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The Site of the Diana, Princess of Wales Memorial Fountain, Hyde Park, London
Report on Geophysical Surveys, May 2003

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Summary

An archaeological evaluation of the proposed site of the Princess Diana Memorial Fountain, Hyde Park, London, revealed evidence of Roman settlement activity. Subsequent geophysical survey was conducted on land to the south and east of this in a bid to trace any associated building remains. Unfortunately, considerable modern interference and activity at the site has meant there is little geophysical evidence for any significant archaeology

Keywords

Geophysical Survey

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THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, London.

Report on geophysical surveys, May 2003.

Introduction

Geophysical surveys of approximately 0.95 hectares were conducted adjacent to the proposed site of the Princess Diana Memorial Fountain in Hyde Park, London. The footprint of the memorial had been subject to an archaeological evaluation by Pre-Construct Archaeology (PCA). The results of these excavations indicated that the majority of the area had been quarried out at some point, probably for gravel in the 19th century. However, on the eastern side of the development site, Iron Age and Roman pottery, ditches, and post holes indicated more noteworthy activity (PCA 2003). Specific evidence for settlement in the area derived from two periods. A rectangular enclosure dating to the late 2nd/early 3rd century AD (appearing to extend out to the east of the trench); and high concentrations of late 3rd/early 4th century Roman pottery and unabraded roof tile found within the fill of parallel enclosure ditches. This fill is interpreted as originating from the demolition of a relatively large building in the near vicinity (*ibid*).

The aim of the survey was to attempt to discover if these features continued outside the memorial area and if there was any more substantial evidence for settlement, such as building foundations.

The site (TQ 270 800) lies on deep permeable mainly fine loamy soils of the Waterstock association (Soil Survey of England and Wales 1983) developed over Taplow Terrace River Gravels (British Geological Survey 1972). At the time of the survey the area was laid out as grass parkland, planted with both mature and young trees.

Method

<u>Magnetometer survey</u>

Magnetometry was chosen in an attempt to locate further ditches. The survey was conducted with a Bartington *Grad601* magnetometer over all the shaded grid-squares on Figure 1 using the standard method outlined in note 2 of Annex 1. Plots of the data-set are presented as both an X-Y traceplot and a linear greyscale, at a scale of 1:1000 on Plan A. A plot of the data-set is superimposed over the OS base map (1:1250) on Figure 2.

The only corrections made to the measured values displayed in the plots were to zero-mean each instrument traverse to remove heading errors and to 'despike' the data through the application of a 2m by 2m thresholding median filter (Scollar *et al* 1990; 492) to reduce the detrimental effects produced by surface iron objects. In addition the lower and upper values of the data have been trimmed for presentation as traceplots.

Earth resistance

Earth resistance survey was also conducted over the whole survey area in an attempt to trace any building remains that might relate to the settlement evidence discovered during the excavations. Measurements were collected with a Geoscan RM15 resistance meter, MPX15 multiplexer and an adjustable PA5 electrode frame in the Twin-Electrode configuration. Readings were collected using the standard method outlined in note 1 of Annex 1 but with an additional mobile probe spacing of 1.0m. A greater separation of the mobile-probe electrodes forces the applied electric current to penetrate further into the ground and can detect anomalies arising from more deeply buried features (Scollar *et al* 1990, 321-4). Readings were taken at 1.0m along each traverse line. Plots of the data-set from the two mobile probe spacings are presented as both an X-Y traceplot and a linear greyscale, at a scale of 1:1000 in Plan B. A linear greyscale of the 0.5m mobile probe spacing data has been superimposed over the base OS map (1:1250) in Figure 3.

Results

Magnetometer survey

A graphical summary of the significant anomalies discussed below is provided on Figure 4a.

The magnetometer data was extremely disturbed by modern interference at the site, such as landscaping, services and ferrous debris.

A large area of noise [1] contains several linear anomalies e.g. [2-3], most probably buried pipes. This area lies to the north of a positive magnetic linear anomaly [4], which coincides with the southern edge of a path that until recently bisected this corner of parkland. Part of this former path has been dotted on the modern OS map (last updated 2002), but older maps between the 1950's and 1999 (Landmark Information Group 2003) show this as the main route from the south side of the Serpentine bridge. A pond was also laid to the north of the path – perhaps served by the pipelines recorded.

Further south, the site is criss-crossed by further services [5-6] and dotted with numerous manhole covers, all of which contribute to the overall noise level of the plot.

Other anomalies in the survey area may be archaeologically significant but it is not possible to single out any clearly unambiguous examples. Such anomalies include

[7], though the levels of disturbance here make it difficult to distinguish from other magnetic activity in the near vicinity. An extremely faint partial rectilinear anomaly [8] appears in the one relatively quiet area of the survey (see Plan A1), but the amount of interference in the rest of the data make this very weak response difficult to differentiate. A third example [9], though of greater magnetic strength, is part of an area of magnetic activity also of uncertain status but perhaps of some archaeological significance.

Earth resistance

The earth resistance survey has been severely affected by the presence of large trees planted across the site. The root systems and exposed ground beneath the branches made the ground surface almost rock-hard, severely hampering the collection of readings, particularly on the south side of the tree trunks. When readings were achieved they have been very high [R1-2] (up to ten times the highest reading in other areas).

Other modern activity has been recorded across the site, e.g. the low resistance readings at [R3], probably associated with the pipeline [2] and pond known to have existed here. Another low resistance linear [R4] correlates with the magnetic anomaly [4], and is a residual trace of the path that was laid here. A broad band of low resistance readings [R5], mainly visible in the 0.5m mobile probe spacing (near surface) data-set, correlates to a observed area of disturbed ground, possibly connected with the excavation. The linear low resistance anomaly at [R6] is close to a line of small trees and may relate to previous planting here. That at [R7] is very striking and would seem to mark a boundary ditch or path, but there are no apparent associated features enclosed by this. When compared to the magnetic results, the section of [R7] running NW-SE, correlates exactly with the location of the magnetic anomaly [5], however [R7] alters direction whereas [5] does not – suggesting perhaps that the responses originate from different features.

The area of high resistance including [R8], to the north of [R7] may indicate levelling or compaction of material against the boundary. A possible rectilinear pattern [R9] is just discernible within an area of high readings and, though probably too large to represent a single structure, may indicate rubble. Discrete areas of high resistance [R10] may relate to former planting pockets. Other areas of high and low readings form no specific patterning and may relate to other miscellaneous recent activity or to local geomorphological variations.

Conclusion

Both the magnetic and resistance survey data indicate severe disturbance by modern activity. The magnetometer survey has been largely overwhelmed by ferrous signals from disturbed ground. The earth resistance survey also shows significant contrasts but many of these may also be suspected to be of recent origin, such as the effects of tree planting and soil compaction. The similarity between the 1.0m mobile spacing (deeper) data and the 0.5m (shallow) data also indicates that there has been substantial near-surface disturbance. This can cause high, near-surface impedance resulting in very little current penetrating to a greater depth, regardless of the electrode separation. There is very little of obvious archaeological significance that can be deciphered from the plots; there is no trace of the fourth side of the rectangular enclosure or the continuation of the enclosure ditches found during the excavation. There is also no definite evidence for any building from which the fill of the ditches was thought to derive. The boundary at [R7] may prove significant and rubble may have been detected at [9]/[R9]; however, this geophysical data cannot itself adequately distinguish Roman structural remains if these are present.

Surveyed by: L Martin
A Payne

Date of survey: 21-22/05/2003

Reported by: L Martin

Date of report: 22/10/2003

Archaeometry Branch,
English Heritage,
Centre for Archaeology.

References

British Geological Survey 1972 South London, England and Wales Drift, Sheet 270, 1:63360.

Pre-Construct Archaeology 2003 'Phased Summary of an Archaeological Excavation at The Diana, Princess of Wales Memorial Fountain, Hyde Park, London' Unpublished.

Scollar, I, Tabbagh, A. Hesse, A. and Herzog, I. (eds.), 1990, *Archaeological Prospecting and Remote Sensing*. Cambridge.

Soil Survey of England and Wales, 1983, Soils of England and Wales, Sheet 6, South East England.

List of historical maps consulted.

All maps were accessed via the Internet from Landmark Information Group Ltd 2003.

Year of Publication	*Scale*	*County*
1869	2500	London
1896	2500	London
1916	2500	London
1953-55	2500	O.S. Plan
1960-73	1250	O.S. Plan
1972-79	2500	O.S. Plan
1987-91	10000	O.S. Plan
1999	10000	O.S. Plan

List of enclosed figures.

Annex 1: Notes on standard procedures

1) **Earth Resistance Survey:** Each 30 metre grid square is surveyed by making repeated parallel traverses across it, all aligned parallel to one pair of the grid square's edges, and each separated by a distance of 1 metre from the last; the first and last traverses being 0.5 metres from the nearest parallel grid square edge. Readings are taken along each traverse at 1 metre intervals, the first and last readings being 0.5 metres from the nearest grid square edge.

   Unless otherwise stated the measurements are made with a Geoscan RM15 earth resistance meter incorporating a built-in data logger, using the twin electrode configuration with a 0.5 metre mobile electrode separation. As it is usually only relative changes in earth resistance that are of interest in archaeological prospecting, no attempt is made to correct these measurements for the geometry of the twin electrode array to produce an estimate of the true apparent resistivity. Thus, the readings presented in plots will be the actual values of earth resistance recorded by the meter, measured in Ohms (Ω). Where correction to apparent resistivity has been made, for comparison with other electrical prospecting techniques, the results are quoted in the units of apparent resistivity, Ohm-m (Ωm).

   Measurements are recorded digitally by the RM15 meter and subsequently transferred to a portable laptop computer for permanent storage and preliminary processing. Additional processing is performed on return to the Centre for Archaeology using desktop workstations.

2) **Magnetometer Survey:** Each 30 metre grid square is surveyed by making repeated parallel traverses across it, all parallel to that pair of grid square edges most closely aligned with the direction of magnetic North. Each traverse is separated by a distance of 1 metre from the last; the first and last traverses being 0.5 metre from the nearest parallel grid square edge. Readings are taken along each traverse at 0.25 metre intervals, the first and last readings being 0.125 metre from the nearest grid square edge.

   These traverses are walked in so called 'zig-zag' fashion, in which the direction of travel alternates between adjacent traverses to maximise survey speed. Where possible, the magnetometer is always kept facing in the same direction, regardless of the direction of travel, to minimise heading error. However, this may be dependent on the instrument design in use.

   Unless otherwise stated the measurements are made with either a Bartington *Grad601* or a Geoscan FM36 fluxgate gradiometer which incorporate two vertically aligned fluxgates, one situated either 1.0m or 0.5 metres above the other; the bottom fluxgate is carried at a height of approximately 0.2 metres above the ground surface. Both instruments incorporate a built-in data logger that records measurements digitally; these are subsequently transferred to a portable laptop computer for permanent storage and preliminary processing. Additional processing is performed on return to the Centre for Archaeology using desktop workstations.

It is the opinion of the manufacturer of the Geoscan instrument that two sensors placed 0.5 metres apart cannot produce a true estimate of vertical magnetic gradient unless the bottom sensor is far removed from the ground surface. Hence, when results are presented, the difference between the field intensity measured by the top and bottom sensors is quoted in units of nano-Tesla (nT) rather than in the units of magnetic gradient, nano-Tesla per metre (nT/m).

3) **Resistivity Profiling:** This technique measures the electrical resistivity of the subsurface in a similar manner to the standard resistivity mapping method outlined in note 1. However, instead of mapping changes in the near surface resistivity over an area, it produces a vertical section, illustrating how resistivity varies with increasing depth. This is possible because the resistivity meter becomes sensitive to more deeply buried anomalies as the separation between the measurement electrodes is increased. Hence, instead of using a single, fixed electrode separation as in resistivity mapping, readings are repeated over the same point with increasing separations to investigate the resistivity at greater depths. It should be noted that the relationship between electrode separation and depth sensitivity is complex so the vertical scale quoted for the section is only approximate. Furthermore, as depth of investigation increases the size of the smallest anomaly that can be resolved also increases.

Typically a line of 25 electrodes is laid out separated by 1 or 0.5 metre intervals. The resistivity of a vertical section is measured by selecting successive four electrode subsets at increasing separations and making a resistivity measurement with each. Several different schemes may be employed to determine which electrode subsets to use, of which the Wenner and Dipole-Dipole are typical examples. A Campus Geopulse earth resistance meter, with built in multiplexer, is used to make the measurements and the Campus Imager software is used to automate reading collection and construct a resistivity section from the results.

Figure 1

THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, LONDON

Location of Geophysical surveys, May 2003

TQ2779

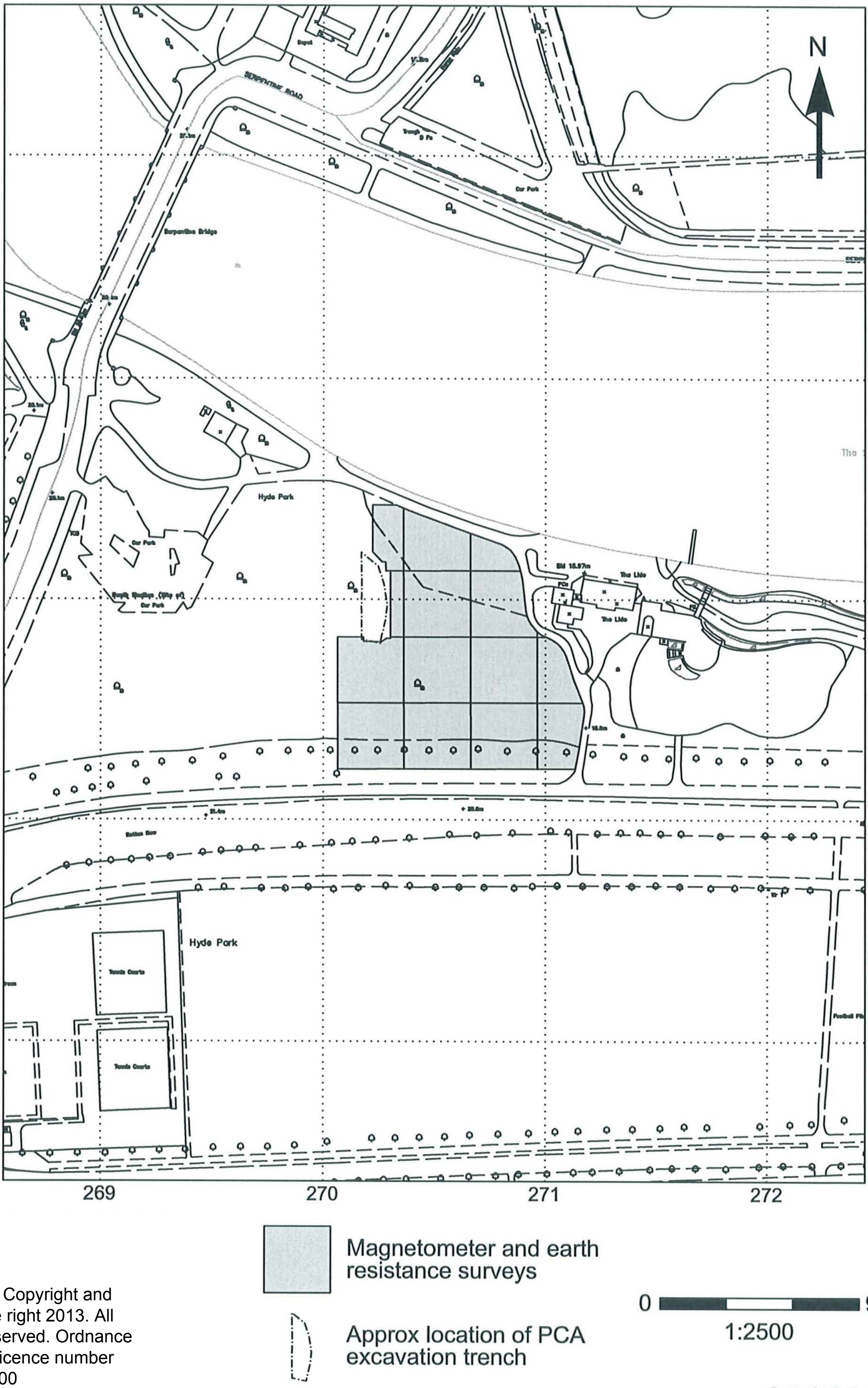

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Figure 2

THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, LONDON

Location of magnetometer survey, May 2003

TQ2779

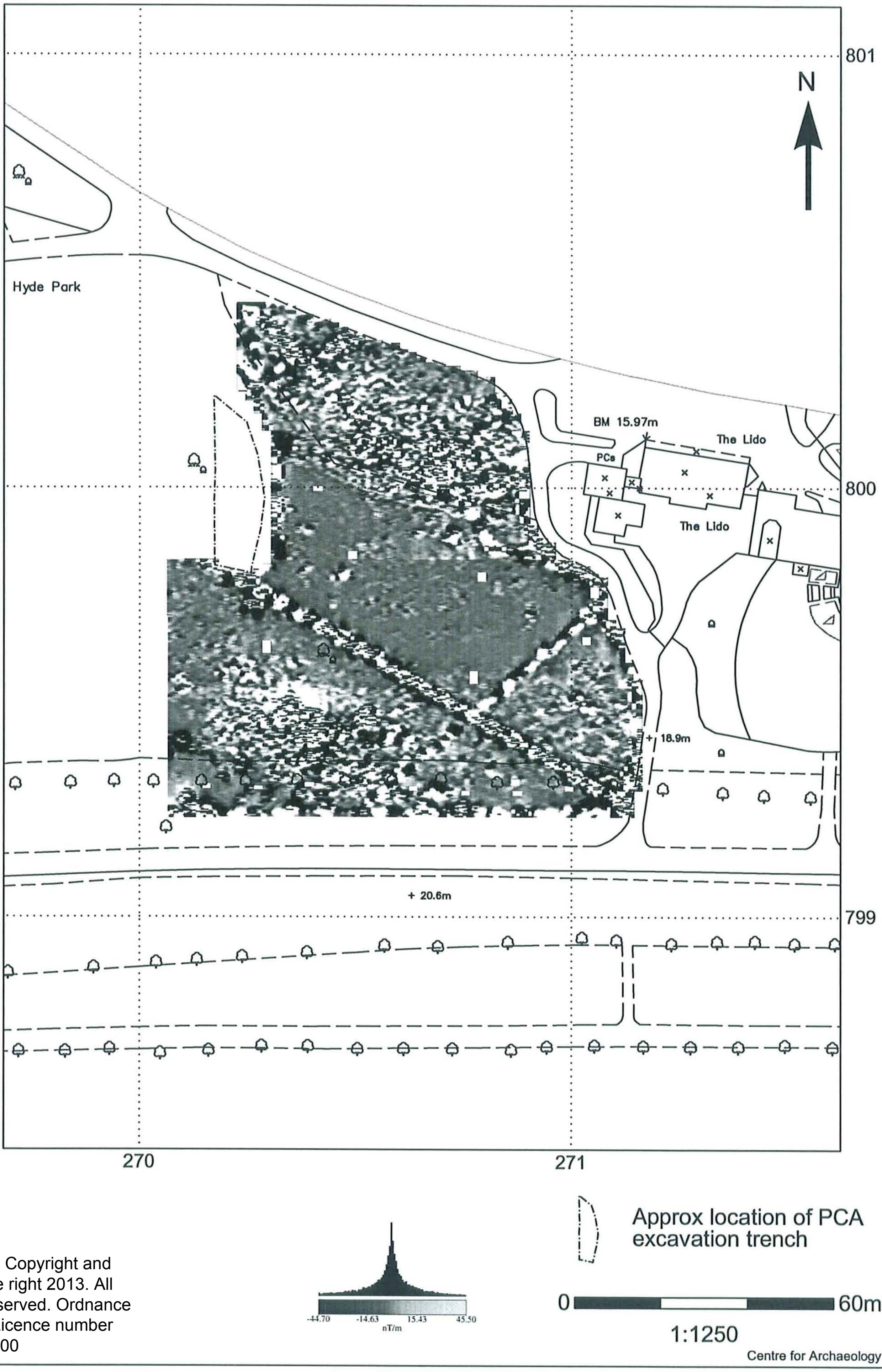

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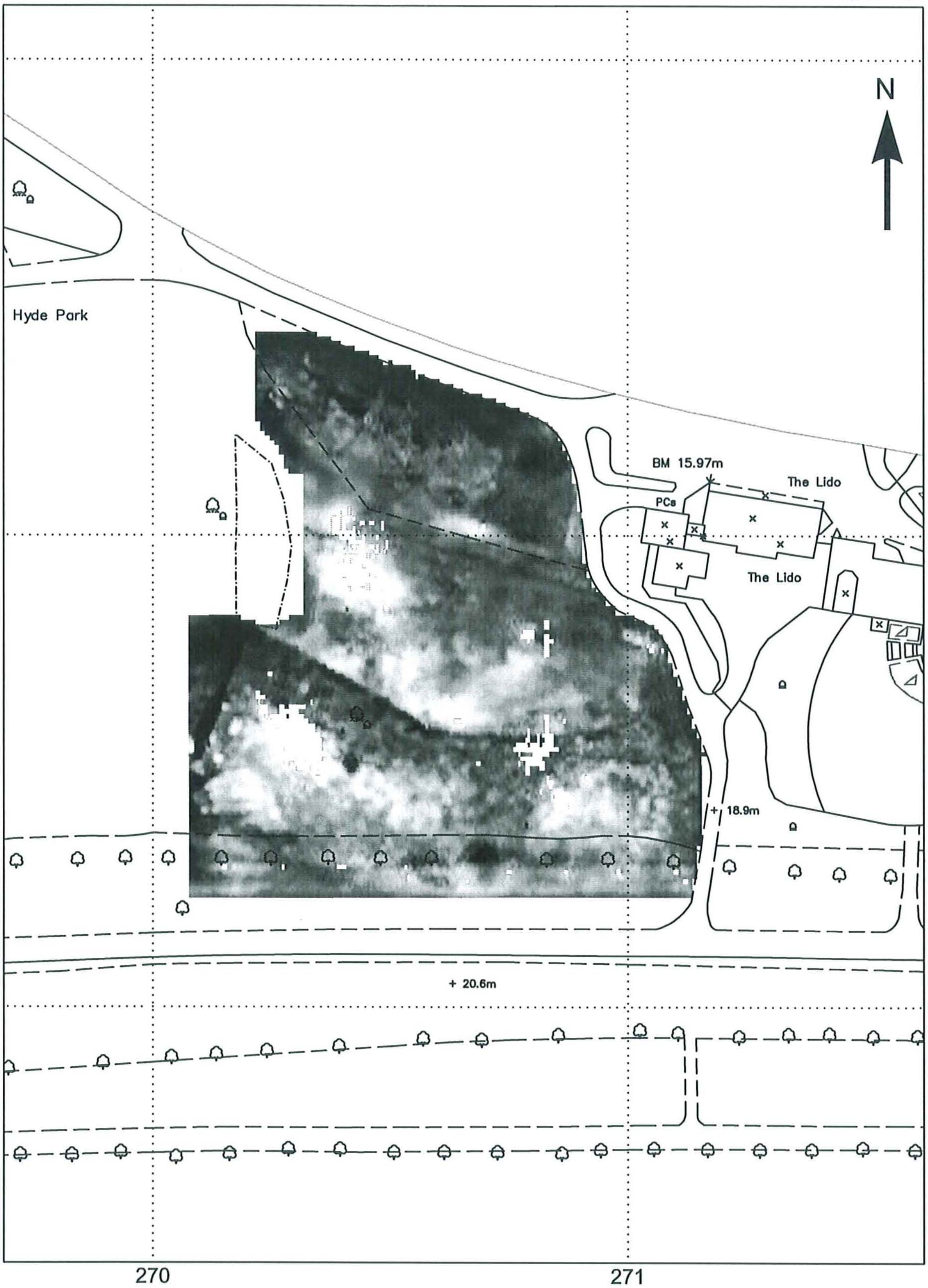
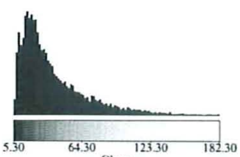
Figure 3

THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, LONDON

Location of earth resistance survey, May 2003

TQ2779





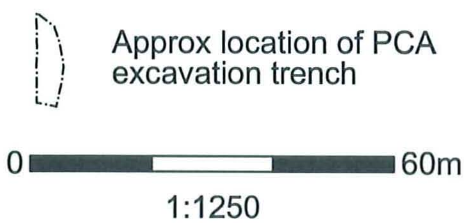


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Figure 4

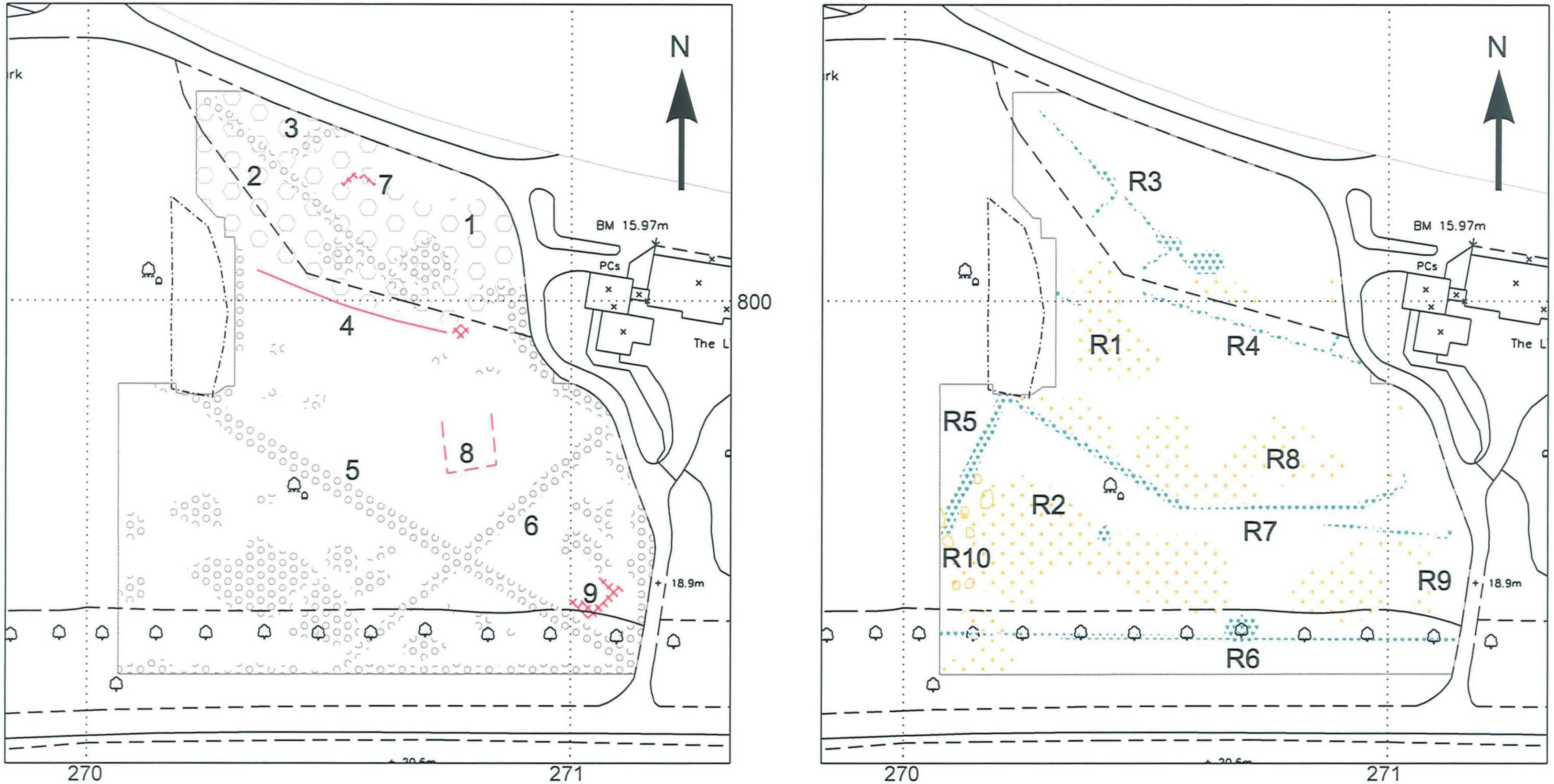
THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, LONDON

Graphical summary of significant geophysical anomalies, May 2003

a) Magnetometer survey

b) Earth resistance survey

TQ2779



Positive magnetic anomaly

Area of modern disturbance

High resistance anomaly

Low resistance anomaly

Approx location of PCA excavation trench

0 60m

1:1250

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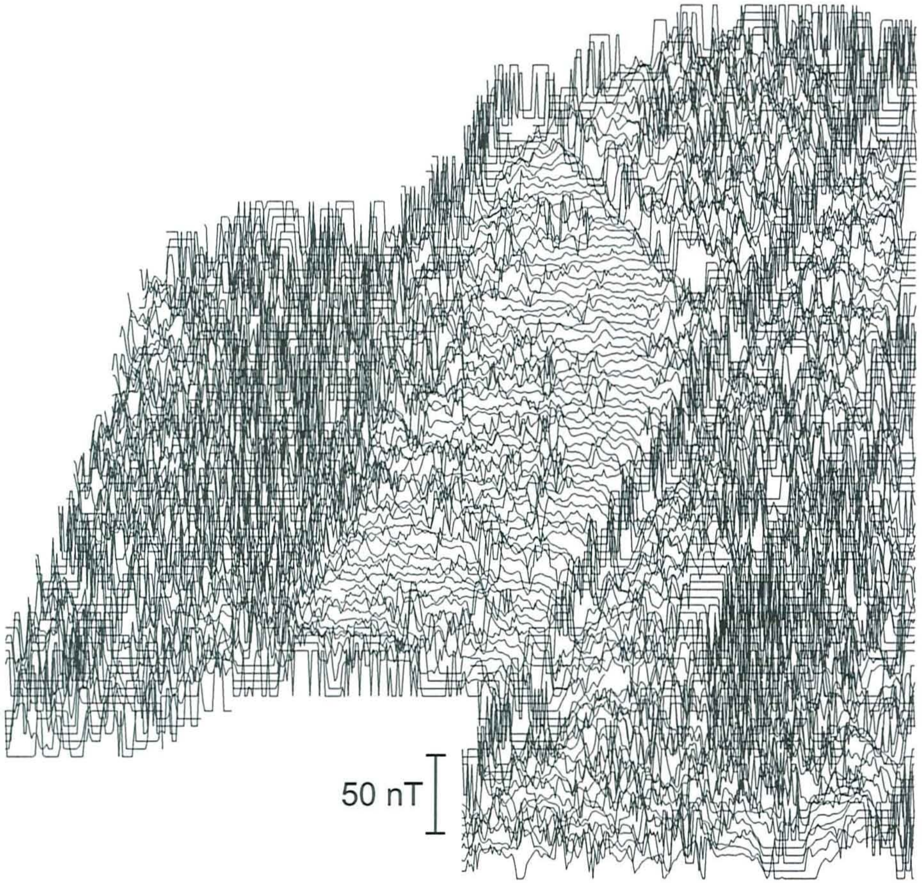
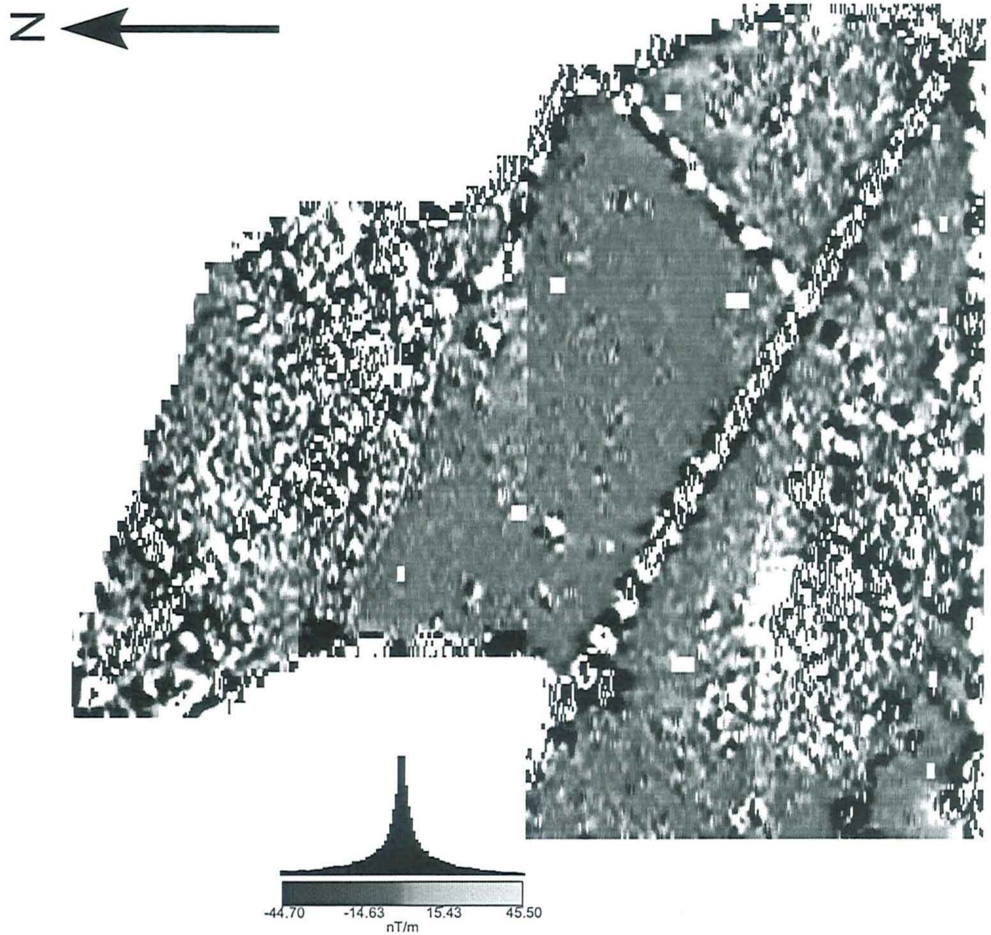
THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, LONDON — PLAN A

Magnetometer survey, May 2003.

1) Traceplot of raw magnetometer data.



2) Linear greyscale of raw magnetometer data.



0 60m

1:1000

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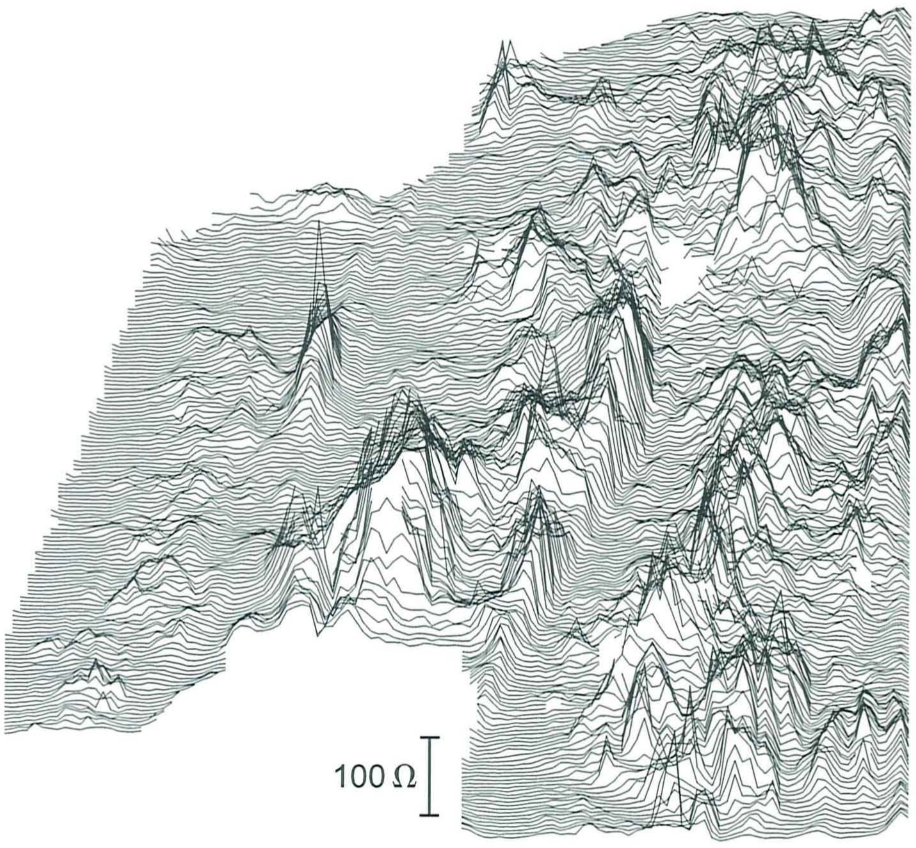
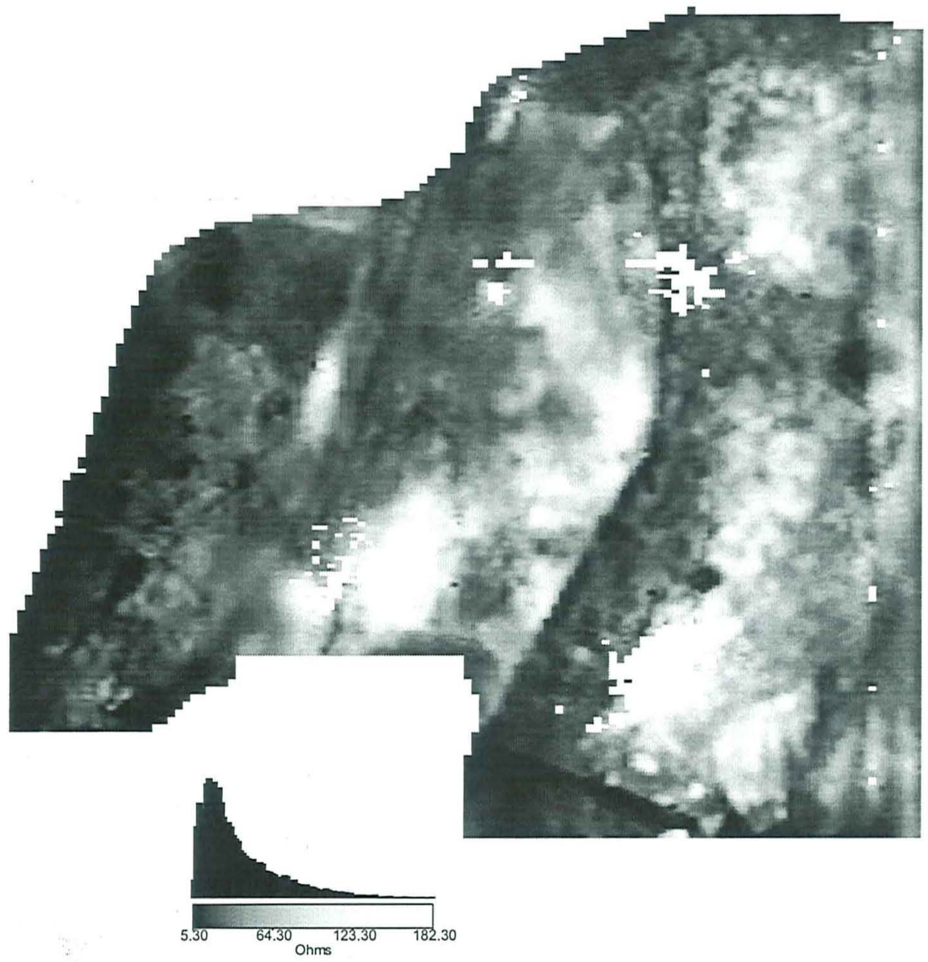
THE SITE OF THE DIANA, PRINCESS OF WALES MEMORIAL FOUNTAIN, HYDE PARK, LONDON PLAN B
Magnetometer survey, May 2003.

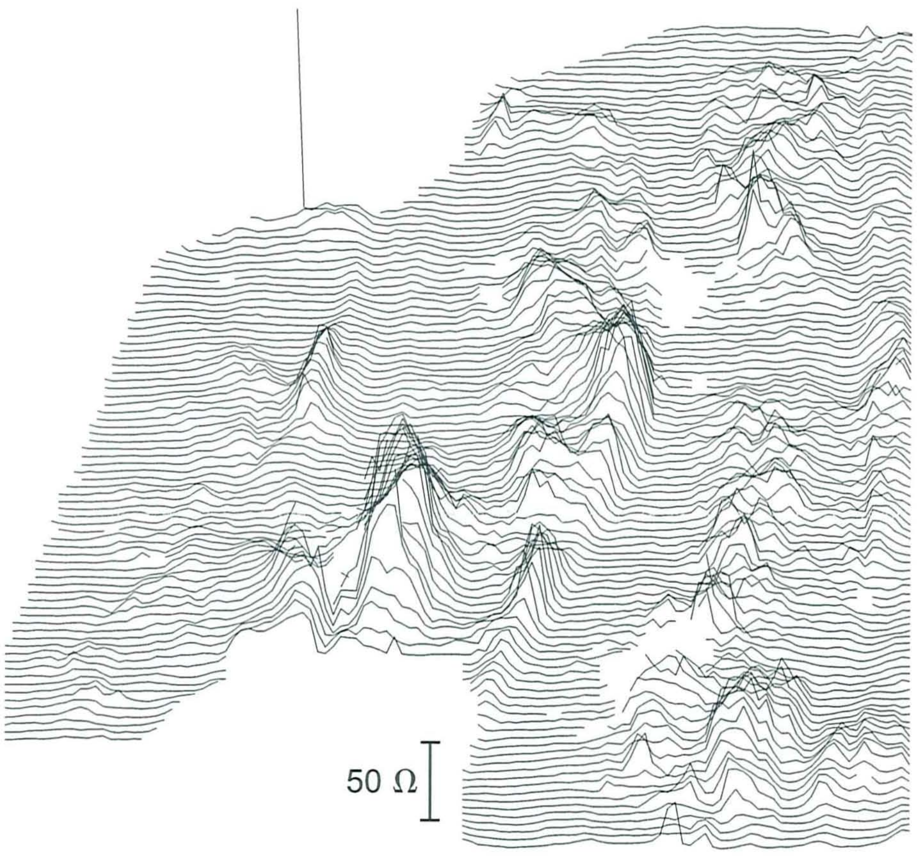
1) Traceplot of 0.5m mobile probe spacing earth resistance data.



2) Greyscale of 0.5m mobile probe spacing earth resistance data.



1) Traceplot of 1.0m mobile probe spacing earth resistance data.



2) Greyscale of 1.0m mobile probe spacing earth resistance data.

0 60m
1:1000