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NORMANTON PHASE 1 REPLACEMENT SCHEME

Topsoil Magnetic Susceptibility Survey

(Survey Ref : 1520698/NOL/AWS)

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Produced by

OXFORD ARCHAEOTECHNICS LIMITED

under the direction of

A.E. Johnson *BA(Hons)*

Commissioned by

Lindsey Archaeological Services

on behalf of

Anglian Water Services Limited

OXFORD ARCHAEOTECHNICS

EVENT 42323
SOURCE 46996
30297

OXFORD ARCHAEOTECHNICS

Specialist Archaeological Field Evaluation

OXFORD ARCHAEOTECHNICS
Noke
Oxford OX3 9TX

Tel / Fax 01865 375536
Mobile 0831 383295
Email archaeotechnics@dial.pipex.com

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SUMMARY

Topsoil magnetic susceptibility mapping was carried out along the route of a proposed replacement water pipeline within two fields just west of the village of Normanton, Lincolnshire fields (from NGR 493560 345980 to 494485 346194) to attempt to determine the location of a previously recorded Romano-British building.

The survey was based upon the principle that past human activity and its associated debris usually creates slight but persistent changes in the local magnetic environment which can be sensed from the surface.

A strong topsoil magnetic susceptibility focus, extending over 100 m along the pipeline corridor, was identified in an area corresponding to the general location of the Roman site previously mapped by the Lincolnshire County Sites & Monuments Record. Further subtle topsoil magnetic susceptibility variations were also recorded.

1. INTRODUCTION

1.1 Geophysical survey was commissioned by Lindsey Archaeological Services on behalf of Anglian Water Services Limited along part of the route (c. 1 km in length) of a proposed replacement water pipeline between the villages of Hough on the Hill and Normanton, c. 10 km northnorthwest of Grantham, Lincolnshire. The fieldwork was carried out in June 1998. The location is shown on Fig. 1.

1.2 The objective of the survey, which was carried out within a 15 m wide corridor crossing two pasture fields just west of the village of Normanton (OS Field Parcels 0002 and 2700; NGR 493560 345980 to 494485 346194) was to determine the location of a previously recorded Romano-British stone building and associated pottery finds.

2. MAGNETIC SURVEY DESIGN

2.1 Survey control was established to the National Grid by EDM Total Station.

2.2 The equipment used for the direct topsoil magnetic susceptibility survey was a Bartington Instruments MS2 meter with an 18.5 cm loop.

2.3 It was anticipated that had the original pipeline trench intercepted archaeological horizons, material derived from such deposits would be have been upcast and incorporated into the present topsoil. Having located the position of the existing pipeline by magnetometer (gradiometer) scanning (Fig. 2), *in situ* topsoil magnetic susceptibility readings were taken at 10 m intervals immediately to the south, with supplementary readings taken where significant variations in the soil magnetism were noted. A 10 m mapping interval is known to give a high probability of intersecting with dispersed horizons from a wide range of archaeological sites, particularly those associated with occupation and industrial activity from the later prehistoric period onwards. Soils over former occupation and industrial sites usually register as stronger patterning, frequently showing a marked focus. Agricultural activity helps to both generate (by ploughing casting up underlying deposits), and ultimately disperses the more magnetic soils over a wider area. Patterns recorded by 10 m magnetic susceptibility mapping tend to define zones of former activity rather than locate individual elements. Nevertheless, in some contexts, a focus of markedly stronger soil magnetic susceptibility (or markedly magnetically lower soils indicative of ploughed down earthworks) is occasionally found to relate to material dispersed from specific underlying features.

2.4 The readings were combined to produce a topsoil magnetic susceptibility colour shade map (Fig. 3), showing contours at 10 SI intervals interpolated within a corridor strip 10 m wide.

2.5 The presence of the existing pipeline precluded more detailed magnetometer (gradiometer) survey, although some gradiometer scanning was possible along the extreme southern edge of the pipeline corridor, using a Geoscan Research FM 36 Fluxgate Gradiometer (sampling 4 readings per metre at 1 metre traverse intervals in the 0.1 nT range). The nanotesla (nT) is the standard unit of magnetic flux (expressed as the current density), here used to indicate positive and negative deviations from the Earth's normal magnetic field.

3. SURVEY RESULTS (Fig. 3)

3.1 93 *in situ* magnetic susceptibility readings were recorded. Susceptibility is reported in SI: volume susceptibility units (x 10^{-5}), a dimensionless measure of the relative ease with which a sample can be magnetized in a given magnetic field.

3.2 *In situ* topsoil susceptibility measurements ranged between 11 and 177 (x 10^{-5}) SI units. The mean for the survey was 40.3 SI units and the standard deviation calculated against the mean was 31 SI units.

3.3 The lowest topsoil magnetic susceptibility readings (below 20 SI) were recorded within the extreme eastern part of the survey corridor, tending to increase towards the higher ground at the centre of the survey corridor, where the measurements showed more local fluctuations, and gradiometer scanning indicated the presence of subtle (1-2 nT) magnetic anomalies.

3.4 A dramatic increase in topsoil magnetism was recorded within the northwest angle of OS Field 0002, where topsoil magnetic susceptibility values exceeded 100 SI (2 standard deviations above the mean). Although this pattern is probably influenced to some extent by the presence of a field boundary (between OS Parcels 0002 and 2700), such 'containment' of magnetically enhanced soils is commonly indicative of anthropogenic enhancement, and as this focus corresponds with the approximate location of the Romano-British building recorded by the Lincolnshire County Sites & Monuments Record, it is probable that this pattern is the result of the dispersal of associated archaeological material into the topsoil. Gradiometer scanning along the southern edge of the proposed pipeline corridor indicated a number of magnetic anomalies over this area of enhancement: more detailed gradiometer survey in this area was precluded by the presence of the original pipeline, farm gates and wire fencing.

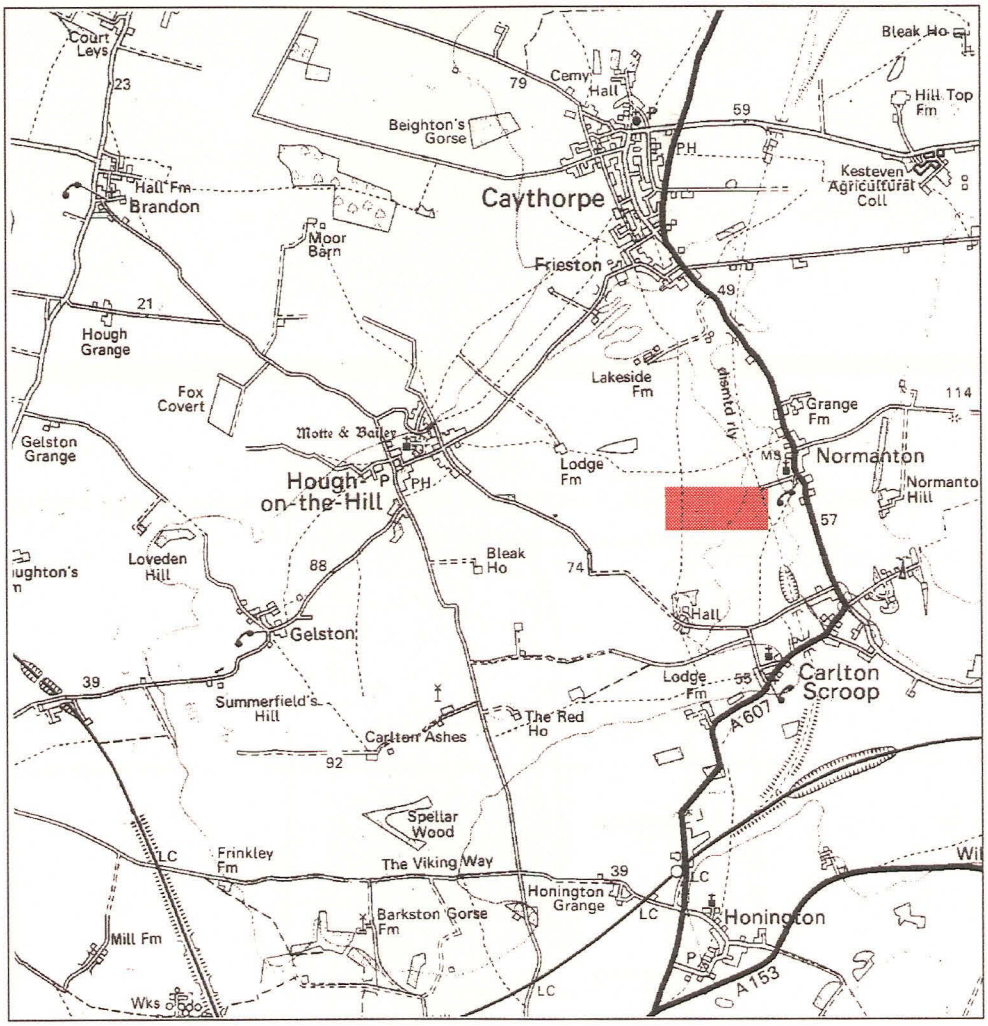
4. CONCLUSIONS

4.1 Topsoil magnetic susceptibility mapping has defined a strong focus of magnetically enhanced topsoils within the proposed replacement pipeline corridor (centred on NGR 493950 346070) lying close to the approximate site of the previously recorded Romano-British building .

Normanton Phase 1 Replacement Scheme

Topsoil magnetic susceptibility survey

Location



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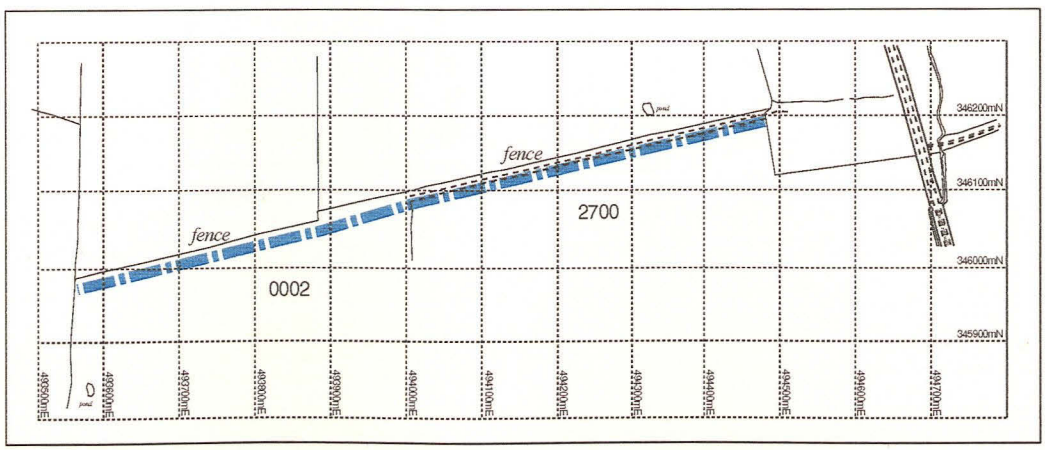
proposed pipeline route



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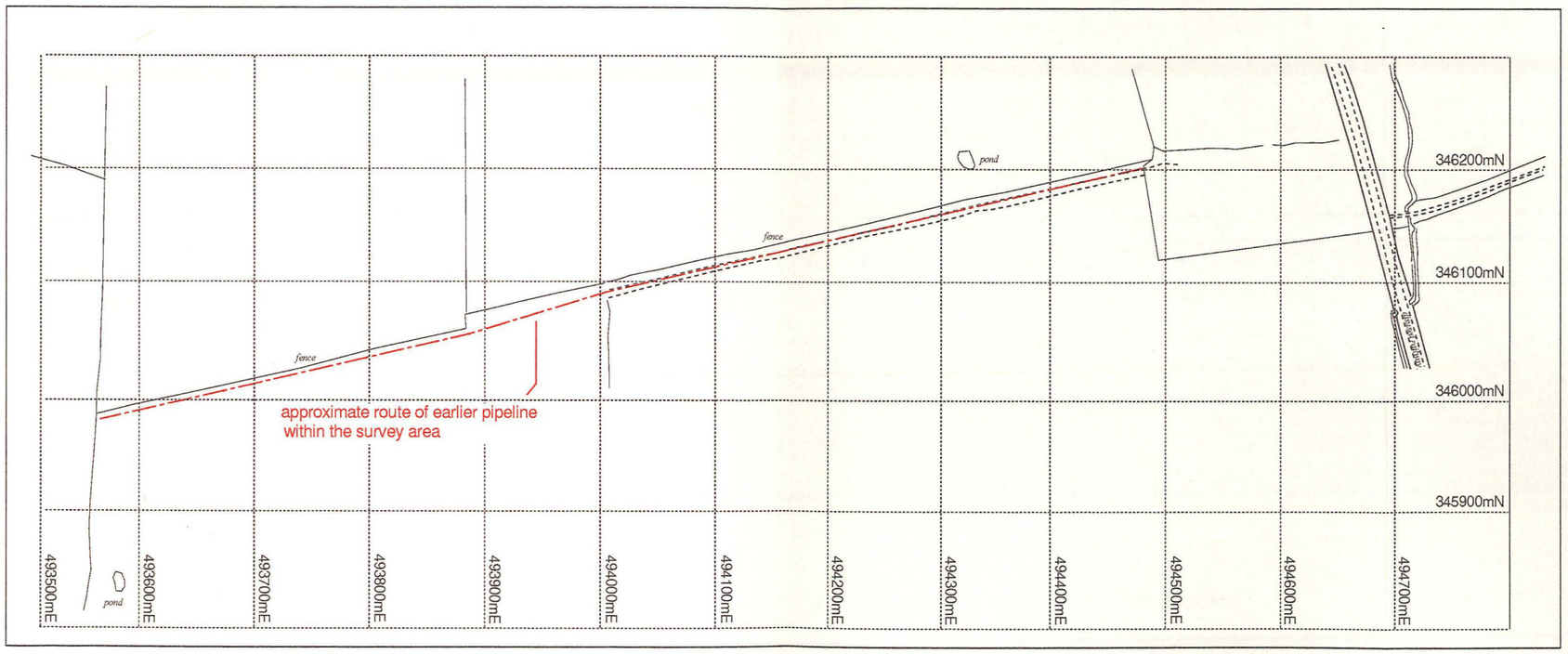
OXFORD ARCHAEOTECHNICS Fig. 1

Normanton Phase 1 Replacement Scheme



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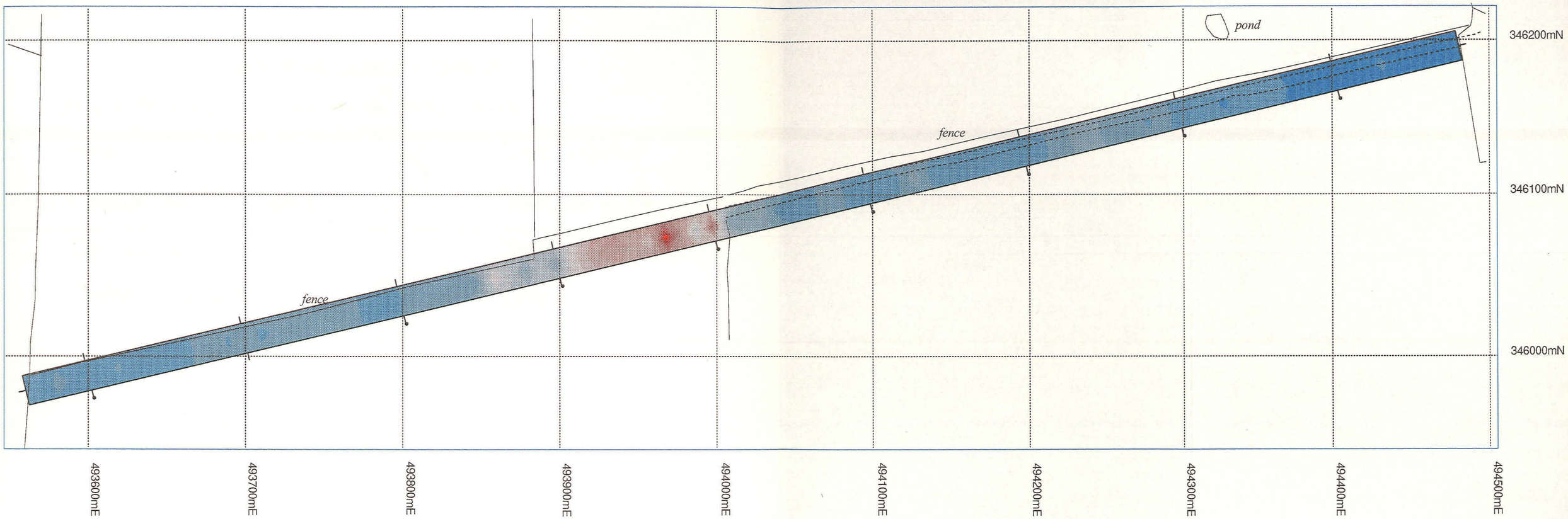
OXFORD ARCHAEOTECHNICS FIG. 2

Normanton Phase 1 Replacement Scheme

Topsoil magnetic susceptibility survey



N

1:2500

Topsoil magnetic susceptibility SI ($x10^{-5}$)

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

OXFORD ARCHAEOTECHNICS FIG. 3

INTERNAL QUALITY CHECK

Survey Reference	1520698 / NOL / AWS	
Primary Author	MJ	Date 12/6/98
Checked By	APJ	Date 12.6.98
Checked By		Date
Further Corrections		Date

OXFORD ARCHAEOTECHNICS
Noke
Oxford OX3 9TX

Tel / Fax 01865 375536
Mobile 0831 383295
Email archaeotechnics@dial.pipex.com