Substrata

Archaeological Geophysical Surveyors

An archaeological gradiometer and earth-resistance survey

Land at Ashcombe, Simonsbath Exmoor, Somerset

Ordnance Survey (E/N): 277340,139440 (point)

Report: 140618

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24 June 2014

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Client:
Exmoor National Park Authority
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Accompanying CD-ROM

1 Survey description and summary

Type of survey:	twin-sensor fluxgate gradiometer
Date of survey:	May 2014
Area surveyed:	0.2ha
Lead surveyor:	Ross Dean BSc MSc MA MIfA

Client
Exmoor National Park Authority, Exmoor House, Dulverton, Somerset, TA22 9HL

Location

Site:	Land at Ashcombe, Simonsbath
Civil Parish:	Exmoor
District:	West Somerset
County:	Somerset
Nearest Postcode:	TA24 7SH
NGR:	SS 773 394 (point)
Ordnance Survey E/N:	277340,139440 (point)
OASIS number:	substrat1-182295
Archive:	At the time of writing, the archive of this survey will be held by Substrata.

Introduction
This report was commissioned by the Exmoor National Park Authority to better understand the nature and context of a set of low earthworks in an area of ground to the west of Ashcombe stream which was once part of the garden and plantation of Simonsbath House (MEM22434 in section 5). The location of the site is shown in Figure 8. Magnetic (gradiometer) and earth resistance surveys were completed across the areas shown in Figures 1 to 3.

Summary
The magnetic and resistance contrasts across the survey areas were sufficient to be able to differentiate between anomalies representing possible archaeological features and background responses.

Both pre-1889 and post 1889 changes to the deposits within the survey area were highlighted within the magnetic (gradiometer) and earth-resistance data sets; 1889 being the year of the publication of the Ordnance Survey first edition map that includes the survey area. A possible former field or enclosure boundary was recorded as partially coinciding with a modern footpath and also partially coinciding with a path created for the Simonsbath House garden and plantation which was mapped by the Ordnance Survey between 1889 and 1962 and recorded in a recent archaeological earthworks survey. Further evidence of this path, not recorded in the recent earthworks survey, was recorded in the earth-resistance data. A possibly branching path, track that pre-dates the publication of the Ordnance Survey first edition map but not necessarily the date of the creation of the Simonsbath House garden and plantation, was recorded in both the gradiometer and earth-resistance data. A possible structure was recorded in the earth-resistance data on the western bank of Ashcombe stream that was not recorded in the 1889 first edition Ordnance Survey map or later maps. A further deposit of rubble or a structure was recorded in the resistance data close to the Ashcombe stream on the southern boundary of the survey area. Again this potential archaeological deposit was not recorded on any Ordnance Survey map. An examination of natural deposits recorded in the data set suggested that the removal of a garden path and the creation of an alternative path between 1891 and 1903 was probably due to water saturation of the ground resulting from works associated with the creation of the Simonsbath House garden and plantation. Field drainage, evident in the gradiometer data set, appears to have been undertaken to mitigate the wet ground associated with natural drainage channels recorded in the earth-resistance survey. There is evidence in the resistance data for either a re-routing of the Ashcombe stream or a palaeochannel of the same close to the modern bridge across the stream. This channel and the potential structure recorded in the earth-resistance data on the

western bank of Ashcombe stream are together likely to be the origin of the low earthworks that prompted this survey.

2 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 the 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

Survey area
The survey area was part of the former garden and plantation of Simonsbath House (MEM22434 in section 5). It is situated in a grassy area at the southern end of Ashcombe combe on the northern side of Simonsbath as shown in Figure 8. The area is bounded to the north by a drainage channel and a former slate quarry (MEM22305 in section 5) on the wooded, steep side of the combe. To the east and south the area is bounded by Ashcombe stream with White Rock Cottage (MEM22117 in section 5) across the stream to the south. Rising ground and woodland delimit the site to the west.

Land use
Grass pasture.

Geology
The solid geology is slate of the Devonian Kentisbury Slates Member. The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

The following is a short summary of information obtained from the Exmoor National Park Authority Historic Environment Record (HER) within approximately 250m of the proposed development site and relevant to the understanding of the gradiometer survey. Access rights to the HER were granted on 1 May 2014.

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

Record: **MEM22088**
Name: Exmoor Royal Forest
Monument/Component Types: HUNTING FOREST (Early-Middle Saxon to AD 19th Century - 410 AD to 1819 AD)
Grid Reference: Centred SS 7757 3852 (12190m by 11858m); *Simonsbath lies within the Forest*
Summary: The Royal Forest is thought to originate in the Saxon period and was the land legally reserved as hunting grounds for the king.

Record: **MEM22117**
Name: White Rock Cottage in Simonsbath
Monument/Component Types:
- •COTTAGE ORNEE? (AD 19th Century to Modern - 1820 AD? to 2050 AD)
- •PARISH SCHOOL (AD 19th Century to Modern - 1857 AD to 2050 AD)
- •TEACHERS HOUSE (AD 19th Century to Modern - 1857 AD to 2050 AD)
- •SCHOOL HALL (AD 19th Century to Modern - 1875 AD? to 2050 AD)

Grid Reference: Centred SS 7736 3941 (29m by 25m); *to the south of the survey area*
Summary: One of the earliest cottages built at Simonsbath, possibly built as a cottage to house a head gardener for Simonsbath House. By 1852 it may have been housing two families. A school was added to the complex in 1857.

Record: **MEM22304**
Name: Stables east of White Rock Cottage, Simonsbath
Monument/Component Types
- •STABLE (AD 19th Century to Modern - 1820 AD? to 2050 AD)
- •STOREHOUSE? (AD 19th Century to Modern - 1820 AD? to 2050 AD)

Grid Reference: Centred SS 7738 3941 (13m by 17m); *to the south of the survey area*
Summary: A building which may originally have served as a secure store for a nearby quarry but was then used as a stables. It was partially converted into a toilet block in the late 20th Century.

Record: **MEM22305**
Name: Quarry north of White Rock Cottage
Monument/Component Types
- •QUARRY (AD 19th Century to AD 20th Century - 1800 AD? to 1900 AD?)
- •FERNERY (GARDEN)? (AD 19th Century to Modern - 1890 AD? to 2050 AD)

Grid Reference: Centred SS 7729 3942 (39m by 32m); *to the north of the survey area*
Summary: A quarry is shown on historic mapping. It may be the quarry mentioned in an estate inventory of 1833, which suggests it provided stone for the Knight estate. It may have acted as a fernery when incorporated into the Ashcombe gardens

Record: **MEM22434**
Name: Ashcombe garden and plantation
Monument/Component Types
- •WOODLAND GARDEN (AD 19th Century to Modern - 1820 AD? to 2050 AD)
- •FOOTBRIDGE (AD 20th Century to Modern - 1900 AD? to 2050 AD)

Grid Reference: Centred SS 7734 3954 (314m by 656m); *the survey area lies within this area*
Summary: A designed landscape dating to the 1820s for John Knight, which was used as a garden by the Fortescues in the late 19th and early 20th Century. It includes a circuitous valley route that incorporates two outcrops of Spa Stone.
Description:
This was a garden created by John Knight as part of his vision for a designed landscape, which was never completed. The garden may have formed a prelude to a woodland garden in Ashcombe. An inventory of 1833 confirms the existence of a garden in Simonsbath and various records dating to 1864, 1867 and 1878 record Simonsbath House as having a garden, shrubberies and pleasure grounds. The 1889 Ordnance Survey first edition map shows this area of land, running along the west side of the Ashcombe stream, as being laid out with paths, various deciduous trees and shaded, small trees that may represent bushes or shrubberies.

A section where several paths meet in the centre is shown as a separately enclosed piece of land and this may have been the original 'garden by the river'; the partial remains of a wall still run across the bottom of the Ashcombe valley here. *The survey area lies within this area.*

The stretch of path through the woodland to the house has a hard surface and may have been wide enough for a horse-drawn vehicle, possibly providing a link to the Upper Stables. An old slate quarry within the garden (MEM22305) may have acted as a fernery.

6 Results, discussion and conclusions

This survey was designed to record magnetic and earth resistance 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

Figure 1 shows the interpretation of the gradiometer survey and Figure 2 shows the interpretation of the earth-resistance survey. Each figure depicts 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.

Figure 3 depicts a combination of the interpretations of the gradiometer and earth resistance surveys without the anomaly group numbers.

Figures 1 to 3 and Table 1 comprise the analysis of the survey data.

Plots of the processed data are provided in Figures 4 to 7 (Appendix 1).

Site: An archaeological gradiometer and earth-resistance survey
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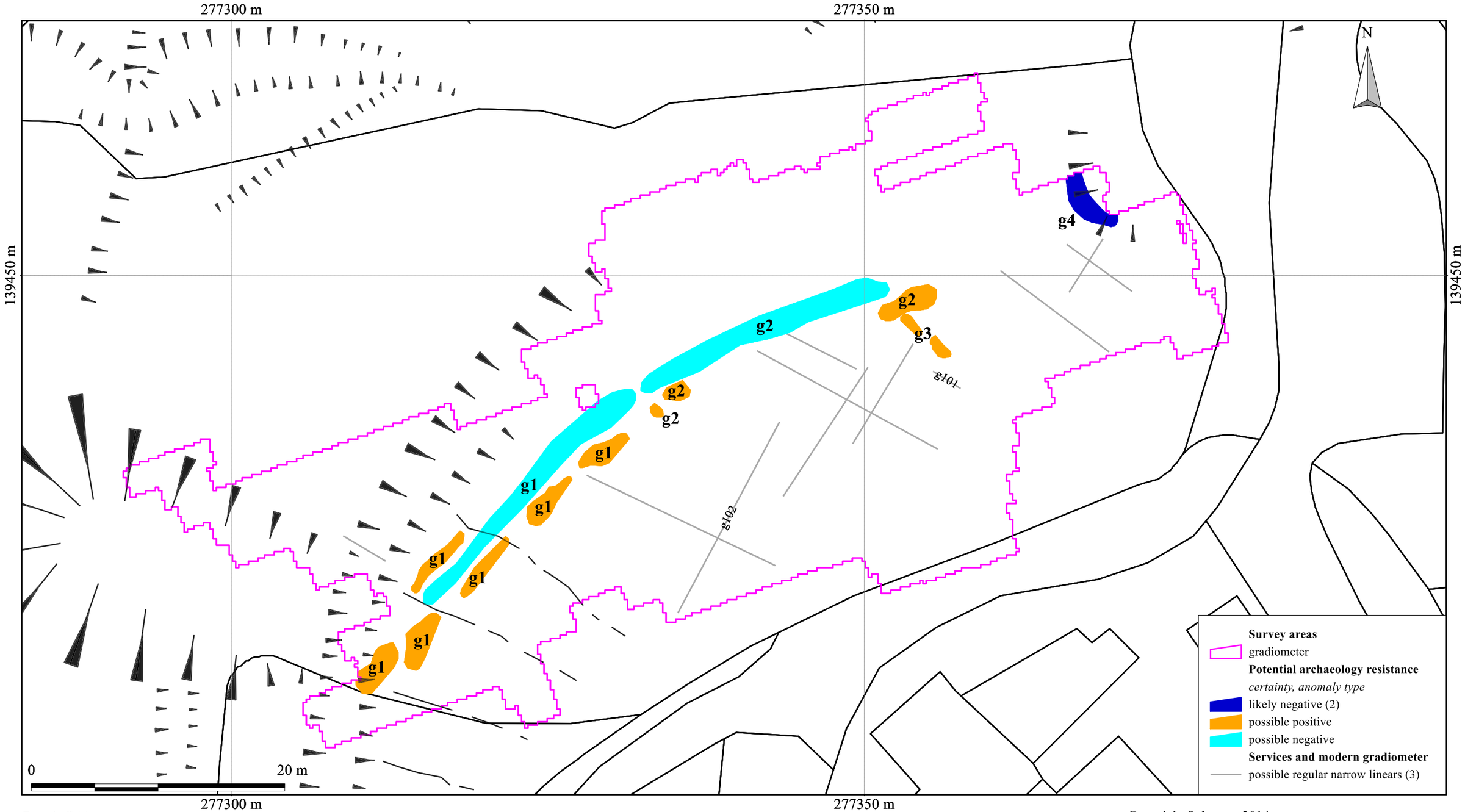
Survey	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
gradiometer	g1	g2 r3 r4	possible, positive & negative	disrupted curvilinear		anomaly group partially coincides with a modern path but, in addition, is likely to represent the same feature as group g2	
	g2	g1 r7 r8	possible, positive & negative	disrupted linear			
	g3		possible, positive	linear			
	g4		likely, negative	curvilinear		anomaly group coincides with mapped earthworks	Riley, H. (2014) Ashcombe Simonsbath Archaeological Survey
	g101		possible, regular narrow linears		field drains		
	g102		possible, regular narrow linears		field drains		
earth-resistance	r1		possible, high & low	linear		anomaly group partially coincides with mapped earthworks but may relate to an older archaeological feature such as wall footings	Riley, H. (2014) Ashcombe Simonsbath Archaeological Survey
	r2	r6	likely, low	linear	path	anomaly group coincides with a path mapped by the Ordnance Survey between 1903 and 1962 & recorded as part of an archaeological earthworks survey	Ordnance Survey 1903 1:2500 to 1962 1:10560, Riley, H. (2014) Ashcombe Simonsbath Archaeological Survey
	r3	r4 g1	possible, high & low	disrupted linear		anomaly group partially coincides with a modern path but, in addition, is likely to represent the same feature as group r4	
	r4	r3 g1	possible, high & low	disrupted linear			
	r5		possible, high	oval		anomaly group a structure or natural feature	
	r6	r2	possible, low	linear			
	r7	g2	possible, high & low	linear			
	r8	g2	possible, low	linear			
	r9		possible, high	linear	rubble or stone wall		
	r10		possible, high	linear	rubble linear		
	r11		possible, high	linear	rubble linear		
	r12		likely, low	curvilinear	path	anomaly group coincides with a path mapped by the Ordnance Survey between 1889 and 1891	Ordnance Survey 1889 1:2500 and 1891 1:10560
	r13		likely, high & low	linear	path	anomaly group coincides with a path mapped by the Ordnance Survey between 1903 and 1962	Ordnance Survey 1903 1:2500 to 1962 1:10560
	r14		possible, high	irregular		anomaly group may represent an area of rubble or a natural feature	
	r201		possible low broad sinuous		wet area/former water flow	anomalies indicate a wet area - possibly area of former surface or sub-surface water flow disrupted by garden landscaping	
	r202		possible low broad sinuous		wet area/former water flow	anomalies indicate a wet area - possibly area of former surface or sub-surface water flow disrupted by garden landscaping	
	r203		possible low broad sinuous		wet area/former water flow	anomalies indicate a wet area - possibly area of former surface or sub-surface water flow disrupted by garden landscaping	
	r204		possible low broad sinuous		wet area/former water flow	anomalies indicate a wet area - possibly area of former surface or sub-surface water flow disrupted by garden landscaping	
	r205		possible high broad sinuous		bank at edge of wet area		
	r206		possible low broad sinuous		wet area/former water flow	anomalies indicate a wet area - possibly area of former surface or sub-surface water flow disrupted by garden landscaping	

Table 1: data analysis



British Grid
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Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

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. Representative; not all instances are mapped.
4. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

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Figure 1: interpretation of gradiometer survey with archaeological earthworks survey (Riley 2014)

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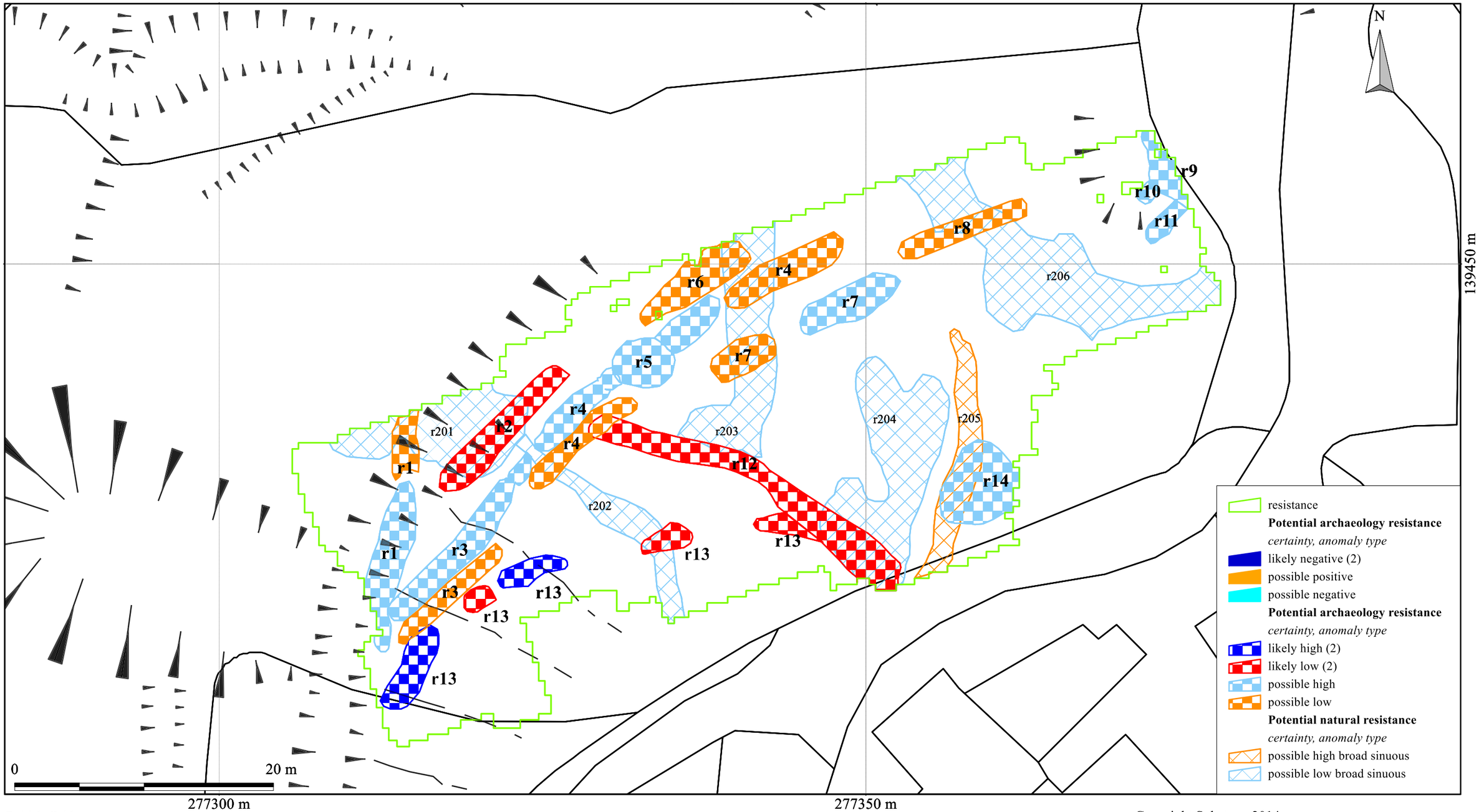

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Figure 2: interpretation of earth-resistance survey with archaeological earthworks survey (Riley 2014)

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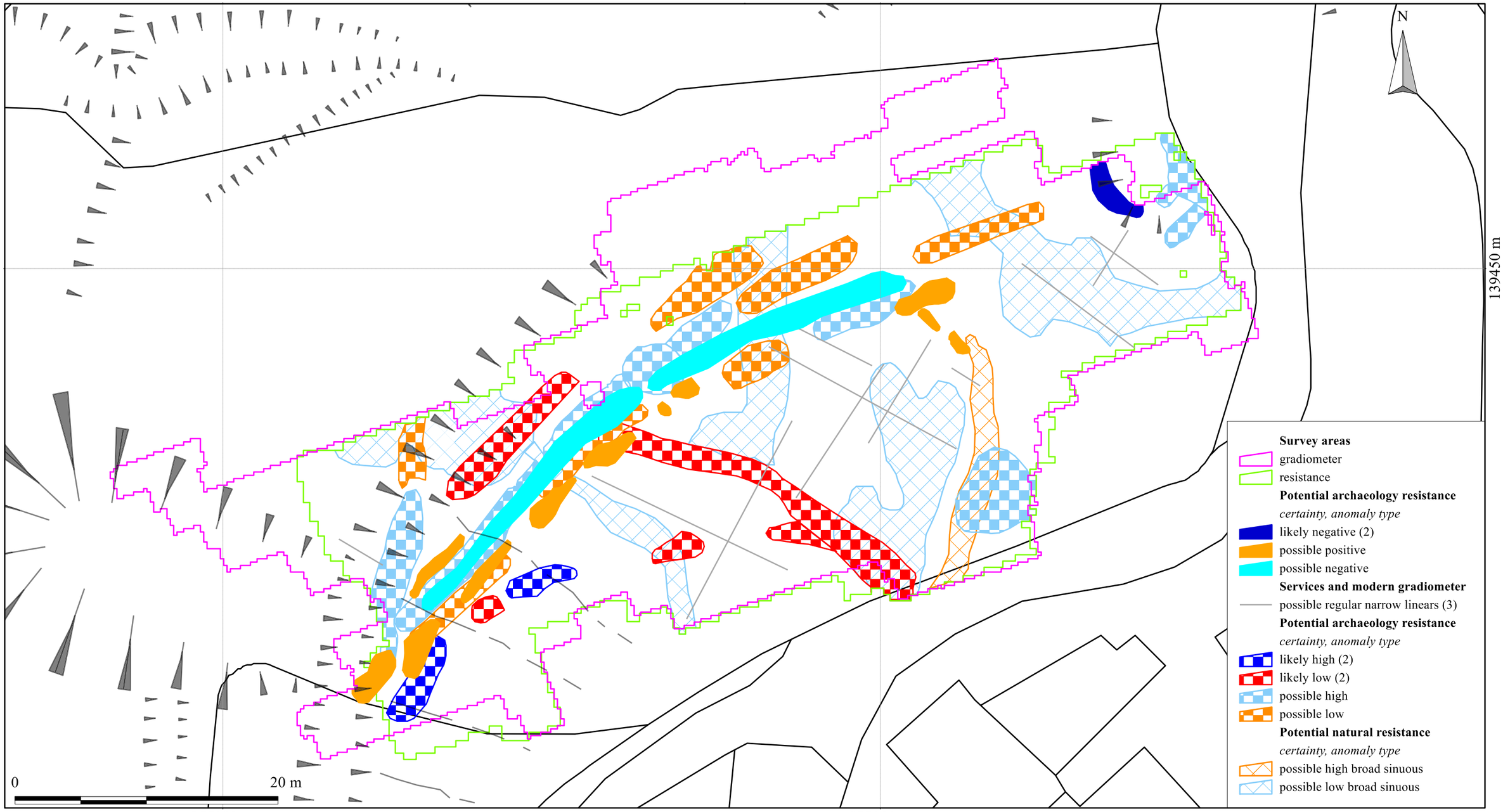

British Grid
centre X: 277339.70 m, centre Y: 139439.56 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

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. Representative; not all instances are mapped.
4. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological gradiometer and earth-resistance survey
Land at Ashcombe, Simonsbath, Exmoor, Somerset
Ordnance Survey (E/N): 277340,139440 (point)
Report: 140618

Figure 3: interpretation of gradiometer and earth resistance surveys with archaeological earthworks survey (Riley 2014)

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6.2 Discussion

Refer to Figures 1 to 3 (this section) and 5 to 7 (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 data analysis Table 1.

General points

Any anomaly trends visible in the data not discussed below are likely to relate to recent activities or natural deposits that are not thought to be affected by the landscaping of the garden and plantation of Simonsbath House or other past human activities.

Data collection along the field edges was restricted as shown in figures 1, 4 and 5 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.

Referring to Figure 5, the strong, positive magnetic response along part of the southern edge of the survey area is due to the presence of steel equipment being used in the renovation of White Rock Cottage immediately south of the survey area. A similar response along part of the eastern edge of the survey area is due to the presence of magnetic materials used in the construction and maintenance of a modern foot-bridge across Ashcombe stream.

Data relating to historical maps and other records

Magnetic anomaly group **g1** and resistance anomaly group **r3** partially coincide with a modern footpath and will, in part, reflect any disturbance associated with the creation and maintenance of that footpath.

Magnetic anomaly group **g4** coincides with earthworks recently mapped by Hazel Riley (Riley, 2014) and may relate to the resistance anomaly groups r9 to r11 representing stony deposits as discussed below.

Resistance anomaly group **r1** partially coincides with earthworks mapped by Hazel Riley (Riley, 2014) which are a manifestation of a former track or path of the Simonsbath House garden and plantation mapped by the Ordnance Survey between 1889 and 1962. It is likely, however, that r1 represents an earlier feature, possibly a field wall, removed sometime before the mapping survey for the Ordnance Survey 1889 first edition map.

Resistance anomaly group **r2** coincides with the same earthworks and path as r1 and is likely to reflect the path discussed above. Group **r6** is also likely to reflect this path.

Resistance anomaly group **r12** coincides with former track or path of the Simonsbath House garden and plantation mapped by the Ordnance Survey between 1889 and 1891.

Resistance anomaly group **r13** coincides with former track or path of the Simonsbath House garden and plantation mapped by the Ordnance Survey between 1903 and 1962.

Data with no previous provenance

Anomaly groups **g1 and g2** and resistance anomaly groups **r3, r4, r7 and r8** (see above for a discussion of g1 and r3 in relation to a modern footpath) represent a disrupted, curvilinear group of possible archaeological deposits and/or structures which may be a former track or path, perhaps with a northerly contemporary or earlier branch suggested by the trend of r4 compared to r8. These deposits and/or structures are

distinct from the Simonsbath House garden and plantation paths mapped by the Ordnance Survey between 1889 and 1962. The anomaly groups appear to trend towards groups r9 to r11 which are discussed below. It is possible, though unlikely, that these anomaly groups reflect the footings of a former field or enclosure wall rather than a path or track.

Resistance anomaly group **r9** may represent a rubble deposit and, as such, may reflect a revetment on the western bank of Ashcombe stream. However, when considered along with the adjacent linear, high resistance anomalies **r10 and r11**, which could represent linear deposits of rubble or wall footings, there is the suggestion of a former stone structure. An archaeological earthworks survey undertaken by Hazel Riley (Riley 2014) recorded a depression coinciding almost exactly with these anomaly groups which could relate to the robbing of stone from this area. As discussed above, the path, track or wall represented by anomaly groups g1, g2, r3, r4, r7 and r8 appears to converge on this area at its eastern end.

The provenance of resistance anomaly group **r14** is difficult to understand and may represent either archaeological deposits such as rubble or natural deposits such as bed rock. An archaeological origin would suggest the remains of a structure or in-fill of a topographical depression of some kind.

Data relating to natural deposits

Resistance anomaly groups **r201 to r206** are most likely to relate to relatively wet natural deposits that could relate to past water flow disrupted by the creation of the Simonsbath House garden and plantation. Groups r203 and r204 are interrupted by the former garden path represented by group r12 which was mapped by the Ordnance Survey in 1889 and 1891 but was removed by 1903 with the path represented by group r13 being laid down sometime between 1891 and 1903. Referring to Figure 7, it is clear that the path represented by anomaly group r12 either lay over or created a wet area and likely surface water flow connected to r203 and r204 which would render the path difficult to maintain and be a reason for its removal and replacement. Group r206 is likely to represent the former bed of the Ashcombe stream, either prior to a possible diversion to the current channel as part of the works to create the Simonsbath House garden or as a former palaeochannel.

Data relating to relatively recent ground works

Magnetic anomaly groups **g101 and g102** are suggestive of field drains which may have been laid to mitigate wet conditions created by the interruption of natural drainage represented by resistance anomaly groups 202 to 204.

6.3 Conclusions

Both pre-1889 and post 1889 changes to the deposits within the survey area were highlighted within the magnetic (gradiometer) and earth-resistance data sets; 1889 being the year of the publication of the Ordnance Survey first edition map that includes the survey area. A possible former field or enclosure boundary was recorded as partially coinciding with a modern footpath and also partially coinciding with a path created for the Simonsbath House garden and plantation which was mapped by the Ordnance Survey between 1889 and 1962 and recorded in a recent archaeological earthworks survey. Further evidence of this path, not recorded in the recent earthworks survey, was recorded in the earth-resistance data. A possibly branching path, track that pre-dates the publication of the Ordnance Survey first edition map but not necessarily the date of the creation of the Simonsbath House garden and plantation, was recorded in both the gradiometer and earth-resistance data. A possible structure was recorded in the earth-resistance data on the western bank of Ashcombe stream that was not recorded in the 1889 first edition Ordnance Survey map or later maps. A further deposit of rubble or a structure was recorded in the resistance data close to the Ashcombe stream on the southern boundary of the survey area. Again this potential archaeological deposit was not recorded on any Ordnance Survey map. An

examination of natural deposits recorded in the data set suggested that the removal of a garden path and the creation of an alternative path between 1891 and 1903 was probably due to water saturation of the ground resulting from works associated with the creation of the Simonsbath House garden and plantation. Field drainage, evident in the gradiometer data set, appears to have been undertaken to mitigate the wet ground associated with natural drainage channels recorded in the earth-resistance survey. There is evidence in the resistance data for either a re-routing of the Ashcombe stream or a palaeochannel of the same close to the modern bridge across the stream. This channel and the potential structure recorded in the earth-resistance data on the western bank of Ashcombe stream are together likely to be the origin of the low earthworks that prompted this survey.

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.

8 Acknowledgements

Substrata would like to thank Rob Wilson-North of the Exmoor National Park Authority for commissioning us to complete this survey.

9 Bibliography

Archaeology Data Service/Digital Antiquity Guides to Good Practice (undated): *Geophysical Data in Archaeology* [Online], Available: http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc [May 2013]

British Geological Survey (undated) *Geology of Britain viewer* [Online], *Available: http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html* [June2014]

Clark, A. (2000) *Seeing Beneath the Soil, Prospecting methods in archaeology*, London: Routledge

Dean, R. (2014) *A gradiometer and earth resistance survey methodology statement, Land at Aschcombe, Simonsbath, Exmoor, Somerset*, Substrata unpublished document

Gafney, C. & Gater, J. (2003) Revealing the Buried Past; Geophysics for Archaeologists, Stroud: Tempus.

Institute for Archaeologists (undated) *IfA house style*, [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/ifa_house_style.pdf [May 2014]

Institute for Archaeologists (2011) *Standard and guidance archaeological geophysical survey*. Reading: Author [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/Geophysics2010.pdf [May 2013]

Institute for Archaeologists (2009) *Code of conduct*. Reading: Author [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/code_conduct.pdf [May 2014]

Institute for Archaeologists (2008) *Code of approved practice for the regulation of contractual arrangements in archaeology*. Reading: Author [Online], Available: http://www.archaeologists.net/sites/default/files/node-files/ifa_code_practice.pdf [May 2014]

Riley, H. (2014) *Ashcombe Simonsbath, Archaeological Survey*, Unpublished report

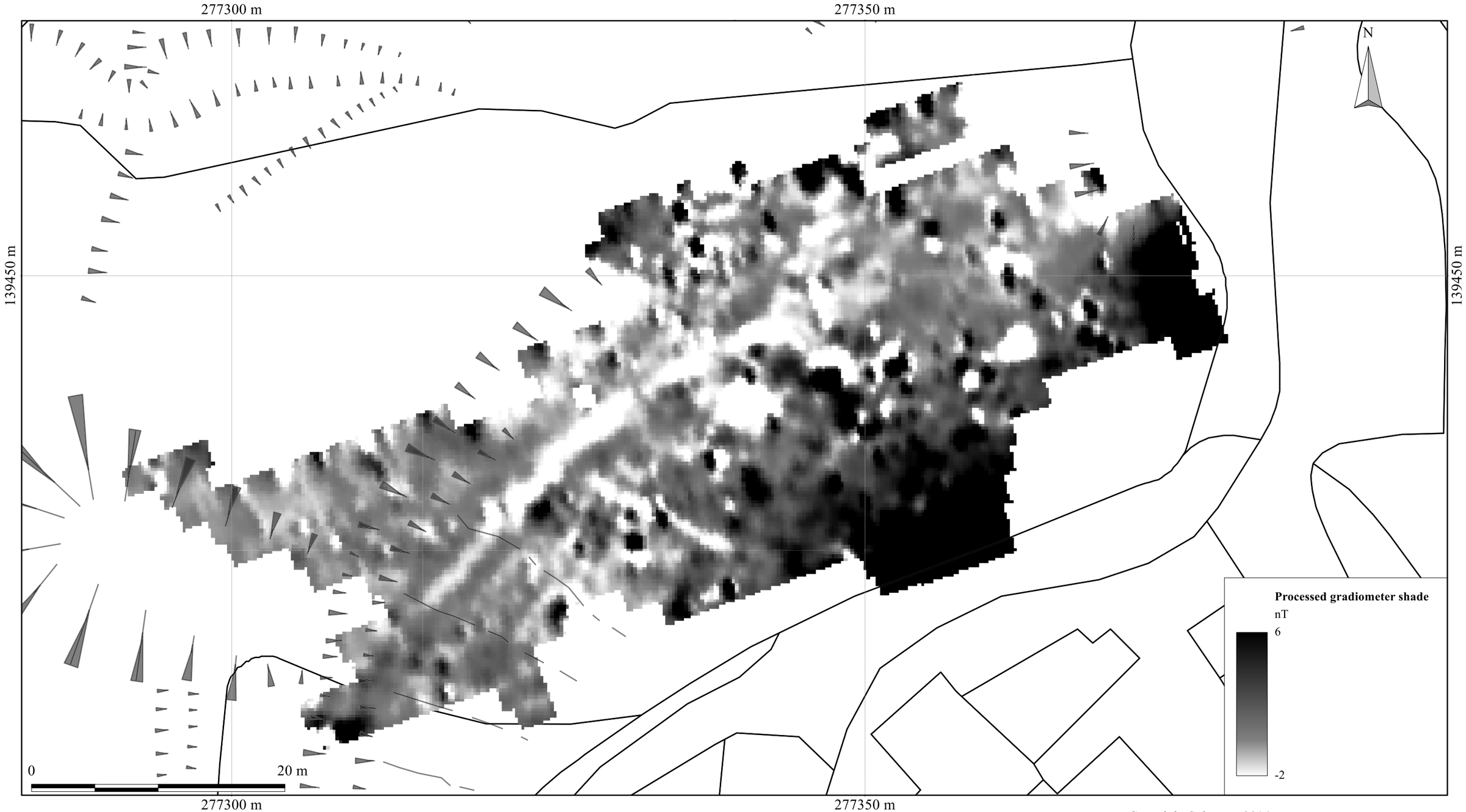
Appendix 1 Supporting plots

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.

A rough rule for interpreting resistance anomalies is that if an x-y trace is drawn of the resistance over an anomaly, then the width of an anomaly at half its maximum height is equal to the width of the buried feature. Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies and it should be noted that the relationship between change in resistance response and depth is not linear (Gaffney and Gater, 2003: 112).



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Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 4: shade plot of gradiometer survey with archaeological earthworks survey (Riley, 2014)

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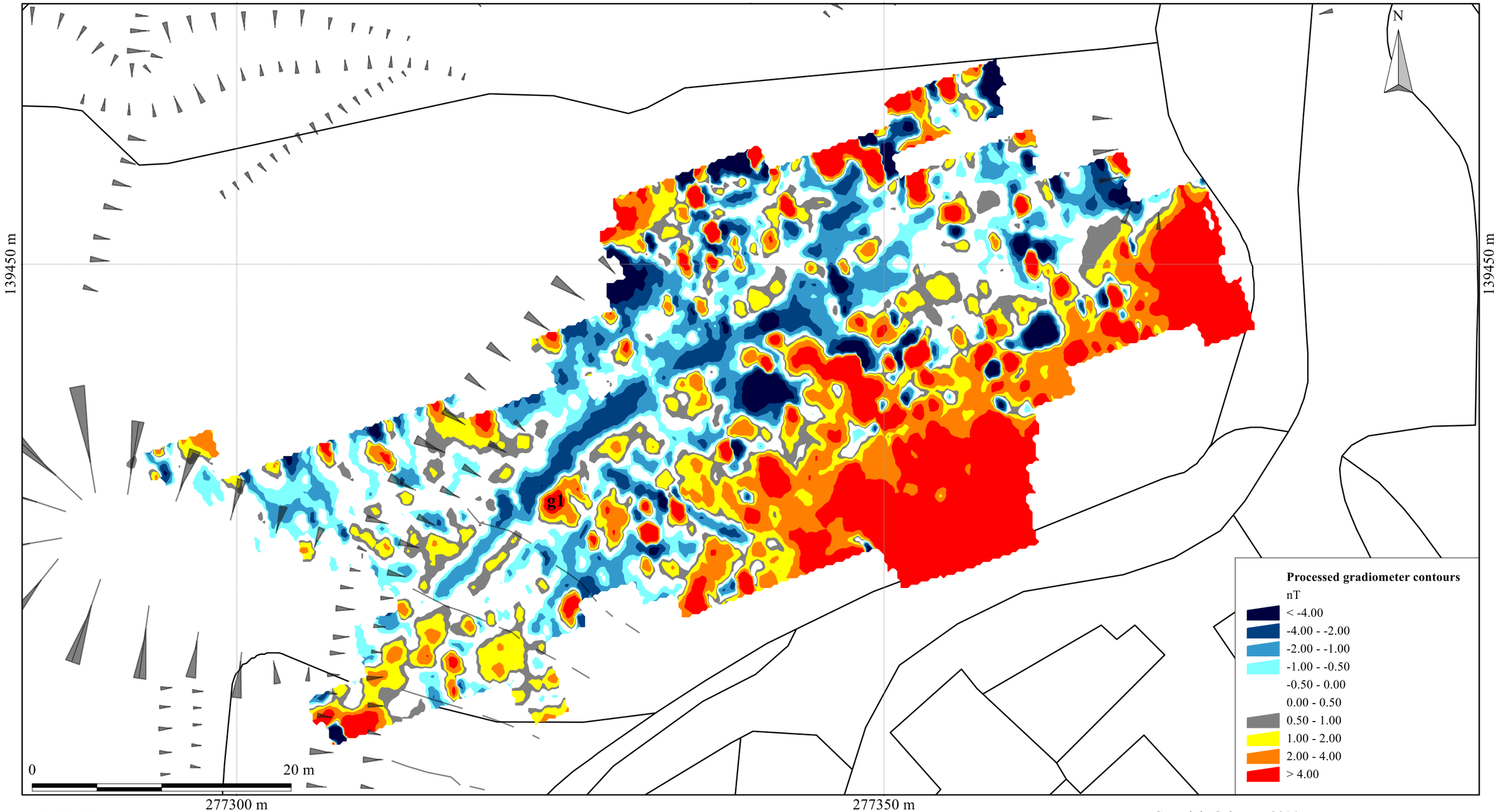

British Grid
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Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer and earth-resistance survey
Land at Ashcombe, Simonsbath, Exmoor, Somerset
Ordnance Survey (E/N): 277340,139440 (point)
Report: 140618

Figure 5: contour plot of gradiometer survey with archaeological earthworks survey (Riley, 2014)

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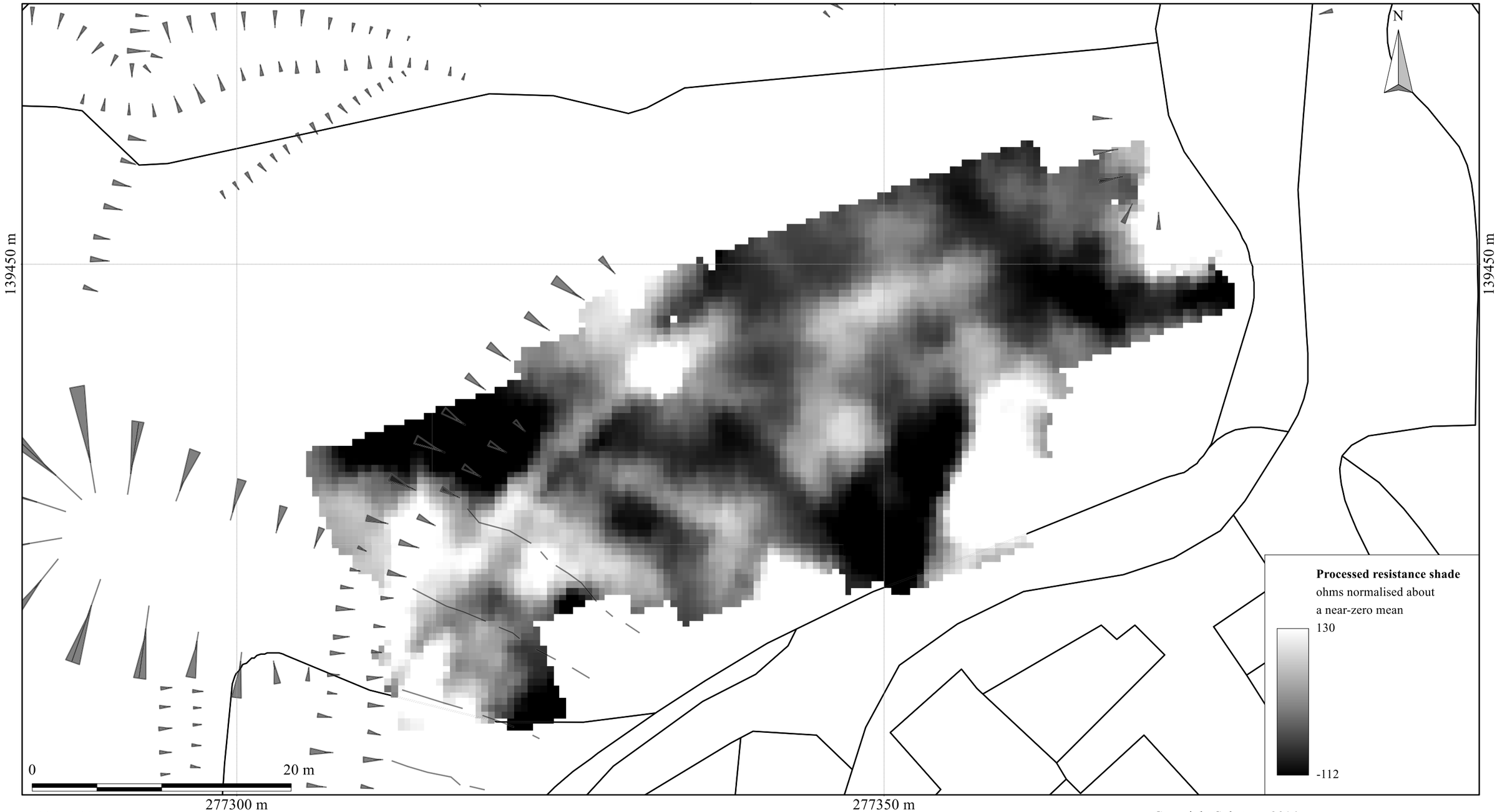

British Grid
centre X: 277339.70 m, centre Y: 139439.56 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer and earth-resistance survey
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Figure 6: shade plot of earth resistance survey with archaeological earthworks survey (Riley 2014)

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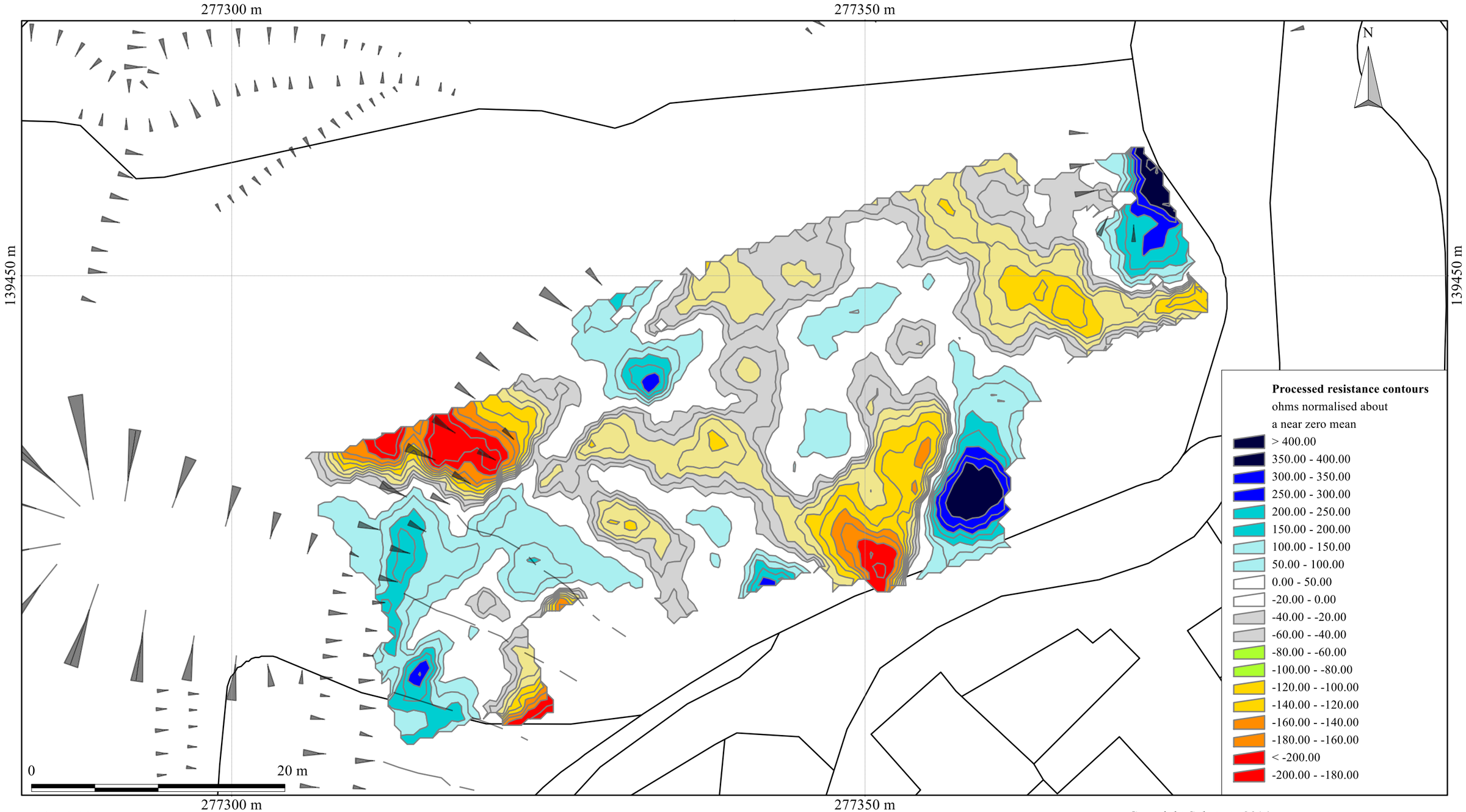

British Grid
centre X: 277339.70 m, centre Y: 139439.56 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer and earth-resistance survey
Land at Ashcombe, Simonsbath, Exmoor, Somerset
Ordnance Survey (E/N): 277340,139440 (point)
Report: 140618

Figure 7: contour plot of earth resistance survey with archaeological earthworks survey (Riley 2014)

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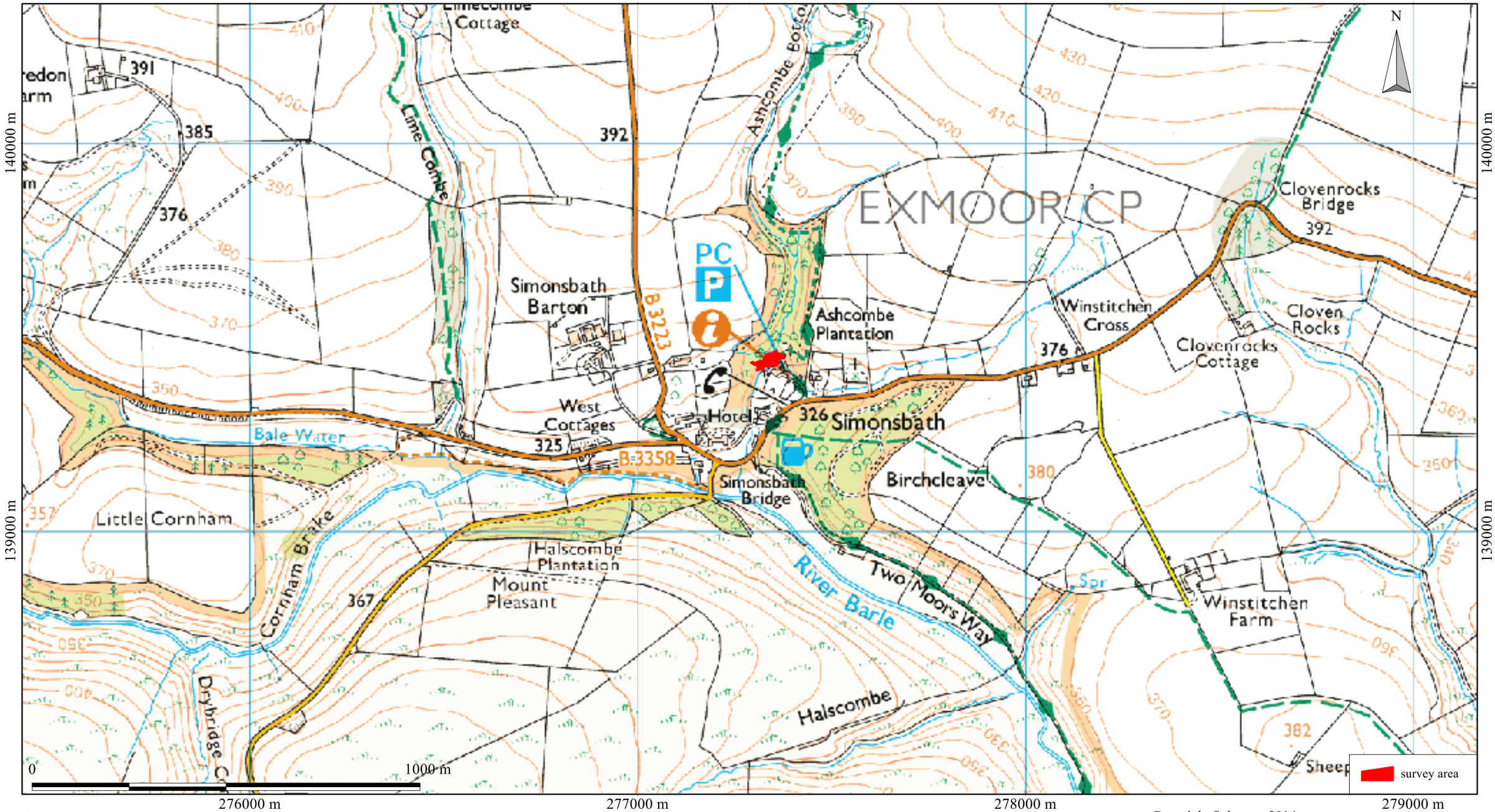

British Grid
centre X: 277288.81 m, centre Y: 139340.21 m

Scale: 1:10000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer and earth-resistance survey
Land at Ashcombe, Simonsbath, Exmoor, Somerset
Ordnance Survey (E/N): 277340,139440 (point)
Report: 140618

Figure 8: location map

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Appendix 2 Methodology Summary

Table 2: methodology summary	
Documents Survey methodology statement: Dean (2014)	
Methodology 1. The work was undertaken in accordance with the survey methodology statement. The geophysical (gradiometer and earth-resistance) 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 *Method of Fixing:* DGPS recording of manual setout of survey grids *Composition:* 30m by 30m grids *Recording:* Geo-referenced and recorded using digital map tiles. *DGPS used:* Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.	
Equipment *Instrument:* Bartington Instruments grad601-2 *Firmware:* version 6.1 *Instrument:* Geoscan Research RM15/MPX15 twin probes with 0.5m separation *Firmware:* RM15 Adv. 30000 Version 2.00	**Data Capture** *Sample Interval:* 0.25-metres *Traverse Interval:* 1 metre *Traverse Method:* zigzag *Traverse Orientation:* N250 *Sample Interval:* 1 metre *Traverse Interval:* 1 metre *Traverse Method:* zig-zag *Traverse Orientation:* N250
Data Processing, Analysis and Presentation Software IntelliCAD Technology Consortium IntelliCAD 7.2 Geoscan Research Geoplot 3 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	

Table 3: gradiometer survey - processed data metadata	
Instrument Type:	Bartington Grad 610
Units:	nT
Direction of 1st Traverse:	250 deg
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing.
Dummy Value:	32702
PROGRAM	
Name:	TerraSurveyor
Version:	3.0.25.1
Stats	
Max:	31.62
Min:	-26.97
Std Dev:	4.31
Mean:	1.20
Median:	0.27
Surveyed Area:	0.18365 ha
Processes: 7	
1 Base Layer	
2 Clip at 3.00 SD	
3 Clip at 1.00 SD	
4 De Stagger: Grids: All Mode: Both By: -3 intervals	
5 DeStripe Median Sensors: All	
6 Edge Match (Area: Top 0, Left 0, Bottom 29, Right 119) to Bottom edge	
7 Interpolate: Match X & Y Doubled.	

Table 4: earth-resistance survey - processed data metadata	
Instrument Type:	Resist. (RM15)
Units:	Ohms normalised about a near zero mean
Direction of 1st Traverse:	250 deg
Collection Method:	ZigZag
Sensors:	1pair (0.5m separation)
Dummy Value:	32702
PROGRAM	
Name:	TerraSurveyor
Version:	3.0.25.1
Stats	
Max:	425.36
Min:	-226.70
Std Dev:	108.61
Mean:	4.23
Median:	-14.08
Surveyed Area:	0.1613 ha
Processes: 4	
1 Base Layer	
2 Despike Threshold: 1 Window size: 3x3	
3 High pass Uniform (mean) filter: Window: 21 x 21	
4 Interpolate: X & Y Doubled.	

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.

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.

<u>Bartington grad601-2 gradiometers</u>

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.

<u>Multiple sensor arrays</u>

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 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.