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**LAND AT  
SUNNYDALE CLOSE,  
SURFLEET,  
LINCOLNSHIRE**

**GEOPHYSICAL SURVEY  
(SUSC15)**

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**Work undertaken for  
M Parker and Sons Ltd.**

**September 2015**

**Report produced by  
Jonathon Smith BA (Hons), MA**

**OASIS Ref: archaeol1-223974  
National Grid Reference: TF 2520 2794  
Planning No: H17-0652-15  
Accession No: LCNCC:2015.171**

APS Report No: **88/15**

**ARCHAEOLOGICAL  
PROJECT  
SERVICES**

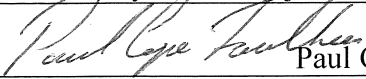
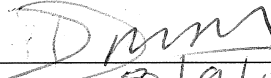




**Quality Control**  
Sunnydale Close,  
Surfleet,  
Lincolnshire

SUSC15

Project Coordinator	Paul Cope-Faulkner
Site Staff	Jonathon Smith
Survey processing and report	Jonathon Smith

Checked by Senior Project Officer	Approved by Team Leader
 Paul Cope-Faulkner	 Denise Drury
Date: 29.9.15	Date: 30/9/15



## CONTENTS

<b>1.</b>	<b>SUMMARY</b> .....	<b>1</b>
<b>2.</b>	<b>INTRODUCTION</b> .....	<b>1</b>
<b>2.1</b>	<b>DEFINITION OF AN EVALUATION</b> .....	<b>1</b>
<b>2.2</b>	<b>BACKGROUND</b> .....	<b>1</b>
<b>2.3</b>	<b>TOPOGRAPHY AND GEOLOGY</b> .....	<b>1</b>
<b>3.</b>	<b>GEOPHYSICAL SURVEY</b> .....	<b>1</b>
<b>3.1</b>	<b>METHODS</b> .....	<b>1</b>
<b>3.2</b>	<b>RESULTS</b> .....	<b>3</b>
<b>4.</b>	<b>DISCUSSION</b> .....	<b>3</b>
<b>5.</b>	<b>ACKNOWLEDGEMENTS</b> .....	<b>4</b>
<b>6.</b>	<b>PERSONNEL</b> .....	<b>4</b>
<b>7.</b>	<b>BIBLIOGRAPHY</b> .....	<b>4</b>
<b>8.</b>	<b>ABBREVIATIONS</b> .....	<b>4</b>

Appendix 1 The Archive

Appendix 2 OASIS Form

### List of Figures

Figure 1 General location plan

Figure 2 Site location map

Figure 3 Layout of survey area

Figure 4 Raw data greyscale plot

Figure 5 Minimally processed data greyscale plot

Figure 6 Processed data greyscale plot

Figure 7 Interpreted plot

Figure 8 1888 OS Map

## 1. SUMMARY

*Detailed magnetic gradiometer survey was undertaken for M Parker and Sons Ltd. in connection with proposed development on land at Sunnydale Close, Surfleet, Lincolnshire. The survey area totalled c. 1.83ha.*

*A settlement at Surfleet has been recorded since at least the times of the Domesday Survey of c. 1086. Medieval salt-making is known from the vicinity. The magnetometer survey revealed a ditch and a possible enclosure. An area of disturbance at the north of the site may be caused by salt-making activities, but this is thought unlikely.*

## 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 M Parker and Sons Ltd. to undertake a detailed magnetometer survey totalling some 1.83ha on land at Sunnydale Close, Surfleet, Lincolnshire. This was in advance of proposed development of the area (Planning No. H17-0652-15).

The survey was carried out on 16<sup>th</sup> September 2015, in accordance with a specification prepared by Archaeological Project Services and approved by the Historic Environment Team, Lincolnshire Country Council.

A settlement at Surfleet has been recorded since at least the times of the Domesday Survey of c. 1086. At this time the land was held by Heppo the Arblester and mention is also made of two salt-production sites. Lidar images show pockets of higher ground towards the northern end of the site, which are comparable to the waste mounds associated with medieval salt-production sites.

### 2.3 Topography and Geology

Surfleet is 5.5km north of Spalding and 17.5km southwest of Boston in the South Holland district of Lincolnshire (Fig 1).

The site (centred approximately on NGR TF 2520 2794) is located east of Sunnydale Close, to the south of the centre of Surfleet and the River Glen (Fig 2). The site lies at about 5m OD.

The local geology is Oxford Clay Formation mudstone overlain by superficial Tidal Flat clay and silt (BGS 2015). Local soils are of the Wisbech association, typically deep stoneless calcareous coarse silty soils (Hodge *et al.* 1984).

## 3. GEOPHYSICAL SURVEY

### 3.1 Methods

The layout of the survey area is shown in Figure 3. The site was flat and recently harrowed, which made it suitable for surveying. The weather was generally warm and bright.

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 an absence of anomalies does not necessarily indicate an 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 intervals 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 TerraSurveyor software. This can emphasise various aspects contained within the data that 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 median 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 median 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 = 2; Y radius = 2; 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 greyscale print-out of the raw data (Fig 4), followed by the minimally processed data (Fig 5; clipped for display but otherwise unprocessed) and the processed data (Fig 6). Magnetic anomalies have been identified and plotted on to an interpretative drawing (Fig 7). Finally the results obtained have been overlain on to a historical map for comparison with known features (Fig 8).

#### *Positive linear anomalies*

Two positive linears have been identified. The first runs southwest to northeast across the southern part of the site and is a very strong signal (highlighted with a solid red line). This probably represents a former ditch. On the south side of the ditch the signal is distinctly negative, perhaps indicating the position of a bank.

The second linear identified in the north part of the site is much more diffuse and irregular in shape (highlighted with a dashed red line). It may represent an irregular enclosure.

#### *Discrete positive anomalies*

One discrete positive anomaly is visible at the western edge of the survey area (highlighted with a red circle). This has the potential to be a human made pit, but could equally result from geological disturbances.

#### *Globular positive anomalies*

The survey area has two distinct ribbons of

irregular globular anomalies running through it (highlighted with green crosshatching). These are likely to be geological deposits and may be related to a watercourse.

#### *Negative anomalies*

There is an area showing weak negative readings in the centre of the survey area (highlighted with blue hatching). The disturbance is likely to be geological in origin.

#### *Modern/magnetic disturbance*

There is an area of strong bipolar disturbances in the northeast corner of the survey area (highlighted with yellow hatching). These readings usually result from modern deposits of metallic debris or brick rubble. However, briquetage from salt-making activities can also cause similar anomalies. Given the historical records of salt-making in the area, it is worth considering this interpretation, but it should be noted that the shape of the anomalies is not typical for salt-processing sites.

## 4. DISCUSSION

The survey revealed one ditch with a possible bank, probably related to drainage. It runs on a roughly similar alignment to a path seen in the 1888 OS map (and which persists in being represented until 1973), but is some 30-40m to the north, so is unlikely to be directly related. A possible irregular enclosure and a possible pit are also present in the survey. None of these features can directly be dated but the fact that they do not appear on the 1888 OS map implies that they predate the map's creation. The other features observed are most likely related to geology or modern detritus.

Pockets of higher ground (towards the northern end of the site) were noted in lidar images, which are comparable to



mounds of waste material associated with medieval salt production. Bipolar disturbances in the northeast corner of the site may be related to salt making activities. However, the readings and the shape of the anomalies are not typical of salt making mounds.

## 5. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge M Parker and Sons Ltd. who commissioned the project. Paul Cope-Faulkner and Denise Drury edited the report.

## 6. PERSONNEL

Project coordinator: Paul Cope-Faulkner  
 Geophysical Survey: Jonathon Smith  
 Survey processing and reporting: Jonathon Smith.

## 7. BIBLIOGRAPHY

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<http://mapapps.bgs.ac.uk/geologyofbritain/home.html> Accessed 17.09.2015

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Hodge, C.A.H., Burton, R.G.O., Corbett, W.M., Evans, R. and Seale, R.S., 1984 *Soils and their use in Eastern England*, Soil Survey of England and Wales **13**

CIfA, 2014a *Standard and Guidance for Field Evaluation*.

CIfA, 2014b *Standard and Guidance for Geophysical Survey*.

## 8. ABBREVIATIONS

BGS	British Geological Survey
CIfA	Chartered Institute for Archaeologists
O.D.	Ordnance Datum





Figure 1 - General Location Plan



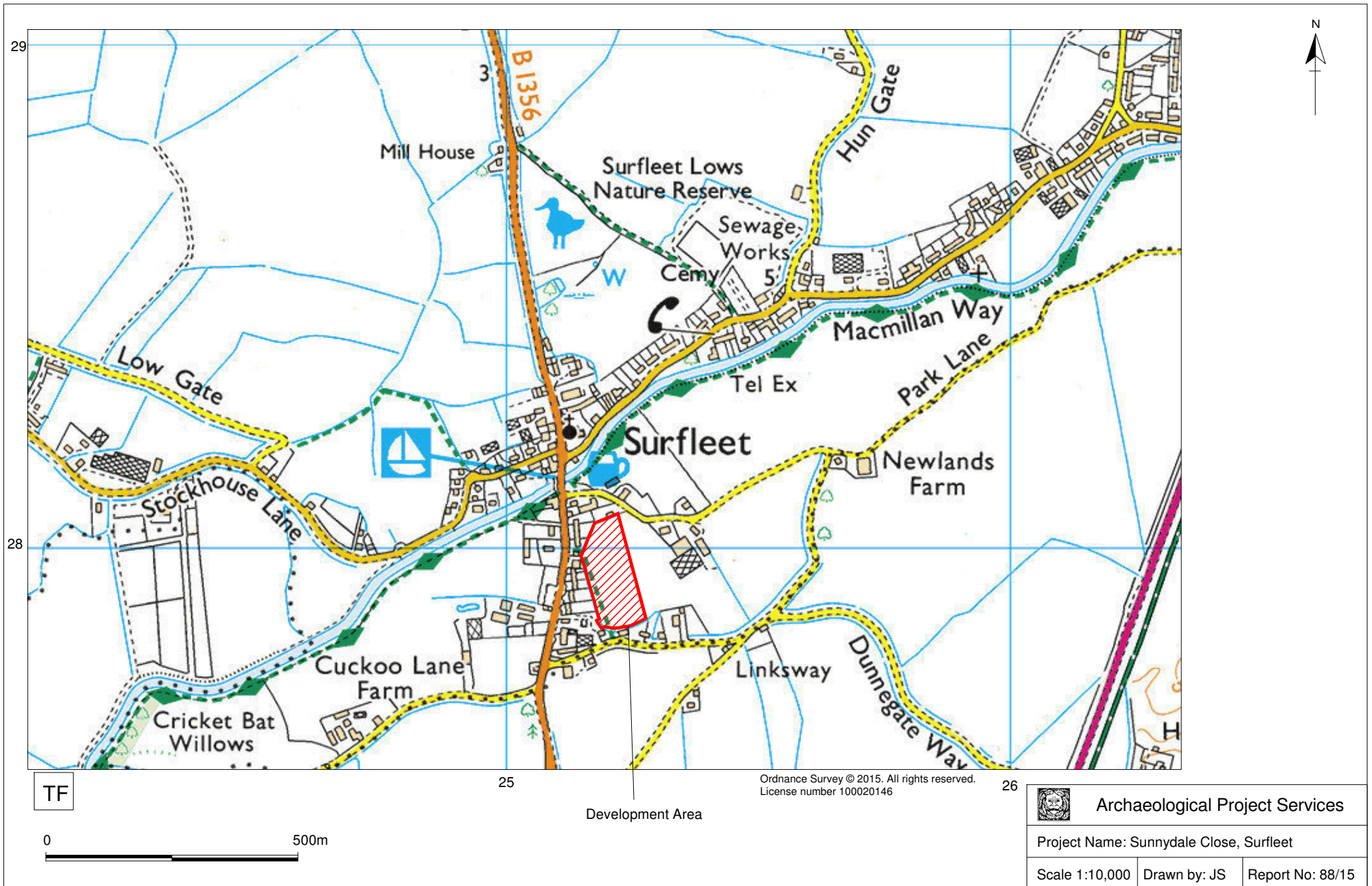


Figure 2 - Site Location






 <b>Archaeological Project Services</b>		
Project Name: Sunnydale Close, Surfleet		
Scale 1:1000	Drawn by: JS	Report No: 88/15

Figure 3 - Site Layout





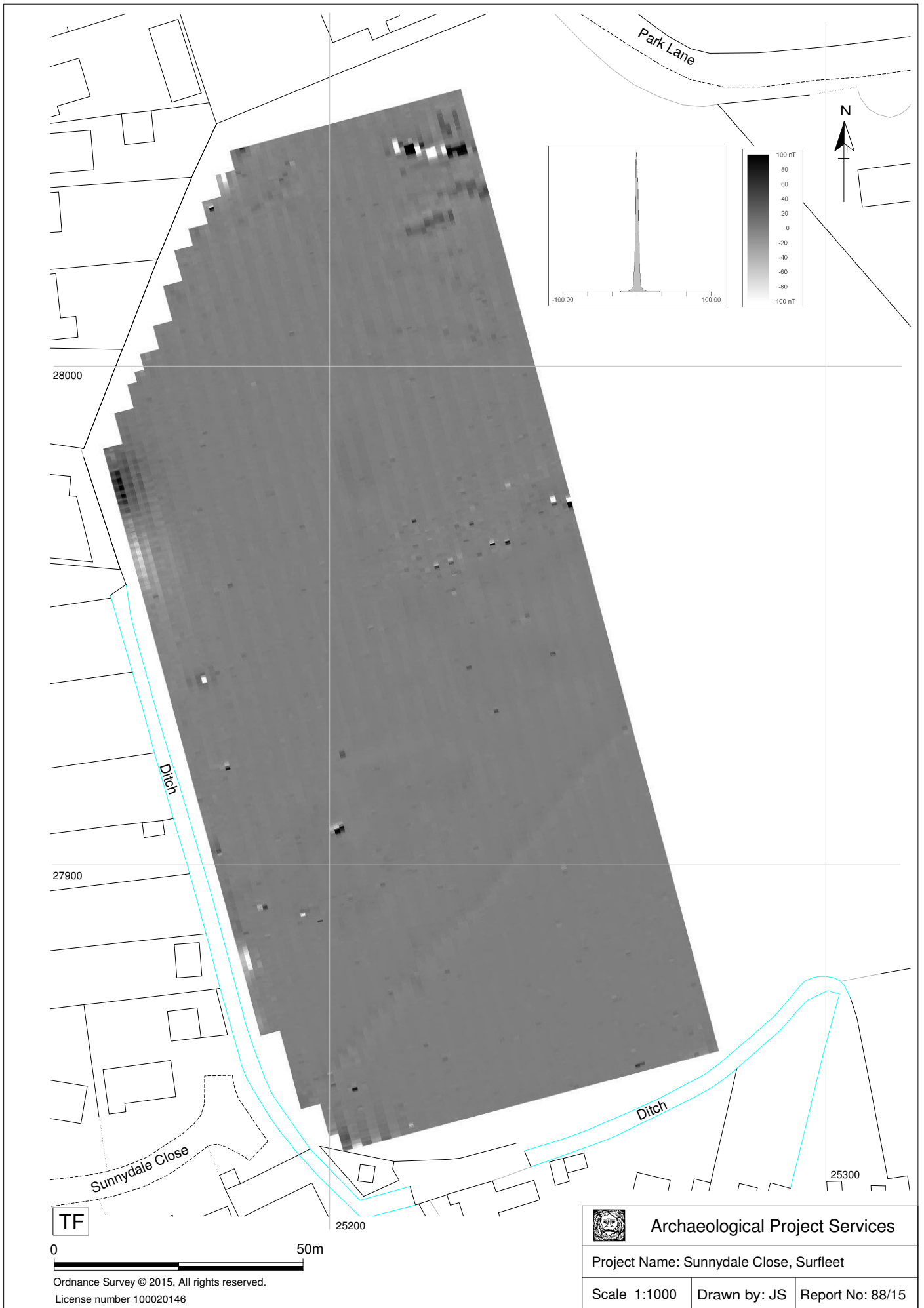


Figure 4 - Raw greyscale plot



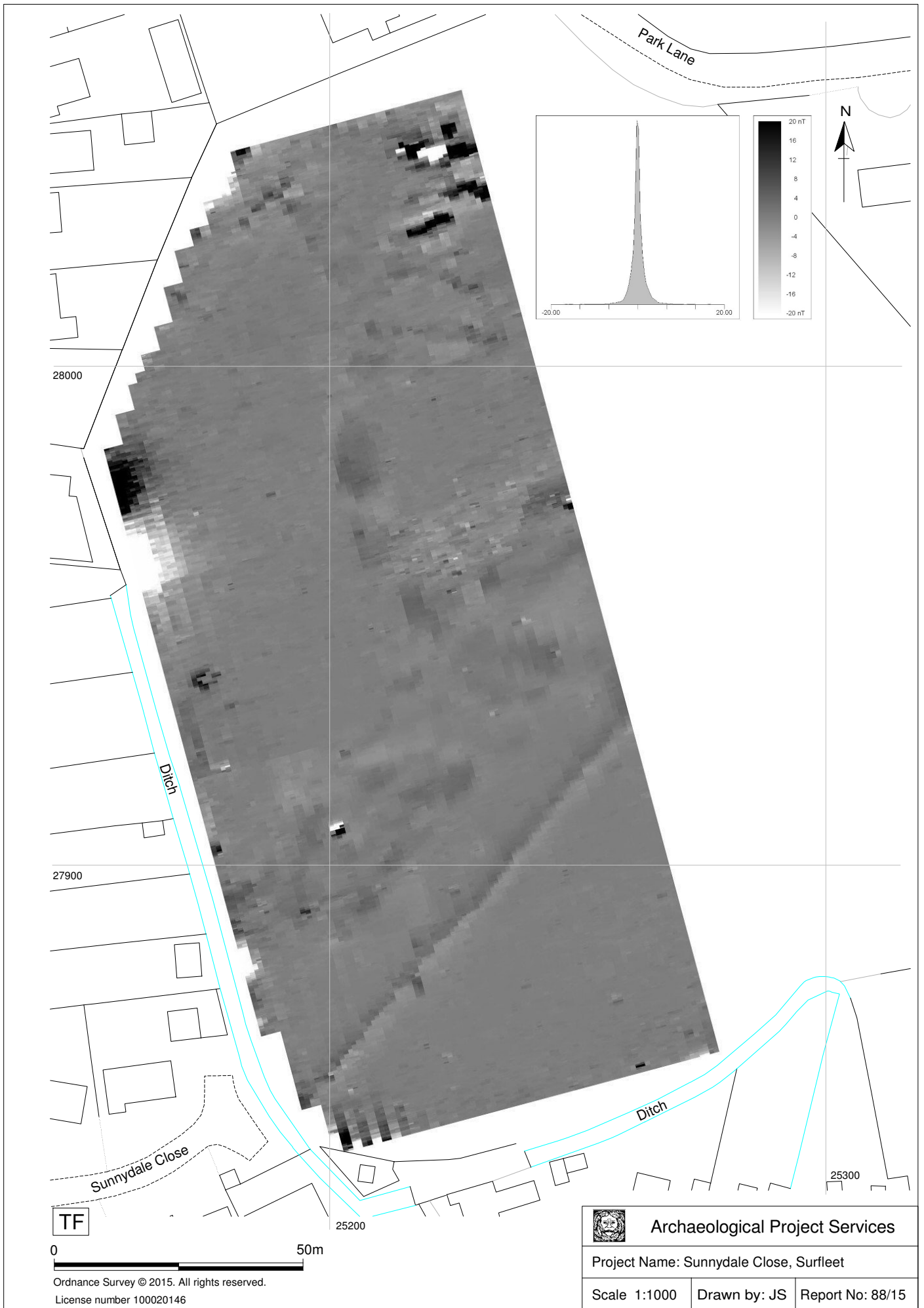
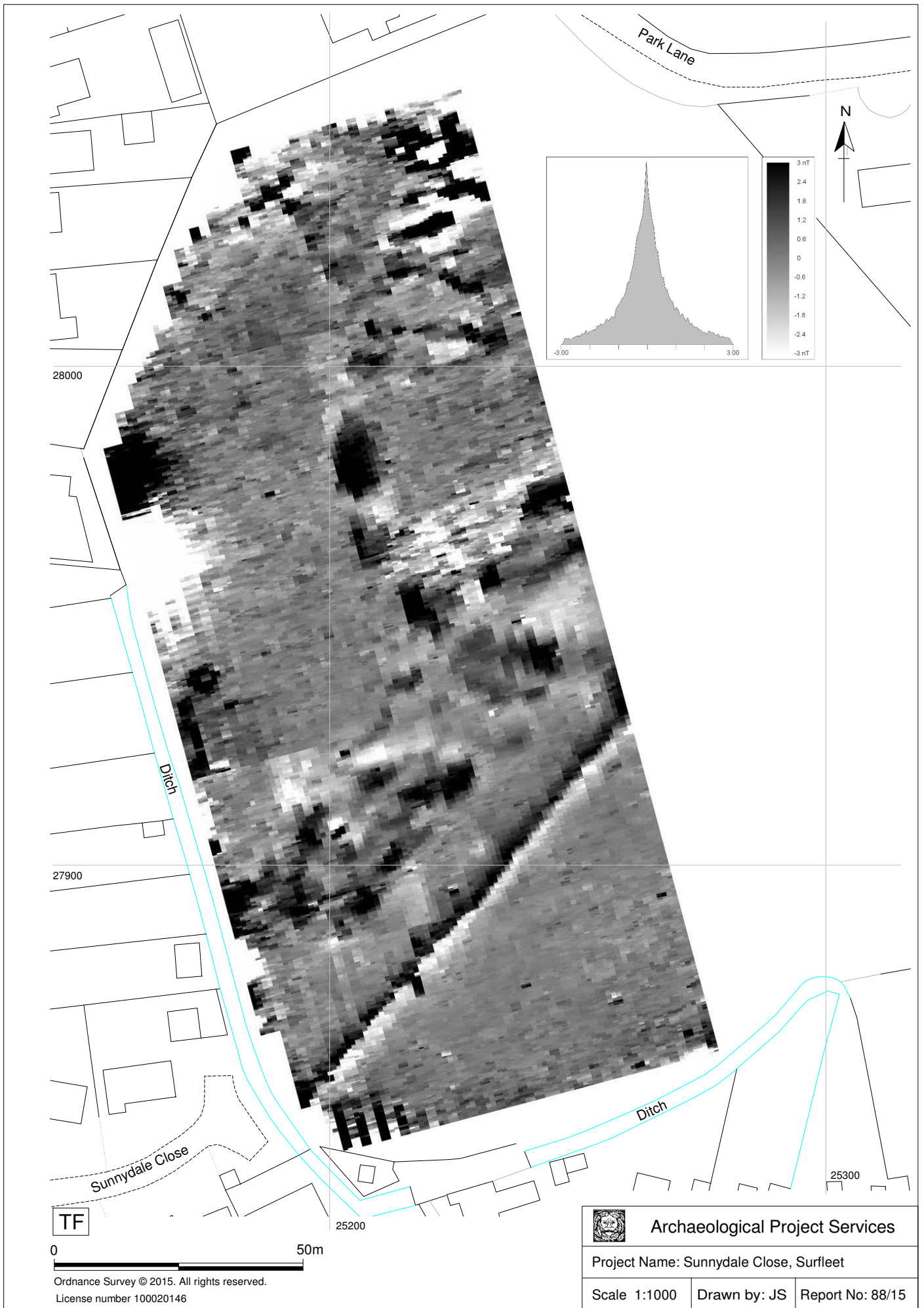


Figure 5 - Minimally processed greyscale plot





28000

27900

TF

25200

25300

0 50m

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Project Name: Sunnydale Close, Surfleet		
Scale 1:1000	Drawn by: JS	Report No: 88/15

Figure 6 - Processed greyscale plot





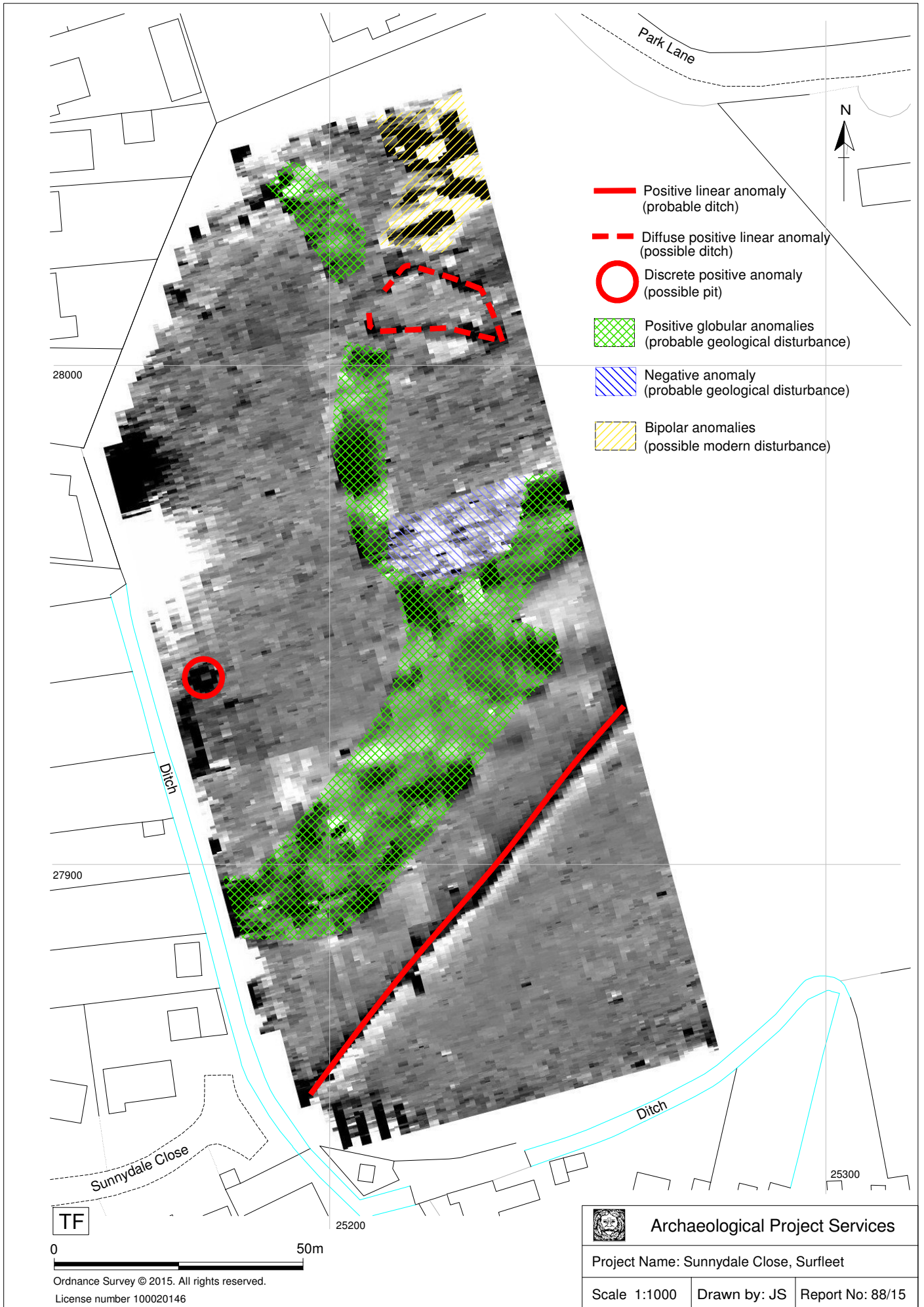
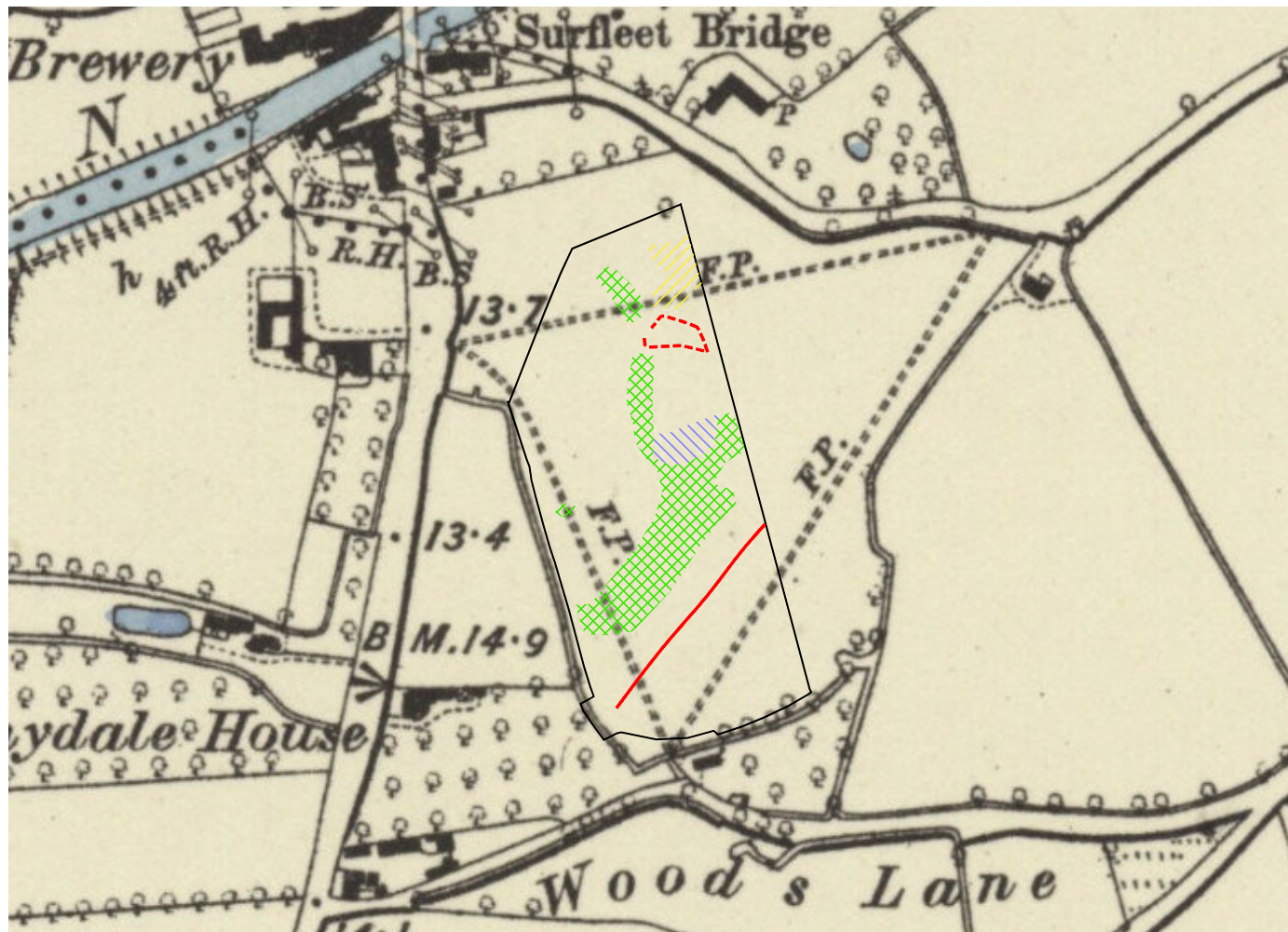


Figure 7 - Interpreted plot







- Positive linear anomaly  
(probable ditch)
- - - Diffuse positive linear anomaly  
(possible ditch)
- ▨ Positive globular anomalies  
(probable geological disturbance)
- ▨ Negative anomaly  
(possible geological disturbance)
- ▨ Bipolar anomalies  
(possible modern disturbance)

Extract from 6 inch 1888 OS map Lincolnshire CXXXIV.NW




 Archaeological Project Services		
Project Name: Sunnydale Close, Surfleet		
Scale 1:3000	Drawn by: JS	Report No: 88/15

Figure 8 - 1888 OS Map



## Appendix 1 THE ARCHIVE

The archive consists of:

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

File names	SUSC1501.xgd to SUSC1514.xgd SUSC15 complete.xcp
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. Grids suffixed with '-a' are re-orientated copies. 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 3.0.25.1 running under Windows 7
Date of last modification	17/09/15
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

Final destination of the archive is:

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

Site Code: SUSC15  
OASIS code: archaeo11-223974  
Accession Number: LCNCC:2015.171

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## Printable version

**OASIS ID: archaeol1-223974**

### Project details

Project name	Geophysical survey at Sunnydale Close, Surfleet
Short description of the project	A 1.83ha magnetometer survey of land near Sunnydale Close, Surfleet, Lincolnshire. The survey revealed a ditch and a possible enclosure. A possible area of medieval salt making was also identified, but this interpretation was thought to be unlikely.
Project dates	Start: 16-09-2015 End: 16-09-2015
Previous/future work	No / Not known
Any associated project reference codes	SUSC15 - Sitecode
Any associated project reference codes	H17-0652-15 - Planning Application No.
Any associated project reference codes	LCNCC:2015.171 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	DITCH Uncertain
Monument type	ENCLOSURE Uncertain
Monument type	PIT Uncertain
Monument type	SALTERN Medieval
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	OXFORD CLAY AND KELLAWAYS BEDS
Drift geology	ALLUVIUM

Techniques Magnetometry

### **Project location**

Country England  
Site location LINCOLNSHIRE SOUTH HOLLAND SURFLEET Sunnydale Close  
Postcode PE11 4BS  
Study area 1.83 Hectares  
Site coordinates TF 2520 2794 52.834069392686 -0.141265798832 52 50 02 N 000 08 28 W Point

### **Project creators**

Name of Organisation Archaeological Project Services  
Project brief originator Contractor (design and execute)  
Project design originator Paul Cope-Faulkner  
Project director/manager Paul Cope-Faulkner  
Project supervisor Jonathon Smith  
Type of sponsor/funding body Developer

### **Project archives**

Physical Archive Exists? No  
Digital Archive recipient The Collection  
Digital Archive ID LCNCC:2015.171  
Digital Media available "Geophysics", "Survey", "Text"  
Paper Archive recipient The Collection  
Paper Archive ID LCNCC:2015.171  
Paper Media available "Correspondence", "Diary", "Map", "Plan", "Report", "Survey "

### **Project bibliography 1**

Publication type Grey literature (unpublished document/manuscript)  
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