

**Former Petroleum Storage Depot
Bognor Road
Chichester
West Sussex**

MAGNETOMETER SURVEY REPORT

for

Development Archaeology Services Ltd

Kerry Donaldson & David Sabin

July 2016

Ref. no. J672

ARCHAEOLOGICAL SURVEYS LTD

**Former Petroleum Storage Depot
Bognor Road
Chichester
West Sussex**

Magnetometer Survey Report

for

Development Archaeology Services Ltd

Fieldwork by David Sabin (Hons) MCIfA

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Report checked by David Sabin

Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey date – 14th July 2016

Ordnance Survey Grid Reference – **SU 87965 04260**



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SUMMARY

Detailed magnetometry was carried out by Archaeological Surveys Ltd across the site of a former petroleum storage depot on the eastern edge of Chichester, West Sussex. The site contains a number of turf covered storage tanks, a disused railway line and other infrastructure. The results of the survey have effectively mapped the location of buried infrastructure associated with steel pipes and armoured cables. To the east of a disused railway line the ground appears undisturbed by features associated with the depot. The north western part of the site and some small zones in between the tanks may also be relatively free of infrastructure. Some weakly positive linear anomalies of uncertain origin can be seen in the northern part of the site, away from zones of modern disturbance, as well as a larger number of discrete positive responses also of uncertain origin.

1 INTRODUCTION

1.1 Survey background

- 1.1.1 Archaeological Surveys Ltd was commissioned by Chris Pine of Development Archaeology Services Ltd (DAS) to undertake a magnetometer survey of an area of land at the former petroleum storage depot, Bognor Road, Chichester, West Sussex. The site has been outlined for a proposed residential development by Hanbury Properties Ltd. The survey forms part of an archaeological assessment of the site.
- 1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2016) and issued to James Kenny, Archaeology Officer for Chichester District Council, prior to commencing the fieldwork.

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. It also aims to find out if there are other unrecorded buried tanks or pipes within the site in order to establish the extent of the modern disturbance. 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 lies within the parish of Oving and is situated to the north of Bognor Road (A259) and east of the A27 Chichester By-pass (see Fig 01). The central OS Grid Reference is SU 87965 04260. The site comprises a disused Oil and Pipelines Agency fuel storage depot and contains a number of fuel storage tanks, visible as grass covered mounds, with several associated buildings, hardstanding and infrastructure in the southern part of the site and a disused railway extending diagonally across the eastern half of the site (see Fig 02). The area covered by the site is approximately 4.85ha with approximately 3.5ha of surveyable land, which contains roughly grazed pasture that had been mown prior to survey.



Plate 1: Survey area looking north west

- 1.3.2 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data. However, the presence of numerous steel objects within the survey area was considered likely to produce high levels of magnetic disturbance. Weather conditions during the survey were fine and warm.

1.4 Site history and archaeological potential

- 1.4.1 An Archaeological Desk-Based Assessment has been carried out by Development Archaeology Services (2014). The site contains a WWII fuel depot and associated infrastructure which may have impacted on any buried archaeological remains; however, the eastern part of the site appears to have

been subject to less disturbance and may have a higher archaeological potential.

- 1.4.2 Within Drayton Sand and Gravel Pit, located to the east of the site, archaeological investigations have recorded evidence for Neolithic, Bronze Age, Iron Age and Roman occupation and activity. To the south are the location of two cropmark ring ditches, a Neolithic stone axe and a Palaeolithic handaxe.
- 1.4.3 The presence of modern structures and infrastructure within the site is likely to cause widespread disturbance. It is possible that the survey will locate unrecorded modern objects such as buried tanks and pipes. Within areas away from modern magnetic disturbance there is potential for the survey to locate archaeological features, should they be present within the site.

1.5 *Geology and soils*

- 1.5.1 The underlying solid geology across the site is clay, silt and sand from the London Clay Formation with with overlying alluvial fan deposits of gravel, sand, silt and clay in the west and River Terrace deposits of sand, silt and clay in the eastern part of the site (BGS, 2016).
- 1.5.2 The overlying soil across the survey area is from the Hamble 2 association and is a typical argillic brown earth. It consists of a deep, stoneless, well drained, silty soil over gravel (Soil Survey of England and Wales, 1983)..
- 1.5.3 Magnetometry survey carried out across similar soils has produced variable results. Where there has been long term occupation and/or industrial activity then there can be sufficient magnetic contrast between the fill of cut features and the material into which they are cut for the formation of magnetic anomalies. Naturally formed features can also be present, and at times these can be difficult to distinguish from those with an anthropogenic origin. The underlying geology and soils are therefore considered acceptable 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 thermoremanence 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 20Hz. The gradiometers have a range of recording data between 0.1nT and 10,000nT. The sensors are not zeroed in the field, as the vertical axis alignment is fixed using a tension band system. In order to produce visible, useful greyscale images a zero median traverse process is undertaken in TerraSurveyor. The system is linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged computer.
- 2.2.2 Data are collected along a series of parallel survey tracks wherever possible. The length of each track is variable and relates to the size of the survey area and other factors including ground conditions. A visual display aids accurate placing of tracks and their separation.
- 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 ± 10000 nT and clipped for display at ± 500 nT (Fig 03) to see the extent of the strongly magnetic pipes and cables clearly and at ± 5 nT (Fig 04) to enhance the weaker anomalies in the eastern part of the site. 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 2016, creating DWG (2010) 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 also drawn and plotted 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.
- 2.3.7 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 the survey area.
- 2.3.8 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 3.5ha within a single site bisected by a disused railway line.
- 3.1.2 Magnetic anomalies located can be generally classified as positive anomalies of an uncertain origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried cables and pipelines. Anomalies




located within each survey area have been numbered and are described in 3.4 below.

3.2 Statement of data quality

- 3.2.1 Data are considered representative of the magnetic anomalies present within the site. Due to the presence of steel tanks, pipelines, cables etc. the data are frequently highly disturbed, and weak anomalies relating to cut features, for example, are unlikely to be resolved within the most disturbed areas. Additional high pass filtering was carried out on the data to allow analysis of weak anomalies within disturbed zones.

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 within the 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 POS DISCRETE UNCERTAIN 	The category applies to a range of anomalies where <u>there is not enough evidence to confidently suggest an origin</u> . Anomalies in this category <u>may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered</u> . 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 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 thermoremanent 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 <u>may therefore be archaeologically significant</u> . 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.
Anomalies with a modern origin AS-ABST MAG DISTURBANCE AS-ABST MAG PIPELINE AS-ABST MAG CABLE 	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around such features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are

	present. Fluxgate sensors may respond erratically and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.
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Table 1: List and description of interpretation categories

3.4 List of anomalies

Area centred on OS NGR 487965 104260, see Figs 03 - 05.

Anomalies with an uncertain origin

(1) - A small number of weakly positive linear anomalies of uncertain origin are located in the north western part of the survey area. Towards the south eastern corner is a single positive linear anomaly which appears to extend between the railway and a lamp post and a cable is possible.

(2) - The northern part of the survey area, to the east and west of the disused railway line, contains a number of discrete positive responses. They appear pit-like; however, due to the widespread magnetic contamination in the site and lack of any associated anomalies, their origin cannot be confidently determined.

Anomalies associated with magnetic debris

(3) - The site contains widespread and numerous strong, discrete, dipolar anomalies which relate to ferrous objects in the topsoil.

Anomalies with a modern origin

(4) - A series of strong, multiple dipolar, linear anomalies extend between the disused railway line and the tanks within the site. These relate to buried fuel pipes.

(5) - A number of strong, multiple dipolar linear anomalies, weaker and narrower in response than anomalies (4), relate to buried cables, although one or two may relate to further pipes. Many extend towards lamp posts near the tank entrances, the full extent of others is not clear.

4 CONCLUSION

- 4.1.1 The survey has located a network of buried steel pipelines and cables. The results demonstrate that much of the site in between the oil storage tanks has been subject to physical disturbance through the digging of pipe and cable trenches. The survey has successfully mapped the location of the buried infrastructure. No additional unmapped buried tanks were located.

- 4.1.2 Away from zones of magnetic disturbance caused by the tanks and associated buried infrastructure the magnetic response is very weak. There are a small number of weakly positive linear anomalies and more numerous discrete anomalies in the northern part of the site, but their origin cannot be determined as they are poorly defined and lack a coherent morphology.
- 4.1.3 The results infer no significant ground disturbance associated with the depot to the east of the disused railway track. In addition, the north western part of the site appears less disturbed than areas to the south, and there are small zones in between tanks within the south western part of the site that demonstrate limited disturbance.

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 thermoremanent 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.

Thermoremanent 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. Thermoremanent features include ovens, hearths, and kilns. In addition thermoremanent 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 $\pm 5\text{nT}$ and $\pm 3\text{nT}$ 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 minimally processed data

COMPOSITE
 Filename: J672-mag-Area1-proc.xcp
 Description: Imported as Composite from: J672-mag-Area1.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB 36
 Northwest corner: 487829.279801136, 104362.527054316 m
 Southeast corner: 488096.729801136, 104168.727054316 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702

Source GPS Points: 886800

Dimensions
 Composite Size (readings): 1783 x 1292
 Survey Size (meters): 267 m x 194 m
 Grid Size: 267 m x 194 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats
 Max: 552.50
 Min: -550.00
 Std Dev: 105.04
 Mean: -0.75
 Median: -0.11
 Composite Area: 5.1832 ha
 Surveyed Area: 2.3905 ha

PROGRAM
 Name: TerraSurveyor
 Version: 3.0.23.0

Processes: 1
 1 Base Layer

GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -500.00 to 500.00 nT

Area 1 filtered data

COMPOSITE
 Filename: J672-mag-Area1-proc-hpf.xcp
 Description: Imported as Composite from: J672-mag-Area1.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 487829.279801136, 104362.527054316 m
 Southeast corner: 488096.729801136, 104168.727054316 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702

Source GPS Points: 886800

Dimensions
 Composite Size (readings): 1783 x 1292
 Survey Size (meters): 267 m x 194 m
 Grid Size: 267 m x 194 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats
 Max: 5.00
 Min: -5.00
 Std Dev: 3.65
 Mean: -0.06
 Median: -0.03
 Composite Area: 5.1832 ha
 Surveyed Area: 2.3905 ha

Processes: 2
 1 Base Layer
 2 Clip from -5.00 to 5.00 nT

GPS based Proce6
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:

4 Clip from -500.00 to 500.00 nT
 5 High pass Uniform (median) filter: Window dia: 300
 6 Clip from -10.00 to 10.00 nT

Area 2 minimally processed data

COMPOSITE
 Filename: J672-mag-Area2-proc.xcp
 Description: Imported as Composite from: J672-mag-Area2.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 487952.333630994, 104366.561104442 m
 Southeast corner: 488097.233630994, 104183.411104442 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702

Source GPS Points: 304400

Dimensions
 Composite Size (readings): 966 x 1221
 Survey Size (meters): 145 m x 183 m
 Grid Size: 145 m x 183 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats
 Max: 552.50
 Min: -550.00
 Std Dev: 32.81
 Mean: 0.95
 Median: 0.06
 Composite Area: 2.6538 ha
 Surveyed Area: 0.9405 ha

Processes: 1
 1 Base Layer

GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -500.00 to 500.00 nT

Area 2 filtered data

COMPOSITE
 Filename: J672-mag-Area2-proc-hpf.xcp
 Description: Imported as Composite from: J672-mag-Area2.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 487952.333630994, 104366.561104442 m
 Southeast corner: 488097.233630994, 104183.411104442 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702

Source GPS Points: 304400

Dimensions
 Composite Size (readings): 966 x 1221
 Survey Size (meters): 145 m x 183 m
 Grid Size: 145 m x 183 m
 X Interval: 0.15 m
 Y Interval: 0.15 m

Stats
 Max: 3.00
 Min: -3.00
 Std Dev: 1.15
 Mean: -0.01
 Median: 0.00
 Composite Area: 2.6538 ha
 Surveyed Area: 0.9405 ha

Processes: 2
 1 Base Layer
 2 Clip from -3.00 to 3.00 nT

GPS based Proce5
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -5.00 to 5.00 nT
 5 High pass Uniform (median) filter: Window dia: 30

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 PDF copy will be supplied to the West Sussex Historic Environment Record with printed copies on request. The report will also be uploaded to the Online Access to the Index of archaeological investigations (OASIS).

Archive contents:

Geophysical data - path: J672 Petrol storage depot, Chichester\Data\				
Path and Filename	Software	Description	Date	Creator
chich1\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA.	14/07/16	D.J.Sabin
chich1\MX\J672-mag.asc chich1\MX\J672-mag-Area1.asc chich1\MX\J672-mag-Area2.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey Area 1 in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.	15/07/16	K.T.Donaldson
Area1\comps\J672-mag-Area1.xcp Area2\comps\J672-mag-Area2.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.	15/07/16	K.T.Donaldson
Area1\comps\J672-mag-Area1-proc.xcp Area2\comps\J672-mag-Area2-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to $\pm 500\text{nT}$).	15/07/16	K.T.Donaldson
Area1\comps\J672-mag-Area1-proc-hpf.xcp Area2\comps\J672-mag-Area2-proc-hpf.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt, high pass filter and clipping to $\pm 5\text{nT}$). Processed composite data file (zmt, high pass filter and clipping to $\pm 3\text{nT}$).	15/07/16	K.T.Donaldson
Graphic data - path: J672 Petrol storage depot, Chichester \Data\				
J672-mag-Area1-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to $\pm 500\text{nT}$.	15/07/16	K.T.Donaldson
J672-mag-Area1-proc. tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	15/07/16	K.T.Donaldson
J672-mag-Area1-hpf-5nT.tif	TerraSurveyor 3.0.23.0	TIF file showing a filtered greyscale plot clipped to $\pm 5\text{nT}$.	15/07/16	K.T.Donaldson
J672-mag-Area1-hpf-5nT. tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	15/07/16	K.T.Donaldson
J672-mag-Area2-proc.-hpf-5nT.tif	TerraSurveyor 3.0.23.0	TIF file showing a filtered greyscale plot clipped to $\pm 5\text{nT}$.	15/07/16	K.T.Donaldson
J672-mag-Area2-proc.-hpf-5nT.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	15/07/16	K.T.Donaldson
CAD data - path: J672 Petrol storage depot, Chichester\CAD\				
J672 version 2.dwg	ProgeCAD 2016	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.	15/07/16	K.T.Donaldson
Text data - path: J672 Petrol storage depot, Chichester\Documentation\				
J672 report.odt	OpenOffice.org 3.0.1 Writer	Report text as an Open Office document.	22/07/16	K.T.Donaldson

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**Geophysical Survey
Former Petroleum Storage Depot
Bognor Road
Chichester
West Sussex**

Map of survey area

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● Survey location

Site centred on OS NGR
SU 87968 84257

SCALE 1:25 000



SCALE TRUE AT A3

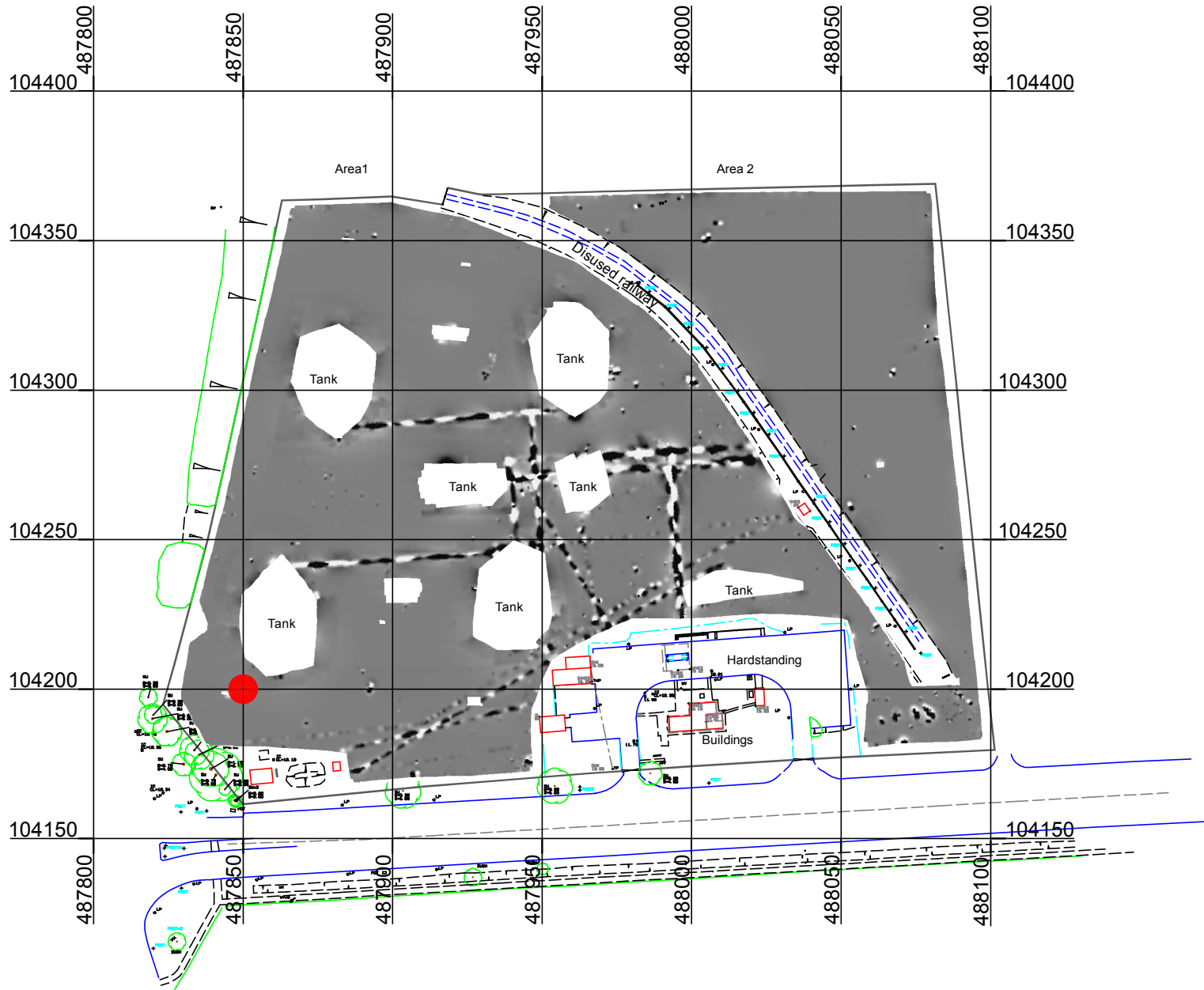
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Referencing information

Referencing grid to OSGB36 datum at 50m intervals

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

487850 104200

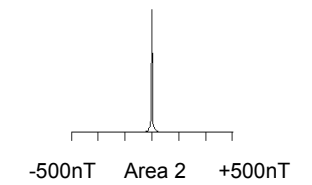


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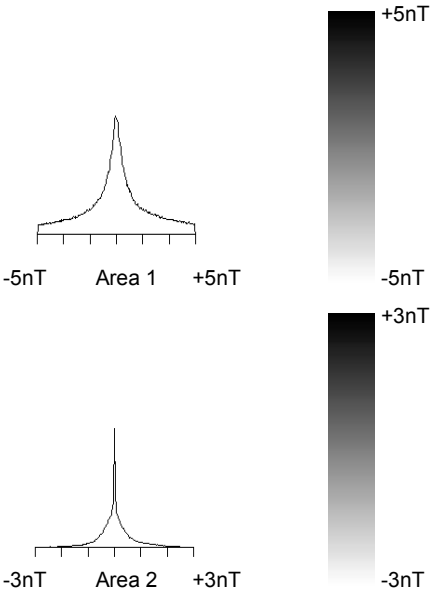
FIG 02



SCALE TRUE AT A3

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Greyscale plot of filtered
magnetometer data



SCALE 1:1000



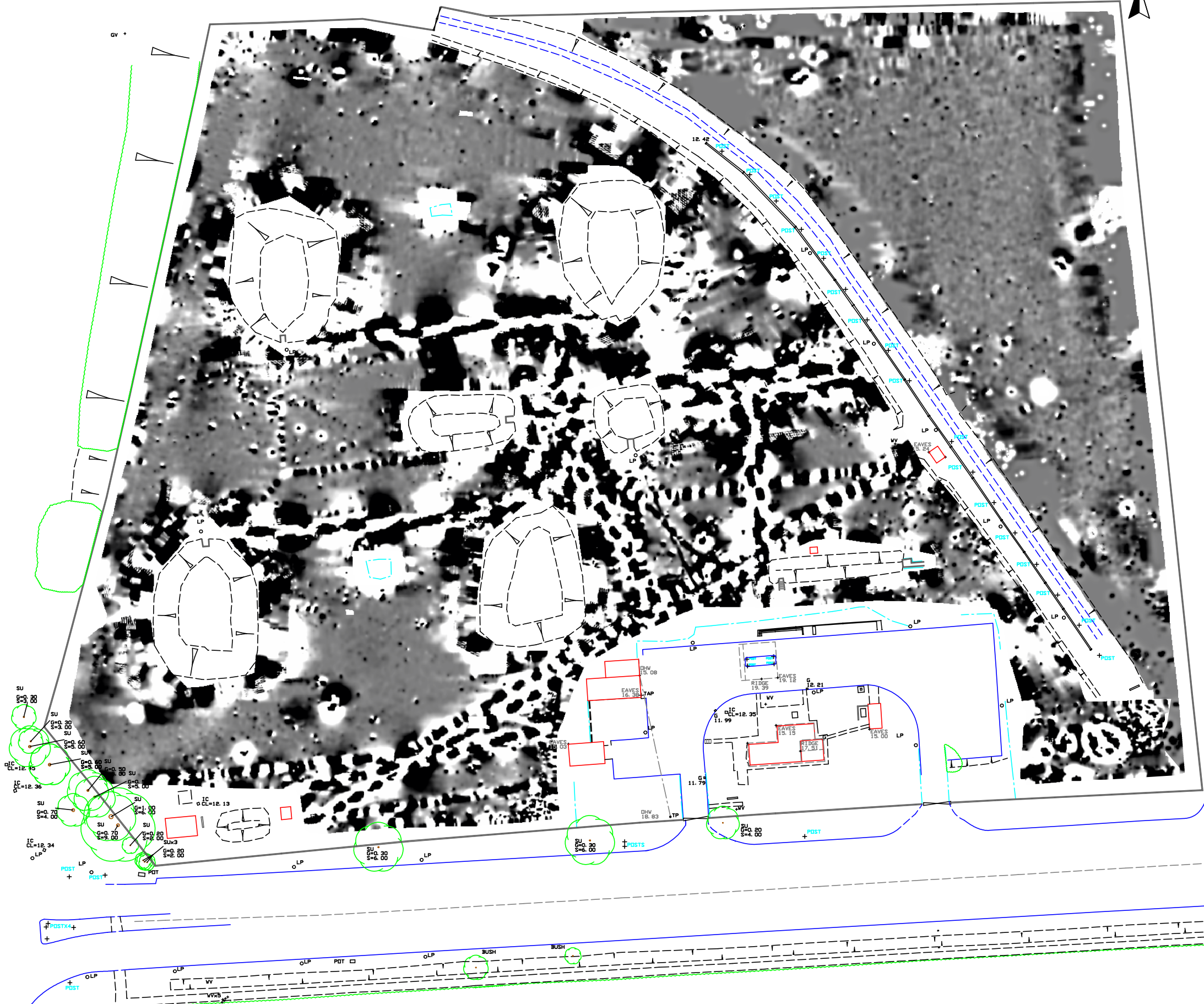
SCALE TRUE AT A3

FIG 04

Area1

Area 2

N



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Abstraction and interpretation of
magnetometer anomalies

- Positive linear anomaly - possible ditch-like feature
- Strong multiple dipolar linear anomaly - pipe
- Strong multiple dipolar linear anomaly - cable / possible pipe
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1000



SCALE TRUE AT A3

FIG 05

