

Substrata

Archaeological Geophysical Surveyors

An archaeological gradiometer survey

Land west of Newcourt Way Exeter, Devon

Ordnance Survey (E/N): 295500,90717 (point)

Report: 140626

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26 June 2014

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Accompanying CD-ROM

Report.....	Adobe PDF format
Copies of report figures	Adobe PDF format
Raw and processed grid & composite files.....	DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata	Adobe PDF format
GIS project, shape files and classification schema	
GIS project.....	Manifold 8 '.map' file
GIS shape files	ESRI standard
GIS classification schema	Adobe PDF format
AutoCAD version of the survey interpretation	AutoCAD DXF

1 Survey description and summary

Type of survey: twin-sensor fluxgate gradiometer
Date of survey: June 2014
Area surveyed: 1ha
Lead surveyor: Ross Dean BSc MSc MA MifA

Client

AC Archaeology Ltd, 4 Halthaies Workshops, Bradninch, Nr Exeter, Devon EX5 4QL

Location

Site: Land west of Newcourt Way
District: Exeter
County: Devon
Nearest Postcode: EX2 7EZ
NGR: SX 955 907
Ordnance Survey E/N: 295500,90717 (point)
OASIS number: substrat1-182490
Archive: At the time of writing, the archive of this survey will be held by Substrata.

Summary

This report was commissioned by AC Archaeology Ltd on behalf of clients and has been prepared in support of a forthcoming planning application for a residential development on land to the west of Newcourt Way, Exeter, Devon. The location of the proposed development area is shown in Figure 3. This survey is part of a programme of work comprising the collation of existing archaeological data held in the Devon County Council Historic Environment Record (DCCHER), a review of cartographic and documentary information held by the Devon Heritage Centre, Exeter, and, subsequent to this survey, the targeted evaluation trenching of the principal archaeological features (AC Archaeology 2014).

The 2014 gradiometer survey reported here was undertaken across field 1 (Figure 3) by Substrata. The adjacent field (field 2) included in the proposed development area was the subject of a gradiometer survey in 2006 by Stratascan Ltd (Heard, 2006) as part of a larger survey along the route of a proposed link road from Old Rydon Lane to the A379 as shown in Figure 3. The archaeological works undertaken in 2006 and 2008 as part of this earlier programme of work are discussed below in Section 5.

The relevant data and archaeological interpretations from the 2006 gradiometer survey are included in Section 6 of this report to provide a single source for the geophysical survey work carried out across the proposed development area.

The magnetic contrast across the area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. Twelve magnetic anomaly groups were identified as pertaining to archaeological deposits or structures. One of the groups in field 2 has been identified by later excavation as a Bronze Age enclosure and three of the remaining groups as linear archaeological features. It is likely that five of the groups in field 1 represent two extensions of these features with the sixth group likely to represent a deposit relatively recent rubble.

2 Survey aims and objectives

Survey aims

1. Define and characterise and detectable archaeological remains on the site.
2. Inform any future archaeological investigation of the area.

Survey Objectives

1. Complete a gradiometer survey across agreed parts of the survey area.
2. Identify any magnetic anomalies that may be related to archaeological deposits,

- structures or artefacts.
3. Within the limits of the techniques and dataset, archaeologically characterise any such anomalies or patterns of anomalies.
 4. Accurately record the location of the identified anomalies.
 5. Produce a report based on the survey that is sufficiently detailed to inform any subsequent development on the site about the location and possible archaeological character of the recorded anomalies.

3 Standards

The standards used to complete this survey are defined by the Institute for Archaeologists (2011). The codes of approved practice that were followed are those of the Institute for Archaeologists (2008 and 2009) and Archaeology Data Service/Digital Antiquity Guides (undated). The document text was written using the house style of the Institute for Archaeologists (Institute for Archaeologists, undated).

4 Site description

Landscape and land use

Fields 1 and 2 shown in Figure 3 comprised the 2014 and 2006 surveys respectively. Both areas were in agricultural use during the surveys.

Geology

The site is located on a solid geology of Permian Dawlish Sandstone Formation sandstones. These rocks comprise Reddish brown sands and sandstones, cross-bedded, with intercalated thin lenses and beds of breccia and mudstone. The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

A comprehensive description of the heritage assets within 1000m of the application area can be found in AC Archaeology (2014).

The following is a short summary of information obtained from the Devon and Dartmoor Historic Environment Record (HER) describing the archaeological works undertaken in 2006 and 2008 as part of an earlier programme of work and relevant to field 2 (Figure 3) in the current proposed development area. Except where specifically cited, this information was obtained using the Heritage Gateway (English Heritage, undated 1).

The reader is advised that this summary should not be used outside the context of this report and is referred to the Devon HER for informed provision of the record.

Field 2

A desk based assessment (Raymond, 2006) indicated that the route of a proposed link road from Old Rydon Lane to the A379 had potential to contain archaeological remains of Prehistoric and later date. A geophysical survey (Heard (2006) and HER entry MDV106162) revealed the presence of a rectilinear enclosure in the south of the northern field (group a, field 2 in Figure 3). This rectilinear enclosure has also been identified in aerial photography and, prior to excavation, was thought to be Romano-British in origin but is now known to be Bronze Age (HER entry MDV81192 below). Further evidence for archaeological activity was identified in a number of positive linear anomalies situated mainly in the centre and western parts of the survey area which included field 2. A number of these anomalies were qualified in the survey report as potentially of agricultural in origin due to their orientation (see Table 1).

The proposed route was subsequently evaluated by the excavation across areas within the current proposed development area and also in fields to the south and southeast of the area (Gilbert and Travers (2007), Gilbert (2007, 2010)). The evaluation of 11 trenches confirmed the presence of a substantial enclosure, first identified by aerial photography and geophysical survey and dated to the Bronze Age (MDV81192 and group a in Figure 1). Within it a single

hut circle was recorded, this was a large structure with a double ring of postholes. Possible contemporary structures were also noted external to the enclosure but within a larger outer enclosure (Gilbert 2010). To the west of this were a series of ditches thought to represent the remains of field systems (Gilbert 2012). These field systems were confirmed during a second phase of evaluation outside the corridor. Other ephemeral features such as isolated pits and postholes were also located and may well be prehistoric.

The area appears to have been employed for agricultural purposes for a considerable span of time. Field boundaries are evident across the site as ditches and fence lines of postholes. While the majority are post-medieval, some would appear to be earlier, probably medieval in date. Post-Medieval clay tobacco pipes, glass and pottery were retrieved from some of the features. The range of ware types suggest that there was more or less unbroken activity at the site from the 16th century onwards, although there appears to have been considerable disturbance of earlier deposits in the 19th century. The pottery is largely fragmented, and the range of identifiable vessels suggests that occupation was of a purely domestic nature. One sherd of Medieval pottery was recovered (HER entry MDV81240).

Historical Landscape Characterisation

Fields 1 and 2 have been characterised as 'Barton fields'. These relatively large, regular enclosures seem likely to have been laid out between C15th-C18th. Some curving boundaries may be following earlier divisions in the pre-existing medieval fields (Devon County Council, undated).

6 Results, discussion and conclusions

This survey was designed to record magnetic anomalies. The anomalies themselves cannot be regarded as actual archaeological features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeological features. The analysis presented below attempts to identify and characterise anomalies and anomaly groups that may pertain to archaeological deposits and structures.

The reader is referred to section 7.

6.1 Results

The 2014 gradiometer survey reported here was undertaken across field 1 (Figure 3) by Substrata. The adjacent field (field 2) included in the proposed development area was the subject of a gradiometer survey in 2006 by Stratascan Ltd (Heard 2006) as part of a larger survey along the route of a proposed link road from Old Rydon Lane to the A379 as shown in Figure 3. The subsequent archaeological works undertaken in 2006 and 2008 as part of this earlier programme of work and relevant to the current proposed development area are discussed in Section 5.

Figure 1 shows the interpretation of the survey across fields 1 and 2. It includes the anomaly groups identified as pertaining to archaeological deposits along with their numbers. Table 1 is an extract from a detailed analysis of the survey data provided in the attribute tables of the GIS project on the accompanying CD-ROM. The relevant data and archaeological interpretations from the 2006 gradiometer survey discussed above (Heard 2006) are included in Figure 1 and Table 1 to provide a single source for the geophysical survey work carried out across the proposed development area.

Figure 1 along with table 1 comprises the analysis of the survey data.

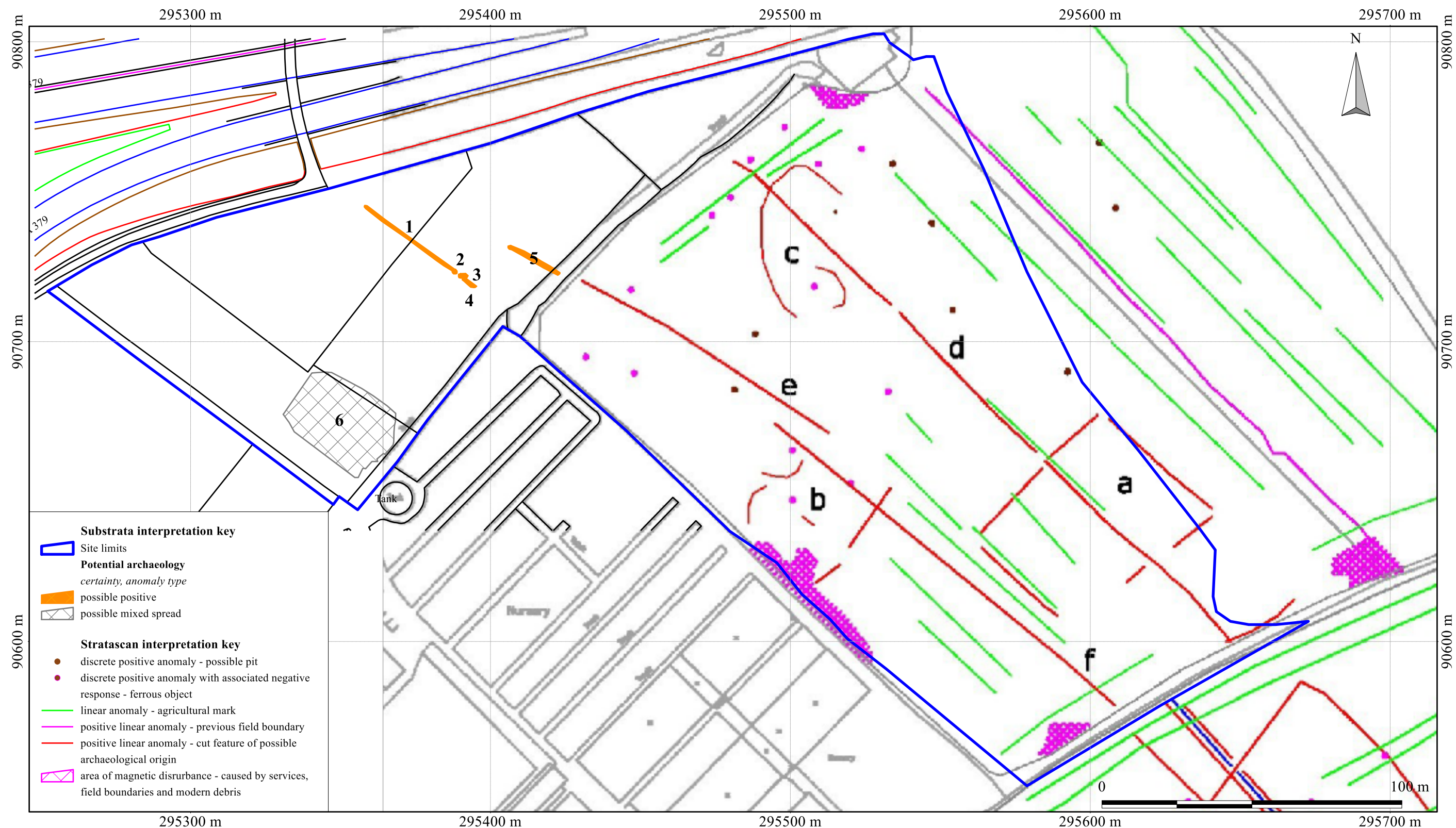
A plot of the processed data is provided in figure 2 (appendix 1).

Site: An archaeological gradiometer survey
Land west of Newcourt Way, Exeter, Devon
Ordnance Survey (E/N): 295360,90720 (point)
Report: 140626

Survey	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence or previous work
Substrata 2014 (field 1, Figure 3)	1	2 3 4	possible positive	linear		anomaly group aligns with an extant field boundary	
	2	1 3 4	possible positive	oval	pit or part of linear deposit		
	3	1 2 4	possible positive	oval	pit or part of linear deposit		
	4	1 2 3	possible positive	linear		anomaly group aligns with direction of traverse but is likely to represent a linear archaeological deposit	
	5		possible positive	linear		anomaly group matches with a group identified as potential archaeology in a pervious survey	Heard (2006)
	6		possible mixed spread	rubble			
Stratascan 2006 (field 2, Figure 3)	a		[likely] positive	rectilinear	a set of cut features of archaeological origin	anomaly group coincides with a rectilinear enclosure identified in an aerial photograph and thought to be Romano-British	Heard (2006: 6,7), HER entry MDV81192
	b		[possible] positive	linear		faint anomalies presenting weak evidence for archaeological activity	Heard (2006: 6)
	c		[possible] positive	linear		faint anomalies presenting weak evidence for archaeological activity	Heard (2006: 6)
	d		[possible] positive	linear	cut feature of archaeological origin	anomalies have a similar orientation to recent agricultural marks; may represent field boundaries or agricultural activities	Heard (2006: 6)
	e		[possible] positive	linear	cut feature of archaeological origin	anomalies have a similar orientation to recent agricultural marks; may represent field boundaries or agricultural activities	Heard (2006: 6)
	f		[possible] positive	linear	cut feature of archaeological origin	anomalies have a similar orientation to recent agricultural marks; may represent field boundaries or agricultural activities	Heard (2006: 6)

[certainty] included in this analysis but not described this way in the original report

Table 1: data analysis



British Grid
centre X: 295480.92 m, centre Y: 90674.18 m

Scale: 1:1300 @ A3. Spatial Units: Meter. Do not scale off this drawing

Copyright Substrata 2014.
Base map: Crown Copyright & Database Right 2014
Licence number 100022432

Notes:

1. All interpretations are provisional and represent potential archaeological deposits.
2. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
3. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological gradiometer survey
Land west of Newcourt Way, Exeter, Devon
Ordnance Survey (E/N): 295500,90717 (point)
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Figure 1: survey interpretation presented with the interpretation of a gradiometer survey
of the adjacent field completed by Stratascan (Heard, 2006)

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6.2 Discussion

Refer to Figure 1 (this section) and Figure 2 (appendix 1). Not all anomalies or anomaly groups identified in the survey dataset are necessarily discussed below. All identified anomaly groups are recorded in the GIS project on the accompanying CD-ROM. Those anomaly groups possibly representing archaeological deposits are included in the data analysis (Table 1).

General points

There are distinct, parallel, closely spaced, northwest to southeast trending linear patterns in the magnetic response in fields 1 and 2. These patterns reflect recent ploughing and crop sowing.

Anomalies thought to relate to natural features were not mapped. Recent man-made objects such as manholes, water management equipment or drains have not been mapped except where they comprise significant magnetic responses across the dataset.

Data collection along the field edges was restricted as shown in figures 1 and 2 due to the presence of magnetic materials and objects in and adjacent to the field boundaries. Strong magnetic responses mapped close to the field boundaries are likely to relate to these items except where indicated otherwise in Figure 1.

Field 1

Anomaly groups **1 to 4** align with a modern field boundary, and have the same trend as linear archaeological features recorded in the 2006 gradiometer survey (Heard 2006: 6, 7) and subsequently excavated (Gilbert and Travers 2006, Gilbert 2007, 2010 and 2012, HER entries MDV106162 and MDV81192). It is likely that these anomaly groups reflect a similar archaeological deposit or a linear set of deposits.

Group **5** aligns with group b (field 2) and is likely to be an extension of the group.

Group **6** is likely to represent a deposit of rubble. No building has been mapped at this site on any historical Ordnance Survey map. It is likely that this deposit is relatively recent.

Field 2

Magnetic anomaly group **a** in field 2 reflects a Bronze Age rectilinear enclosure first recognised on aerial photographs then recorded in the 2006 gradiometer survey and subsequently excavated (ibid).

Groups **b, c, d and f** were described in the 2006 survey report (Heard 2006: 6, 7) as magnetically positive anomalies likely to relate to archaeological features with varying degrees of certainty as shown in Table 1. Subsequent work has revealed the linear features (groups **d, e and f**) to be part of a Prehistoric to Post-Medieval landscape of fields, enclosures and settlements as discussed in Section 5 and listed in Appendix 5.

6.3 Conclusions

The magnetic contrast across the area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. Twelve magnetic anomaly groups were identified as pertaining to archaeological deposits or structures. One of the groups in field 2 has been identified by later excavation as a Bronze Age enclosure and three of the remaining groups as linear archaeological features. It is likely that five of the groups in field 1 represent two extensions of these features with the sixth group likely to represent a deposit relatively recent rubble.

7 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

Ross Dean, trading as Substrata, will assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79).

8 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

9 Bibliography

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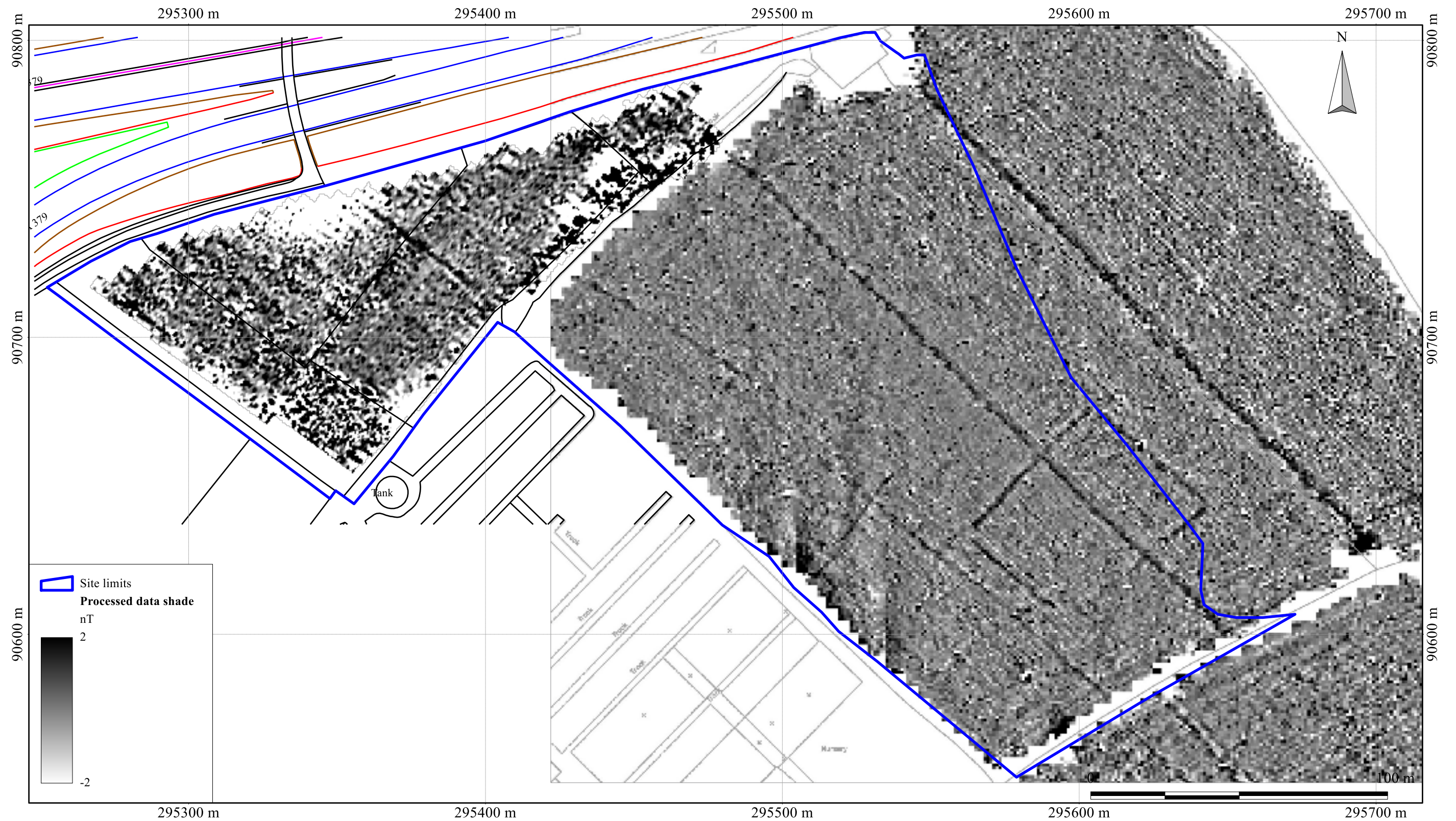
Raymond, F. (2006) *An Archaeological Desk-Based Assessment of The Newcourt Area - Lower RNSD Site and Land Alongside Old Rydon Lane and the A379, Topsham*

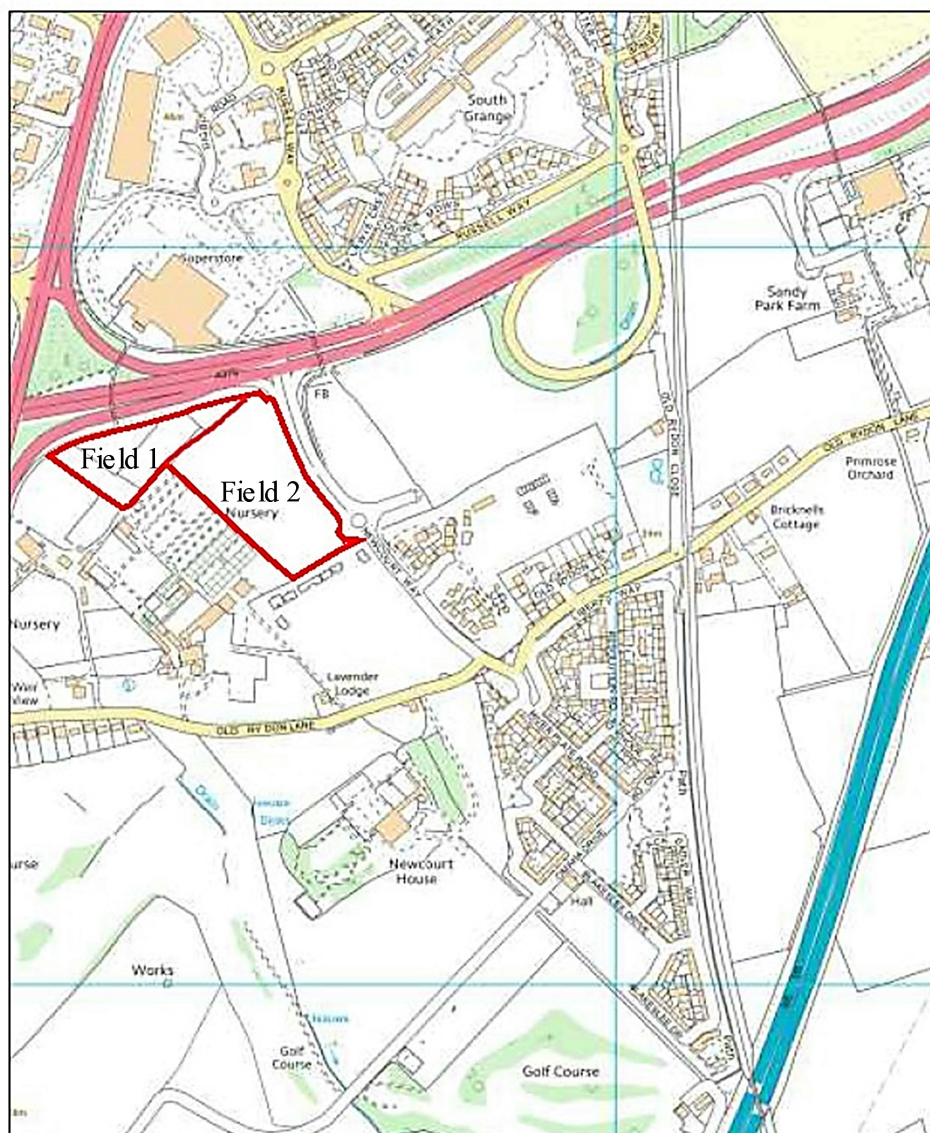
Appendix 1 Supporting plots

General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.





PROJECT
Land west of Newcourt Way,
Exeter

TITLE

Figure 3: site location

Appendix 2 Methodology Summary

Table 2: methodology summary, field 1 (refer to Heard 2006 for field 2)	
Documents Survey methodology statement: Dean (2014)	
Methodology <ol style="list-style-type: none"> 1. The work was undertaken in accordance with the survey methodology statement. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Institute for Archaeologists (2011) and Archaeology Data Service/Digital Antiquity Guides (undated). 2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system. 3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology. 	
Grid <i>Method of Fixing:</i> DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. <i>Composition:</i> 30m by 30m grids <i>Recording:</i> Geo-referenced and recorded using digital map tiles. <i>DGPS used:</i> Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.	
Equipment <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1	Data Capture <i>Sample Interval:</i> 0.25-metres <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN36
Data Processing, Analysis and Presentation Software IntelliCAD Technology Consortium IntelliCAD 7.2 DW Consulting TerraSurveyor3 Manifold System 8 GIS Microsoft Corp. Office Excel 2013 Microsoft Corp. Office Publisher 2013 Adobe Systems Inc Adobe Acrobat 9 Pro Extended	

Appendix 3 Data processing

Table 3: gradiometer survey - processed data metadata	
<p>SITE</p> <p>Instrument Type: Bartington Grad 610</p> <p>Units: nT</p> <p>Direction of 1st Traverse: 0 deg</p> <p>Collection Method: ZigZag</p> <p>Sensors: 2 @ 1.00 m spacing.</p> <p>Dummy Value: 32702</p> <p>PROGRAM</p> <p>Name: TerraSurveyor</p> <p>Version: 3.0.22.1</p>	
<p>Stats</p> <p>Max: 226.01</p> <p>Min: -221.80</p> <p>Std Dev: 19.41</p> <p>Mean: -0.72</p> <p>Median: -0.10</p> <p>Surveyed Area: 1.0884 ha</p> <p>Processes: 30</p> <ol style="list-style-type: none"> 1 Base Layer 2 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 4, Left 585, Bottom 12, Right 599) 3 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 9, Left 565, Bottom 17, Right 586) 4 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 17, Left 544, Bottom 30, Right 580) 5 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 31, Left 524, Bottom 41, Right 544) 6 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 38, Left 508, Bottom 42, Right 523) 7 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 42, Left 497, Bottom 47, Right 515) 8 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 46, Left 482, Bottom 54, Right 498) 9 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 47, Left 492, Bottom 51, Right 507) 10 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 48, Left 472, Bottom 54, Right 487) 11 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 52, Left 463, Bottom 61, Right 474) 12 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 87, Left 346, Bottom 94, Right 360) 13 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 92, Left 323, Bottom 103, Right 353) 14 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 101, Left 304, Bottom 110, Right 323) 15 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 104, Left 291, Bottom 110, Right 310) 16 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 109, Left 271, Bottom 114, Right 291) 17 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 114, Left 261, Bottom 119, Right 283) 18 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 120, Left 251, Bottom 126, Right 268) 19 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 127, Left 219, Bottom 135, Right 239) 20 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 130, Left 199, Bottom 140, Right 223) 21 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 153, Left 146, Bottom 159, Right 165) 22 Clip at 1.00 SD 23 DeStripe Median Sensors: nfw14.xgd nfw15.xgd nfw19.xgd nfw1.xgd nfw8.xgd nfw9.xgd nfw13.xgd nfw16.xgd nfw18.xgd nfw2.xgd nfw7.xgd nfw10.xgd nfw12.xgd nfw17.xgd 24 DeStripe Median Sensors: nfw3.xgd nfw6.xgd nfw4.xgd nfw5.xgd 25 DeStripe Median Traverse: Grids: nfw13.xgd nfw12.xgd 26 DeStripe Median Traverse: Grids: nfw16.xgd nfw17.xgd 27 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 52, Left 484, Bottom 54, Right 499) 28 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 103, Left 314, Bottom 107, Right 326) 29 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 121, Left 258, Bottom 124, Right 273) 30 Search & Replace From: -300 To: 300 With: Dummy (Area: Top 153, Left 156, Bottom 159, Right 169) 	

Appendix 4 Summary of relevant entries from the Devon and Dartmoor Historic Environment Record (HER) referring to previous work within the proposed development area

Source: Heritage Gateway (English Heritage, undated 1).

The reader is advised that this summary should not be used outside the context of this report and is referred to the Devon HER for informed provision of the record.

HER Number: MDV81192

Name: Settlement, between A379 and Old Rydon Lane

Summary: Settlement, between A379 and Old Rydon Lane. The evaluation confirmed the presence of a substantial enclosure, first identified by aerial photographs, and dated to the Bronze Age. Within it a single hut circle was recorded, this was a large structure with a double ring of postholes. Possible contemporary structures were also noted external to the enclosure.

Location Grid Reference: SX 956 906

Monument Type(s) and Dates: SETTLEMENT (Lower Palaeolithic to I - 698000 BC to 100 AD (Between))

Full description

A desk based assessment indicated that the site had potential to contain archaeological remains of prehistoric and later date. A geophysical survey over the route revealed the presence of field systems and smaller paddocks, and an enclosure. The proposed route was subsequently evaluated by the excavation of a number of trenches and the area to the west and east of the southern part of the route has also been evaluated by trial trenching. The evaluation of 11 trenches confirmed the presence of a substantial enclosure, first identified by aerial photography and dated to the Bronze Age. Within it a single hut circle was recorded, this was a large structure with a double ring of postholes. Possible contemporary structures were also noted external to the enclosure. A major Bronze Age land boundary was recorded following the topography of the area with an entrance way aligned on the enclosure. Several linear ditches were located, not all of which had previously been predicted by the geophysical survey during the initial evaluation of the road corridor. These field systems were confirmed during a second phase of evaluation outside the corridor. Other ephemeral features such as isolated pits and postholes were also located and may well be prehistoric, as a Neolithic flint scatter was recorded from the topsoil. A chert blade core that was found during this evaluation and was of Mesolithic or Neolithic date. This may just be a casual loss. A smashed Bronze Age urn was recovered within the western terminal of ditch 01/013, fill 01/014. The urn was placed with a pebble mace-head and a fragment of quern stone. (Please see the finds tab for other artefacts recovered).

Gilbert (2010)

HER Number: MDV81240

Name: Archaeological Features between A379 and Old Rydon Lane

Summary: Site of post-medieval field boundaries and fence lines indicated by several ditches and rows of postholes. Modern features also noted.

Location Grid Reference: SX 956 906

Monument Type(s) and Dates: ARCHAEOLOGICAL FEATURE (Early Medieval to XXI - 1066 AD to 2009 AD (Between))

Full description

The area appears to have been employed for agricultural purposes for a considerable span of time. Field boundaries are evident across the site as ditches and fence lines of postholes. While the majority are post-medieval, some would appear to be earlier, probably medieval in date. Post-Medieval clay tobacco pipes, glass and pottery were retrieved from some of the features. The range of ware types suggest that there was more or less unbroken activity at the site from the 16th century onwards, although there appears to have been considerable disturbance of earlier deposits in the 19th century. The pottery is largely fragmented, and the range of identifiable vessels suggests that occupation was of a purely domestic nature. One sherd of medieval pottery was recovered. There were several modern features recorded in the area including two geotechnical pits and a large modern pipeline parallel to the road of Old Rydon Lane.

Gilbert (2010)

HER Number: MDV81249

Name: Archaeological Features between A379 and Old Rydon Lane

Summary: Undated features recorded during an evaluation between A379 and Old Rydon Lane. The features consisted of clusters and isolated pits and postholes.

Location Grid Reference: SX 956 906

Monument Type(s) and Dates: ARCHAEOLOGICAL FEATURE (Unknown date)

Full description

Undated features recorded during an evaluation between A379 and Old Rydon Lane. The features consisted of cluster sand isolated pits and postholes. Map object based on this Source.

Gilbert (2010).

HER Number: MDV106162

Name: Rectilinear enclosure and linear features, North-East of Exeter Golf and Country Club

Summary: Geophysical survey identified a possible rectilinear enclosure along with other linear anomalies and one circular anomaly.

Location Grid Reference: SX 956 905

Protected Status: SHINE: Prehistoric rectangular, single ditched enclosure north of Lavender Lodge

Monument Type(s) and Dates: OCCUPATION SITE (Unknown date)

Full description

A rectilinear enclosure of possible archaeological origin has been identified in the south of the northern field. This rectilinear enclosure has also been identified in aerial photography and is thought to be Romano-British in origin. Further evidence for archaeological activity can be identified in a number of positive linear anomalies situated mainly in the centre and western parts of the survey area. However a number of these anomalies may be agricultural in origin due to their orientation. A possible circular cut feature has been identified in the east of the survey area that may be archaeological in origin. Areas of magnetic disturbance of modern origin situated in the south and east of the survey area may obscure subtle features of possible archaeological origin.

Raymond (2006), Gilbert and Travers (2006), Gilbert (2007), Heard (2006), Gilbert (2010)

Appendix 5 Geophysical surveying techniques

1 Introduction

Substrata offers magnetometer and earth resistance surveying. We also provide other archaeology-specific geophysical surveys such as ground penetrating radar and resistivity. The particular method or combination of methods used depends on local soil conditions and the survey requirements. These methods are capable of delivering fast and accurate assessments of the archaeology of both large and small sites.

Further details can be found on our website at www.substrata.co.uk.

2 Magnetometer surveying

Standard magnetometer surveys are the workhorse of archaeological surveying when speed and cost-effectiveness are important. Identifiable archaeological features include areas of occupation, hearths, kilns, furnaces, ditches, pits, post-holes, ridge-and-furrow, timber structures, wall footings, roads, tracks and similar buried features.

Magnetometer surveying is used to detect and map small changes in the earth's magnetic field caused by concentrations of ferrous-based minerals within the soil and subsoil, and by materials buried beneath the surface. While most of these changes are too small to affect a compass needle, they can be detected and mapped by sensitive field equipment. During surveys the different magnetic properties of top-soils, sub-soils, rock formations and archaeological features are recorded as variations against a background value. Subsequently magnetic anomalies resulting from potential archaeology can be identified and interpreted.

Bartington grad601-2 gradiometers

A gradiometer is a type of magnetometer and is sensitive to relatively small changes in the earth's magnetic field. Our primary surveying instruments are Bartington Grad601-2 (dual sensor) fluxgate gradiometers with automatic data loggers. They are specifically designed for field use by archaeologists. The Bartington gradiometers provide proven technology in archaeological magnetic surveying and offer fast, accurate set-up and survey rates. They are sensitive to depths of between 0 and 1.5m below ground level, with optimum sensitivity at depths of 1m or less.

Multiple sensor arrays

A technique relatively new to commercial archaeological surveying but well understood in academic circles involves the use of multiple magnetometer sensors towed behind a quad bike or similar vehicle. With multiple sensors and the use of on-board GPS units, it is possible to achieve faster survey rates at competitive commercial rates when compared to the use of multiple instruments and the techniques discussed above provided the ground is suitable for the vehicle and array. Substrata is pleased to announce that we now offer this service on suitable larger sites

3 Earth resistance surveying

Earth resistance surveying is an excellent tool for detecting buried archaeology. Its relatively slow rate of survey compared to magnetometer surveys means that it is usually employed in commercial surveys when a detailed understanding of buried building remains is required. This technique measures changes in the electrical resistance of the ground being surveyed. In practice, the recording of differences in the electrical resistance of near-surface deposits and structures allows the detection and interpretation of masonry and brick foundations, paving and floors, drains and other cavities, large pits, building platforms, robber trenches, ditches, graves and similar buried features.

Resistance to electrical current flow in the ground depends on the moisture content and structure of the soil and other materials buried beneath the surface. For example, the higher the moisture content of a soil, the less resistant it is to electrical current flow. A ditch completely buried beneath the present ground surface is likely to have an infill soil different to that surrounding the ditch in terms of compactness and composition. As a result, the soil filling the buried ditch will retain moisture in a different way to the surrounding soil which means it will

have an electrical resistance at variance with the surrounding environment. By passing a small current through the ground it is possible to detect, record, plot and interpret such changes in electrical resistance.

For earth resistance surveying Substrata uses the Geoscan Research RM15 series multi-probe resistance meters and purpose-built automatic data-loggers. The Geoscan MPX15 multiplexer is an integral part to the instrument configuration and facilitates multi-probe arrays which speed up survey area coverage rates and, if required, facilitate simultaneous multiple-depth data collection.