NAA

GEOPHYSICAL SURVEY REPORT

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OLD STATION ROAD
HALESWORTH
SUFFOLK

prepared for
Lanpro Services Limited
on behalf of
Heritage Developments Limited

Project No.: 1401

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LAND AT OLD STATION ROAD

HALESWORTH, SUFFOLK

GEOPHYSICAL SURVEY REPORT

Summary

Northern Archaeological Associates was commissioned by Lanpro Services on behalf of Heritage Developments to undertake a geophysical survey at Old Station Road, Halesworth, Suffolk (NGR: TM 38461 78319). The survey was required to evaluate the archaeological potential of the site in support of a planning application for residential development. The survey was carried out on the 21st August 2017 and covered an area of approximately 1 hectare of grassland.

The results of the geophysical survey have not identified any remains of an archaeological nature. Magnetic anomalies identified within the survey area are likely to relate to either modern or agricultural activity, or to be of geological or pedological origin.

There are numerous regularly spaced linear anomalies composed of weak increases in magnetic response. These are considered to be of an agricultural nature, but given the current land use it is unclear if they indicate relatively modern ploughing or earlier agricultural practices.

Around the perimeter of the site are several areas of magnetic disturbance likely to be caused by modern material in the topsoil, and above-ground sources of magnetic 'noise' such as the metal fencing used to enclose the survey area.

Several weak trends and isolated positive responses of an amorphous form have been identified across the site that are of uncertain origin.

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FIGURE LIST

DIGITAL CONTENTS

Report copy (PDF)

Scaled figures:

- Gradiometer survey grid location
- Unprocessed data
- Processed data
- XY-trace data
- Interpreted data

Disclaimer

The results of geophysical survey may not reveal all potential archaeology and do not provide a comprehensive map of the sub-surface, but only responses relative to the environment. Geological, agricultural and modern responses may mask archaeological features. Short-lived features may not give strong responses. Only clear features have been interpreted and discussed in this report.

1.0 INTRODUCTION

1.1 Northern Archaeological Associates was commissioned by Lanpro Services on behalf of Heritage Developments to undertake a geophysical survey at Old Station Road, Halesworth, Suffolk (NGR: TM 38461 78319: **Figure 1**). The survey was required to evaluate the archaeological potential of the site in support of a planning application for residential and commercial development. The survey was carried out on the 21st August 2017and covered an area of approximately 1 hectare of grassland.

Location

1.2 The proposed development site was located to the north of the town of Halesworth (**Figure 1**). The area targeted with geophysical survey was bordered by farmland to the north and east and residential areas to the south and west. The topography of the survey area comprised a downward slope to the north-west to approximately 10m above Ordnance Datum (aOD) with the south east of the site lying at approximately 20m aOD.

Geology

1.3 The solid geology of the survey area largely consists of gravel of the Crag Group formation with superficial deposits of Diamicton of the Lowestoft Formation. In the north-west corner of the site there is an area containing sand of the Crag Group with no superficial recorded deposits (British Geological Survey 2017). The soils are mapped as Hanslope comprising chalky till, slowly permeable calcareous clayey soils with occasional areas of slowly permeable non-calcareous clayey soils (Soil Survey of England and Wales 1983).

Archaeological background

1.4 No archaeological background information was provided for the compilation of this report.

1.5 Historic maps from 1883 show that the proposed development area formerly was located within an area of open fields used for agricultural purposes. Since the 1950s, the town's growth has seen agricultural land to the south of the site given over to residential development. This includes the row of houses located directly to the south of the survey area, which is situated within the former extent of the field targeted by the geophysical survey (1882 -1883 First Edition 6 inch OS map).

1.6 The Suffolk Heritage Explorer records cropmarks relating to a linear feature and field boundary, both of unknown date, to the north of the survey area and an artefact scatter of grey ware with slag fragments to the west of the site (Suffolk County Council Archaeological Service 2017).

2.0 AIMS

2.1 The aims of the survey were:

- To attempt to characterise the nature of any sub-surface remains within the survey boundary and to identify possible concentrations of past activity in order to inform the requirement for any archaeological mitigation work at the site; and

- To produce a report including XY-trace plots, raw and processed greyscale images of the survey areas and interpretations of these results.

3.0 METHODOLOGY

3.1 The geophysical survey was undertaken as gradiometer survey using the Bartington Grad601-2 dual magnetic gradiometer system with data logger. The readings were recorded at a resolution of 0.1nT and data was collected with a traverse interval of 1m and a sample interval of 0.25m. All recorded survey data was collected with reference to a site survey grid comprised of individual 30m x 30m squares. The grid was established using Real Time Kinematic (RTK) differential GPS equipment and marked out using non-metallic survey markers. All grid nodes were set out with a positional accuracy of at least 0.1m as per existing guidelines (English Heritage 2008; CIfA 2014) and could be re-located on the ground by a third party. The base lines used to create the survey grids are shown on **Figure 2** and further details are available in **Appendix A.**

3.2 The processing was undertaken using Geoplot 3.0 software and consisted of standard processing procedures. Details of processing steps applied to collected data are given in **Appendix B**.

3.3 On the greyscale plot (**Figure 3 left and Figure 4 left**), positive readings are shown as increasingly darker areas and negative readings are shown as increasingly lighter areas. The XY-trace plot demonstrates the readings as offsets from a central line **(Figure 3 right)**. The interpreted data uses colour coding to highlight specific readings in the survey area **(Figure 4 right)**. In this report, the word anomaly is used to refer to any outstanding high or low readings forming a particular shape or covering a specific

area. **Appendix C** details the terminology and characterisation of anomalies used for interpreting data.

Surface conditions and other mitigating factors

3.4 The survey area boundaries were relatively informal, comprising hedgerows, trees, fences, gates, trackways and streams. In the south of the survey area, there were several metallic features including stacked piles of fences at the southern field entrance. It was necessary to avoid all metal objects to ensure that magnetic responses did not impinge on the survey results and mask potential buried features. Two areas of high vegetation were located within the survey area and dummy values were used where the passage of survey was prevented. Areas containing modern debris, dense vegetation and woodland were unsuitable for survey.

4.0 RESULTS

4.1 There are numerous weak isolated anomalies with an amorphous form across the survey area. Those with a coherent patterning or broader form have been identified within the interpretation; however, given the lack of anomalies conclusively identified as being of an archaeological nature, a very tentative interpretation applies, and their origin is unknown.

4.2 There are several weak and diffuse linear trends. These fail to produce the necessary patterning or increases in magnetic response in order to be interpreted fully, and as a consequence their origin is unknown.

4.3 Across the survey area there are numerous alignments of regular, broadly spaced weak positive linear anomalies. The regular patterning of these linear anomalies is indicative that they are caused by agricultural activity, but due to their weak responses it is unclear if they are caused by relatively modern ploughing or, given the current pasture land use, are indicative of earlier agricultural practices.

4.4 There is a broad increase in magnetic response in the north-west of the survey area that is likely to be caused by geological or pedological changes in the substrata. It is possible, given the topography of the site that the increase in magnetic response relates to a build up of soil that has washed down the slope from the north-east of the site.

4.5 Dipolar anomalies within the site are likely to be caused by modern material with a high magnetic susceptibility in the topsoil or near the surface. One very strong isolated bipolar response has been identified, but is considered to be modern and caused by highly magnetic material, such as a ferrous object.

4.6 Areas of external interference encapsulate concentrations of bipolar areas of disturbance in the south and west of the survey area. These correspond with the location of above-ground modern features including metal fences and other ferrous material peripheral to the site.

5.0 CONCLUSIONS

5.1 The results of the geophysical survey have not identified any remains of an archaeological nature.

5.2 Several isolated trends and positive responses of an amorphous form have been identified. As a consequence of their weak and diffuse nature, a detailed interpretation is not possible and their exact origin is unknown.

5.3 Survey results have detected disturbances caused by above-ground modern features, regularly spaced linear anomalies indicative of agricultural practices, as well as a broad increase in magnetic response likely to be indicative of geological or pedological changes in the substrata.

6.0 STORAGE AND CURATION

6.1 The records of the geophysical survey are currently held by NAA. All material will be appropriately packaged for long-term storage in accordance with national guidelines (English Heritage 2008; CIfA 2014). The Suffolk County Council HER Parish Code for the site is HWT 054 and the event number is ESF25791. An online OASIS form will be completed on the results of the works within three months of the completion of the project under the reference number northern1-293660. This will include submission of a pdf version of the final report to the Archaeology Data Service via the OASIS form.

REFERENCES

1882 -1883 First Edition 6 inch OS map, published 1883. Suffolk XXVIII. SW

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APPENDIX A

TECHNICAL INFORMATION

Gradiometer Survey Instrumentation

The data was collected using Hand Held Bartington Grad 601-2 fluxgate gradiometers. The Bartington 601-2 is a single axis, vertical component fluxgate gradiometer comprising a data logger battery cassette and two sensors. The sensors are Grad-01-1000L cylindrical gradiometer sensors mounted on a rigid carrying frame, each sensor contains two fluxgate magnetometers with 1m vertical separation.

The gradiometer records two lines of data on each traverse, the grids are walked in a zig-zag pattern amounting to 15 traverses. The gradiometers are calibrated at the start of every day and recalibrated whenever necessary.

The difference in the magnetic field between the two fluxgates in each sensor is measured in nanoTesla (nT) and for this investigation the readings are measured at 0.1nT. The units' sensors can measure down to 1m from the ground level depending on the ground conditions.

Readings reach between +/-100nT and lower readings are created by upstanding or harder remains such as walls or areas of stone, higher readings are created by softer or cut features, such as ditches and pits (see below).

Limitations

Poor results can be due to several factors including short lived archaeological occupation/use or sites with minimal cut or built features. Results can also be limited in areas with soils naturally deficient in iron compounds or in areas with soils overlying naturally magnetic geology, which will produce strong responses masking archaeological features.

Overlying layers such as demolition rubble or layers of made ground can hide any earlier archaeological features. The presence of above ground structures and underground services containing ferrous material can distort or mask nearby features.

Particularly uneven or steep ground can distort results beyond the capabilities of processing to even out. Over processing of data can also obscure features.

Table 1: Survey summary

	Survey
Grid size	30mx30m
Traverse interval	1m
Reading interval	0.25m
Direction of 1st traverse	North
Number of Grids	18

Table 2: Grid co-ordinates (The base line is shown on Figure 2)

Grid point (gp) A	**Grid point (gp) B**
NGR: 638387.539 278282.164	NGR: 638420.972 278285.101

APPENDIX B

DATA PROCESSING INFORMATION

The processing is undertaken using Geoplot 3.0 software, and the following processing techniques:

- Zero Mean Traverse - to remove directional effects inherent in the survey,
- Destagger - to shift the traverses back or forward to correct for user error,
- Clip - to enhance the weaker features, by reducing the readings above a set value,
- Despike - removing data points that are above an appropriate mean to reduce the appearance of dominant readings, created by modern ferrous objects distorting the results,
- Low pass filter - Decreases the correlation between neighbouring cells effectively smoothing the data
- Interpolation – reduces the blocky effect of the survey smoothing the appearance of the data.

Table 3: Processing steps

Minimal Processing	**Increased Processing**
• Zero Mean Traverse +5/-5 • Destagger: all grids - 1	• Low Pass Filter • Interpolate Y, Expand - Linear ,x2

APPENDIX C

DATA VISUALISATION INFORMATION

Figures

The data is used to produce a series of images to demonstrate the results of surveys these are detailed below:

- Greyscale/Colourscale Plot – This demonstrates the results as a shaded drawing with highest readings showing as black, running through different shades to lowest showing as white. This can also be created using a colour pallet to demonstrate the different values.

- XY-trace Plot – This creates a line drawing showing the peaks and troughs of the readings as vertical offset from a centreline.

- Interpreted data – This is created to show features and particular high or low readings to re enforce and clarify the written interpretation of the data. This is based on the Greyscale plot but with different colours representing the various readings.

Magnetic anomalies and terminology

The different magnetic anomalies can represent different features created by soil and geology, human activity, modern or agricultural activity. Anomalies interpreted with a 'greater' categorisation are considered more likely to be of an archaeological nature; a more tentative interpretation is applied to those with a 'lesser' categorisation as a consequence of weaker increases in magnetic response or the anomalies incomplete patterning or irregular form.

Isolated anomalies or anomalies with a more amorphous form possibly represent infilled or thermomagnetic features that can be of an archaeological or natural origin. Areas of heating/burning or heated objects produce thermoremanent responses as this creates a magnetic field. These can appear as bipolar responses or as magnetic debris depending on whether it is in situ, or moved into place.

Weak and diffuse anomalies with an uncertain origin are denoted by trends. It is possible that these belong to archaeological features, but given their weak signatures it is equally plausible that they relate to natural soil formations.

Regularly spaced linear anomalies are often caused by agricultural practices. Depending on their form and magnetic responses they either denote ridge and furrow, modern ploughing or land drains.

Dipolar readings are single positive responses with a surrounding negative response. Strong responses tend to be caused by ferrous objects. These responses have only been shown when located near to archaeological features. Given the former land uses of the survey area it is possible that identified dipolar anomalies relate to mining activity and are indicative of further pits and mine shafts.

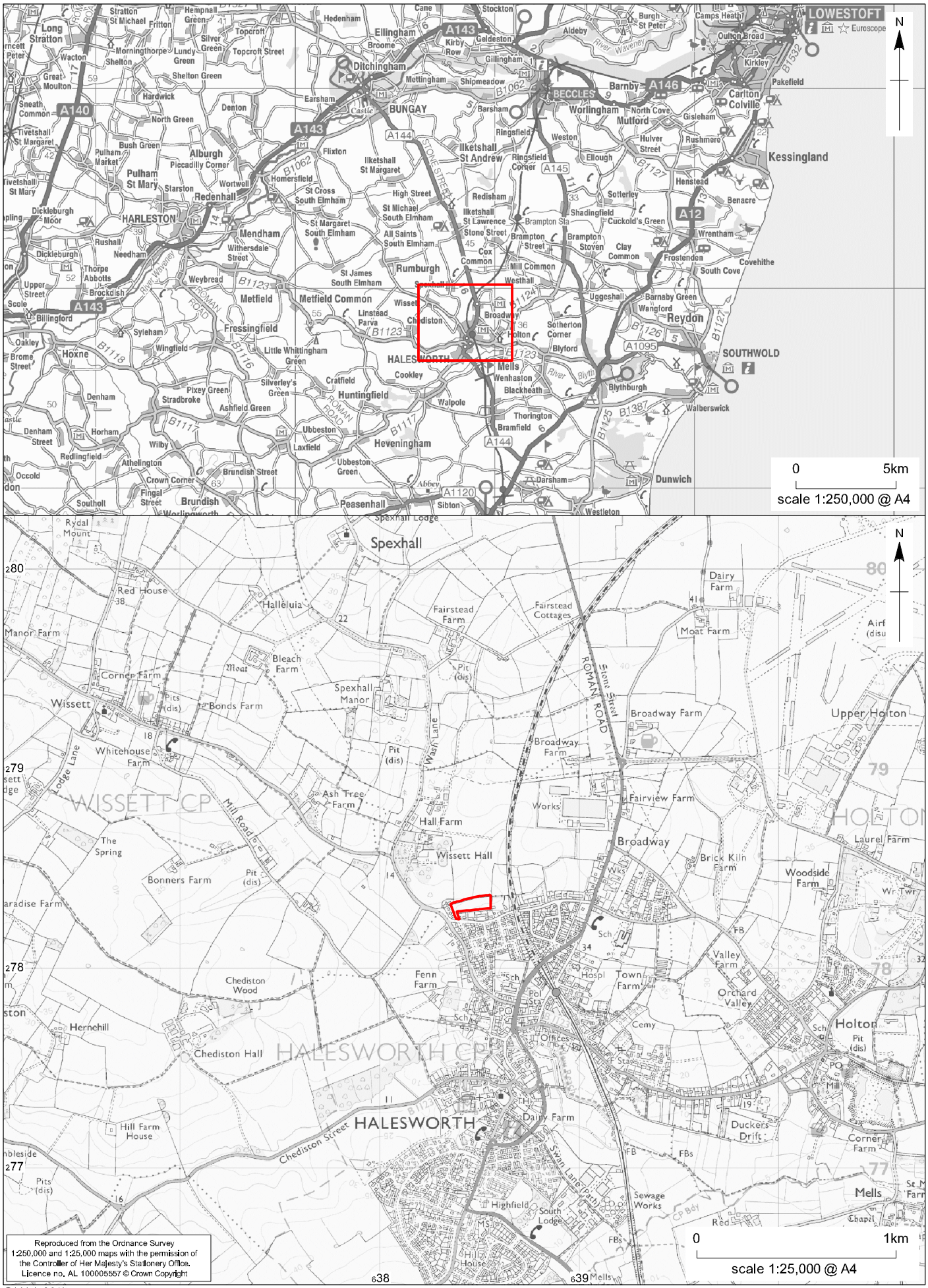
Positive anomalies with associated negative responses (bipolar) denote features with a strong magnetic response, likely to be of a modern origin. Linear bipolar anomalies are often modern

services such as cables; however weaker responses can be archaeological features such as earthworks.

Increased magnetic response is caused by magnetic debris and is noticeable as areas of positive and negative responses, which can relate to general ground disturbance, spreads of ferrous debris or areas of rubble.

Areas of magnetic disturbance, often along the edges of survey areas are caused by standing metal structures such as fencing and buildings. This can cause interference extending out from the structure, across the area.

Variable broad magnetic responses can demonstrate natural features or changes in geology or soil type.



Old Station Road, Halesworth, Suffolk: site location *Figure 1*

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KEY

geophysical survey baseline

geophysical survey grid

geophysical survey area

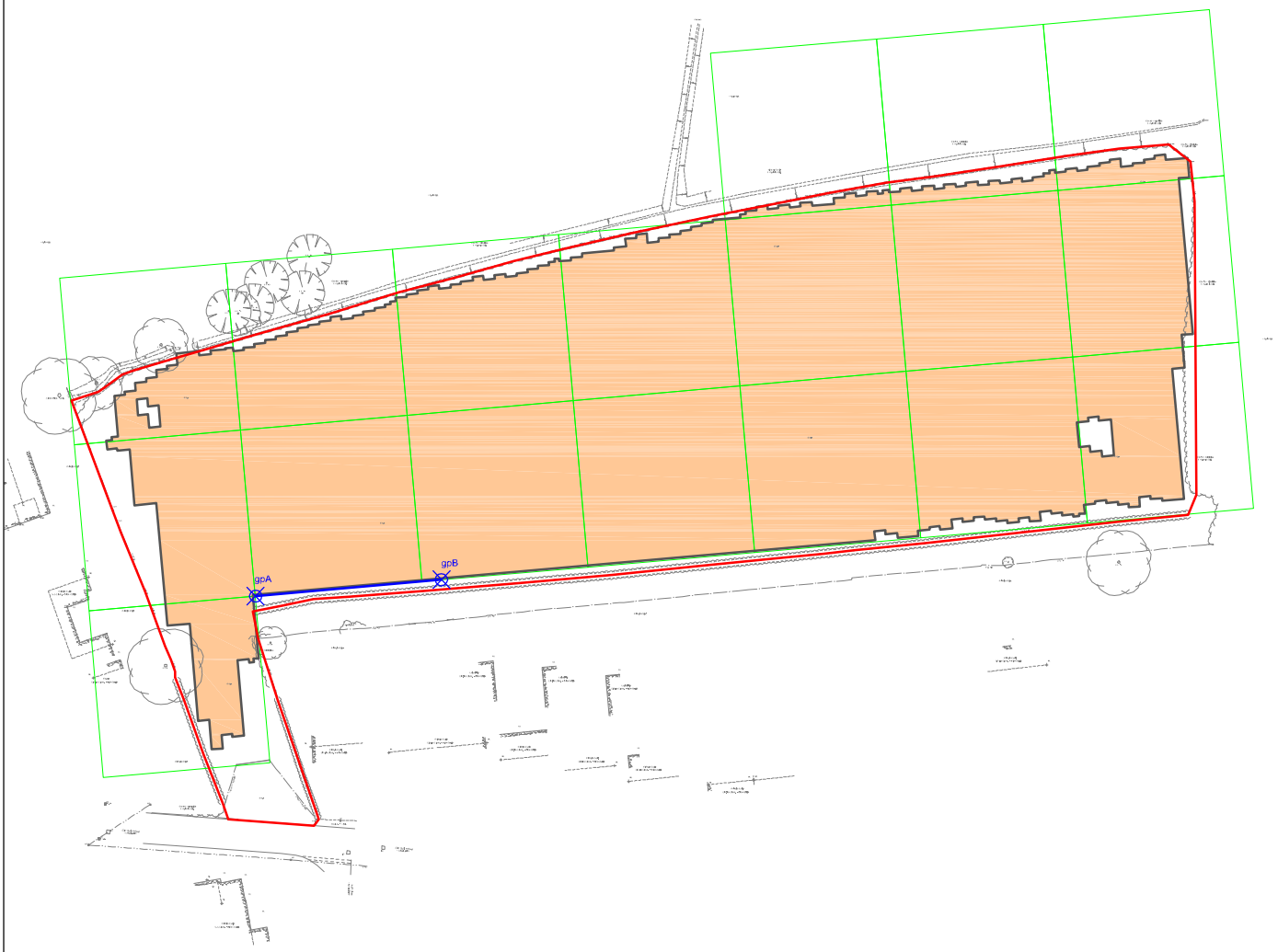
proposed development boundary

N

0 50 m

scale 1:1250 @ A4

Based on survey data supplied by: Survey Solutions: survey date: 20/07/16
© Copyright Survey Solutions



Old Station Road, Halesworth, Suffolk: grid location

Figure 2

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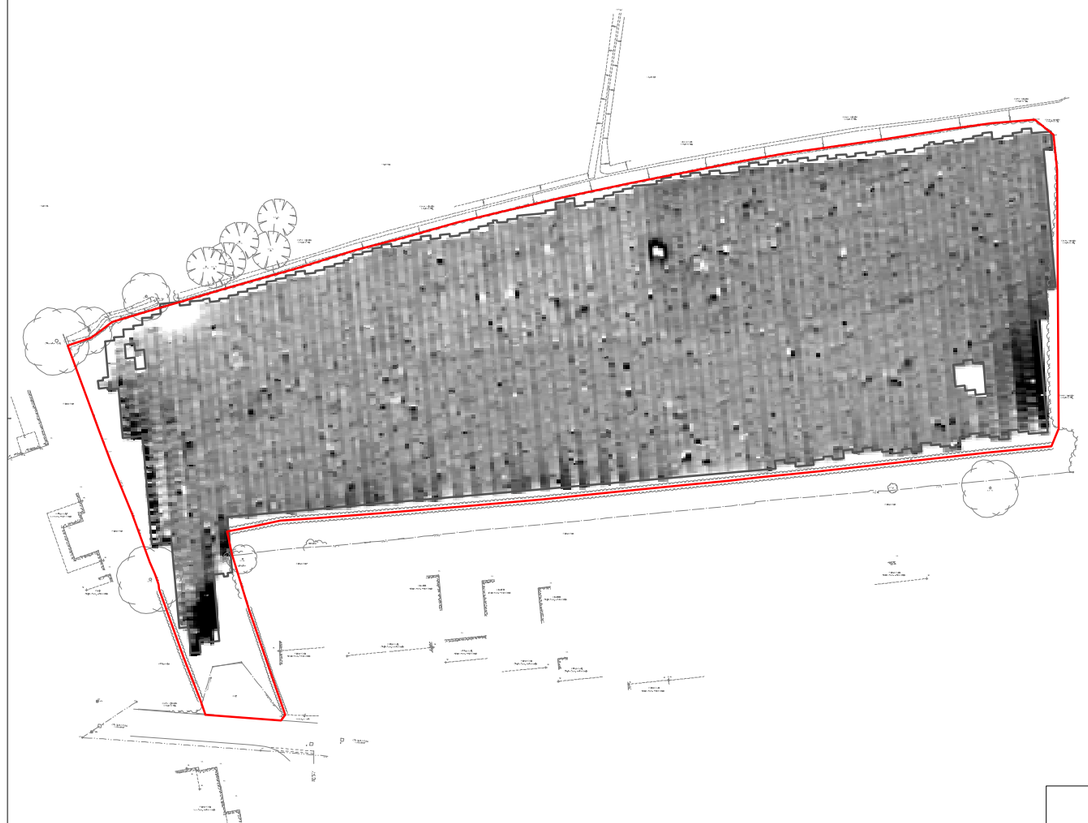
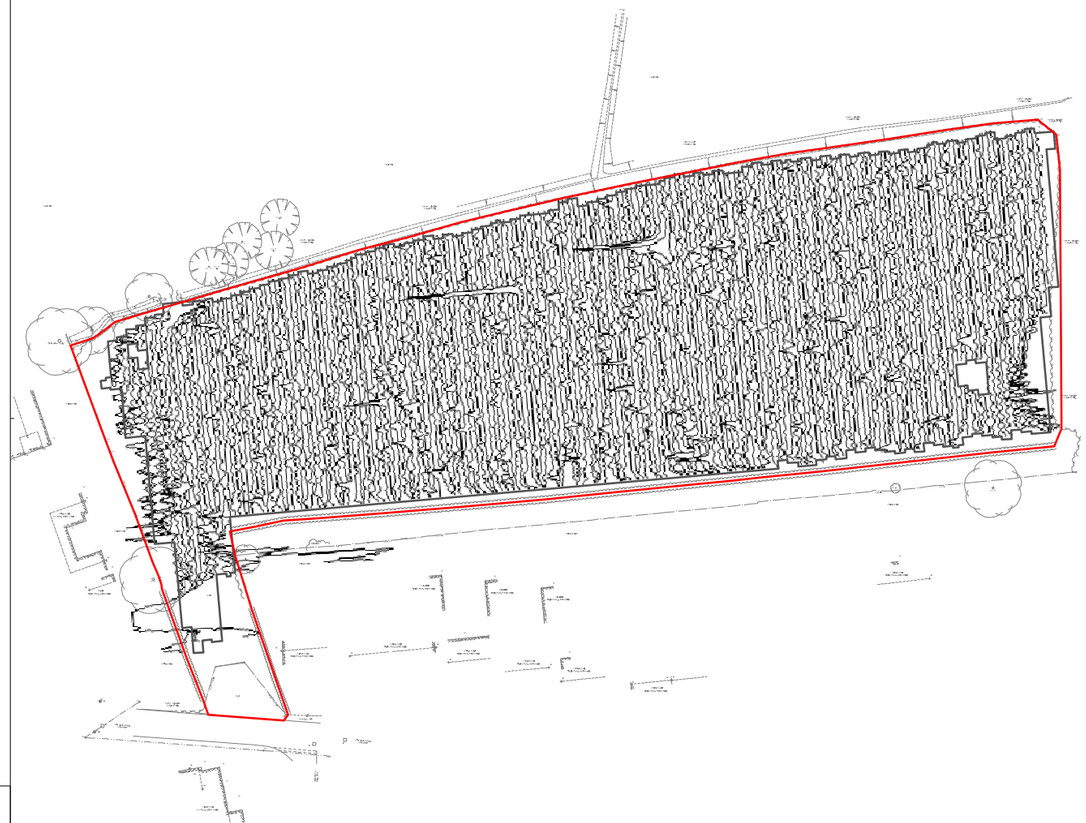
0 50 m
scale 1:1250 @ A3

N

Based on survey data supplied by: Survey Solutions: survey date: 20/07/16





5nT
-5nT
Pallette:grey55.ptt

XY scale
30.00 nT

Old Station Road, Halesworth, Suffolk: unprocessed greyscale and XY-trace plots of gradiometer survey results

Figure 3

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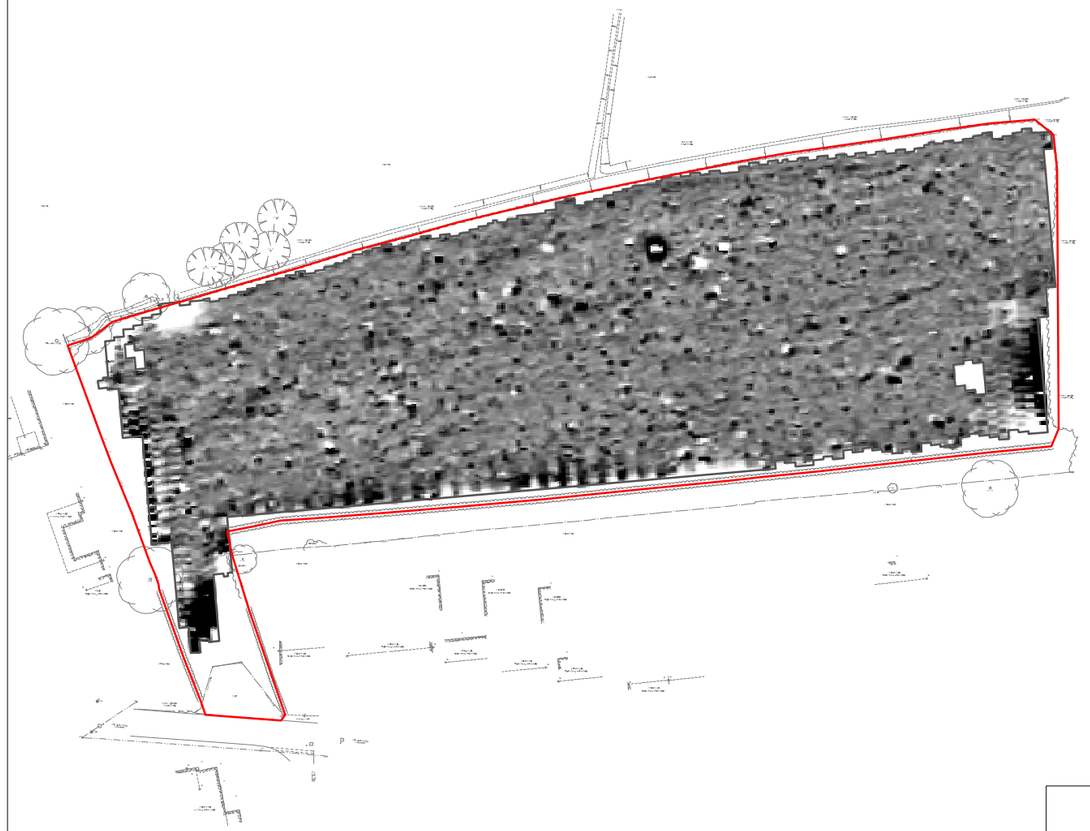
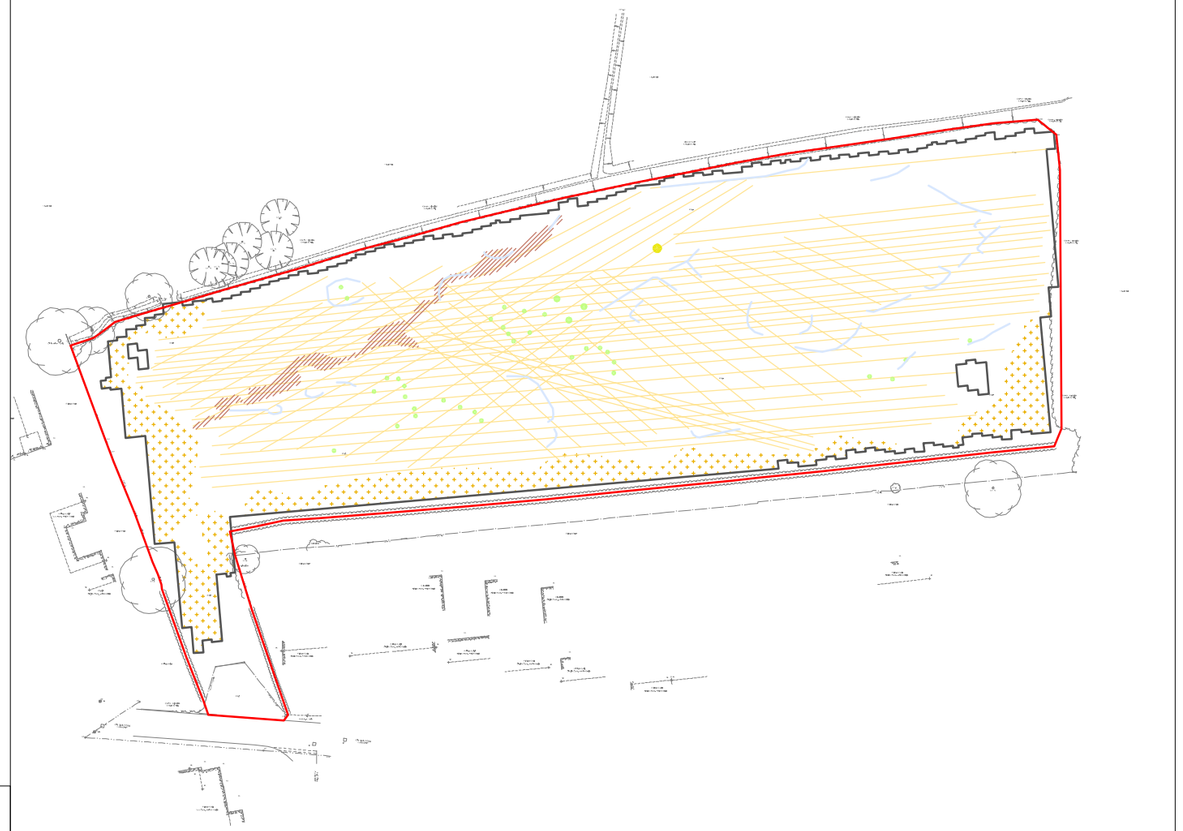
0 50 m
scale 1:1250 @ A3

N

Based on survey data supplied by: Survey Solutions: survey date: 20/07/16





2nT
-2nT
Pallette:grey55.ptt

KEY

- weak isolated positive response (unknown origin)
- trends
- agriculture
- geology?
- bipolar response (modern)
- external interference (e.g. fencing)
- edge of geophysical survey
- survey area

Old Station Road, Halesworth, Suffolk: processed greyscale plot and interpretation of gradiometer survey results

Figure 4