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**MILLER HOMES**

**LAND TO THE SOUTHEAST OF RAINFORD, ST HELENS**

**GEOPHYSICAL SURVEY REPORT**

**FEBRUARY 2022**

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**FEBRUARY 2022**

**PREPARED BY:**

Mike Birtles Senior Archaeologist



**REVIEWED BY:**

Kevin Horsley Principal Archaeologist



**APPROVED BY:**

Dave Jackson Technical Director



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## SUMMARY

Wardell Armstrong LLP (WA) was commissioned by Miller Homes to undertake a geophysical survey at land to the southeast of Rainford, St Helens, Merseyside, centred at National Grid Reference (NGR): SD 48793 00161. The geophysical survey was required to inform a forthcoming planning application. The geophysical survey was undertaken in accordance with a Written Scheme of Investigation (WSI) produced in response to advice given by Alison Plummer, acting as the archaeological planning advisor on behalf of Merseyside Environmental Advisory Service. The objective of the geophysical survey was to determine the presence/absence, nature and extent of potential archaeological features within the study area, and the presence/absence of any known modern features within the survey area, which may affect the results.

The survey was undertaken over five days between the 7<sup>th</sup> February and the 11<sup>th</sup> February 2022 and comprised of two fields of arable farmland.

The investigation revealed several former field boundaries as illustrated on the Ordnance Survey 1<sup>st</sup> Edition map, published in 1850. The survey results were quite 'noisy' suggesting that there has been spreads of demolition materials deposited and ploughed into the soil over the years, the possible source of this noise being the former cottages (HER MME7038), the former Rookery railway station (HER MME17445) and the possible coal mine (HER MME20595). Furthermore, a cluster of potential circular cut features were identified, which may represent later prehistoric activity.

The presence of further ephemeral features cannot be ruled out in areas which are masked by the geomagnetic noise.

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## **ACKNOWLEDGEMENTS**

Wardell Armstrong LLP (WA) thanks Miller Homes, for commissioning the project, and for all their assistance throughout the work. Also, WA thank Alison Plummer, Planning Archaeologist for Merseyside Environmental Advisory Service for her assistance.

The geophysical survey was undertaken by Mike Birtles with assistance from Thea Miliotis. Mike Birtles also wrote the report and prepared the figures. The project was managed by Alice Howell. This report was edited by Kevin Horsley.

## **1 INTRODUCTION**

### **1.1 Project Circumstances and Planning Background**

1.1.1 Between 7<sup>th</sup> and 11<sup>th</sup> February 2022, Wardell Armstrong LLP (WA) undertook a geophysical survey at land south-east of Rainford, St Helens, Merseyside, centred at National Grid Reference (NGR): SD 48793 00161 (Figure 1). It was commissioned by Miller Homes, who intends to develop the site. A planning application has not yet been submitted at the time of writing. However, Merseyside Environmental Advisory Service (MEAS) confirmed that should an application come forward, that they would request, in the first instance, fieldwalking and geophysical survey to the inform the necessity and scope for further evaluation work.

1.1.2 No previous archaeological fieldwork has been undertaken within the site.

1.1.3 The geophysical survey of the site was therefore commissioned as the first stage of the pre-application archaeological work, in order to help determine the presence/absence, nature and extent of archaeological remains within the proposed development site.

### **1.2 Project Documentation**

1.2.1 The project conforms to advice given in consultation with the archaeological planning advisor for MEAS. A Written Scheme of Investigation (WSI) was then produced to provide a specific methodology based on the brief for a programme of geophysical survey (WA 2022). This was approved by the archaeological planning advisor prior to the fieldwork taking place. This is in line with government advice as set out in Section 16 of the National Planning Policy Framework 2021 (MHCLG 2021).

1.2.2 This report outlines the work undertaken on site, the subsequent programme of post-fieldwork analysis, and the results of this scheme of archaeological evaluation.

## **2 METHODOLOGY**

### **2.1 Standards and Guidance**

2.1.1 The archaeological geophysical survey was undertaken following the Chartered Institute for Archaeologists *Standard and guidance for geophysical survey* (CifA 2020), the EAC Guidelines for the *Use of Geophysics in Archaeology: Questions to Ask and Points to Consider* (EAC 2015) and the WA Geophysical Survey Manual (WA 2021a).

### **2.2 Documentary Research**

2.2.1 An archaeological desk-based assessment was prepared by WA, which set out the archaeological and historical background of the site and provided an assessment of the significance of all known and potential heritage assets up to 1km from the area of investigation (2021b).

### **2.3 The Geophysical Survey**

#### **2.4 Technique Selection**

2.4.1 Archaeological geophysics is defined as the “examination of the Earth’s physical properties using non-invasive ground survey techniques to reveal buried archaeological features, sites and landscapes” (Gaffney & Gater 2003). Geomagnetic survey is offered as a standard level investigative method as it offers the quickest ground coverage out of the various survey techniques and responds to a variety of remains derived from archaeological activity (EAC 2015). Other techniques may be offered as a complementary service, to better understand the nature of the remains identified through geomagnetic survey.

2.4.2 A geomagnetic survey was selected as the most appropriate technique for this site due to the rapid data collection technique and the expected presence of possible archaeological features at depths of no more than 1.5m. A magnetometer survey identifies the presence of magnetised features within the ground, which can either be created by thermoremanence (heated remains such as kilns or hearths) or defined in terms of the magnetism inducted when it is placed in a magnetic field (Gaffney & Gater 2003).

#### **2.5 Field Methods**

2.5.1 The geomagnetic survey was carried out using a Bartington Grad 601-2 dual gradiometer system which utilises two sensors set 1m apart. The survey was undertaken within a system of 30m by 30m grids which were delineated across the



site using temporary grid markers. The grids were set out and recorded using a Trimble R8 with an accuracy of up to 0.10m.

2.5.2 The survey was undertaken using a zig-zag traverse pattern, utilising a sample interval of 0.25m and a traverse interval of 1m, providing 3600 sample measurements per full survey grid. Measurements were recorded on the Bartington's on-board datalogger which was downloaded at regular intervals and backed up appropriately.

## 2.6 Data Processing

2.6.1 The data were downloaded on site into a laptop computer for processing and storage. Geophysical survey data were processed using TerraSurveyor software, which was used to produce 'greyscale' images of the raw data. Positive magnetic anomalies are displayed as dark grey, and negative magnetic anomalies are displayed as light grey. A palette bar shows the relationship between the grey shades and geomagnetic values in nano-tesla (nT) for each area.

2.6.2 Raw data were processed in order to further define and highlight the archaeological features detected. The following basic data processing functions were used:

- **Destripe:** to reduce the effect of striping in the gradiometer data, sometimes caused by the misalignment of the twin sensors (zero mean traverse was performed on all survey grids using a threshold of 2 standard deviations).
- **Clip:** to clip data to specified maximum and minimum values, in order to limit large noise spikes in the geophysical data (clipped from -3nT to 3nT).

## 2.7 Interpretation

2.7.1 Three types of geophysical anomaly were detected in the gradiometer data:

- **Positive Magnetic:** Regions of anomalously high or positive magnetic data, which may be associated with the presence of high magnetic susceptibility soil filled features, such as pit or ditches.
- **Dipolar Magnetic:** regions of paired positive and negative magnetic anomalies, which typically reflect ferrous or fired materials, including fired/ferrous debris in the topsoil, or fired structures such as kilns or hearths.
- **Magnetic Disturbance:** areas of high amplitude magnetic disturbance or interference, which may be associated with the presence of modern structures, such as services, fences or buildings.

## 2.8 Presentation

2.8.1 The greyscale images were combined with site survey and Ordnance Survey (OS) data to produce the geophysical survey figures used in the report. Colour-coded geophysical interpretation diagrams are provided for each area in the report, showing the locations and extent of the magnetic anomalies. Archaeological interpretation diagrams are also provided, which are based on the interpretation of the geophysical survey results, in light of the archaeological and historical context of the site.

## 2.9 Site Archive

2.9.1 A full professional archive has been compiled in accordance with the project specification, and the Archaeological Archives Forum recommendations (Brown 2011). The archive will be deposited with Liverpool Museum, with copies of the report sent to the Merseyside HER, available upon request. A digital copy of the archive will be deposited with the Archaeological Data Service (ADS). The archive can be accessed under the unique project identifier **WA22 / ST18957**.

2.9.2 Wardell Armstrong LLP supports the **Online Access to the Index of Archaeological InvestigationS (OASIS)** project. This project aims to provide an on-line index and access to the extensive and expanding body of grey literature, created as a result of developer-funded archaeological work. As a result, details of the results of this project will be made available by WA as a part of this national project. The OASIS reference for the project is: **wardella2-504706**.

### **3 BACKGROUND**

#### **3.1 Location and Geological Context**

3.1.1 The Site is located to the south-east of Rainford (centred at National Grid Reference (NGR) SD 48793 00161) and is situated to the south of Higher Lane (B5205). The Site is bounded by Rookery Lane to the northwest, Higher Lane to the northeast and a strip of woodland to the southeast. The southwest boundary is defined by Rainford Linear Park, along a section of a former railway, and by Diamond Business Park.

3.1.2 The site is approximately 12.5ha in size and is rectangular in shape. The site slopes gently downhill from the north to south. At present the site comprises partially harvested arable land. Approximately 11ha was available for survey, the remaining 1.5ha being located within Dial House Wood.

3.1.3 The solid geology of the Site comprises the Pennine Lower Coal Measures Formation, sedimentary bedrock formed approximately 318 to 319 million years ago in the Carboniferous Period (local environment previously dominated by swamps, estuaries and deltas). Superficial deposits consist of Glaciofluvial Sheet Deposits, Devensian sand and gravel, superficial deposits formed up to 2 million years ago in the Quaternary Period (BGS 2022).

#### **3.2 Historical and Archaeological Background**

3.2.1 A desk-based assessment was produced to assess the known historical and archaeological background of the site and the surrounding landscape to a distance of 1km (WA 2021b). It is not intended to repeat that information here and what follows is a brief overview, for further details please refer to the original document.

3.2.2 This report identified that there were two designated heritage assets within the site boundary, however there are a further 16 within the wider search area of 1km.

3.2.3 The HER records the following two non-designated heritage assets located within the Site boundary which are of Industrial date:

- the site of Cottages (HER MME7038); and
- the location of a possible coal pit (HER MME20595).

3.2.4 The site of Rookery Station (HER MME17445) and the route of St Helens to Rainford Railway (HER MME18088) are located on the southwestern boundary of the Site; now within Rainford Linear Park.

- 3.2.5 **Prehistoric (up to AD 43):** Evidence for activity within the search area during the prehistoric period is limited to a possible barrow (funerary mound) (HER MME7612), located 660m to the south-east of the Site, although it should be noted that this is based on 19<sup>th</sup> century field name evidence only (WA 2021b).
- 3.2.6 **Romano-British (AD 43 to 410):** There are no Romano-British HER entries recorded in the Site or search area (*Ibid*).
- 3.2.7 **Early Medieval (AD 410 to 1066):** The only evidence for settlement during this time within the area is from the place name 'Rainford' which is derived from the Old Norse and Old English languages. Rainford is suggested to mean 'the ford by a boundary strip' from the Old Norse word *reinn* and the Old English word *ford*. According to Mills, the reference seems to refer to the point at which the road through the moss lands, which surround the village, crossed the Sankey Brook (Mills 2011). Other sources suggest that the first element of the name is actually the shortened form of a personal name, *Ragn*. The suggested core of the early medieval settlement is located 965m north-west of the Site (HER MME18242) (WA 2021b).
- 3.2.8 **Medieval (AD 1066 to 1540):** There is one HER entry within the search area which relates to the medieval period; a possible moated site at Rookery Farm, located 115m south of the Site (HER MME14670). The property appears on Yates' map of 1786, labelled 'Parrs' and is drawn as a relatively large square surrounded by a rough square of trees. Other moated sites in Merseyside are represented by Yates in this way (*Ibid.*).
- 3.2.9 Evidence for farming around Rainford in the medieval period is rare. Occasionally pieces of medieval pottery have been found in local fields, especially to the north and south-west of the village, and a possible medieval ridge and furrow field system has been identified (*Ibid.*).
- 3.2.10 **Post-medieval and Industrial (AD 1540 to present):** By the start of the post-medieval period, Rainford yeoman farmers began to realise the potential for the industry in the village. They were assisted by a degree of independence which strengthened their sense of entrepreneurial initiative, allowing the exploitation of newly enclosed 'waste' land for peat, clay, coal and for the establishment of the early kilns. This arose from changes in land holding which saw large-scale enclosure by the mid-seventeenth century. When pottery first started to be produced in Rainford, probably in the sixteenth century, the village would have had a sparse and scattered population with the majority of people employed in agriculture and living on the edges of the surrounding mosslands. Early production of dark-glazed pottery could only have been

on a small-scale cottage industry, supplementing an already established farming economy (WA 2021b).

- 3.2.11 The first pottery kilns and workshops were associated with farmhouses and outbuildings, both in outlying locations and within the core of the settlement. By the seventeenth century, the clay tobacco pipe industry was of increasing importance in Rainford, and the clay pipe became Rainford's main industrial product. Writing in the early nineteenth century Edward Baines noted that Rainford was '*famous for the manufacture of tobacco pipes which are made in great abundance. There are here excellent beds of clay, which are used for the making of fire bricks, and crucibles*'. There is evidence for pipe making 115m south of the Site; the former site of a Clay Tobacco Pipe Workshop is recorded just to the south of Rookery Farm (HER MME7003). This building is shown on the Tithe map of 1841, and recorded as a 'cottage, pipe shop and garden' (*Ibid.*).
- 3.2.12 The earliest record of coal extraction in Rainford dates to 1696, and mining was undertaken in Rainford through the eighteenth century, although this remained minimal. Records show that coal was being transported to the village from surrounding areas such as Parr and Garswood to supply 'mugworks'. Within the Site, there is some possible evidence for coal extraction as suggested by a field name 'Coal Pit Croft' (HER MME20595, Plot 1222a on the Tithe Map of 1841). Within the search area, the location of a possible nineteenth century coal pit is recorded in the HER close to Mill Lane Farm, 680m east of the Site (HER MME16999) (*Ibid.*).
- 3.2.13 Railway links near and through Rainford developed in the mid-nineteenth century. Railway transport started in 1848 with the opening of the Liverpool to Bury Railway at the north end of the village. This line was built primarily to carry coal from the Wigan and East Lancashire coalfields. In 1858 the St Helens to Ormskirk line was opened, along which were several stations serving Rainford including 'Rookery', formerly located just outside the Site boundary (HER MME17445), with the former railway line now utilised as Rainford Linear Park which bounds the southwestern boundary of the Site (HER MME18088) (*Ibid.*).
- 3.2.14 Post medieval mapping shows the agricultural character of the Site throughout the nineteenth century. Some small-scale industry was taking place within the search area, for example two windmills: one 385m south-west of the Site (HER MME7309) and one 600m to the south-east (HER MME7307); and a watermill 500m also to the southeast (HER MME7308). At some point between 1850 and 1892, a 'Pottery' had been

established 335m to the southeast of the Site, on Old Mill Lane (HER MME10057)  
(*ibid.*).

## 4 GEOPHYSICAL SURVEY RESULTS

### 4.1 Introduction

- 4.1.1 The geophysical survey covered the development footprint associated with the proposed housing development, excluding Dial House Wood.
- 4.1.2 The survey area was divided into two parts by a partial hedgerow on a north to south alignment, in the eastern portion of the site. Area 1 measured 8.65ha and Area 2 measured 2.35ha (Figure 2).
- 4.1.3 Small discrete dipolar magnetic anomalies were detected which were dispersed across the whole of the study area. These are almost certainly caused by fired or ferrous litter in the topsoil, which is typically for modern agricultural land.
- 4.1.4 The results of the geophysical survey are depicted in Figures 3-6, with geophysics anomalies classified by type. Potential archaeological features are discussed below, with Historic Environment Record (HER) references given where known. Figure 7 illustrates the First Edition Ordnance Survey (6 inches to 1 mile) map, published in 1850, with the archaeological interpretation shown.

### 4.2 Results (Figures 3-6)

- 4.2.1 The majority of the site was surveyed with the exception of approximately 1.5ha within the confines of Dial House Wood along the northern boundary.

#### Area 1

- 4.2.2 Ten linear positive magnetic responses of moderate magnitude (**1a-1e**) were identified in Area 1, this type of response is typical of soil filled ditches which respect five former field boundaries illustrated on the ordnance survey 6 inch to 1 mile map published in 1850 (Figures 6 and 7). Response **1a** also appears to contain a ceramic drain, this was observed during the fieldwork where the drain had previously been breached causing a sinkhole to appear.
- 4.2.3 A cluster of three curvilinear positive magnetic responses (**2a**) were located centrally within Area 1. These responses which measured approximately 16m in diameter, are of weak magnitude but might be indicative of circular cut features such as ring ditches (Figure 6).
- 4.2.4 Three weak to moderate positive magnetic curvilinear responses were identified, **3a** to the east and **3b** and **3c** to the west. These responses may indicate soil-filled ditches such as enclosures (Figure 6).

- 4.2.5 Two strong dipolar linear responses located centrally within Area 1 in close proximity to response **1b** have been identified, responses such as these indicate ditches that contain thermoremnant material or modern ceramic field drains (Figure 6, shown in red).
- 4.2.6 A dipolar response (**4b**) along the northern boundary in the vicinity of two former gate posts could possibly respond to metalling of a former roadway to Dial House. This response measured 50m in length with a maximum width of 8m (Figure 7).
- 4.2.7 Spreads of magnetic material were identified along the former railway line to the south of the area (**5a**), and also to the west of the site (**5b**). This is typical of fired ceramic material and clinker/ cinders that have been spread out over the land. A further spread of magnetic material has been identified towards the east of Area 1 (**5c**) (Figure 5).

## Area 2

- 4.2.8 A positive magnetic linear response (**1f**) of moderate magnitude was identified traversing this area on an east to west alignment (Figure 6). This response respects the location of a former field boundary illustrated on the First Edition Ordnance Survey (6 inch to 1 mile) map, published in 1850 (Figures 7).



## **5 CONCLUSIONS**

### **5.1 Interpretation**

5.1.1 The geophysical survey covered the development footprint associated with the proposed housing development. The purpose of the survey was to determine the presence/absence nature and extent of potential archaeological features within the within the study area, and to identify the presence/absence of any known modern features within the survey area, which may affect the results.

5.1.2 The geomagnetic anomalies with archaeological potential identified were concentrated in Area 1. The remains primarily comprised former field boundaries which first appeared on the First Edition Ordnance Survey (6 inch to 1 mile) map, published in 1850 (Figure 7).

5.1.3 A cluster of curvilinear responses identified within Area 1 are typical of prehistoric features such as roundhouses or funerary monuments. The desk-based study identified the location of a possible prehistoric funerary mound (HER MME7612) 660m to the south-east of the site, the evidence of which is based on 19<sup>th</sup> century field name evidence only (WA 2021b). These responses were weak, however, trends of a circular nature are visible.

5.1.4 Spreads of thermoremnant magnetic material along the southern boundary are typical of industrial settings, and the presence of the former railway line is a likely source of this magnetic material.

5.1.5 It is reasonable to infer that the spread of thermoremnant magnetic materials identified towards the west of Area 1 could be debris from the demolition of the former cottages (HER MME7038) and/or the former railway station (HER MME17445).

5.1.6 A spread of magnetic thermoremnant material was identified towards the eastern portion of Area 1 which could be related to the possible former mine (HER MME20595).

5.1.7 Both areas were generally noisy and it is possible that further ephemeral features might be masked by the geomagnetic noise.

### **5.2 Significance**

5.2.1 The archaeological framework research agenda for North West England highlights the potential for sites of 'circles' in the North West (PH44) and the use of geophysics and

excavation to identify. Although at this stage the potential ring ditches are unconfirmed, they would be worthy of further investigation (NWRF 2022a).

- 5.2.2 Several boundaries were identified during this fieldwork which are recorded on the First Edition Ordnance Survey map but not on previously less detailed maps. These could help inform on NWRRF Ind15 regarding the understanding of historic field systems and enclosures (NWRF 2022b).

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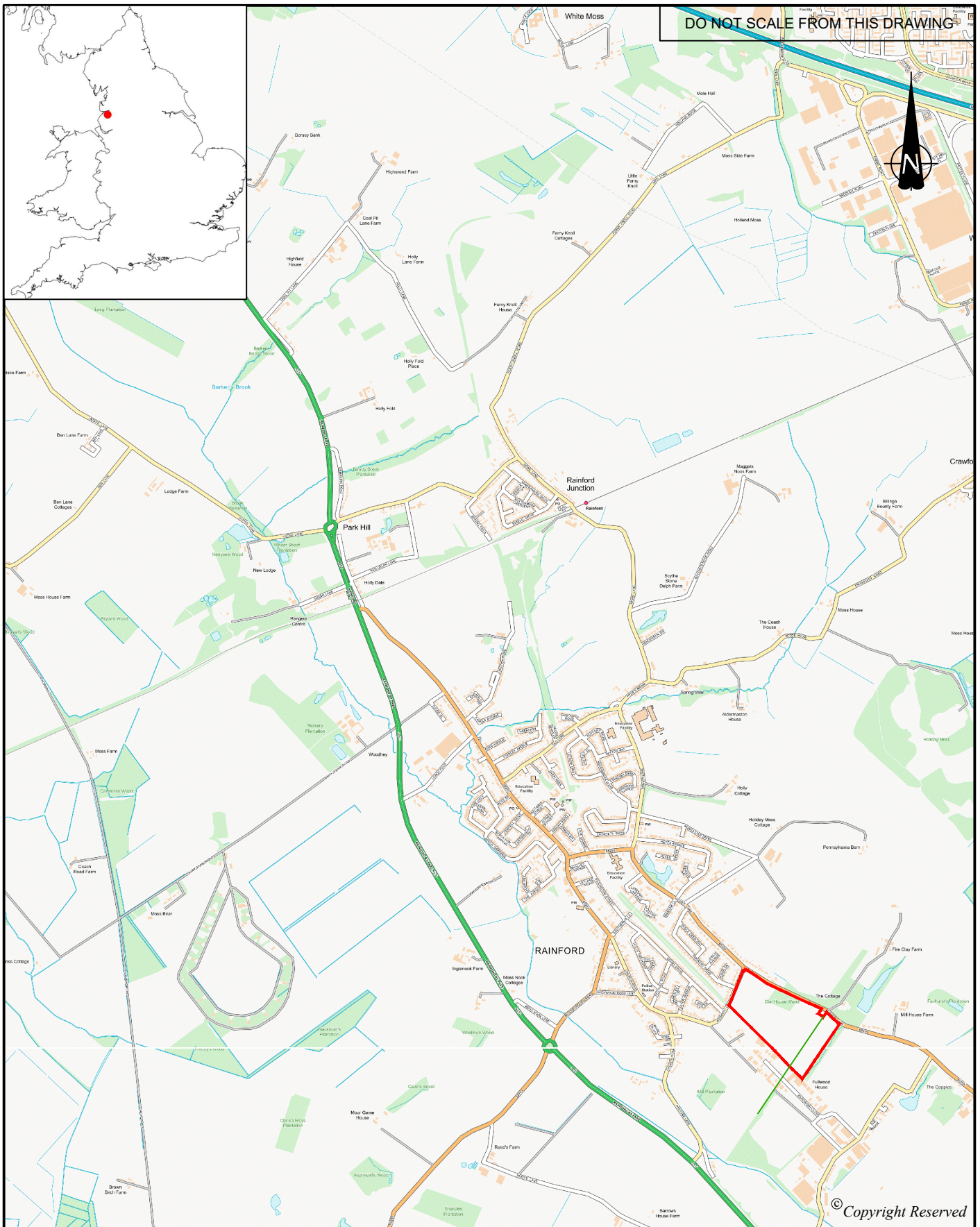
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## **APPENDIX 1: FIGURES**



CLIENT	Miller Homes		DRG No.	ST18957-101		REV	A	
PROJECT	Land to the South-east of Rainford, St Helens Merseyside, Geophysical Survey		SIZE	A4		SCALE	1:25,000	
			DATE	Feb 2022		APPROVED BY	DJ	
DRAWING TITLE	Figure 1: Site Location		DRAWN BY	MB		CHECKED BY	KH	
						■ BOLTON   TEL 01204 227 227 WWW.WARDELL-ARMSTRONG.COM <input type="checkbox"/> BIRMINGHAM <input type="checkbox"/> LEEDS <input type="checkbox"/> CARDIFF <input type="checkbox"/> LONDON <input type="checkbox"/> CARLISLE <input type="checkbox"/> MANCHESTER <input type="checkbox"/> EDINBURGH <input type="checkbox"/> NEWCASTLE UPON TYNE <input type="checkbox"/> GLASGOW <input type="checkbox"/> STOKE ON TRENT		



DO NOT SCALE FROM THIS DRAWING

KEY:

- Geophysical Survey Area
- Development Area Boundary

REVISION	DETAILS	DATE	DRN	CHKD	APPD
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CLIENT  
**Miller Homes**

PROJECT  
**Land to the South-east of Rainford St, Helens, Merseyside. Geophysical Survey**

DRAWING TITLE  
**Figure 2: Location of Geophysical Survey Areas**

DRG No.	ST18957-102	REV	A
DRG SIZE	A3	SCALE	1:2000
DRAWN BY	MB	CHECKED BY	KH
		APPROVED BY	DJ

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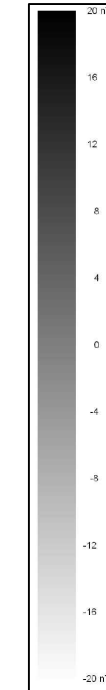
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- NEWCASTLE UPON TYNE
- GLASGOW
- STOKE ON TRENT



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KEY:

 Development Area Boundary




REVISION	DETAILS	DATE	DRN	CHKD	APPD
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PROJECT  
**Land to the South-east of Rainford St, Helens, Merseyside. Geophysical Survey**

DRAWING TITLE  
**Figure 3: Minimally processed data with survey grid**

DRG No.	ST18957-103	REV	A
DRG SIZE	A3	SCALE	1:2000
DRAWN BY	MB	CHECKED BY	KH
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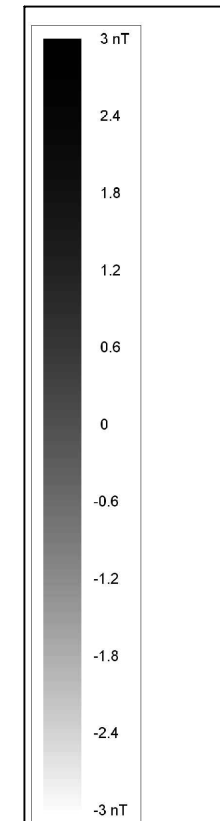
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- STOKE ON TRENT



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KEY:

 Development Area Boundary




REVISION	DETAILS	DATE	DRN	CHKD	APPD
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CLIENT  
**Miller Homes**

PROJECT  
**Land to the South-east of Rainford St, Helens, Merseyside. Geophysical Survey**

DRAWING TITLE  
**Figure 4: Processed data**

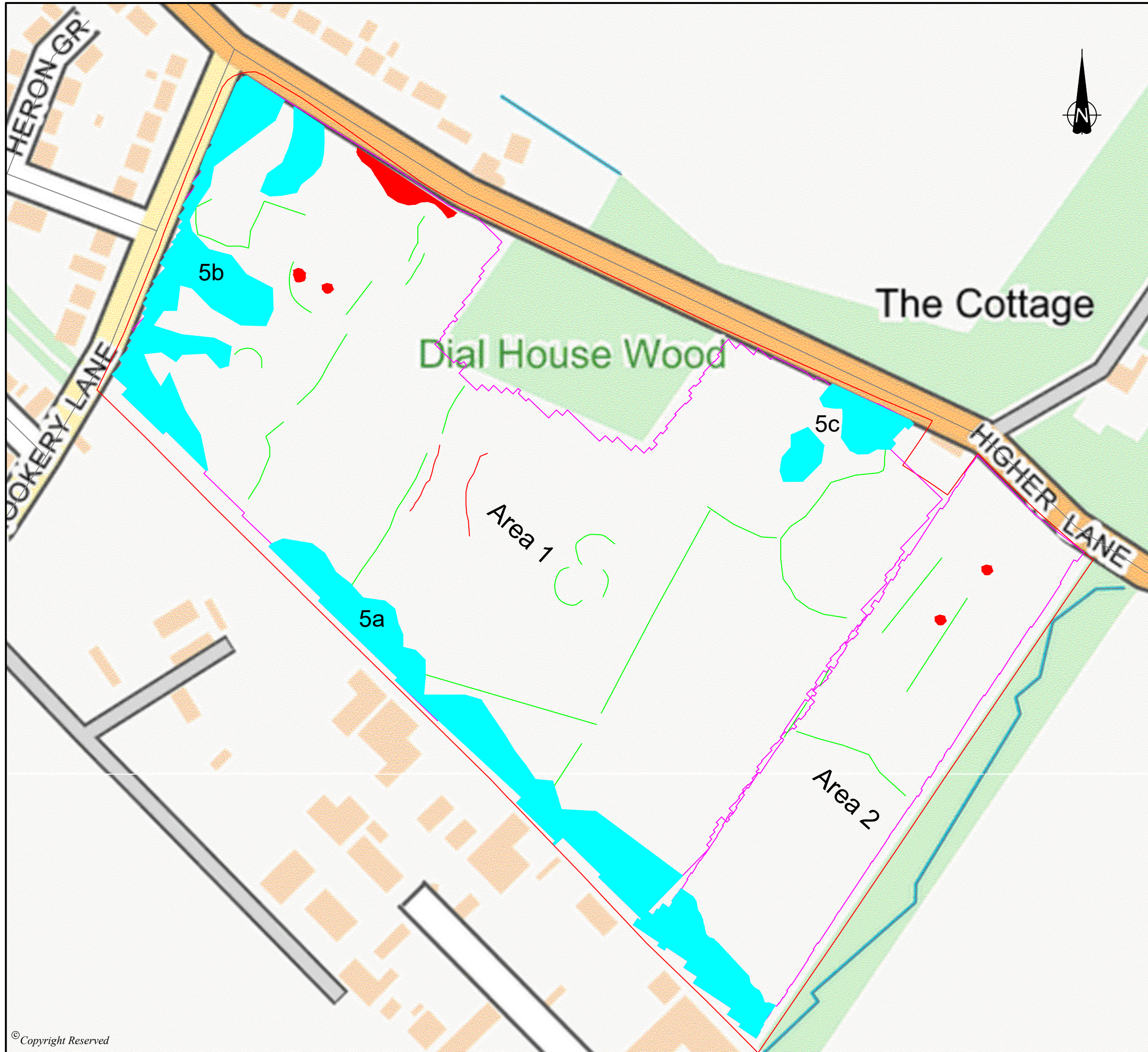
DRG No.	ST18957-104	REV	A
DRG SIZE	A3	SCALE	1:2000
		DATE	Feb 2022
DRAWN BY	MB	CHECKED BY	KH
		APPROVED BY	DJ

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DO NOT SCALE FROM THIS DRAWING

KEY:

- Development Area Boundary
- Positive magnetic response
- Di-polar response
- Magnetic disturbance
- 5a** Interpretation label

REVISION	DETAILS	DATE	DRN	CHKD	APPD
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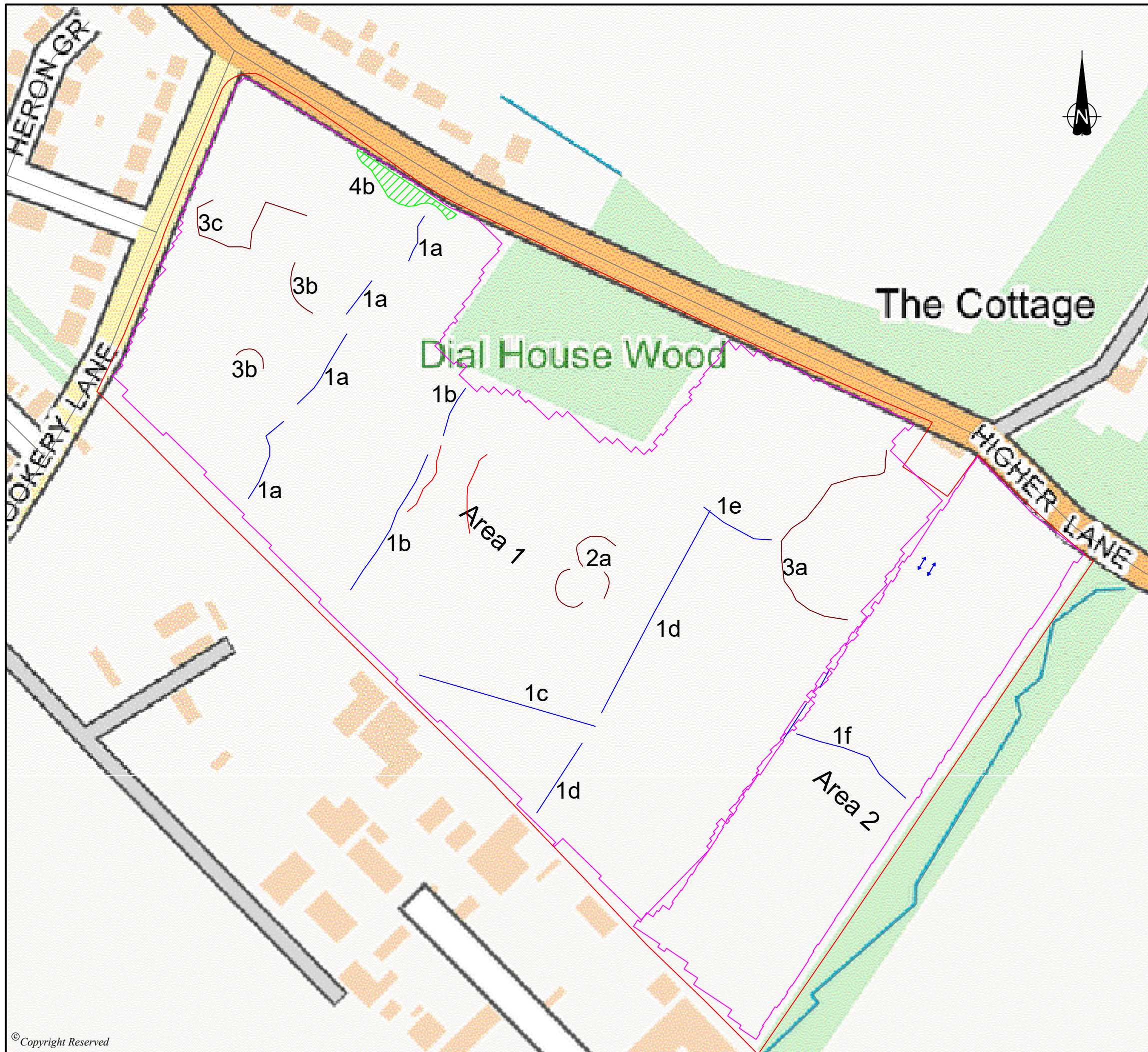
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DRAWING TITLE  
**Figure 5: Geophysical Interpretation**

DRG No.	ST18957-105	REV	A
DRG SIZE	SCALE	DATE	
A3	1:2000	Feb 2022	
DRAWN BY	CHECKED BY	APPROVED BY	
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<input type="checkbox"/> EDINBURGH	<input type="checkbox"/> NEWCASTLE UPON TYNE
<input type="checkbox"/> GLASGOW	<input type="checkbox"/> STOKE ON TRENT



DO NOT SCALE FROM THIS DRAWING

KEY:

Development Area Boundary

Probable ceramic drain within ditch

Possible soil filled feature

Probable former field boundary

Magnetic material, possible metalling

Possible agricultural features

1a Interpretation label

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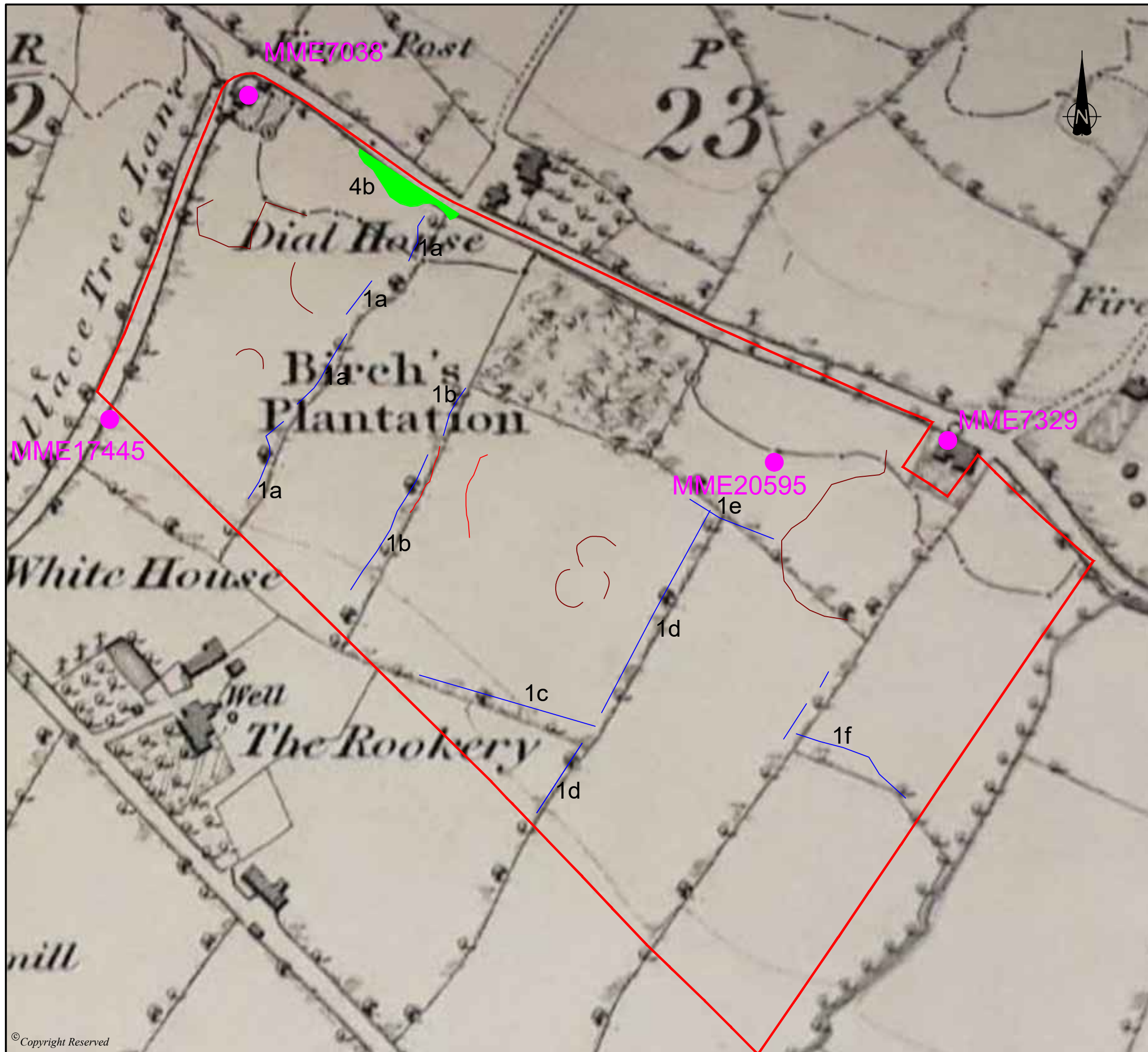
DRAWING TITLE  
Figure 6: Archaeological Interpretation

DRG No.	ST18957-106	REV	A
DRG SIZE	A3	SCALE	1:2000
DRAWN BY	MB	CHECKED BY	KH
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DO NOT SCALE FROM THIS DRAWING

KEY:

- Heritage Asset
- Probable ceramic drain within ditch
- Possible soil filled feature
- Magnetic material, possible metalling
- Probable former field boundary
- 1a** Interpretation label

REVISION	DETAILS	DATE	DRN	CHKD	APPD

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DRAWING TITLE  
**Figure 7: Archaeological Interpretation with Ordnance Survey First Edition map published in 1850**

DRG No.	ST18957-107	REV	A
DRG SIZE	A3	SCALE	1:2000
DRAWN BY	MB	CHECKED BY	KH
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**STOKE-ON-TRENT**

Sir Henry Doulton House  
Forge Lane  
Etruria  
Stoke-on-Trent  
ST1 5BD  
Tel: +44 (0)1782 276 700

**BIRMINGHAM**

Two Devon Way  
Longbridge Technology Park  
Longbridge  
Birmingham  
B31 2TS  
Tel: +44 (0)121 580 0909

**BOLTON**

41-50 Futura Park  
Aspinall Way  
Middlebrook  
Bolton  
BL6 6SU  
Tel: +44 (0)1204 227 227

**BRISTOL**

Desk Lodge  
2 Redcliffe Way  
Bristol  
BS1 6NL

**BURY ST EDMUNDS**

6 Brunel Business Court  
Eastern Way  
Bury St Edmunds  
Suffolk  
IP32 7AJ  
Tel: +44 (0)1284 765 210

**CARDIFF**

Tudor House  
16 Cathedral Road  
Cardiff  
CF11 9LJ  
Tel: +44 (0)292 072 9191

**CARLISLE**

Marconi Road  
Burgh Road Industrial  
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CA2 7NA  
Tel: +44 (0)1228 550 575

**EDINBURGH**

Great Michael House  
14 Links Place  
Edinburgh  
EH6 7EZ  
Tel: +44 (0)131 555 3311

**GLASGOW**

2 West Regent Street  
Glasgow  
G2 1RW  
Tel: +44 (0)141 433 7210

**LEEDS**

36 Park Row  
Leeds  
LS1 5JL  
Tel: +44 (0)113 831 5533

**LONDON**

Third Floor  
46 Chancery Lane  
London  
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Tel: +44 (0)207 242 3243

**NEWCASTLE UPON TYNE**

City Quadrant  
11 Waterloo Square  
Newcastle upon Tyne  
NE1 4DP  
Tel: +44 (0)191 232 0943

**TRURO**

Baldhu House  
Wheal Jane Earth Science Park  
Baldhu  
Truro  
TR3 6EH  
Tel: +44 (0)187 256 0738

**International offices:**

**ALMATY**

29/6 Satpaev Avenue  
Hyatt Regency Hotel  
Office Tower  
Almaty  
Kazakhstan  
050040  
Tel: +7(727) 334 1310

**MOSCOW**

21/5 Kuznetskiy Most St.  
Moscow  
Russia  
Tel: +7(495) 626 07 67