the western extent of the area.
(Appendix 1, Figs 17-22)
- 5.10 Area 10. Centred on SJ 2688 1852
Parallel linear anomalies (M10/3, appendix 1, Fig. 22), indicative of cultivation marks following a north-east/south-west axis were recorded in the area with scatters of debris (M10/1), possibly from rubbish pits, west of them. Similar scatters were recorded in Area 11 (M11/2), centred on SJ 2680 1847.
(Appendix 1, Figs 17-22)
- 5.11 Area 12. Centred on SJ 2675 1840
A linear anomaly (M/12, appendix 1, Fig. 28) on the west side of the area is probably a metalled trackway. On the eastern extent of the area, the features marked as M12/4 appear to be pits, which may be associated with features M/3 and M/5 on the same plan (Appendix 1, Fig. 28).
(Appendix 1, Figs 23-28)
- 5.12 Area 13. Centred on SJ 2670 1832
Comprises scatters of debris (M/13/2-3, appendix 1, Fig. 28) and a feature in the north-east corner of the area, which is presumably rubbish material related to the location of a pond.
(Appendix 1, Figs 23-28)
- 5.13 Area 14. Centred on SJ 2672 1825
Several small anomalies (M14/1-2, appendix , Fig. 28) may also be rubbish pits.
(Appendix 1, Figs 23-28)

6 DISCUSSION

- 6.1 The geophysical survey has identified a number of potentially important archaeological features in this area which has hitherto not provided good aerial photographic information.
- 6.2 A comparison with aerial photographic evidence and the geophysical survey of Area 1 produces good correlation for the pit alignment, PRN 3617.
- 6.3 The positive magnetic anomalies in Areas 2 and 5 suggest previously unrecorded ring ditches.
- 6.4 Areas 8-14 show small anomalies, which are suggestive of rubbish pits, which may produce dating evidence.

- 6.5 It would appear likely that several linear features, as in Areas 3 and 4, revealed during the geophysical survey may represent field boundaries relating to early farming methods and land allotment.

7 CONCLUSION

- 7.1 The results of all three stages of archaeological assessment have shed further light on the nature and survival of the archaeological resource within the proposed corridor route.
- 7.2 Geophysical evidence has revealed new features, which emphasise the high archaeological sensitivity of the proposed route.
- 7.3 It is considered, however, that the geophysical evidence is not sufficient to determine the nature or the chronology of the archaeology with any certainty. It is therefore recommended that a programme of excavation work be undertaken, prior to any groundwork, in order to properly assess the date, function and form of the features .

8 ACKNOWLEDGEMENTS

- 7.1 CPAT contracts would like to acknowledge the assistance of Stratascan in conducting the Geophysical Survey (Appendix 1).

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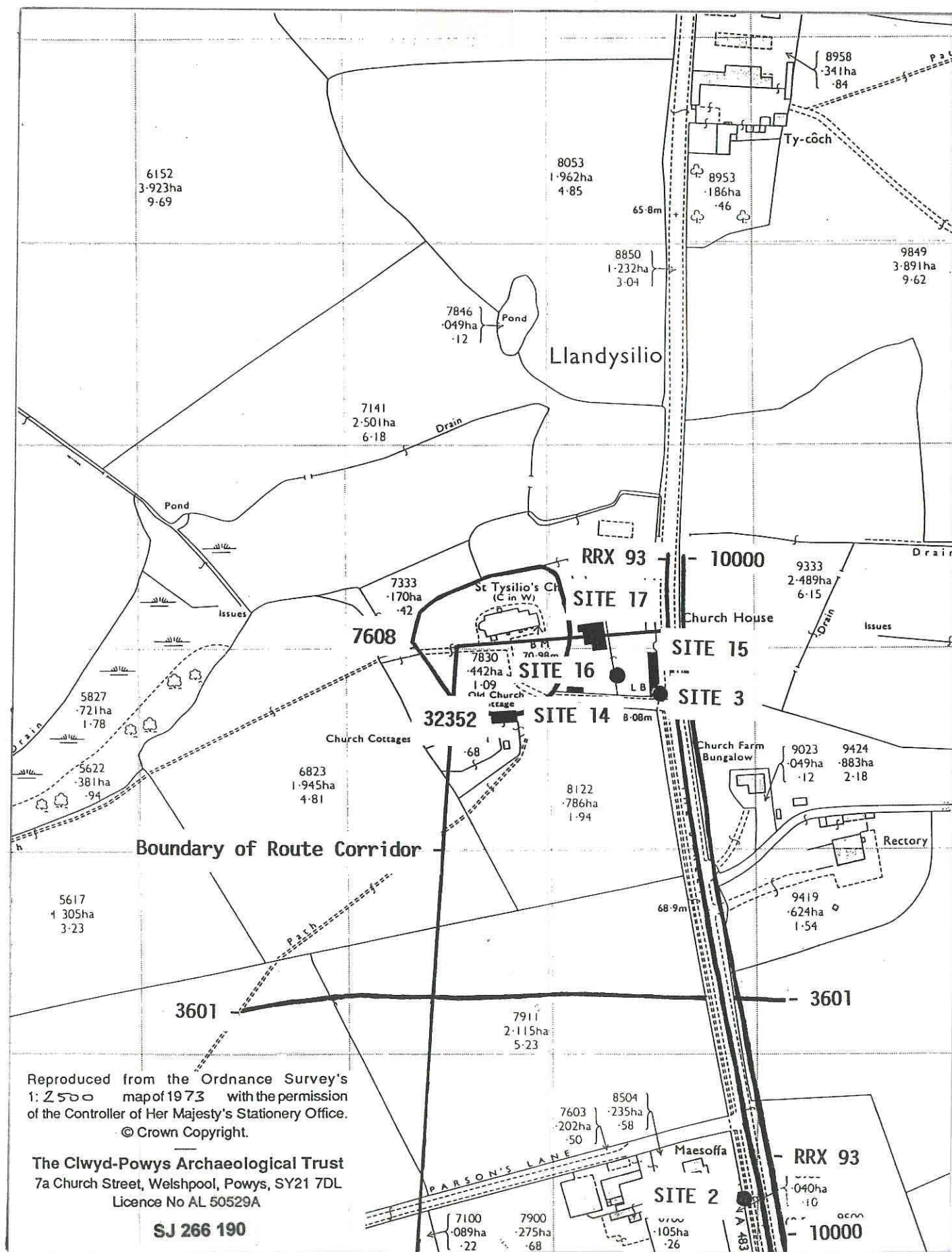


Fig. A Archaeological Sites in the northern sector of the proposed corridor route
Scale 1: 2500
 (after Hankinson 1995, Fig. 3)

APPENDIX 2

GAZETTEER OF PREVIOUSLY IDENTIFIED ARCHAEOLOGICAL SITES

All the archaeological sites covering the geophysical survey are listed below, with previously known sites given their respective PRNs, followed by the list of new sites identified during Stages 1 and 2 of the assessment (Hankinson 1995, 8-11).

PRN 3601 Four Crosses Pit Alignments (Section within route corridor from SJ 2664 1912 to SJ 2690 1913).

A cropmark group representing a field system which is delineated by a series of pit alignments and ditches, first recognised by aerial photography. Limited excavation was carried out on the pit alignments between 1981 and 1984 (Owen and Britnell, 1989), although no conclusive dating evidence was discovered. The SMR attributes a putative Bronze Age date for the field system, but medieval and even post-medieval dates have been suggested (Silvester 1992, 56; Owen and Britnell 1989, 38). Examination of the oblique aerial photographic collection by Hankinson (1995, Stage 2) the proposed route demonstrated that a pit alignment crosses the route corridor dividing at an unrelated angle a medieval/post-medieval open field. This field is identified as "Maes y Llan" on the enclosure award of 1799 (Hankinson 1995, Fig 4) and is also referred to in a 17th century document. Hankinson (1995, 6) it is unlikely that the pit alignments can be of medieval or post-medieval date, and are probably of earlier origin.

PRN 5022 Street Farm Ridge and Furrow (SJ 2685 1870)

An area of medieval/post-medieval ridge and furrow cultivation generally aligned east-north-east/west-south-west with ridges 6-10m across, situated to the west of Street Farm. Probably only part of a larger area of ridge and furrow which would have originally encompassed much of the route corridor; RAF aerial photographs taken in 1947-48 suggest that the area encompassed the adjacent fields to the west and south at that time.

PRN 6419 Four Crosses 'Roman Settlement' (SJ 27 18)

Probable Romano-British settlement in the area of Four Crosses attested by pottery finds during excavations between 1981 and 1985 (Warrilow *et al.* 1986), and a coin find from Llandrinio. No likely site has yet been located, but it is possible that the junction of the two putative Roman roads at SJ 2700 1861, could be associated with a settlement at this location. The grid reference given above is that contained within the SMR and may have no bearing on the actual location of the site.

PRN 6424 Four Crosses 'Mesolithic Settlement' (SJ 27 18)

Finds of possible Mesolithic material and apparent Mesolithic C14 dates from barrow excavations undertaken between 1981 and 1985 (Warrilow *et al.* 1986) suggest some form of Mesolithic activity in Four Crosses. This may be a settlement site, although no likely candidate has yet been found. The grid reference given above is that contained within the SMR and may have no bearing on the actual location of the site.

PRN 7608 Llandysilio Churchyard (SJ 2677 1931)

The sub-circular shape of the churchyard for Llandysilio Church suggests an early medieval/Dark Age foundation. The present church is located immediately outside the route corridor. Sub-surface traces of this early period of Christian activity on the site may remain.

PRN 10000 Offa's Dyke (From SJ 2700 1862 to SJ 2687 1930)

The Dark Age earthwork known as Offa's Dyke (SAM Mg 33) appears to run along the eastern side of the main A483 road, and may not therefore be present within the route corridor. However, the northern part of this section has been levelled, and owing to the uncertainty over its line, the possibility remains that the ditch associated with the dyke has been preserved under the present road. The southern part of this section, to the east of the A483, is a Scheduled Ancient Monument.

RRX 93 Roman Road (From SJ 2700 1861 to SJ 2686 1930)

The hypothetical line of a Roman road from Wroxeter to Clawdd Coch, near Llanymynech may run along the present line of the main A483 adjacent to Offa's Dyke.

Greenwood Ridge and Furrow (SJ 2690 1854). Hankinson 1995, Site 1

An area of medieval/post-medieval ridge and furrow cultivation aligned east-north-east/west-south-west with ridges c.6m across, situated to the north of the garage at Four Crosses. Probably only part of a larger area of ridge and furrow which would have originally encompassed much of the route corridor.

Rose Cottage Ridge and Furrow (SJ 2675 1885). Hankinson 1995, Site 19

A former area of ridge and furrow cultivation aligned approximately east-north-east/west-south-west, situated to the west of Rose Cottage, which was recognised on RAF aerial photographs taken in 1947 and 1948. Probably only part of a larger area of medieval/post-medieval ridge and furrow which would have originally encompassed much of the route corridor.

Field 8122 (SJ 268 192)

Parcel of land immediately south of Llandysilio Church. Noted as having "minor undulating earthworks" in 1992 (Silvester, R. J., 1992, CPAT Report No. 40).

APPENDIX 3

SPECIFICATION FOR AN ARCHAEOLOGICAL GEOPHYSICAL EVALUATION BY THE CLWYD-POWYS ARCHAEOLOGICAL TRUST

1 Introduction

- 1.1 The proposed development involves the construction of a new road corridor to bypass the village of Four crosses, Powys.
- 1.2 This proposed development lies immediately to the W of Four Crosses though an area of high archaeological sensitivity.
- 1.3 Following an Archaeological Assessment undertaken by CPAT Contracts (Report No. 154, September 1995) in which a number of archaeological sites were identified and which were considered to be potentially at risk from the proposed development, the Curatorial Section of the Clwyd-Powys Archaeological Trust, in their capacity as archaeological advisors to the local authority, have determined that a field evaluation is necessary to assess the implications of the proposed development on the archaeological resource. Accordingly a brief (No ASB 222, dated 19th June 1997) has been prepared by CPAT Curatorial which describes the scheme of archaeological works required.

2 Objectives

- 2.1 The objectives of the evaluation are:
 - 2.1.1 to reveal by means of geophysical survey the presence and nature of the archaeology within the area of the proposed development in so far as these aims are possible;
 - 2.1.2 to prepare a report outlining the results of the field evaluation and incorporating sufficient information on the archaeological resource for a reasonable planning decision to be taken regarding the archaeological provision for the area affected by the proposed development;
 - 2.1.3 to identify and recommend areas for further evaluation excavation.

3 Methods

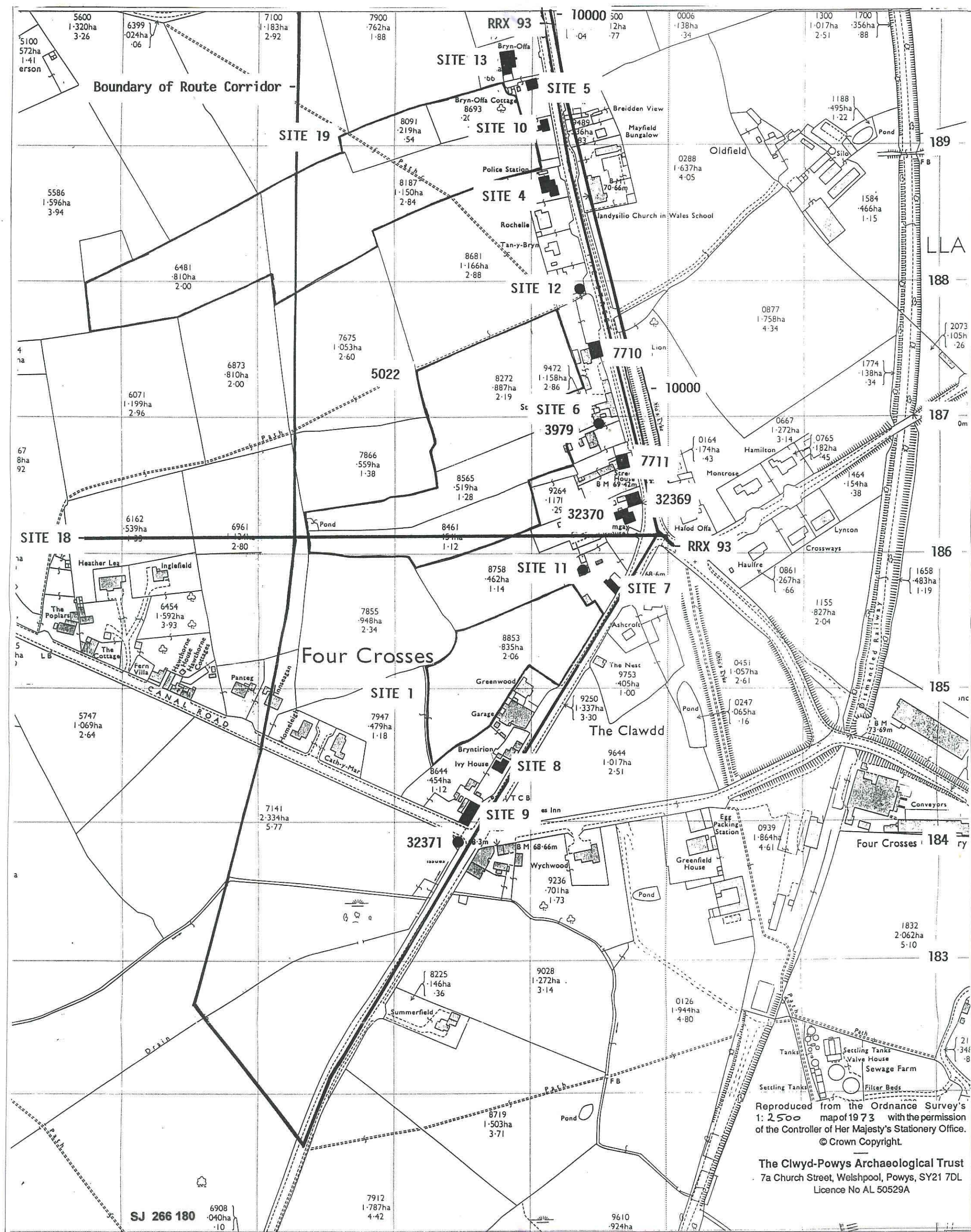
- 3.1 Both magnetometer and resistivity survey will be used according to the relevant soil type and on the recommendation of the geophysics specialist.
- 3.2 Following the on-site work an illustrated and bound report will be prepared according to the principles laid out in the Curatorial Brief (page 4). This will be in A4 format and contain conventional sections on- Site location, Topography and Geology, Historic Background; Conclusions and Recommendations and References, together with appropriate appendices.
- 3.3 The site archive will be prepared to specifications laid out in Appendix 3 in the Management of Archaeological Projects (English Heritage, 1991).

4 Resources and Programming

- 4.1 The evaluation will be undertaken by a small team of 3 skilled geophysicists and archaeologists under the direct supervision of an experienced field archaeologist, who will also be responsible for undertaking the desk-based assessment. Overall supervision will be by Dr A Gibson, a senior member of CPAT's staff who is also a member of the Institute of Field Archaeologists.

- 4.2 All report preparation will be completed by the same field archaeologist who conducted the evaluation.
- 4.3 It is anticipated that the assessment and evaluation will take no more than 10 days in all and that the subsequent report would be prepared immediately thereafter, dependent on the client's instructions and the arrangement of a suitable timetable. The date of commencement, at the time of writing, has yet to be agreed with the client, and will be dependent on the state of the site and negotiated access. The archaeological curator will be informed of the detailed timetable and staffing levels when agreement has been reached with the client.
- 4.4 Requirements relating to Health and Safety regulations will be adhered to by CPAT and its staff
- 4.5 CPAT is covered by appropriate Public and Employer's Liability insurance.

A.M. Gibson
Projects manager



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FOUR CROSSES BYPASS, POWYS

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STRASSCAN
GEOPHYSICAL & SPECIALIST SURVEY SERVICES

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1 SUMMARY OF RESULTS

The geophysical survey has succeeded in identifying areas of possible archaeological interest, including several possible ditches and an enclosure boundary.

2 INTRODUCTION

2.1 Background synopsis

Clwyd-Powys Archaeological Trust commissioned a geophysical survey as part of the archaeological evaluation of the Four Crosses Bypass project.

2.2 Site location

14 areas were to be investigated, and they are located between the towns of Llandysilio and Four Crosses in the County of Powys. The OS Reference for the approximate centre of each area is given below.

| Area | OS Ref. |
|------|--------------|
| 1 | SJ 2685 1920 |
| 2 | SJ 2680 1897 |
| 3 | SJ 2680 1887 |
| 4 | SJ 2685 1882 |
| 5 | SJ 2676 1874 |
| 6 | SJ 2688 1872 |
| 7 | SJ 2678 1865 |
| 8 | SJ 2685 1865 |
| 9 | SJ 2680 1855 |
| 10 | SJ 2688 1852 |
| 11 | SJ 2680 1847 |
| 12 | SJ 2675 1840 |
| 13 | SJ 2670 1832 |
| 14 | SJ 2672 1825 |

2.3 Description of site

| Area | Ground cover | Sub soils |
|------|--------------|--|
| 1 | Grazing | Deep well drained fine loamy soils derived from Palaeozoic sandstone and shale |
| 2 | Grazing | As above |
| 3 | Grazing | As above |
| 4 | Grazing | As above |
| 5 | Grazing | Slowly permeable seasonally waterlogged fine silty and clayey soils derived from Palaeozoic slaty mudstone and siltstone |
| 6 | Grazing | As above |

| Area | Ground cover | Sub soils |
|------|--------------|-----------|
| 7 | Grazing | As above |
| 8 | Grazing | As above |
| 9 | Grazing | As above |
| 10 | Grazing | As above |
| 11 | Grazing | As above |
| 12 | Grazing | As above |
| 13 | Grazing | As above |
| 14 | Grazing | As above |

2.4 Site history and archaeological potential

We are not aware of the history or archaeological potential of the areas surveyed.

2.5 Survey objectives

The objective of the survey is to investigate areas affected by the Four Crosses Bypass project.

2.6 Survey methods

As the survey areas cover two different sub soils a trial survey was carried out using both magnetometer and resistivity on Areas 2 and 10. The results of this trial are presented in Figures 3 and 4. After consultation with the client it was decided that magnetometry was the most appropriate technique. Both techniques are described in more detail below.

3 **METHODOLOGY**

3.1 Date of fieldwork

The field work was carried out between 29 July 1997 and 13 August 1997.

3.2 Grid locations

The referencing for the 14 areas has been plotted onto Figures 5, 11, 17 and 23.

3.3 Description of techniques and equipment configurations

3.3.1 *Magnetometer*

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and

ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using an FM36 Fluxgate Gradiometer, manufactured by Geoscan Research. The instrument consists of two fluxgates mounted 0.5m vertically apart, and very accurately aligned to nullify the effects of the earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.

3.3.2 *Resistance Meter*

This method relies on the relative inability of soils (and objects within the soil) to conduct an electrical current which is passed through them. As resistivity is linked to moisture content, and therefore porosity, hard dense features such as rock will give a relatively high resistivity response, while features such as a ditch which retains moisture give a relatively low response.

The resistance meter used was an RM15 manufactured by Geoscan Research incorporating a mobile Twin Probe Array. The Twin Probes are separated by 0.5m and the associated remote probes were positioned approximately 15m outside the grid. The instrument uses an automatic data logger which permits the data to be recorded as the survey progresses for later downloading to a computer for processing and presentation.

Though the values being logged are actually resistances in ohms they are directly proportional to resistivity (ohm-metres) as the same probe configuration was used through-out.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Magnetometer

Readings were taken at 0.5m centres along traverses 1m apart. This equates to 800 sampling points in a full 20m x 20m grid. All traverses are surveyed in a "parallel" rather than "zigzag" mode.

Resistivity

Readings were taken at 1.0m centres along traverses 1.0m apart. This equates to 400 sampling points in a full 20m x 20 grid. All traverses were surveyed in a "zigzag" mode.

3.4.2 Depth of scan and resolution

Magnetometer

The FM36 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an optimum resolution for the technique.

Resistivity

The 0.5m probe spacing of a twin probe array has a typical depth of penetration of 0.5m to 1.0m. The collection of data at 1m centres with a 0.5m probe spacing provides an optimum resolution for the technique.

3.4.3 Data capture

Magnetometer

The readings are logged consecutively into the data logger which in turn is daily downloaded into a portable computer whilst on site. At the end of each job, data is then transferred to the office for processing and presentation.

Resistivity

The readings are logged consecutively into the data logger which in turn is daily downloaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Magnetometer

Processing is performed using specialist software known as *Geoplot 2*. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies..

The following schedule shows the basic processing carried out on all processed magnetometer data used in this report:

| | |
|---------------------------|------------------------------------|
| <i>Zero mean grid</i> | <i>Threshold = 0.25 std. dev.</i> |
| <i>Zero mean traverse</i> | <i>Last mean square fit = off</i> |
| <i>Despike</i> | <i>X radius = 1 Y radius = 1</i> |
| | <i>Threshold = 3 std. dev.</i> |
| | <i>Spike replacement = mean</i> |

Resistivity

The processing was carried out using specialist software known as *Geoplot 2* and involved the 'despiking' of high contact resistance readings and the passing of the data through a high pass filter. This has the effect of removing the larger variations in the data

often associated with geological features. The nett effect is aimed at enhancing the archaeological or man-made anomalies contained in the data.

The following schedule shows the processing carried out on the processed resistance plots.

| | |
|-------------------------|---|
| <i>Despike</i> | <i>X radius = 1</i> <i>Y radius = 1</i> <i>Spike replacement</i> |
| <i>High pass filter</i> | <i>X radius = 10</i> <i>Y radius = 10</i> <i>Weighting = Gaussian</i> |

3.5.2 Presentation of results and interpretation

Magnetometer

The presentation of the data for each site involves a print-out of the raw data both as grey scale and trace plots, together with grey scale plots of the processed data, and, if appropriate, after further processing to emphasise various aspects within the data. Magnetic anomalies have been identified and plotted onto the 'Abstraction of Anomalies' drawing for the site (Figure ?), numbered for ease of reference and prefixed with the letter 'M'. An interpretative plot of these anomalies has also been included in Figure ?.

Resistivity

The presentation of the data for the site involves a print-out of the raw data as a grey scale plot, together with grey scale plots of the processed data. Anomalies have been identified and plotted onto the 'Abstraction of Anomalies' drawing (Figure ?), numbered for ease of reference and prefixed with the letter 'R'. An interpretative plot of these anomalies has also been included in Figure ?.

4 RESULTS

Area 1

The most noteworthy feature found in this area is the strong rectilinear positive anomaly M1/1. This appears to be made up of a series of discrete anomalies suggesting the feature is an alignment of substantial pits. Crossing this obliquely is the weak positive linear anomaly M1/9 which is probably a cultivation feature such as a ploughline.

Against the road is the strong magnetic disturbance M1/2 which is caused by a steel pipeline. However at its northern end is an interesting semicircular positive anomaly M1/3 which may be part of a small ring ditch. To the west of M1/3 is the weak linear positive anomaly M1/8 which has the appearance of a shallow ditch.

There are several discrete positive anomalies of which three have been numbered, M1/5, M1/6 and M1/7. These may be pits.

M1/4 along the north west edge is an area of magnetic disturbance from a metal fence or possibly another pipeline.

Area 2

Several positive curvilinear and rectilinear anomalies were found in this site. Notably M2/4, M2/5 and M2/6 are strong responses and are likely to be ditches. M2/7 and M2/8 are short anomalies but may be part of larger features. There are also two weak positive rectilinear anomalies M2/2 and M2/3 crossing each other orthogonally and are probably shallow ditches.

M2/1 is interpreted as the strong disturbance from a metal pipeline.

Area 3

Again several linear anomalies have been found together with two clusters of discrete positive anomalies M3/7 and M3/8 which may be pits.

The linear anomalies fall into three types. M3/1 is a curving fragmented positive feature which appears to continue as the weak rectilinear M3/2. Parallel to and either side of M3/2 are two further weak rectilinear responses giving these anomalies the appearance of cultivation marks. M3/9 is a thin positive rectilinear feature which is interpreted as a shallow ditch.

Area 4

Crossing this site is a weak linear feature made up of M4/1 and M4/2. It also appears to line up with M5/3 in the neighbouring site to the west. This may be a large enclosure boundary.

Several discrete positive anomalies have been found again being interpreted as pits. The strong disturbance M4/5 on the eastern side is from the nearby hedge.

Area 5

This survey has revealed two strong linear anomalies M5/1 and M5/2. M5/1 is made up of a positive and negative element suggesting a ditch and bank. M5/2 being positive is more likely to be a ditch only. The clusters of discrete positive anomalies M5/4 and M5/5 are probably pits.

Area 6

Area 6 is magnetically rather noisy in nature. The strong disturbance M6/2 has the appearance of a spread of debris such as hard-core or slag possibly from the nearby houses. The rest of the site reveals a series of parallel positive and negative linear anomalies collectively labelled M6/1 and are probably from an agricultural operations such as sub-soiling or mole ploughing.

Area 7

This area produced few anomalies. A weak linear positive anomaly M7/1 is seen in the south eastern corner and a few discrete positive anomalies M7/2 towards the west account for the features found.

Area 8

Where the survey areas abut the hedges at the north and south ends the debris in the hedges causes the magnetic disturbances M8/1 and M8/5. Between these are several parallel negative linear anomalies M8/2 interpreted as cultivation marks such as sub-soiling. M8/3 is a strong discrete response worthy of investigation. It is either the strong thermoremanent effect from burning such as a hearth or from deeply buried metal. There are a number of other discrete mixed anomalies M8/4 which have the appearance of magnetic debris.

Area 9

M9/1 towards the eastern end of the area is a tapered linear anomaly with both positive and negative elements indicating both a ditch and an embankment.

At the western end two weaker linear anomalies M9/4 and M9/5 cross each other obliquely. M9/5 also has positive and negative elements again suggesting a ditch and bank.

Across the centre of the site are scatters of strong discrete anomalies of which M9/2 picks out three. These are thought to be metal debris.

M9/3 is a series of parallel weak linear anomalies likely to be from cultivation.

Area 10

Two areas of disturbance M10/2 and M10/4 at the eastern end of the site are probably debris close to the field boundary. The parallel negative linear anomalies M10/3 are thought to be cultivation marks. The spread of discrete anomalies M10/1 are interpreted as debris in rubbish pits.

Area 11

M11/2 is a scatter of small debris and M11/1 is the magnetic disturbance from the nearby field boundary.

Area 12

M12/1 is a linear anomaly made up of mixed responses suggesting a track surfaced with clinkers or slag.

The strong discrete positive anomalies M12/4 together with M12/3 are worthy of investigation as they have the appearance of large pits. A weak linear anomaly M12/2 crosses the site close to these features.

Area 13

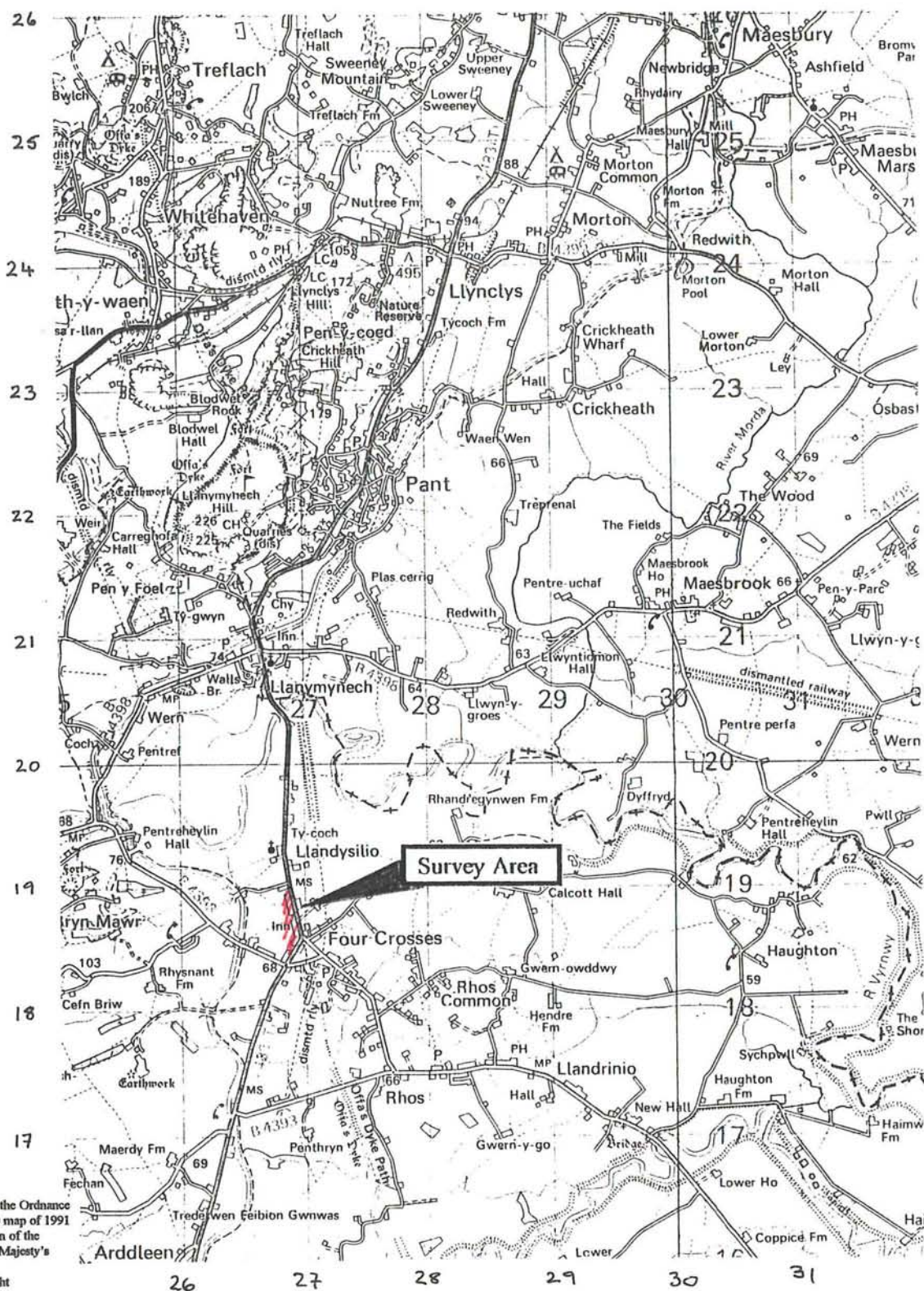
Apart from a scatter of debris a strong discrete area of disturbance M13/1 is seen in the north eastern corner. As this coincides with a pond this is interpreted as a tip of rubbish.

Area 14

Several discrete anomalies M14/1 and M14/2 at the southern end of the site are the only features in this area. M14/1 may be worth investigating as it may be a rubbish pit.

5 CONCLUSIONS

The survey has found a number of interesting features including many ditches and possible pits. The pit alignment in Area 1 is of particular interest.



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Date August 1997

Client CLWYD-POWYS
ARCHAEOLOGICAL TRUST

Scale 1:50 000

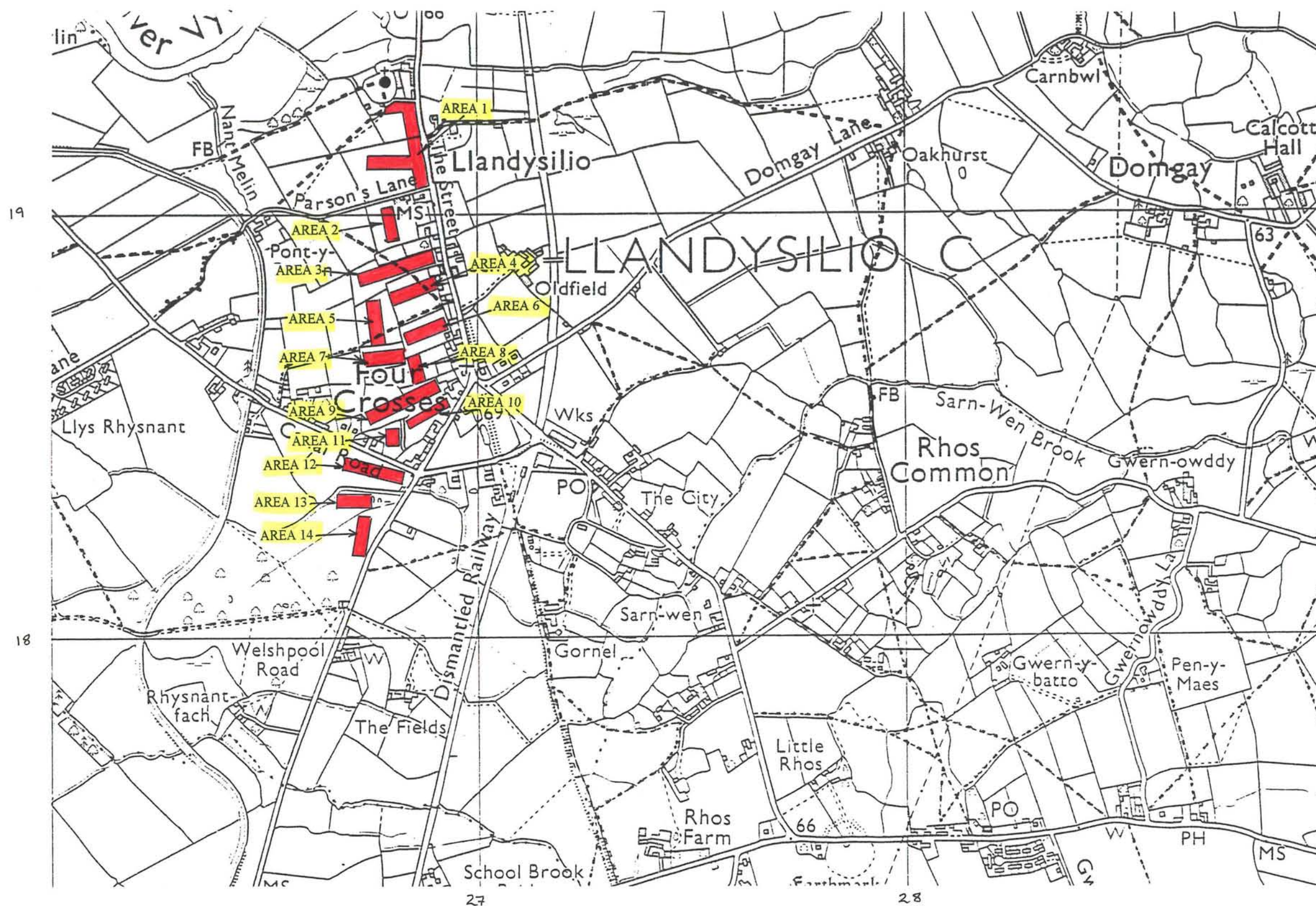
Subject Geophysical Survey
Four Crosses Bypass, Powys
General Location Plan

Figure 1

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DATE: August 1997

CLIENT: CLWYD-POWYS ARCHAEOLOGICAL TRUST

FIGURE: 2

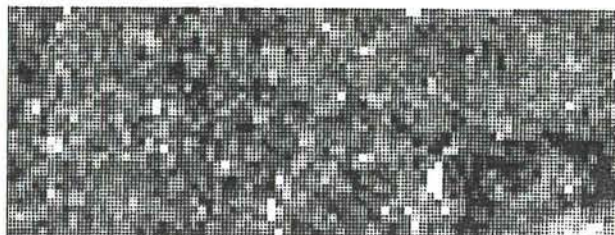
SCALE: 1:10 000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Detailed Location Plan

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Resistivity data

Plotting parameters

Minimum -10Ω (white)

Maximum $+10\Omega$ (black)



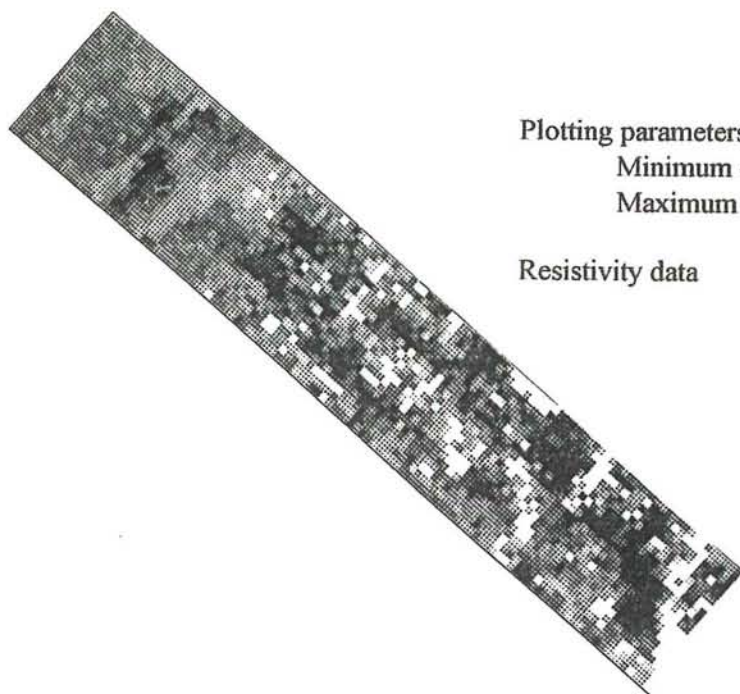
Plotting parameters

Minimum -2nT (white)

Maximum $+2\text{nT}$ (black)

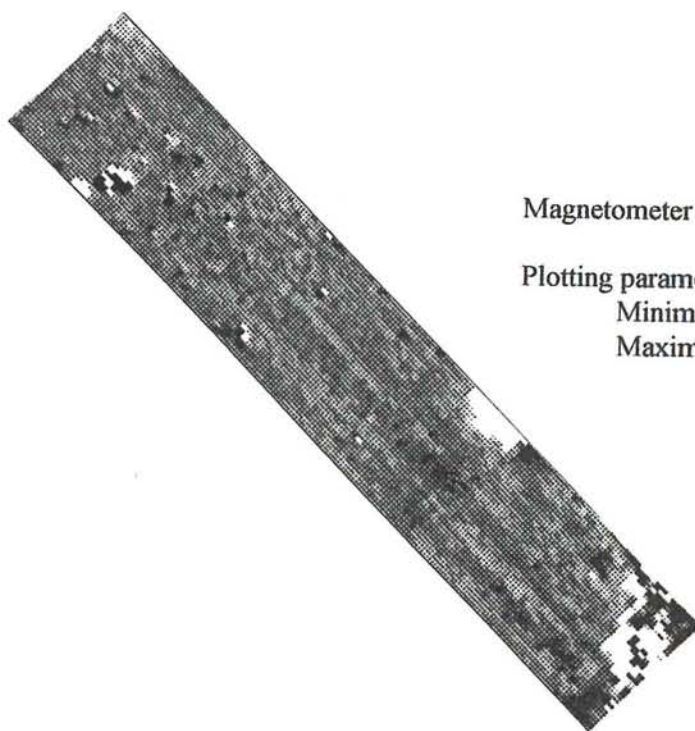
Magnetometer data

| | | |
|------------------|--|--|
| Date August 1997 | Client CLWYD-POWYS ARCHAEOLOGICAL TRUST | STRATASCAN TM TILTRIDGE FARM UPPER HOOK ROAD UPTON UPON SEVERN WORCESTERSHIRE WR8 0SA UK TELEPHONE (01684) 592266 FAX (01684) 594142 |
| Scale 1:1000 | Subject Geophysical Survey Four Crosses Bypass, Powys Comparative plot of processed data | |
| Figure 3 | Area 2 | |



Plotting parameters
Minimum -10Ω (white)
Maximum $+10\Omega$ (black)

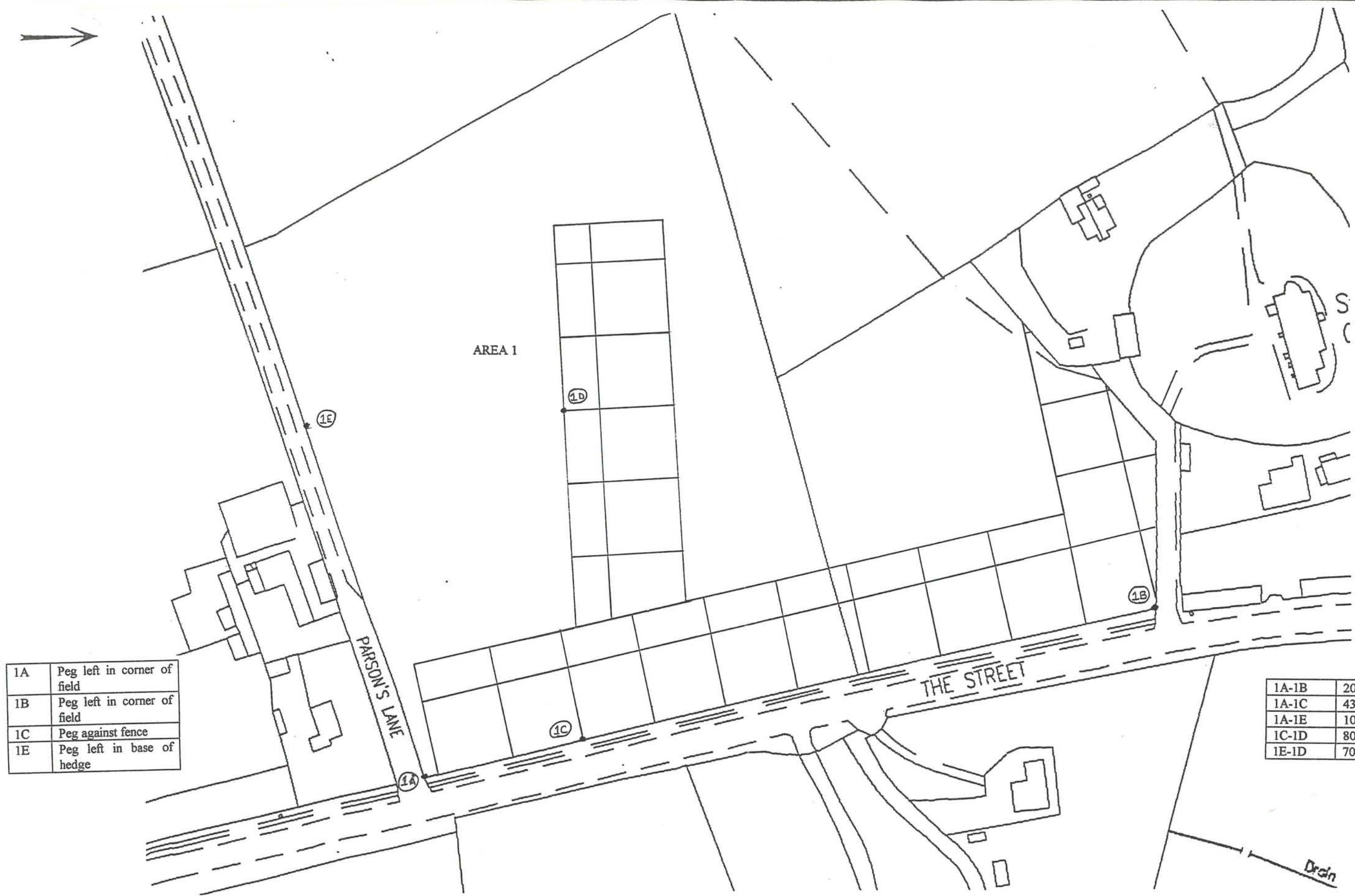
Resistivity data



Magnetometer data

Plotting parameters
Minimum $-2nT$ (white)
Maximum $+2nT$ (black)

| | | | | |
|--------|-------------|---------|---|--|
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| Scale | 1:1000 | Subject | Geophysical Survey Four Crosses Bypass, Powys Comparative plot of processed data Area 10 | |
| Figure | 4 | | | |



| | |
|----|-----------------------------|
| 1A | Peg left in corner of field |
| 1B | Peg left in corner of field |
| 1C | Peg against fence |
| 1E | Peg left in base of hedge |

| | |
|-------|------|
| 1A-1B | 200m |
| 1A-1C | 43m |
| 1A-1E | 100m |
| 1C-1D | 80m |
| 1E-1D | 70m |

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FIGURE: 5

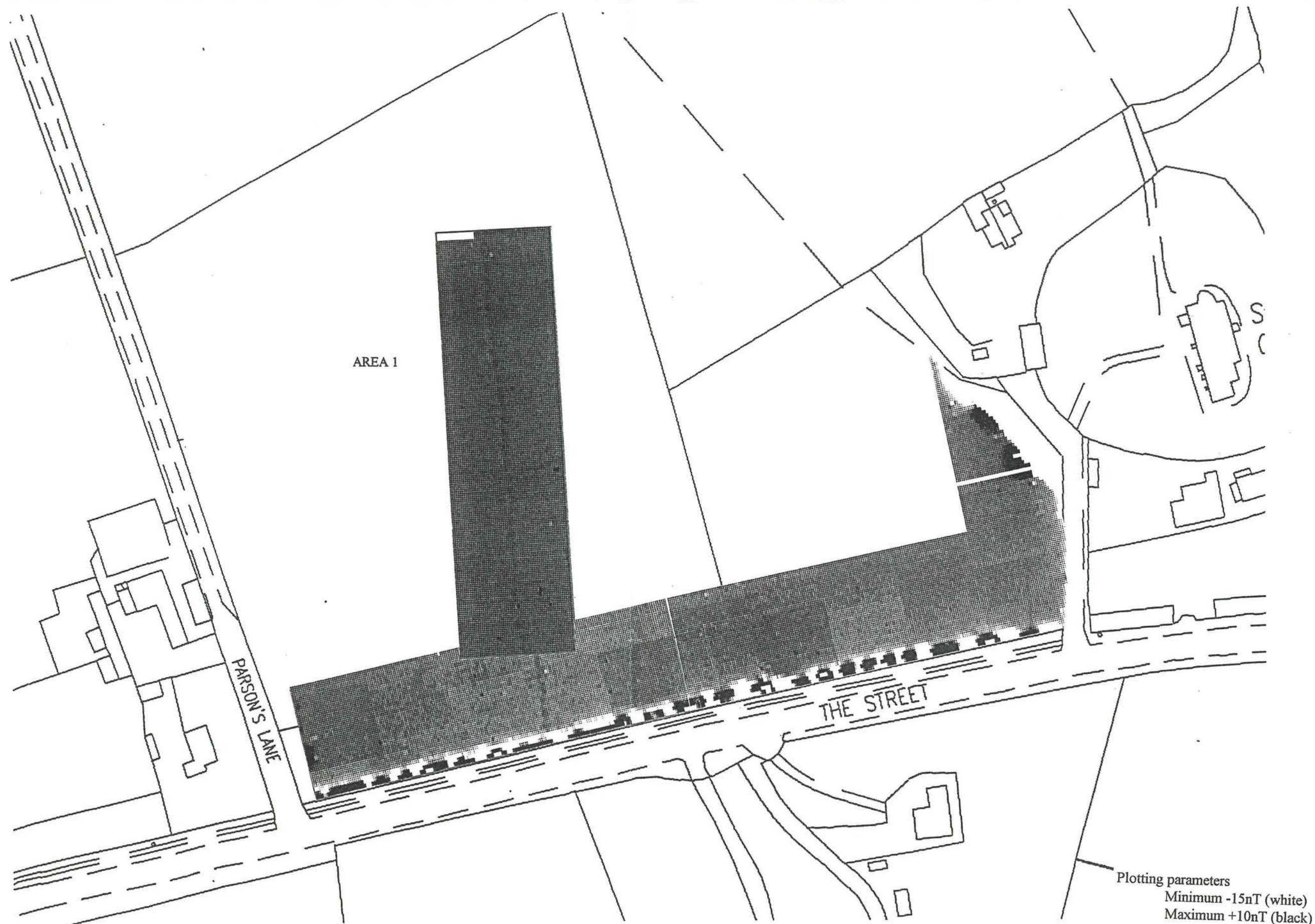
SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Site plan showing location of survey grids and referencing - Area 1

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FIGURE: 6

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Plot of raw magnetometer data - Area 1

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Plotting parameters 100nT/cm
 Positive values displace above the trace line
 Hidden lines have not been plotted

DATE: August 1997

CLIENT: CLWYD-POWYS ARCHAEOLOGICAL TRUST

FIGURE: 7

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
 Trace plot of raw magnetometer data showing positive values only - Area 1

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Plotting parameters -100nT/cm
 Negative values displace above the trace line
 Hidden lines have not been plotted

DATE: August 1997

CLIENT: CLWYD-POWYS ARCHAEOLOGICAL TRUST

FIGURE: 8

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
 Trace plot of raw magnetometer data showing negative values only - Area 1

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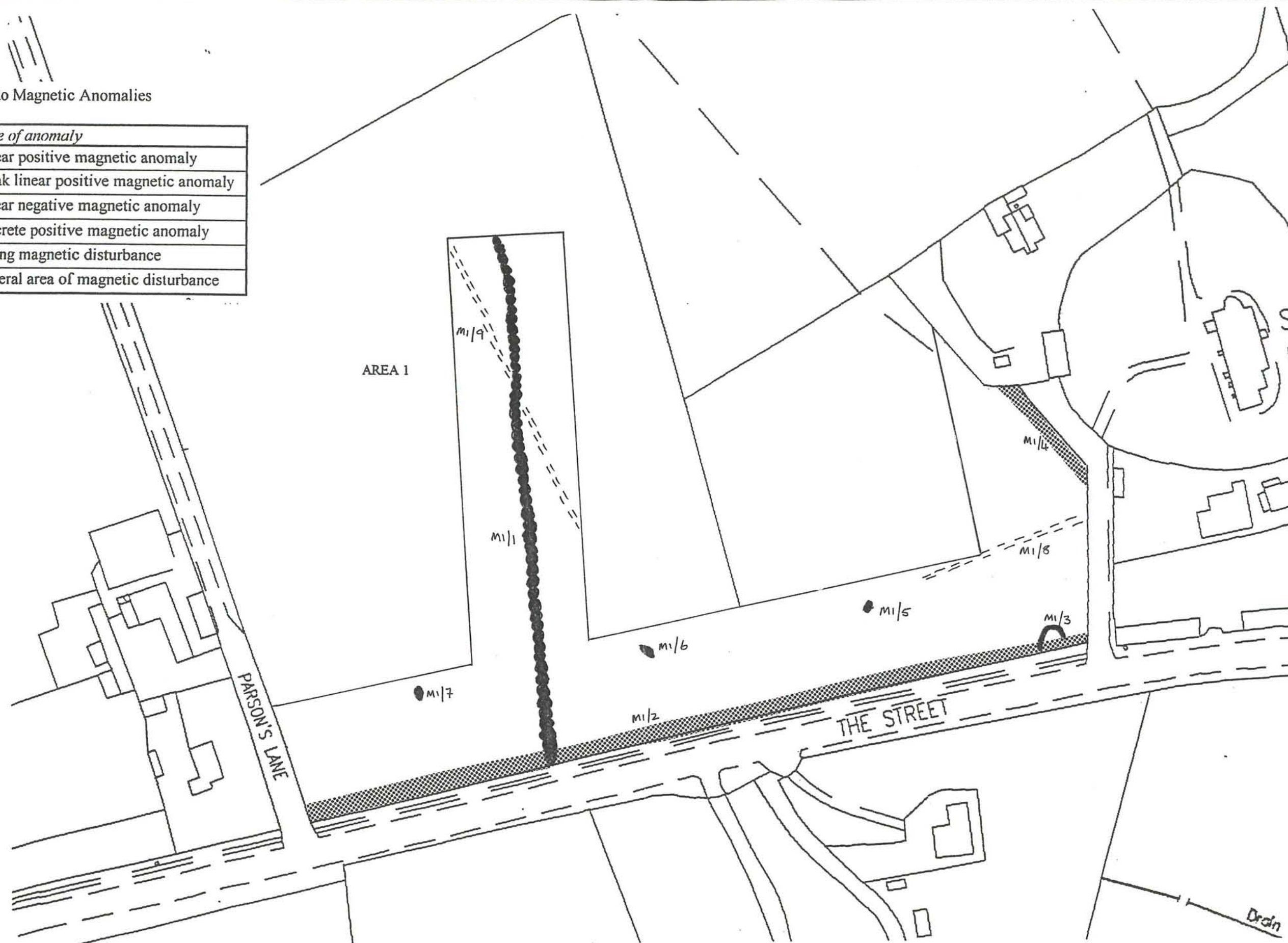
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| | | | | |
|-------------------|---|-----------|--|--|
| DATE: August 1997 | CLIENT: CLWYD-POWYS ARCHAEOLOGICAL TRUST | FIGURE: 9 | STRATASCAN GEOPHYSICAL & SPECIALIST SURVEY SERVICES | TILTRIDGE FARM UPPER HOOK ROAD UPTON UPON SEVERN WORCESTERSHIRE WR8 0SA UK TEL: 01684 592266 FAX: 01684 594142 EMAIL: STRATASCAN@AOL.COM |
| SCALE: 1:1000 | SUBJECT: Geophysical Survey - Four Crosses By-pass, Powys Plot of processed magnetometer data - Area 1 | | | |



| Symbol | Type of anomaly |
|--------|---------------------------------------|
| | Linear positive magnetic anomaly |
| | Weak linear positive magnetic anomaly |
| | Linear negative magnetic anomaly |
| | Discrete positive magnetic anomaly |
| | Strong magnetic disturbance |
| | General area of magnetic disturbance |



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FIGURE: 10

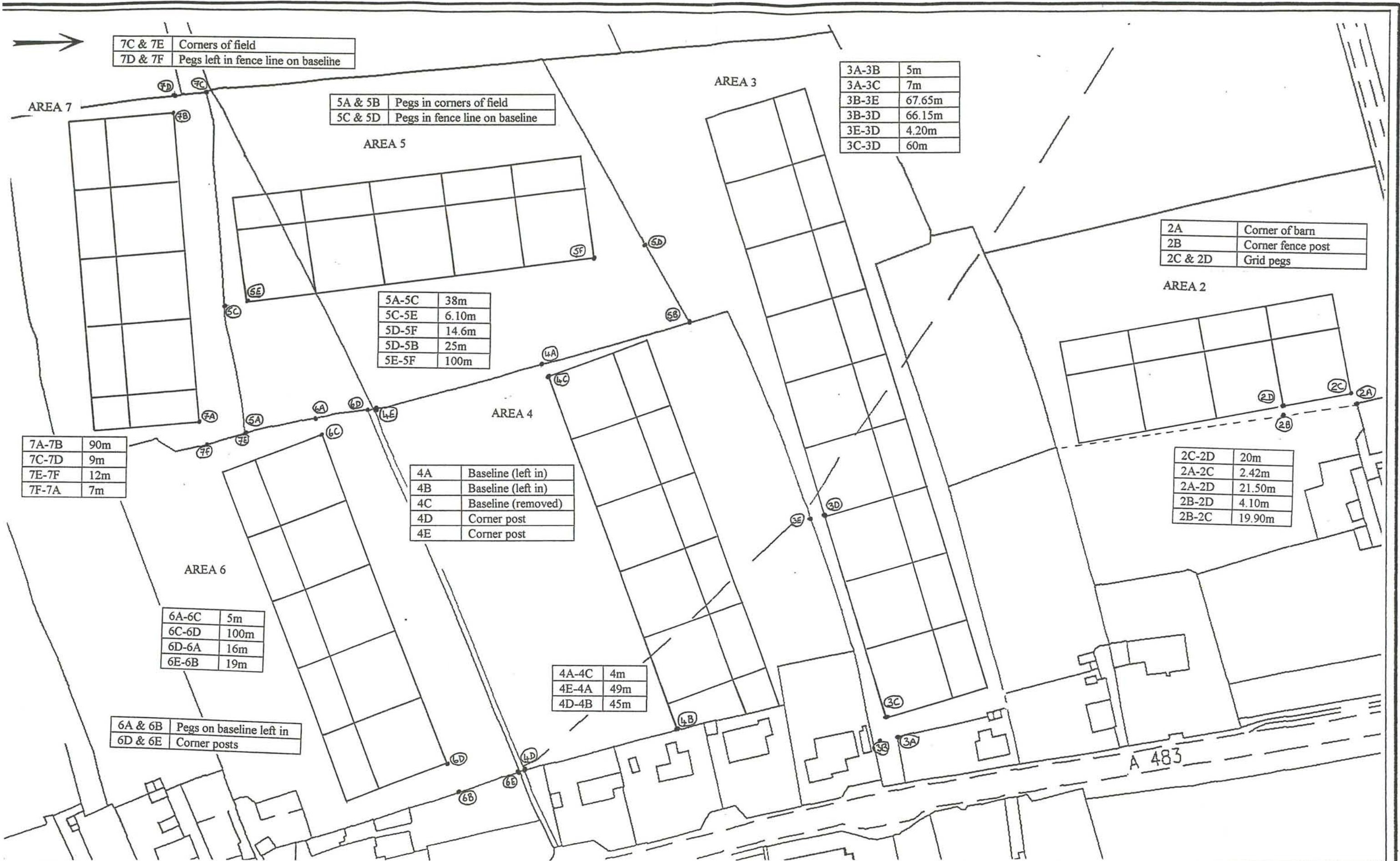
SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass - Powys
Abstraction of Magnetic Anomalies - Area 1

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FIGURE: 11

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Site plan showing survey areas and referencing - Areas 2 to 7

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FIGURE: 12

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Plot of raw magnetometer data - Areas 2 to 7

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FIGURE: 13

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Trace plot of raw magnetometer data showing positive values only - Areas 2 to 7

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FIGURE: 14

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Trace plot of raw magnetometer data showing negative values only - Areas 2 to 7

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Plotting parameters
 Minimum -2nT (white)
 Maximum +2nT (black)

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FIGURE: 15

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses By-pass, Powys
 Plot of processed magnetometer data - Areas 2, 3, 4, 5, 6 and 7

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FIGURE: 16

SCALE: 1:1000

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Abstraction of Magnetic Anomalies - Areas 2 to 7

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FIGURE: 17

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Site plan showing survey areas and referencing - Areas 8 to 11

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FIGURE: 18

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Plot of raw magnetometer data - Areas 8 to 11

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FIGURE: 19

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Trace plot of raw magnetometer data showing positive values only - Areas 8 to 11

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FIGURE: 20

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Trace plot of raw magnetometer data showing negative values only - Areas 8 to 11

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FIGURE: 21

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses By-pass, Powys
Plot of processed magnetometer data - Areas 8, 9, 10 and 11

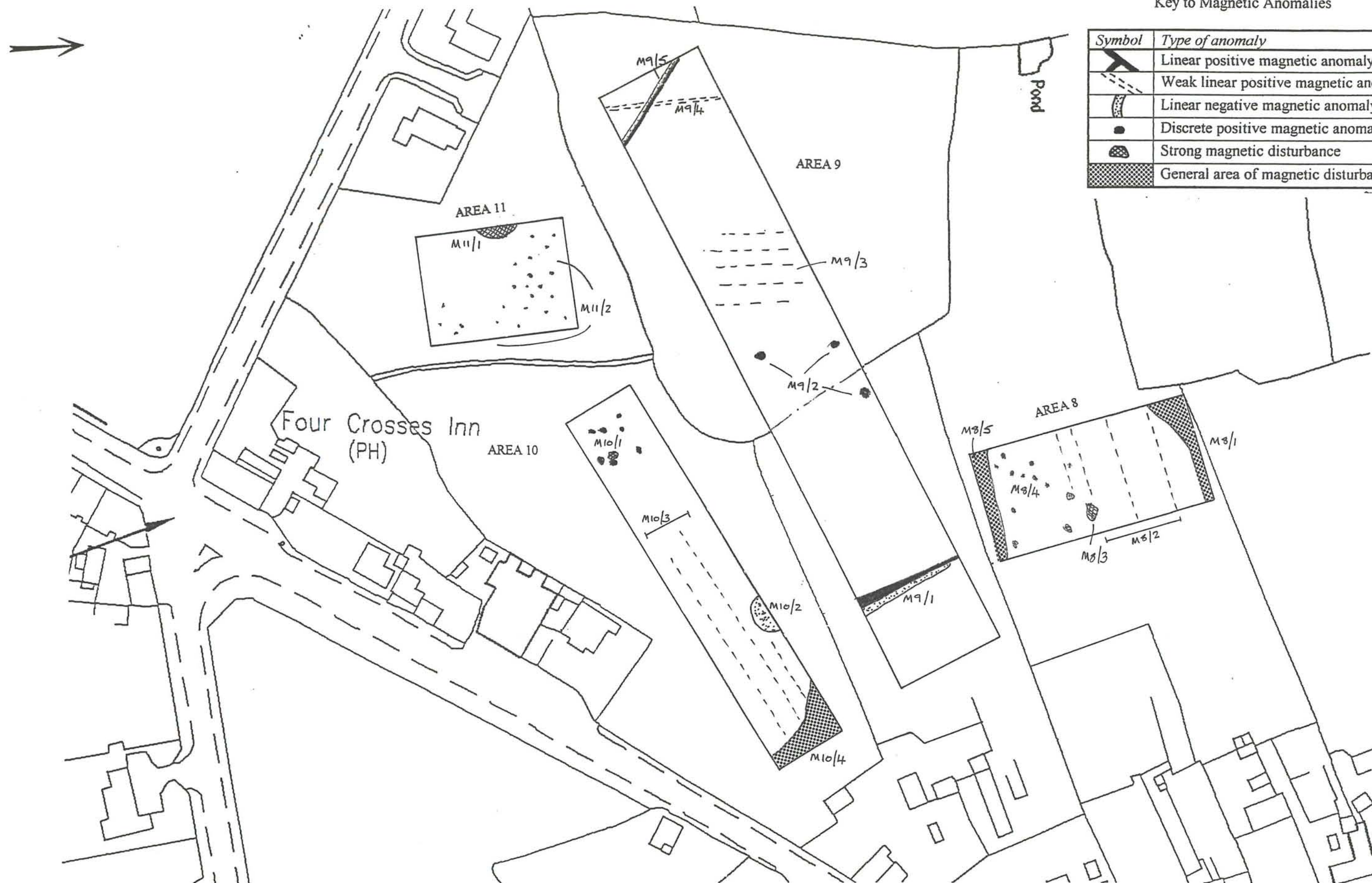
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Key to Magnetic Anomalies

| Symbol | Type of anomaly |
|--------|---------------------------------------|
| | Linear positive magnetic anomaly |
| | Weak linear positive magnetic anomaly |
| | Linear negative magnetic anomaly |
| | Discrete positive magnetic anomaly |
| | Strong magnetic disturbance |
| | General area of magnetic disturbance |



DATE: August 1997

CLIENT: CLWYD-POWYS ARCHAEOLOGICAL TRUST

FIGURE: 22

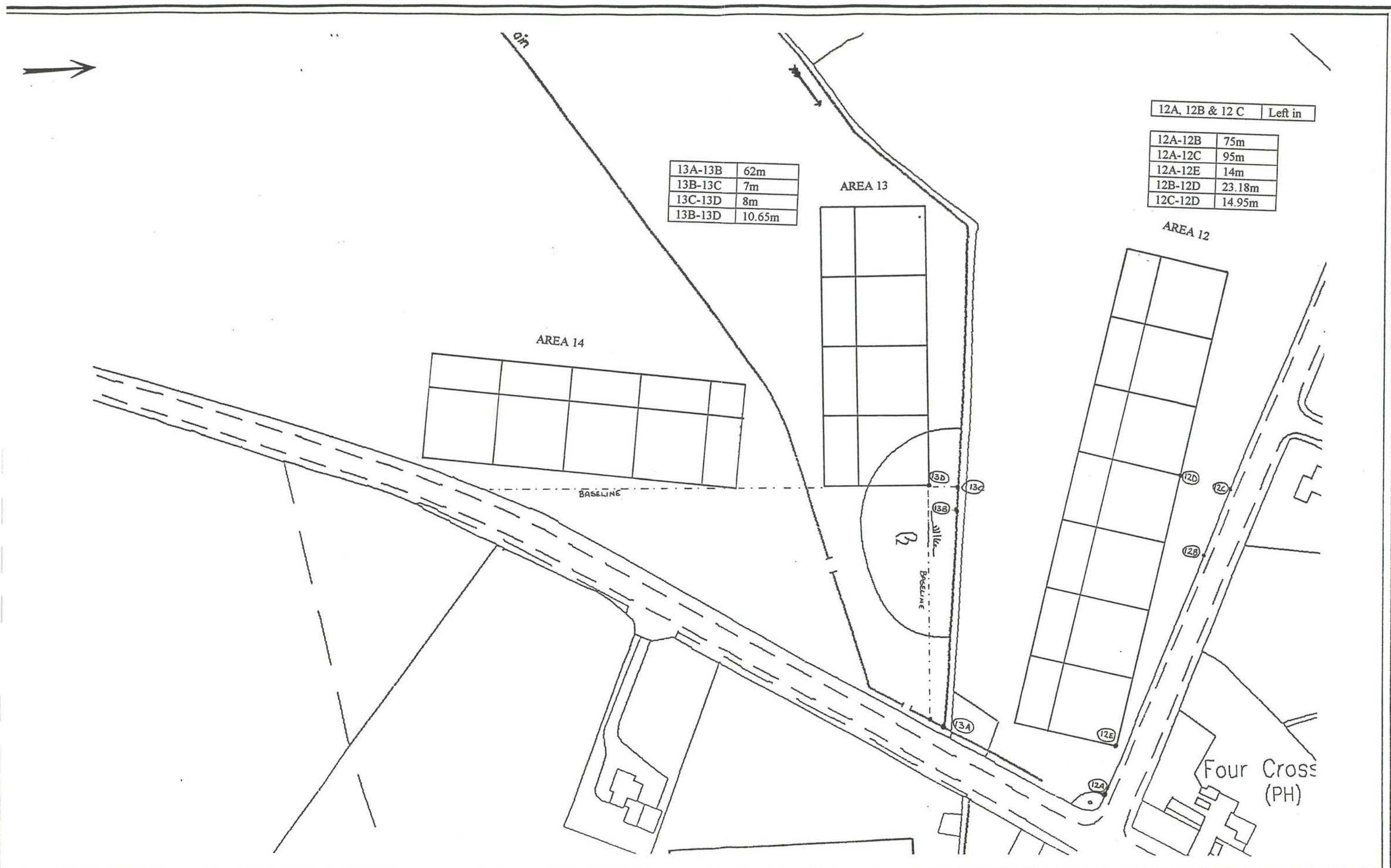
SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Abstraction of Magnetic Anomalies - Areas 8 to 11

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FIGURE: 23

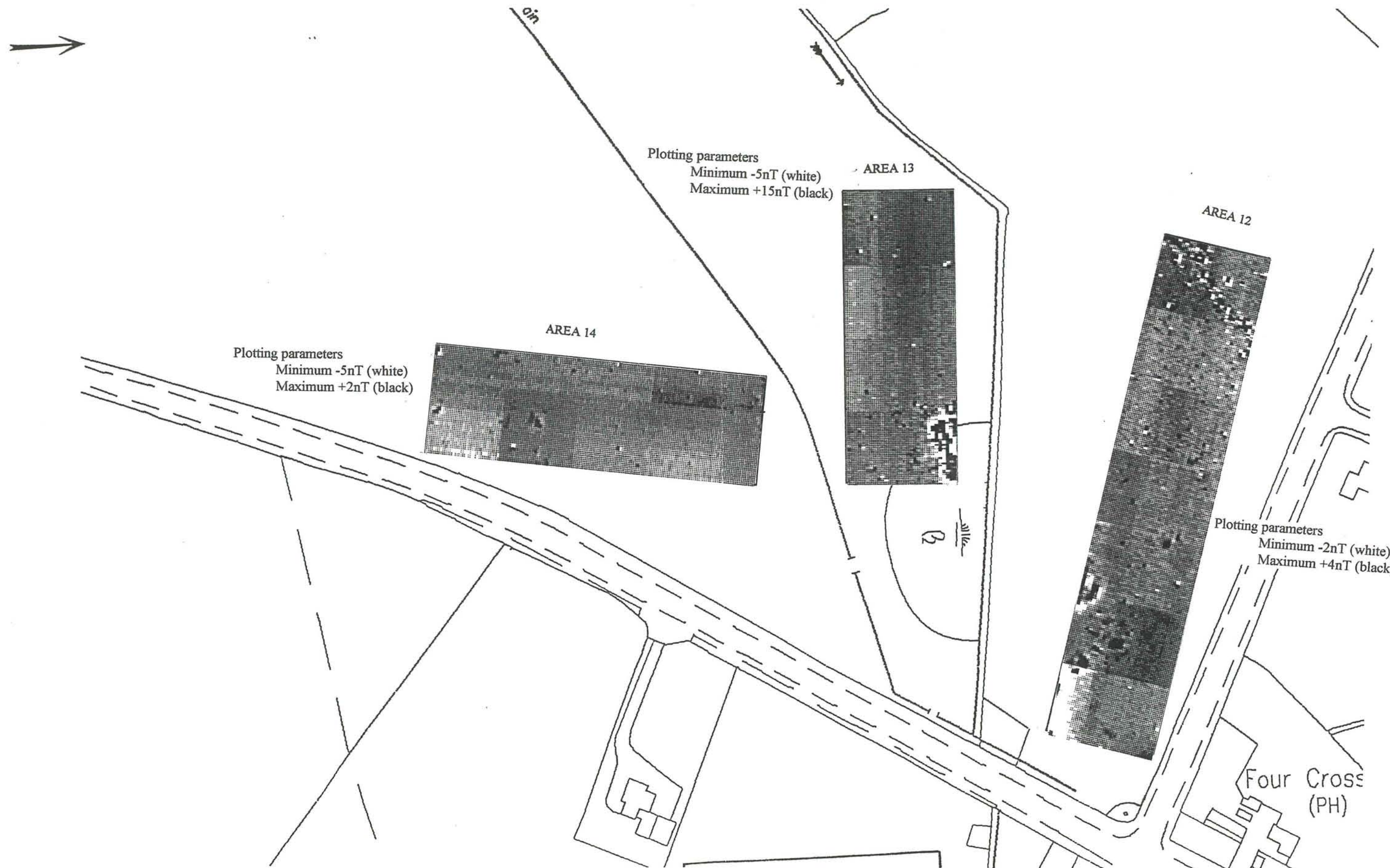
SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Site plan showing survey areas and referencing - Areas 12 to 14

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DATE: August 1997

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FIGURE: 24

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
Plot of raw magnetometer data - Areas 12 to 14

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FIGURE: 25

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
 Trace plot of raw magnetometer data showing positive values only - Areas 12 to 14

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Plotting parameters -40nT/cm
 Negative values displace above the trace line
 Hidden lines have not been plotted

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FIGURE: 26

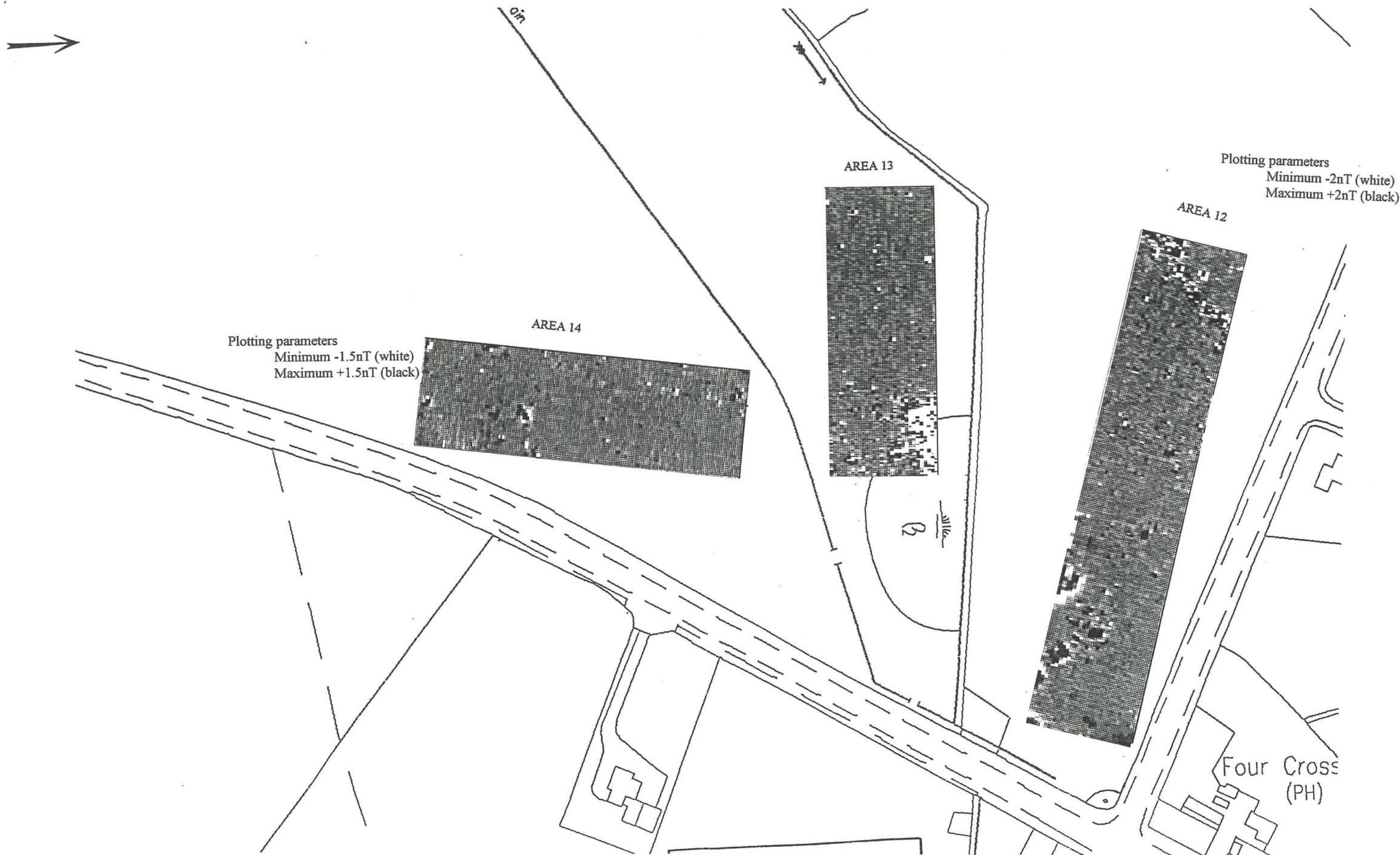
SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass, Powys
 Trace plot of raw magnetometer data showing negative values only - Areas 12 to 14

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FIGURE: 27

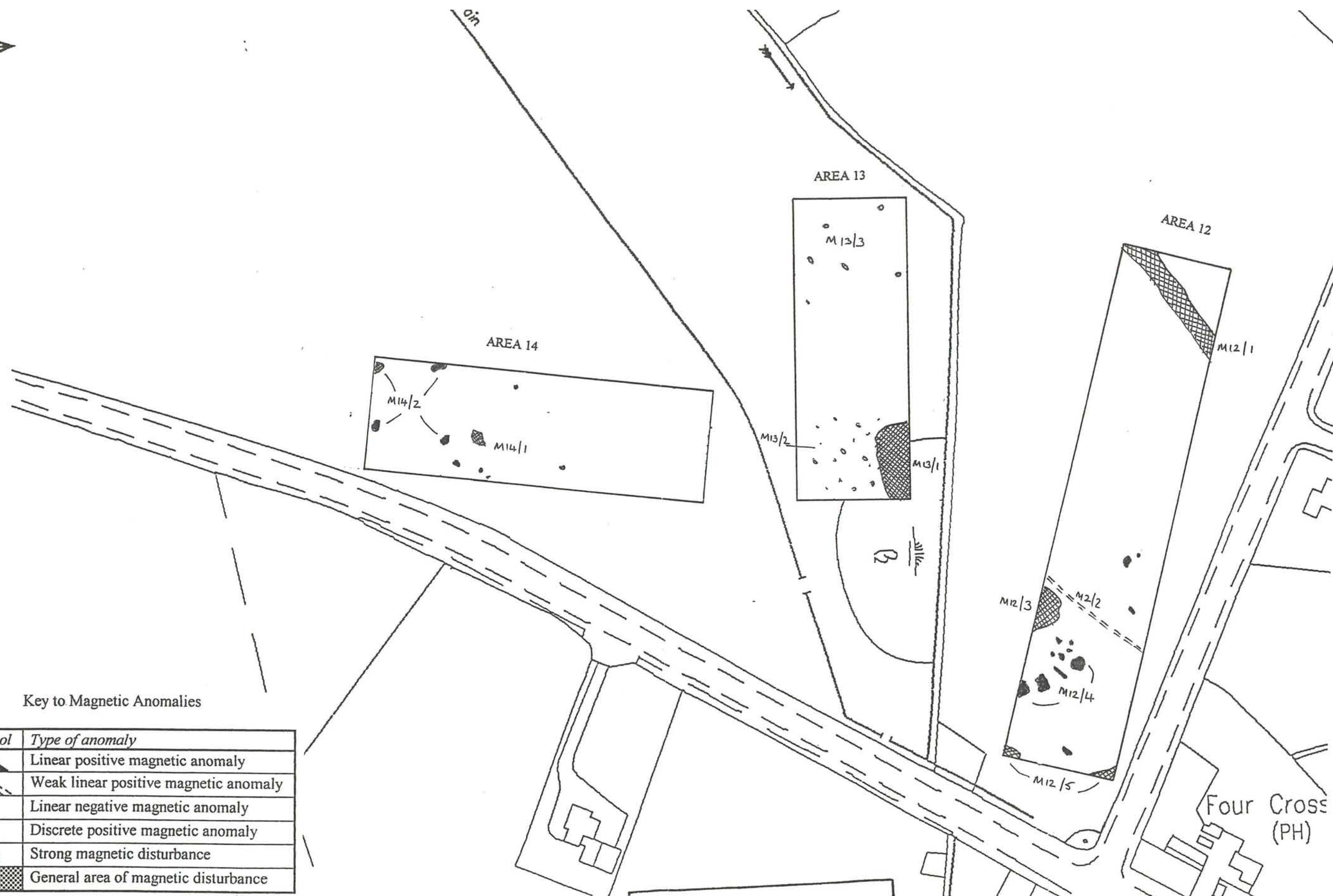
SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses By-pass, Powys
Plot of processed magnetometer data - Areas 12, 13 and 14

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Key to Magnetic Anomalies

| Symbol | Type of anomaly |
|--------|---------------------------------------|
| | Linear positive magnetic anomaly |
| | Weak linear positive magnetic anomaly |
| | Linear negative magnetic anomaly |
| | Discrete positive magnetic anomaly |
| | Strong magnetic disturbance |
| | General area of magnetic disturbance |

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FIGURE: 28

SCALE: 1:1000

SUBJECT: Geophysical Survey - Four Crosses Bypass - Powys
Abstraction of Magnetic Anomalies - Areas 12 to 14

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