NYCC HER	
SNY	479
ENY	25
CNY	869
Parish	1092
Rec'd	03/02/2000

GEOPHYSICAL SURVEY OF AN AREA WITHIN THE FRIARY GARDENS, RICHMOND, NORTH YORKSHIRE

cf plan app 1/92C/1270E/LAF

A programme of research carried out
on behalf of

On Site Archaeology

by

GeoQuest Associates

1 INTRODUCTION

1 1 A programme of detailed geophysical survey has been carried out within an area of garden situated between Richmond Community Hospital and Victoria Road, about 200m NNW of the core of the historic market town of Richmond in North Yorkshire (NZ 170 010) An area of approximately 0 2 hectares was examined with the aim of providing information concerning the likely extent and character of subsoil archaeological features associated with the Friary, prior to a planned enhancement of the gardens

1 2 The research was carried out by GeoQuest Associates on behalf of On Site Archaeology (OSA), according to instructions supplied by Mr N Pearson of OSA Results of the geophysical survey were intended to inform a programme of archaeological evaluation and any mitigation that may be required before constructing a new access and hard landscaping features within the garden

1 3 Figure 1 shows the location of geophysical survey areas on a plan digitised from Richmondshire District Council drawing number 3L/X/1/1/5 In Figure 1 new paths, ramps and steps for the proposed garden enhancement are marked in blue It was not possible to extend the survey up to the southern boundary of the garden development (adjacent to Victoria Road) owing to dense woodland in this area The geophysical survey took place on 26th and 27th January 2000

2 LAND USE, TOPOGRAPHY AND GEOLOGY

2 1 Most of the geophysical survey area comprises a small lawn situated immediately south of Richmond Community Hospital and north of Victoria Road A stone wall and herbaceous border formed the W limit of the survey area, while the E extent was defined by the ruins of Greyfriar Tower and trees adjoining the Memorial Gardens Vehicle parking on hardstanding areas south of the hospital was restricted during the survey period to minimise unwanted effects on the geophysical data

2 2 A raised area of bare humic soil and modern debris, measuring about 10x10m, was located between the public conveniences and Greyfriars Tower, suggesting a site of recent dumping and upcast during construction of the road wall

2 3 No significant earthworks of archaeological interest were visible in the survey area A 10-15cm high bank, about 1 5m wide, along the N margin of the lawn almost certainly represents a spread of soil from construction of the modern block-paved hospital driveway

2 4 The solid geology underlying the study area comprises Namurian (Carboniferous) Millstone Grits Such lithologies are likely to have a low magnetic susceptibility providing a favourable environment for the development of strong geomagnetic field anomalies over cut features infilled with topsoil Moreover, any surviving wall

footings constructed of Gritstone are also likely to be manifest as significant high resistivity anomalies

2 5 The site's archaeological interest stems from the presence of the Richmond Greyfriars whose medieval friary and associated lands still form a distinct unit referred to as the Friars' Close The 15th century bell tower and parts of the chancel and south aisle still survive as the sole upstanding evidence of the Friary church (Figure 1) The east end of the chancel are located beneath the memorial gardens, while the Richmond Community Hospital has been recently redeveloped from the Friary buildings which were previously occupied by Richmond School Richmond Friary has been the subject of a number of archaeological investigations which have recovered a comprehensive picture of the layout and chronology of the surviving structures Most recently, a watching brief was carried out by OSA during ground reduction and drainage works for the Richmond Community Hospital and parking areas (On Site Archaeology, 1999) Their report also provides a comprehensive review and synthesis of previous archaeological research on the Richmond Greyfriars site

3 THE GEOPHYSICAL SURVEYS

Field Methods

3 1 Measurements of vertical geomagnetic field gradient were recorded using a Geoscan FM36 fluxgate gradiometer (green shading, Figure 1) A zig-zag traverse scheme was employed and data were logged in grid units of 20x20m at 1 0x0 5m intervals, thus providing 800 measurements per grid Appendix A provides further information about the technique

3 2 Subsoil electrical resistivity values were measured using a Geoscan RM15 resistivity meter operating in 'twin-electrode' configuration (red shading, Figure 1) A spacing of 0 5m was employed between the mobile electrodes, giving a maximum sensing depth of about 1 0m A zig-zag traverse scheme was again used with data being logged in grid units of 20x20m at 1 0x0 5m intervals Appendix B provides further information about this technique

3 3 Data were downloaded on-site into an IBM Thinkpad computer for preliminary processing, printing and storage These data were subsequently transferred to a laboratory computer for further processing, interpretation and archiving

Data Processing

3 4 The GeoQuest InSite® software was used to process the geophysical data and to produce continuous tone grey-scale images of the geomagnetic and resistivity data at

a scale of 1 250 These results are shown in Figures 2 and 4 A convention is used that shows positive magnetic and resistivity anomalies as dark grey and negative anomalies as light grey Figures 2 and 4 include keys which relates the grey-scale intensities to anomaly values in nano Tesla per metre and Ohms

3 5 The following basic processing steps were applied to the data

Remov**a**l of striping artifacts in the geomagnetic images caused by alternating changes m level between zig-zag traverses

Remov**a**l of **R**andom **'S**pikes' due to small ferrous objects or fired stone on or near the ground surface (magnetometer survey) or poor electrical contact (resistivity survey) This process replaces spikes with the mean of near-neighbours

DeShear corrects for apparent shear in strong geomagnetic anomalies surveyed by zig-zag traversing

Correction for drift in magnetometer calibration with time

Adjustment of grid mean **v**alues to achieve an optimum match along the lines of contact between data grids (both data sets)

Interpolation of the data, using a bilinear function, to generate a regular mesh of values at 0 25 x 0 25m intervals

3 6 The geophysical images were printed on a Hewlett Packard HP650C **D**esignjet plotter with 256 grey shades and 600 dpi resolution A sigmoid function was used to map the data to printed grey tones since this provides a measure of contrast equalisation Appendix C provides more information about data processing and itemises the algorithms that were applied to produce the grey scale images in Figures 2 and 4

3 7 In Figure 3 the geomagnetic data have been reprocessed to yield a series of profiles spaced at 0 5m intervals, with positive anomaly peaks highlighted by solid shading This form of presentation may be useful in identifying the polarity, and hence subsoil target characteristics, of specific features

Key to Figure 5

3 8 A number of significant anomalies have been detected in the data and these are presented on a 1 250 geophysical interpretation plan using coded colours and patterns The following types of anomaly have been distinguished

Green Significant regions of anomalously high or positive magnetic field gradient which might be associated with high susceptibility, soil-filled structures such as pits and ditches

Blue Areas of anomalously low or negative magnetic field gradient, corresponding to features of low magnetic susceptibility, such as concentrations of Millstone Grit, for example within wall footings or areas of collapse debris

Red Strong dipolar magnetic anomalies (paired negative-positive) which, in this context, almost certainly reflect near-surface iron objects and have been ignored in the subsequent archaeological interpretation

Brown Significant areas of relatively high electrical resistivity which may mark concentrations of stone rubble or wall footings

Orange Regions of relatively low electrical resistivity which generally signify more moist subsoil, such as may occur within ditches, drains and wells

3 9 An archaeological interpretation plan at 1 250 is presented in Figure 6 which includes feature codes f1, f2, etc, to assist in the discussion below

4 INTERPRETATION

4 1 A striking pattern of linear, high resistivity anomalies has been detected forming a rectangular network beneath the lawn W of the Greyfriars Tower These anomalies are consistent with a set of wall footings (f1 - f7 & f12) which almost certainly correspond to the Great Cloister conjectured to exist in this location (OSA, 1999, Figure 8) Judging from the anomaly magnitude and wavelength (typically 1 0m to 1 5m) it seems likely that the upper courses of the wall footings are at a depth of less than 0 5m

4 2 Several, more diffuse, high resistivity linear anomalies suggest the presence of minor (or less well preserved) walls within the cloister (f3, f7 and on f4) The relatively weak nature of these anomalies may also suggest that the upper courses of these conjectured walls are present at greater depth than those described above

4 3 It is interesting to note that no significant geomagnetic anomalies have been detected in positions corresponding to the conjectured cloister walls This feature is unusual and suggests that the magnetic susceptibility of the subsoil into which the foundations have been inserted is close to that of the building stone

4 4 Several diffuse areas of high electrical resistivity have been mapped within the cloister and within the woodland SW of the Greyfriars Tower Such anomalies almost certainly correspond to volumes of collapse or demolition debris associated

with destruction of the Cloister building A significant deposit of such material appears to be located on the axis of the proposed flight of steps ascending from Victona Road into the woodland area (f**11**)

4 5 Of possible archaeological interest is the presence of a chain of compact, positive magnetic anomalies that can be traced for a distance of about 13m E-W close to the northern wall of the Cloister It seems possible that these anomalies reflect a set of tree boles, pits or a drain associated with a former garden or the Cloister building (f**8**)

4 6 The geomagnetic survey has located a set of three, distinct positive magnetic lineations in the NE quadrant of the survey area which almost certainly represent clay land drains or ditches infilled with topsoil (f**6**)

4 7 Several low resistivity zones have been mapped in the study area, providing evidence for regions of more moist or thicker soil None of these anomalies correlate with significant geomagnetic features and it is conjectured that they may represent infilled drains (or planting beds) of the Friary (or formal garden) f**9** and f**10** are examples of such features in Figure 6

4 **8** Few geophysical features of archaeological interest have been detected within the wooded part of the study area, almost certainly as a result of tree root effects on the resistivity distribution and the depth of made ground Hence, this negative result should not be taken as evidence for the absence of subsoil archaeological remains in this part of the proposed garden redevelopment

5 SUMMARY AND CONCLUSIONS

5 1 Detailed geophysical surveys has been carned out on an area of land immediately south of Richmond Community Hospital in order to identify features of archaeological interest pnor to a proposed enhancement of the garden

5 2 The surveys have detected a stnking grid pattern of geophysical anomalies beneath the existing lawn and are thought to provide evidence for the Cloister in the position suggested by a previous study (On Site Archaeology, 1999) The geophysical results indicate that wall footings of the Cloister range are extensive and well preserved, and may be present at depths of less than 0 5m

5 3 Geophysical evidence was found for concentrations of rock rubble, or other debns, beneath several parts of the study area In particular, it would appear that the proposed access route from Victona Road may encounter a significant deposit of such material

5 4 The results of this investigation indicate that the resistivity survey technique should have good potential for recovering the plan of further building structures beneath the Memorial Gardens and adjacent areas

6 REFERENCE

On Site Archaeology, 1999 *Richmond Community Hospital An Archaeological Watching Brief* OSA Report No 98WB04

7 CREDITS

Survey M J Noel PhD, FRAS & A Newton BA, MA
Report M J Noel
Date 1st February 2000