NET 2: Area B16 - Chilwell Park & Ride, Site of Attenuation Pond: **Results of Archaeological Gradiometer Survey**

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1 Introduction

This report details the archaeological gradiometer survey of the Net 2 Area B16 Attenuation Pond development area (Figure 1, NGR 449800, 336000; full regional location plan given in Archaeological Project Services 2012). The gradiometer survey was conducted over this area to detect archaeological remains and must be viewed in terms of an addendum to a larger geophysical survey report for the area (Archaeological Project Services 2012). Although the techniques employed on this survey area similar to the original survey, a discrete materials and methods section is given in this report. However, the interpretation scheme has been followed that was utilised in the original report.

2 Geology

The development area is located on a solid geology of Mercia Mudstone of Triassic origin. No drift geologies are recorded above the Mercia Mudstone. Consequently, soil profiles are liable to thin (c. <1m) above this Pliocene land-surface.

3 Survey Aims and objectives

This gradiometer survey aimed to provide a magnetic map of the development area, for the definition of archaeological features.

4 Survey methodology

4.1 Field methodology: gradiometer survey

This survey used a Bartington Grad 601 gradiometer. This gradiometer has two sensor tubes with a 1m separation between tubes. Each sensor tube has a 1m separation between sensors. A maximum depth of penetration into the sediment profile is 1.5m, although features within the top 1m are routinely identified. The gradiometer was balanced on site by scanning for a location of low magnetic response over an area of $1m^2$. The gradiometer was then calibrated to the earth's magnetic field and the sensor tubes calibrated to each other. A maximum tolerance of 0.5nT (nano tesla) between sensor tubes was used in the calibration, although a lower level of sensor tolerance was routinely achieved.

The 0.6ha survey area was divided into c. 18 survey grids, each 30m by 30m. The traverse interval was 1m, with a sample interval of 0.25m, using a 'zig-zag' survey method. All data were logged automatically and collected using real time survey, pacing between grid baselines.

4.2 Processing methodology

All the collected data were downloaded into the Grad 601 software. The data were then imported into 'Archaeosurveyer' software for analysis. A processing sequence of data clipping, destriping, despiking and interpolation was used to analyse the data within

Archaeosurveyer before export of raw and processed data (ascii files) into ArcGIS (ver. 8.3) for georeferencing, interpretation and presentation.

4.3 Generic materials and methods

All data from the geoprospection survey was imported into ArcGIS (ver. 8.3). This facilitated data integration with other key data sets such as the OS data and site engineering plans.

4.4 Interpretation

The original interpretation scheme is kept (Archaeological Project Services, 2012), but is broken down into 2 component tables for the survey area, being groupings of anomalies of probable archaeological original and groupings of anomalies of possible archaeological origin. A further number of ambiguous positive and negative anomalies have been digitised.

5 Results

The gradiometer survey produced a good quality data set across the survey area (Figures 2, 3 and 4). The interpretation of these results provided a range of anomalies of probable and possible archaeological origin. Some of the survey area was not surveyed due to interference from metal fencing placed around the attenuation pond.

5.1 Anomaly Groups of probable archaeological origin

Group1 is a group of positive anomalies running north/south. This is interpreted as a probable field boundary, probably a 'cut' ditched feature, of unknown date.

Group 2 is group of other linear features, which generally have a mixed magnetic signal, except for polygon 11 which is clearly positive. These linear features may or may not be related. They probably represent older ditched boundaries of unknown date.

Group 3 is a potential small rectilinear feature, composed of positive anomalies 0 and 1, probably representing 'cut ditch' features. Anomalies 2 and 3 may be related to this feature, but the relationship from the gradiometer data is unclear.

Group 4 is predominantly two largish polygons of magnetic disturbance, possibly representing building debris, rubble, potentially mixed colluvium or made ground. Within this mass of magnetic signal are the positive anomalies 123 and 124, associated with the negative anomalies 120, 121 and 122. These positive anomalies might represent a discrete feature/s within this larger spread of material.

Group 5 is second area of magnetic disturbance. This is again possible building debris, rubble, potentially mixed colluvium or made ground.

Group	Polygon Numbers	Summary interpretation and figure
1	Positive: 12, 21, 39, 40, 47, 48	Large cut feature, possible field boundary
2	Positive: 11 Magnetic disturbance: 4, 5, 6, 7, 10, 43	Group of other linear features, relationship between features is unclear
3	Positive: 0, 1, 2 Negative: 3	Possible small enclosure
4	Magnetic disturbance: 45, 44 Positive: 123, 124 Negative 120, 121, 122	Large area of magnetic disturbance – possible building debris/made ground
5	Magnetic disturbance: 109 Negative: 107, 108	Second area of magnetic disturbance – possible building debris/made ground

Table 1: Magnetic anomaly groups for features of probable archaeological origin.

5.2 Anomaly Groups of possible archaeological origin

Group 6 is composed of both positive and negative anomalies. Although this group of polygons only represent possible archaeological features, the overall shape of the anomaly grouping is rectilinear/ovoid, indicating a possible archaeological structure.

Group 7 is a further group of both positive and negative anomalies. Again, this grouping only represents possible archaeological features.

Group 8 is another group of both positive and negative anomalies. Again, this grouping only represents possible archaeological features.

Group 9 is another group of both positive and negative anomalies. Again, this grouping only represents possible archaeological features.

Group 10 is composed of a number of possible linear features across the survey area. These are less well defined than Groups 1 and 2, but are of possible archaeological origin. These polygons might represent further 'cut feature ditches', due to the positive polarity of these anomalies.

Group 11 is in the south-eastern corner of the development area and could represent possible archaeological remains.

Group 12 is a possible 'cut feature', which has a rectilinear form, a possible small ditched structure, c. 5m across. However, the form of this feature is vague, hence it is defined as only 'possible' archaeology'.

Group 13 are anomalies which are not in other groupings, all of possible archaeological origin.

Group	Polygon Numbers	Summary interpretation and figure
6	Positive: , 68, 75, 78, 81, 82101 Negative: 69, 70, 71, 73, 74, 76, 79, 80, 84, 102	Possible feature of composed of both positive and negative anomalies
7	Positive: 30, 31, 33, 36, 37, 41, 42 Negative: 32, 34, 38	Group of anomalies representing undefined possible archaeology
8	Positive: 49, 50, 52 Negative: 51	Group of anomalies representing undefined possible archaeology
9	Positive: 13, 15, 18, 110 Negative: 14, 16, 17	Group of anomalies representing undefined possible archaeology
10	Positive: 8, 19, 20, 23, 63, 67, 69, 104, 105	Group of possible linear features
11	Positive: 66 Negative: 62, 65	Group of anomalies representing undefined possible archaeology
12	Positive: 87	Possible structure
13	Positive: 27, 29, 46, 60, 95, 98, 114 Negative: 26, 27, 61, 97, 99, 111, 112	Other anomalies not feature in the other groupings

Table 2: Magnetic anomaly groups for features of possible archaeological origin.

6 Discussion

In general terms, there are a large number of probable and possible archaeological features considering the small size of the survey area. Most of these features are linear in nature, and probably represent land divisions and field boundaries, namely Groups 1 and 2. However, other polygons potentially indicate archaeological features associated with settlement/building debris, particularly anomaly Group 3 and 4. However, there is also a mass of other anomaly groups that represent possible archaeological remains. Given the small nature of the survey area it is difficult to further the interpretation of these other possible features. The density and nature of these results is similar to that revealed by the gradiometer survey previously undertaken (IBID 2012).

7 Conclusions and recommendations

The gradiometer survey has revealed a high density of magnetic anomalies of probable and possible archaeological origin. As a consequence the area of the attenuation pond should be stripped in a manor sensitive to the archaeological remains.

8 References

Archaeological Project Services. 2012. (*Net Phase 2). Toton Park and Ride, Toton Lane, Nottingham, Geophysical Survey*. Unpublished Report written by S J Malone for SLR Consulting

10 Gradiometer processing log

Stats (processed data):
Grid Size: 30.00 m x 30.00 m
X Interval: 0.25 m
Y Interval: 1.00 m
Max: 5.78
Min: -5.25
Std Dev: 0.83
Mean: 0.02
Median: 0.00
Dummay data value: 32702

Processes: 7
1 Base Layer
2 DeStripe Median Traverse: Grids: All
3 Clip at 1.00 SD
4 Despike Threshold: 1 Window size: 1x3
5 De Stagger: Grids: All Mode: Outbound By: 2 intervals
6 Clip at 3.00 SD
7 Interpolate: Match X & Y Doubled.

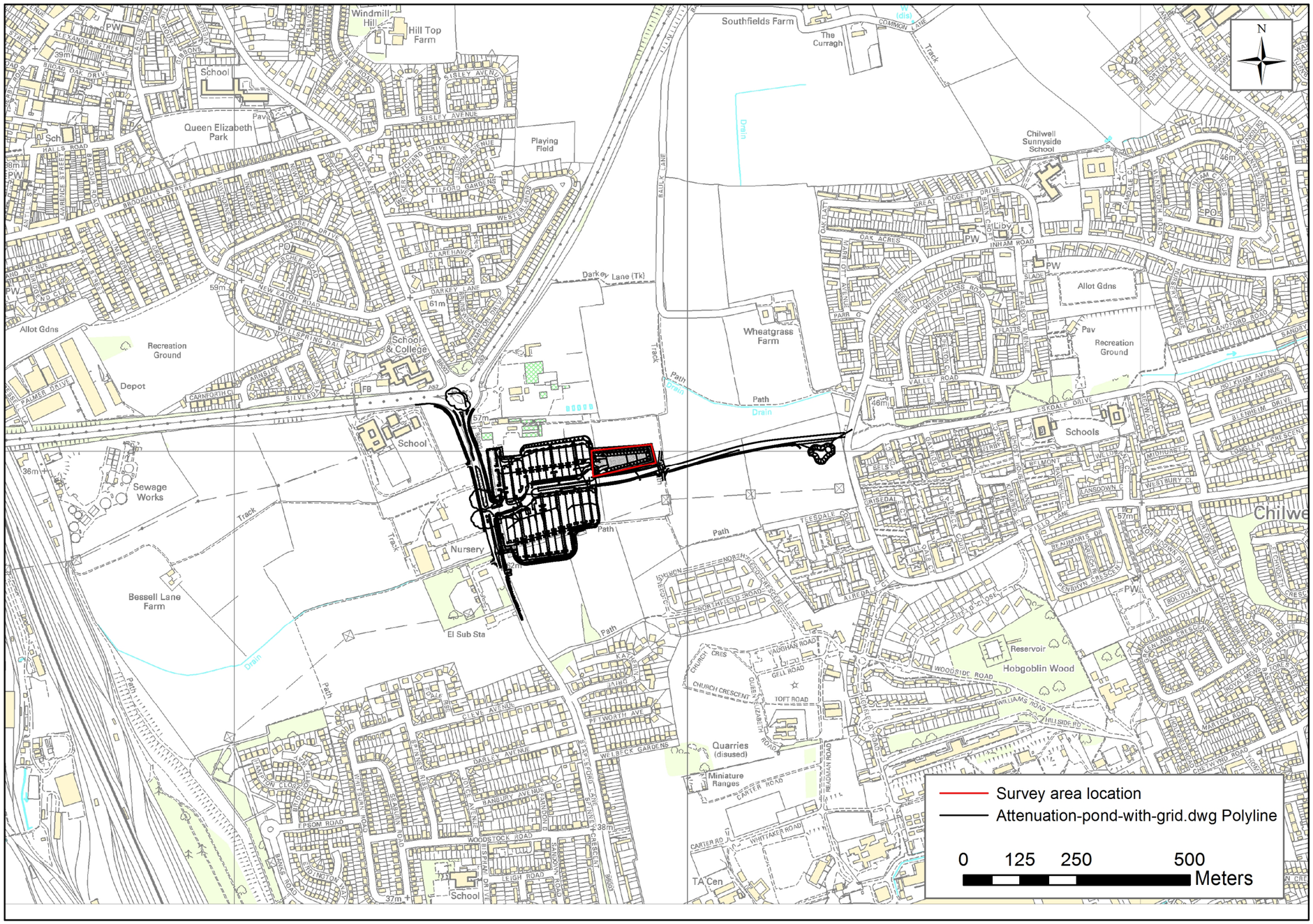

Figure 1: The site location (HMSO Crown Copy Right – used with permission (HMSO Crown Copyright, OS licence number 100019139).

Figure 2: Raw gradiometer data plot for the attenuation pond survey.

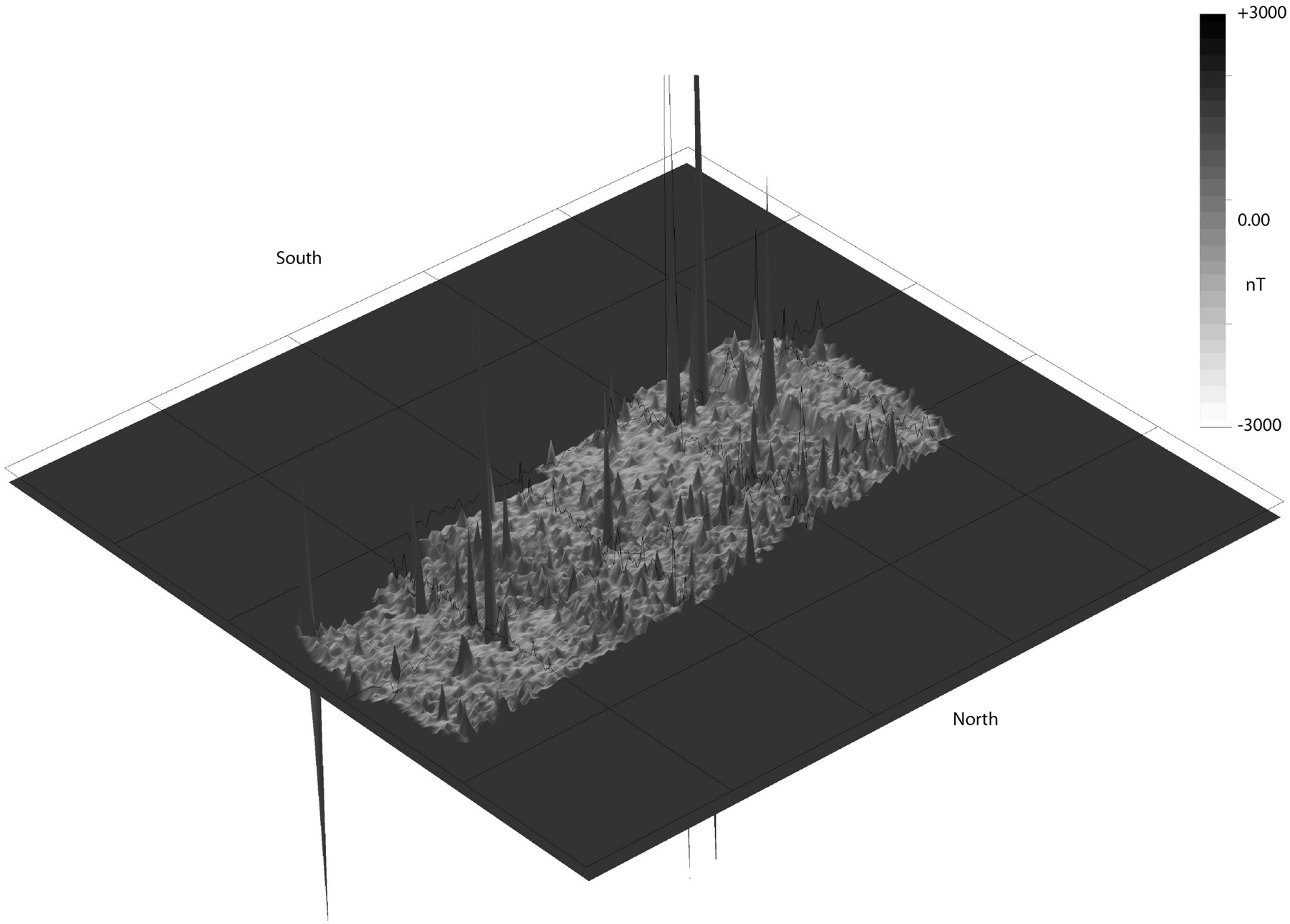

Figure 3: Data trace plot for the attenuation pond survey.

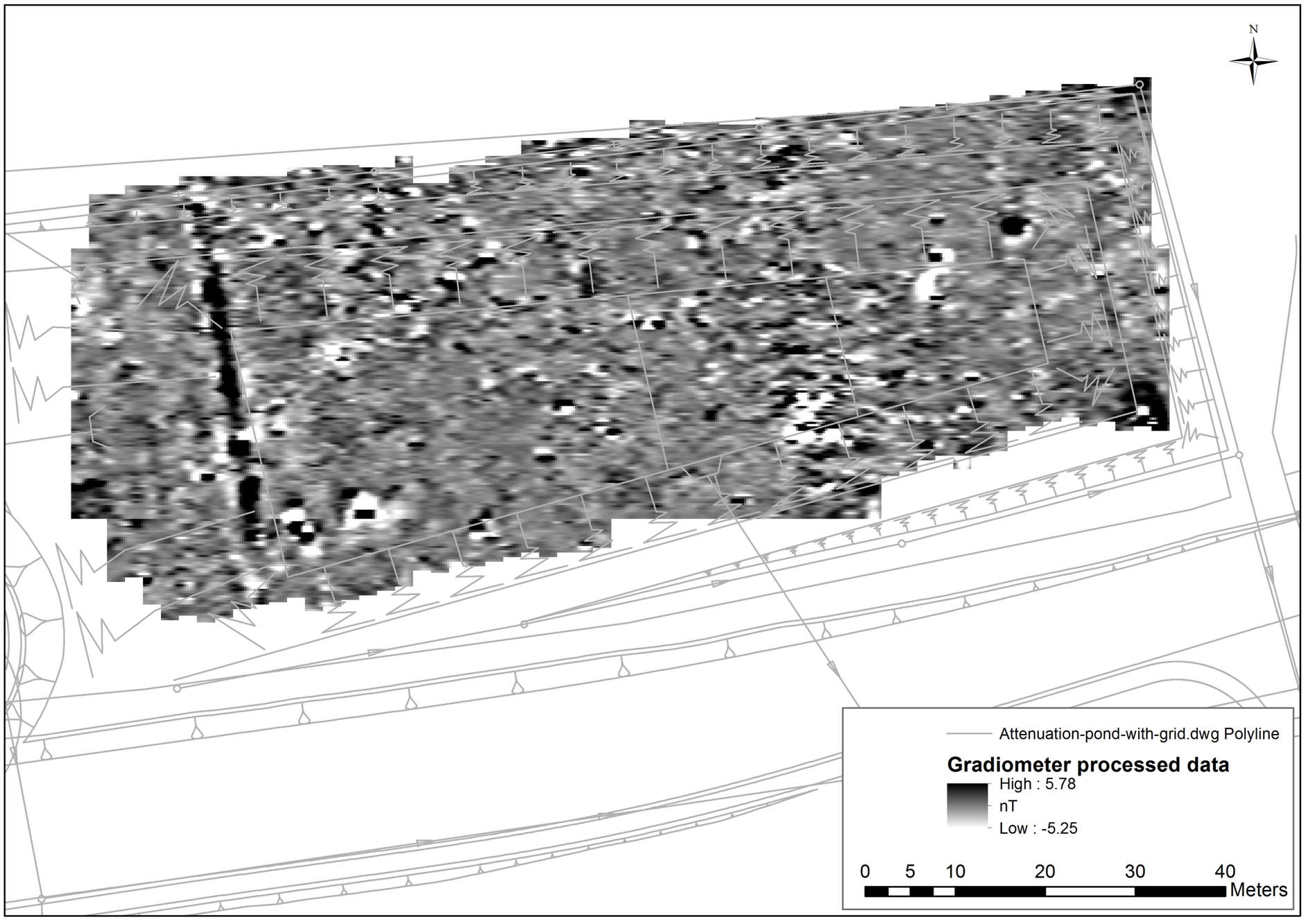

Figure 4: Gradiometer data shown against the attenuation pond outline.

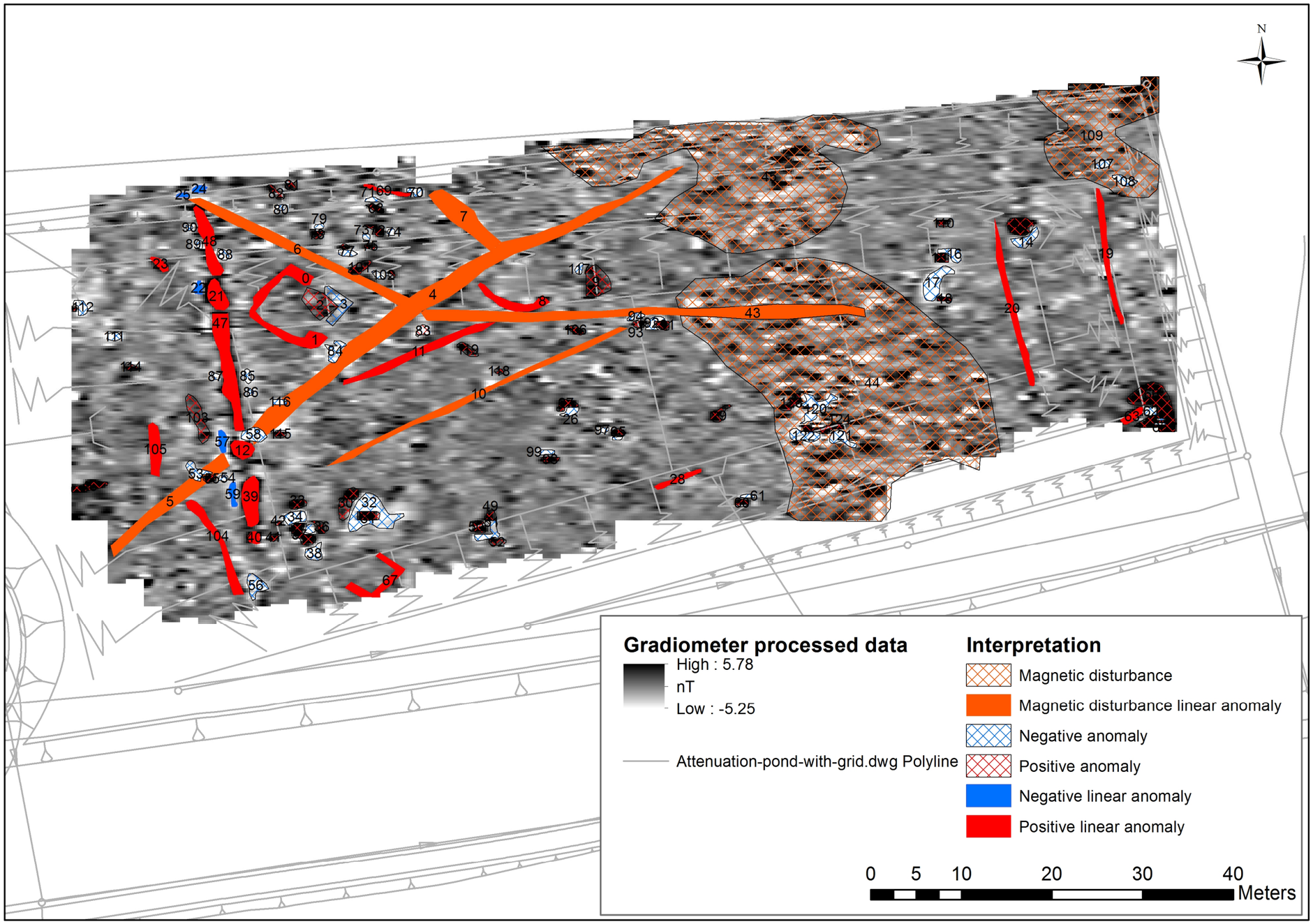

Figure 5: Gradiometer data and interpretation shown against the attenuation pond outline.

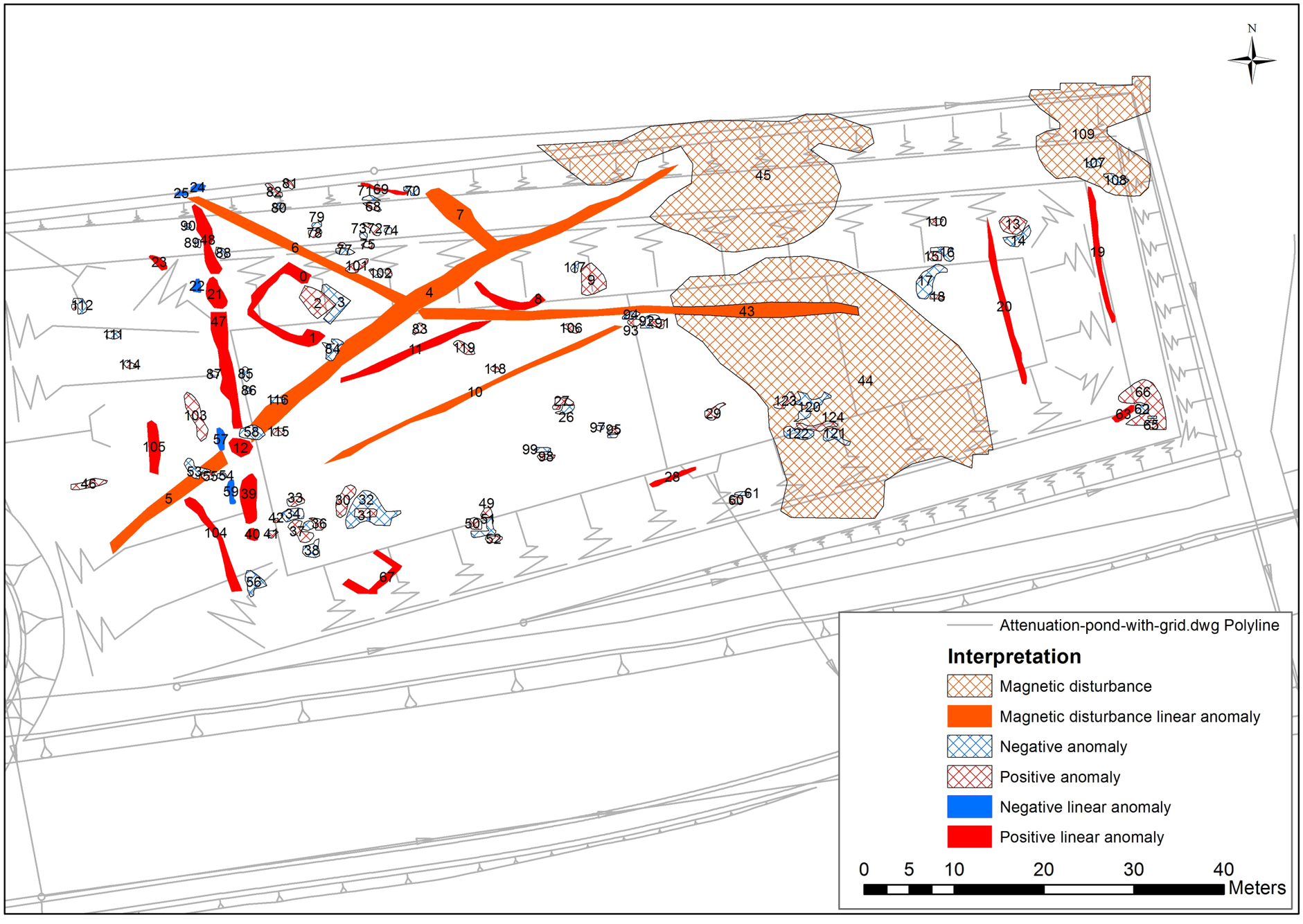

Figure 6: Interpretation shown against the attenuation pond outline.

Appendix 1

THE ARCHIVE

The Archive consists of:
1. Report text and Figures
2. Digital Data:
    ASC0017.asc processed data
    ASC0019.asc raw data

All primary records are currently kept by:
Trent & Peak Archaeology
Unit 1 Holly Lane, Chilwell,
NG9 4AB

The archive will eventually be deposited with:
Brewhouse Yard Museum,
Nottingham

Project Code: *CPA*