

## **Note: Outline Planning Application (OPA) Site Boundary**

*The following report was produced prior to the finalisation of the application site boundary. The final application site boundary is shown on Figure 1.1 in ES Appendix 1.1. Therefore, references within the report to the site boundary do not reflect the site area and site boundary submitted with the OPA.*

*The reports were correct at the time of preparation, and all information within the Environmental Statement assessment reflects the latest relevant information.*

# GEOPHYSICAL SURVEY REPORT

# sumo

Survey

**GEOPHYSICS FOR  
ARCHAEOLOGY &  
ENGINEERING**

## **East of Lympne Industrial Estate, Otterpool, Kent**

Client  
**Oxford Archaeology**  
For  
**Arcadis Ltd**

Survey Report  
**12993**

Date  
**July 2018**

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## GEOPHYSICAL SURVEY REPORT

Project name:  
**East of Lympe Industrial Estate,  
Otterpool, Kent**

SUMO Job reference:  
**12993**

Client:  
**Oxford Archaeology**  
For:  
**Arcadis Ltd**

Survey date:  
**26-27 June 2018**

Report date:  
**17 July 2018**

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## 1 SUMMARY OF RESULTS

An earth resistance survey was conducted over approximately 1.2 ha of grassland in order to identify possible structural remains. No responses indicative of masonry structures have been detected. Linear ditch-type anomalies have been recorded, along with possible former quarry pits. Anomalies of uncertain origin have been identified, though they are likely to be of modern origin rather than archaeological.

## 2 INTRODUCTION

### 2.1 Background synopsis

**SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area in order to locate possible buried structural remains of Roman date. The work was commissioned by **Oxford Archaeology** via **Arcadis** who are acting on behalf of Folkestone & Hythe District Council and Cozumel Estates. It was undertaken prior to an outline planning application for a new garden settlement - Otterpool Park - to accommodate up to 8,500 homes (use class C2 and C3) and use class D1, D2, A1, A2, A3, A4, B1a, B1b, B2, C1 development with related highways, green and blue infrastructure (access, appearance, landscaping, layout and scale matters to be reserved).

### 2.2 Site details

<b>NGR / Postcode</b>	TR 113 538 / TN25 6DD
<b>Location</b>	The site is located immediately to the east of Lympne Industrial Estate, approximately 12km east of Folkestone, Kent.
<b>HER/SMR</b>	Kent
<b>District</b>	Folkestone and Hythe
<b>Parish</b>	Lympne CP
<b>Topography</b>	Mostly level
<b>Current Land Use</b>	Grassland
<b>Geology</b>	Solid: Hythe Formation - sandstone and limestone (interbedded). Superficial: Head - clay and silt (BGS 2018).
<b>Soils</b>	Malling Association (571c) - well drained non-calcareous fine loamy soils over limestone (SSEW 1983).
<b>Archaeology</b>	A previous magnetometer survey (HA 2017) across the survey area identified an extensive complex of linear and rectilinear anomalies, aligned north-east/south-west. The complex comprises six enclosures, two trackways, and six likely quarry pits. Numerous discrete anomalies within the interior of the enclosures are ascribed a possible archaeological origin, perhaps related to pits or post-holes. The rectilinear morphology of the identified anomalies is suggestive of Roman activity. Another magnetometer survey (SUMO 2018) on land approximately 400m to the south identified a number of ditch-like anomalies suggestive of a former field system, on a south-west/north-east alignment, and pairs of parallel linear anomalies which may represent trackways. The site lies within the grounds of the former Lympne Airport and it possible that remains associated with this may be present in the data.
<b>Survey Methods</b>	Earth resistance survey
<b>Study Area</b>	1.2ha

### 2.3 **Aims and Objectives**

To confirm whether any of the anomalies detected by previous magnetometer survey (HA 2017) indicate the presence of masonry structures or building remains.

## 3 **METHODS, PROCESSING & PRESENTATION**

### 3.1 **Standards & Guidance**

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (EH 2008) (then English Heritage), the Chartered Institute for Archaeologists (CIfA 2014) and the European Archaeological Council (EAC 2016).

### 3.2 **Survey methods**

Earth resistance survey was chosen as an efficient and effective method of locating archaeological anomalies.

<b>Technique</b>	<b>Instrument</b>	<b>Traverse Interval</b>	<b>Sample Interval</b>
Earth Resistance	Geoscan Research RM15 (twin array)	1.0m	1.0m

More information regarding this technique is included in Appendix A.

### 3.3 **Data Processing**

The following basic processing steps have been carried out on the data used in this report:  
De-spike, edge-match, interpolation.

### 3.4 **Presentation of results and interpretation**

The presentation of the results involves a grey-scale plot of processed data. Anomalies are identified, interpreted and plotted onto the 'Interpretation' drawings. The minimally processed data are provided as a greyscale image in Figure 05.

## 4 **RESULTS**

*Specific anomalies have been given numerical labels [1] [2] which appear in the text below, as well as on the Interpretation Figures.*

### 4.1 **Probable Archaeology**

- 4.1.1 Several low resistance linear anomalies [1] have been identified in the data. Low resistance anomalies are typically indicative of cut features, such as ditches and are not usually associated with structural remains. In this instance, the anomalies correspond with the locations of ditch-like features detected in the previous magnetometer survey across the area (HA 2017), hence they have been classified as being archaeological. It should be noted that not all of the ditches identified in the magnetometer survey appear in the resistance data; this is probably due to very dry ground conditions.

#### 4.2 **Possible Archaeology**

4.2.1 Moderately high resistance linear anomalies [2], forming a 'Z-like' shape have been detected. These responses could be representative of buried surfaces or structural remains, however only the southern arm of the feature corresponds with a trackway identified in the previous magnetometer survey. The responses could instead be of more modern origin, perhaps related to drainage or the site's use as part of an airfield.

#### 4.3 **Possible Quarrying Activity**

4.3.1 Two discrete areas of low resistance [3] have been detected in the centre and south-east of the area. These are indicative of cut features and correspond with magnetic anomalies associated with possible former quarry pits in the previous magnetometer survey (*ibid*), though they could also be related to former airfield infrastructure. Given the lack of moisture in the soils (see 4.1.1) it is unlikely that the responses do reflect anything archaeological. It is only the context that raises the possibility of the archaeological interpretation. The baked ground conditions will have limited penetration of the electrical currents; very close surface features, compacted ground / airfield features are the most likely explanation.

#### 4.4 **Uncertain**

4.4.1 Two linear anomalies of moderate-strength resistance [4] can be seen in the north-west of the area. These are of uncertain origin, though could be related to land drains, other modern agricultural activity or the former airfield.

4.4.2 A single, discrete high resistance anomaly in the south of the area is of uncertain origin, though does correspond with the location of a strong ferrous response in the magnetometer survey (*ibid*), suggesting it is likely to be of modern origin, or possibly associated with a former airfield feature. Further discrete anomalies have been identified in the north of the area and are likely to be modern.

#### 4.5 **Natural**

4.5.1 Amorphous areas of low resistance are present across the site. These are of uncertain origin, but are likely to be of natural origin, i.e. related to localised variations in the moisture content of the soils.

## 5 DATA APPRAISAL & CONFIDENCE ASSESSMENT

5.1 The earth resistance survey has revealed evidence of cut features, such as ditches, along with possible former quarry pits and anomalies of uncertain origin; however, no anomalies suggestive of masonry structures have been identified. The detection of linear anomalies corresponding with those identified in the previous magnetometer survey indicate that the technique has been effective, however the very dry conditions have clearly affected the results.

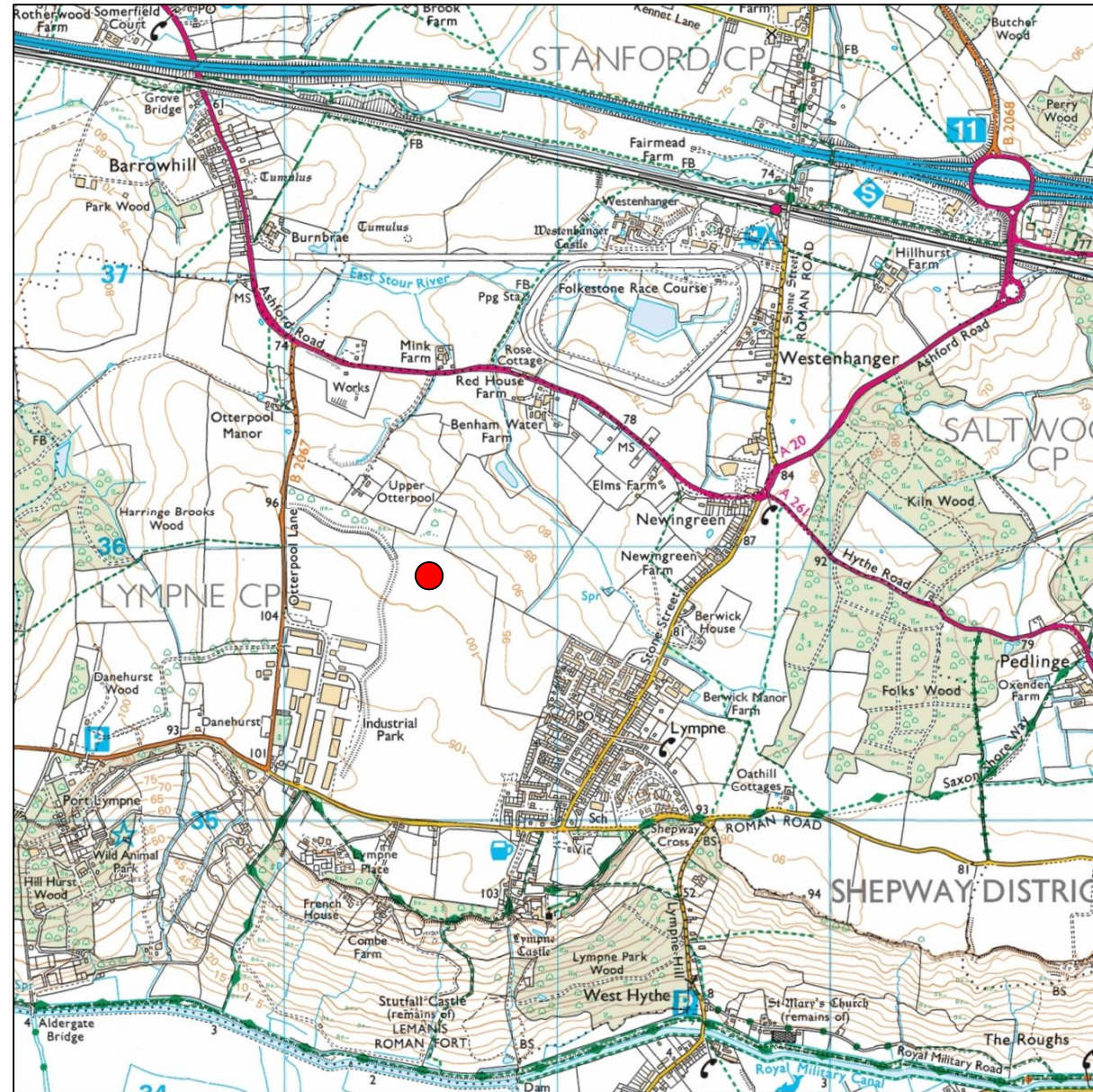
## 6 CONCLUSION

- 6.1 The survey on land east of Lympne Industrial Estate has not revealed any remains suggestive of masonry structures. Low resistance linear anomalies relate to cut features, identified as ditches in the earlier survey. A 'Z-shape' feature has been classified as being of possible archaeological origin, simply because of its context. However, its exact origin cannot be determined with confidence and it may equally be of modern origin. Two possible former quarry pits have been identified, along with linear anomalies and discrete features which are probably modern or related to the former airfield site.

## 7 REFERENCES

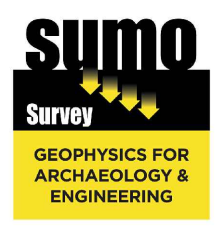
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[http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics\\_2.pdf](http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_2.pdf)
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- SUMO 2018 *Geophysical Survey Report - Former Lympne Airfield, Otterpool Park, Kent*. Ref. J12992. SUMO Geophysics; unpublished report.





 Site Location

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Title: Site Location Diagram

Client: Oxford Archaeology

Project: 12993 - East of Lympe Industrial Estate, Otterpool, Kent

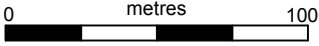
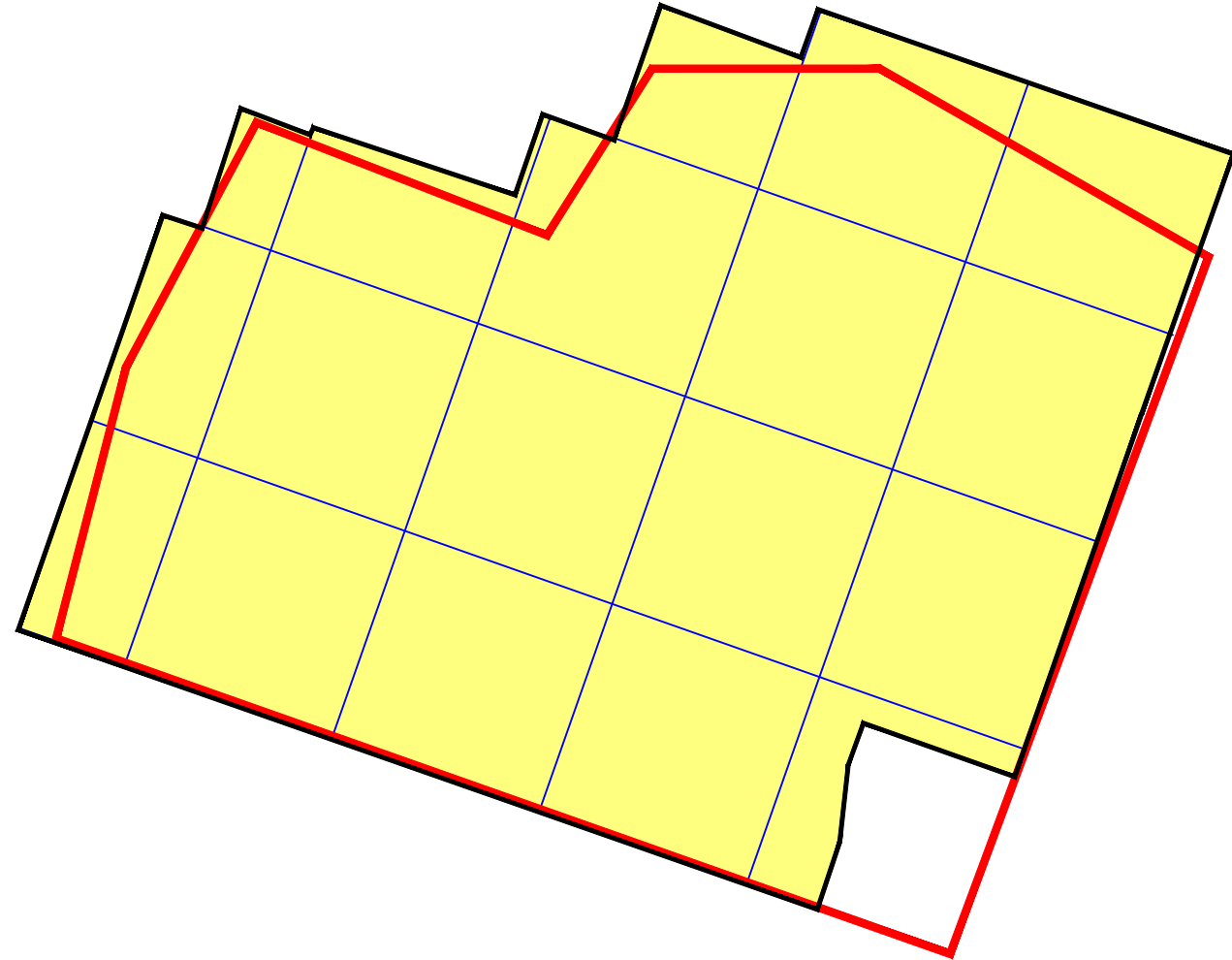
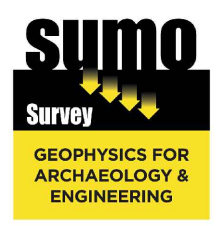
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1:25000 @ A3

Fig No: 01



Survey Area - showing 30m grid



Title:  
Location of Survey Area

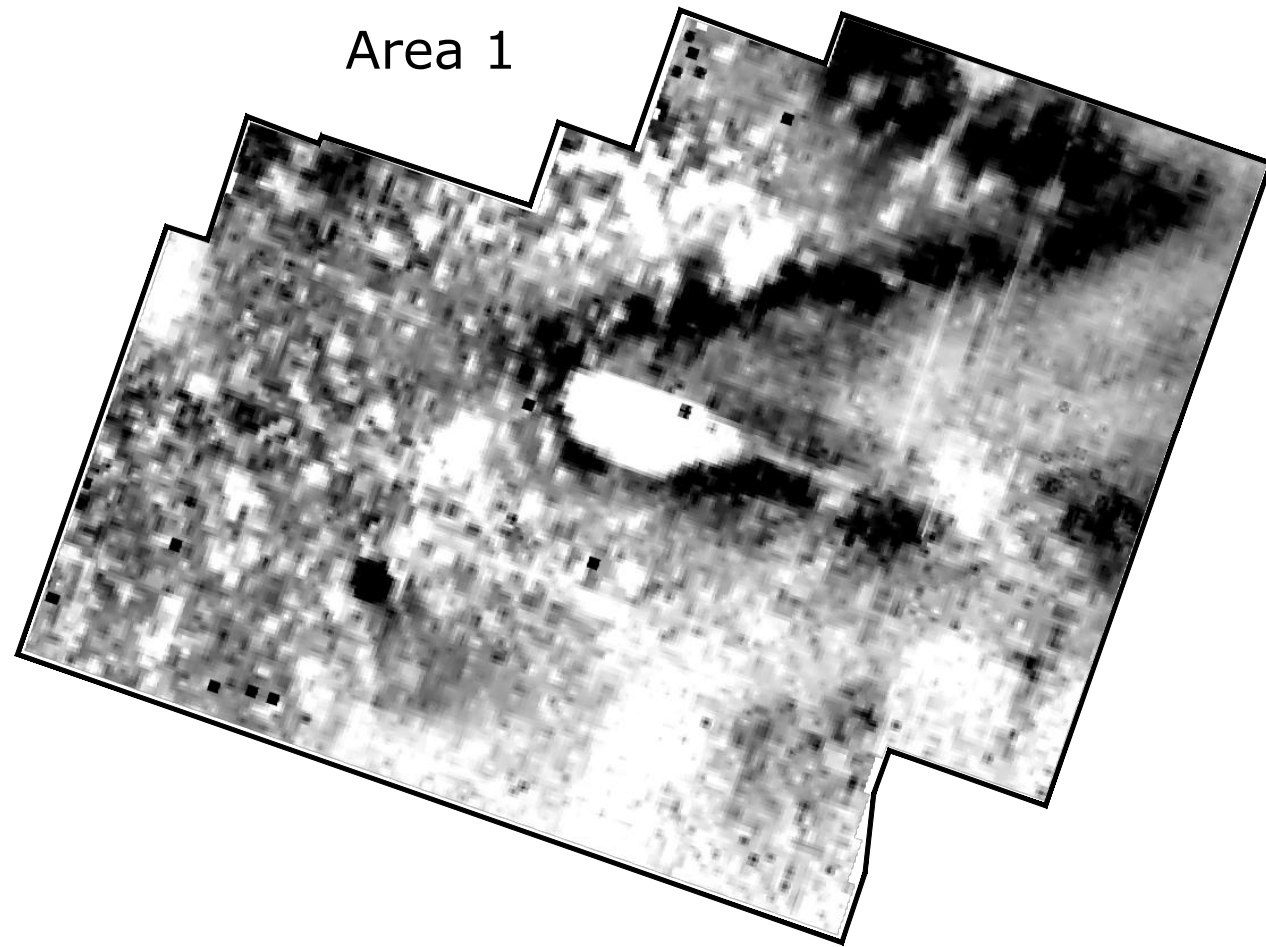
Client:  
Oxford Archaeology

Project:  
12993 - East of Lympe Industrial Estate,  
Otterpool, Kent

Scale:  
0 metres 50  
1:1000 @ A3

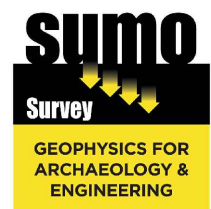
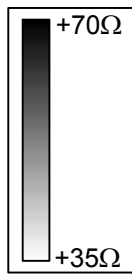
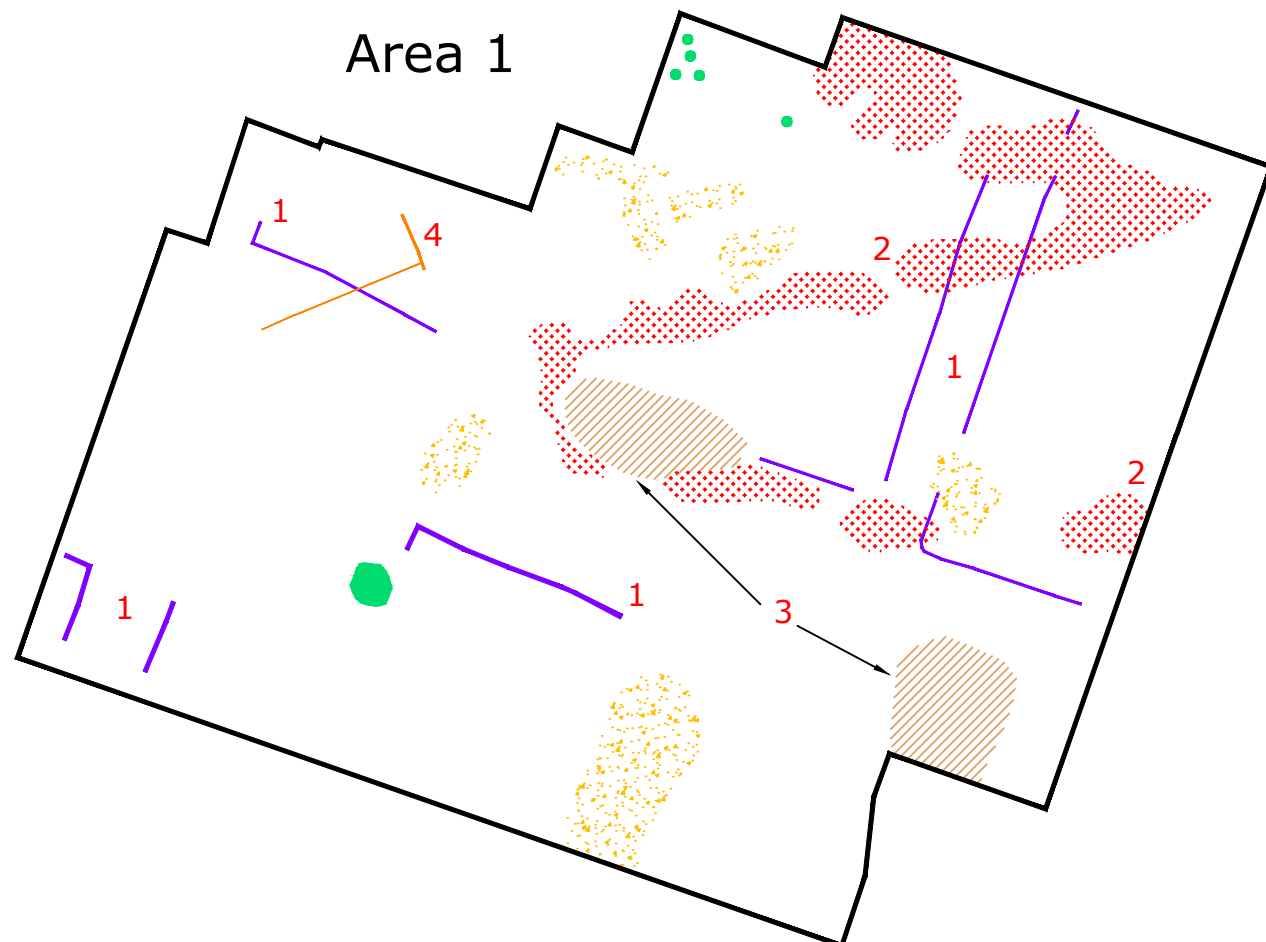
Fig No:  
02





### KEY

	Low resistance linear - cut feature of probable archaeological origin
	Low resistance area - possible cut feature (former quarrying activity)
	Moderate resistance area - uncertain origin / ?archaeology
	Moderate resistance linear - uncertain origin
	Discrete high resistance anomaly - uncertain origin
	Low resistance area - uncertain / possible natural origin



Title: Earth Resistance Survey - Greyscale Plot & Interpretation

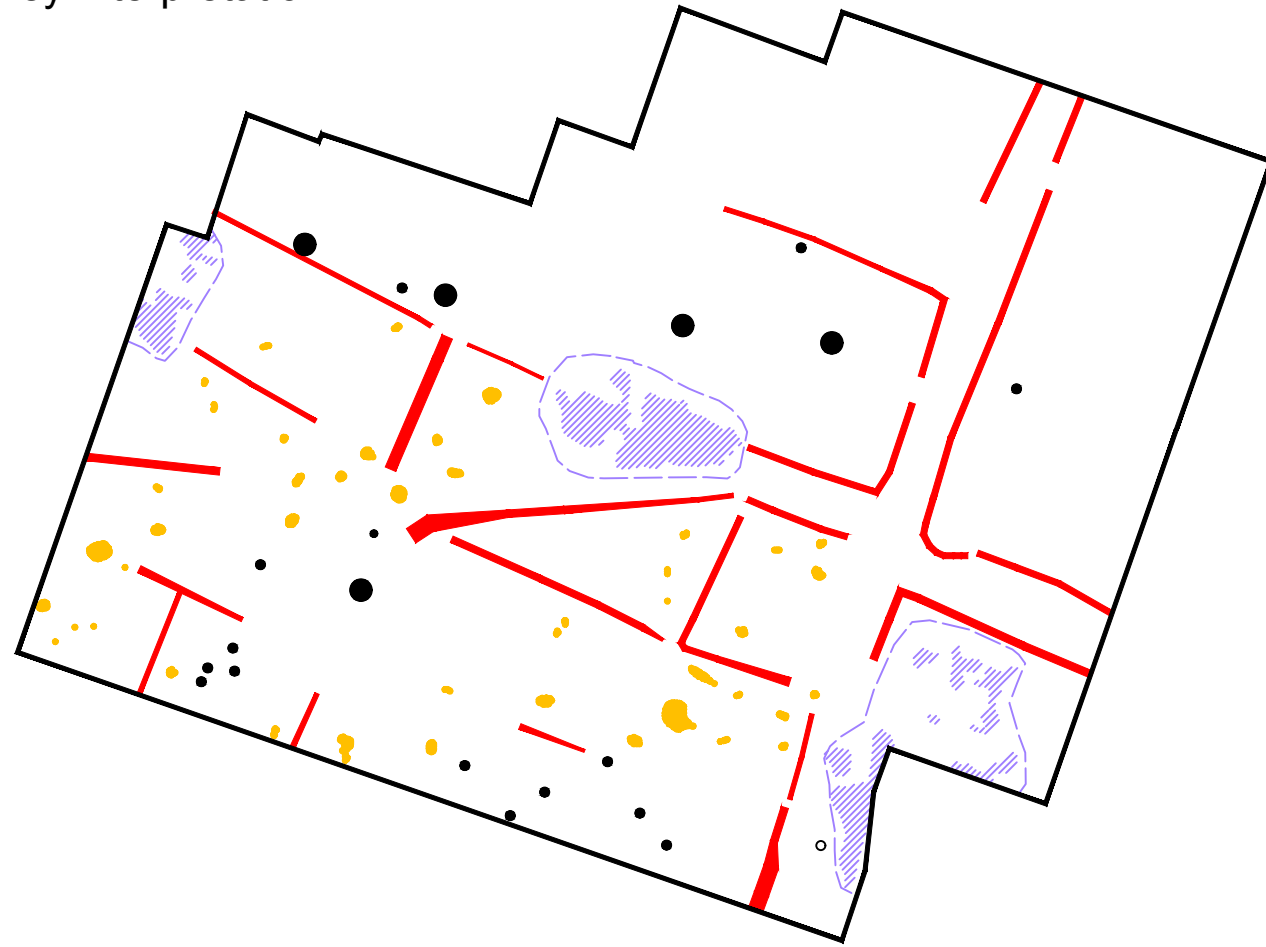
Client: Oxford Archaeology

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Scale: 0 metres 62.5  
1:1250 @ A3

Fig No: 03

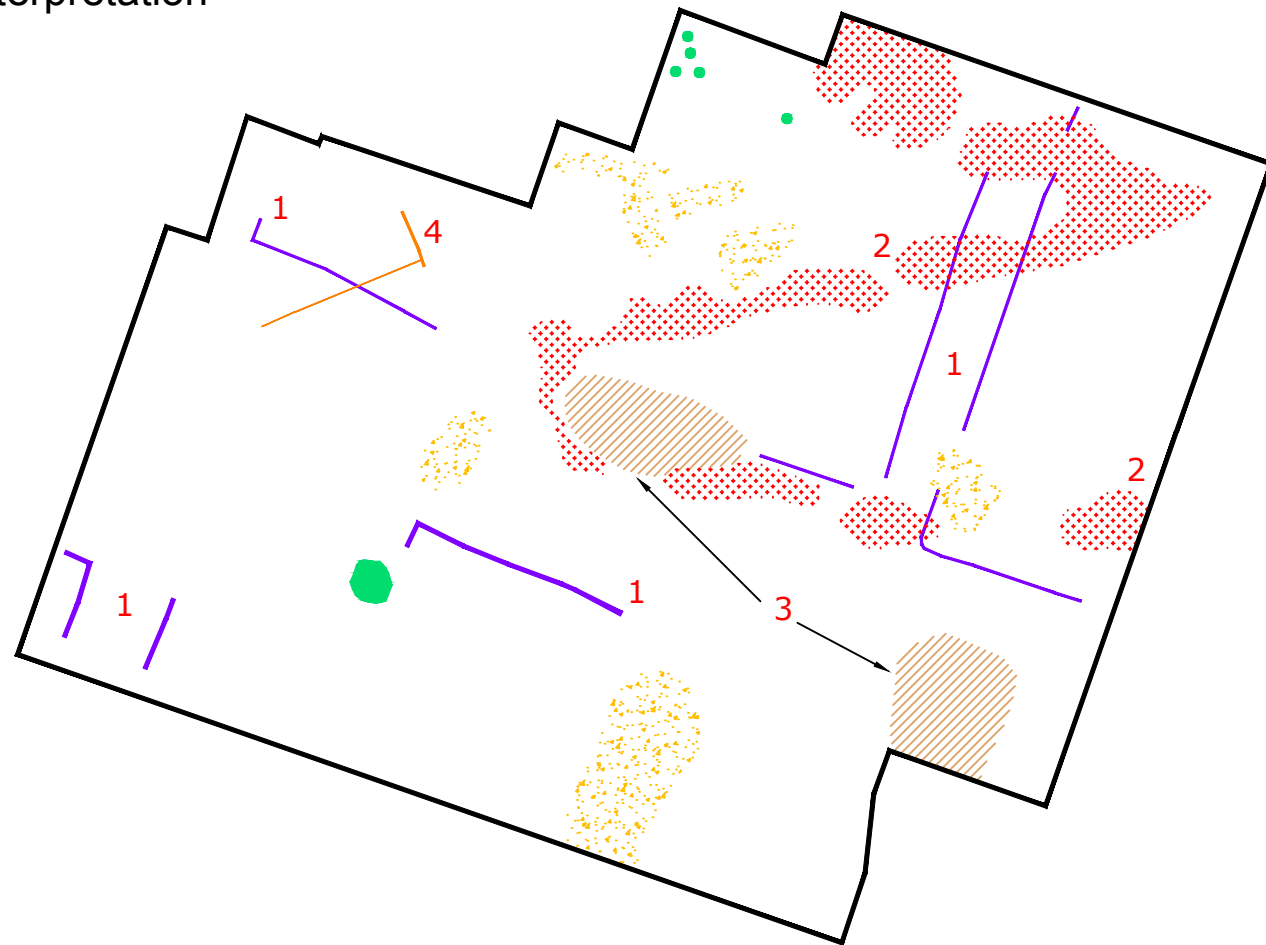
Previous Magnetometer Survey Interpretation  
(Headland 2017)



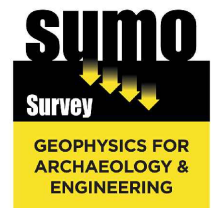
KEY	
●	Dipolar isolated - ferrous material
■ (blue hatched)	Magnetic enhancement - quarry
■ (red)	Magnetic enhancement - archaeology
■ (yellow)	Magnetic enhancement - archaeology?



Earth Resistance Survey Interpretation



KEY	
■ (purple line)	Low resistance linear - cut feature of probable archaeological origin
■ (orange hatched)	Low resistance area - possible cut feature (former quarrying activity)
■ (red dotted)	Moderate resistance area - uncertain origin / ?archaeology
■ (orange line)	Moderate resistance linear - uncertain origin
● (green)	Discrete high resistance anomaly - uncertain origin
■ (yellow dotted)	Low resistance area - uncertain / possible natural origin



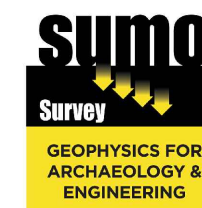
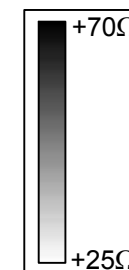
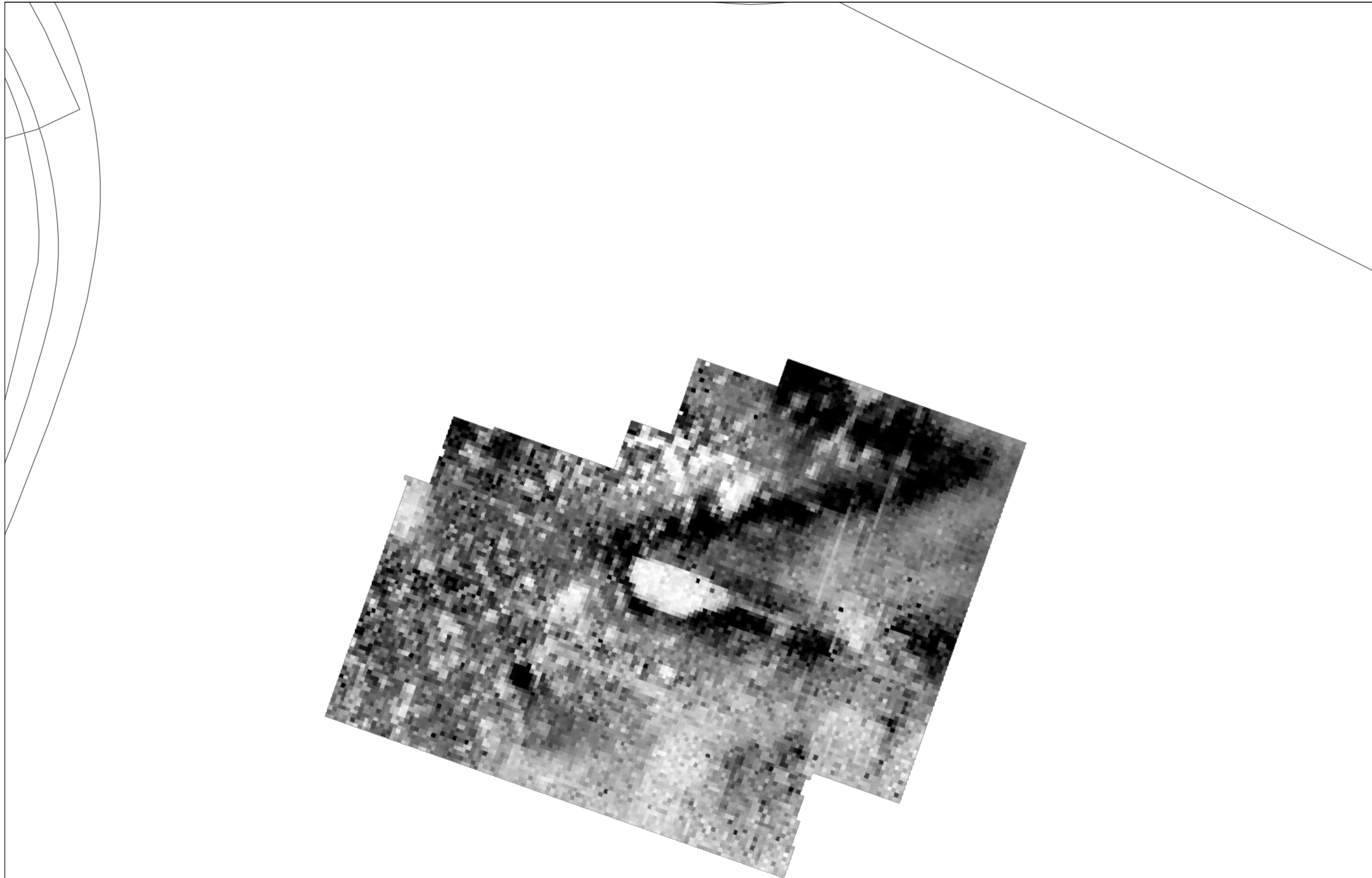
Title: Earth Resistance Survey - Interpretation & Interpretation of Previous Geophysical Survey

Client: Oxford Archaeology

Project: 12993 - East of Lympe Industrial Estate, Otterpool, Kent

Scale: 0 metres 50  
1:1000 @ A3

Fig No: 04



Title: Minimally Processed Data

Client: Oxford Archaeology

Project: 12993 - East of Lympe Industrial Estate,  
Otterpool, Kent

Scale: 0 metres 50  
1:1000 @ A3

Fig No: 05

## Appendix A - Technical Information: Earth Resistance Survey Method

### Instrumentation: Geoscan RM15 resistance meter (with optional MPX multiplexer)

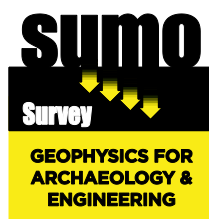
This instrument measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The most common arrangement is the Twin Probe configuration which involves two pairs of electrodes (one current and one potential): one pair remain in a fixed position, whilst the other measures the resistance variations across a grid. The resistance is measured in ohms and, when calculated, resistivity is in ohm-metres. The resistance method as used for standard area survey employs a probe separation of 0.5m, which samples to a depth of approximately 0.75m. The nature of the overburden and underlying geology will cause variations in this depth.

### Data Processing

Despike	In resistance survey, spurious readings can occasionally occur, usually due to a poor contact of the probes with the surface. This process removes the spurious readings, replacing them with values calculated by taking the mean and standard deviation of surrounding data points.
Grid Edge Match	If a twin probe survey is carried out over several sessions it is not always possible to position the remote probes to adequately compensate for broad changes in ground moisture. This can give rise to distinct edges between adjacent grids where data have been collected at different times. The grid edge match function removes these discontinuities.
High Pass Filter	Carried out over a whole resistance data-set, the filter removes low frequency, large scale spatial detail, such as that produced by broad geological changes. The result is to enhance the visibility of the smaller scale archaeological anomalies that are otherwise hidden within the broad 'background' change in resistance.
Low Pass Filter	This process removes high frequency, small scale spatial detail, making it useful for smoothing data or enhancing larger weaker features. It can be applied across a whole data-set or limited to a specific area.

### Display

Greyscale / Colourscale Plot	This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.
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- Archaeological
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