

ARCHAEOLOGICAL PROJECT SERVICES



Geophysical Survey Report

**On land off
TOOT LANE
FISHTOFT
LINCOLNSHIRE**

Prepared for
SLR CONSULTING LIMITED
By
Archaeological Project Services

Date: March 2019

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Document Control

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CONTENTS

1.	SUMMARY	1
2.	INTRODUCTION	1
2.1	DEFINITION OF AN EVALUATION	1
2.2	PROJECT BACKGROUND	1
2.3	TOPOGRAPHY AND GEOLOGY.....	1
2.4	ARCHAEOLOGICAL SETTING	1
3.	GEOPHYSICAL SURVEY.....	2
3.1	OBJECTIVES	2
3.2	METHODS	2
3.2	RESULTS.....	3
4.	DISCUSSION	4
5.	ACKNOWLEDGEMENTS	4
6.	PERSONNEL	4
7.	BIBLIOGRAPHY.....	4
8.	ABBREVIATIONS	5

Appendices

1. Technical Information
2. The Archive
3. OASIS Form

List of Figures

- Figure 1 General location plan
- Figure 2 Survey location plan
- Figure 3 Survey setout
- Figure 4 Raw Greyscale data
- Figure 5 Processed Greyscale data
- Figure 6 Interpretation

1. SUMMARY

A detailed magnetic gradiometer survey was undertaken on land at Toot Lane, Fishtoft, Lincolnshire. The work was undertaken to accompany a planning application for development of the site.

The geophysical results have identified multiple features of which few archaeological potential. Other anomalies indicate an infilled creek along the southern part of the site with the remaining features relating to modern use of the field.

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*’ (ClfA 2014a).

2.2 Project Background

Archaeological Project Services was commissioned by SLR Consulting to undertake a detailed magnetometry survey of land at Toot Lane, Fishtoft, Lincolnshire, in order to accompany a planning application for future development of the site. The geophysical survey was undertaken on the 14th of February and 7th of March 2019 in accordance with a Written Scheme of Investigation prepared by Archaeological Project Services and approved by the Planning Archaeologist, Boston Borough Council.

2.3 Topography and Geology

Fishtoft is located 4km southeast of Boston, in the administrative district of Boston Borough, Lincolnshire (Fig. 1). The site is situated a further 1.7km northwest of Fishtoft, on the east side of Toot Lane, at National Grid Reference TF 3515 4372 (Fig. 2). The site lies at a height of c. 2m OD on the generally level ground of the Lincolnshire Fens.

Local soils are of the Pepperthorpe/Tanvats Series, typical alluvial gley soils (Robson 1990, 31). These are developed over a drift geology of marine alluvium which in turn seals a solid geology of the Ampthill Clay Formation (BGS 2019).

2.4 Archaeological Setting

The site sits within an area of known archaeological activity. Prehistoric activity has been noted in the vicinity but the main focus lies some distance to the southwest.

The village of Fishtoft appears to have begun life in the Middle Saxon period as a possible support centre for a monastic complex or an early Urban Centre as revealed by excavations off Clampgate Road in 2003 (Cope-Faulkner 2012). Recorded as Toft in the Domesday Survey of c. 1086, the land was held by Count Alan and Guy de Craon (Foster and Longley 1979).

The site lies to the south of the Rochford Tower. Constructed around the start of the 16th century,

probably 1504, the red brick tower has three stories including an undercroft. A lookout platform, Toot Hill, is said to be associated with the tower. Lying to the north of the site, it is indicated on the 1888 25" Ordnance Survey map and the 6" map of 1906, but is not present on the 6" map of 1956. The platform has since been ploughed flat (LHER 12757). A significant scatter of medieval finds was plotted along the western side of Wainfleet Road to the north of the proposed development site (LHER 13824).

The former moated site of Fishtoft Grange (LHER 12998) lies to the southeast of the proposed development. Just to the north of the grange, a late medieval pottery and brick scatter was recovered and appears to be associated with the grange (LHER 12735). Pottery of this date has also been recovered from land to the southwest of the site (LHER 12996).

3. GEOPHYSICAL SURVEY

3.1 Objectives

The aim of the geophysical survey was to gather sufficient information to indicate the potential presence of archaeological remains and to establish:

- the form of any probable archaeological features present within the site;
- the spatial arrangement of any probable archaeological features present within the site
- the density of any probable archaeological features present in the investigation area.

3.2 Methods

The magnetic gradiometry survey was carried out with a Bartington Grad 601-2 fluxgate magnetometer. The area was divided into grids and each grid was walked systematically in a parallel pattern, taking readings every 0.25m in traverses 1m apart. Readings are automatically recorded on a datalogger which was downloaded at the end of each day. The gradiometer was 'zeroed' at the start of each day and at intervals throughout to ensure consistent results are achieved throughout the survey.

16 grids were laid out over the site of the survey area as shown in Figure 3.

The site lies on fairly level ground with the survey area having an intermittent low scrub cover (Plate 1). The survey avoided the areas immediately adjacent to metal fencing and housing so as not to affect the data.



Plate 1- View overlooking the site, looking east

Data obtained from the survey were processed using Terra Surveyor software (Version 3.0.33.10). Following initial examination of the results, the data were clipped (-3 to 3 nT) to provide contrast to enhance the final processed image

Data were exported as a JPG image and georeferenced for use in scale plans of the site. Anomalies were then checked against historical maps, and where available, lidar contour data.

The survey was undertaken in accordance with Written Scheme of Investigation and English Heritage (2008) and ClfA (2014b) guidelines and codes of conduct. Detailed methodology can be found in Appendix 1.

3.2 Results

The presentation of the data for the site involves a greyscale print-out of the raw data (Fig. 4; clipped for display but otherwise unprocessed) and the processed data (Fig. 5). Magnetic anomalies have been identified and plotted on to an interpretative drawing (Fig. 6).

There are several weak positive linear anomalies within the survey area. These may represent infilled ditches but due to their weak response they are more likely to relate to former agricultural activity at the site or the natural build-up of magnetically enhanced material.

The bipolar linear running east-west across the site is the current trackway across the site. This may have been reinforced with building rubble and would explain the bipolar effect in the data. There are also further bipolar linears that are present in the area which are believed to relate to field drains.

The two isolated dipolar anomalies have been caused by two metal borehole caps.

There are several areas of bipolar disturbance which are probably caused by nearby modern activity, such as fences and housing.

The southern part of the site is dominated by areas of positive response. There are no coherent patterns within the responses to suggest they are the result of human activity. They are typical responses relating to roddons, the infilled creeks of the marsh/fen environment typical in south Lincolnshire.

4. DISCUSSION

The geophysical results have identified several anomalies within the site of which most are believed to relate to modern agricultural activity. The site is dominated by an infilled creek which, though often used for settlement, contains no evidence for occupation and is unlikely to mask potential archaeological features. This geophysical survey does not preclude the survival of archaeological features which are not susceptible to detection, such as dispersed settlement, postholes or features which may have been too ephemeral to show in the data collected.

5. ACKNOWLEDGEMENTS

Archaeological Project Services wish to acknowledge the assistance of Mr T Malim of SLR Consulting Limited for commissioning this work. The work was coordinated by Paul Cope-Faulkner who also edited this report.

6. PERSONNEL

Project Manager: Paul Cope-Faulkner
Geophysical Survey: Sean Parker
Archiving: Denise Buckley
Survey processing and reporting: Sean Parker

7. BIBLIOGRAPHY

BGS, 2019 *Geology of Britain Viewer*. Available at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (accessed 15.02.2019)

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

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

Cope-Faulkner, P, 2012 *Clampgate Road, Fishtoft. Archaeology of a Middle Saxon Island Settlement in the Lincolnshire Fens*, Lincolnshire Archaeology and Heritage Reports Series No. **10**

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

Foster, CW and Longley, T (eds), 1974 *The Lincolnshire Domesday and the Lindsey Survey*, Lincoln Record Society **19**

Heritage Gateway, 2019, Available at
<http://www.heritagegateway.org.uk> (accessed 15.02.2019)

Robson, JD, 1990 *Soils of the Boston and Spalding district [Sheet 131]*, Memoirs of the Soil Survey of Great Britain

8. ABBREVIATIONS

APS	Archaeological Project Services
BGS	British Geological Survey
CifA	Chartered Institute for Archaeologists

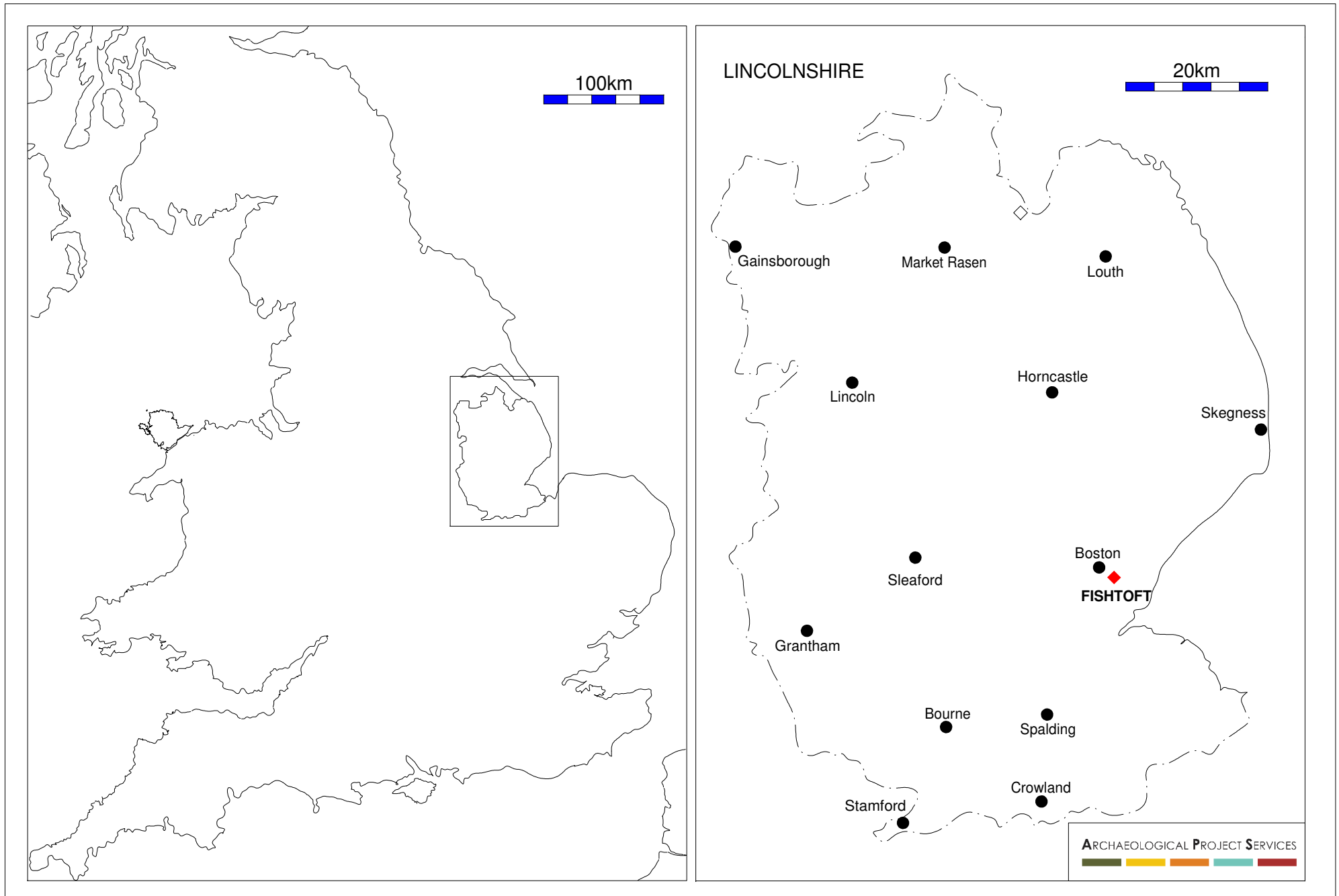
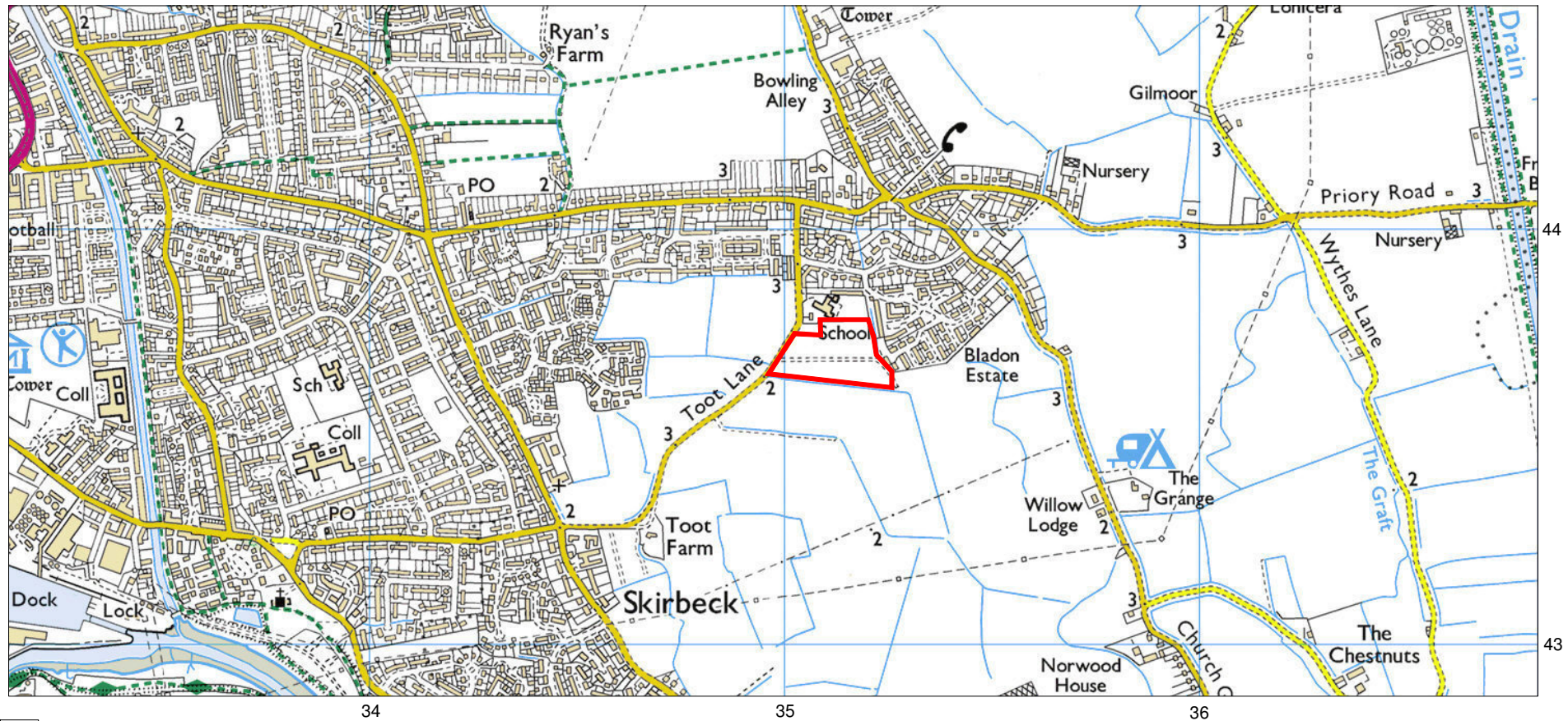


Figure 1 - General location plan

TOOT LANE FISHTOFT



TF



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Licence Number 100020146



Survey Area

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Project: Toot Lane, Fishtoft

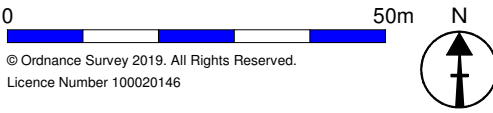
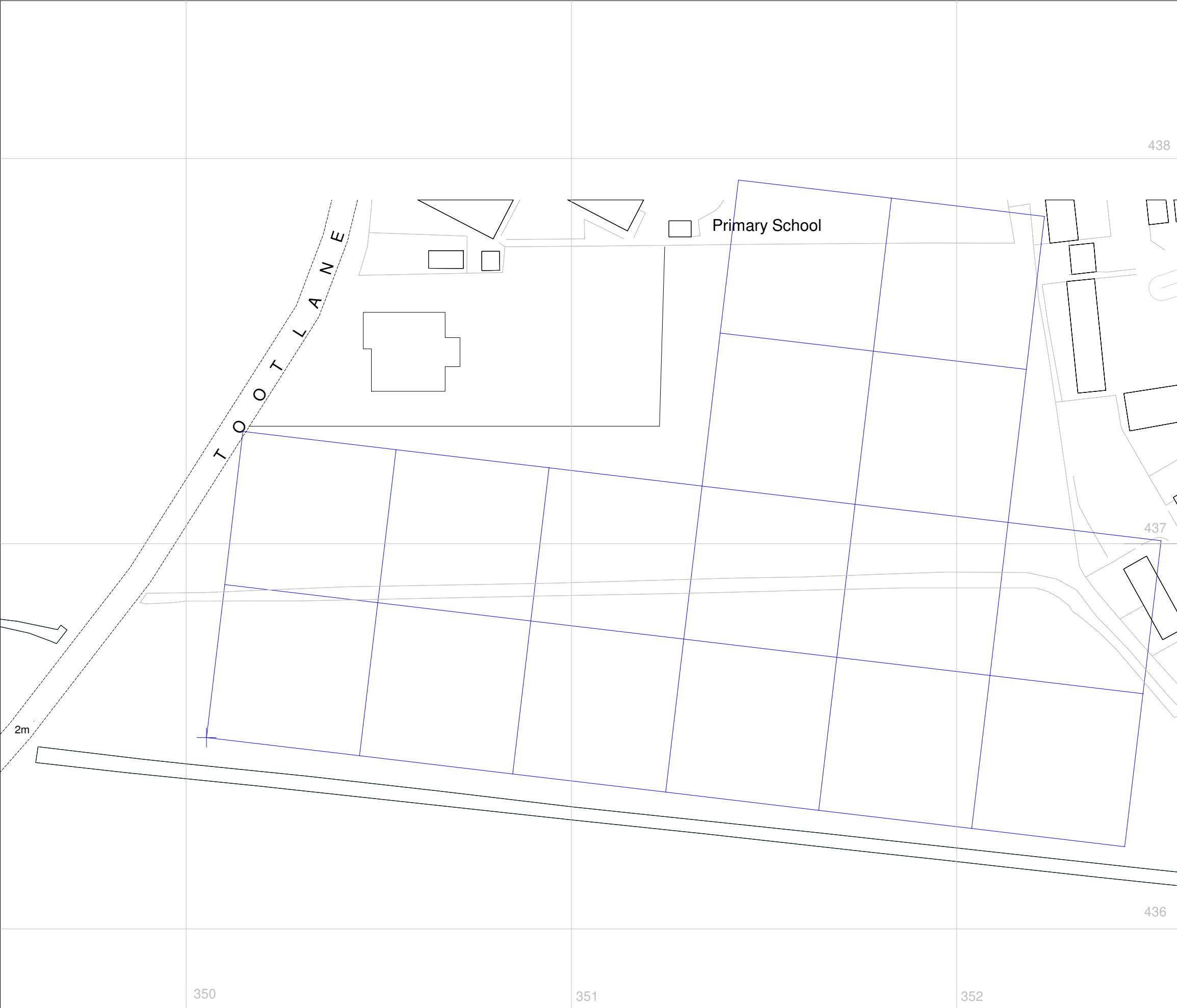
Scale 1:15000

Drawn by: SP

Report No:16/19

Figure 2 - Survey location plan

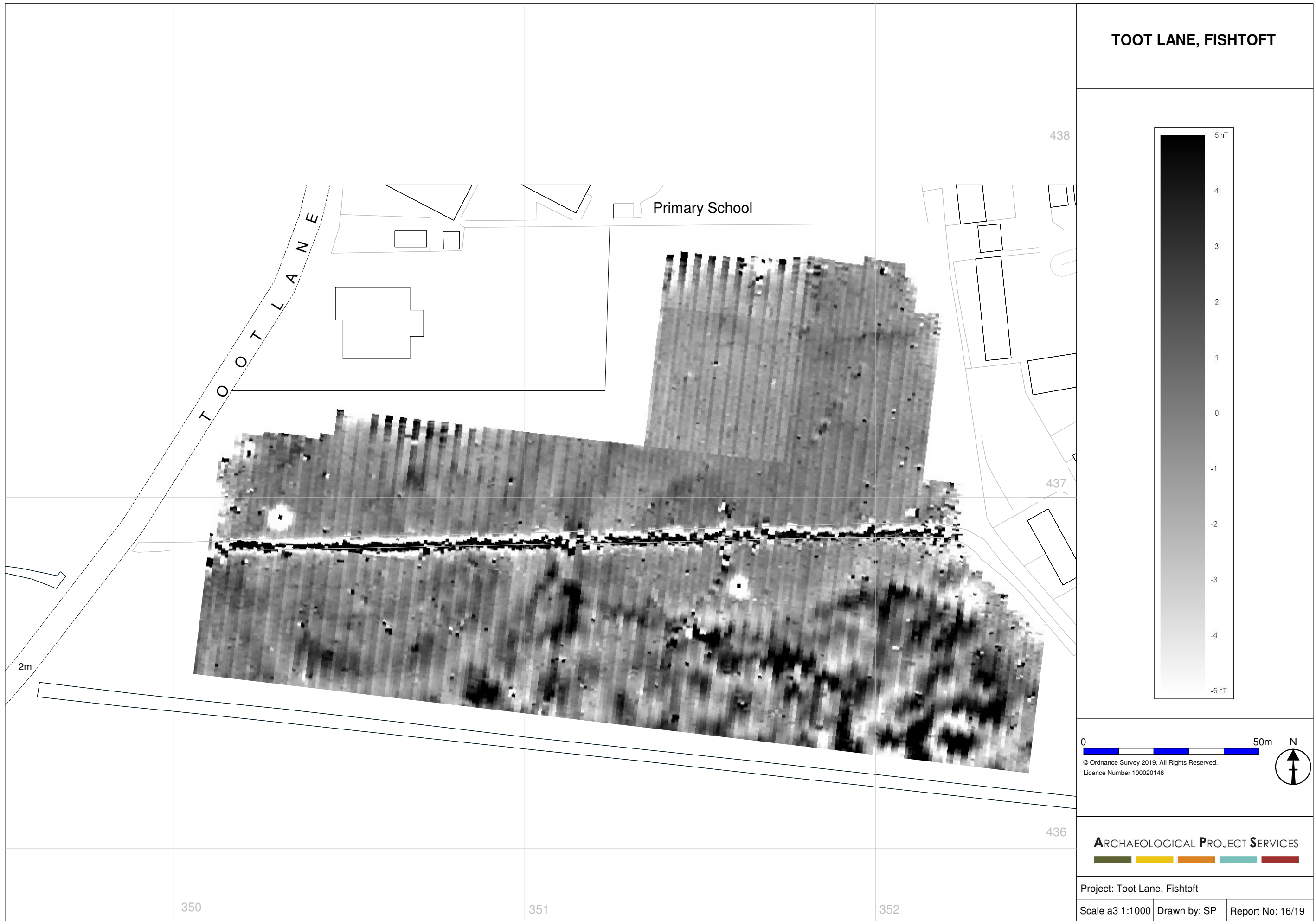
TOOT LANE, FISHTOFT



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Project: Toot Lane, Fishtoft
Scale: 1:1000 | Drawn by: SP | Report No:16 /19

Figure 3 - Site Setout



TOOT LANE, FISHTOFT

438

Primary School

TOOT LANE

437

2m

436

350

351

352

ARCHAEOLOGICAL PROJECT SERVICES

Project: Toot Lane, Fishtoft

Scale a3 1:1000 Drawn by: SP Report No: 16/19

Figure 4 - Raw Greyscale Data

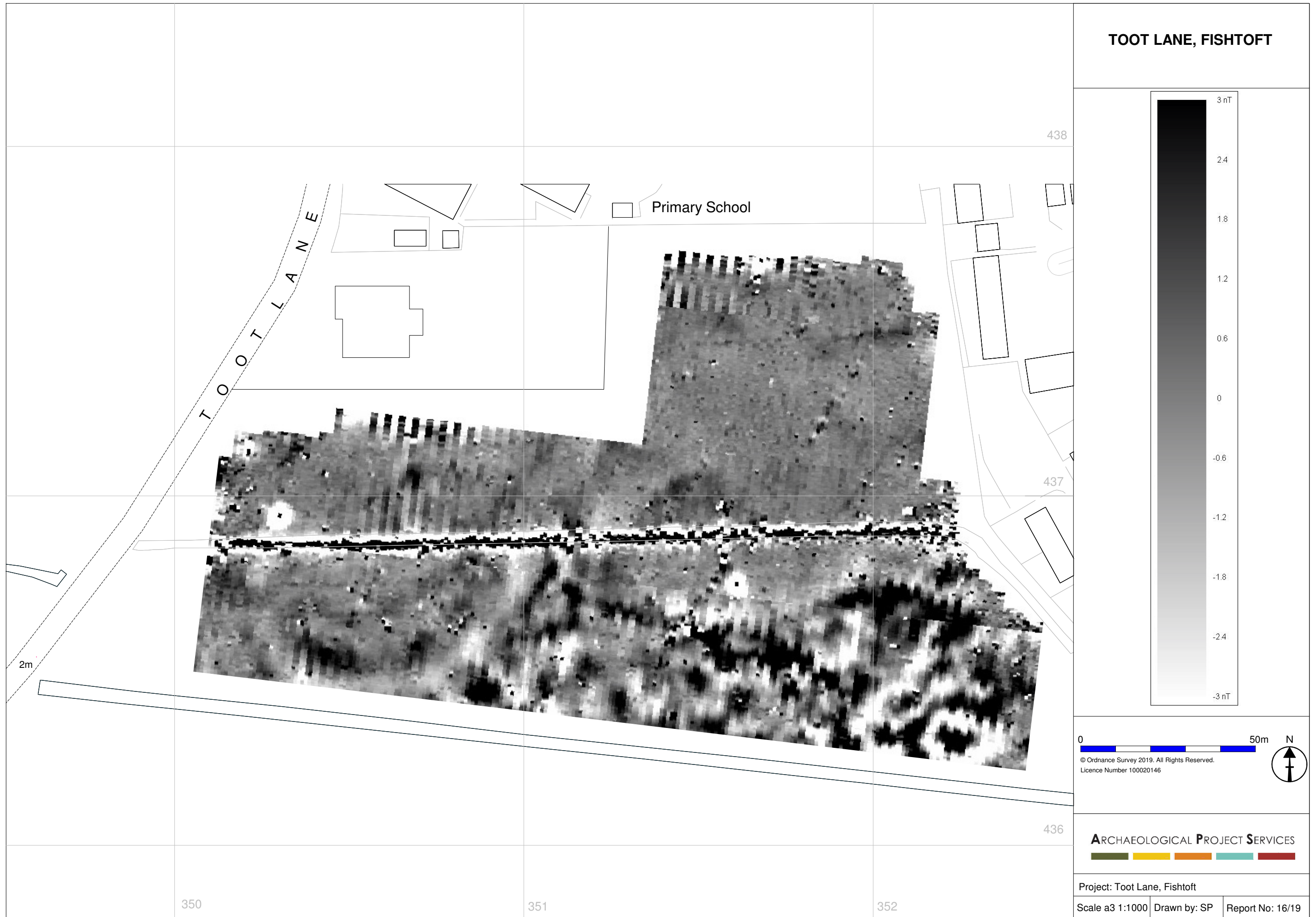


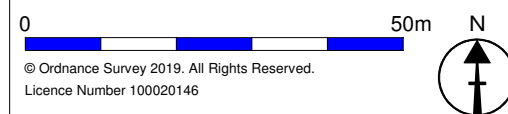
Figure 5 - Processed Greyscale Data



TOOT LANE, FISHTOFT

KEY

- Bipolar Linear
- - - Weak Positive Linear
- Isolated Dipolar Response
- ▣ Area of Positive Response
- ▣ Area of Bipolar disturbance



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Project: Toot Lane, Fishtoft
 Scale a3 1:1000 | Drawn by: SP | Report No: 16/19

Figure 6 - Interpretation

Appendix 1

TECHNICAL INFORMATION

Principles of magnetometry

The basis for magnetic prospecting is the presence of weakly magnetised iron oxides in the soil. Depending on the state of iron oxides, the material will exhibit either a weak or a strong magnetisation (Gaffney and Gater 2003).

Human activities tend to enrich sediments with magnetic particles. Strong heat, such as that generated by fires, cause surrounding iron particles in the soil to become aligned with the earth's magnetic field and take on a magnetic charge. Where these particles accumulate, such as in cut features like ditches and pits, a weak positive magnetic anomaly is apparent. In cases where very strong heat has been applied, such as furnace and kiln bases, a bipolar magnetic anomaly will be apparent, with one area having a strong positive signature and one area having a strongly negative area. Where banks have been built up from natural geological material which excludes magnetically enriched sediments, or walls have been made of stone, this may result in a negative anomaly. Modern metallic items and fired bricks cause sharp bipolar spikes. Modern services have a tendency to alternate between positive and negative readings along their length.

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).

Bartington Grad 601-2

A gradiometer uses two sensors separated by a fixed distance in order to measure the difference in strength between the earth's magnetic field and the soil. The Bartington Grad 601 uses two fluxgate sensors separated vertically by 1m to take these readings, which reduces variations associated with the Earth's magnetic field and deep geology. 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 instrument has typical penetration of 0.5m-1m, although stronger anomalies can be detected at greater depths. The 601-2 model uses two pairs of sensors to take parallel readings 1m apart.

Methodology

The survey area is divided into grid squares of 30m². The grids are set out using a survey grade GPS, accurate to 0.03m. The grids are systematically walked in a parallel pattern with the gradiometer taking readings every 0.25m along a traverse, and each traverse being separated by 0.5m. This equates to 7200 sampling points in a full 30m x 30m grid. Readings are automatically recorded on a datalogger which is downloaded at the end of each day. The gradiometer is 'zeroed' at the start of each day and at intervals throughout to ensure consistent results are achieved throughout the survey.

Data Processing

The data is downloaded and processed using TerraSurveyor software (version 3.0.32.4). The raw data is then adjusted to emphasise possible features. At each stage the data is examined as a greyscale image and as a trace plot.

Minimally Processed data

The data is clipped so that the mid-range of readings is most visible. This involves excluding all readings outside of a chosen suitable range.

Processed Data

The following processes are applied to produce the processed greyscale image:

- **Destripe:** Each traverse is flattened with regard to surrounding traverses by setting the median value of the traverse to 0nT. This produces cleaner images, but may cause bleeding where particularly strong signals are present at one end of a traverse.
- **Data Clip:** The data is clipped to provide the most suitable contrast for seeing archaeological features. This excludes values outside of a chosen range.

The following processes may also be applied to improve the clarity of the processed greyscale images:

- Despiking: Isolated anomalous readings, such as those generated by tiny iron fragments, are removed from the data. This makes the images cleaner. The parameters used are: X radius = 2; Y radius = 2; Threshold = 3SD; Spike replacement = median.

Data is exported as a JPG image and georeferenced for use in scale plans of the site. Anomalies are then checked against historical maps, and where available, lidar contour data.

References

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

Gaffney C and Gater, J, 2006 *Revealing the Buried Past: Geophysics for Archaeologists*, The History Press

Appendix 2

THE ARCHIVE

The archive consists of:

- 2 Daily record sheets
- 1 Report text and illustrations
- 1 Digital data

File names	F TTL19.xyz
Explanation of codes used in file names	.xyz files allow whole composite to be generated and stored easily.
Description of file formats	All files are in xyz format where Z= nT reading
List of codes used in files	
Hardware, software and operating systems	TerraSurveyor 3.0.33.10 running under Windows 10
Date of last modification	07/03/19
Indications of known areas of weakness in data	
Survey Technique	Parallel
Origin	Starts at 0
Grid size	40mx40m
Interval	X=0.25, Y=0.5m
Dummy Value	32702
XYZ Separation	Comma

All primary records are currently kept at:

Heritage Lincolnshire/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

Accession Number : LCNCC : 2019.28

Appendix 3

OASIS FORM

OASIS ID: [archaeol1-345379](#)

Project details

Project name	Toot Lane, Fishtoft, Lincolnshire
Short description of the project	Magnetometry survey over field revealed nothing of archaeological significance.
Project dates	Start: 14-02-2019 End: 07-03-2019
Previous/future work	No / Not known
Any associated project reference codes	FTTL19 - Sitecode
Any associated project reference codes	LCNCC: 2019.28 - Museum accession ID
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 3 - Operations to a depth more than 0.25m
Monument type	N/A None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Rural residential
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	KIMMERIDGE CLAY
Drift geology	ALLUVIUM
Techniques	Magnetometry

Project location

Country	England
Site location	LINCOLNSHIRE BOSTON FISHTOFT Toot Lane
Study area	2.41 Hectares
Site coordinates	TF 3515 4372 52.973440568129 0.012920733895 52 58 24 N 000 00 46 E Point

Project creators

Name of Organisation	SLR Consulting Ltd and Archaeological Project Services
Project brief originator	Archaeological Project Services
Project design originator	Paul Cope-Faulkner
Project director/manager	Paul Cope-Faulkner

Project supervisor	Sean Parker
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	The Collection
Digital Archive ID	LCNCC:2019.28
Digital Contents	"Survey"
Digital Media available	"Geophysics","Text"
Paper Archive recipient	The Collection
Paper Archive ID	LCNCC:2019.28
Paper Contents	"Survey"
Paper Media available	"Correspondence","Report","Survey "

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Toot Lane, Fishtoft, Lincolnshire: Geophysical Survey
Author(s)/Editor(s)	Parker, S.
Other bibliographic details	16/19
Date	2019
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Description	A4 and A3 comb-bound