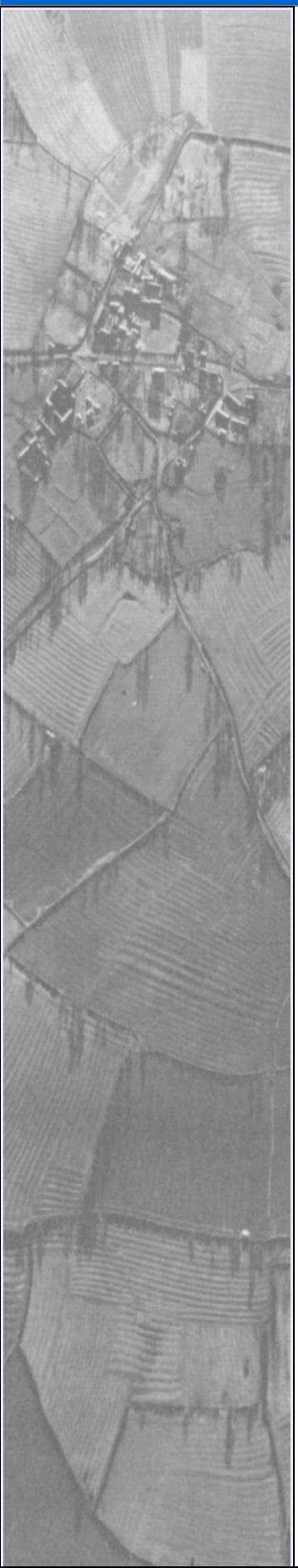

Carwitham Barton
Otterham
Cornwall

MAGNETOMETER SURVEY REPORT

for

Otter Power Ltd

David Sabin and Kerry Donaldson

March 2015

Ref. no. 597

ARCHAEOLOGICAL SURVEYS LTD

Carwitham Barton
Otterham
Cornwall

Magnetometer Survey Report

for

Otter Power Ltd

Fieldwork by David Sabin (Hons) MCIfA
Report by Kerry Donaldson BSc (Hons)
Report checked by David Sabin
Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey dates – 18th March 2015
Ordnance Survey Grid Reference – **Turbine 1 SX 15640 92581, Turbine 2 SX 15461 92545**

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SUMMARY

A detailed magnetometer survey was carried out over the site of two proposed wind turbines by Archaeological Surveys Ltd. The turbines are located at Carwitham Barton in Otterham, Cornwall within two north facing fields at 200m AOD. The surveys were carried out over the turbine locations and the proposed access corridors. The results show a number of discrete positive responses which appear to relate to pit-like features. A number of positive linear anomalies have also been located, and while some may relate to agricultural activity, others do not appear to have any coherent morphology or pattern. Two former field boundaries, removed in the 20th century were also located, together with a potential third such feature, which has not been mapped. Evidence for land drainage and agricultural activity is also recorded in the data.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Otter Power Ltd to undertake a magnetometer survey of an area of land at Carwitham Barton, near Otterham in Cornwall. The site has been outlined for a proposed development of two wind turbines and the survey forms part of an archaeological assessment of the site.

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin so that they may be assessed prior to development of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 The survey and report generally follow the recommendations set out by: English Heritage (2008) *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3 Site location, description and survey conditions

1.3.1 The site is located at Carwitham Barton, within the parish of Otterham, and 650m north east of the hamlet of Marshgate in Cornwall. Turbine 1 is centred on Ordnance Survey National Grid Reference (OS NGR) SX 15640 92581 and Turbine 2 on SX 15461 092545, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 3.3ha of pasture within two separate fields. Survey within the eastern field is referred to as Area 1 with the western field referred to as Area 2. The two areas include a 1ha block centred on each turbine and access corridors up to 30m wide where conditions allowed. The land slopes down to the north and in parts was very boggy. Much of Area 2 was waterlogged and poached by cattle. Some slight undulations were noted in the central part of both survey areas though it is possible that they relate to the underlying geology.

Plate 1: Area 1 looking south east

1.3.3 The ground conditions across the site were poor within Area 2 but generally fine within Area 1. The survey corridor covering the access routes was often very boggy and included a made track along the southern boundary of the field with agricultural items near the south eastern end. All of the 1ha survey blocks were covered, but parts of the access corridor were unsurveyable due to the poor conditions. Weather conditions during the survey were fine and sunny but cold.

1.4 Site history and archaeological potential

1.4.1 The turbine location is on a north facing slope at 200m AOD. To the north are three clusters of late Neolithic or Bronze Age barrows situated on higher ground and ridges. Several medieval boundaries are also recorded in the vicinity of the turbines, and the medieval settlement at Carwitham is located 300m south of Turbine 1. Early mapping shows that the two turbines were situated within a single field in 1842, with the southern part of Area 1 containing a field boundary between 1842 and at least 1945, removed by

1962, and another to the north west of Turbine 1 between 1886 and 1945, removed by 1962.

1.4.2 The existence of medieval, post medieval and modern field boundaries within the site and surrounding area indicates a high potential for the survey to locate such features. There is also potential for the survey to locate buried archaeological features should they exist within the site.

1.5 Geology and soils

1.5.1 The underlying geology is mudstone and siltstone from the Crackington Formation (BGS, 2015).

1.5.2 The overlying soil across the site is from the Halstow association and is a typical non-calcareous pelosol. It consists of a slowly permeable, clayey soil over shale (Soil Survey of England and Wales, 1983).

1.5.3 Magnetometry carried out over similar geology and soil has produced good results. The site is, therefore, considered suitable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20 Hz. The gradiometers have a range of recording data between 0.1nT and 10,000nT. The system is linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.

2.2.2 Data are collected along a series of parallel survey transects wherever possible. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses.

2.2.3 Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.3 Data processing and presentation

2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display using TerraSurveyor.

2.3.2 The data are collected between limits of ±10000nT and clipped for display at ±10nT for Area 1 and ±5nT for Area 2. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track. A zero median traverse function is required in order to remove fixed offset values present within the sensors which do not undergo a zeroing procedure in the field. The approach ensures that the gradiometer sensors are very accurately aligned and fixed to the vertical magnetic field and are not influenced by localised magnetic fields or disturbed by vibration. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on any processes, such as clipping, carried out on the data.

2.3.4 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot.

2.3.5 The raster images are combined with base mapping using ProgeCAD Professional 2014, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GPS, resection method, etc.

2.3.6 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within each survey area.

2.3.7 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results

3.1.1 The detailed magnetic survey was carried out over a total of 2 survey areas covering approximately 3.3ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, anomalies associated with land management, linear anomalies of an agricultural origin, areas of magnetic debris and strong discrete dipolar anomalies relating to ferrous objects. Anomalies located within each survey area have been numbered and are described below.

3.2 Statement of data quality

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset. Within both survey areas there is evidence for zones of suppressed magnetic susceptibility visible as areas showing much weaker magnetic contrast. These tend to correlate with wetter areas within the fields probably indicating that the ground is permanently damp in places.

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is

indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	Description and origin of anomalies
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG NEG DISCRETE UNCERTAIN AS-ABST MAG POS UNCERTAIN AS-ABST MAG NEG UNCERTAIN	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies relating to land management AS-ABST MAG BOUNDARY AS-ABST MAG LAND DRAIN	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel positive or negative linear anomalies.
Anomalies with an agricultural origin AS-ABST MAG AGRICULTURAL	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing.
Anomalies associated with magnetic debris AS-ABST MAG DEBRIS AS-ABST MAG STRONG DIPOLAR	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, or hearths and may therefore be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Turbine centred on OS NGR 215640 92581, see Figures 03 & 04.

Anomalies with an uncertain origin

(1) – A positive curvilinear anomaly is located in the northern part of the turbine area. It only appears as a semi-circular feature which may have been truncated by ploughing. It may be associated with a discrete positive response and negative curvilinear. It is within a zone of surface undulations, but it is not possible to determine if these relate to the underlying geology or anthropogenic features. It is not possible to determine if this relates to a cut, ditch-like feature, but an archaeological origin should be considered.

(2 & 3) – The survey area contains two discrete positive anomalies that appear to relate to pit-like features, which may have some archaeological potential. Anomaly (2) has dimensions of 4.2m by 5.4m and is located to the north of a fragmented positive linear anomaly and to the west of a group of positive discrete responses (4). Anomaly (3) is larger and more irregular in shape with dimensions of 7.6m by 8.3m.

(4) – Located 12m to 18m west and south west of anomaly (2) in the northern part of the site are a small group of discrete positive responses. Several other pit-like responses can be seen throughout the survey area.

(5) – Towards the southern end of the access route is a positive linear anomaly. It has a similar response to anomalies (15) which relate to land drains. A weaker, narrower positive linear anomaly appears to continue towards the south west, but it is not clear if this is associated.

(6) – At the southern end of the access route is a negative response, flanked by two positive linear responses. This type of anomaly would generally indicate a former Cornish Hedge field boundary, although none has been marked on any former mapping from 1842 onwards. This anomaly could therefore relate to an unmapped field boundary, removed prior to 1842.

(7) – A positive linear anomaly, parallel with and located 6.5m to the south of anomaly (13) may be associated with the former field boundary.

(8) – A positive linear anomaly is located in the south western corner of the survey area and is parallel with the south western land boundary located 11m to the west. It is possible that is relates to a cut feature; however, this part of the survey area contains a number of anomalies (9) with no coherent form.

(9) – The southern part of the survey area contains a number of positive linear, curvilinear and discrete anomalies. A small number of negative linear anomalies are also apparent. There is a lack of coherent morphology to these responses and although they may relate to cut features, a natural origin or association with

agricultural ruts should be considered.

(10) – A weakly positive linear anomaly can be seen in the south eastern part of the turbine area. It has a similar orientation to anomaly (15) and is it possible that it is relate to land drainage, or possibly agricultural activity. Two other weakly positive linear anomalies are oriented parallel with it to the north.

(11) - A positive linear anomaly has a similar response, but slightly different orientation, to agricultural anomalies (16). It is possible that it also relates to agricultural activity, but this is not certain.

(12) – Two short, positive linear anomalies are oriented north west to south east in the central part of the survey area, but their origin is uncertain.

Anomalies associated with land management

(13) – A negative response, flanked by positive responses, crosses the central part of the survey area. This relates to a former field boundary recorded on mapping between 1842 and 1946 but removed by 1962.

(14) – Crossing the north western corner of the turbine area is a negative anomaly, flanked by two positive responses. This relates to a field boundary not mapped in 1842, but recorded between 1886 and 1946 and removed prior to 1962.

(15) – Three positive linear anomalies, oriented west north west to east south east, extend either fully or partially across the turbine area. These appear to relate to land drains.

Anomalies with an agricultural origin

(16) – A series of linear anomalies, parallel with the western field boundary, relate to agricultural activity. They are more clearly seen within zones of shallow geology, and less clear in waterlogged areas.

Anomalies associated with magnetic debris

(17) – In the southern part of the survey area are a number of patches of magnetic debris. These may be associated with ground consolidation, but this is not certain.

3.5 List of anomalies - Area 2

Turbine centred on OS NGR 215461 92545, see Figures 03 & 04.

Anomalies with an uncertain origin

(18) – In the north eastern part of the turbine survey area is a positive anomaly with a discrete positive response and possible curvilinear anomaly adjacent to it. The anomalies are within a zone of undulations; however, it is not certain if these relate to the underlying geology or if they are anthropogenic features.

(19) – The survey area contains a number of positive linear anomalies with no coherent pattern or morphology. It is possible that some relate to agricultural activity or vehicle ruts.

(20) – A short, positive linear anomaly can be seen in the southern part of the site along the access corridor. This type of response may indicate a cut feature; however, it is not possible to determine its origin.

(21) – A negative linear anomaly extends along the long axis of the access route. It is possible that it relates to a vehicle rut or agricultural mark.

Anomalies associated with land management

(22) – Three positive linear anomalies extend partially across the survey corridor. Their position and orientation indicate that they are associated with land drains recorded on a 1985 aerial photograph; however, the southernmost and northernmost should continue across the whole of the survey area and the middle one is not recorded on the aerial photograph.

Anomalies with an agricultural origin

(23) – A series of parallel linear anomalies relate to agricultural activity and are clearly seen on areas where the geology is close to the surface. They are not well defined in areas that are waterlogged.

Anomalies associated with magnetic debris

(24) – A band of magnetic debris extends along the south eastern edge of the access corridor. It is likely to be associated with material used for ground consolidation along the track.

(25) – Strong, discrete, dipolar anomalies are a response to ferrous and other magnetically thermoremnant objects within the topsoil and are evident within both survey areas.

4 CONCLUSION

4.1.1 The detailed magnetometer survey located a positive curvilinear anomaly to the north of the location of Turbine 1. Although semi-circular in shape it is possible that it relates to a cut feature. Two other large pit-like anomalies have also been located within Area 1; one to the south west of the turbine location and one in the southern part of the access corridor. The survey area also contains a number of positive linear and discrete anomalies that could not be confidently interpreted.

4.1.2 Area 1 also contains anomalies relating to two field boundaries removed during the middle of the 20th century. There is also some evidence for a third, previously unmapped, field boundary towards the south western part of the access corridor.

4.1.3 Area 2 also contains a large pit-like feature to the north of the turbine location and a number of positive linear anomalies that lack a coherent form. Both survey areas contain parallel linear anomalies that relate to a series of land drains. Agricultural anomalies can also be seen within zones of shallow geology, but both areas also contain zones of low magnetic contrast where waterlogging has occurred.

5 REFERENCES

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Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material.

Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field.

Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±20nT and ±10nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero (destripe) Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise differences between the baseline value of gradiometer sensors.

High Pass Filtering

A mathematical process used to remove low frequency anomalies relating to survey tracks and modern agricultural features.

Appendix C – survey and data information

Area 1

COMPOSITE
Filename: J597-mag-Area1.xcp
Description: Imported as Composite from: J597-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y): OSGB36
Northwest corner: 215581.804180226, 92639.1216293522 m
Southeast corner: 215727.004180226, 92303.1216293522 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 667900

Dimensions
Composite Size (readings): 968 x 2240
Survey Size (meters): 145 m x 336 m
X Interval: 0.15 m
Y Interval: 0.15 m

Stats
Max: 11.05
Min: -11.00
Std Dev: 3.94
Mean: 0.17
Median: -0.01
Composite Area: 4.8787 ha
Surveyed Area: 1.8942 ha

Processes: 1
1 Base Layer

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -20.00 to 20.00 nT
5 Clip from -10.00 to 10.00 nT

Area2

COMPOSITE
Filename: J597-mag-Area2.xcp
Description: Imported as Composite from: J597-mag-Area2.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y): OSGB36
Northwest corner: 215398.134234919, 92608.1799941515 m
Southeast corner: 215590.734234919, 92393.5299941515 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 598900

Dimensions
Composite Size (readings): 1284 x 1431
Survey Size (meters): 193 m x 215 m
X Interval: 0.15 m
Y Interval: 0.15 m

Stats
Max: 5.53
Min: -5.50
Std Dev: 1.29
Mean: 0.03
Median: 0.00
Composite Area: 4.1342 ha
Surveyed Area: 1.4014 ha

Processes: 1
1 Base Layer

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -10.00 to 10.00 nT
5 Clip from -5.00 to 5.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site. A submission of the report will be made to Online AccesS to the Index of archaeological investigationS (OASIS)

Archive contents:

Geophysical data Area 1 - path: J597 Carwitham Barton\Data				
Path and Filename	**Software**	**Description**	**Date**	**Creator**
carwitham1\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA.		D.J.Sabin
carwitham1\MX\J597-mag-Area1.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey Area 1 in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.		D.J.Sabin
Area1\comps\ J597-mag-Area1.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.		D.J.Sabin
Area1\comps\ J597-mag-Area1-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT).		D.J.Sabin
Geophysical data Area 2 - path: J597 Carwitham Barton\Data				
carwitham2\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA at.		D.J.Sabin
carwitham2\MX\J597-mag-Area2.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey Area 2 in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.		D.J.Sabin
Area2\comps\ J597-mag-Area2.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.		D.J.Sabin
Area2\comps\ J597-mag-Area2-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT).		D.J.Sabin
Graphic data - path: J597 Carwitham Barton\Data				
Area1\graphics\ J597-mag-Area1-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT.		K.T.Donaldson
Area1\graphics\ J597-mag-Area1-proc.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.		K.T.Donaldson
Area2\graphics\ J597-mag-Area2-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT.		K.T.Donaldson
Area2\graphics\ J597-mag-Area2-proc.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.		K.T.Donaldson
CAD data - path: J597 Carwitham Barton\CAD				
J597 version 1.dwg	ProgeCAD 2014	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.		K.T.Donaldson
Text data - path: J597 Carwitham Barton\Documentation				
J597 report.odt	OpenOffice.org 3.0.1 Writer	Report text as an Open Office document.		K.T.Donaldson

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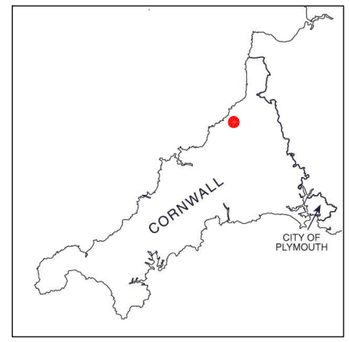
Map of survey area



● Survey location

Turbine 1 centred on OS NGR SX 15640 92581

Turbine 2 centred on OS NGR SX 15461 92545

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

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Referencing information

Referencing grid to OSGB36 datum at 50m intervals

Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

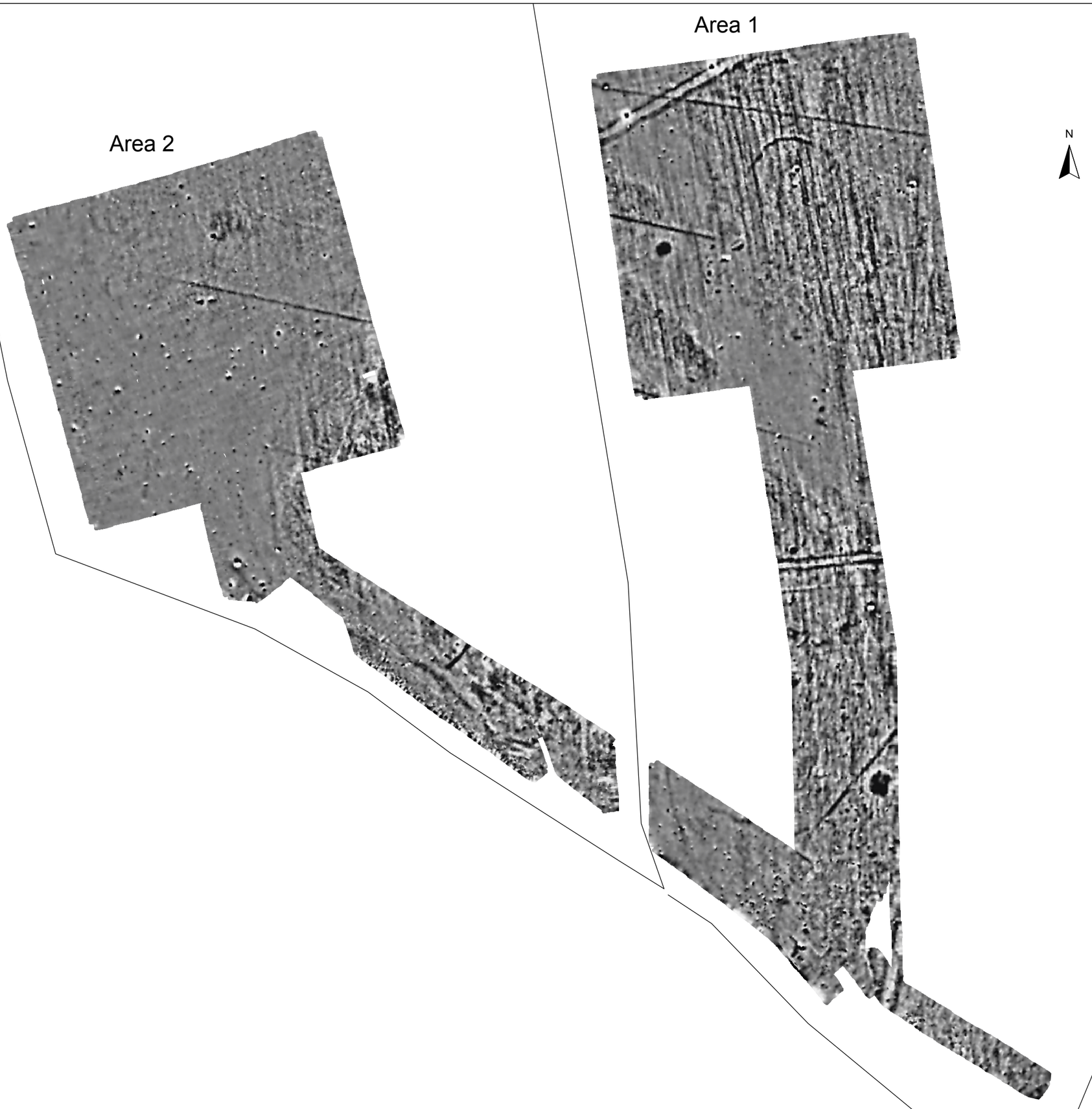
- Turbine area 1 centred on 215640 92581
- Turbine area 2 centred on 215461 92545
- Proposed access track

SCALE 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 02



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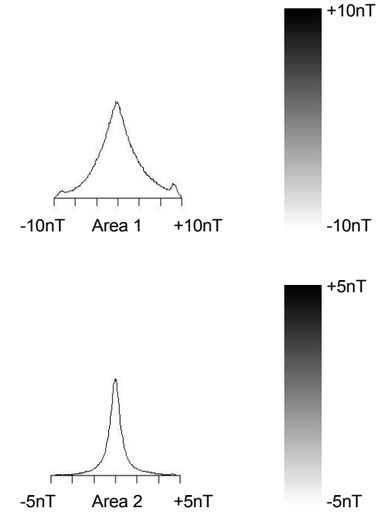
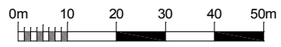
Greyscale plot of minimally processed magnetometer data



SCALE 1:1250



SCALE TRUE AT A3

FIG 03

Area 1

Area 2

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Abstraction and interpretation of magnetometer anomalies

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Positive linear anomaly - possible land drain
- Negative linear anomaly - material of low magnetic susceptibility
- Positive linear anomaly - possible former field boundary
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 04