# LAND OFF LARCH AVENUE, NETTLEHAM, LINCOLNSHIRE

# GEOPHYSICAL SURVEY

**Work undertaken for**
**BEAL DEVELOPMENTS Ltd**
**and HSBC Bank**

**February 2015**

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

**OASIS Ref**: archaeol1-203975
**National Grid Reference:** TF 01517 75593

APS Report No: **16/15**

ARCHAEOLOGICAL PROJECT SERVICES

# Quality Control

Larch Avenue,
Nettleham,
Lincolnshire
(NELA15)

| | |
|---|---|
| Project Coordinator | Neil Jefferson |
| Site Staff | Neil Jefferson, Ryan Godbold, Mary Nugent, Fiona Walker, Ian Jefferson |
| Survey processing and report | Neil Jefferson |

| Checked by Senior Manager | Approved by Team Leader |
|---|---|
| Gary Taylor | Denise Drury |
| Date: 12/8/15 | Date: 27/2/15 |

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## 1. SUMMARY

*Detailed magnetic gradiometer survey was undertaken for Beal Developments Ltd in connection with proposed development on land off Larch Avenue, Nettleham, Lincolnshire. The survey totalled c. 13.4ha.*

*Two positive anomalies of clear archaeological origin have been identified. These are likely to form part of a field system that pre-dates evidence of former ridge and furrow agriculture.*

*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.*

## 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'* (IfA 2008).

### 2.2 Background

Archaeological Project Services was commissioned by Beal Developments Ltd to undertake detailed magnetometer survey totalling some 14ha on land off Larch Avenue, Nettleham, Lincolnshire. This was in advance of proposed development of the area. The survey was carried out between 27th and 29th of January 2015.

### 2.3 Topography and Geology

Nettleham is located 6km northeast of Lincoln, in the administrative district of West Lindsey (Fig. 1).

The site is located 1km northeast of the centre of Nettleham, on the north side of Larch Avenue, at National Grid Reference TF 01517 75593 (Fig. 2). The proposed development area encompasses some 14 hectares.

The site slopes predominantly down to the north towards the existing stream.

The solid geology consists of Argillaceous rocks of the Rutland Formation, which formed in the Jurassic Period (BGS 2015).

## 3. GEOPHYSICAL SURVEY

### 3.1 Methods

Location and layout of the survey areas is shown in Figure 3. Part of the southern area contained building and could not be surveyed, reducing the area from c.14ha to c.13.4ha. The site is divided into three fields which all contained a very young grain crop. All were in good condition for survey. Weather was generally overcast and damp.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2011) 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 (Clarke 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): -3 to 3nT.

### 3.2 Results

The presentation of the data for the site involves a print-out of the raw or minimally processed data as greyscale plot (Figs 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.

*Positive linear anomalies*
Two positive anomalies of clear archaeological origin have been identified. Both located in the western field, their alignment suggest that they are likely to form old field boundaries pre-dating a group of possible furrows.

*Discrete positive anomalies*
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)*
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 agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris.

*Geological Features*
Irregular features probably representing undulations in the natural are evident at the north eastern corner of the site.

*Possible Furrows.*
A series of fairly weak parallel linear responses occur across the western area of the site. These may reflect earlier ridge and furrow cultivation.

*Removed Field Boundary.*
A strong linear response represents a removed field boundary. The possible furrows stop just before the boundary suggesting a medieval/ post-medieval date.

## 4. DISCUSSION

Two positive anomalies of clear archaeological origin have been identified. These are likely to form part of a field system that pre-dates the furrows.

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

## 5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge Beal Homes Ltd who commissioned the project; Gary Taylor and Denise Drury (APS) edited the report.

## 6. PERSONNEL

Project coordinator: Neil Jefferson
Geophysical Survey: Neil Jefferson, Ryan Godbold, Mary Nugent, Fiona Walker, Ian Jefferson
Survey processing and reporting: Neil Jefferson

## 7. BIBLIOGRAPHY

BGS 2015, *http://mapapps.bgs.ac.uk/geologyofbritain/home.html accessed February 2015*

Clark, A., 1996 *Seeing Beneath the Soil*, London, 2nd edn.

English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation.*

IfA, 2008 *Standard and Guidance for Field Evaluation.*

IfA, 2011 *Standard and Guidance for Geophysical Survey.*

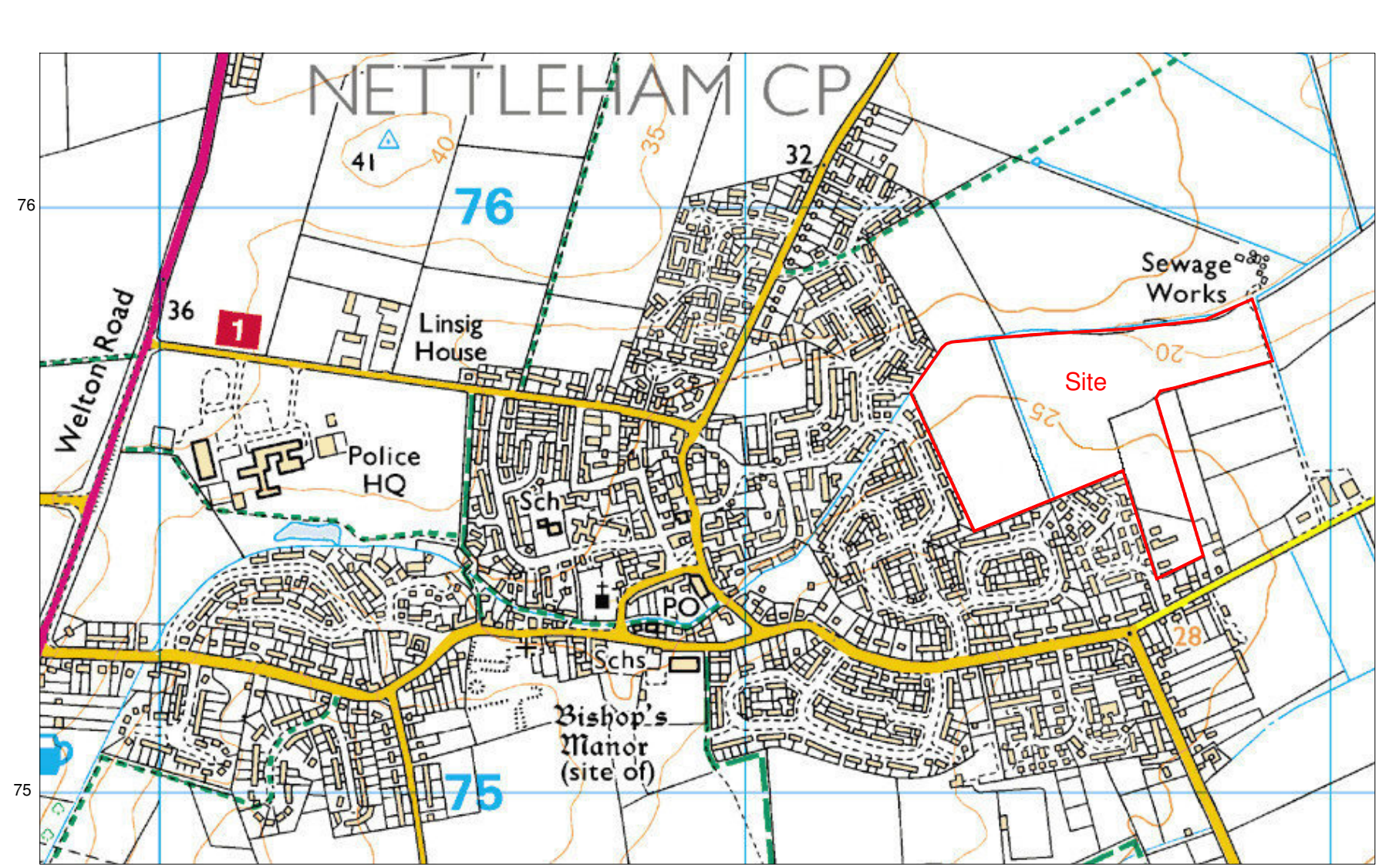
BGS website: accessed 11/02/2015

## 8. ABBREVIATIONS

BGS British Geological Survey

IfA Institute for Archaeologists


Figure 1 - General location plan




Archaeological Project Services

Project Name: Larch Avenue, Nettleham

| Scale 1:10,000 | Drawn by: JS | Report No:16/15 |
|---|---|---|

Figure 2 - Site Location

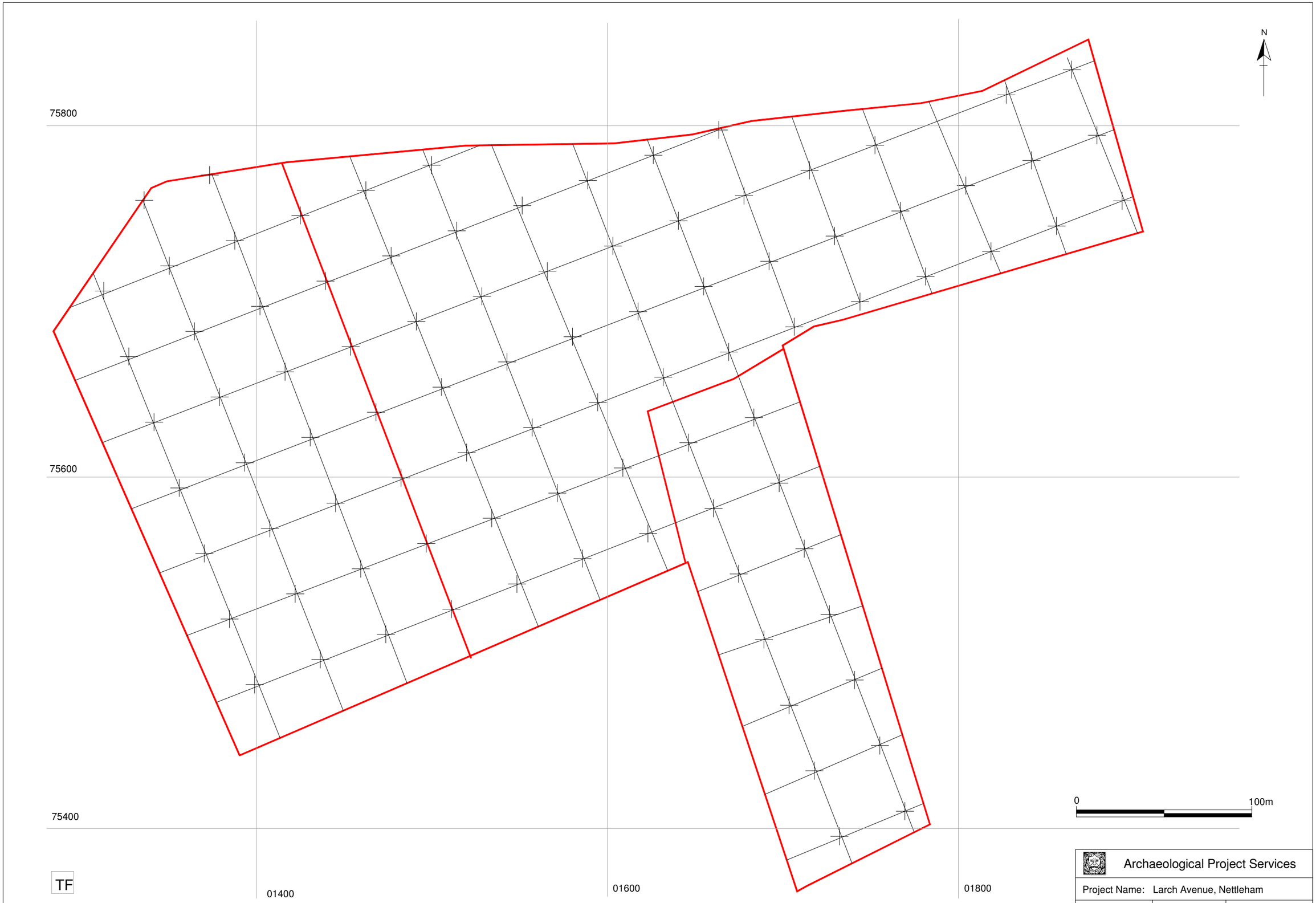



Figure 3 - Survey Layout

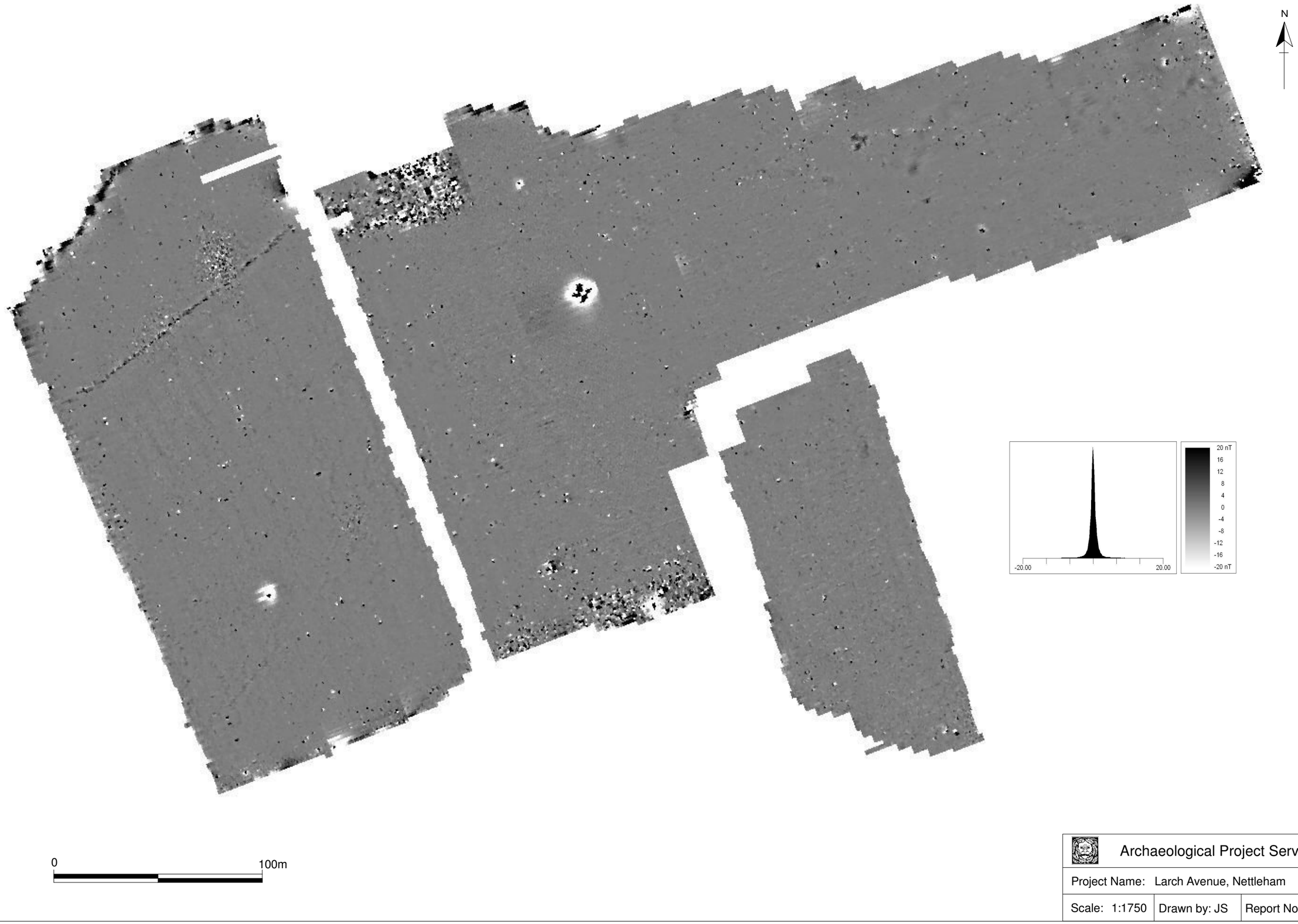



Figure 4 - Minimally processed data greyscale plot

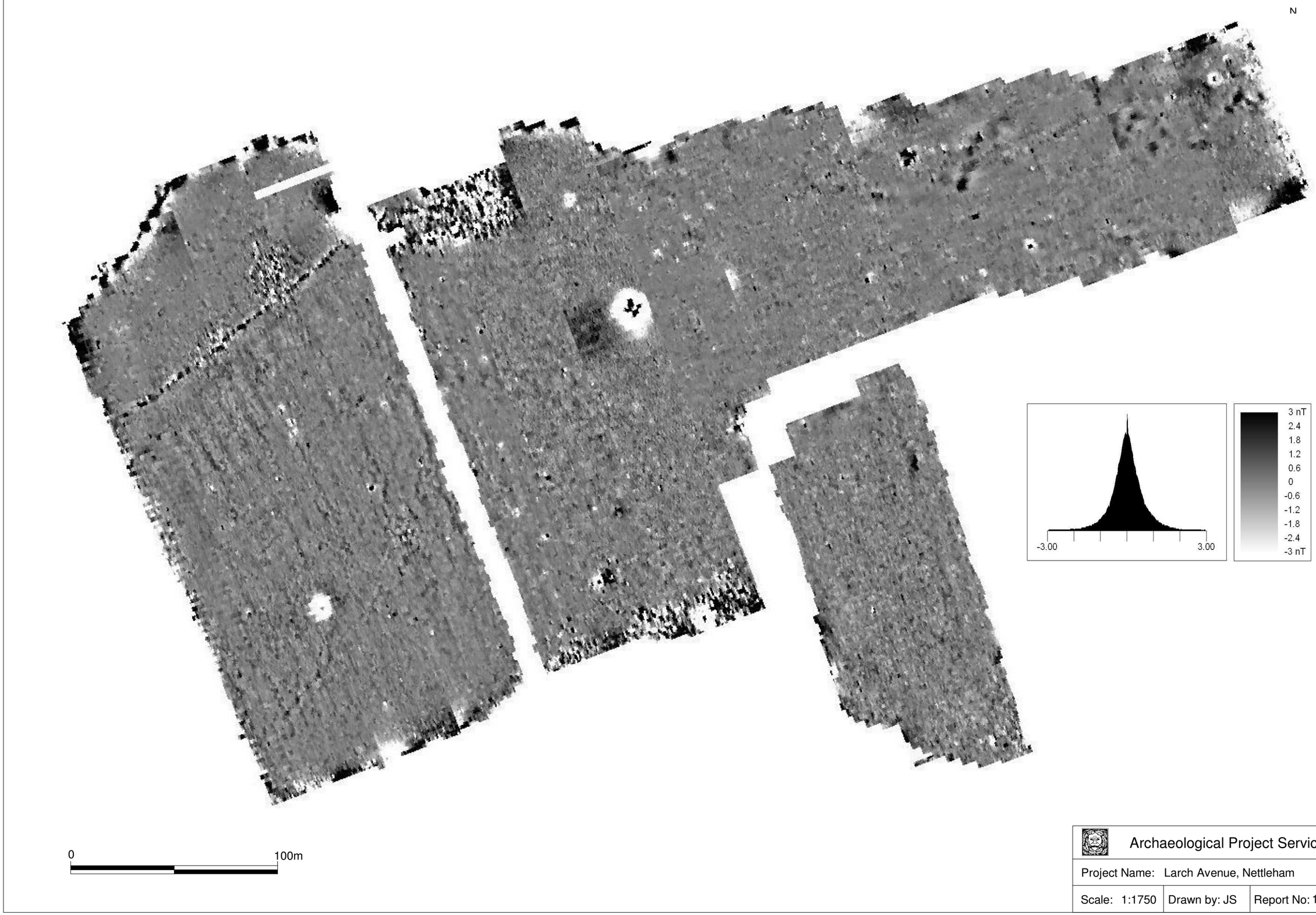



Figure 5 - processed data greyscale plot

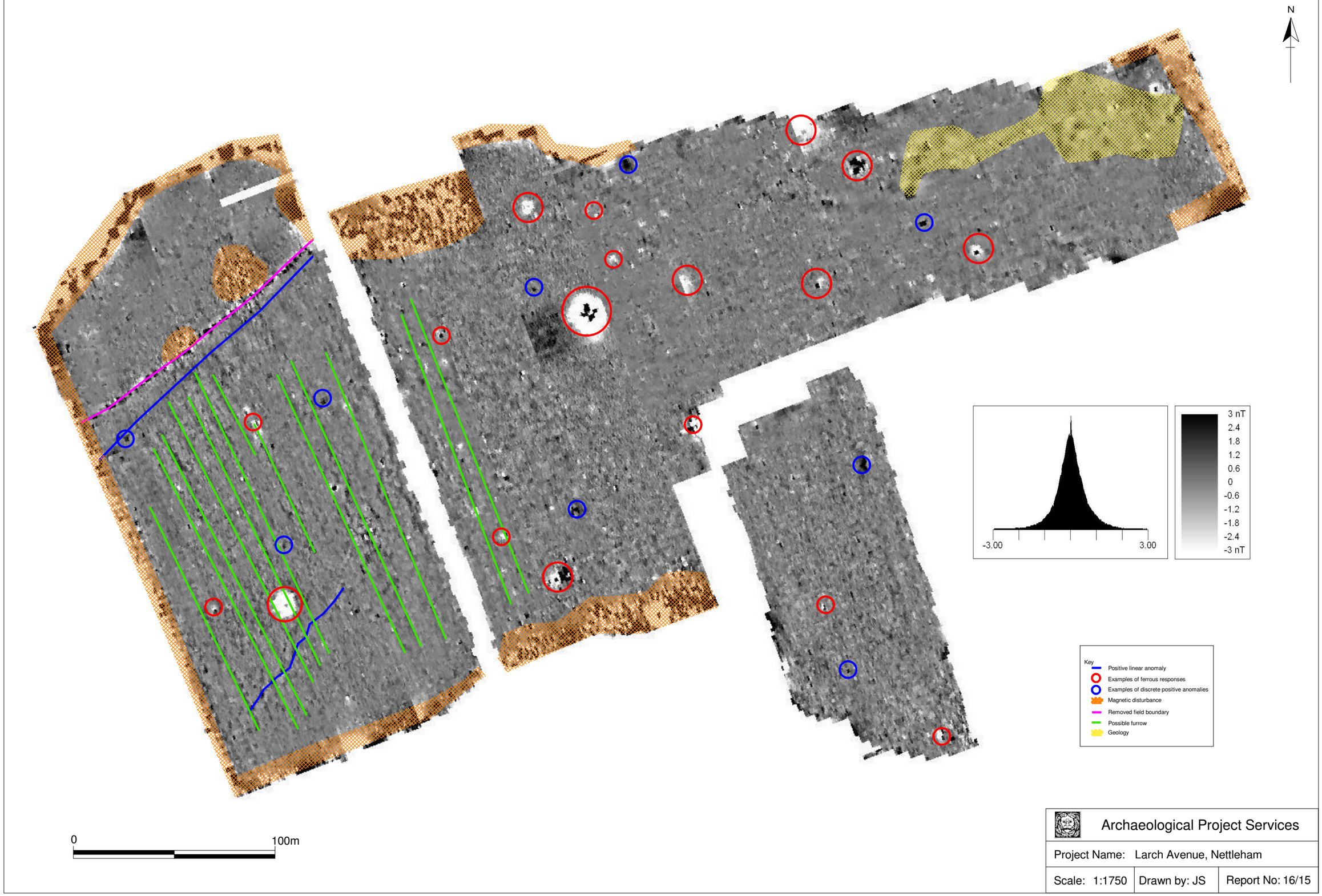



Figure 6 - interpretative plot

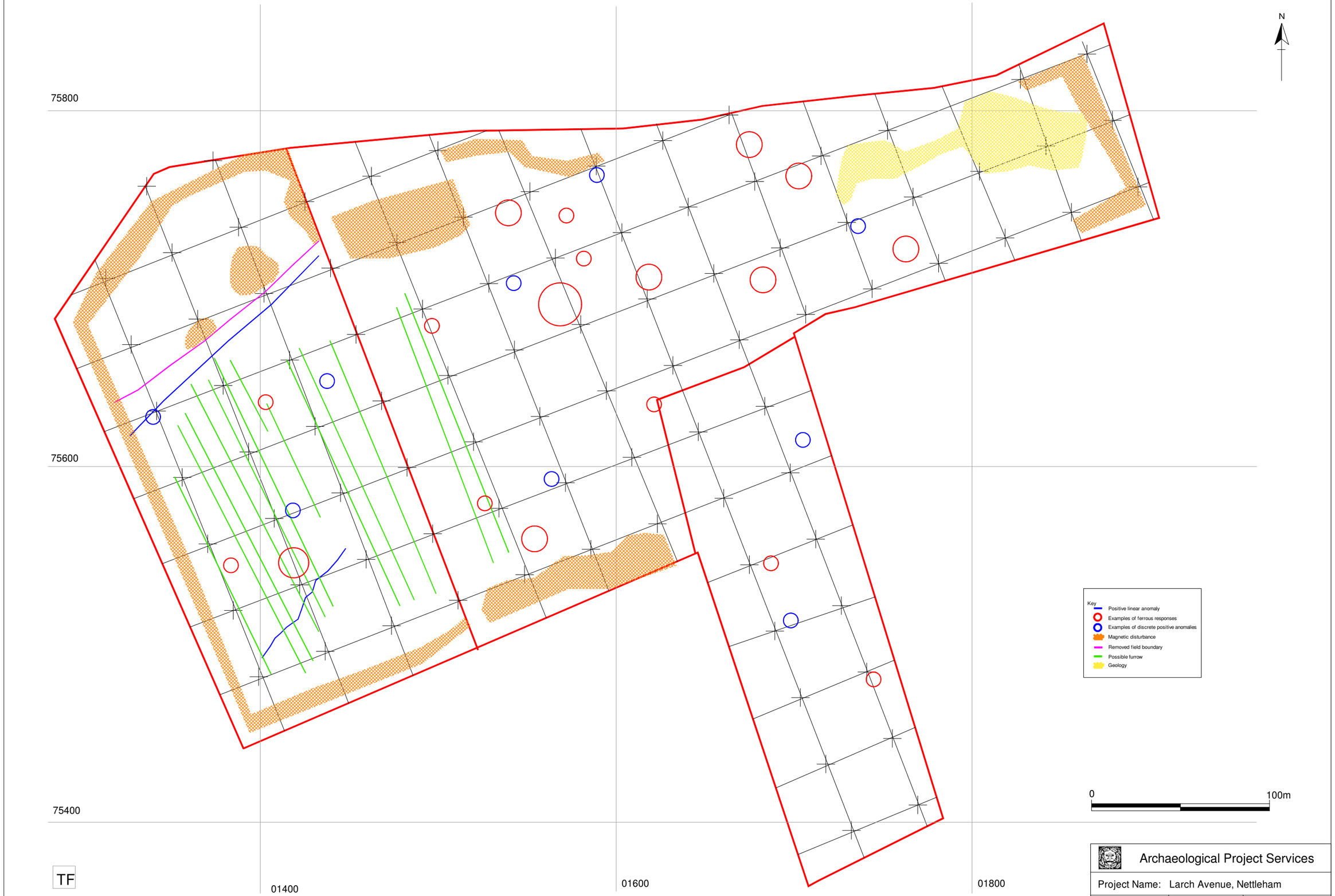



Figure 7 - Location and layout of survey area, overlaid with interpretive

# Appendix 1

## THE ARCHIVE

The archive consists of:

| | |
|---|---|
| 3 | Daily record sheets |
| 1 | Report text and illustrations |
| | Digital data |

| | | | |
|---|---|---|---|
| File names | NELA15-01-97.xgd | | |
| Explanation of codes used in file names | xgd files are magnetometer grids, named with site code and number in the order surveyed.<br>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 | ArcheoSurveyor 2.5.15 running under Windows XP Service Pack 3 | | |
| Date of last modification | 11/02/15 | | |
| 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

Archaeological Project Services Site Code: NELA15

OASIS record number archaeol1-203975

# OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

## OASIS ID: archaeol1-203975

### Project details

| | |
|---|---|
| Project name | LAND OFF LARCH AVENUE, NETTLEHAM, LINCOLNSHIRE |
| Short description of the project | Detailed magnetic gradiometer survey was undertaken for Beal Developments Ltd in connection with proposed development on land off Larch Avenue, Nettleham, Lincolnshire. The survey totalled c. 13.4ha. Two positive anomalies of clear archaeological origin have been identified. These are likely to form part of a field system that pre-dates a group of furrows, of former ridge and furrow agriculture. 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. |
| Project dates | Start: 27-01-2015 End: 29-01-2015 |
| Previous/future work | Not known / Not known |
| Type of project | Field evaluation |
| Methods & techniques | "Geophysical Survey" |
| Development type | Not recorded |
| Prompt | Voluntary/self-interest |
| Position in the planning process | Not known / Not recorded |
| Solid geology (other) | argillaceous rocks |
| Drift geology | Unknown |
| Drift geology (other) | none |
| Techniques | Other |

### Project location

| | |
|---|---|
| Country | England |
| Site location | LINCOLNSHIRE WEST LINDSEY NETTLEHAM LAND OFF LARCH AVENUE, NETTLEHAM, LINCOLNSHIRE |
| Study area | 13.40 Hectares |

| | |
|---|---|
| Site coordinates | TF 01517 75593 53.267318022 -0.47769701847 53 16 02 N 000 28 39 W Point |

**Project creators**

| | |
|---|---|
| Name of Organisation | Archaeological Project Services |
| Project brief originator | None |
| Project design originator | Neil Jefferson |
| Project director/manager | Neil Jefferson |
| Project supervisor | Neil Jefferson |
| Type of sponsor/funding body | Developer |

| | |
|---|---|
| Entered by | neil jeffersoin (info@apsachaeology.co.uk) |
| Entered on | 17 February 2015 |

# OASIS: