
**LAND OFF QUEENS ROAD,
SPALDING,
LINCOLNSHIRE
(SPQR15)**

GEOPHYSICAL SURVEY

**Work undertaken for
South Holland District Council**

June 2015

**Report compiled by
Neil Jefferson BSc (Hons)**

Accession No: LCNCC:2015.110
OASIS Ref: archaeo11-215107
National Grid Reference: TF 25831 23649

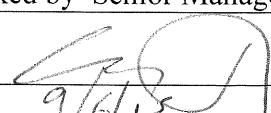
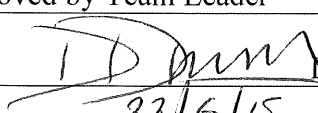
APS Report No: **57/15**

**ARCHAEOLOGICAL
PROJECT
SERVICES**



Quality Control
Queens Road,
Spalding,
Lincolnshire
(SPQR15)

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Site Staff	Neil Jefferson
Survey processing and report	Neil Jefferson

Checked by Senior Manager	Approved by Team Leader
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Date: 9/6/15	Date: 22/6/15

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1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for South Holland District Council in connection with proposed development on land off Queens Road, Spalding, Lincolnshire. The survey totalled c. 0.9ha.

The survey recorded a number of discrete positive responses might represent isolated pit features but these are not strong and are difficult to interpret on the basis of form alone.

Other responses are probably due to debris possibly associated with the construction of the surrounding buildings, footpaths and a children's play area.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as '*a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate*' (CIfA 2014a).

2.2 Background

Archaeological Project Services was commissioned by South Holland District Council to undertake detailed magnetometer survey totalling some 0.9ha on land off Queens Road, Spalding, Lincolnshire. This was in advance of proposed development of the site. The survey was carried out on 5th June 2015.

2.3 Topography and Geology

Spalding is located 32km northeast of Stamford and 30km south of Boston, in the South Holland district of Lincolnshire (Fig. 1). The site is located 1km northeast of the centre of Spalding, west of the Queens Road and south of Holbeach Road, at National Grid Reference TF 25831 23649 (Fig. 2).

The solid geology consists of mudstone of the Oxford Clay Formation which formed in the Jurassic Period. This is overlaid by Tidal Flat Deposits of clay and silt, which formed in the Quaternary Period (BGS 2015). The site is on a very gentle slope down to the east at about 4m OD.

3. GEOPHYSICAL SURVEY

3.1 Methods

The site consists of a recreation area covered in short grass with stands of trees, footpaths and a children's play area. The location and layout of the survey areas is shown on Figure 3. The weather was overcast with occasional rain and the conditions for the survey were good.

Survey was undertaken in accordance with English Heritage (2008) and CIfA (2014b) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. This records subtle changes in the magnetic field resulting from differing features in the soil. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

The mapping of anomalies in a systematic

manner allows interpretation of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by kilns or hearths, usually resulting in a bipolar (positive/negative) response. More subtle positive anomalies representing pits and ditches can be seen where these contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). A negative anomaly may result from upcast bank material. Wall foundations can also show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique. It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features (Clark 1996).

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

Sampling interval and data capture

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 6400 sampling points in a full 40m x 40m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on

site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

Processing and presentation of results

Processing is performed using specialist ArcheoSurveyor software. 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 (Destripe or zero mean traverse). Despiking is also performed to reduce the effect of the anomalies resulting from small iron objects often found on agricultural land. Further processing can then be carried out which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following are the processing techniques carried out on the processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)
2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean
3. Clip (excludes extreme values allowing better representation of detail in the mid range): -5 to 5nT.

3.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale plots (Fig. 4; clipped for display but otherwise unprocessed), together with

greyscale plots of the processed data (Fig. 5). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 6) and are described below. The identified features have been overlain onto a map of the site (Fig. 7).

Discrete positive anomalies (Blue Circles)

Examples of discrete positive anomalies are highlighted and possibly represent pit features. However, these are somewhat isolated, the responses are not strong, and they are difficult to interpret on the basis of form alone.

Iron spikes (discrete bipolar anomalies) (Red Circles)

Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response. Such items usually derive from relatively recent management or use of the land.

Magnetic disturbance (Red Hatching, Pink lines)

Strong bipolar responses represent a scatter of ferrous material, possibly including building material, metal fencing, pathways (pink lines) and general debris. A children's play area was excluded from the survey but still generated a halo of magnetic disturbance. The play area is highlighted in solid pink (Figs. 6 and 7).

4. DISCUSSION

Only a small amount of the area was unaffected by modern magnetic material. The readings located in the northern part of the site suggest that the area contains significant amounts of debris, possibly building rubble, which may be associated with the construction of the nearby buildings. Paths crossing the site were also recorded. Although a children's play area was omitted from the survey the equipment at that location produced a

magnetic response that extended beyond the confines of the play area (Fig. 7).

In the areas unaffected by modern magnetic disturbance, a number of possible pits were recorded. However, the readings are not strong and are difficult to interpret on the basis of form alone.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge South Holland District Council who commissioned the project; Gary Taylor and Denise Drury (APS) edited the report.

6. PERSONNEL

Project coordinator: Neil Jefferson
Geophysical Survey: Neil Jefferson and Jon Smith
Survey processing and reporting: Neil Jefferson

7. BIBLIOGRAPHY

- BGS, 2015
<http://mapapps.bgs.ac.uk/geologyofbritain/home.html> accessed June 2015
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- English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation*.

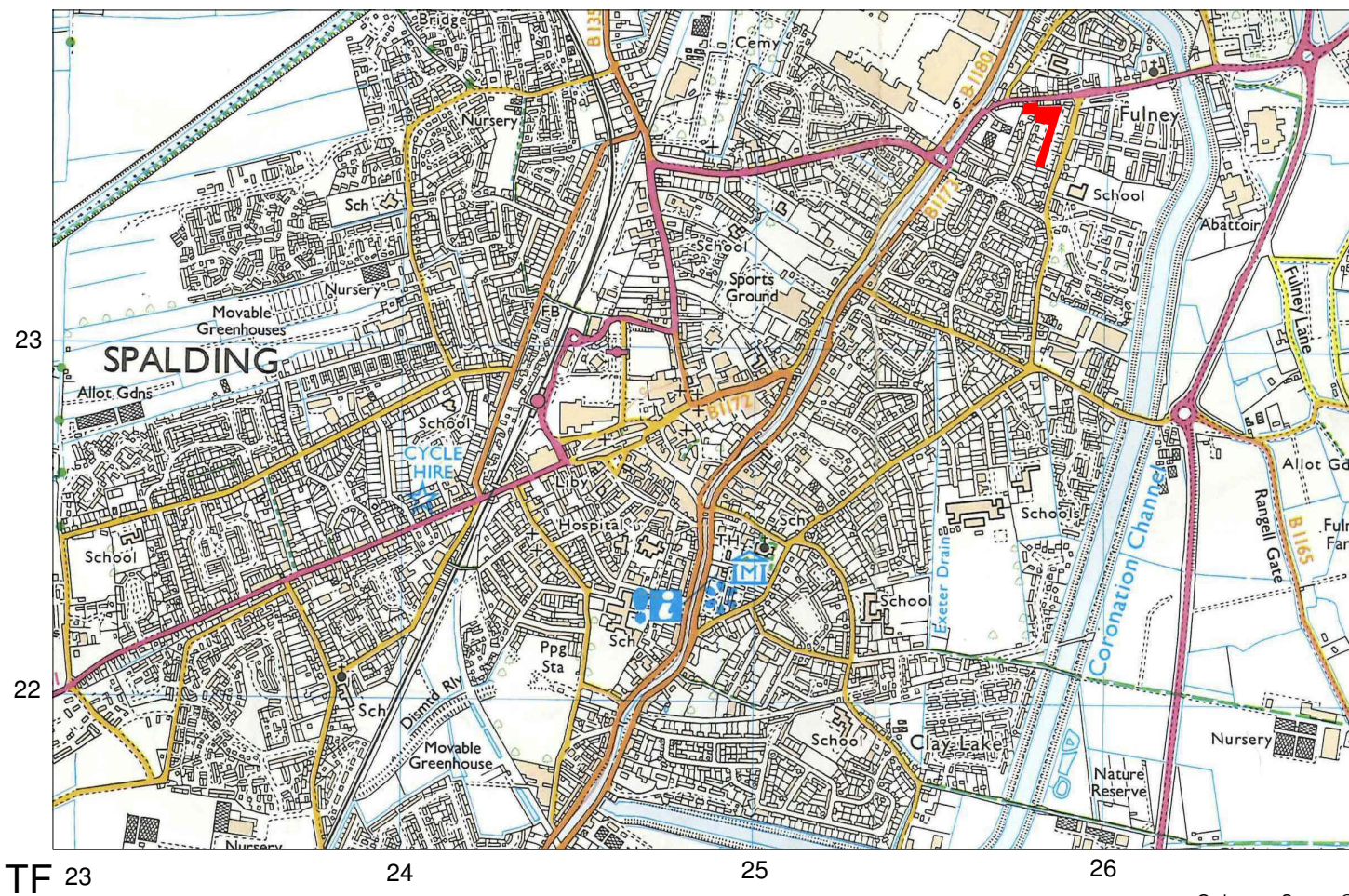
8. ABBREVIATIONS

BGS British Geological Survey

CIfA Chartered Institute for
Archaeologists



Figure 1 - General Location Plan



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Site **7**


 Archaeological Project Services		
Project Name: Queens Road, Spalding		
Scale 1:20,000	Drawn by: NMJ	Report No: 57/15

Figure 2 - Site location

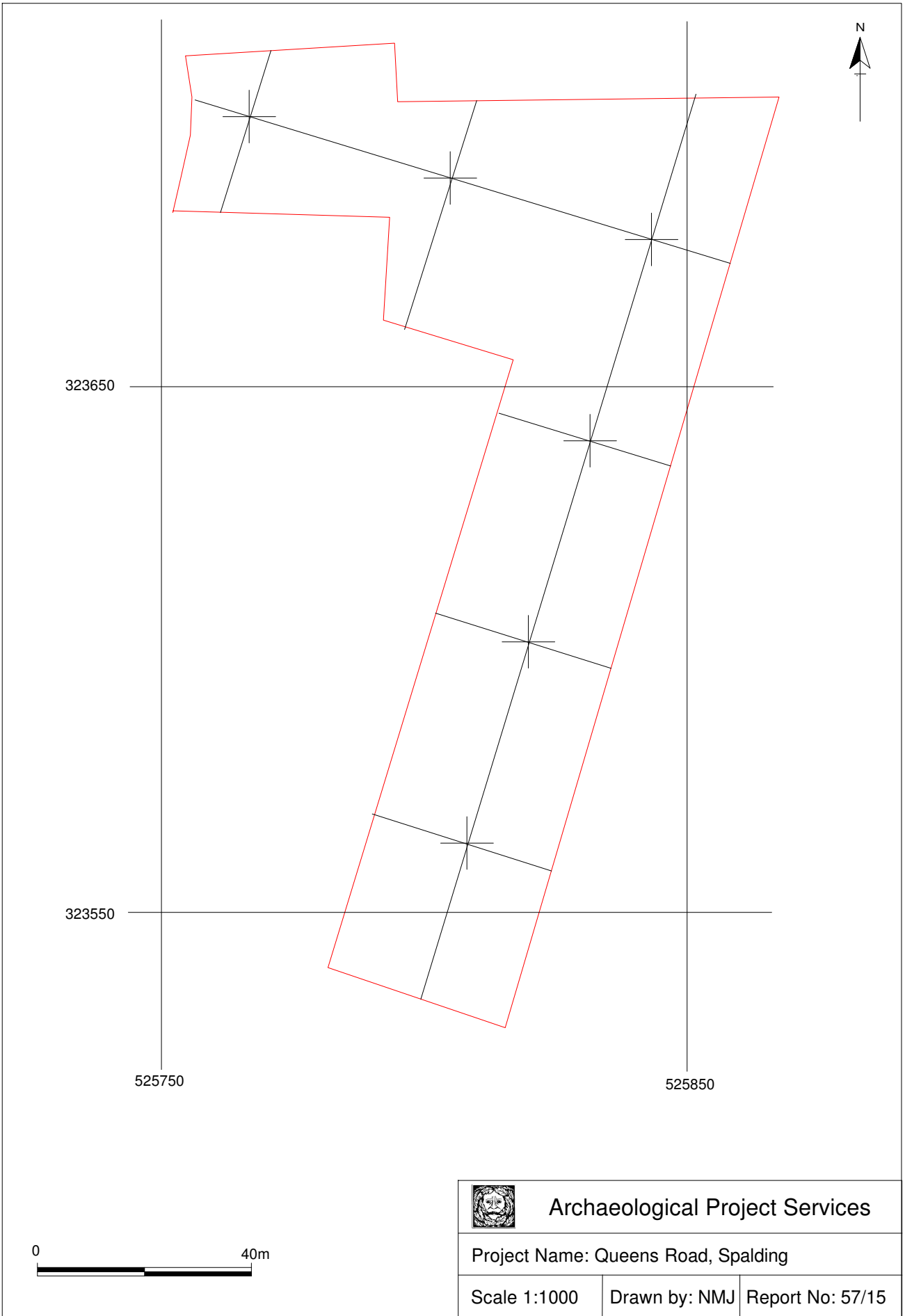
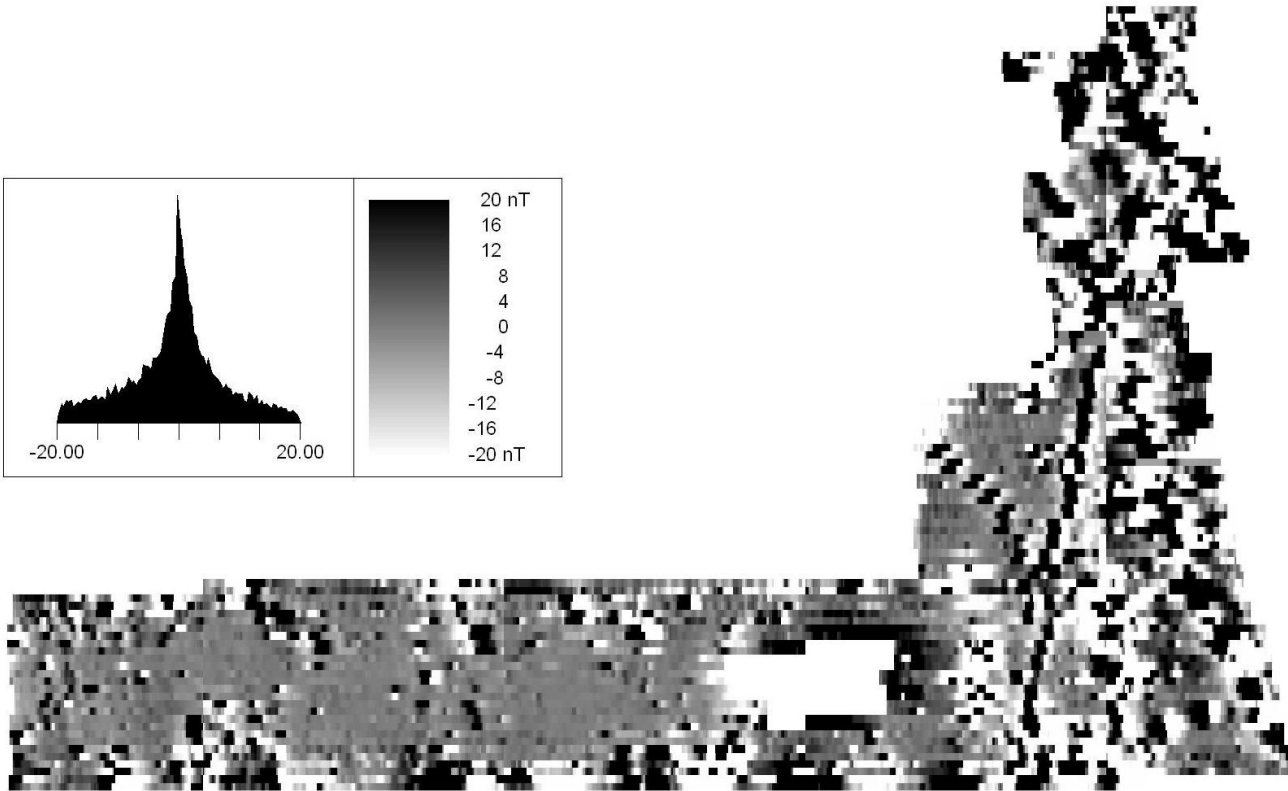
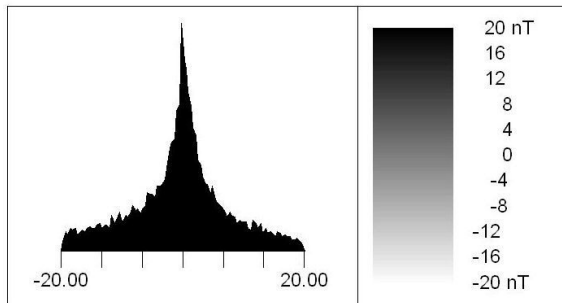


Figure 3 - Location and layout of survey area



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Scale 1:1000

Drawn by: NMJ

Report No: 57/15

Figure 4 - Minimally processed data greyscale plot

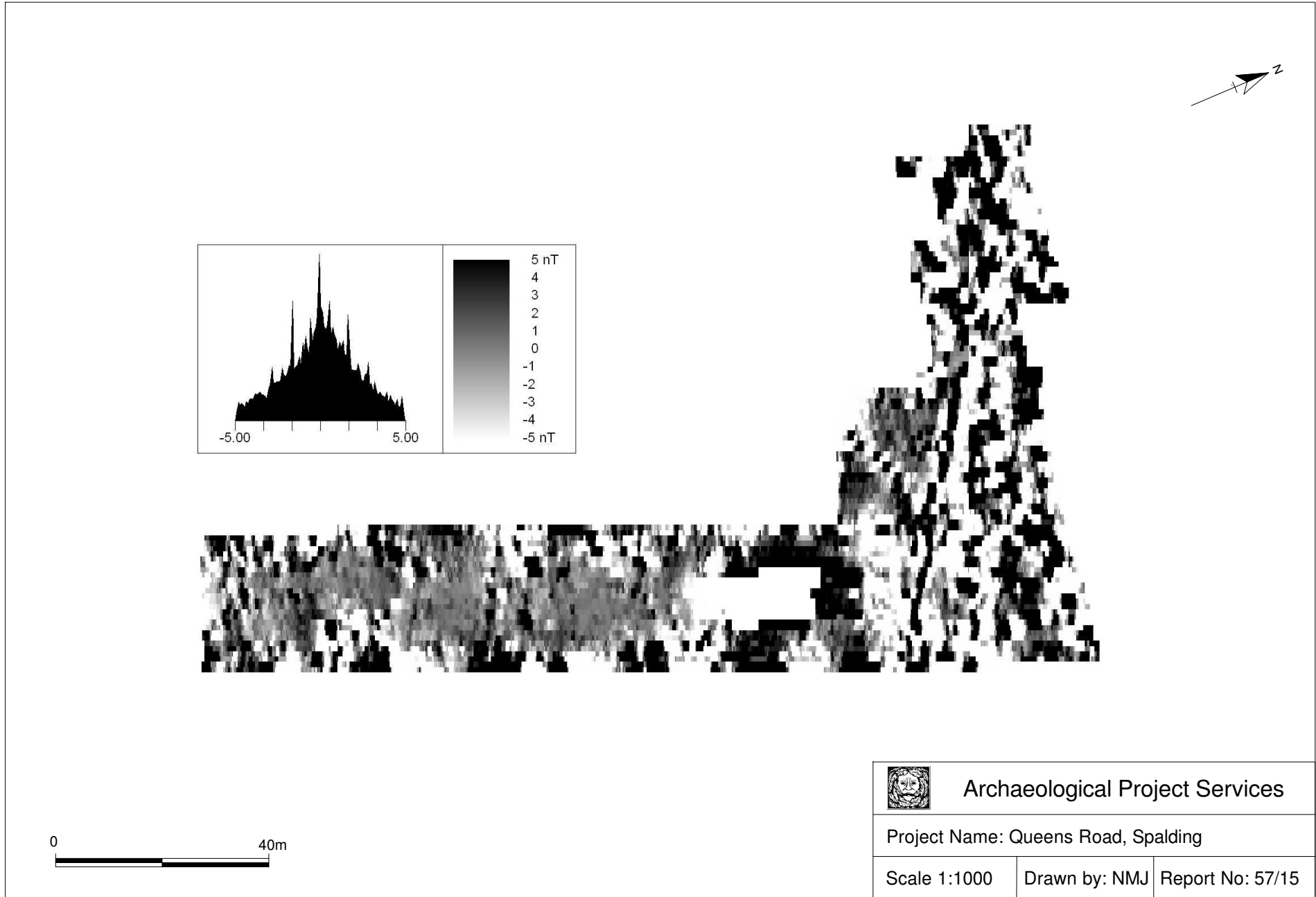

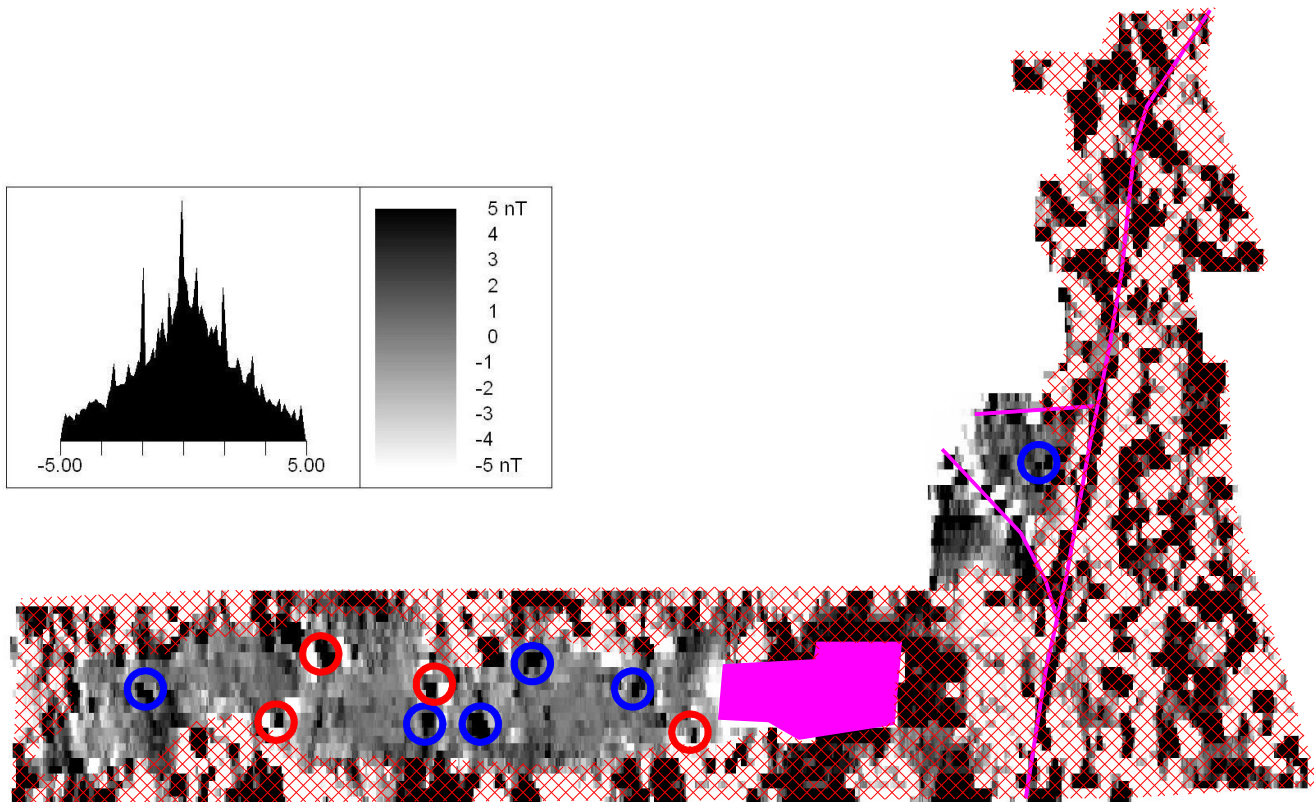
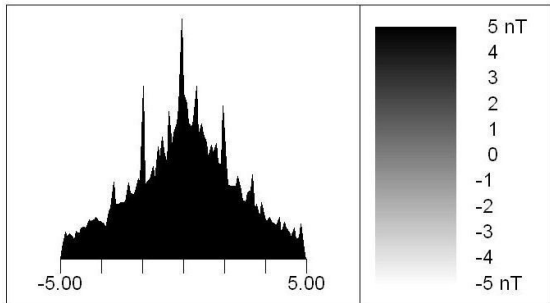


Figure 5 - Processed data greyscale plot

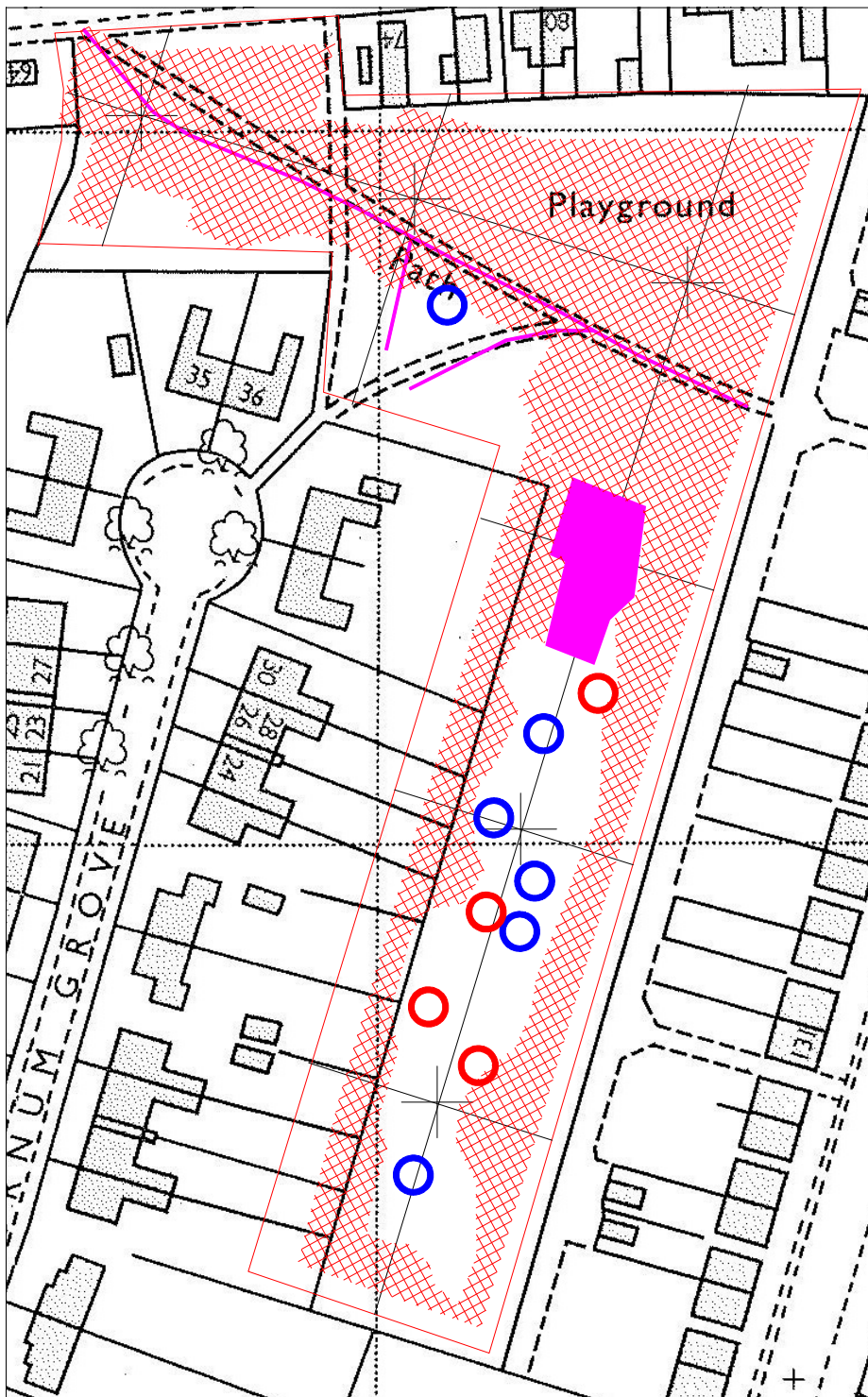
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Project Name: Queens Road, Spalding		
Scale 1:1000	Drawn by: NMJ	Report No: 57/15







Key	
	Examples of ferrous responses
	Examples of discrete positive anomalies
	Magnetic disturbance
	Modern features

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Figure 6 - Interpretive greyscale plot



-  Examples of ferrous responses
-  Examples of discrete positive anomalies
-  Magnetic disturbance
-  Modern features

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Figure 7 - Location and layout of survey area, overlaid with interpretive plot

Appendix 1

THE ARCHIVE

The archive consists of:

- 1 Daily record sheet
- 1 Report text and illustrations
- Digital data

File names	SPQR15 _01-14.xgd	
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. xcp files are composites containing record of all the data and processes used to produce the end product	
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters	
List of codes used in files	D indicates a "dummy" value within the composite data	
Hardware, software and operating systems	TerraSurveyor running under Windows 7	
Date of last modification	08/06/15	
Indications of known areas of weakness in data		

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Sleaford, Lincolnshire
NG34 9RW

The ultimate destination of the project archive is:

The Collection
Art and Archaeology in Lincolnshire
Danes Terrace
Lincoln
LN2 1LP

Accession Number LCNCC:2015.110

Archaeological Project Services Site Code: SPQR15

OASIS record number archaeo11-215107

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OASIS ID: archaeol1-215107

Project details

Project name	Geophysical survey on land off Queens Road, Spalding, Lincolnshire
Short description of the project	Magnetometer survey of land off Queens Road, Spalding, Lincolnshire, recorded extensive modern disturbance due to adjacent development, paths and a children's play area. A number of discrete positive anomalies were also recorded and may represent pits, though they are difficult to interpret on the basis of form alone.
Project dates	Start: 05-06-2015 End: 05-06-2015
Previous/future work	No / Not known
Any associated project reference codes	SPQR15 - Sitecode
Any associated project reference codes	2015.110 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Other 14 - Recreational usage
Monument type	PIT? Uncertain
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	OXFORD CLAY AND KELLAWAYS BEDS
Drift geology	ALLUVIUM
Techniques	Magnetometry

Project location

Country England

Site location LINCOLNSHIRE SOUTH HOLLAND SPALDING land off Queens Road
 Study area 0.90 Hectares
 Site coordinates TF 2583 2365 52.795373651 -0.1335706672 52 47 43 N 000 08 00 W Point

Project creators

Name of Organisation Archaeological Project Services
 Project brief originator Local Authority Archaeologist and/or Planning Authority/advisory body
 Project design originator Neil Jefferson
 Project director/manager Neil Jefferson
 Project supervisor Neil Jefferson
 Type of sponsor/funding body Developer

Project archives

Physical Archive Exists? No
 Digital Archive recipient The Collection
 Digital Archive ID 2015.110
 Digital Contents "Survey"
 Digital Media available "Geophysics"
 Paper Archive recipient The Collection
 Paper Archive ID 2015.110
 Paper Contents "Survey"
 Paper Media available "Correspondence", "Map", "Miscellaneous Material", "Plan", "Report", "Survey "

Project bibliography 1

Publication type Grey literature (unpublished document/manuscript)
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 Issuer or publisher APS
 Place of issue or publication HECKINGTON
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Entered on 22 June 2015

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