

ARCHAEOLOGICAL SERVICES

DURHAM UNIVERSITY

on behalf of



Durobrivae Roman town
Water Newton
Peterborough
Cambridgeshire

geophysical survey

report 4900
December 2018

Contents

1.	Summary	1
2.	Project background	3
3.	Historical and archaeological background	4
4.	Landuse, topography and geology	6
5.	Geophysical survey	7
6.	Conclusions	15
7.	Sources	16

Appendix:	Historic England Geophysical Survey Questionnaire	18
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Figures

Figure 1:	Site location
Figure 2:	Magnetometer survey overview
Figure 3:	Magnetometer survey (filtered data)
Figure 4:	Plan of magnetically enhanced areas
Figure 5:	Probable stone and soil-filled features
Figure 6:	Physical interpretation (with anomaly labels)
Figure 7:	Archaeological interpretation

1. Summary

The project

- 1.1 This report presents the results of a geophysical survey conducted at the Roman town of *Durobrivae*, Water Newton, near Peterborough. The works comprised approximately 23.1ha of magnetometer survey within the walled area of the town.
- 1.2 The works were commissioned by the Nene Valley Archaeological Trust (NVAT) and conducted by Archaeological Services Durham University.

Results

- 1.3 The survey has revealed a plan of the town, which developed along both sides of Ermine Street, a major Roman road. The layout of the town does not conform to any regular grid pattern of streets, but has various roads on different alignments.
- 1.4 Substantial lengths of the town wall have been detected, especially around the southern parts of the town, where possible wall towers or bastions have also been identified as well as two large external ditches. The survey has confirmed that the wall is staggered at at least two of the main gates, the south-east (London) and south-west (Ircchester) gates.
- 1.5 Many buildings have been detected, often represented by stone wall footings though others are interpreted from probable robber trenches or construction slots. The buildings are concentrated along the roads, typically with a short gable end at the street frontage, though many other buildings are also present, set further back, away from the roads. Two particularly large buildings or complexes have been detected, both on the west side of Ermine Street. The southern of these comprises a very large courtyard building, set a short distance back from the road within a large walled enclosure, with smaller, ancilliary buildings (possibly stables and/or baths) and almost certainly a temple at the south-western corner of the enclosure. This complex may have been a *mansio*, though the large complex just to the north could equally have served such a function. Unusually for a Roman 'small town', both buildings appear to have had official or public functions.
- 1.6 The majority of buildings measure between 12-18m in length and 7-9m in width, though both larger and smaller buildings are also present. The buildings which share a street frontage are densely packed and there is magnetic evidence to suggest that a substantial fire spread through many of the buildings towards the northern corner of the walled town, along both sides of Ermine Street; the fire appears to have extended for about 130m along the road.
- 1.7 Many smaller isolated anomalies almost certainly reflect pits, for storage and waste, and possibly wells, as well as ovens and hearths. Larger irregular shaped pits were almost certainly for sand and gravel extraction.
- 1.8 Pre-Roman features detected within the survey might include a few circular and arcuate ditches, which could possibly be associated with Bronze Age barrows. The age and nature of the low mound and its associated ditches in the south-east quarter of the site remain uncertain. Whilst the area within the inner ditch circuit appears to be undisturbed, there may have been some encroachment of settlement across the outer ditch circuits. This feature may be part of the prehistoric landscape of the Nene Valley.

- 1.9 Another feature which probably pre-dates the Roman settlement is a ditch aligned north-east/south-west, which appears to underlie the whole of the walled town area. This could perhaps be the remains of a landscape-scale boundary ditch, such as those recorded at Ferry Meadows to the east.
- 1.10 In many instances the magnetometer survey has confirmed the aerial photographic evidence for settlement features, however, it has also added considerable detail and value to that existing knowledge. The results are directly relevant to research themes in the East of England research framework and contribute to ongoing research by the Nene Valley Archaeological Trust.

2. Project background

Location (Figure 1)

- 2.1 The survey area comprised the walled part of the small Roman town of *Durobrivae*, Water Newton, just west of Peterborough in northern Cambridgeshire (NGR centre: TL 121 969). The River Nene lies just north and east of the survey area; the A1 Great North Road formed the southern boundary of the site. The survey area and neighbouring fields were all farmland.
- 2.2 The survey covered one large pasture field of approximately 23.1ha. The field was a large irregular polygon, which just encompassed the remains of the walled town. The field had been divided into two roughly equal smaller fields until recently.
- 2.3 The survey area lies within an extensive, 140ha, scheduled monument: ‘The fort and Roman walled town of *Durobrivae* and its south, west and east suburbs, immediately south and east of Water Newton Village’ (ref. 1021429). The monument includes the buried and surviving earthwork remains of the walled town of *Durobrivae* and the fort to the west, and all suburbs, cemeteries and industrial areas, as well as two villa complexes to the west and a prehistoric landscape including, for example, three large Neolithic henge-like circular structures and several Bronze Age barrows.

Objective

- 2.4 The aim of the survey was to assess the nature and extent of sub-surface features of potential archaeological significance within the survey area, particularly those related to the walled part of the Roman town, and to produce a town plan based on the geophysical evidence. The survey results will contribute to ongoing research by the Nene Valley Archaeological Trust (NVAT).
- 2.5 Research objectives are built into archaeological projects, as a result of the Historic England (formerly English Heritage) national policy framework and its objectives, as outlined within *Exploring Our Past* (English Heritage 1991), *Frameworks for our Past* (English Heritage 1996), the *Research Agenda* (English Heritage 1997) and the *Policy Statement on implementation* (1999). This survey was designed to address research priorities set out in *Research and Archaeology Revisited: a revised framework for the East of England* (Medlycott 2011), specifically for Roman towns. There is scope for significant developments in our understanding of the inter-relationships between towns and their hinterlands. Other research themes include:
- the geophysical surveys at Great Chesterford and Caistor St Edmund have demonstrated how much they can add to our understanding of the morphology of these sites - the extension of this type of survey to similar ‘green-field’ towns, such as *Durobrivae*, should be considered (Medlycott 2011, p48).
 - *Durobrivae* (Water Newton) has been highlighted as an important but atypical Roman town and its hinterland
 - the origins of towns, their role as defensive centres, changes in their internal layouts and housing densities, role as centres of supply and demand all need further study
 - the character of late Roman towns in the region, including their relationship with the Saxon Shore forts
 - the Roman town as an urban centre/central place, ‘Romanisation’, pre- and post-Roman occupation in and around the town, and the town’s relationship to the traditional ‘Boudiccan narrative’

Methods statement

- 2.6 The surveys have been undertaken in accordance with instructions from Dr Stephen Upex of NVAT, survey proposals provided by Archaeological Services Durham University and national standards and guidance (see para. 5.1 below).
- 2.7 Since the survey area was within a Scheduled Monument the surveys were also undertaken in accordance with the conditions of a licence granted by Historic England (HE) under Section 42 of the Ancient Monuments and Areas Act 1979 (as amended by the National Heritage Act 1983).

Dates

- 2.8 Fieldwork was undertaken between the 16th and 18th October 2018. This report was prepared for December 2018.

Personnel

- 2.9 Fieldwork was conducted by Duncan Hale and Mark Woolston-Houshold. This report was prepared by Duncan Hale, the Project Manager, with illustrations by Janine Watson.

Archive/OASIS

- 2.10 The site code is **PWN18**, for **Peterborough Water Newton 2018**. The survey archive will be retained at Archaeological Services Durham University and a copy supplied on CD to the client for deposition with the project archive in due course. Archaeological Services Durham University is registered with the **Online Access to the Index of archaeological investigationS project (OASIS)**. The OASIS ID number for this project is **archaeol3-335959**.

Acknowledgements

- 2.11 Archaeological Services Durham University is grateful for the assistance of Dr Stephen Upex and Mr Geoffrey Dannell of NVAT, the landowner Mr Robert Waterworth, the farm manager Mr Ian Wright, and Sarah Poppy of Historic England, in facilitating this research. NVAT were awarded funding for the research from the Society of Antiquaries, The Roman Society and The Goodliff Fund.

3. Historical and archaeological background

- 3.1 The historical and archaeological background to the Roman small town of Durobrivae is readily available elsewhere (for example, in the Historic England List Entry: <https://historicengland.org.uk/listing/the-list/list-entry/1021429>). Therefore a brief summary only is provided here, based on the list entry and a draft version of a NVAT Research Project Design (Upex, forthcoming).
- 3.2 The prehistoric landscape around Durobrivae is mostly known only from aerial photography, but is rich in monuments. To the south of the A1, there are three large Neolithic henge-like structures. Two of these are linked to form a figure of eight and lie about 80m south of the town wall, the third lies about 400m to the south of the town. All three measure over 100m in diameter. The same area also contains an extensive group of circular ditched features measuring between 15-25m in diameter, probably Bronze Age barrows.

- 3.3 Details of the Iron Age landscape are uncertain, with the exception of a concentration of farmsteads, again largely known through aerial photography. However, a major focus of Iron Age settlement has been partially investigated by excavations at Ferry Meadows Country Park, just 2km to the east (Upex 2018; Jones 1981; Challands 1973 & 1974). This area was also the subject of a recent geophysical survey, which mapped the surviving extents of Bronze Age, Iron Age and Romano-British features within the grassed areas of the park (Archaeological Services 2016).
- 3.4 Five types of town are known to have existed in Roman Britain: *coloniae*, *municipia*, *civitas* capitals, Roman provincial capitals and Roman small towns. The first four types can be classified as ‘public towns’ because each had an official status within the provincial administrative system. Durobrivae is classed as a Roman small town. Roman small towns are settlements of urban character which lack the administrative status of public towns, but which are nevertheless recognisably urban in terms of morphology, features and function. They tend to lack the planned rectangular street grids, public buildings and well-appointed town houses of the public towns and instead are generally characterised by mainly insubstantial timber or half-timbered structures. Some small towns possess an enclosing wall (as at Durobrivae), while others have masonry or earthwork defences. Additional features include temples, bath houses, ovens, kilns and cemeteries. Some small towns had their origins in earlier military sites such as fort-*vici* and developed into independent urban areas following the abandonment of the forts. Others developed alongside major roads and were able to exploit a wide range of commercial opportunities as a result of their location (HE List Entry).
- 3.5 The origin of Durobrivae remains uncertain, being both close to a fort and at a location on a major road which could be a convenient staging post. The town was thought to have originated as a *vicus* associated with the (?Claudian) fort less than 200m to the west, however, it has been suggested more recently that the fort may be a post-Boudican construct, which may have only been in use for a few months, and is probably not connected to the town’s development; the settlement may have developed as a convenient location where Ermine Street crossed the River Nene (Upex 2014). The name Durobrivae means the ‘settlement/fort by the river crossing/bridges’ (Rivet 1980; Rivet & Smith 1979).
- 3.6 Durobrivae is untypical of Roman small towns both in its relatively large size, and in possessing possible public buildings (evident on aerial photographs). It is also rare for a town of this size to survive untouched by later development or by intrusive excavation (HE List Entry). Upex points out another discrepancy from the usual ‘small town’ model, in that Durobrivae has extensive extra-mural suburbs, some of which are as densely packed with buildings as the inside of the town, and which extend to some 160 hectares (Upex forthcoming). Archaeological Services recently conducted a geophysical survey over parts of the northern suburbs, 400m north of the walled area, which revealed a landscape of settlement, roads, industrial activities and agriculture (Archaeological Services 2018).
- 3.7 The first systematic investigations of the town and surrounding area were carried out by Edmund Tyrell Artis, house steward to Lord Fitzwilliam in the early 19th century. Artis conducted a series of excavations between 1820 and 1827, identifying buildings within the town, its suburbs and wider area, as well as extramural cemeteries and pottery kilns. These were carefully recorded, and in 1828 he

published a plan of the town and its suburbs, as well as drawings of individual buildings (Artis 1828). Since then there has been little excavation either within the walled area or beyond. Between 1956 and 1958 Ernest Greenfield carried out excavations on four different areas on behalf of the Inspectorate of Ancient Monuments in advance of road work to widen the A1 (Perrin 1999); three of these were on the south side of the road, while two trenches were cut through the south town wall. The latter trenches revealed dry stone footings backed by a clay ramp, and indicated a date in the late 2nd century AD for construction of the town wall. In 1957 the Water Newton Research Committee was set up to undertake further investigation in advance of work to by-pass Water Newton and Sibson, and carried out several excavations in 1958 (HE List Entry).

- 3.8 The area immediately beyond the town walls contains a number of extramural cemeteries. To the south, lead and stone coffins and inhumations were first discovered by workmen during the construction of the Great North Road in 1739, and in 1998 maintenance work along the A1 revealed a total of at least 57 individual burials dating to the late 3rd and 4th centuries. Artis discovered a mixed cremation and inhumation cemetery outside the north-west wall, and another of inhumations only at the south end of the east wall (*ibid.*).
- 3.9 The suburban area immediately to the west of Billing Brook and the walled town is dominated by the pottery industry, which in the late 2nd century AD was beginning to expand and flourish, coinciding with the probable date of enclosure of the core of the town within a ditch, stone wall and bank. Artis identified a number of kilns there, some within the area of the abandoned fort, while the 1958 excavations discovered five kilns south of the A1 around Billing Brook datable to the late 2nd to early 4th centuries AD. The pottery industry was best known for its production of colour coated wares, but also produced grey wares and mortaria (*ibid.*).
- 3.10 The most recent investigations within the walled town comprised trial geophysical surveys to determine which of three techniques (magnetic gradiometry, earth resistance and GPR) would be most useful for more extensive survey at the site (Lockyear & Halliwell 2017). The surveys were undertaken by the Community Archaeology Geophysics Group and NVAT, supervised by Kris Lockyear of UCL, and demonstrated that all three techniques were effective and complementary.

4. Landuse, topography and geology

- 4.1 At the time of survey the land comprised one large grassed field, used for pasture and silage. The field had been divided into two smaller fields until recently; rabbit warrens and badger setts were noted along the course of the former field boundary. Badger setts were also present near the south-eastern limit of the field.
- 4.2 The site was predominantly level with a mean elevation of approximately 9m OD, being on the first river terrace of the River Nene, though several earthworks were present. The agger of Ermine Street Roman road was aligned north-west/south-east across the field, standing to a height of approximately 1.5m with long sloping banks to either side. The course of the town wall was present as a broad bank around the edges of the field and a slightly raised circular mound was present in the south-east of the site, measuring about 40m in diameter.

- 4.3 The underlying solid geology of the area comprises Middle Jurassic sandstone, siltstone and mudstone of the Grantham Formation, which are overlain by river terrace deposits of sand and gravel. Alluvial deposits were present on the lower ground to the immediate north and east of the site, associated with the River Nene, and to the immediate west of the site, associated with Billing Brook.

5. Geophysical survey

Standards

- 5.1 The surveys and reporting were conducted in accordance with Historic England guidelines, *Geophysical survey in archaeological field evaluation* (David, Linford & Linford 2008); the Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for archaeological geophysical survey* (2014); the CIfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service & Digital Antiquity *Geophysical Data in Archaeology: A Guide to Good Practice* (Schmidt 2013).

Technique selection

- 5.2 Geophysical survey enables the relatively rapid and non-invasive identification of sub-surface features of potential archaeological significance and can involve a suite of complementary techniques such as magnetometry, earth electrical resistance, ground-penetrating radar, electromagnetic survey and topsoil magnetic susceptibility survey. Some techniques are more suitable than others in particular situations, depending on site-specific factors including the nature of likely targets; depth of likely targets; ground conditions; proximity of buildings, fences or services and the local geology and drift.
- 5.3 In this instance, based on aerial photographic cropmark evidence and previous work, it was known that wall foundations, roads, ditches and pits would be present on the site, and that other types of feature such as fired structures (for example, ovens and hearths) would also be present.
- 5.4 Given the anticipated depth of targets and the non-igneous geological environment of the study area a magnetic technique, fluxgate gradiometry, was considered appropriate for detecting the types of feature mentioned above. This technique involves the use of magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can reflect archaeological features.

Field methods

- 5.5 Magnetic gradiometer measurements were determined using a Sensys Magneto MX V3 multi-sensor magnetometer survey system towed by a quad-bike. Eight FGM650/3 fluxgate gradiometer sensors were mounted at 0.5m intervals, logging data at less than 0.08m intervals along traverses, providing high density data collection.
- 5.6 Data collection point locations were recorded in relation to the Ordnance Survey (OS) National Grid using an integrated global navigation satellite system (GNSS) with real-time kinematic (RTK) correction typically providing 10mm accuracy.

- 5.7 Data were downloaded on site into a laptop computer for initial processing and storage and subsequently transferred to a desktop computer for processing, interpretation and archiving.

Data processing

- 5.8 Sensys MonMX, DLMGPS and MagnetoARCH software were used to record and display gradient and positional data and to create an initial greyscale image of raw gridded data at 0.2m by 0.2m intervals. Geoplot 4 software was then used to produce a continuous tone greyscale image of the raw (minimally processed) data and to produce further continuous tone greyscale and colour images of filtered data. Greyscale images are presented in Figures 2-3; various additional, higher resolution, images are provided on an accompanying CD. In the greyscale images, positive magnetic anomalies are displayed as dark grey and negative magnetic anomalies as light grey. Palette bars relate the greyscale intensities to anomaly values in nanoTesla.

- 5.9 The following basic processing functions have been applied to the data:

<i>clip</i>	clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic
<i>de-spike</i>	locates and suppresses iron spikes in gradiometer data
<i>interpolate</i>	increases/decreases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.125m x 0.125m intervals

- 5.10 The following filter has been applied to the magnetic data (Figure 3):

<i>low pass filter</i>	(applied with Gaussian weighting) to remove high frequency, small-scale spatial detail; for enhancing larger weak features and smoothing data
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Interpretation: anomalies

- 5.11 Three types of magnetic anomaly are present in the data:

<i>positive magnetic</i>	regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches
<i>negative magnetic</i>	regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids
<i>dipolar magnetic</i>	paired positive-negative magnetic anomalies, which typically reflect ferrous or fired items (including horseshoes, brick rubble, fences and service pipes) and/or fired structures such as kilns or hearths

- 5.12 In this instance we have not prepared a separate geophysical interpretation plan, since the majority of data values are considered anomalous in such a busy and varied dataset, and any attempt at defining and colour-coding all of the anomalies would provide an over-simplistic interpretation and be less informative than the greyscale image itself. However, in Figure 4, as a less subjective measure, Geoplot software has been used to allocate the colour red to areas of strongly enhanced magnetism (in this instance, values over +8nT). This allows differentiation between the weaker positive magnetic anomalies typically associated with soil-filled ditches and pits, for example, and the stronger anomalies which are considered more likely to reflect burnt or fired materials.

Interpretation: features

General comments

- 5.13 For ease of reference, anomaly numbers shown bold in the text below (eg **A**, **B**, etc) are also shown on the archaeological interpretation plan.
- 5.14 Except where stated otherwise in the text below, the weaker positive magnetic anomalies are taken to reflect slight increases in relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning. Many such linear and discrete positive magnetic anomalies have been detected across the survey. In this instance, as noted above, many stronger positive magnetic anomalies have also been detected, which may reflect concentrations of burnt or fired materials; these are shaded red in Figure 4. An interpretation of probable stone and soil-filled features is provided in Figure 5. Figures 4 and 5 are combined to provide overall physical and archaeological interpretation plans (Figures 6 and 7).
- 5.15 A great many negative magnetic anomalies have also been detected throughout the survey. In this instance, these anomalies almost certainly indicate the presence of stone; narrow linear anomalies are likely to reflect wall footings while the much broader linear anomalies almost certainly reflect metalled roads and tracks. Various stone features, soil-filled features and burnt areas are discussed further below.
- 5.16 In the magnetically quieter parts of the site, the survey has detected very narrow, parallel, magnetic striations on two perpendicular axes. These anomalies almost certainly reflect former episodes of ploughing.
- 5.17 Small, discrete dipolar magnetic anomalies have been detected across the survey area. These almost certainly reflect items of near-surface ferrous and/or fired debris, such as chainlinks, nails and brick/tile fragments. Low concentrations of such anomalies are detected in almost every magnetic survey, and in most cases these will have little or no archaeological significance. However, in this instance, it is likely that these anomalies reflect a mixture of both ancient and modern objects.
- 5.18 A narrow band of small dipolar magnetic anomalies, up to 3m in width, has been detected along the line of the former field boundary across the middle of the survey area. These anomalies could reflect brick rubble and other materials laid as hardcore for a track alongside the former boundary, providing access to a field in the north. Other anomalies here could reflect fragments of steel wire, nails and staples, for example, which may have been used in a former fence. Much of the course of the

former boundary is now disturbed by rabbit warrens and badger setts, particularly in the north, which are avoided by an existing track. Large intense magnetic anomalies at the southern end of the track are due to the presence of steel mesh fence panels, posts and gates. A large dipolar magnetic anomaly just north of the fenced entrance area reflects two adjacent troughs.

- 5.19 Two narrow parallel negative magnetic lineations have been detected intermittently across the south-western part of the field; these anomalies correspond to an existing track to another field in the west.
- 5.20 The vast majority of other anomalies detected at the site are almost certainly associated with the Roman town and are discussed below.

Town wall, gates and bastions

- 5.21 The course of the town wall has been detected as a linear negative magnetic anomaly around much of the presumed wall circuit (**A**). In some places the anomaly is well-defined while in others it is absent, or at least intermittent; stone will have been robbed from the wall once it fell out of use. The wall is most evident around the south-west of the town and in parts of the east and south-east, where the anomaly typically measures between 2.5-3m in width; the actual width of the wall footing is likely to be at the narrower end of this range.
- 5.22 A weak, irregularly-shaped, positive magnetic anomaly has been detected along much of the inner face of the wall. In places, this anomaly measures up to about 6m in width and almost certainly reflects components of the clay ramp or bank behind the wall identified by Greenfield (Perrin 1999).
- 5.23 In the geophysical survey, and as noted on aerial photographs, the line of the wall appears to be staggered at at least two gates through the wall. This is apparent in the geophysics at the southern (London) gate (**B**) on Ermine Street and the western (Irchester) gate (**C**). Based on aerial photographs, Upex (forthcoming) suggests that the southern gate may have been set at right angles to the wall, perhaps to give greater defensive strength to the entrance. In the geophysical survey the wall could also have a slight stagger near the mid-point of the north-eastern wall section (**D**); this could perhaps indicate the presence of a minor or postern gate through the defences here, though the magnetic data are not clear along this edge.
- 5.24 Additional possible small postern gates may be present in the western town wall, where internal roads appear to extend right up to the wall (**E**, **F**). The external ditch appears to continue unbroken across the front of the possible southern gate **E**. A possible continuation of the northern road through the wall at **F** is unclear and the external ditch there is beyond the survey limit. There will of course have been other gates too, at least in the north where Ermine Street leaves the walled area, though that is just beyond the present survey limit. Other gates may have been blocked at a later date and therefore not detectable, while others may have been in parts of the wall that were heavily robbed.
- 5.25 At intervals along parts of the town wall there appear to be stone projections, presumably towers or bastions; the features appear to be square or rectangular rather than rounded, stirrup or triangular. Five possible bastions have been identified along the south-western part of the wall.

Roads and tracks

- 5.26 The survey has detected a series of substantial roads and tracks, many of which are well-defined, though they do not follow any regular grid pattern. By far the most substantial road in the survey area is Ermine Street, a major Roman road that headed north from London (*Londinium*) to Lincoln (*Lindum Colonia*) and York (*Eboracum*). Within Durobrivae, Ermine Street and its agger survives to a height of approximately 1.5m above the surrounding land. In the geophysical survey the road is evident as a broad negative magnetic anomaly of varying width between 6-8m.
- 5.27 Several side streets have been detected on both sides of Ermine Street. These roads are narrower, typically 3-5m wide, but are again detected as strong negative magnetic anomalies, reflecting stone, sand and gravel.
- 5.28 The layout of the roads suggests that there was no official town planning and that the settlement first developed along Ermine Street and then expanded back from the main road. Several weak and less well-defined anomalies detected between some buildings almost certainly reflect paths and trackways providing access to rear yards or garden areas.
- 5.29 The partial remains of a road have been detected on the interior side of the town wall, adjacent to the clay bank behind the wall. This road has been detected as weak, irregular and diffuse anomalies around parts of the interior, similar in nature to the access tracks between buildings rather than the well-constructed roads detected elsewhere on the site.
- 5.30 Greenfield cut two excavation trenches across the town's southern wall in 1956, just east of the Irchester gate (**C**). One of these, 'Trench A', extended a little way into the town interior and recorded, from south to north: the base of the wall, a clay ramp behind it, several deposits associated with a road (perhaps indicating several phases of road), and various occupation deposits including pits, hearths, oven-bases, postholes and metalled areas (Perrin 1999). This road may have been constructed and maintained in a more *ad hoc* fashion than other roads within the town.
- 5.31 One of the more unusual features detected in the survey, with regard to roads, is the presence of linear positive magnetic anomalies (**G**) within the road that heads north from the Irchester gate (**C**). These anomalies probably reflect earthen deposits and may indicate that materials such as sand/gravel and stone, which had been used in the road construction, were subsequently excavated for re-use elsewhere and the road was then backfilled with earth.

Buildings

- 5.32 As noted above, a great many narrow linear negative magnetic anomalies have also been detected throughout the survey. These anomalies almost certainly indicate the presence of stone, and while some may represent stone kerbs and drains, many others will reflect stone used in wall footings. Some of the footings appear to be for walled yards or other enclosed areas, but many appear to reflect building foundations. A selection of buildings are described below.
- 5.33 Like the roads, the buildings are oriented in many different directions, rather than on any regular plan, the only consistency being that where they are adjacent to a road, they are typically aligned with a narrow gable end fronting onto the street. This is

most evident along Ermine Street, where buildings are aligned perpendicular to the road, on both sides, for almost its entire length throughout the walled town. In places, these buildings are densely packed along the street frontage. An unfortunate consequence of this appears to have been a substantial fire towards the northern corner of the walled town; while the negative magnetic anomalies there reflect wall footings, the very strong positive magnetic anomalies within and around the footings almost certainly reflect burnt materials, such as burnt daub or cob from the walls. The fire appears to have extended for about 130m along both sides of Ermine Street.

- 5.34 Concentrations of probable burnt materials are not confined to this area in the north, however. Similar anomalies have been detected throughout the survey, some associated with other buildings and others probably indicative of discrete, isolated features such as pits, ovens and hearths (Figure 4).
- 5.35 Two substantial building complexes have been detected within the walled town. The more northerly complex (**H**) is located immediately south of the large burnt area, above, and is aligned parallel to Ermine Street. The building measures approximately 70m long by 60m wide; the northern end of the building is partly obscured by anomalies associated with a minor road. The central part of the building appears to be generally devoid of structural remains, with the exception of wall footings flanking a possible wide entrance into the complex from Ermine Street; this possible entrance is centrally placed along the street frontage. Anomalies along the eastern and western sides of the building indicate the presence of distinct enclosed spaces or rooms around the central open area or courtyard; the rooms vary in size from 20m by 10m at the north-west corner (**K**) to 7m by 5m (**L**) next to the entrance on the east side. Although not clear in the data, it is likely that at least the southern side of the complex also comprised a range of rooms. There appear to be at least two additional rooms (**M**) on the west side of the building, extending beyond the otherwise rectangular building plan.
- 5.36 The other large complex (**N**) is located just south of **H**, across a side street, also on the west side of Ermine Street. The main building measures approximately 55m by 40m and appears to sit inside a large enclosure defined by walls along its north and west sides (**O**) and roads on the other sides. As above, the central part of the main building appears to be clear of structures, and ranges of rooms have been detected on three sides. The main entrance is again from Ermine Street, along a 10m wide approach to the north-eastern corner of the courtyard building. The remains of smaller buildings are almost certainly present in the east of the enclosure.
- 5.37 The purpose of these large buildings is not clear, but their size and form are typical of public or 'official' buildings. Both are directly associated with Ermine Street and as such either could have been a *mansio*, perhaps, though both are considerably larger than the *mansio* excavated at Godmanchester to the south. A smaller group of strong anomalies was detected outside each of the two large buildings, to the south-east of **H** and to the east of **N**. In each case the anomalies reflect both probable wall remains and burnt areas, and could possibly represent the remains of bath-houses or stables associated with a *mansio*.
- 5.38 Given the location of the latter complex (**N**), centrally placed within the walled town, with its defined enclosure, ancillary buildings and open spaces, this is perhaps the

more likely candidate for a *mansio* at Durobrivae. The larger complex to the north (**H**) could perhaps have been a market or other public space.

- 5.39 A small building (**P**) at the south-western corner of the possible *mansio* complex (**N**) is particularly well-defined. The building is aligned north-south and measures approximately 23m by 8m. It appears to comprise two small rooms at either end of a larger central area; the central area encloses a small structure of perhaps 3.5m by 3m, with an additional, possibly apsidal, feature at its north end. This building is almost certainly a temple, with both a *cella* and an *adytum*, and possibly with steps or a portico to the north.
- 5.40 The trial surveys in 2016 also detected clear evidence for a Romano-British temple (**Q**), to the immediate west of the northern courtyard complex (**N**). This is only recognisable as such in the electrical resistance survey, where it was detected as a square central room and ambulatory set within a courtyard with an entrance facing west (Lockyear & Halliwell 2017); the gradiometer anomalies detected here in the trial survey and in the present survey indicated the presence of square and rectangular features, but with less definition.
- 5.41 Another building of particular note has been detected in the south-east of the site, on the southern edge of the broad circular mound evident on the ground. This building (**R**) is aligned east-west and measures 24m by 16m. Two internal wall footings provide a floor plan consistent with an aisled hall, the central hall being 8m wide with aisles to either side each measuring 4m in width. The wall footings at the north-eastern corner of the building appear to be missing; in the geophysical survey there appears to be a probable ditch here, which might be assumed to have cut through the corner of the building. However, this is not certain and it is not clear if the ditch here is a continuation of a presumed drainage ditch associated with a road or if the ditch is associated with the mound to the north. An aisled building of almost identical size and plan has recently been investigated at a large villa complex on the Broughton Castle estate in Oxfordshire; this building contained some of the best dressed stonework found on the site so far and is provisionally interpreted as a barn for storing grain (iNews website).

Ditches, slots, enclosures, pits, wells

- 5.42 This category of remains typically comprises soil-filled features, and is similarly well represented across the site. A sample of these features is presented below.
- 5.43 Broad, linear, positive magnetic anomalies have been detected around parts of the southern side of the walled town (**S**). These anomalies almost certainly reflect substantial ditches outside the town wall. The ditches are most clearly represented at the south-western corner of the town, where the survey has detected two parallel ditches, each measuring up to 6m in width, separated by a berm of 8-10m width.
- 5.44 Perhaps the most intriguing ditches are those which appear to be associated with the broad low mound (**T**) in the south-east of the walled area. The mound is enclosed by three ditch circuits and several other ditches appear radially aligned to the mound. Although the mound is roughly circular, only the outer ditch circuit is close to circular; the innermost circuit is almost trapezoidal. A road, aligned east-south-east from near the Irchester gate (**C**), heads to the southern side of the mound. The road's northern drainage ditch appears to join the mound's inner circuit

ditch, which appears to clip the north-eastern corner of the aisled building (**R**), above. However, the road's southern ditch does not appear to cut through the same building; the anomalies for the wall footings are continuous there and appear to overlie the road ditch. The chronological relationship between the mound, circuit ditches, road and aisled building cannot be determined by this survey but could be established by excavation and dating.

- 5.45 Similarly the age and purpose of the mound is unknown. There are almost no magnetic anomalies on the mound, save for occasional small dipolar anomalies which probably reflect near-surface ferrous litter. If the mound pre-dated the settlement, it was not encroached upon. Given the apparently *ad hoc* nature of the settlement's development, it seems unlikely that the mound could be a later feature, inserted into an otherwise undisturbed part of the townscape. It is perhaps more likely that the ditch circuits had already infilled sufficiently for the settlement to encroach upon them, but not onto the surviving mound. However, this is also uncertain. The mound may be part of the local prehistoric landscape of Neolithic henge-like monuments and Bronze Age barrows.
- 5.46 Occasional other circular and sub-circular features have been detected, which appear to be out of character with the Roman settlement and may not be contemporary. One example in the north-east quarter of the town is particularly clear and measures 20m in diameter. Other examples are typically less complete but could possibly reflect the remains of ditches associated with round barrows; many are known to the south of the town and elsewhere along the valley.
- 5.47 One prominent ditch (**U**) extends across the entire walled settlement area, aligned north-east/south-west. The ditch appears discontinuous in the data but this is almost certainly due to differential survival across the site. This feature almost certainly pre-dates the settlement as it appears to be overlain by at least three roads, the south-western town wall and many other occupation features. The ditch has been detected beneath the berm on the south side of the town wall, is absent across the town ditches, and has been detected again continuing south-west beyond the ditches. In places, the remains of a second, parallel, ditch have also been detected. These features could indicate the remains of landscape-scale land boundaries, as have been seen on aerial photographs and a recent geophysical survey (Archaeological Service 2016) at Ferry Meadows to the east.
- 5.48 Whilst not so easy to identify on such a busy site, narrow linear positive magnetic anomalies could reflect either small drainage gullies, robbed wall trenches or beam slots for timber structures. Each type of feature will almost certainly be present on this site in abundance. Examples of this anomaly type which are considered more likely to reflect construction slots include anomalies labelled **V** and **W** in the west of the walled area, but there are many others.
- 5.49 Another relatively common feature type in this survey is represented as large, often irregularly-shaped, weak positive magnetic anomalies (eg **X**); these are particularly common on the north-eastern side of the site but are also present in other parts of the settlement. The anomalies are almost certainly soil-filled pits, in this instance probably quarry pits for sand and gravel, which could have been used in road construction, for example, with sand also used as the aggregate component of daub for walls. The fill of the pits is very uniform magnetically, deposits with slightly

enhanced magnetic susceptibility but virtually no evidence for ferrous and fired debris within the fills.

- 5.50 Many small discrete positive magnetic anomalies, of varying strengths, have been detected throughout the survey. These anomalies all indicate materials whose magnetic susceptibility has been raised or enhanced beyond the background soil levels, and comprise both weakly magnetised and strongly magnetised materials. It is likely that the weaker examples represent predominantly soil-filled features such as pits (eg **Y**, in the south-west), while the stronger examples could reflect either pits containing higher concentrations of burnt or fired materials or small isolated features such as ovens and hearths (eg **Z**, also in the south-west). Some of these features could also possibly reflect former wells, with varied fills.

6. Conclusions

- 6.1 Approximately 23ha of high resolution magnetometer survey was undertaken within the walled town of Durobrivae near Peterborough.
- 6.2 The survey has revealed a plan of the town, which developed along both sides of Ermine Street, a major Roman road. The layout of the town does not conform to any regular grid pattern of streets, but has various roads on different alignments.
- 6.3 Substantial lengths of the town wall have been detected, especially around the southern parts of the town, where possible wall towers or bastions have also been identified as well as two large external ditches. The survey has confirmed that the wall is staggered at at least two of the main gates, the south-east (London) and south-west (Ircchester) gates.
- 6.4 Many buildings have been detected, often represented by stone wall footings though others are interpreted from probable robber trenches or construction slots. The buildings are concentrated along the roads, typically with a short gable end at the street frontage, though many other buildings are also present, set further back, away from the roads. Two particularly large buildings or complexes have been detected, both on the west side of Ermine Street. The southern of these comprises a very large courtyard building, set a short distance back from the road within a large walled enclosure, with smaller, ancillary buildings (possibly stables and/or baths) and almost certainly a temple at the south-western corner of the enclosure. This complex may have been a *mansio*, though the large complex just to the north could equally have served such a function. Unusually for a Roman 'small town', both buildings appear to have had official or public functions.
- 6.5 The majority of buildings measure between 12-18m in length and 7-9m in width, though both larger and smaller buildings are also present. The buildings which share a street frontage are densely packed and there is magnetic evidence to suggest that a substantial fire spread through many of the buildings towards the northern corner of the walled town, along both sides of Ermine Street; the fire appears to have extended for about 130m along the road.
- 6.6 Many smaller isolated anomalies almost certainly reflect pits, for storage and waste, and possibly wells, as well as ovens and hearths. Larger irregular shaped pits were almost certainly for sand and gravel extraction.

- 6.7 Pre-Roman features detected within the survey might include a few circular and arcuate ditches, which could possibly be associated with Bronze Age barrows. The age and nature of the low mound and its associated ditches in the south-east quarter of the site remain uncertain. Whilst the area within the inner ditch circuit appears to be undisturbed, there may have been some encroachment of settlement across the outer ditch circuits. This feature may be part of the prehistoric landscape of the Nene Valley.
- 6.8 Another feature which probably pre-dates the Roman settlement is a ditch aligned north-east/south-west, which appears to underlie the whole of the walled town area. This could perhaps be the remains of a landscape-scale boundary ditch, such as those recorded at Ferry Meadows to the east.
- 6.9 In many instances the magnetometer survey has confirmed the aerial photographic evidence for settlement features, however, it has also added considerable detail and value to that existing knowledge. The results are directly relevant to research themes in the East of England research framework and contribute to ongoing research by the Nene Valley Archaeological Trust.

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Archaeological Trust

Appendix: Historic England Geophysical Survey Summary Questionnaire



Survey Details

Name of Site: Durobrivae Roman town, Water Newton, near Peterborough

County: Cambridgeshire

NGR Grid Reference: TL 121 969

Start Date: 16-10-18

End Date: 18-10-18

Geology at site:

Middle Jurassic sandstone, siltstone and mudstone of the Grantham Formation, overlain by river terrace deposits of sand and gravel

Known archaeological Sites/Monuments covered by the survey

Durobrivae Roman small town, within SAM ref. 1021429: 'The fort and Roman walled town of Durobrivae and its south, west and east suburbs, immediately south and east of Water Newton Village'

Archaeological Sites/Monument types detected by survey

?prehistoric ditches: land boundaries, ditch circuits and round barrows

Roman small town: town walls, gates & towers, town ditches, internal roads, buildings, probable public buildings, temples, pits and ditches

Surveyor: Archaeological Services Durham University

Name of Client: Nene Valley Archaeological Trust

Purpose of Survey: Research

Location of:

a) Primary archive, i.e. raw data, electronic archive etc:

Archaeological Services Durham University

b) Full Report:

Nene Valley Archaeological Trust

Cambridgeshire HER

Historic England – East of England office

Historic England – Geophysics team

Archaeological Services Durham University

Technical Details

Type of Survey: Magnetometer

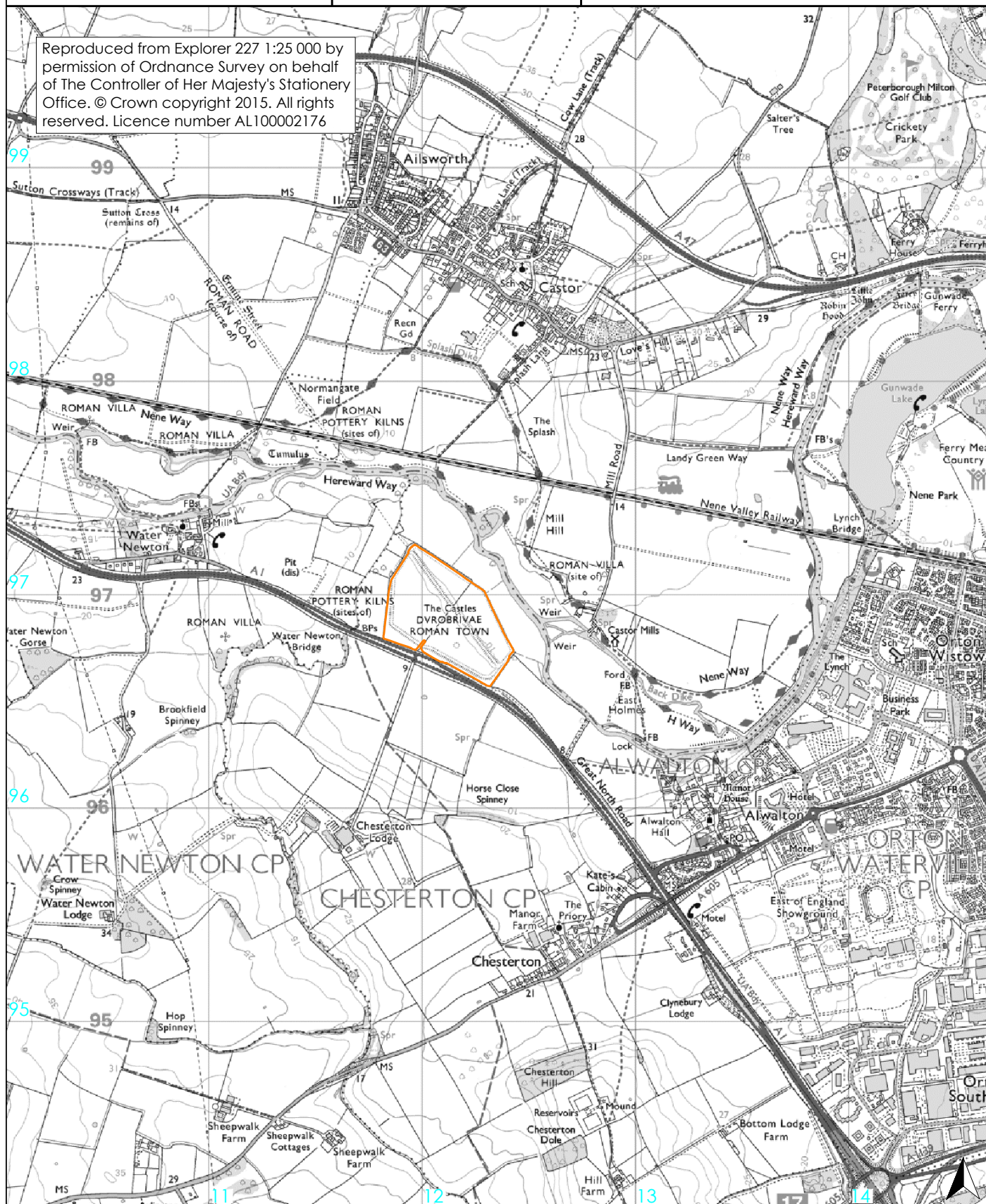
Area Surveyed: 23.2 ha

Traverse Separation: 0.5m **Reading/Sample Interval:** 100Hz (approx. 0.05m)

Type, Make and model of Instrumentation: Sensys Magneto MX V3 with 8 x FGM650/3 fluxgate gradiometer sensors

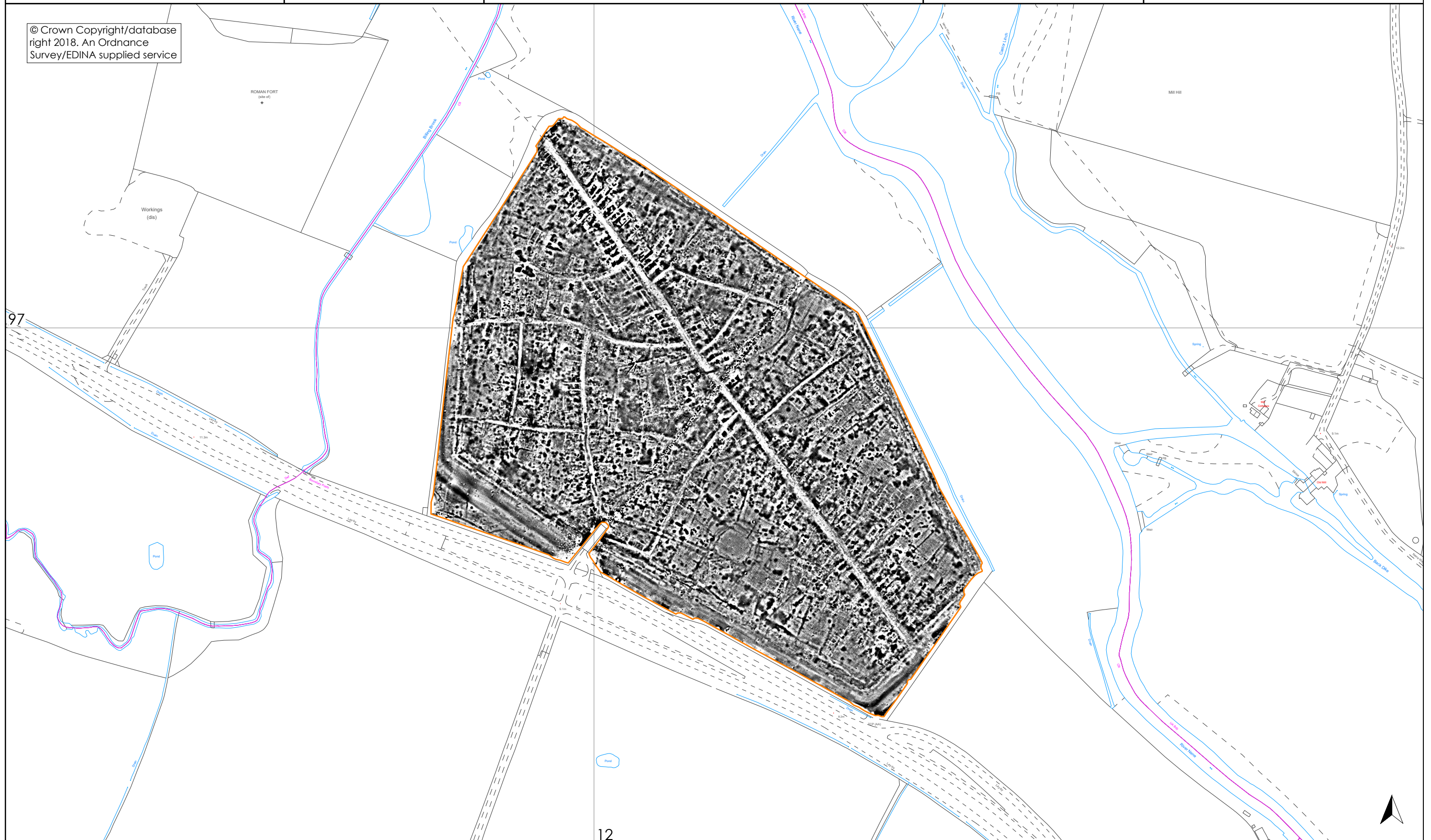
Land use at the time of the survey: Grassland - Pasture

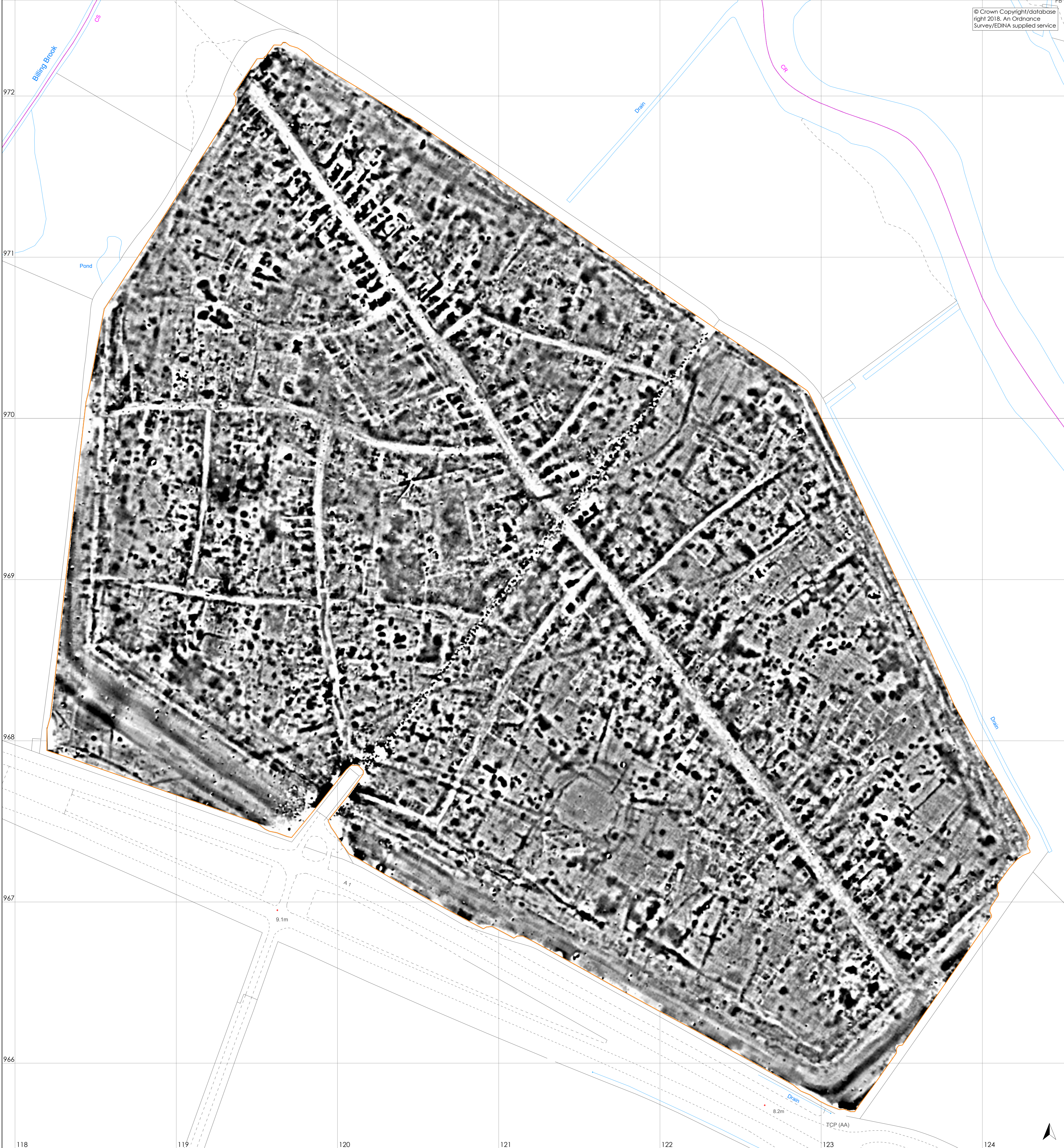
Reproduced from Explorer 227 1:25 000 by permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office. © Crown copyright 2015. All rights reserved. Licence number AL100002176



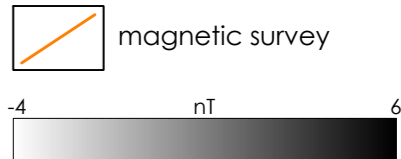
site boundary

0 1km
scale 1:25 000 for A4 plot





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0 50m
scale 1:1000 for A0 plot

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Durobrivae Roman town
Water Newton
Peterborough
Cambridgeshire

geophysical survey
report 4900

Figure 3: Magnetometer survey (filtered
data)

magnetic survey
magnetically enhanced area



0 50m
scale 1:1000 for A0 plot

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Figure 4: Plan of magnetically
enhanced areas





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- magnetic survey
- soil-filled / earthen feature
- wall
- road
- recent field boundary
- existing track

0 50m
scale 1:1000 for A0 plot

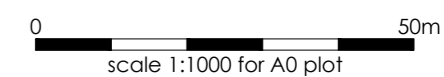
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Figure 5: Probable stone and soil-filled
features



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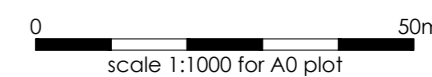
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Figure 6: Physical interpretation (with anomaly labels)





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Figure 7: Physical interpretation (with anomaly labels)

