Substrata
Archaeological Geophysical Surveyors

An Archaeological Geophysical Gradiometer Survey

Land at Poltimore House, Poltimore, Devon NGR 296700 096400

Report: 111007
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Plate 1: area 4, looking south west ..... front cover
Oliver Creighton

Accompanying CD-ROM

Report ..... Adobe PDF format
Survey areas and grids ..... Adobe PDF format
Data files ..... grid files generated using DW Consulting ArcheoSurveyor2
GIS project and shape files ..... ESRI standard
GIS classification schema ..... Adobe PDF format

1 Survey description and summary

Type of survey: twin-sensor fluxgate gradiometer
Date of survey: between 6 and 30 September 2011
Area surveyed: 21.8 ha
Lead surveyor: Ross Dean BSc MSc MA MIfA

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Poltimore Community and Landscape Project, Department of Archaeology, University of Exeter, Laver Building, North Park Road, Exeter EX4 4QE

Site

Location:	Land at Poltimore House
Parish:	Poltimore
District	East Devon
County:	Devon
NGR:	296700 096400
OASIS number:	substrat1-118376

Poltimore House is a Tudor House of the sixteenth century with many later additions and alterations. It has had several uses, including a school, nursing home and hospital (HER 10156). The grounds in which the survey took place included a deer park mentioned in the sixteenth century and still extant in AD 1822 (HER 19787), an eighteenth century former lodge to the north-east of the house (rebuilt as Threepenny Lodge on the original foundations after a fire) (HER 29721), a mid nineteenth century stable block (HER 49339), elements of formal gardens attached to the house and the ponds and weirs of a former Chinese garden (HER 49340).

Survey purpose
The principal aims of the survey were to:
1. Define and characterise any 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.

Results summary
A total of 141 magnetic anomaly groups were identified as representing possible archaeological deposits and features. A number of these anomaly groups enhanced and extended the evidence for changes to the landscape of Poltimore House provided by the Margary map of 1809, Ordnance Survey 1:2500 series maps from 1889 to 1905 and the Ordnance Survey 1:10000 series map from 1980.

Evidence is presented in this report for magnetic anomaly groups pertaining to tracks, roads, enclosures, buildings, garden landscapes and a number of other potential archaeological features and deposits. A detailed summary of these anomaly groups and the archaeology they may represent is provided in section 3.3.

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 Schmidt (2002). The document text was written using the house style of the Institute for Archaeologists (Institute for Archaeologists, undated).

2 Site description

See figure 6 for a map of survey areas 1 to 5.

Land use and landscape

Area 1: cleared scrub surrounded by woodland, sloping downhill north to south
Area 2: pasture sloping downhill north to south with boundaries of hedging and fencing.
Area 3: relatively flat pasture with boundaries of hedging and fencing.
Area 4: relatively flat pasture rising to the north with a former water garden and boundaries of fencing.
Area 5: flat pasture with boundaries of fencing, hedging and a stream on the southern side.

Geology

The solid and drift geology across the site is complex The solid rocks are all of the Permian Exeter Group. A fault trends east-west across areas 4 and 5 and is approximately marked by the stream running through area 4.

Area 1: rocks of the Poltimore Mudstone Member
Area 2: rocks of the Poltimore Mudstone Member to the north, Dawlish Sandstone in the centre and Quaternary head to the south
Area 3: Dawlish Sandstone with Quaternary head on the western boundary and Quaternary alluvium across the rest of the area
Area 4: Quaternary alluvium across the area with Poltimore Mudstones close to the house
Area 5: Quaternary alluvium across the area with Dawlish Sandstones close to the house and Quaternary head on the eastern side

(British Geological Survey, 1995).

Soils

The soils in the survey area are defined as typical brown sands of the Bridgnorth association (Soil Survey of England and Wales, 1983). A typical soil profile is:

0 - 25cm: dark reddish brown, stoneless loamy sand
25 - 50cm: reddish brown, stoneless or very slightly stony loamy sand; weak medium subangular blocky or single grain structure
50 - 60cm: reddish brown, slightly stony sandy; single grain structure
At 60cm: reddish brown sandstone

(Findley et al, 1983: 145).

This soil profile must be read with caution in the context of the Poltimore Estate given the complex drift geology discussed above. It is likely that soils profiles will vary across the site.

Known archaeological sites in the survey area

Extracts from the Historic Environment Record used to create the summaries below were provided by Devon County Historic Environment Service on 18 January 2012.

HER records of sites within or immediately adjacent to the survey area:

10156: Poltimore Country House, XIX XVI XVII XX centuries, extant building, Grade II listed
10157: Dovecote, Post-Medieval, demolished building, location unknown
10158: Plaster Work within Poltimore House, Modern and XVII XVIII centuries, ar-

chitectural component

19787: Poltimore House Deer Park, XIV XVI XVII XVIII centuries, enhanced natural feature (survey areas 4 and 5)

29721: Lodge, multi-period XVIII century onwards, documentary evidence

49339: Stable, XIX century, extant building, Grade II listed

49340: Formal Garden, XIX century, enhanced natural feature including a former Chinese garden (survey area 4)

Historical Landscape Characterisation

Park/garden: a park planted with ornamental trees or a garden round a house (Devon County Council, undated).

3. 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 4.

3.1 Results

The survey was split into 5 areas for the purposes of analysis and discussion. These areas are shown in figure 6.

Figures 1 to 5 show the interpretation of survey areas 1 to 5. Tables 1 to 5 are extracts from a detailed analysis of the data provided in the attribute tables of the GIS project on the accompanying CD-ROM. Figure 7 is a summary plot of the survey interpretation for the entire survey area.

Figures 1 to 5 and tables 1 to 5 together comprise the analysis and interpretation of the survey data.

The processed gradiometer data is presented in figures 8 to 13.

Not all anomalies or anomaly groups identified in the survey dataset are listed 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 data analysis tables 1 to 5.

The magnetic contrast across the survey areas was relatively low but sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. A total of 141 magnetic anomaly groups were identified as representing possible archaeological deposits or features.

Survey data analysis

Site: Land at Poltimore House, Exeter, Devon
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anomaly group	characterisation certainty	anomaly class	anomaly form	archaeological characterisation	comments	supporting evidence	associated anomaly group(s)
1	possible	positive	linear				
2	likely	positive	linear	ditch	likely drainage ditch along the side of a track	Ordnance Survey 1889 1:2500 map	3 4
3	likely	negative spread	linear	track	shown on 1889 through to 1980 OS maps	Ordnance Survey 1889 1:2500 map	2 4
4	likely	positive	linear	ditch	likely drainage ditch along the side of a track	Ordnance Survey 1889 1:2500 map	2 3
5	possible	positive	linear	ditch			
1001	possible	repeated parallels		cultivation traces			

Table 1: area 1

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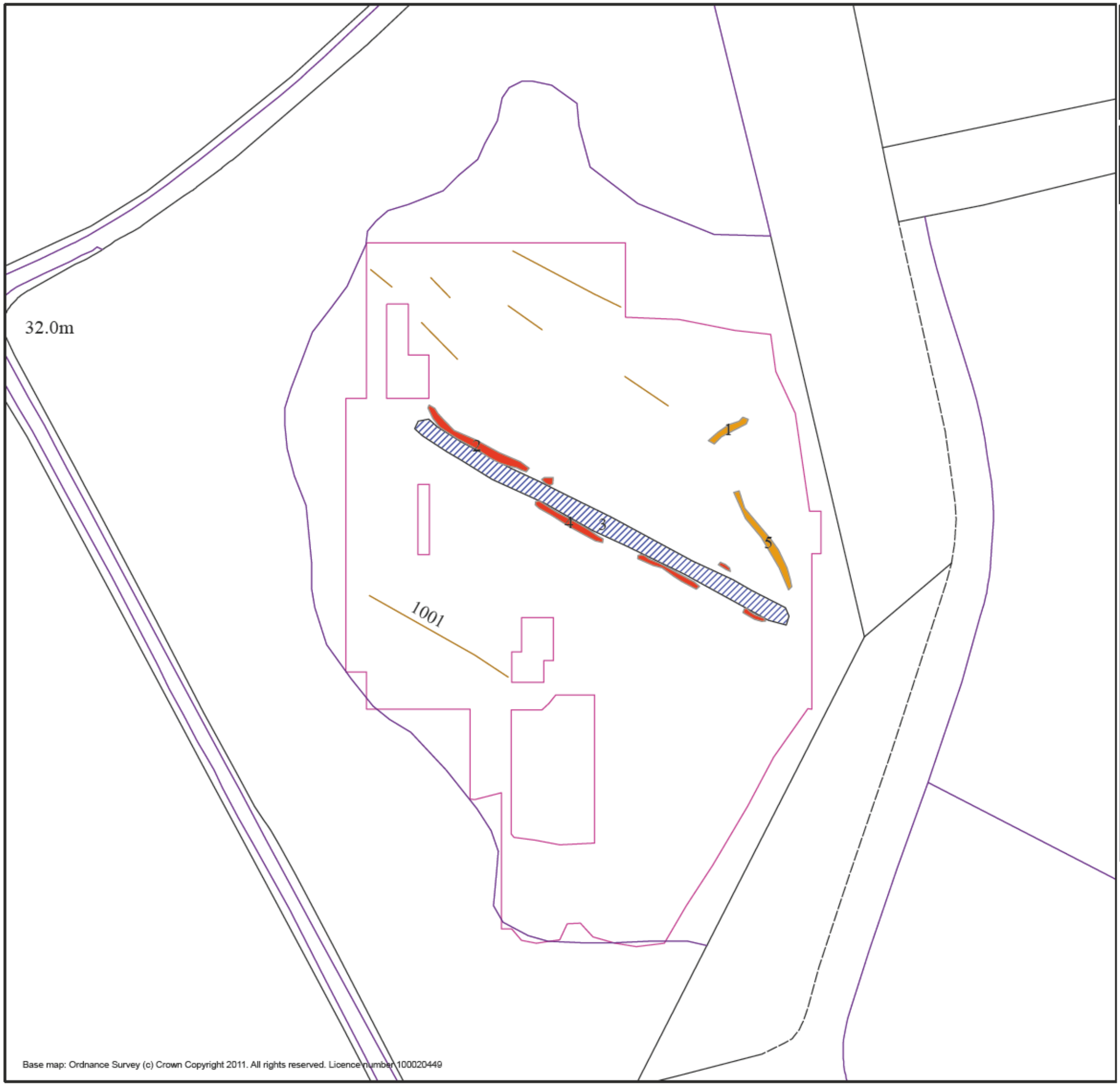

Legend

N

survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
4. Filled circles used to define anomalies are symbols and do not indicate possible circular archaeological features unless specifically indicated in the text.

0 10 20 40 Meters

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Figure 1: survey interpretation, area 1

Survey data analysis
Site: Land at Poltimore House, Exeter, Devon
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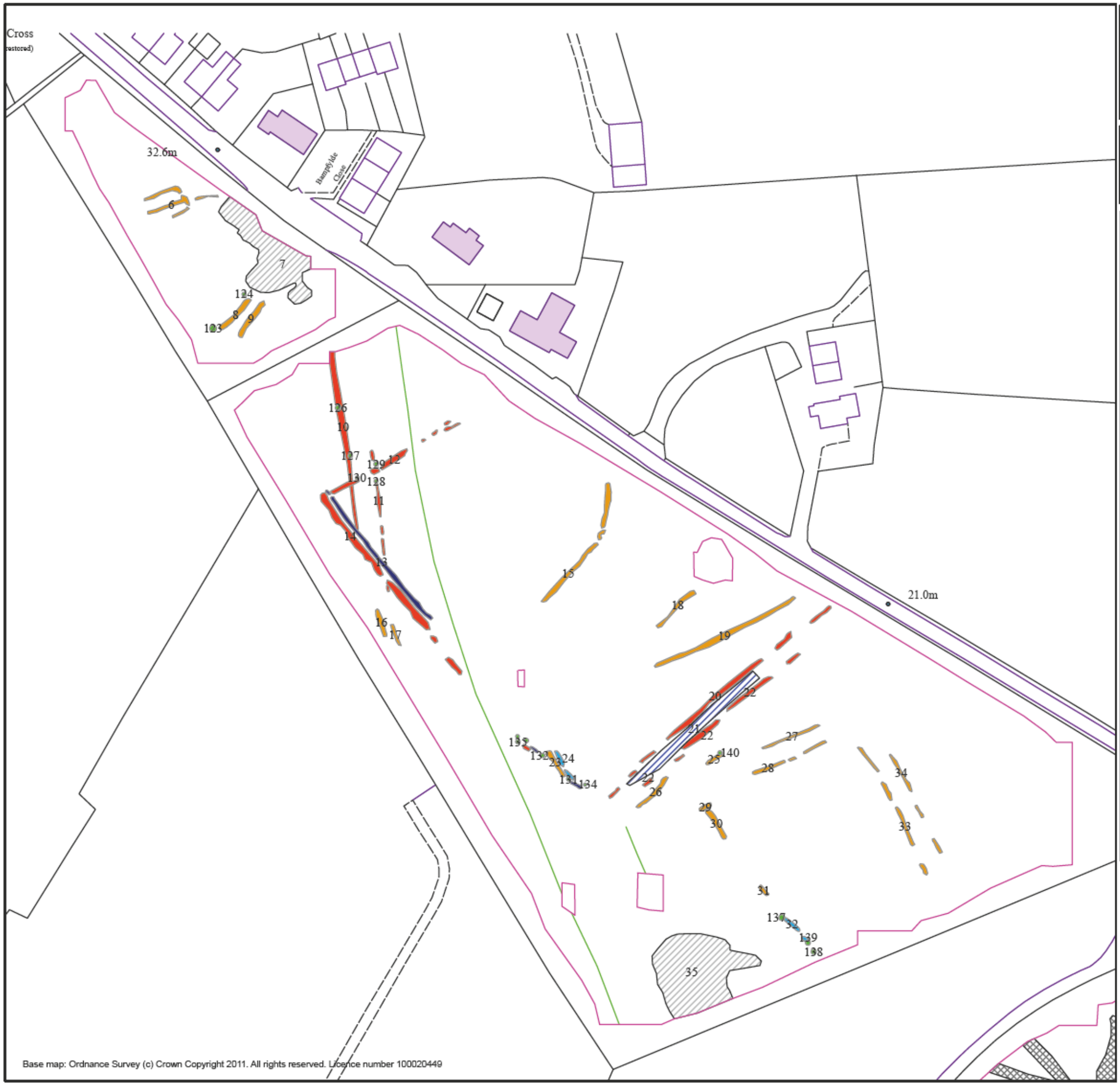
anomaly group	characterisation certainty	anomaly class	anomaly form	archaeological characterisation	comments	supporting evidence	associated anomaly group(s)
6	possible	positive	multilinear		anomalies could relate to archaeological features or could be ploughing traces		
7	possible	mixed	irregular	rubble	anomaly pattern partially masked by strong ferrous response in southern area where an iron gate & field entrance rubble are visible of ground		
8	possible	positive	linear				
9	possible	positive	linear				
10	likely	positive	linear	road or track	linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	11 16 17
11	likely	positive	linear	road or track	disrupted linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	10 16 17
12	likely	positive	linear	enclosure boundary	disrupted linear anomaly group corresponds to an enclosure shown on 1809 Margary Map	Margary Map 1809	13 14
13	likely	negative	linear	enclosure boundary	disrupted linear anomaly group corresponds to an enclosure shown on 1809 Margary Map	Margary Map 1809	12 14
14	likely	positive	linear	enclosure boundary	disrupted linear anomaly group corresponds to an enclosure shown on 1809 Margary Map	Margary Map 1809	12 13
15	possible	positive	curvilinear				
16	possible	positive	linear				10 11 17
17	possible	positive	linear				10 11 16
18	possible	positive	linear				
19	possible	positive	linear				
20	likely	positive	linear	road or track	disrupted linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	21 22
21	likely	negative spread	linear	road or track	disrupted linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	20 21
22	likely	positive	linear	road or track	disrupted linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	20 21
22	likely	positive	linear	road or track	disrupted linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	20 21
22	likely	positive	linear	road or track	disrupted linear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	20 21
23	possible	positive	linear				24
24	possible	negative	linear				23
25	possible	positive	linear				
26	possible	positive	linear	road or track	disrupted linear possibly relating to a ditch associated with a routeway		20 21 22 ?
27	possible	positive	linear		tenuous anomaly patterns		
28	possible	positive	linear				29
29	possible	positive	linear				28
30	possible	positive	linear		linear anomaly with negative "shadow anomaly" corresponds approximately to enclosure shown on 1809 Margary map	Margary Map 1809	31 32
31	possible	positive	linear	enclosure boundary	linear anomaly corresponds approximately to enclosure shown on 1809 Margary map	Margary Map 1809	30 32
32	possible	negative	linear	enclosure boundary	linear anomaly corresponds approximately to enclosure shown on 1809 Margary map	Margary Map 1809	30 31
33	possible	positive	linear		disrupted linear anomaly with negative "shadow anomaly"		
34	possible	positive	linear				
35	possible	mixed	irregular	rubble			

Table 2: area 2



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Legend

N

- survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
4. Filled circles used to define anomalies are symbols and do not indicate possible circular archaeological features unless specifically indicated in the text.

0 20 40 80 Meters

Figure 2: survey interpretation, area 2

Survey data analysis
Site: Land at Poltimore House, Exeter, Devon
NGR 296700 096400
Report: 111007

anomaly group	characterisation certainty	anomaly class	anomaly form	archaeological characterisation	comments	supporting evidence	associated anomaly group(s)
36	possible	mixed	irregular	rubble			
37	likely	mixed	irregular	rubble	anomaly group represents rubble at the site of a structure shown on the Ordnance survey maps of 1968 and 1980 but not 1905 or 1889	Ordnance Survey 1968 1:2500 and 1980 1:10000 maps	
38	possible	positive	linear				
39	possible	positive	linear				
40	possible	positive	linear				
41	possible	positive	curvilinear	ditch or drain	anomaly group possibly represents recent drain serving field drains but may relate to an older reused feature		2005
42	possible	positive	linear	ditch	anomaly group may represent one side of a track		43 44
43	possible	negative spread	linear	road or track	tenuous		42 44
44	possible	positive	linear	ditch	tenuous - anomaly group may represent one side of a track		42 43
45	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
46	possible	positive	linear				
47	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
48	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
49	possible	positive	linear		disrupted linear		
50	possible	positive	multilinear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
51	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
52	possible	positive	oval	pit			
53	possible	positive	linear				
54	possible	positive	oval	pit			
55	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
56	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
57	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
58	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
59	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
60	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
61	possible	positive	linear		tenuous anomaly patterns - may represent ditches or drainage or past ploughing but as a whole may point towards older field system(s)		
62	possible	negative	linear				63
63	possible	negative	linear				62
64	possible	mixed	irregular	rubble			
65	possible	north-south high-low		in-situ heating event	correct orientation and anomaly pattern		
66	possible	mixed	irregular	rubble			69 70 72 73
67	possible	positive	linear				
68	possible	negative	linear				
69	possible	positive	multilinear		positive anomaly group with "negative shadow"		66 70 72 73
70	possible	negative	multilinear		possible "negative shadows" but relatively strong magnitude so shown as possibly archaeologically significant		66 69 72 73
71	possible	negative	linear				
72	possible	negative	linear				66 69 70 73
73	possible	negative	linear				66 69 70 72
74	possible	positive	linear		tenuous anomaly patterns		
75	possible	negative	linear				
76	possible	positive	linear				
77	likely	positive	curvilinear	road edge	curvilinear anomaly group corresponds to line of road shown on 1809 Margary Map	Margary Map 1809	
78	possible	positive	linear				
79	possible	positive	linear				
80	possible	positive	linear				
1002	possible	repeated parallels		cultivation traces			

Table 3: area 3

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Legend

N

survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
4. Filled circles used to define anomalies are symbols and do not indicate possible circular archaeological features unless specifically indicated in the text.

0 10 20 40 Meters

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Figure 3: survey interpretation, area 3

Survey data analysis
Site: Land at Poltimore House, Exeter, Devon
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anomaly group	characterisation certainty	anomaly class	anomaly form	archaeological characterisation	comments	supporting evidence	associated anomaly group(s)
81	possible	positive	linear				
82	possible	positive	linear		anomalies represent either a ditch or a service trench		
83	possible	positive	linear				
84	possible	positive	linear				
85	possible	positive	linear				
86	possible	positive	linear				
87	possible	negative	linear				
88	possible	positive	linear		tenuous anomaly patterns		
89	possible	mixed	irregular	rubble			
90	possible	positive	linear	garden feature or track	anomaly group corresponds to a line of trees on 1889 and 1905 OS maps - could represent remnants of garden features	Ordnance Survey 1889 1:2500 and Ordnance Survey 1905 1:2500 maps	95 98 104
91	possible	positive	linear				
92	possible	positive	linear				
93	possible	positive	linear				
94	possible	positive	linear				
214	possible	negative	linear				
95	possible	positive	linear	garden feature or track	anomaly group corresponds to a line of trees on 1889 and 1905 OS maps - could represent remnants of garden features	Ordnance Survey 1889 1:2500 and Ordnance Survey 1905 1:2500 maps	90 98 104
96	possible	positive	curvilinear				
97	possible	mixed	irregular	rubble			
98	possible	positive	linear	garden feature or track	aligned with a footbridge (OS 1968 map - now gone) corresponds to a line of trees on 1889 and 1905 OS maps - could represent remnants of garde	Ordnance Survey maps 1889 1:2500, 1905 1:2500, 1968 1:2500	90 95 104
99	possible	mixed	irregular	rubble			
100	possible	positive	linear				
101	possible	positive	linear	ditch or field drain			
102	possible	positive	linear	a ditch or field drain			
103	possible	positive	linear	a ditch or field drain	a ditch or field drains		
104	possible	positive	linear	garden feature or track	aligned with a footbridge (OS 1968 map - now gone) corresponds to a line of trees on 1889 and 1905 OS maps - could represent remnants of garde	Ordnance Survey maps 1889 1:2500, 1905 1:2500, 1968 1:2500	90 95 98
105	possible	positive	linear	a ditch or field drain			
106	possible	positive	linear	a ditch or field drain			
1003	possible	repeated parallels		cultivation traces			
1004	possible	repeated parallels		cultivation traces			
1005	possible	repeated parallels		cultivation traces			
1006	possible	repeated parallels		cultivation traces			
1007	possible	repeated parallels		cultivation traces			
1008	possible	repeated parallels		cultivation traces or field drains			

Table 4: area 4

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Legend

N

survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
4. Filled circles used to define anomalies are symbols and do not indicate possible circular archaeological features unless specifically indicated in the text.

0 20 40 80 Meters

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Figure 4: survey interpretation, area 4

Survey data analysis
Site: Land at Poltimore House, Exeter, Devon
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anomaly group	characterisation certainty	anomaly class	anomaly form	archaeological characterisation	comments	supporting evidence	associated anomaly group(s)
107	possible	mixed		rubble			
108	possible	medium contrast linear		brick-lined drain or culvert	some sections observed in cuttings and holes by surveyors		109 110 112 113 114 194-196 199 200 202 203
109	possible	medium contrast linear		brick-lined drain or culvert	some sections observed in cuttings and holes by surveyors		108 110 112 113 114 194-196 199 200 202 203
110	possible	medium contrast linear		brick-lined drain or culvert	some sections observed in cuttings and holes by surveyors		108 109 112 113 114 194-196 199 200 202-205
111	possible	positive	multilinear	ditch or field drains			
112	possible	medium contrast linear		brick-lined drain or culvert	some sections observed in cuttings and holes by surveyors		108 109 110 113 114 194-196 199 200 202 203
113	possible	medium contrast linear		brick-lined drain or culvert	some sections observed in cuttings and holes by surveyors		108 109 110 112 114 194-196 199 200 202 203
114	possible	medium contrast linear		brick-lined drain or culvert			108 109 110 112 113 194-196 199 200 202 203
115	possible	positive	linear		observed by surveyors to coincide with extant low linear earthwork and coincides with road shown on 1809 Margary Map	Margary Map 1809	116 117
116	possible	positive	linear		observed by surveyors to coincide with extant low linear earthwork and coincides with road shown on 1809 Margary Map	Margary Map 1809	115 117
117	possible	medium contrast linear		brick-lined drain or culvert	may be drain or ditch partially filled with rubble - seems to trend towards weir shown on 1889 and 1905 Ordnance Survey maps	Ordnance Survey maps 1889 1:2500, 1905 1:2500, 1968 1:2500	115 116
118	possible	positive	linear				
119	possible	positive	linear				
120	possible	positive	linear		lines up approximately to a foot bridge show on the Ordnance survey 1889 map	Ordnance Survey 1889 1:2500 map	
121	possible	positive	linear				
122	possible	mixed		rubble			
194	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200202 203
195	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200 202 203
196	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200 202 203
199	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200 202 203
200	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200 202 203
202	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200 202 203
203	possible	dipole		ferrous material - part of drainage			108 109 110 112 113 114 194-196 199 200 202 203
1009	possible	repeated parallels		cultivation traces			

Table 5: area 5

Base map: Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

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Land at Poltimore House, Exeter, Devon
NGR 296700 096400
Report: 111007

Legend

N

survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
4. Filled circles used to define anomalies are symbols and do not indicate possible circular archaeological features unless specifically indicated in the text.

0 20 40 80 Meters

Figure 5: survey interpretation, area 5

3.2 Discussion

Not all anomalies or anomaly groups identified in the survey dataset are 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 data analysis tables 1 to 5.

Area 1 (table 1, figures 1 and 9)
Anomaly groups 2, 3 and 4 in area 1 correspond to a track or road shown on the 1:2500 series Ordnance Survey maps of 1889, 1905 and 1968/69, and on the 1980 1:10000 series Ordnance Survey map.

Area 2 (table 2, figures 2 and 10)
Anomaly groups 10 and 11 are likely to represent archaeological deposits associated with a road shown on the 1809 Margary map, as are groups 20 to 22 (figure 14). Groups 30 to 32 may be associated with such a road but this is less certain.

Anomaly groups 12 to 14 approximately correspond to a rectangular enclosure shown on the 1809 Margary map (figure 14).

Anomaly group 35 is likely to represent a deposit of rubble and may be associated with a structure or enclosure shown on the 1809 Margary map and/or former stables sited in this area (Oliver Creighton 2011, pers. comm., October).

Area 3 (table 3, figures 3 and 11)
Anomaly group 37 is likely to represent a deposit of rubble coinciding with the position of a building mapped in 1968 and 1980 by the Ordnance Survey but which is not shown on the 1889 and 1905 1:2500 series Ordnance Survey maps for the area.

Three other anomaly groups that may represent deposits of rubble were recorded in area 3; groups 36, 64 and 66. Group 66 may be associated with a building or enclosure highlighted by linear anomaly groups 69 to 71, 74, 75 and possibly 78. No such structure was recorded on the 1809 Margary map or on the 1:2500 series Ordnance Survey maps of 1889, 1905 and 1968/69. It is also absent from the 1980 1:10000 series Ordnance Survey map.

Of the linear and curvilinear anomaly patterns recorded in area 3, groups 42, 43 and 44 may represent a track bounded by two ditches. Group 77 is very likely to represent archaeological deposits associated with a track or road shown on the 1809 Margary map that appears to have been straightened some time before the production of the 1889 1:2500 series Ordnance Survey map of the area. Groups 62 and 63 may represent wall footings or similar deposits.

Anomaly group 65 may represent an in-situ heating event such as a hearth, kiln or furnace. Caution must be exercised in this interpretation as such anomaly patterns can also be generated by fortuitously situated and orientated ferrous materials.

Area 4 (table 4, figures 4 and 12)
As can be seen in figure 12, the magnetic survey data for area 4 is strongly influenced by a number of ferrous-rich services such as iron pipes and/or steel cables that run across the area. It is likely that some of these once served the extant water garden situated in the centre of the area.

Of the various linear anomaly patterns recorded across area 4, groups 90, 95, 98 and 104 coincide with lines of trees mapped on the 1889 and 1905 1:2500 Ordnance Survey maps of the area (figure 15) and could represent garden features. In addition to their potential relationship to mapped lines of trees, linear anomaly groups 98 and 104 align with each other and a footbridge shown on the 1889 and 1905 1:2500 series Ordnance Survey maps and, as such, could represent a path, track or similar archaeological feature.

Anomaly groups 85, 86, 88, 92, 93, 94 and 214 may also represent garden features.

Anomaly group 3001 possibly represents a palaeochannel of the existing stream and may be indicative of the straightening of the stream at some time in the past, perhaps during a phase of garden creation or during the construction of the water garden.

Area 5 (table 5, figures 5 and 13)
As can be seen in figures 5 and 13, the eastern side of the survey area is dominated by a large anomaly pattern likely to represent an area of rubble (group 2032 and groups 2029 and 2030). The survey team noted that this rubble was visible around an entrance gate on the eastern field boundary and elsewhere in the survey area. There is a possibility that these anomaly patterns represent underlying near-surface geology, specifically the Quaternary head noted in section 2. The anomaly pattern edges are so well defined, however, that a man-made origin is more likely.

Anomaly groups 2019 to 2028 and 2031 are likely to represent rubble filled drainage ditches.

Groups 108 to 110, 112 to 114, 194 to 196, 199, 200, 202 and 203 are likely to represent well built, brick-lined drains noted by the survey team in some cuttings and holes across the survey area.

Group 117 is also likely to represent a brick lined drain or culvert which trends towards a weir shown on the 1889 and 1905 1:2500 series Ordnance Survey maps and still extant as a brick built structure. Group 117 may be an extension of group 114. The two anomaly groups run alongside linear anomaly groups 115 and 116 which coincide with a road shown on the 1809 Margary map.

Anomaly group 120 trends towards a footbridge recorded on the 1889 1:2500 series Ordnance Survey map for the area.

3.3 Conclusions

A total of 141 magnetic anomaly groups were identified as representing possible archaeological deposits and features. A number of these anomaly groups enhanced and extended the evidence for changes to the landscape of Poltimore House provided by the Margary map of 1809, Ordnance Survey 1:2500 series maps from 1889 to 1905 and the Ordnance Survey 1:10000 series map from 1980.

Evidence within the survey dataset for various types of archaeological features and deposits are summarised below.

Tracks and roads

- Evidence of an unmapped track or road: anomaly groups 42 to 44 in area 3 (figure 3).
- Evidence supporting the removal and alteration of roads and tracks between 1809 and 1889: anomaly groups 10, 11 and 20 to 22 in area 2 (figure 2), group 77 in area 3 (figure 3), and groups 115 and 116 in area 5 (figure 5).
- Evidence for the removal of tracks between 1889 and 1905: anomaly group 120 in area 5 (figure 5).
- Evidence for the removal of tracks after 1905 and before 1968: anomaly groups 90, 95, 98 and 104 in area 4 (figure 4) and (see also 'garden landscapes' below).
- Evidence supporting the removal of a track after 1980: anomaly groups 2, 3 and 4 in area 1 (figure 1).

Enclosures

- Evidence supporting the removal and alteration of enclosures between 1809 and 1889: anomaly groups 12 to 14 in area 2 (figure 2).

Buildings

- Evidence of an unmapped building or stone enclosure: anomaly groups 66, 69 to 71, 74, 75 and possibly 78 in area 3 (figure 3).
- Evidence supporting the removal and alteration of buildings between 1809 and 1889: anomaly group 35 in area 2 (figure 2).
- Evidence supporting the removal of a building after 1980: anomaly group 37 in area 3 (figure 3).

Garden landscapes

- Evidence for the existence of garden features and/or other structures that partially coincide with lines of trees mapped by the Ordnance Survey in 1889 and 1905 but not in 1968: anomaly groups 85, 86, 88, 90, 92, 93, 94, 95, 98, 104 and 214 in area 4 (figure 4) (see also 'tracks and roads' above).
- Evidence for landscape or garden drainage: anomaly groups 108 to 110, 112 to 114, 117, 194 to 196, 199, 200, 202 and 203 in area 5 (figure 5).

Other potential archaeological features and deposits

The numerous other anomaly groups recorded in the data set of this survey and mapped in figures 1 to 5 are likely to represent deposits and features beneath the surface. Some of these will pertain to archaeological features and deposits such as field and enclosure boundaries. The more likely examples not discussed above are:

Field 2: anomaly groups 15, 18, 19, 27, 28, 30 to 32, 33 and 34 (figure 2).
Field 3: anomaly groups 49, 55 to 61, 67, 68, 79 and 80. Group 65 may represent an in-situ heating event such as a hearth, kiln or furnace (figure 3).
Field 4: anomaly groups 81, 100, 101, 102 and 106. Groups 82, 84 and 91 may be associated with the water garden (figure 4).
Field 5: anomaly groups 109, 111 and 121 (figure 5).

3.4 Recommendations

In general terms, all those anomalies specifically identified in section 3.3 warrant further archaeological investigation to clarify their archaeological significance. A subsection of these should be chosen when addressing the next phase of the investigation within the context of a research framework which this report will inform.

It is recommended that attention be paid to some of the anomalies discussed in section 3.3 as 'other potential archaeological features and deposits'. While no clear evidence of

archaeological structures can be discerned from these anomaly groups, it is within this group that archaeological deposits pre-dating the house and grounds may be found.

The quality of magnetometer survey datasets is dependant on the magnetic contrast of the sediments and deposits within the survey area. The magnetic contrast for this site was relatively low and so it is certain that more archaeological deposits and features will be found than have been recorded in the survey data set. This should be taken into account when deciding on further archaeological work.

4. 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.

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).

5. Acknowledgements

Substrata would like to thank Dr Penny Cunningham of the Poltimore Community and Landscape Project, Department of Archaeology, University of Exeter for commissioning us to complete the survey, arranging site access and organising student and community involvement. Thanks also to Professor Ollie Creighton, Associate Professor in Archaeology, Department of Archaeology, University of Exeter for briefing us on the landscape archaeology of the Poltimore estate, his enthusiasm for our work and for the image used on the front cover of this report.

Our thanks also go to Gemma Lissaman, Ted Hitchings, Jonathan Wyatt, Ruth Carpenter, Ruth Akan and Joanne Place for volunteering to take part in the survey. Their enthusiasm and interest was inspiring. The survey data collected by them forms part of the dataset used in this publication. Our special thanks to Gemma and Ted for their regular help through out the survey. Gemma became an accomplished gradiometer surveyor and Ted a good support surveyor who provided some useful contributions to surveying techniques.

6. References

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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.

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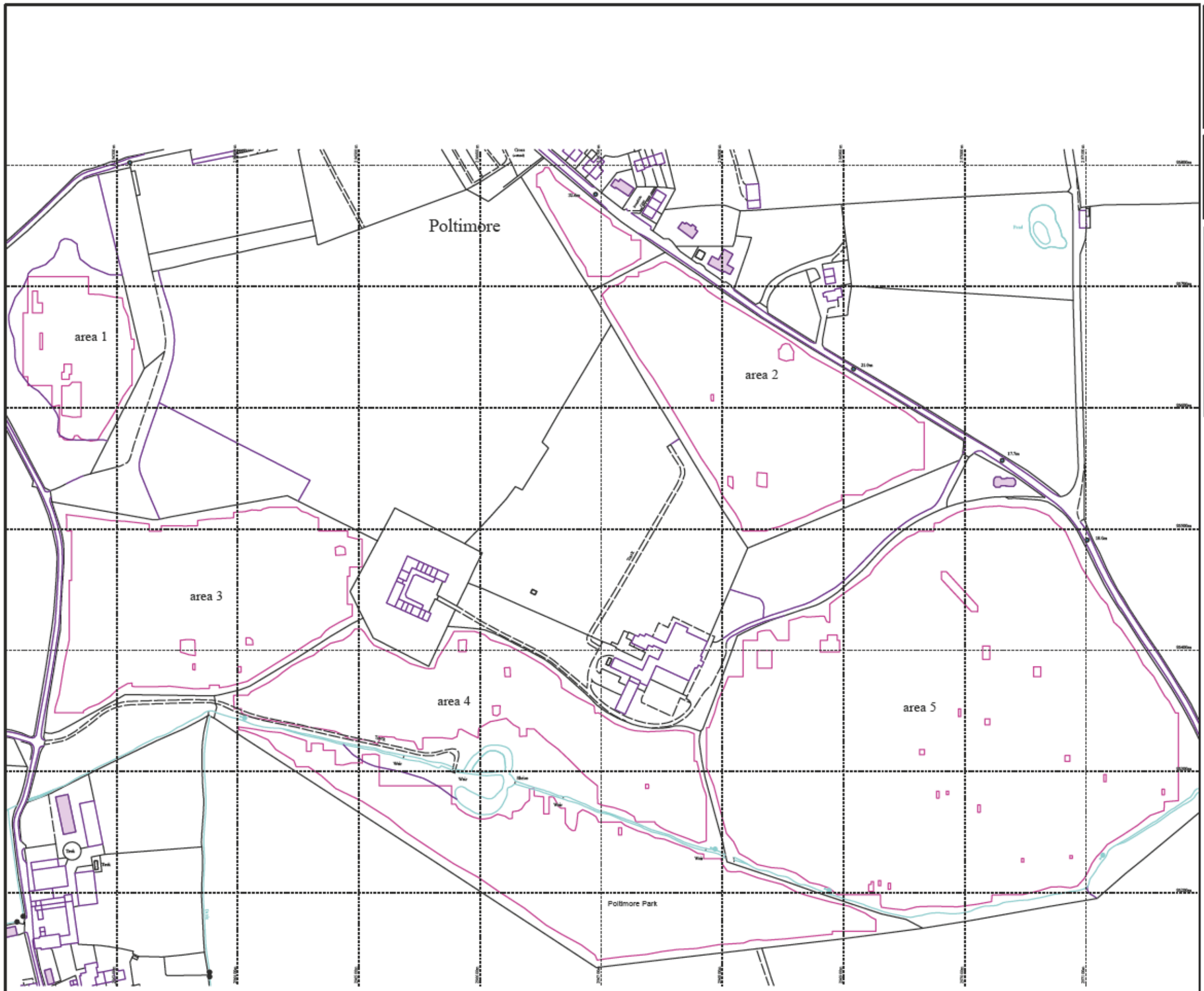
Land at Poltimore House, Exeter, Devon
NGR 296700 096400
Report: 111007

N

Legend

survey area



0 50 100 200 Meters

Base map: Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

Figure 6: survey area

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Report: 111007

Legend

N

survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
4. Filled circles used to define anomalies are symbols and do not indicate possible circular archaeological features unless specifically indicated in the text.

0 50 100 200 Meters

Base map: Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

Figure 7: survey interpretation. all areas

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NGR 296700 096400
Report: 111007

N

Legend

processed gradiometer data (nT)

High : 2

Low : -2

0 50 100 200 Meters

Base map: Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

Figure 8: shade plot of processed data. all areas

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Figure 9: shade plot of processed data, area 1

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Figure 10: shade plot of processed, area 2

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Figure 11: shade plot of processed data, area 3

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Land at Poltimore House, Exeter, Devon
NGR 296700 096400
Report: 111007

N

Legend

processed gradiometer data (nT)

High : 2

Low : -2

0 20 40 80 Meters

Base map: Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

Figure 12: shade plot of processed data, area 4

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Report: 111007

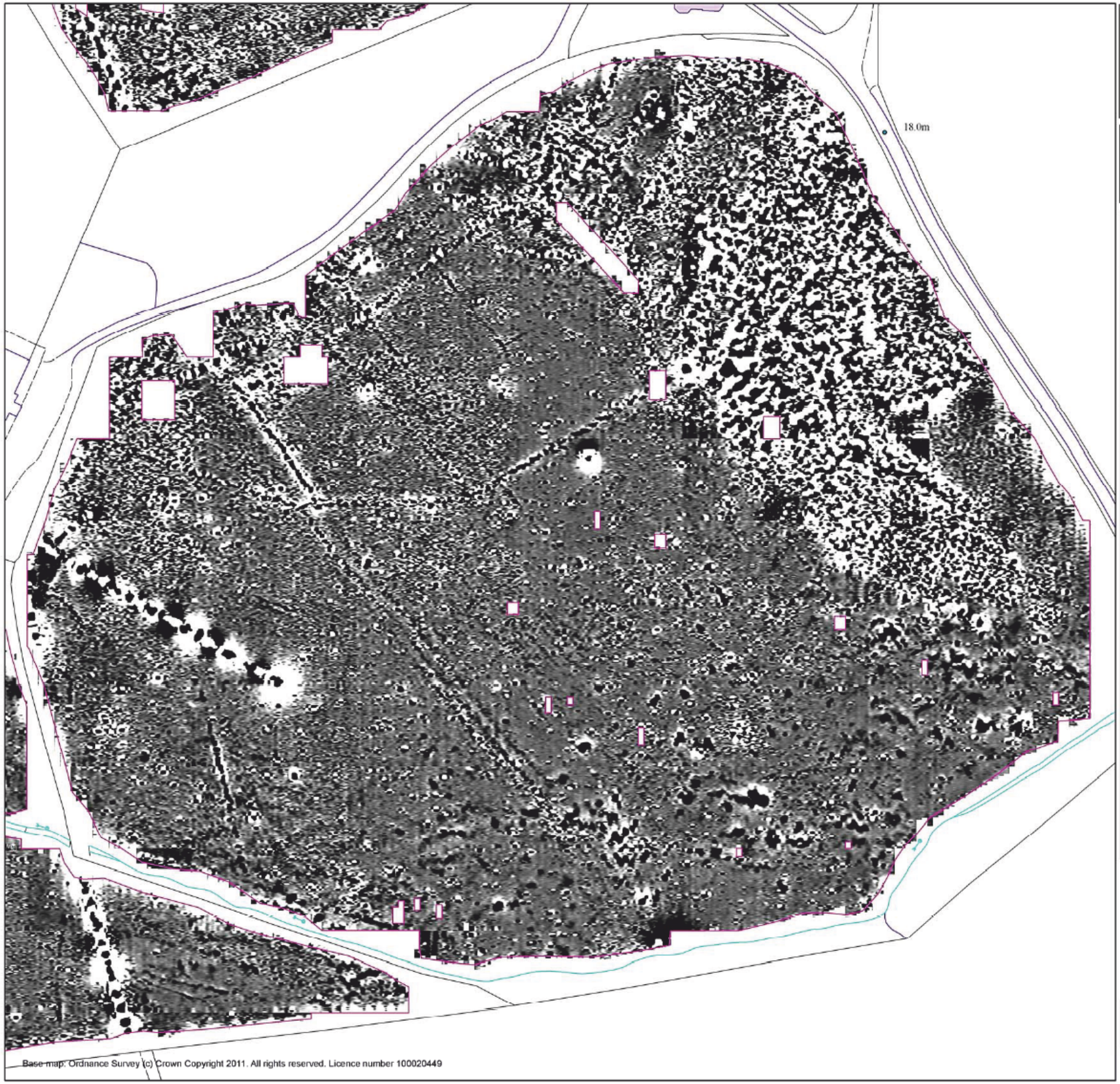

Figure 13: shade plot of processed data, area 5

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Legend

N

survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential archaeological trends

certainty, class

- possible, repeated parallels (2)

services and modern

certainty, class

- possible, high contrast linear
- possible, low contrast linear
- possible, high positive linear
- possible, regular narrow linears (2)
- possible, mixed spread
- possible, mixed linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. Representative of trends; only anomalies relevant to potential archaeology are recorded.
3. Anomalies likely to represent very recent ground disturbance are not highlighted.
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0 20 40 80 Meters

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Figure 14: areas 2 and 5 interpretation with 1809 Margary map

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Legend

- survey area

potential archaeology

certainty, class

- likely, positive anomaly (supporting evidence)
- likely, negative anomaly (supporting evidence)
- possible, positive anomaly
- possible, negative
- likely, mixed (supporting evidence)
- possible, mixed
- likely, negative spread (supporting evidence)
- possible, negative spread
- possible, north-south high-low
- possible, dipole (2, 4)
- possible, medium contrast linear

potential natural

certainty, class

- possible, weak broad bipolar (2)
- possible, sinuous broad linear

N

0 10 20 40 Meters

Base map: Ordnance Survey (c) Crown Copyright 2011. All rights reserved. Licence number 100020449

Figure 15: part of area 4 interpretation
with Ordnance Survey 1889 1:2500 map

Appendix 2 Methodology

Table 5: survey methodology
Documents Brief: Dr Penny Cunningham, Poltimore Community and Landscape Project, Department of Archaeology, University of Exeter Project design: Dean (2011)
Methodology 1. The work was undertaken in accordance with the project design. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Institute for Archaeologists (2011) and Schmidt (2002). 2. The survey used a temporary survey grid accurately positioned using a suitable DGPS system, co-registered to the Ordnance Survey National Grid using a digital map. The survey grid was composed of continuous 30m by 30m sub-grids. 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 *Method of Fixing:* DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. *Composition:* 30–metre by 30-metre grids. *Recording:* Geo-referenced and recorded using digital map tiles. *Traverse Orientation:* grid south.
Data processing, analysis and presentation software DW Consulting ArcheoSurveyor2 ArcGIS 9.3 Golden Software Inc. Surfer 8 Autodesk AutoCAD 2004LT Microsoft Corp. Office Publisher 2003.
Gradiometer survey equipment and data capture *Instrument:* Bartington Instruments grad601-2, *Firmware:* version 6.1 *Sample Interval:* 0.125-metres *Traverse Interval:* 1 metre *Traverse Method:* zigzag

Appendix 3 Data processing

Table 6: survey data processing - archaeology clip processing plot

Software: DW Consulting ArcheoSurveyor2 v 2.5.11.0

Stats

Max:	175.47
Min:	-175.38
Std Dev:	24.60
Mean:	-0.05
Median:	0.00
Surveyed Area:	21.794 ha

Processes: 65

1 Base Layer
2 De Stagger: Grids: ph273.xgd ph266.xgd ph272.xgd ph267-a.xgd ph271.xgd ph268.xgd ph270.xgd ph269.xgd Mode: Both By: -2 intervals
3 De Stagger: Grids: ph274.xgd ph281.xgd ph275.xgd ph280.xgd ph276.xgd ph279.xgd ph277.xgd ph278.xgd Mode: Both By: -6 intervals
4 De Stagger: Grids: ph46.xgd ph47.xgd ph48.xgd ph49.xgd ph50.xgd ph01.xgd ph51+ph02.xgd ph52.xgd ph53.xgd ph03.xgd ph04.xgd ph05.xgd ph06.xgd ph07.xgd ph08.xgd ph09.xgd ph10.xgd ph11.xgd ph12.xgd ph17.xgd ph18.xgd ph19.xgd ph13.xgd ph14.xgd ph15.xgd ph16.xgd ph20.xgd ph21.xgd ph22.xgd ph23.xgd ph24.xgd ph25.xgd ph26.xgd ph27.xgd ph28.xgd ph29.xgd ph30.xgd ph31.xgd ph32.xgd ph33.xgd ph34.xgd ph36.xgd ph37.xgd ph38.xgd ph39.xgd ph40.xgd ph41.xgd ph42.xgd ph43.xgd ph44.xgd ph45.xgd Mode: Both By: -8 intervals
5 De Stagger: Grids: ph03.xgd ph04.xgd Mode: Both By: 2 intervals
6 De Stagger: Grids: ph14.xgd Mode: Both By: 6 intervals
7 De Stagger: Grids: ph13.xgd Mode: Both By: 8 intervals
8 De Stagger: Grids: ph15.xgd Mode: Both By: -6 intervals
9 De Stagger: Grids: ph29.xgd Mode: Both By: 6 intervals
10 De Stagger: Grids: ph31.xgd ph32.xgd ph33.xgd ph34.xgd Mode: Both By: 6 intervals
11 De Stagger: Grids: ph36.xgd ph37.xgd ph38.xgd ph39.xgd ph40.xgd ph41.xgd ph42.xgd ph43.xgd ph44.xgd ph45.xgd Mode: Both By: 2 intervals
12 De Stagger: Grids: ph227.xgd ph233.xgd ph228.xgd ph232.xgd ph183+ph229.xgd ph231.xgd ph184.xgd ph187+ph230.xgd Mode: Both By: -6 intervals
13 De Stagger: Grids: ph235.xgd ph234.xgd Mode: Both By: -6 intervals
14 De Stagger: Grids: ph247.xgd ph246.xgd ph245.xgd ph244.xgd ph243.xgd ph242.xgd Mode: Both By: -6 intervals
15 De Stagger: Grids: ph236.xgd ph237.xgd ph238.xgd ph239.xgd ph240.xgd ph241.xgd Mode: Both By: -3 intervals
16 De Stagger: Grids: ph259.xgd ph260.xgd ph258.xgd ph261.xgd ph257.xgd ph262.xgd Mode: Both By: -6 intervals
17 De Stagger: Grids: ph263.xgd ph264.xgd ph265.xgd Mode: Both By: -6 intervals
18 De Stagger: Grids: ph256.xgd ph255.xgd ph254.xgd Mode: Both By: -2 intervals
19 De Stagger: Grids: ph248.xgd ph249.xgd ph250.xgd ph251.xgd ph252.xgd ph253.xgd Mode: Both By: -2 intervals
20 De Stagger: Grids: ph177.xgd ph178.xgd ph179.xgd Mode: Both By: -4 intervals
21 De Stagger: Grids: ph180+ph330.xgd Mode: Both By: -4 intervals
22 De Stagger: Grids: ph182.xgd ph181.xgd ph180+ph330.xgd Mode: Both By: -8 intervals
23 De Stagger: Grids: ph184.xgd Mode: Both By: -2 intervals
24 De Stagger: Grids: ph187+ph230.xgd Mode: Both By: 2 intervals
25 De Stagger: Grids: ph196.xgd ph195.xgd Mode: Both By: -2 intervals
26 De Stagger: Grids: ph203.xgd ph198.xgd ph206.xgd ph202.xgd ph199.xgd ph205.xgd ph201.xgd ph200.xgd Mode: Both By: -8 intervals
27 De Stagger: Grids: ph206.xgd ph205.xgd ph204.xgd Mode: Both By: -2 intervals
28 De Stagger: Grids: ph208.xgd ph209.xgd Mode: Both By: -2 intervals
29 De Stagger: Grids: ph207.xgd Mode: Both By: -6 intervals
30 De Stagger: Grids: ph95+ph282.xgd ph284.xgd ph286.xgd ph289.xgd ph283.xgd ph287.xgd ph288.xgd Mode: Both By: -6 intervals
31 De Stagger: Grids: ph75+ph285.xgd Mode: Both By: -6 intervals
32 De Stagger: Grids: ph297+ph217.xgd ph298+ph211.xgd ph305.xgd ph296.xgd ph299.xgd ph304.xgd ph295.xgd ph300.xgd ph303.xgd Mode: Both By: -6 intervals
33 De Stagger: Grids: ph307.xgd Mode: Both By: -6 intervals
34 De Stagger: Grids: ph301.xgd ph302.xgd Mode: Both By: -6 intervals
35 De Stagger: Grids: ph317.xgd ph319.xgd ph318.xgd Mode: Both By: -6 intervals

continued

Table 6 (continued): survey data processing - archaeology clip processing plot

Software: DW Consulting ArcheoSurveyor2 v 2.5.11.0

36 De Stagger: Grids: ph321.xgd ph322.xgd ph325.xgd ph320.xgd ph323.xgd ph324.xgd Mode: Both By: -6 intervals
37 De Stagger: Grids: ph180+ph330.xgd ph185+ph331.xgd ph333+ph186.xgd Mode: Both By: -6 intervals
38 De Stagger: Grids: ph332.xgd Mode: Both By: -6 intervals
39 De Stagger: Grids: ph153.xgd ph132.xgd ph131.xgd ph107.xgd ph154.xgd ph152.xgd ph133.xgd ph130.xgd ph108.xgd ph106.xgd ph155.xgd ph151.xgd ph134.xgd ph129.xgd ph110+ph109.xgd ph105.xgd ph160.xgd ph156.xgd ph150.xgd ph135.xgd ph128.xgd ph111.xgd ph104.xgd ph164.xgd ph161.xgd ph157.xgd ph149.xgd ph136.xgd ph127.xgd ph112.xgd ph103.xgd ph165.xgd ph162.xgd ph158.xgd ph148.xgd ph137.xgd ph126.xgd ph113.xgd ph102.xgd ph166.xgd ph163.xgd ph159.xgd ph147.xgd ph138.xgd ph125.xgd ph114.xgd ph101.xgd ph174.xgd ph173.xgd ph167.xgd ph146.xgd ph139.xgd ph124.xgd ph115.xgd ph100.xgd ph175.xgd ph172.xgd ph168.xgd ph145.xgd ph140.xgd ph123.xgd ph116.xgd ph99.xgd ph171.xgd ph169.xgd ph144.xgd ph141.xgd ph122.xgd ph117.xgd ph98.xgd ph170.xgd ph143.xgd ph142.xgd ph121.xgd ph118.xgd ph97.xgd ph120.xgd ph119.xgd ph96.xgd Mode: Both By: -4 intervals
40 De Stagger: Grids: ph85.xgd ph86.xgd ph84.xgd ph87.xgd ph83.xgd ph88.xgd ph82.xgd ph89.xgd ph81.xgd ph90.xgd ph80.xgd ph91.xgd ph79.xgd ph92.xgd ph78.xgd ph93.xgd ph77.xgd ph94.xgd ph76.xgd Mode: Both By: -4 intervals
41 De Stagger: Grids: ph68.xgd ph67.xgd ph69.xgd ph66+ph65.xgd ph70.xgd ph64.xgd ph54.xgd ph71.xgd ph63.xgd ph55.xgd ph72.xgd ph62.xgd ph56.xgd ph73.xgd ph61.xgd ph57.xgd ph74.xgd ph60.xgd ph58.xgd Mode: Both By: -4 intervals
42 De Stagger: Grids: ph68.xgd ph67.xgd ph69.xgd ph66+ph65.xgd Mode: Both By: -4 intervals
43 De Stagger: Grids: ph70.xgd ph71.xgd ph72.xgd ph73.xgd Mode: Both By: -4 intervals
44 De Stagger: Grids: ph91.xgd ph92.xgd ph93.xgd ph94.xgd Mode: Both By: -4 intervals
45 De Stagger: Grids: ph99.xgd ph98.xgd ph97.xgd ph96.xgd Mode: Both By: -4 intervals
46 De Stagger: Grids: ph107.xgd ph108.xgd ph106.xgd ph110+ph109.xgd ph105.xgd Mode: Both By: -3 intervals
47 De Stagger: Grids: ph111.xgd ph112.xgd ph113.xgd ph114.xgd ph115.xgd ph116.xgd ph117.xgd ph118.xgd ph119.xgd Mode: Both By: -2 intervals
48 De Stagger: Grids: ph128.xgd ph127.xgd ph126.xgd ph125.xgd ph124.xgd ph123.xgd ph122.xgd ph121.xgd ph120.xgd Mode: Both By: -2 intervals
49 De Stagger: Grids: ph132.xgd ph131.xgd ph133.xgd ph130.xgd ph134.xgd ph129.xgd Mode: Both By: -4 intervals
50 De Stagger: Grids: ph135.xgd ph136.xgd ph137.xgd Mode: Both By: -4 intervals
51 De Stagger: Grids: ph138.xgd ph139.xgd ph140.xgd Mode: Both By: -2 intervals
52 De Stagger: Grids: ph141.xgd ph142.xgd Mode: Both By: -4 intervals
53 De Stagger: Grids: ph150.xgd Mode: Both By: 2 intervals
54 De Stagger: Grids: ph166.xgd ph163.xgd ph159.xgd Mode: Both By: -2 intervals
55 De Stagger: Grids: ph167.xgd Mode: Both By: -2 intervals
56 De Stagger: Grids: ph160.xgd ph164.xgd ph161.xgd ph165.xgd ph162.xgd Mode: Both By: -2 intervals
57 De Stagger: Grids: ph172.xgd ph168.xgd ph171.xgd ph169.xgd ph170.xgd Mode: Both By: -2 intervals
58 Clip at 1.00 SD
59 DeStripe Median Sensors: All
60 DeStripe Median Traverse: Grids: ph161.xgd ph157.xgd (vertical)
61 DeStripe Median Traverse: Grids: ph157.xgd
62 DeStripe Median Traverse: Grids: ph134.xgd ph135.xgd (vertical)
63 DeStripe Median Traverse: Grids: ph159.xgd (vertical)
64 DeStripe Median Traverse: Grids: ph306.xgd ph314.xgd (vertical)
65 Clip at 4.00 SD

Appendix 4 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. The gradiometers (a type of magnetometer) and resistance meters employed are sensitive to depths of between 0 and 1.5m below ground level, with maximum sensitivity at depths of 1m or less.

2 Magnetometer surveying

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 magnetised 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. Identifiable archaeological features include areas of occupation, hearths, kilns, furnaces, ditches, pits, postholes, ridge-and-furrow, timber structures, wall footings, roads, tracks and similar buried features.

A gradiometer is a type of magnetometer and is sensitive to relatively small changes in the earth's magnetic field. Substrata uses two types of gradiometer both specifically designed for field use by archaeologists. Our primary surveying instruments are Bartington *Grad*601-2 (dual sensor) fluxgate gradiometers with automatic data loggers. We also use a Geoscan FM36 fluxgate gradiometer with the option of either manual or automatic sampling triggers. The Bartington gradiometers provide proven technology in archaeological magnetic surveying and offer fast, accurate set-up and survey rates. The Geoscan FM36 provides an effective, if older, solution when surveys are required within woodland and other areas of limited accessibility.

3 Earth resistance surveying

This method measures changes in the electrical resistance of the ground being surveyed. In practice, differences in the electrical resistance of materials facilitates the detection and interpretation of masonry and brick foundations, paving and floors, drains and other cavities, large pits, building platforms, robber trenches, timber structures, 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 multi-probe resistance meters and purpose-built automatic data-loggers. The MPX15 multi-probe facility can be used to speed up standard surveys and it is also useful when simultaneous multiple-depth analysis is required.