KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTFORDSHIRE

DETAILED MAGNETOMETER SURVEY

Report Number: 1031

July 2013

KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTFORDSHIRE

Detailed Magnetometer Survey

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Site Code	VPM13	**NGR**	TL 1408 0664
Planning Ref.	-	**OASIS**	britanni1-155259
Approved By	Matthew Adams	**DATE**	July 2013

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ABSTRACT

A range of anomalies were detected within the dataset, unfortunately none of which can be definitively assigned a probable archaeological origin. Alluvial deposits laid down by the River Ver (located approximately 100m from the centre of the survey grid) could be masking potential archaeological anomalies. The relatively high magnetic background of the site could also prevent weak, low contrast anomalies from being detected.

It is likely that this area has been a floodplain for some considerable time and therefore only suitable for farmland due to highly fertile soil and occasional flooding. The background research shows this land-use continued until it was turned into Verulamium Park. This interpretation is given further credence by the lack of archaeological features present during an archaeological evaluation undertaken nearby.

1.0 INTRODUCTION

On the 15th July 2013 Britannia Archaeology Ltd (BA) undertook a detailed magnetometer survey on behalf of Claire Hallybone, Senior Archaeologist at Thames Water Utilities Ltd, in response to a request by Simon West the District Archaeologist at St Albans City and District Council. The survey covered an area of 1.6 hectares of land at King Harry Lane, Verulamium Park, St Albans, Hertfordshire (NGR TL 14 06) as part of a programme of archaeological works culminating in a 'strip, map and record' phase.

This survey was undertaken to cover the footprint of the proposed sewer upgrade, while allowing for a suitable zone around the periphery (see Figures 1 & 2). The aim was to locate anomalies of potential archaeological origin, relating to the Roman town of Verulamium and its Iron Age precursor, that are likely to be damaged by the proposed works. The weather was very hot and sunny following a hot and dry spell.

2.0 SITE DESCRIPTION

The site is located on short cut grass within Verulamium Park (see DP's 1 – 3), to the north of the existing running track and Mud Lane, to the south-east of the Roman town of Verulamium and to the south of St Albans. It is present at approximately 80m AOD on a terrace that overlooks the River Ver that is situated further north.

The Bedrock is described as Lewes Nodular Chalk Formation and Seaford Chalk Formation, a sedimentary rock formed approximately 84 to 94 million years ago in the Cretaceous Period, when the local environment was dominated by warm shallow chalk shelf seas (BGS, 2013).

The superficial deposits are alluvium soils composed of clay, silt, sand and gravel that were deposited by rivers up to 2 million years ago forming channels comprising river terrace material. Fine silt and clay was also deposited from overbank floods creating floodplain alluvium and bogs depositing peat (BGS, 2013).

2.1 Digital Site Photos

DP1

Proposed Compound Area, Looking North-west, running track back-left of photo.

DP2

View of Access Route

DP3

Manhole 0602, Looking North-east along the line of the proposed sewer upgrade.

3.0 WATER INDUSTRY CODE OF PRACTICE

The archaeological work was undertaken using Thames Waters permitted development rights, in accordance with the Water Industry Act's Code of Practice which gives guidance on matters which they should consider when undertaking their duties in respect of conservation, access and recreation.

3.1 Environment Act 1995 Water Industry Act 1991 Code of Practice on Conservation, Access and Recreation: Guidance for the Environment Agency and Water and Sewerage Undertakers.

The duties involve:

- the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest;
- the protection and conservation of buildings, sites and objects of archaeological, architectural, engineering (in the case of the Agency) or historic interest;
- the effect of any proposals on the beauty or amenity of any rural or urban area or on any flora, fauna, features, buildings, sites or objects;
- in the case of the Agency, the effect which any proposals would have on the economic and social well-being of local communities in rural areas;
- the maintenance of public freedom of access to places of natural beauty and to buildings, sites or objects of archaeological, architectural or historic interest;
- the availability of water and associated land to which the relevant bodies have rights for recreational purposes, taking into account the needs of disabled people;
- additional environmental duties with respect to sites of special interest.

4.0 ARCHAEOLOGICAL BACKGROUND

Detailed magnetometer survey was undertaken over 1.6 hectares of park land located in an area considered to have very high archaeological potential.

The site is located near to the Roman town of Verulamium and its Iron Age precursor. Roman Watling Street is situated to the south of the survey area orientated south-east to north-west connecting at Verulamium's London Gate.

During excavations in the 1960's, below what is now the running track to the south of Mud Lane, Late Iron Age and Roman remains were recorded that included a cemetery located just outside London Gate, comprising inhumations (some with lead coffins and a triple tomb) and cremations (HHER 6740 and 6741), pottery kilns (HHER 6808), ditches, a Belgic enclosure and the remains of Watling Street (Anthony, I. E, 1968).

Substantial remains of late Roman masonry were also found at the foot of Holywell Hill, 500m to the east of the Roman town (HHER Number 13674, St Albans Urban Archaeological Database Event 290, Monument 501 and Niblett and Thompson 2005). During an evaluation in July 2007 further sections of this building were observed (Heritage Network, 2007). This building is present just beyond the alluvial deposits which demarcate the extent of the floodplain, finds included Roman brick, roof tile, flint and mortar and some 1st -2nd century potsherds.

During an evaluation by Wessex Archaeology (Martin, J. 2010) to the south-east on the Westminster Lodge Leisure Centre site, an east to west aligned ditch containing 1st – 4th

century Roman pottery and the base of a flint and mortar wall that was previously uncovered during the construction of a gas main (Heritage Network, 2007 above) were recorded. Medieval pottery was also recovered from a layer overlying the Roman remains.

A now demolished Medieval/Post-medieval farm was present between the survey area and London Gate to the west.

Remains of a Second World War prisoner of war transit camp were also present to the south-east and recorded during the Wessex Archaeology Evaluation (Martin, J. 2010).

5.0 PROJECT AIMS

A systematic detailed geophysical survey is required of the development area to enable the archaeological resource, both in quality and extent, to be accurately quantified.

6.0 METHODOLOGY

6.1 Instrument Type Justification

Britannia Archaeology Ltd employed a Bartington Dual Grad 601-2 fluxgate gradiometer to undertake the survey, because of its high sensitivity and rapid ground coverage. The surveyors noted that that the site had a very high magnetic background susceptibility possibly due to previous ground disturbance or ferrous material being introduced into the topsoil by phases of past manuring and more recent littering.

6.2 Instrument Calibration

One hour was allowed in the morning for the magnetometers sensors to settle before the start of the first grid. The instrument was zeroed after every three grids to minimise the effect of sensor drift. An area with a relatively low magnetic reading was chosen to calibrate the instrument, this same point was used to zero the sensors throughout the survey providing a common zero point. Due to the incessant sunshine, sensor drift was noted throughout the day.

6.3 Sampling Interval and Grid Size

The sampling interval was set at 0.25m along 1m traverse intervals, providing 4 readings a metre, the magnetometer survey was undertaken on 20 x 20m grids.

6.4 Survey Grid Location

The survey grid was set out to the Ordnance Survey OSGB36 datum to an accuracy of ±0.1m employing a Leica Viva Glonnass Smart Rover GS08 differential global positioning system (DGPS). Data were then converted to the National Grid Transformation OSTN02

and the instrument was regularly tested using stations with known ETRS89 coordinates. The grids were positioned on a north-south alignment (Figure 2).

6.5 Data Capture

Instrument readings were recorded on an internal data logger that were downloaded to a laptop at lunchtime and then also at the end of the day. The grid order was recorded on a BA pro-forma to aid in the creation of the data composites. Data were filed in job specific folders. These data composites were checked for quality on site by BA, allowing grids to be re-surveyed if necessary. The data were backed up onto an external storage device in the office and finally a remote server at the end of the day. A five metre exclusion zone was left between the boundaries and the survey area to reduce the amount of magnetic disturbance.

6.6 Data Presentation and Processing

Data are presented in both raw and processed data plots in greyscale format (Figures 3 and 4). An XY trace plot of the processed data has also been included (Figure 5). The raw data is presented with no processing, and was clipped to produce a uniform greyscale plot. The processed data schedule is also displayed below.

Raw Data:
Data Clipping: -3/+3 standard deviation.

Processed Data:
De-spike: X diameter = 3, Y diameter = 3, Threshold = 1, centre value=mean, replace with = mean;
Data Clipping: 1 standard deviation;
De-stripe: Traverse, Median, X (Horizontal).
Data Display: Clip to -3/+3 standard deviation.

An interpretation plan characterising the anomalies recorded can be found at Figure 6, it draws together the evidence collated from both greyscale and XY trace plots (Figures 3, 4 and 5). All figures are tied into the National Grid and printed at an appropriate scale.

6.7 Software

Raw data was downloaded using Bartington software Grad601 and will be stored in this format as raw data. The software used to process the data and produce the composites was DW Consulting's Archeosurveyor v2.0. Datasets were exported into AutoCAD and placed onto the local survey grid. An interpretation plot was then produced using AutoCAD.

6.8 Grid Restoration

Britannia Archaeology Ltd did not position any reference stations in the field due to the presence of the general public. The grid can be relocated using the geo-referenced stations on Figure 2 to accurately target the location of the geophysical anomalies.

7.0 RESULTS & DISCUSSION

The surveyors noted that the sites overall magnetic background was particularly high, causing difficulty in locating a suitable zero station to set-up the instruments sensors. A plethora of 'iron spike' responses were recorded within the dataset, that may have been caused by archaeological artefacts, however it is more likely that they are the remains of modern cultural debris being introduced into the topsoil. These responses seem to be fairly evenly spaced throughout the fields with no apparent concentration. It is likely that this ferrous debris has been randomly lost by the public throughout its current land-use as parkland, or deposited during manuring in the earlier phase of Medieval/Post-medieval farming.

Three areas of magnetic disturbance were recorded, the largest being present on the southern boundary caused by the close proximity of the path. The smallest response is present on the eastern boundary of the survey and appears to be a large magnetic response relating to buried ferrous material, no obvious cause was witnessed by the surveyors in this location. A large area of magnetic disturbance was also recorded in the north-west corner of the survey, this was a relatively strong response that in part originates from buried ferrous material. This anomaly may also be related to the previous Medieval/Post-medieval farm, or could be associated with the sewer pipe.

A very strong dipolar linear trend orientated north-east to south-west locates the position of the ferrous metal sewer pipe that is to be replaced. Four strong dipolar discrete anomalies also demarcate the location of iron service covers and grates.

One area of magnetic enhancement is located on the western boundary, this may relate to the remains of the former Medieval/Post-medieval farm that is known to have been present nearby.

Six smaller positive discrete anomalies have been recorded within the dataset that are indicative of archaeological pit-type features, however a geological origin cannot be ruled out. Two large strong positive discrete anomalies have also been recorded close to the sewer pipe, they have tentatively been assigned a potential archaeological origin, however they may also be related to workings of the sewer pipe.

A single weak positive linear trend aligned north-north-east to south-south-west has been interpreted as a possible ditch type anomaly, although equally it could be of a geological origin, a modern service run or a land drain.

8.0 CONCLUSION

A range of anomalies were detected within the dataset, unfortunately none of which can be definitively assigned an archaeological origin. Wessex Archaeology in their 2010 evaluation (Martin, J. 2010) recorded deep deposits of alluvium that could be even deeper in the survey area which is also closer to the River Ver (located approximately 100m from the centre of the survey grid). The gradiometer detects to an approximate

maximum depth of 1m below the base of the sensor, therefore this deep alluvium could be masking potential anomalies.

The relatively high magnetic background of the site could prevent weak, low contrast anomalies from being detected. It is also possible that a degree of landscaping has occurred within this area, which may have also caused the relatively high magnetic background present within the survey area.

It is likely that this area has been a floodplain for some considerable time, proving to be highly fertile while prone to occasional flooding. This makes it suitable for farmland rather than settlement or other activity, the background research confirms that this type of land use continued until it was turned into a park in around 1929. This suggestion is given further credence by the lack of archaeological features present in the Wessex Archaeology trenches (Martin, J. 2010) located nearest to the geophysical survey area.

The subsequent 'strip, map and record' phase of excavation work should allow the interpretations given within this report to be put to test.

9.0 PROJECT ARCHIVE AND DEPOSITION

A full archive will be prepared for all work undertaken in accordance with guidance from the *Selection, Retention and Dispersion of Archaeological Collections,* Archaeological Society for Museum Archaeologists, 1993. Arrangements will be made for the archive to be deposited with the relevant museum/HER Office.

10.0 ACKNOWLEDGEMENTS

Britannia Archaeology Ltd would like to thank Claire Hallybone of Thames Water Utilities Ltd for funding the project and arranging access. Our thanks also to Simon West, District Archaeologist of St Albans City and District Council for his advice throughout the project.

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English Heritage PastScape www.pastscape.org.uk

Heritage Gateway www.heritagegateway.org.uk

Archaeological Data Service (ADS) www.ads.ahds.ac.uk

English Heritage National List for England
www.english-heritage.org.uk/professional/protection/process/national-heritage-list-for-england

DEFRA Magic http://magic.defra.gov.uk/website/magic

Appendix 1 – Technical Details

Magnetometer Survey

The magnetometer differs from the 'active' magnetic susceptibility meter by being a 'passive' instrument. Rather than injecting a signal into the ground it detects slight variations in the Earth's magnetic field caused by cultural and natural disturbance (Clark).

Thermoremanent magnetism is produced when a material containing iron oxides is strongly heated. Clay for example has a high iron oxide content that in a natural state is weakly magnetic, when heated these weakly magnetic compounds become highly magnetic oxides that a magnetometer can detect.

The demagnetisation of iron oxides occurs above a temperature known as the Curie point; for example haematite has a Curie point of 675 Celsius and magnetite 565C. At the time of cooling the iron oxides become permanently re-magnetised with their magnetic properties re-aligned in the direction of the Earth's magnetic field (Gaffney and Gater). The direction of the Earth's magnetic field shifts over time and these subtle alignment differences can be recorded. Kilns, hearths, baked clay and ovens can reach Curie point temperatures, and are the strongest responses apart from large iron objects that can be detected. Other cultural anomalies that can be prospected include occupation areas, pits, ditches, furnaces, sunken feature buildings, ridge and furrow field systems and ritual activity (David, 2011). Commonly recorded anomalies include modern ferrous service pipes, field drainage pipes, removed field boundaries, perimeter fences and field boundaries.

Fluxgate Gradiometers

Fluxgate gradiometers are sensitive instruments that utilise two sensors placed in a vertical plane, spaced 1 metre apart. The sensor above reads the Earth's magnetic (background) response while the sensor below records the local magnetic field. Both sensors are carefully adjusted to read zero before survey commences at a 'zeroing' point, selected for its relatively 'quiet' magnetic background reading. When differences in the magnetic field strength occur between the two sensors a positive or negative reading is logged. Positive anomalies have a positive magnetic value and conversely negative anomalies have a negative magnetic value relative to the site's magnetic background. Examples of positive magnetic anomalies include hearths, kilns, baked clay, areas of burning, ferrous material, ditches, sunken feature buildings, furrows, ferrous service pipes, perimeter fences and field boundaries. Negative magnetic anomalies include earthwork embankments, plastic water pipes and geological features.

The instruments are usually held approximately 0.30m to 0.50m above the ground surface and can detect to a depth of between 1-2metres. Best practice dictates that the optimal direction of traverse in Britain is east to west.

Magnetic Anomalies

Linear trends

Linear trends can be both positive and negative magnetic responses. If they are broad, relatively weak or negative in nature they may be of agricultural or geological origin, for example periglacial channels, land drains or ploughing furrows. If the responses are strong positive trends they are more likely to be of archaeological origin. Archaeological settlement ditches tend to be rich in highly magnetic iron oxides that accumulate in them via anthropogenic activity and humic backfills. Conversely surviving banks will be negative in nature, the material is derived from subsoil deposits that is less likely to be positively magnetic. Curvilinear trends can also be recorded and are indicative of archaeological structures such as drip-gullies.

Discrete anomalies

Discrete anomalies appear as increased positive responses present within a localised area. They are caused by a general increase in the amount of magnetic iron oxides present within the humic back-fill of for example a rubbish pit.

'Iron spike' anomalies

These strong isolated dipolar responses are usually caused by ferrous material present in the topsoil horizon. They can have an archaeological origin but are usually introduced into the topsoil during manuring.

Areas of magnetic disturbance

An area of magnetic disturbance is usually associated with material that has been fired. For example areas of burning, demolition (brick) rubble or slag waste spreads. They can also be caused by ferrous material, e.g. close proximity to barbwire or metal fences and field boundaries, buried services, pylons and modern rubbish deposits.

Appendix 2 – OASIS Form

OASIS ID: britanni1-155259

Project details

Project name	King Harry Lane, Verulamium Park, St Albans, Hertfordshire
Short description of the project	A range of anomalies were detected within the dataset, unfortunately none of which can be definitively assigned a probable archaeological origin. Alluvial deposits laid down by the River Ver (located approximately 100m from the centre of the survey grid) could be masking potential archaeological anomalies. The relatively high magnetic background of the site could also prevent weak, low contrast anomalies from being detected. It is likely that this area has been a floodplain for some considerable time and therefore only suitable for farmland due to highly fertile soil and occasional flooding. The background research shows this land-use continued until it was turned into Verulamium Park. This interpretation is given further credence by the lack of archaeological features present during an archaeological evaluation undertaken nearby.
Project dates	**Start:** 15-07-2013 **End:** 15-07-2013
Previous/future work	No / Yes
Any associated project reference codes	VPM13 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Other 14 - Recreational usage
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Service infrastructure (e.g. sewage works, reservoir, pumping station, etc.)
Prompt	Water Act 1989 and subsequent code of practice
Position in the planning process	Not known / Not recorded
Solid geology (other)	Lewes Nodular Chalk Formation and Seaford Chalk Formation
Drift geology	RIVER TERRACE DEPOSITS
Techniques	Magnetometry

Project location

Country	England
Site location	HERTFORDSHIRE ST ALBANS ST ALBANS King Harry Lane, Verulamium Park, St Albans, Hertfordshire
Study area	1.60 Hectares
Site coordinates	TL 1408 0664 51 0 51 44 46 N 000 20 50 W Point
Height OD / Depth	**Min:** 80.00m **Max:** 80.00m

Project creators

Name of Organisation	Britannia Archaeology Ltd
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Timothy Schofield
Project director/manager	Timothy Schofield
Project supervisor	Timothy Schofield
Type of sponsor/funding body	Water Authority/Company
Name of sponsor/funding body	Thames Water Utilities

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Verulamium Museum
Digital Contents	"Survey"
Digital Media available	"Geophysics", "Images raster / digital photography", "Images vector", "Survey", "Text"
Paper Archive recipient	Verulamium Museum
Paper Contents	"Survey"
Paper Media available	"Map", "Microfilm", "Photograph", "Plan", "Report", "Survey", "Unpublished Text"

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	King Harry Lane, Verulamium Park, St Albans Hertfordshire; Detailed Magnetometer Survey

Author(s)/Editor(s)	Schofield, T.P.
Other bibliographic details	R1031
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Issuer or publisher	Britannia Archaeology Ltd
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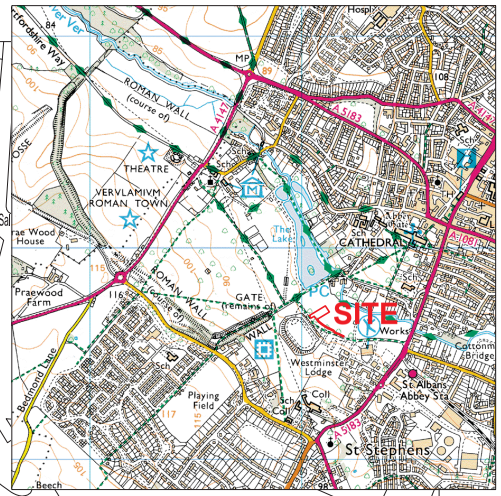
Entered on	5 November 2013



N

	Existing Sewer System
	Proposed Sewer Pipe
	Site Boundary

NGR:	REPORT NUMBER:
514088 206645	1031

PROJECT:
PROPOSED SEWER PIPE, KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTS

CLIENT:
Thames Water

DESCRIPTION:
SITE LOCATION & PROPOSED CONSTRUCTION PLAN

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IP14 1RB
T: 01449 763034
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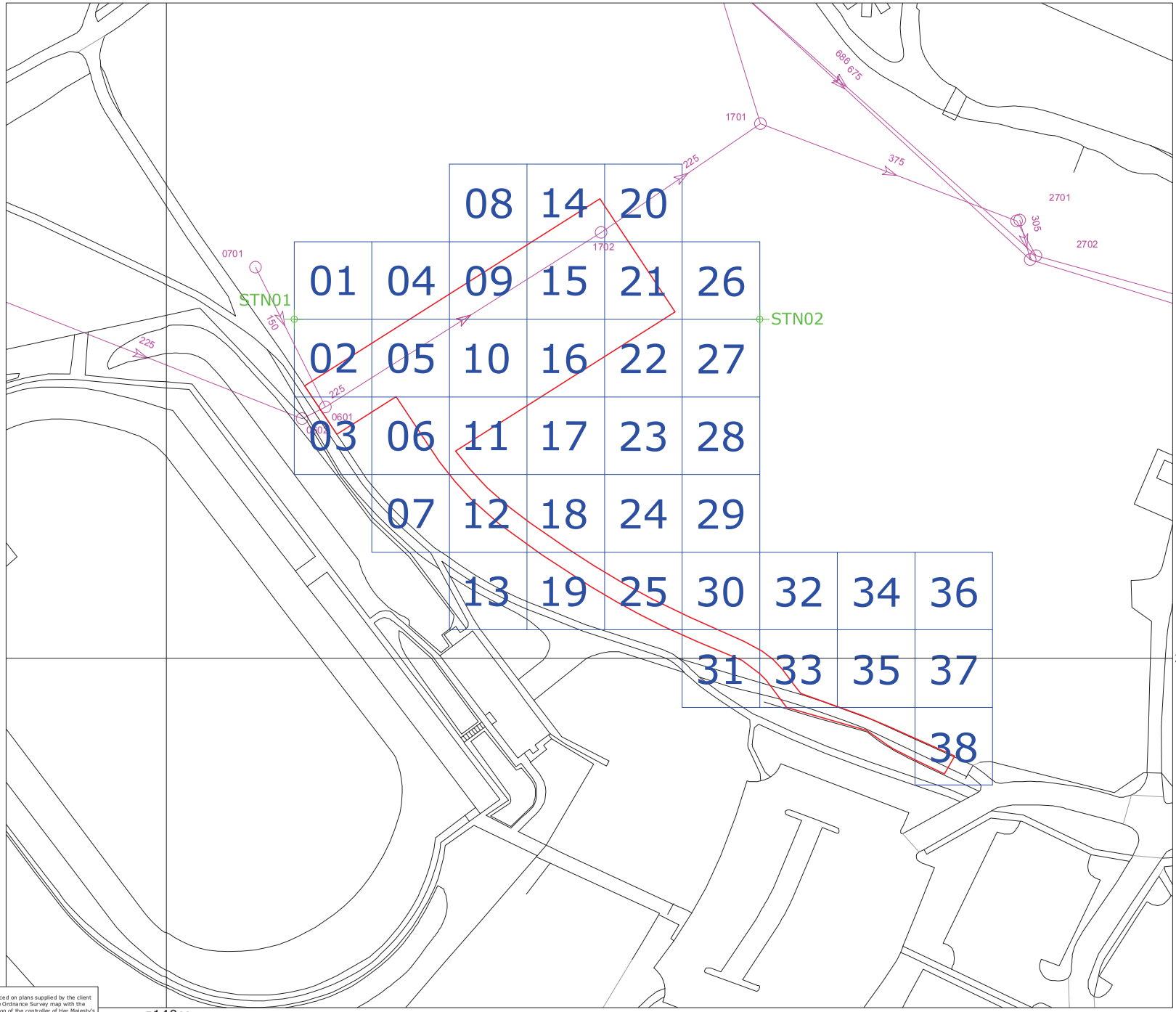
SCALE:		
1:1250	0 — 50m	
PLOT:	APPROVED:	VERSION:
A3	TPS	03
DATE:	AUTHOR:	FIGURE:
JULY 2013	MCA	01



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N

STATION	EASTING	NORTHING
01	514032.955	206687.346
02	514152.955	206687.346

Existing Sewer System

Site Boundary

NGR: 514088 206645

REPORT NUMBER: 1031

PROJECT: PROPOSED SEWER PIPE, KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTS

CLIENT: Thames Water

DESCRIPTION: SURVEY GRID & STATION REFERENCING PLAN

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W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

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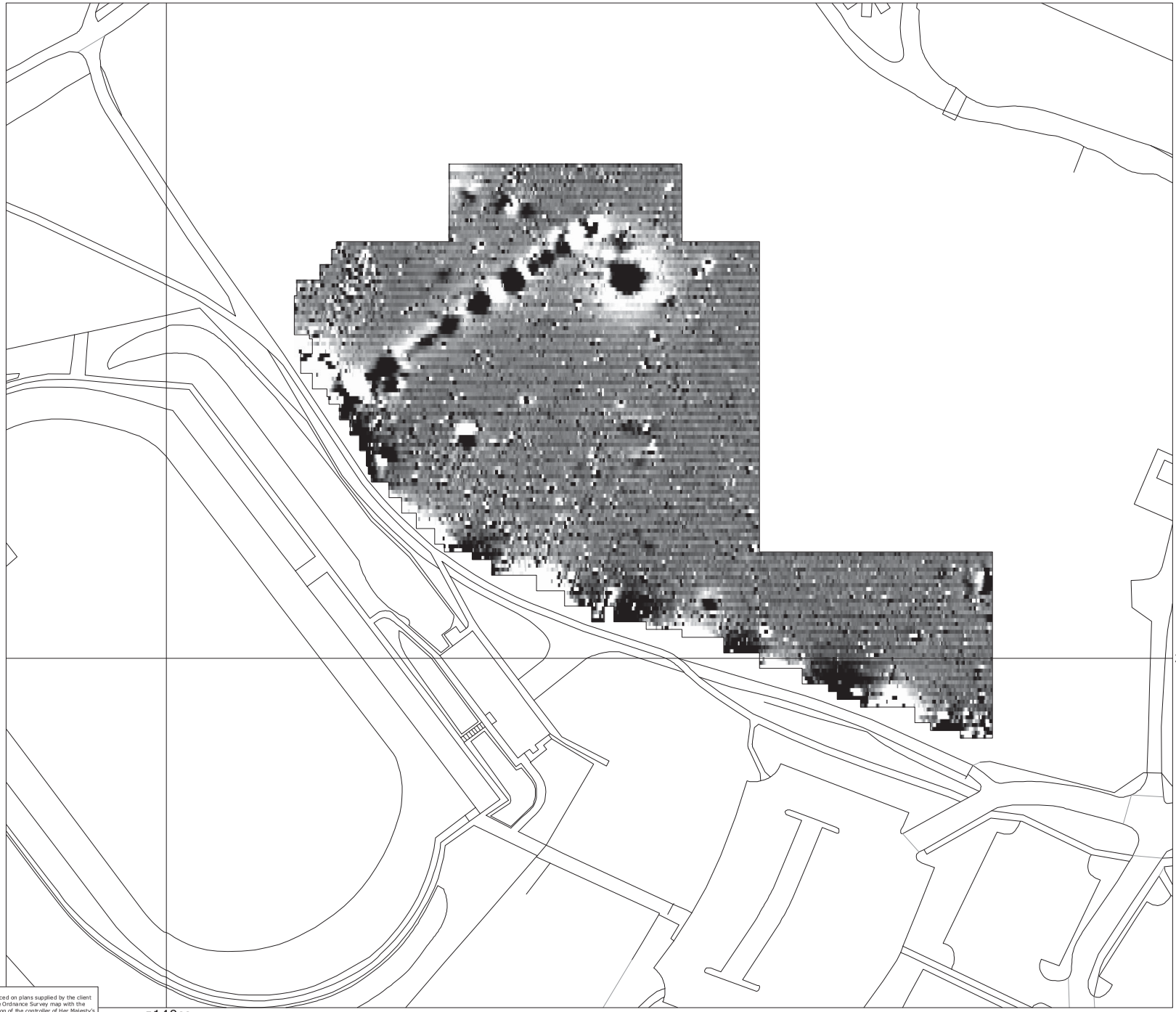
JULY 2013	TPS	02



NGR:	REPORT NUMBER:
514088 206645	1031

PROJECT:
PROPOSED SEWER PIPE, KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTS

CLIENT:
Thames Water

DESCRIPTION:
RAW MAGNETOMETER GREYSCALE PLOT

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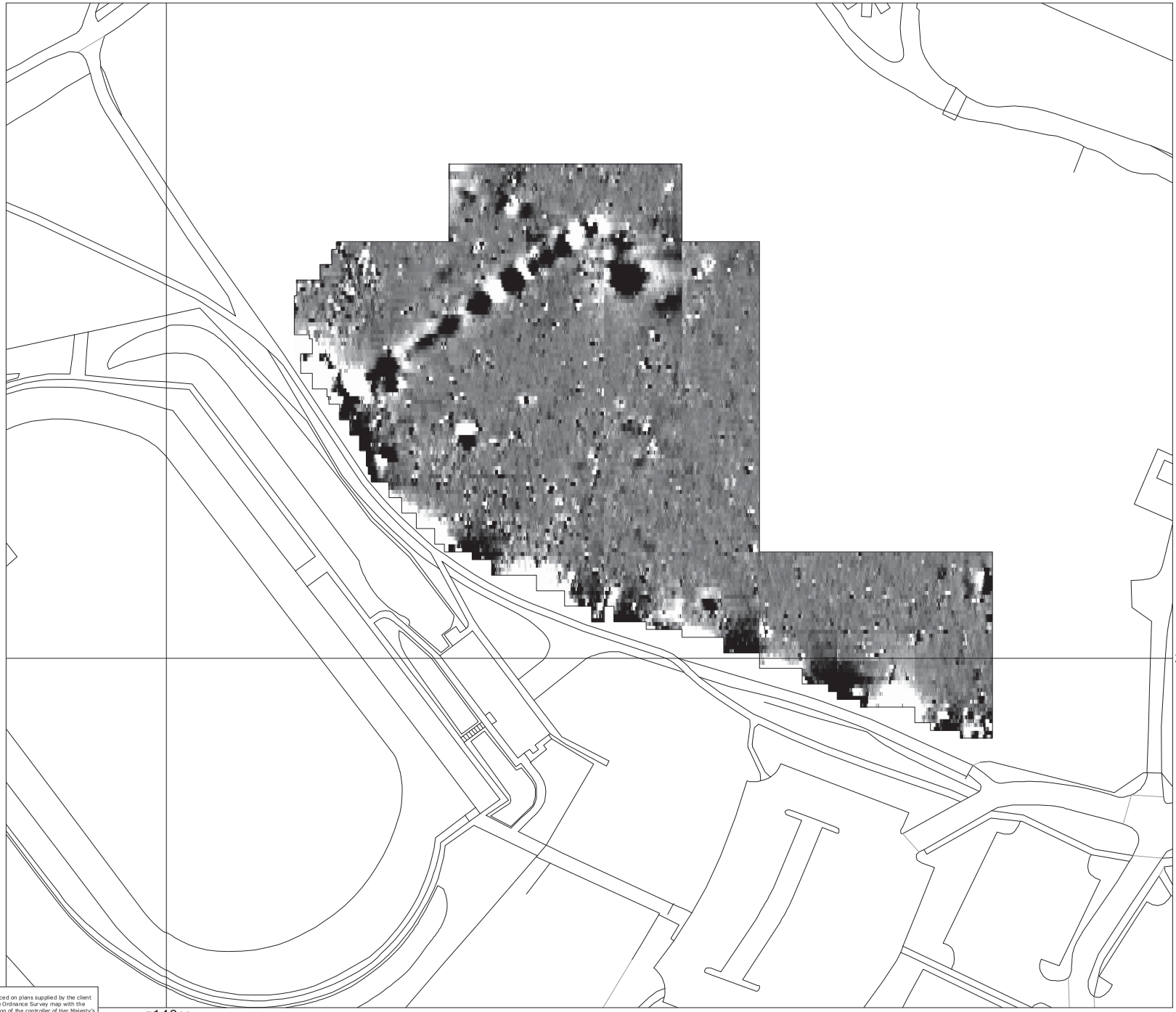
SCALE: 1:1000 (0 – 50m)

PLOT:	APPROVED:	VERSION:
A3	MCA	01
DATE:	AUTHOR:	FIGURE:
JULY 2013	TPS	03



NGR:	REPORT NUMBER:
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PROJECT:
PROPOSED SEWER PIPE, KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTS

CLIENT:
Thames Water

DESCRIPTION:
PROCESSED MAGNETOMETER GREYSCALE PLOT

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W: www.britannia-archaeology.com

SCALE: 1:1000 (0 – 50m)

PLOT:	APPROVED:	VERSION:
A3	MCA	01
DATE:	AUTHOR:	FIGURE:
JULY 2013	TPS	04

115 nT/cm	Scale Interval
NGR: 514088 206645	REPORT NUMBER: 1031

PROJECT:
PROPOSED SEWER PIPE, KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTS

CLIENT:
Thames Water

DESCRIPTION:
PROCESSED MAGNETOMETER XY TRACE PLOT

BRITANNIA ARCHAEOLOGY LTD

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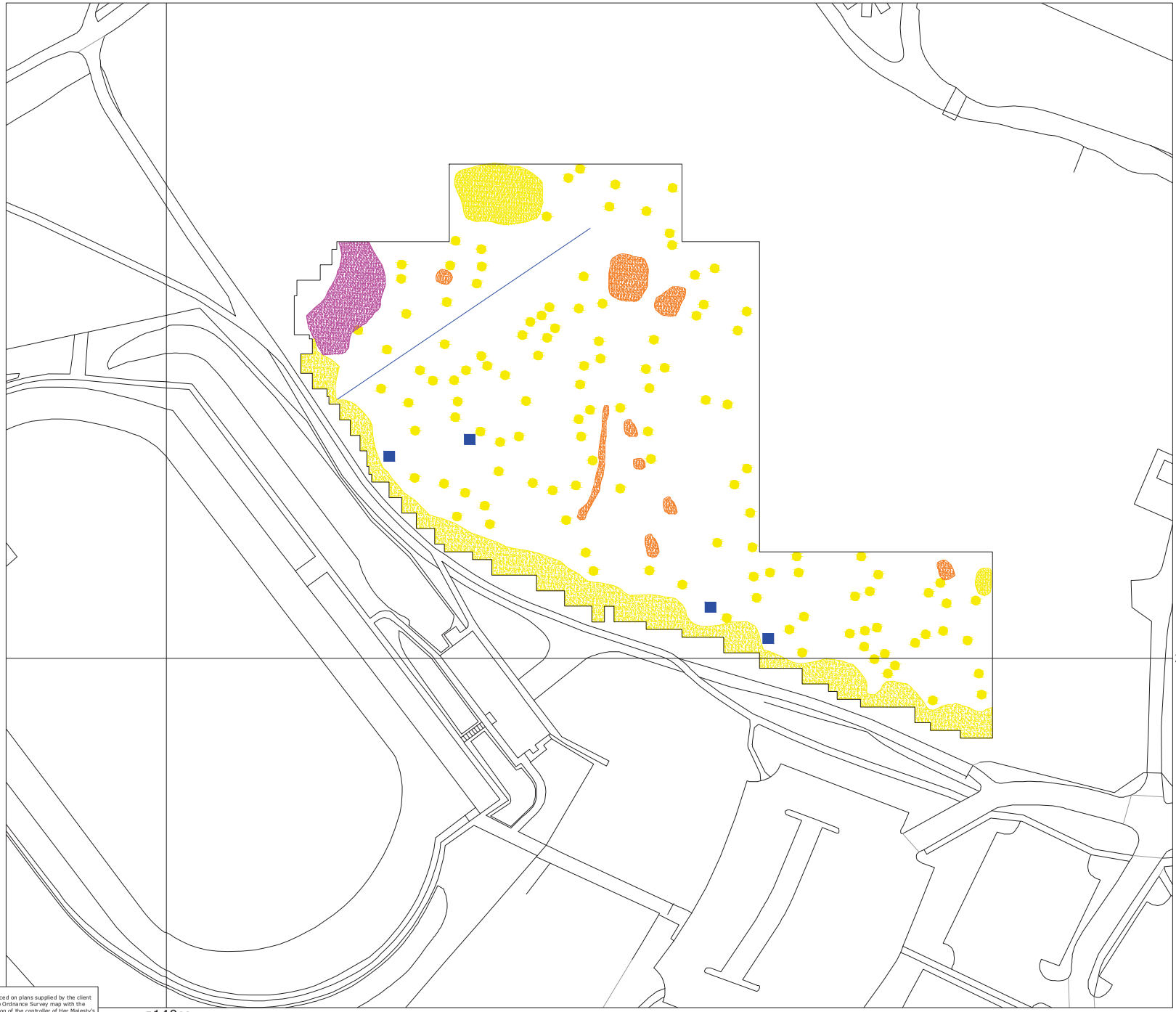
SCALE: 1:1000 (0 – 50m)

PLOT:	APPROVED:	VERSION:
A3	MCA	01
DATE: JULY 2013	AUTHOR: TPS	FIGURE: 05



	Weak Positive Linear Anomaly, Archaeology?
	Positive Discrete Anomaly, Archaeology?
	Area of Magnetic Enhancement, Archaeology?
	Strong Dipolar Discrete Anomaly, Modern Service Cover
	Strong Dipolar Linear Trend, Modern Sewer Run
	Area of Magnetic Disturbance
	Isolated Dipolar Responses

NGR: 514088 206645

REPORT NUMBER: 1031

PROJECT: PROPOSED SEWER PIPE, KING HARRY LANE, VERULAMIUM PARK, ST ALBANS, HERTS

CLIENT: Thames Water

DESCRIPTION: INTERPRETATION PLOT OF MAGNETOMETER ANOMALIES

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JULY 2013	TPS	06