McDONALD INSTITUTE MONOGRAPHS

The Isola Sacra Survey

Ostia, Portus and the port system of Imperial Rome

Edited by Simon Keay, Martin Millett,
Kristian Strutt and Paola Germoni

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With contributions by
Antonia Arnoldus-Huyzendveld†, Giulia Boetto, Paola Germoni, Alessandra Ghelli, Jean Philippe Goiran, Ludmilla Lebrun-Nesteroff, Simon Keay, Ilaria Mazzini, Martin Millett, Carlo Pavolini, Carlo Rosa, Férreol Salomon, Kristian Strutt, Cécile Vittori, Sabrina Zampini

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Contents

Contributors vi
Figures vii
Tables ix
Preface by Carlo Pavolini xi
Acknowledgements xxi

Chapter 1 Introduction 1
Simon Keay, Martin Millett, Kristian Strutt and Paola Germoni

Chapter 2 Background to the Isola Sacra 11
Simon Keay, Martin Millett and Kristian Strutt

Chapter 3 The Survey Methodology 25
Simon Keay, Martin Millett and Kristian Strutt

Chapter 4 Results of the Survey 33
Simon Keay, Martin Millett and Kristian Strutt

Chapter 5 The Portus to Ostia Canal 123
A multi-proxy analysis of the evolution of the Portus to Ostia canal
Ferréol Salomon, Ludmilla Lebrun-Nesteroff, Jean-Philippe Goiran, Giulia Boetto, Antonia Arnoldus-Huyzendveld†, Paola Germoni, Alessandra Ghelli, Illaria Mazzini, Cécile Vittori, Sabrina Zampini and Carlo Rosa
The Isola Sacra shipwrecks
Giulia Boetto, Alessandra Ghelli and Paola Germoni
General Conclusions
Simon Keay

Chapter 6 Chronological Synthesis 147
Simon Keay, Martin Millett and Kristian Strutt

Chapter 7 The Isola Sacra and the Port System of Imperial Rome 167
Simon Keay, Martin Millett and Kristian Strutt

Gazetteer of sites (Paola Germoni) 173

References 187
Index 197

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Figures

1.1 *The location of the Isola Sacra in Italy in relation to Portus and Ostia* 2
1.2 *Map of Portus, Ostia, and the Isola Sacra in the Roman period* 3
1.3 *Aerial view of the northern part of the Isola Sacra* 4
1.4 *Aerial view looking south-west across the Isola Sacra* 5
1.5 *The* Basilica di S. Ippolito *as excavated and on display* 6
1.6 *Aerial view of the* Necropoli di Porto 7
1.7 Mausolea *(tombs nos 78, 79 and 80) in the* Necropoli di Porto 7
1.8 *Marble blocks from the site of the* statio marmorum 8
2.1 *Maps showing phases in the development of the Tiber delta* 12
2.2 *Extract from the map entitled* Il paese di Roma *by Eufronsino della Volpaia (1547)* 13
2.3 *Extract from an anonymous map (1557)* 14
2.4 *Extract from an anonymous map (1557)* 15
2.5 *Antonio Danti's fresco map (1581–82) in the Vatican Gallery of the Maps* 15
2.6 *Extract from the map by Orazino Torriani (1603)* 16
2.7 *Extract from the map entitled* Topografia geometrica dell'agro romano *by G.B. Cingolani (1692)* 17
2.8 *Map of the Tiber delta entitled* Planimenta Generale della Paga Litoranea *by Giovanni Amenduni (1884)* 18
2.9 *Extract from Rodolfo Lanciani's* Carta Archeologica dei Dintorni di Roma *(1894– 1906)* 19
2.10 *Map of the Isola Sacra showing the location of the sites of previous finds listed in the Gazetteer* 21
2.11 *Map showing the Roman structures recorded in the area of the Fiume Morto* 22
3.1 *Total station survey in progress by the* Terme di Matidia 27
3.2 *GPS survey in progress* 28
3.3 *Gradiometry survey in progress* 28
3.4 *The LEA MAX fluxgate gradiometer array* 29
3.5 *The GSSI Ground-Penetrating Radar array in use* 30
4.1 *Key to symbols used in the gradiometer interpretation images in this chapter* 34
4.2 *Map showing the layout of the gradiometer survey Areas* 35
4.3 *Plan of Area 1 showing the gradiometer survey results* 38
4.4 *Plan of Area 1 showing the interpretation of the gradiometer survey results* 39
4.5 *Plan of Area 2 showing the gradiometer survey results* 40
4.6 *Plan of Area 2 showing the interpretation of the gradiometer survey results* 41
4.7 *Plan of Area 3 showing the gradiometer survey results* 42
4.8 *Plan of Area 3 showing the interpretation of the gradiometer survey results* 43
4.9 *Plan of Area 4 showing the gradiometer survey results* 44
4.10 *Plan of Area 4 showing the interpretation of the gradiometer survey results* 45
4.11 *Plan of Area 5 showing the gradiometer survey results* 46
4.12 *Plan of Area 5 showing the interpretation of the gradiometer survey results* 47
4.13 *Plan of Area 6 showing the gradiometer survey results* 48
4.14 *Plan of Area 6 showing the interpretation of the gradiometer survey results* 49
4.15 *Plan of Area 7 showing the gradiometer survey results* 52
4.16 *Plan of Area 7 showing the interpretation of the gradiometer survey results* 53
4.17 *Plan of Area 8 showing the gradiometer survey results* 54
4.18 *Plan of Area 8 showing the interpretation of the gradiometer survey results* 55
4.19 *Plan of Area 9 showing the gradiometer survey results* 56
4.20 *Plan of Area 9 showing the interpretation of the gradiometer survey results* 57
4.21 *Plan of Area 10 showing the gradiometer survey results* 58
4.22 *Plan of Area 10 showing the interpretation of the gradiometer survey results* 59
4.23 *Plan of Area 11 showing the gradiometer survey results* 60
4.24 *Plan of Area 11 showing the interpretation of the gradiometer survey results* 61
4.25 *Plan of Area 12 showing the gradiometer survey results* 64
4.26 *Plan of Area 12 showing the interpretation of the gradiometer survey results* 65
4.27 *Plan of Area 13 showing the gradiometer survey results* 66

4.28 *Plan of Area 13 showing the interpretation of the gradiometer survey results* *67*
4.29 *Plan of Area 14 showing the gradiometer survey results* *68*
4.30 *Plan of Area 14 showing the interpretation of the gradiometer survey results* *69*
4.31 *Plan of Area 15 showing the gradiometer survey results* *70*
4.32 *Plan of Area 15 showing the interpretation of the gradiometer survey results* *71*
4.33 *Plan of Area 16 showing the gradiometer survey results* *72*
4.34 *Plan of Area 16 showing the interpretation of the gradiometer survey results* *73*
4.35 *Plan of Area 17 showing the gradiometer survey results* *74*
4.36 *Plan of Area 17 showing the interpretation of the gradiometer survey results* *75*
4.37 *Plan of Area 18 showing the gradiometer survey results* *76*
4.38 *Plan of Area 18 showing the interpretation of the gradiometer survey results* *77*
4.39 *Plan of Area 19 showing the gradiometer survey results* *78*
4.40 *Plan of Area 19 showing the interpretation of the gradiometer survey results* *79*
4.41 *Plan of Area 20 showing the gradiometer survey results* *82*
4.42 *Plan of Area 20 showing the interpretation of the gradiometer survey results* *83*
4.43 *Plan of Area 21 showing the gradiometer survey results* *84*
4.44 *Plan of Area 21 showing the interpretation of the gradiometer survey results* *85*
4.45 *Plan of Area 22 showing the gradiometer survey results* *86*
4.46 *Plan of Area 22 showing the interpretation of the gradiometer survey results* *87*
4.47 *Plan of Area 23 showing the gradiometer survey results* *88*
4.48 *Plan of Area 23 showing the interpretation of the gradiometer survey results* *89*
4.49 *Plan of Area 24 showing the gradiometer survey results* *90*
4.50 *Plan of Area 24 showing the interpretation of the gradiometer survey results* *91*
4.51 *Plan of Area 25 showing the gradiometer survey results* *92*
4.52 *Plan of Area 25 showing the interpretation of the gradiometer survey results* *93*
4.53 *Plan of Area 26 showing the gradiometer survey results* *94*
4.54 *Plan of Area 26 showing the interpretation of the gradiometer survey results* *95*
4.55 *Plan of Area 27 showing the gradiometer survey results* *96*
4.56 *Plan of Area 27 showing the interpretation of the gradiometer survey results* *97*
4.57 *Plan of Area 28 showing the gradiometer survey results* *98*
4.58 *Plan of Area 28 showing the interpretation of the gradiometer survey results* *99*
4.59 *Plan of Area 29 showing the gradiometer survey results* *102*
4.60 *Plan of Area 29 showing the interpretation of the gradiometer survey results* *103*
4.61 *Plan of Area 30 showing the gradiometer survey results* *104*
4.62 *Plan of Area 30 showing the interpretation of the gradiometer survey results* *105*
4.63 *Plan of Area 31 showing the gradiometer survey results* *106*
4.64 *Plan of Area 31 showing the interpretation of the gradiometer survey results* *107*
4.65 *Plan of Area 32 showing the gradiometer survey results* *108*
4.66 *Plan of Area 32 showing the interpretation of the gradiometer survey results* *109*
4.67 *Plan of Area 33 showing the gradiometer survey results* *110*
4.68 *Plan of Area 33 showing the interpretation of the gradiometer survey results* *111*
4.69 *Plan showing the location and the results of the Ground-Penetrating Radar survey in the via Valle Sacra* *112*
4.70 *Plan showing the interpretation of the results of the Ground-Penetrating Radar survey in the via Valle Sacra* *113*
4.71 *Photo mosaic of the vertical Aeronautica Militare aerial photographs of the Isola Sacra* *116*
4.72 *Photo mosaic of the vertical Royal Air Force aerial photographs of the Isola Sacra* *117*
4.73 *LiDAR image of the Isola Sacra showing features mentioned in the text* *118*
4.74 *Satellite image of the Isola Sacra* *119*
4.75 *Plan showing the features plotted from aerial photography, LiDAR and satellite imagery* *120*
5.1 *General location of the Ostia-Portus system and the Isola Sacra in the Tiber delta* *124*
5.2 *Detailed map of the two areas studied: north and south of the Isola Sacra* *125*
5.3 *Detailed map of the area investigated in 2017* *126*
5.4 *Cross-section of sedimentary cores from the boreholes drilled in the northern part of the Portus to Ostia Canal* *130*

5.5 *Detailed palaeoenvironmental analyses of Cores ISF-1 and ISN-1* *132*
5.6 Palaeoenvironmental Age-Depth Model *(PADM Chart) of Cores ISF-1 and ISN-1* *133*
5.7 *Main phases in the formation of the Isola Sacra* *136*
5.8 *The excavation area with the position of the Isola Sacra l and 2 shipwrecks, and the timber* *140*
5.9 *The Isola Sacra 1 shipwreck* *141*
5.10 *View from the south-west of Isola Sacra 1* *142*
5.11 *The pieces of the strakes on the stainless supports within the storage facility at Ostia* *142*
5.12 *Plan of Isola Sacra 1* *143*
5.13 *The port side of Isola Sacra 1 preserved up to the gunwale* *143*
6.1 *Plan of Isola Sacra in the Claudian period/early first century* AD *148*
6.2 *Plan of Isola Sacra in the late first century* AD *150*
6.3 *Plan of Isola Sacra under Trajan/early second century* AD *152*
6.4 *Interpretation of the layout of the field-systems on the Isola Sacra in the early second century* AD *154*
6.5 *Plan of Isola Sacra in the High Empire* *158*
6.6 *Detailed plan of the southern area showing the principal buildings* *161*
6.7 *Reconstruction image showing the canals on the south side of Portus and the north side of the Isola Sacra with the Tiber in flood* *164*
7.1 *Plan showing the Isola Sacra in relation to Portus and Ostia* *170*

Tables

1.1 *Isola Sacra geophysics: Summary of fieldwork seasons and areas covered* *9*
4.1 *Principal air photographs consulted in this study* *115*
4.2 *Multispectral bands in the Worldview 2 satellite imagery* *115*
5.1 *Location and heights of the cores drilled* *127*
5.2 *Radiocarbon dates* *128*
5.3 *Archaeological dates* *129*
6.1 *Buildings within the southern settlement* *160*

Preface

Carlo Pavolini

The survey that is published in this volume forms part of the Portus Project which is directed by Simon Keay. This initiative followed on from the overall 1998–2004 survey of Portus (Keay *et al*. 2005) and, since 2007, has produced several benchmark publications (eg. Keay and Paroli 2011).[1] It is an initiative conducted in close collaboration with the *Soprintendenza Archeologica di Ostia*, now the *Parco Archeologico di Ostia Antica*. The contribution of the latter to the publication is recognized by the presence of its archaeologist Paola Germoni, who is one of the four editors of the book, and who also co-signed the introduction, oversaw the preparation of other parts of the book, and took part in the drafting of its text (see below), along with Simon Keay, Martin Millett and Kristian Strutt.

In the first years of its activity, the Italian-British research programme was focused upon the imperial harbour basins to the north of the Tiber delta at the site of Portus and in its hinterland. They produced extraordinary results, for an idea of which one only needs to refer to the essential works mentioned in the previous paragraph. But in turning specifically to the Isola Sacra – where the results of the research are no less exceptional, as we shall see – the greater part of the work was undertaken between 2008 and 2012, with the collaboration (apart from the *Soprintendenza*, now the *Parco Archeologico di Ostia Antica* by virtue of its responsibilities to protect its cultural heritage) of such scientific institutions as the British School at Rome, the Universities of Southampton and Cambridge, and many other institutions and scholars of diverse origins and specialisms.

The difference between the survey of 1998–2004 (Keay *et al.* 2005) and that published here is fairly clear. The objective of the former was to study an area that had been built-up in antiquity, in some areas densely, while the latter is a landscape survey that has as its setting an area of *c.* 98 ha that we could define as 'free' of structures. However, this was only 'free' in a certain sense: the authors of the introduction make it clear that while the lands of the Isola Sacra are largely used for agricultural purposes today, there is also a large presence of houses, warehouses and other structures, as well as drainage channels relating to the *Bonifica* (drainage programme) of the early twentieth century and trenches for electric cables etc, all of which have inevitably conditioned a survey based upon geo-detection methodologies. While undertaking the survey, the archaeologists also had to take into account periods of time when fields were fallow or used for pasture.

A separate debate concerns the serious problem of illegal building. Nowadays, this is less prevalent and more controlled across the land area of the ancient Isola Sacra on account of various land protection measures; unfortunately, however, it is still widespread across the land which extends as far as the present-day coast of Fiumicino, and which corresponded to the sea in antiquity. It is also responsible for the current state of the banks of the watercourses which define the Isola to the north-east and to the north-west (in other words the Fiumicino Canal, or '*Fossa Traiana*', and the Tiber itself), which are cluttered with workshops for boat repairs and other often illegal installations. It is a situation that is lamented by the authors and which only leaves free the area of the Capo Due Rami, which corresponds to the north-easternern angle of the Isola.[2]

I will not detain myself on the numerous details provided in the text. This is the case of the 'traditional' sources discussed in Chapter 2, in which are included, for example, maps before and after the flood of 1557,[3] and aerial photographs from 1911 (Shepherd 2006) down to the Second World War (R.A.F. and *Aeronautica Militare Italiana*) and subsequently (*S.A.R.A.-Nistri*). Amongst these sources, those that derived from archaeological research undertaken before the start of the Portus Project stand out, and the description of them by the authors of this book forms a cohesive whole in the context of a review of the topography of

the Isola as traditionally understood. Some of these are very well-known sites, such as the *Ponte di Matidia*, the *Basilica di S. Ippolito*, and the building identified as the *Isaeum* of Portus, a hypothesis which the authors support, to my mind correctly. Above all, the famous *Necropoli di Porto*, otherwise known as the Isola Sacra necropolis, which has been the object of excavations since the time of Guido Calza,[4] and which was given this name at a time before other burial areas, often of a similar size, had been uncovered in the vicinity. At this point, it is useful to mention the important Gazetteer of Sites, an appendix to the volume prepared by Paola Germoni, which lists discoveries of every kind from the Isola Sacra, collated not only from earlier publications, but also from official archives, including the old *Giornali di Scavo*, accounts sent to the *Ministero*, unpublished notes produced by members of the *Soprintendenza* etc. It consists of 52 sites that are distinguished with the symbol G (**G1**, **G2**, etc) that are located on the map Fig. 2.11.

I do not wish to reflect upon the methodologies used in the survey (Chapter 3, which like Chapters 6 and 7, was written by Keay, Millett and Strutt), not least because I do not feel sufficiently competent to do so. Correctly, this is a very technical account which will surely be of great value to experts who specialize in the application of non-destructive techniques to the study of ancient landscapes, an area of expertise which is going through a period of continual development. In the case of the Isola Sacra, therefore, the use of aerial photographs was accompanied by the study of satellite images and LiDAR data, the latter being a form of aerial laser scanning. I have already referred to the topographic survey undertaken between 2008 and 2012, and in Chapter 3 it is mentioned again, providing numerous technical details; the same is the case for the approach taken by the main form of geophysical survey undertaken in the Isola Sacra, namely magnetometry.

Up until this point, I have reflected upon the methods used in the survey. The following chapter, however, examines the results, which are presented on a method-by method basis: the results obtained from the gradiometry - effectively the interpretation of the geophysical anomalies, those from Ground-Penetrating Radar (G.P.R.), aerial photographic evidence and LiDAR coverage. The outcome of all of this fieldwork is provided by the splendid set of images, all of a high quality and definition, that are amongst the greatest merits of the book. It is logical that within its broader iconographic repertoire, and over and above the many photographs provided, the drawings should be of overall importance, particularly the plans. To give just one example to illustrate my point, the plan in Fig. 4.2 reproduces the general 'mosaic' of the 33 rectangular areas in which the area covered by the Roman Isola Sacra was divided in order to present the results of the survey. Area by area, the successive figures present the results obtained by means of the different (and integrated) techniques that I briefly describe above. Thus, for instance, Fig. 4.4 (which corresponds to Area 1, which represents the northern sector of the Isola Sacra between the *Basilica di S. Ippolito*, the '*Fossa Traiana*', and the *Ponte* and *Terme di Matidia*) synthesizes the results from the gradiometry and the discoveries made before the survey, which are superimposed upon the layout of the modern landscape, which is represented in a lighter colour.

In any event, the author of the preface to a book does not need to describe the results point by point, as this would be both repetitive and boring. For a book as rich and complex as this one, it was necessary to try and understand its overall structure and to focus upon specific issues. Now that I have done this, I would like to concentrate upon several specific points about which it seems to me possible to put forward some personal reflections, in some cases. There are also the issues relating to the most 'revolutionary' discoveries provided by the Portus Project in relation to the historical and archaeological study of the Isola Sacra in recent years.

Pride of place amongst these goes to the discovery of the canal which crossed the whole of the island from north-west to south-east: this had already been reported in previous years,[5] but is only described in detail and with the benefit of full documentation in this volume. Thus, the Portus to Ostia Canal not only occupies the whole of Chapter 5 in this book, but also acts as one of the key factors underlying the new interpretation of the topography of the ancient island. In the conclusions, the authors define it as the most ambitious work of infrastructure and engineering documented on the Isola Sacra, with evident implications for the history of the entire port and urban system that had the mouth of the Tiber as its fulcrum. And it is right that the editors refer to it as the Portus to Ostia Canal, and not *vice versa*; this might seem to be purely a question of terminology but for them, however, it confirms the absolute centrality of the creation of the Claudian and Trajanic basins (and the settlement which developed around them) within the context of the transformations of the entire coastline which they brought about during the first and second centuries AD.

The mouth of the northern end of the canal was cut into the southern quay of the '*Fossa Traiana*'. Significantly, this point lay opposite the mouth of the *Canale Romano* on the northern side, a canal which

ran eastwards in an arc in the direction of the Tiber (see the topography of this in Fig. 1.2). The Portus to Ostia Canal was the widest[6] of all those that have been located so far at Portus and in its vicinity since the publication of the 1998–2004 geophysical survey. It is not worth going into detail here about the geological and geoarchaeological research that has defined its characteristics, and which has been the result of work of experts on the prehistoric and protohistoric phases of the fluvial and coastal phases of the Tiber delta, such as F. Salomon, J.-Ph. Goiran, A. Arnoldus-Huyzendveld† amongst others. The boreholes, already published in part and now interpreted as part of a stratigraphic sequence in their broader context, were drilled in part between 2011 and 2013, and completed in 2017.

Turning attention to the historical aspects, and in particular hypotheses about ship draught and navigability, it is very interesting to learn that the canal could have been used at least in part by commercial ships of considerable tonnage equivalent to, for example, the 150-ton vessel on display in the splendid museum of the *Bourse* at Marseille. While it is true that this water route seems to have been crossed by a road and thus a bridge at a certain point, it is possible that this may have been a mobile installation. Moreover, the question as to whether the Portus to Ostia Canal was used for navigation alone or whether it also served to relieve Tiber flood waters, remains open.[7] Another major problem to confront us concerns the southern end of the canal. One cannot state with certainty that it flowed into the Tiber opposite Ostia, or directly into the sea; the various possibilities can be seen in Figs 5.1, 5.2 and 5.7. The writers would seem to favour the first possibility, not unreasonably. This issue is so important that it recurs several times, as well as in Chapters 6 and 7, where it is noted that in all the hypotheses noted above, the interplay of currents and the silt transported by the canal would have created difficulties for manoeuvring ships and made it difficult to establish a river port in this sector.

Nevertheless, a first conclusion concerning such a new and unexpected feature of the topography of the Isola is its chronology. In the volume it is argued that the watercourse was created between the end of the first and the beginning of the second century AD, an obvious coincidence with the grandiose Trajanic engineering enterprise at Portus; in the conclusions of the book, the dating is further refined to a date of somewhere between AD 110–120, with a final completion during the reign of Hadrian. Its disuse, however, would have begun between the late second and the beginning of the third century AD: this is an interesting suggestion which could be taken to support those arguments which have suggested that the first signs of the decline of the port system at the mouth of the Tiber - referring to Ostia, however, and not Portus - were already becoming manifest in the Severan period (see below). This therefore means that the canal would have been in full use for a relatively short period of time, perhaps a century or so; in the conclusions, it is argued that after this, the authorities were clearly not able to manage dredging operations, and the canal silted up, perhaps in the course of the fourth century AD, as the 1998–2004 survey has shown to have been the case with other watercourses around Portus.

There are several indicators that help us to better define this chronology, such as the function of the watercourse as interpreted from another sensational discovery. This concerns two shipwrecks from the Isola Sacra (Figs 5.9–13), whose relationship to the canal is stated as probable rather than certain.[8] The section of text that discusses these benefitted from an expert in the archaeology of ships, Giulia Boetto, as well as Alexandra Ghelli and Paola Germoni. Wreck no. 1 was discovered in 2011, *c.* 300m to the north of the north bank of the Tiber, in the course of works for the new *Ponte della Scafa*; Wreck no. 2 (arranged perpendicularly to Wreck 1) was found a little later, but while the remains of the former were completely recovered,[9] the latter has not yet been completely excavated (the known section is 14m long). Apart from presenting very interesting details about process of excavation, restoration and conservation, and the types of wood used in Wreck no. 1, there is a discussion of its chronology, with a *terminus ante quem* of the third century AD proposed on the basis of stratigraphic evidence.[10] On the other hand, the relatively small size of the boats supports the idea – proposed by the writers in the preceding pages – that this watercourse may have also been used by boats of small and medium capacity, with a draught of 2.5m: in other words, *naves caudicariae* or boats of a similar typology used for local commercial cabotage and, above all else, in connecting Portus with Ostia.

Overall, therefore, the Isola Sacra canal would not have constituted port infrastructure in the strict sense, as was indeed the case of the *Canale Romano* or the '*Fossa Traiana*' itself; nor were warehouses or analogous installations documented along its banks. It must, therefore, have served more for transit (and occasionally for mooring[11]) than for the unloading and storage of merchandise.

In the final part of the book (Chapters 6 and 7), Keay, Millett and Strutt present a holistic synthesis of everything presented up to this point. For ease of reference, I have alluded to many of their conclusions in my preceding pages. For what remains, I will omit

much information that was known prior to the survey. However, it is important to note that the writers take a stand on the respective roles of Claudius and Trajan in the complex process of the port system as we understand it today. The impact of the interventions undertaken under the first of the two emperors is reinforced: while the Fiumicino Canal was thought to have been excavated in the Trajanic period until recently, the 1998–2005 survey has confirmed that it must have already existed under Claudius.[12] A not unimportant consequence of this was that the Isola Sacra could be considered to have been an island by the middle of the first century AD,[13] even though it did not have the epithet 'Sacra'; the chapter also discusses the Late Antique name for this strip of land and its possible explanation, an issue upon which I will not dwell.

The frequent floods which would have affected the Isola, also explain the rarity of ancient rural settlements, a fact confirmed by the survey. The excavation of canals clearly improved the situation, as we have seen, but the impression that the Isola had a limited population is also true of subsequent periods, with one exception. It is at this point that a highly relevant issue, that of the so-called *Trastevere Ostiense*, makes its first appearance in the book. It has only been in the last decades that it has begun to receive the attention that it deserves, owing to discoveries on the ground and numerous publications. One should not forget that the Isola Sacra in the Roman period was very different to what it is today, not only because it was 'narrower' on the coastal side, but also because to the east, the ancient course of the Tiber incorporated the extensive meander that was subsequently cut and isolated by the sixteenth century flood mentioned earlier. They are very well-known issues, but not everyone realizes that the part of the Isola which corresponded to the spur of land within the meander was relatively heavily urbanized down to at least the first century AD.[14]

In terms of terrestrial communications, the principal ancient road on the Isola was the via Flavia, as is well known; but also of importance here, was its connection with Portus (and thus its crossing of the '*Fossa Traiana*'). The authors argue in favour of a Flavian date for the origin of the *Ponte di Matidia*, which would have then been repaired – by Matidia – in the Trajanic period. In short, the Flavian interventions in the Isola would have been considerable, and are also attested (as is discussed in another part of the text) by both the building of the first *mausolea* at the *Necropoli di Porto* at the end of the first century AD, and the fact – noted by P. Pensabene – that 15 percent of the documented marble blocks from the *statio marmorum* on the south side of the '*Fossa Traiana*' are also attributable to the Flavian period.

The line of the via Flavia in the southern part of our territory is uncertain, and its relationship to that of the Portus to Ostia Canal cannot be defined with certainty; neither are we in a position to document in detail and with certainty the route by which, in the opposite sense, it entered Ostia from the south and left it again by the north in order to reach the river, and in the end to cross the Isola itself and arrive at Portus.[15] As for the means by which the road crossed the Tiber, the location and configuration of the bridge whose piers were seen in 1879, are not precisely known (Site **G50** of the Gazetteer). Several suggestions, however, are possible. The text provides reasons for thinking that in origin, the via Flavia would have followed a straight line, from its origin in the north-west down to the right bank of the river. This would support an argument in favour of a bridge at the position of site **G50** (Fig. 2.10), and thus a road access into Ostia at a point at or near Tor Boacciana. The creation of the canal on the Isola under Trajan would have thus led to a change in the line of the via Flavia and the creation of a bridge on the canal itself (see above), which should not be confused with the archaeologically attested structure crossing the Tiber to the south. All of these topographic details are illustrated on Figs 5.1, 5.7 and various others.

The survey has also documented – and this is another significant novelty – the division of the land on the Isola into lots (Fig. 6.4), by ditches of substantial width that could also have been navigated by small boats, as well as being used for drainage. Leaving details of them aside, there are several important aspects worth noting. In some parts of the Isola one glimpses the existence of rectangular allotments oriented east–west, following a modular length equivalent to 50m or multiples of 50m (100m, 150m) that are difficult to relate to the customary system of Roman land divisions; nor are the productive uses of the allotments easy to identify. As regards their chronology, there are reasons for thinking that the sub-divisions of the land into allotments occurred after the establishment of the via Flavia, which then came to constitute the western, or rather the north-western, margin of the land scheme, and was subsequently cut by the Portus to Ostia Canal. Did this belong to a formal *limitatio*? The authors leave this question open, while recalling that in one passage (222.6) the *Liber Coloniarum* speaks of lands around Portus being assigned to *coloni* by Vespasian, Trajan and Hadrian, and to single individuals by Lucius Verus, Marcus Aurelius and Commodus. Certainly, none of these sources explicitly mention the Isola Sacra, although in theory, the term *strigae* could correspond to these lots.

In terms of the areas of burial, the survey confirms the existence of a burial area along the via

Redipuglia (**G17–G19**) that largely represented a continuation of the *Necropoli di Porto* par excellence, which is situated along the via Flavia, and its offshoots (viz. the burials of the *Opera Nazionale Combattenti*, site **G20**). There were also other groups of tombs, and for an overall evaluation of this phenomenon and the observations that follow, the general plans on Figs 6.4–6.5 prove useful.

It is interesting to note that, amongst other things, the tombs located to the north-east of the via Flavia, which are difficult to identify from geophysical evidence alone, do not seem to have included standing *mausolea*, with a few exceptions. Moreover, the strange structures identified along the west bank of the Tiber on the eastern side of the Isola, could also be evidence of *mausolea*, although this would need to be confirmed with excavation.

With good reason, the authors pose the question: since fairly large cemeteries have been documented on the Isola, where did the people reside when they were alive? There was a settlement near the southern bridgehead of the *Ponte di Matidia*, to be sure, but this was not very dense and was for the most part occupied by public buildings.[16] There is a lack of evidence for *domus*, *insulae* and similar buildings on the Isola, and this is also in large measure the situation at Portus. This is at least what is understood from the current state of research.

This is a major issue that is not easily interpreted. As the geophysical survey proceeded and subsequent open area excavations of certain areas were undertaken, it has intrigued members of the Portus Project and caused them to pose questions about the 'urban' character of Portus. In his publications and in conference presentations, Simon Keay has put forward the suggestive hypothesis that there existed a substantial degree of commuting between Ostia and Portus: that is that many individuals involved in the loading and unloading of merchandise at the imperial harbour basins, and in storing it in the warehouses etc, would have lived in the old *colonia* and travelled to their 'place of work' daily, either by road (along the via Flavia), or by boat – in which case they would have used the Isola Sacra canal, or directly by sea. Boats for local cabotage, such as the *caudicariae* or the *lyntres*, would have also been used for this. This is what is left to be guessed at in another passage of the text, where it is argued that thanks to the transport infrastructure that we now understand better, Portus could be reached from Ostia (and *vice versa*) in as little as an hour on foot or by boat. Another hypothesis that is suggested in addition, or as an alternative, is that some of the port workers could have resided in lodgings situated on the now lost upper storeys of the *horrea* at Portus.

Returning to the funerary landscape of the Isola Sacra, the authors suggest, if I understand them correctly, that the *mausolea* on the north side of the Isola were destined for the inhabitants along the southern bank of the '*Fossa Traiana*' and the *Portuenses*, and that the tombs along the via Flavia (including the so-called *Necropoli di Porto*), as well as those situated along the banks of the Tiber, would have served the needs of the *Ostienses*. This is an interpretation about which I would be cautious, and indeed the conclusions warn against overly simplistic hypotheses about 'spatial segregation' and instead suggest the existence of 'mixed' funerary situations; in relation to this, they cite inscriptions from the *Necropoli di Porto* recording individuals who were active in both port cities,[17] both of which were characterised by having societies that were both complex and mobile. All of this is true, although in my opinion, the main argument is a topographic one: in fact, if one examines plans like Figs 6.4–5 (and others), one cannot not help but notice the fact that the tombs along the via Flavia only become dense along the northern stretch of the route, suggesting or confirming the idea that this cemetery had mainly comprised just one of the '*necropolis di Porto*'.[18] When (and if) the funerary panorama of the north-east bank of the Isola along the Tiber are better known, it will perhaps be possible to know whether this sector really was a burial space shared by the residents of Ostia and Portus.

The settlement which, thanks to the survey, has been identified along the southern bank of the Isola Sacra, and thus the right bank of the Tiber, constitutes a reality that is so new and important, as well as having so many implications, that it is justly assigned ample space in the concluding chapters of the book, and inevitably I will do the same here. The discovery, even if only by means of geophysical survey and without verification by means of excavation, had already caused a major sensation (and not just in the scientific community) at the time when Simon Keay made it the object of a press conference held in Rome in April of 2014, that was broadly taken up by the mass media. Following that public presentation, the coordinators of the survey published a report on the discovery that was synthetic, but also exhaustive (Germoni *et al.* 2019). I also attempted to formulate some personal reflections on the matter that were published in the same collection of papers (Pavolini 2019).

The settlement of which we are speaking covers *c.* 4 ha, and is comprised – overall or in large part – by a group of warehouses that were aligned along the southern bank of the Isola. This excluded the area lying between the presumed course of the canal and the route of the via Flavia to the west, which is

understandable because between both of these only a narrow tongue of land would have remained available, and it would have been unsuitable for these kinds of construction. On the eastern side, the complex of buildings that have been identified could be seen to represent a continuation of the collection of buildings that had already been identified in the spur of land within the ancient meander of the Tiber (see in particular, Fig. 6.2). However, it is unclear whether or not there was a gap between both groups of buildings at its narrowest point.

In summary, therefore, five buildings have been revealed to date by the geophysics (the essential details are summarized in Table 6.1 of the book), of which four were definitely warehouses,[19] while the interpretation of the fifth remains more uncertain. In terms of the typology, three of the *horrea* belong to the courtyard type,[20] for which the authors cite Ostian parallels. The fourth is also a probable warehouse although it may perhaps have had a different function and is without any strict parallels on the other side of the river. The fifth building is decisively different, as it seems to consist of a large enclosed quadrangular area and subdivided by lines of internal pilasters[21] (a space for unloading cargoes prior to their storage in warehouses?). In terms of the chronology of this quarter, settlement evidence prior to the late first century AD is rare, perhaps on account of the frequent Tiber floods, while the excavations of the last century indicate that the earliest structures were built from *opus reticulatum* (see Note 21), which can be generically dated to the first–second century AD.

An equally relevant structure that has been revealed by the non-destructive survey in this southern sector of the Isola, is the probable defensive wall that shuts off the 'warehouse quarter' to the north (Fig. 6.6), whose chronology is far from clear. It is significant that, as its discoverers note, it respects the orientation of the system of landscape division that has been discovered to the north: but does that mean that we ought to necessarily attribute it to the same period, that is the late first century AD, or ought we think instead of a more recent date which is not in itself identifiable? To answer this is challenging: as we will see, the authors incline towards the second hypothesis, but in the meantime discount the idea that this defensive circuit could be considered to have been some kind of continuation, on the other side of the river, of the walls of Ostia that are dated by Fausto Zevi on the basis of epigraphic evidence to 63–58 BC. They do this because it is logical to do so (the Isola defensive circuit was clearly destined to protect a complex of vital importance such as the series of *horrea*, and these are much later than the Ciceronian period, as we know), as well as for a whole series of issues. In effect, the defensive wall has a width of 3–5m and has square external towers (not on the angles) of *c.* 6–8m: these are characteristics that – without going into too much detail – differ significantly from those of the late Republican wall circuit of Ostia.

In terms of its circuit, once the Isola Sacra wall reached its western limit, it turned sharply south in the direction of the northern wall of Building 1. The relative chronology of both structures will only be resolved by excavation; however, there are indications from the magnetometry to make one think that the defences were later than the outer wall of the warehouse and that this was incorporated into them in order to consolidate the defensive system. Towards the east, albeit without proof, the authors argue that the wall continued in a straight line as far as the inner (west) bank of the meander (as the above cited plans might be taken to suggest). If this is the case, it would have ensured that the southern and eastern arms of the Tiber would have been provided with an adequate degree of protection against any assailants.

Turning now to the crucial question of its chronology, one point of great importance is the fact that if on the one hand the Isola Sacra wall circuit is significantly different from that of Ostia, on the other it has characteristics that are remarkably similar to those of late antique date that were built at Portus,[22] as the authors argue. Fundamental to understanding the chronology of these are the results of the sondage, albeit of limited scope, undertaken at the so-called '*Antemurale*' of Portus. The stratigraphic sequence here has made it possible to push the date of the fortifications of Portus back from both the traditional Constantinian period, and the late fourth to early fifth century AD date that had been attributed to them at one stage. It is now argued that the fortification could have been completed around AD 470–80, and that it could have been undertaken by a *praefectus Urbi* of Odovacar (Keay and Paroli 2011, 7, notes 22, 82 and 141).

It is clear, then, that if the fortification running along the northern side of the *horrea* on the southern side of the Isola Sacra should also be attributed to a late date on the grounds of similarity, and that if a future stratigraphic excavation should confirm this, then it would raise interesting questions about the last stages of the history of Ostia. These are issues that I have raised in the article mentioned above (Pavolini 2019), which is also cited by the authors of this volume who tend to agree with the hypotheses formulated there. They thus espouse the vision of an Ostia in which the underlying rationale for its earlier floruit had already begun to fade from the third century AD onwards, and which in the middle of the fifth century AD was

heading towards its definitive crisis as an urban institution. There is far too much to say about this issue, but it has already been done on numerous occasions and not only by me.

And still, given the context of our discussion, we can do no less than remember a key fact which is that after the end of the Republic, let alone during Late Antiquity by which time they had largely fallen into disuse, the fortifications of Ostia were never reconstructed. At Portus, as we have just seen, matters played out differently, something which makes one think that in the last period of its use, the warehouse quarter of the *Trastevere Ostiense*[23] with its protective wall, and I would say the Isola Sacra as a whole, was by now under the administrative jurisdiction of Portus[24] rather than Ostia, and therefore under its economic and political control as well. The historical implications would have been evidently highly significant, and need to be further explored.

The final paragraphs of Chapter 7 are dense with final observations and important questions. For the large scale building projects undertaken at both Ostia and at Portus at different times in their histories, particularly those completed for the *annona*, should one think of them in terms of public or private initiatives, or perhaps as combined operations, and in what proportions? As regards Ostia, Janet Delaine (2002) has suggested that in many cases, the investment would have come from private sources (from members of the urban ordo or from *collegia*, freedmen of the *colonia* etc), but it is then worth posing the same question about land ownership, as the authors of the book do, where there are similar problems. In the case of Portus, one can probably attribute it to imperial property, which would have been acquired through inheritance: but what about the lands of the Isola Sacra? Here the question seems to be more complex: the directors of the survey tend to distinguish between the lots, which in the central and northern sectors of the Isola came to be divided up and distributed to *coloni* or those to whom it had been assigned – perhaps as a result of imperial intervention, and those along the southern strip, which at least from the second half of the first century AD when the *horrea* began to appear, could have been in private hands.

The definitive conclusions to the volume do no more than expand upon the contents of Chapters 6 and 7 (which are in themselves conclusive as we have seen), but do so in terms of a broader context. One aspect perhaps prevails above all others: for any future study of Ostia, the change in our perception of its history as a result of the survey results is, and will remain, fundamental. This is because from now on, we need to envisage Ostia as no longer being just the settlement on the left bank of the river as we have traditionally known it, with the *Trastevere* as a poorly studied appendage, but as a great commercial river port (a 'commercial corridor' is the textual definition), or a port cut in two by a river ('a port bisected by a river' as described in the book). And here, a comparison with the Urbs itself becomes inevitable, since studies in recent decades (it is not necessary to provide references, but sufficient to think of the contributions by C. Mocchegiani Carpano, E. Rodríguez Almeida and F. De Caprariis, amongst others) have given the impression of a Rome served commercially by quays and landing stages – with their ensemble of storage buildings – not just concentrated around the *Emporium* and the northern river port of *Tor di Nona*, but spread out along the whole length of the urban stretch of the Tiber.

Consequently, our image of Ostia should also change in respect of its demographic profile. Even though calculations concerning this have always been somewhat random, for obvious reasons, and it seems appropriate to retain the same note of caution from now onwards, it is clear that we cannot still think – for this Ostia as broadly understood – of a population equivalent to the figure of 30,000–40,000 that is usually cited; there would have been many more. The text states this, as well as alluding to another element that, in the context of needing to re-examine the size of the population, is particularly relevant: I am alluding to the large urban expansion of Ostia to the south-east of the Republican walls that would have been documented by another programme of non-destructive survey, namely the geophysical survey directed years ago by Michael Heinzelmann, which remains almost completely unpublished, as our authors lament. In any event, if there is a confirmation of this and add this possible 'Ostia outside the walls' to a *Trastevere* that is otherwise somewhat more densely occupied than previously thought, in schematic terms Ostia would pass from the status of a small to medium sized centre to one of a middle to large size. So many aspects of its history (its relations with Rome and Portus itself), will have to be radically reviewed, while in terms of didactic communication to the non-specialist public, someone would need to re-write the popular guides as well.

The conclusions to the volume speak of the beginnings of the first century AD as the possible initial establishment phase of the commercial infrastructure to the north of the Tiber, with everything that this implies. Without prejudice to excavation controls, this dating could be considered to be too high, since in some parts of the text, the second half of the first century AD had been suggested as the period that

marked the first appearance of the *horrea*, which would have developed above all in the course of the second century AD. In any case, even if it is admitted that a true flourishing of the '*Trastevere*' had begun between AD 50 and 100, in the analysis of the authors this would suggest that the commercial and urban revitalization of the old colony of Ostia was essentially determined by the establishment of the Claudian basin at Portus, rather than as a result of the Trajanic basin, and we have already seen some possible reasons for this.

This picture is completed by the reflections that appear in the final paragraphs of the chapter, and which encompass the broader geographical context of the port system created by the Romans along the central stretch of the Tyrrhenian coast (with Trajan as the protagonist in some of the decisive interventions), and which ranged from Centumcellae in the north to Terracina to the south, if not beyond, since further south lie Pozzuoli and Naples. At the 'heart' of this system lay the Ostia/Portus conurbation, and the 'heart of the heart' was the Isola Sacra, for the understanding of which this book accomplishes a gigantic breakthrough. Notwithstanding its length and completeness and the fact that the present contribution stands out as an essential point of departure, it is not necessarily one of arrival (and I believe that the authors can agree with this). So, the wish – that can perhaps seem to be customary but which has rarely been so justified – is that the Portus Project and the Italian-British surveys of the Isola Sacra around the imperial harbour basins and in its hinterland continue, using both non-destructive and traditional archaeological methodologies, so that they can provide us with further new and unexpected discoveries for historical reflection.

Notes

1 In relation to this Pavolini 2013.
2 Many programmes of urban and landscape replanning along the modern Roman coastline have been drawn up in recent years, with few practical outcomes up until now. Nevertheless, interesting ideas relating to these – with projects in which the archaeological context based upon Ostia and Portus (with the Isola Sacra at their heart) assumes crucial importance – are to be found, for example, in two recent volumes produced by the *Dipartimento di Architettura e Progetto dell'Universita di Roma La Sapienza*, with a contribution by this writer. (Pavolini 2015); see also Pavolini 2019.
3 This is the date which is usually attributed to the moment when the meander formed by the Tiber close to Ostia is cut, remains isolated and silts up, creating the so-called Fiume Morto, although it has been argued that this was a gradual process lasting several years and was not complete until 1562: see amongst others Pannuzi and Rosa 2017.
4 The book cites works down to and including the most recent contribution by Olivanti and Spanu 2019, although it omits the matching article in the same *Atti del Terzo Seminario ostiense* (Baldassarre *et al.* 2019) which integrates and replaces earlier publications by Baldassarre and her collaborators.
5 It was first presented publicly by Germoni *et al.* 2011: figs 1.3–4, although at this stage it was only possible to provide an illustration of the first stretch of the canal.
6 The writers estimate its width at *c.* 35m.
7 In effect, given the general topography, a double function would seem the most probable, and this would not only be the case with the Portus to Ostia Canal, but also those that have been identified, or better interpreted, as a result of recent fieldwork (the *Canale Romano*) mentioned above, the northern canal and the '*Fossa Traiana*' itself: see Keay and Paroli 2011: Figs 1.3–4.
8 Further on, the editors of the volume put forward the hypothesis that the vessels were found in what was the final stretch of the canal which, in nearing the bank of the Tiber, would have turned gently to the west, as seems to be suggested by aerial photographs, coinciding with the route taken by the via Flavia.
9 Length of *c.* 12m x width of 4.88m.
10 This is the rationale for suggesting that the canal was not abandoned later than the Severan period.
11 This may have been the context of the Isola Sacra wrecks.
12 This is probably one of the canals referred to in the well-known inscription (CIL XIV, 85) that records the decision of the central power to create canals that aimed to resolve at least in part the problems of the Tiber floods. It dates to AD 46, and such a chronology confirms (something implicit in the analysis of the authors) that the excavation of the first harbour basin and its canal lying to the south of it must have been planned together. However, the fact that the *statio marmorum* along the line of the '*Fossa Traiana*' was active during the final decades of the first century AD (see below), is a fact that speaks for itself.
13 Which implies that it is only from this point that we can speak of a Tiber delta.
14 All of the relevant bibliography for this, with studies by A. Arnoldus-Huyzendveld, L. Paroli, A. Pellegrino and others, is cited in the volume.
15 In respect to the solution adopted in this book, the question is perhaps rather more complex. I simply refer the reader to Pavolini 2018 which discusses hypotheses relating to the final stretch of the coastal *via Severiana*, which ran from southern Lazio, and after entering Ostia from the south probably, at least to my mind, coincided with the southern stretch of the Decumanus Maximus and the *Via della Foce* as far as the Tiber. There must have been, therefore, stretches of coastal roads that existed prior to the Severan re-organization of the road, and hypothetically the via Flavia could thus be considered to represent their continuation on the Isola Sacra.
16 I note in passing some hypotheses that appear later in the text (in other words, the conclusions), that suggest

the possibility that both here and in the *statio marmorum* further to the east were situated offices – used by imperial officials – charged with collecting customs on merchandise that being transported from the ports to Rome (and in lesser quantity to Ostia).

17 Also, in another passage which refers to epigraphic and juridical documentation, it is noted how many *navicularii* and other members of associations connected with commerce supply and port activities, would have carried out their work both in the old *colonia* and the imperial harbours.

18 And to my mind it is significant that the 'decline' of the cemetery dateable only by its *mausolea* can only be detected from *c*. the first half of the third century AD, as has always been understood. This is perhaps a confirmation of the fact that the importance of Ostia was gradually decreasing and that, as a consequence, the intensity of fluvial and terrestrial connections between Ostia and Portus was also diminishing. While all of this was occurring, Portus obviously continued to be inhabited and flourished, although its inhabitants came to be buried elsewhere. This is, therefore, a complex issue that clearly cannot be developed here.

19 A small part of Building 1 was discovered during an excavation in 1968 (Zevi 1972 and **G41**).

20 I would like to draw attention in this note to many issues relating to such warehouses and related problems that are all very well documented in Chapters 6 and 7 of the book. For example, the probability that the principal product stored in them was grain; the possibility that there were auctions or similar activities in their courtyards, as Janet DeLaine (2005) has suggested in relation to some Ostian buildings; finally, calculation of storage capacity, not only that of the 'warehouse quarter' but also of the urban area of both Portus and Ostia as a whole, a subject about the authors themselves stress prudence.

21 This Building 5 had been observed in the sondages dug in the 1960s (the circumstances of the find and the publication by Zevi and others appears in the entry **G44** in the Gazetteer), and to it perhaps belonged the mosaics located immediately to the east of the limits of the survey, **G45**-**G46**. This was a built-up area, the characteristics of which are for the moment less clear, which extended to the south-west of the sites listed and included structures built from *opus reticulatum* (of the first century AD) that were observed in the same sondages.

22 In making all of these observations, I take as read the fact they all derive from magnetometry results. I have pointed this out on various occasions, and the authors themselves also have this in mind; however, this does not prevent us from reasoning and formulating hypotheses from this kind of evidence.

23 The date of whose abandonment is unknown; in the conclusion, reference is made only to the existence of an undated tomb 'a cappuccina' which was discovered in the old excavations at **G43**.

24 As is well known, the first source that defines Portus as a *civitas* dates to AD 313. The change in its administrative status could have thus occurred earlier, we do not know when, and it could have involved the 'annexation' of the Isola Sacra to the new territory administered by the new *civitas*. Rather broader considerations related to the continued flourishing of Portus in Late Antiquity are discussed in Pavolini 2019.

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Note regarding the Gazetteer

Information about previously explored sites on Isola Sacra is summarized in the Gazetteer (see pp. 173–85). Throughout the text and on the illustrations, references to these sites in text uses the abbreviated form (**G1**), meaning Gazetteer site 1.

Note

1 It was directed by Simon Keay; Grant numbers AH/1004483/1 and AHE509517/1.

Chapter 4

Results of the Survey

Simon Keay, Martin Millett and Kristian Strutt

Abstract

This chapter provides a detailed account of the features recorded in the survey, describing, mapping and offering interpretations of them. The first and largest section describes the features located in the gradiometer survey of thirty-three areas across the island. For each area a plot of the geophysical survey results is accompanied by an interpretative plan. Shorter sections follow on the G.P.R. survey of a single area, and the evidence from aerial photography, LiDAR and satellite imagery for the whole island. These latter sources of evidence provide important information that complements the results from the geophysical survey. Throughout the text, the results of the survey are integrated with the evidence from previous archaeological work.

Geophysical survey 1: gradiometry

Note on terminology

Throughout this section we have used the following conventions to describe and interpret anomalies in the survey data (Fig. 4.1). Geophysical anomalies are described according to their form and their polarity, followed by a basic archaeological interpretation. Our terminology distinguishes 'discrete' (isolated) and 'linear' anomalies. The polarity of an anomaly is described as 'positive', 'negative' or 'dipolar', based upon its magnetic signature. The archaeological interpretation of the geophysical survey results is based upon both comparisons drawn between anomalies and features of known type, and inference derived from known archaeological comparators. The terminology used to describe features has been kept simple, but for consistency we use the term 'ditch' to describe certain negative linear anomalies in order to avoid confusion over the use of the word 'canal'. This latter is reserved for the principal navigable waterways on the Isola Sacra and at Portus. Nevertheless, the word 'ditch' may be misleading since many such features, while relatively small in the grand scheme of things, still measure 4–5m across, and were quite possibly navigable in smaller boats. The exact nature of these features remains unknown, and is further discussed below (p. 153).

The survey areas

Some 98 ha out of a total ground area of *c.* 140 ha were covered in the gradiometer survey of the Isola Sacra. When taken in conjunction with our previous survey of Portus, the overall coverage is approximately 350 ha. In order to facilitate the description and interpretation of the results, the Isola Sacra was sub-divided into thirty-three separate areas (Fig. 4.2) presented at 1:1,500 scale. This represents a compromise between the wish to show the results at as large a scale as possible, and the requirements of a manageable format that can be easily visualized and cross-referenced to the text. However, this approach does create some problems. First, it can be difficult to follow larger continuous features across the landscape. Thus, the Roman canal that extends from north to south right across the Isola Sacra is broken up and discussed in segments. Second, there is inevitably some overlap between certain areas. To ensure that this does not create confusion for the reader, all feature labels on the images are prefaced with the area number under which they are described (thus, the magnetic anomaly, **m1.1,** is described under Area 1). Sites described in the Gazetteer (pp. 173–85) are indicated on the images by number (eg. **G1** is site 1 in the Gazetteer).

The present-day topography of the Isola Sacra is dominated by the ditches that formed the land divisions of the *bonifica*. These were established as land divisions in the early part of the twentieth century and used for irrigation and drainage. The layout of the survey areas was aligned with the grid of the *bonifica* in order to make sub-division of the survey area as economical as possible. Areas 1–4 run southwards from

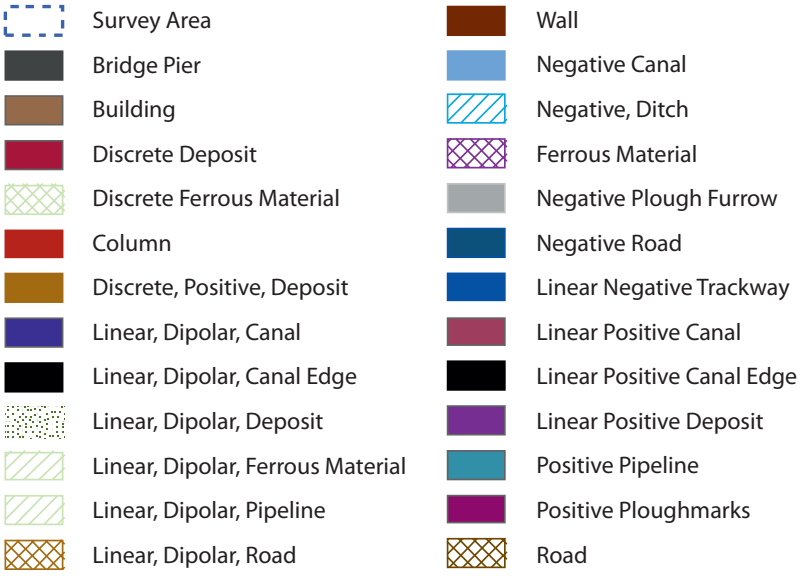


Figure 4.1. *Key to symbols used in the gradiometer interpretation images in this chapter. (Drawing: Kristian Strutt.)*

the *Terme di Matidia* (**G12**) and the '*Fossa Traiana*' (the modern Fiumicino Canal) down to the area immediately to the south of the *Necropoli di Porto* (**G35**). These areas incorporate the ancient coastline, the northern section of the via Flavia, and the features continuing to its east. Areas 5–8 extend to the east, overlapping with Areas 1–4 in the west along the line of the Portus to Ostia Canal discovered in the gradiometry survey (pp. 155–57). Areas 9–12 are located between this canal and the Capo Due Rami, covering the fields beside the '*Fossa Traiana*' and the area of the ancient *statio marmorum* (**G28a**).

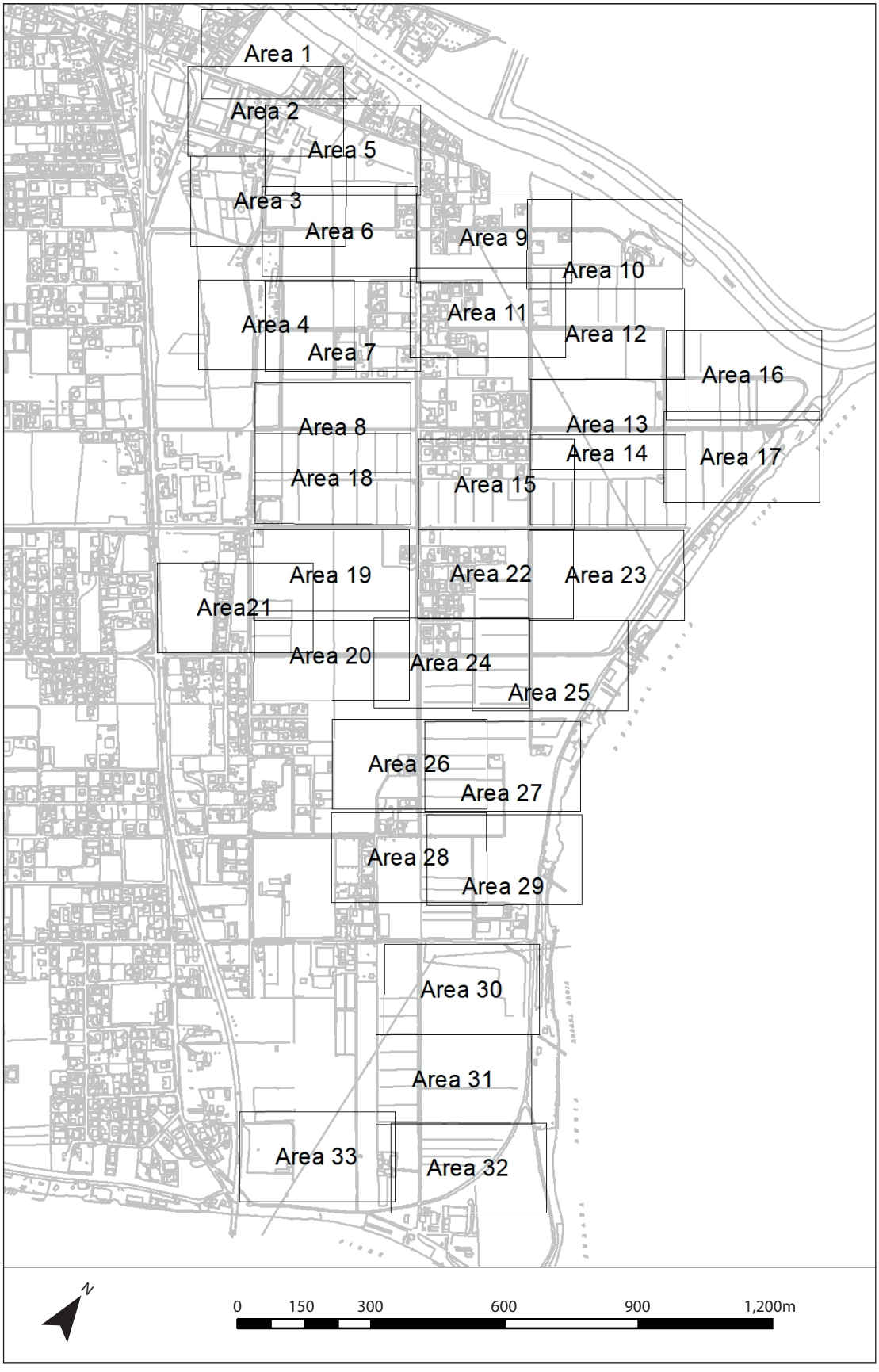
Areas 13–17 encompass the central and eastern portion of the Isola Sacra, running southwards from the Capo Due Rami on the west bank of the Tiber and the fields between the river and the Portus to Ostia Canal. Areas 18–21 are located over the central western part of the Isola Sacra, covering the continuing line of the Portus to Ostia Canal and the via Flavia. They are matched to the east by Areas 22–25, encompassing the fields alongside the Tiber. To the south of these Areas 26–29 lie between the Portus to Ostia Canal and the Tiber. The remaining areas (30–33) are situated alongside the Tiber on the southern side of the Isola Sacra, opposite Ostia Antica.

Area 1 (Figs 4.3 and 4.4)
This was the northernmost area surveyed and covered a plot to the north of the via Redipuglia, to the west of the *Basilica di S. Ippolito* (**G14**) and to the south of the *Terme di Matidia* (**G12**). In total an area of almost 2ha was surveyed with the results indicating a high density of archaeological features.

In the north-east quadrant of the area, a strong linear anomaly [**m1.1**] demarcates the line of the modern dike constructed along the southern side of the '*Fossa Traiana*'. The line of a road is visible, comprising two parallel linear features [**m1.2** and **m1.3**], running directly south for a distance of over 40m. This is flanked to the west by evidence of parallel structures [**m1.4**] close to the embankment and connecting to the baths (**G12**). Anomalies slightly to the east suggest that these are structures and a basalt road corresponding to the section of paved road and brick faced walls located during excavations in the area in 1971 and 1975 (**G13**). These structures continue further to the south [**m1.5** and **m1.6**], immediately to the east and west of the road.

To the south of the bath complex (**G12**), two strong, broad features are represented in the results [**m1.7** and **m1.8**] and probably represent the surface of two further roads cutting across the site. The first runs from north to south for a distance of 48m, while the second, further to the west, runs parallel to it for a distance of 22m, before turning to the east and continuing for a further 20m. Several parallel linear features are also visible [**m1.9** and **m1.10**], running west to east,

Figure 4.2 *(opposite). Map showing the layout of the gradiometer survey Areas described in this chapter. (Drawing: Kristian Strutt.)*


Area 1
Area 2
Area 5
Area 3
Area 6
Area 9
Area 10
Area 4
Area 11
Area 12
Area 7
Area 16
Area 8
Area 13
Area 14
Area 17
Area 18
Area 15
Area 19
Area 22
Area 23
Area21
Area 20
Area 24
Area 25
Area 26
Area 27
Area 28
Area 29
Area 30
Area 31
Area 33
Area 32
N
0
150
300
600
900
1,200m

suggesting the existence of structures here. Further to the south, several linear features are present [**m1.11** and **m1.12**], corresponding broadly to funerary buildings found during excavation in 1975 (**G16**), and the area is cut by the line of a modern field drain [**m1.13**]. Several large structures appear in the south portion of the survey, including a rectilinear feature [**m1.14**], a linear anomaly [**m1.15**] possibly demarcating the line of a road, and a second rectilinear feature [**m1.16**]. All share the orientation of the line of tombs to the south of the via Redipuglia, and probably represent a continuation of this funerary complex (**G19** and **G24**).

The entire survey area is divided by a massive dipolar anomaly [**m1.17**], caused by the foundations of a modern concrete boundary. To its west, three major structures are visible, probably large buildings. The first [**m1.18**], corresponds to a series of undulations in the topography, with the others [**m1.19**] and [**m1.20**] located further to the north towards the southern bank of the '*Fossa Traiana*'.

Area 2 (Figs 4.5 and 4.6)
Area 2, which is situated to the south of Area 1 and overlaps with Area 5 to the east, is in a zone of modern buildings and sports fields to the east of the modern via della Scafa which runs to Fiumicino Airport. The area is dominated by dipolar anomalies caused by modern ferromagnetic materials, fence lines and utilities pipes. Two dipolar features [**m2.1** and **m2.2**] are located on the western confines of the survey, marking possible remains of ancient structures. A series of similar anomalies is present to the east under the largest of the sports pitches. A symmetrical pattern of dipolar features [**m2.3**] is the northernmost of these, with a linear dipolar feature [**m2.4**] crossing the centre of the pitch to the south. This is matched by a second linear feature [**m2.5**], a short linear anomaly [**m2.6**] running north–south, and a rectilinear pattern of discrete dipolar anomalies. These linear anomalies seem to correspond to remains of the funerary complex uncovered during excavations in this area in 1958 (**G18**). Two parallel linear anomalies [**m2.7**] run across the grounds from north to south, and a group of dipolar anomalies [**m2.8**] is situated in the southern part of the pitch. In the area to the east a broad dipolar linear feature [**m2.9**] runs from north to south marking the line of a modern pipe. A second smaller linear feature [**m2.10**] runs across this from east to west. Several dipolar maculae [**m2.11**] are located further to the east, and a broad series of dipolar readings [**m2.12**] results from the iron fence surrounding the sports ground.

To the north-west of these, the small pitch and area of excavation to the south of the via Redipuglia show evidence of a pipeline [**m2.13**] and, together with fainter traces of possible structural remains [**m2.14**] that correspond to the group of tombs located during excavations in 1999 and 2000 (**G19** and **G20**). To the east of the sports ground a band of dipolar readings [**m2.15**] marks disturbance from fence lines. A second band of dipolar measurements [**m2.16**] relates to disturbance from the frontage of the nineteenth-century farm buildings. A pipeline [**m2.17**] cuts across the farmyard from west to east. Several positive linear anomalies [**m2.18**] indicate possible buried structures. A broad band of deposit [**m2.19**] cuts across the area, showing the presence of sand deposits formed by longshore drift along the ancient coastline. A funerary monument was uncovered here in 2008 (**G23**). A further band of such deposits is visible immediately to the south of the via Redipuglia [**m2.20**], and another runs some 50m to the east [**m2.21**]. Several linear features [**m2.22** and **m2.23**] cut across the dune deposits, suggesting the line of an earlier road. In particular, a pair of positive linear features [**m2.24**] is visible. These are on the same alignment as the land allotment boundaries noted further south (below, Area 3, **m3.26**) and east (below, Area 5). Some structural remains are indicated by a rectilinear feature [**m2.25**] to the south of this, a further negative linear anomaly is located to the south [**m2.26**]. These anomalies relate to features to the east of the line of the via Flavia and the results of the G.P.R. survey (p. 114).

Area 3 (Figs 4.7 and 4.8)
Area 3 lies immediately to the south of Area 2, with Areas 5 and 6 overlapping it to the east. It extends on either side of the cemetery excavated in 1938 (**G34**). The excavated *mausolea* lay *c.* 25m to the west of the line of the via Flavia. The zone surveyed to the west of the via Flavia is dominated by a series of dipolar anomalies, with a cluster of features [**m3.1**] alongside three large anomalies [**m3.2**] and two dipolar features [**m3.3**] along the modern field boundary. A line of discrete dipolar features [**m3.4**] runs across the fields to the south from east to west. A second line of features [**m3.5** and **m3.7**] run further to the south, with several smaller features [**m3.6**] further south. The wire fence along the eastern edge of the fields has saturated the measurements along the edge of the area [**m3.8** and **m3.9**]. The background response in the magnetometry is relatively uniform, and it is probable that the whole of this half of the area formed part of the ancient beach.

To the east of the 1938 excavation (**G34**) is a series of dipolar anomalies denoting the geological features representing sand deposits from earlier coastlines that run across the entire survey area (p. 11). Two such bands of deposits are visible, [**m3.11**] and [**m3.12**, **m3.13** and **m3.14**]. The latter extends southwards across the

line of the via Flavia and continues northwards towards via Redipuglia.

To the east of the excavated *mausolea* (**G34**), there is a series of rectilinear anomalies [**m3.15–m3.16**] that represents further funerary structures fronting on to the via Flavia. Those to the south [**m3.16**] are aligned with the Roman road, whilst some to the north sit at a 45° angle to it. Several of these structures appear to cut across the line of the via Flavia, suggesting that its course may have been altered through time. The findspot of the sarcophagus of the muses (**G32**) lay immediately to the north within this complex.

The zone further to the east contains a complex of features. One, lying to the north [**m3.17**], represents probable structures (perhaps further tombs) which are intersected by two curvilinear anomalies [**m3.18**] which continue to the south-west. To the south of these, a linear feature [**m3.19–m3.20**] cuts across the site from east to west, intersecting with a perpendicular linear feature [**m3.21**] running from north to south. Further south are two parallel linear features [**m3.23** and **m3.24]** running from east to west and cutting across a band of dipolar readings [**m3.25**]; these mark former dunes which continue further to the south [**m3.26** and **m3.27**]. They are cut by a parallel linear east–west anomaly to the south [**m3.28**]. Two further perpendicular linear features [**m3.29** and **m3.30**] are also visible running north–south. Overall, these negative linear features form a rectangular grid delimited by ditches [**m3.19**, **m3.20**, **m3.23**, **m3.24** and **m3.28**] running east–west, with [**m3.21**, **m3.29** and **m3.30**] set perpendicular and running north–south. They represent a regular system of land allotment with connected trackways.

Area 4 (Figs 4.9 and 4.10)
Area 4 lies to the south of Area 3 and is separated from it by a gap. It overlaps Area 7 to the east and abuts Area 8 to the south. The southern part of the excavated *Necropoli di Porto* (**G35**) lies in the centre of this area, with its tombs flanking the via Flavia. To its west there is scant evidence for archaeological features. However, a number of broad positive linear features [**m4.1–m4.3**] run across the area from north-west to south-east, and probably demarcate deposits associated with the ancient shoreline, whilst a broad band of dipolar readings [**m4.4**] relate to dune deposits. A band of similar deposits [**m4.5** and **m4.6**] on a north to south alignment, is visible just to the east of the *Necropoli di Porto*, whilst a more substantial band [**m4.9–m4.11**] measuring some 35m wide runs across the area on the same alignment further to the east. A series of linear features [**m4.7, m4.8, m4.12–m4.15**] cuts across these from west to east, while a single similar negative feature [**m4.16**] cuts perpendicularly across the southern part of the area in a northerly direction. These represent a continuation of the system of land division seen in Area 3 (above, **m3.28**), which terminates towards the eastern side of the via Flavia.

Area 5 (Figs 4.11 and 4.12)
Area 5 lies to the east of the via Flavia and overlaps with the eastern parts of Areas 2 and 3, and Area 6 to the south. The remains of a substantial building [**m5.1**] can be seen bordering the south side of the via Redipuglia, with its eastern wall (**G31**) still standing above ground. The structure measures some 30m by 15m, and there is a series of rooms abutting its western and southern sides [**m5.2**]. It probably represents a continuation of the multi-phase building excavated on the line of the via Redipuglia in 2000 (**G26**). A linear negative feature [**m5.3**] is located to its south running alongside remains of a possible wall. A positive linear anomaly [**m5.4**] continues further to the south-east, running parallel to a negative linear anomaly.

To the east lie a series of features associated with the Portus to Ostia Canal that runs north–south across the Isola Sacra (pp. 155–57), and which at this point measures *c.* 50m across. Its western limit, which is more clearly defined further south, is visible here as a linear feature [**m5.5**], marking a possible canal edge or revetment. A second linear feature, [**m5.6**] oriented east to west, directly abuts it to the west. This maintains the alignment of the anomaly [**m2.24**] further to the west and appears to form part of the large-scale system of land division (pp. 151–55). Two large apsidal features [**m5.7** and **m5.8**] are set against the eastern side of [**m5.5**] at this intersection. A broad negative anomaly [**m5.9**] marks the centre of the canal, with an east–west negative feature [**m5.10**] cutting across it. This also cuts a broad positive north–south anomaly [**m5.11**] which continues to the south [**m5.12**] and marks the eastern edge and possible revetment of the canal. The tombs excavated in 2000 (**G27**) apparently lay close to the western edge of this canal, whilst structures associated with the *statio marmorum* (**G28a**) lay on its eastern side. A large block of marble (**G28**) found in 1990 lay within the canal and was presumably lost or dumped there. A group of positive anomalies [**m5.13**] lying immediately to the west of the canal, mark the external and internal walls of another large building (30m by 15m) that may be linked with [**m6.1**] to the south.

Area 6 (Figs 4.13 and 4.14)
Area 6 lies between Areas 5 and 7 and overlaps with Area 3 to the west. The southward continuation of the Portus to Ostia Canal identified in Area 4 occupies much of the eastern half of this area. Just west of the canal, two negative linear features [**m6.1** and **m6.2**] are

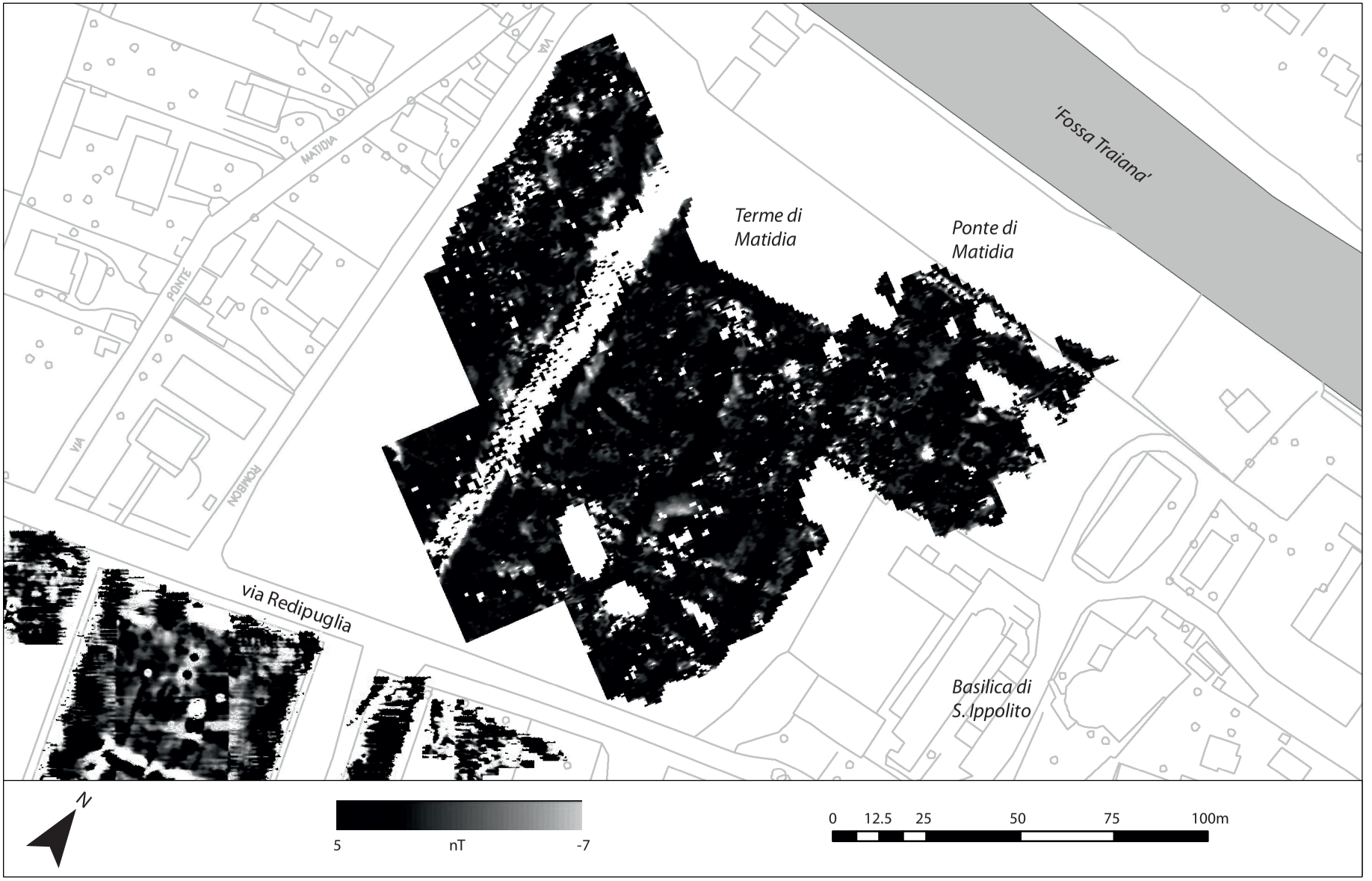


Figure 4.3. *Plan of Area 1 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

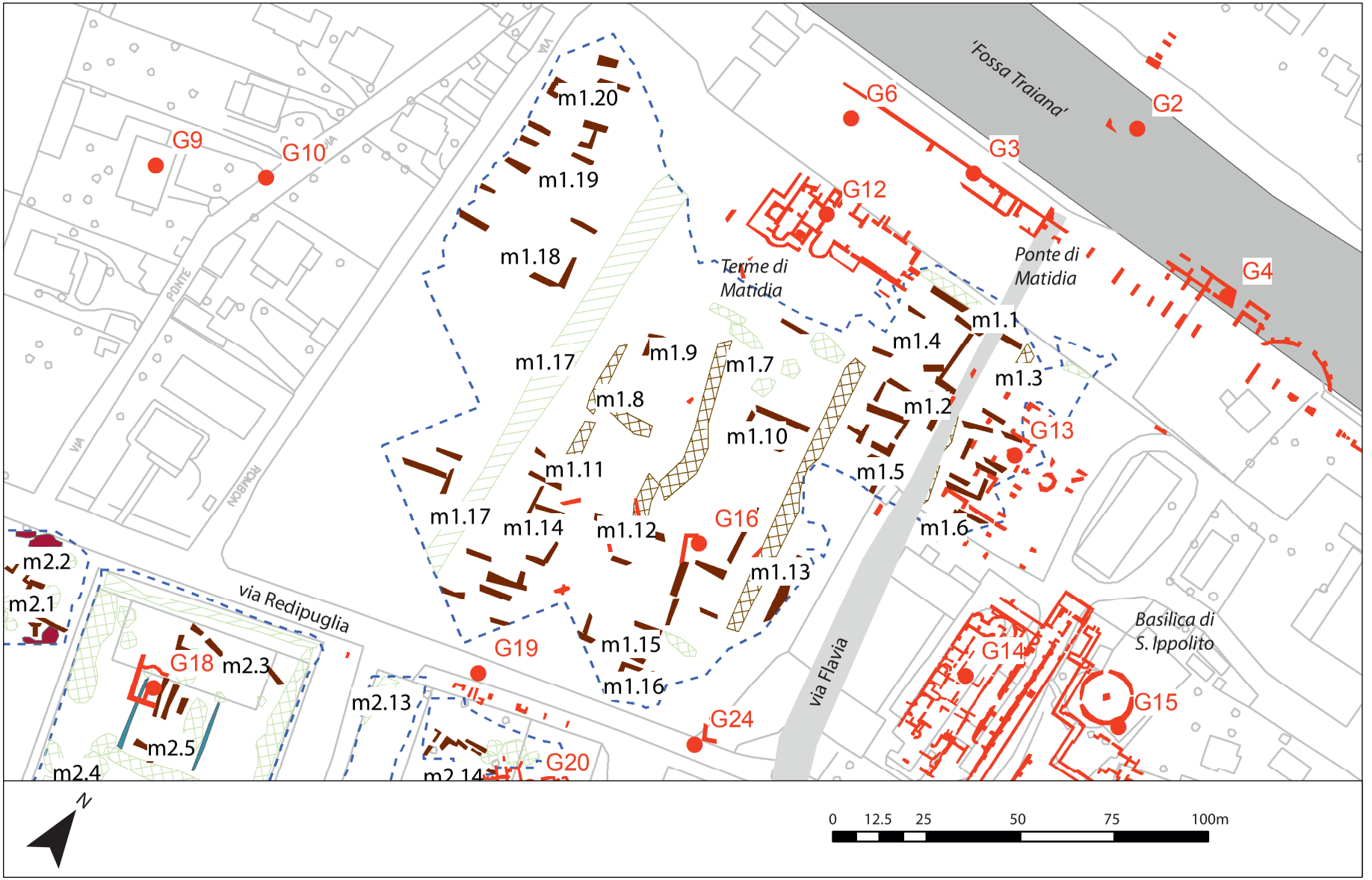


Figure 4.4. *Plan of Area 1 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

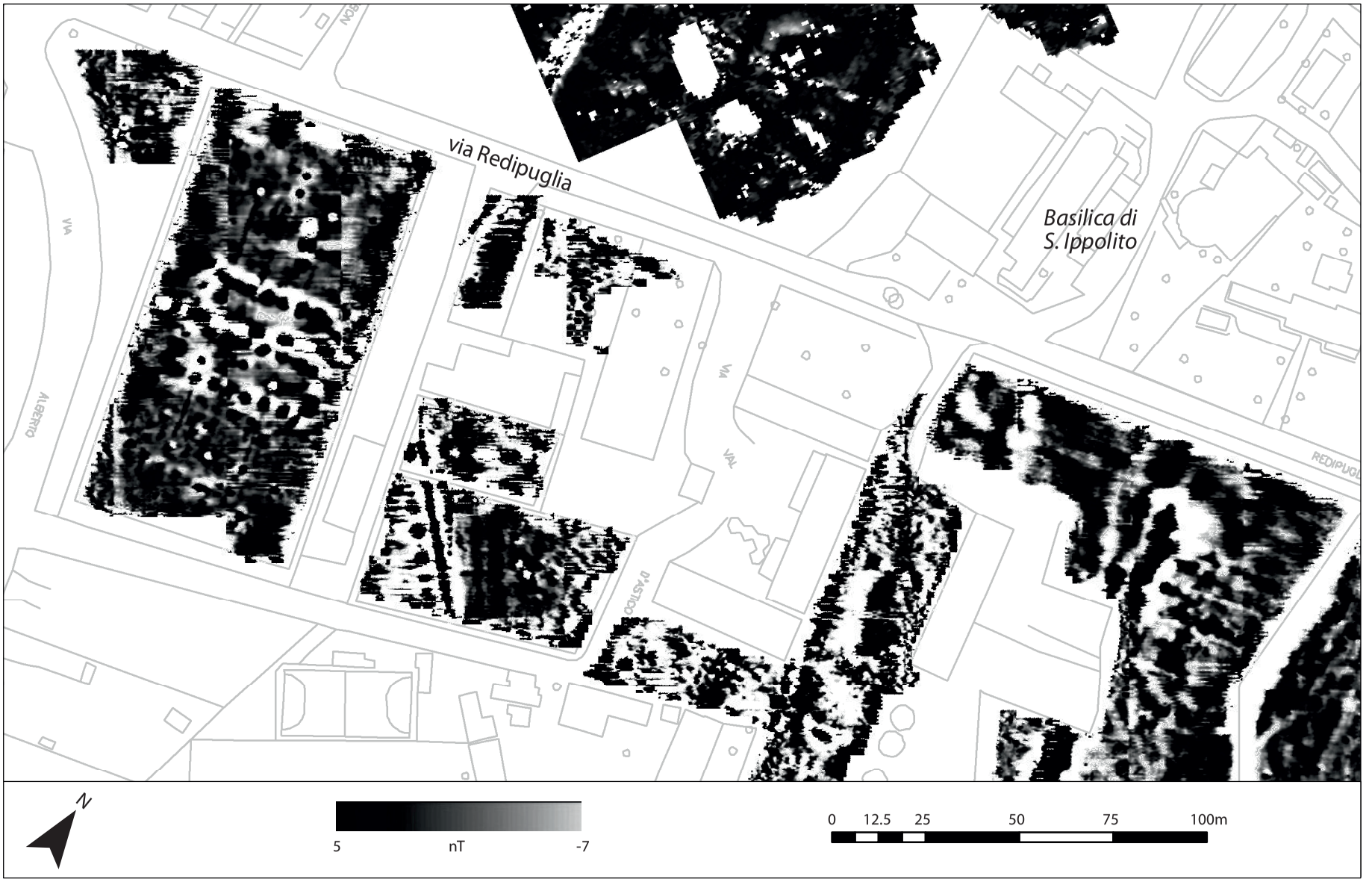


Figure 4.5. *Plan of Area 2 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

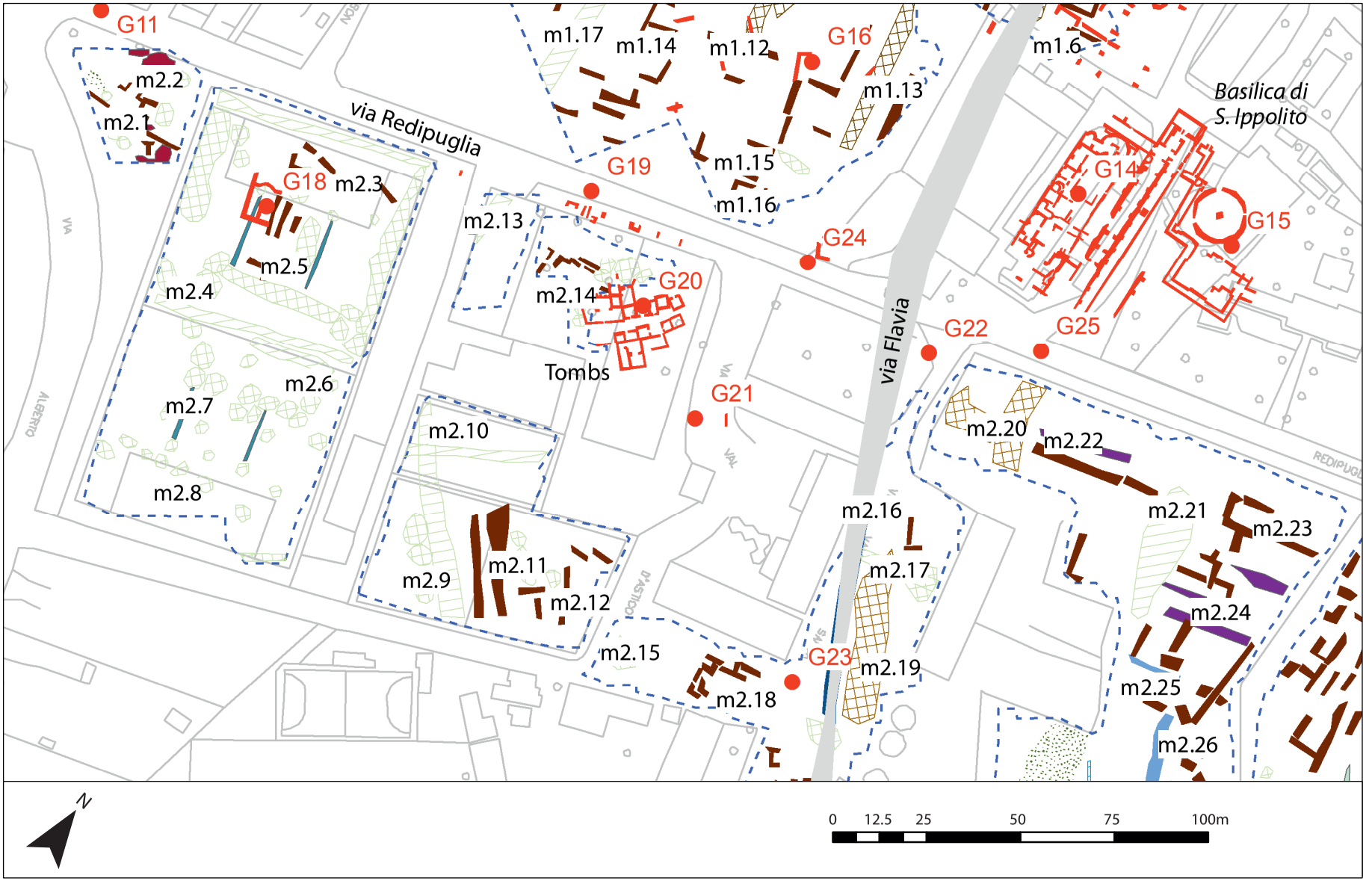


Figure 4.6. *Plan of Area 2 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

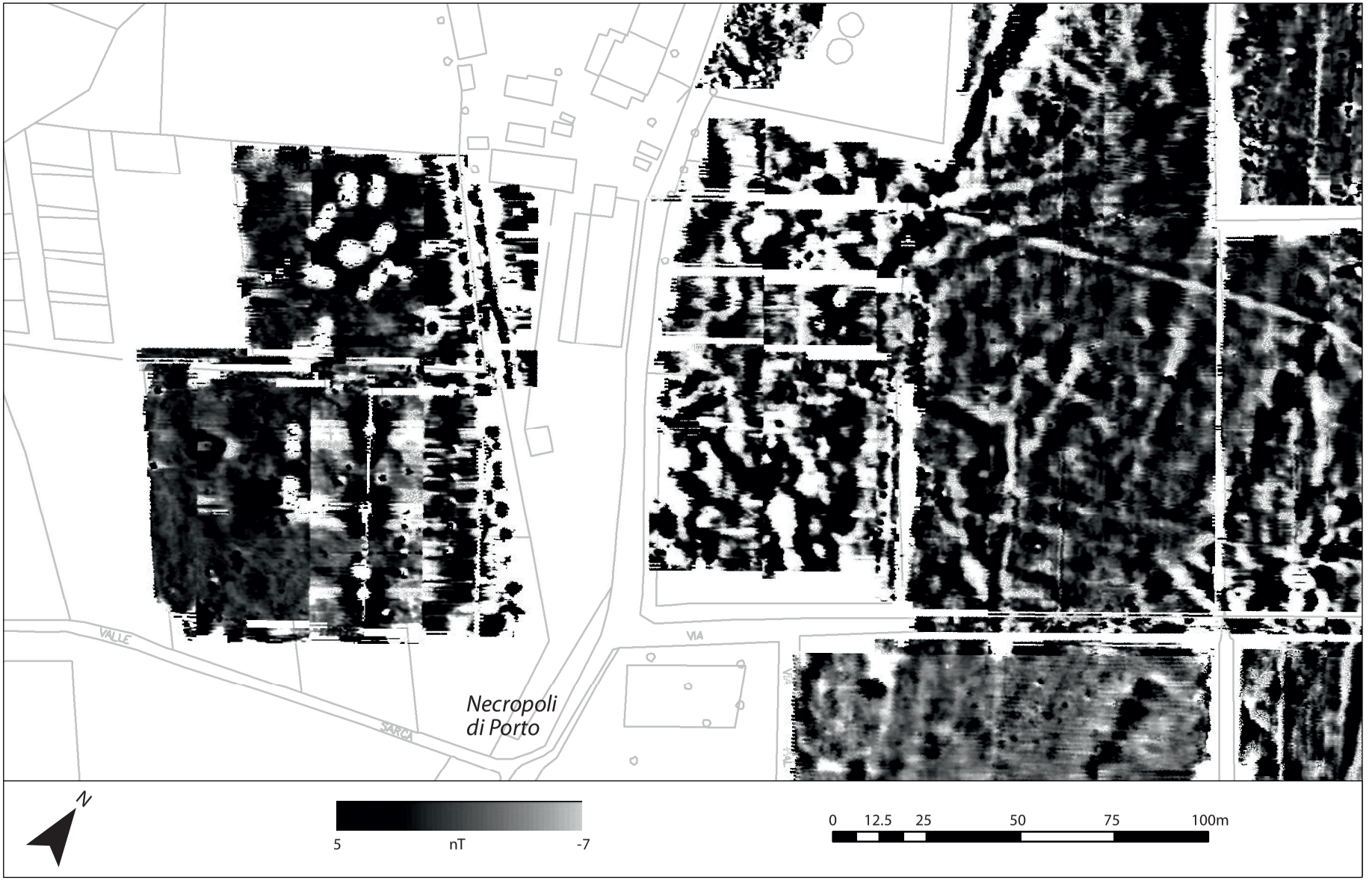


Figure 4.7. *Plan of Area 3 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

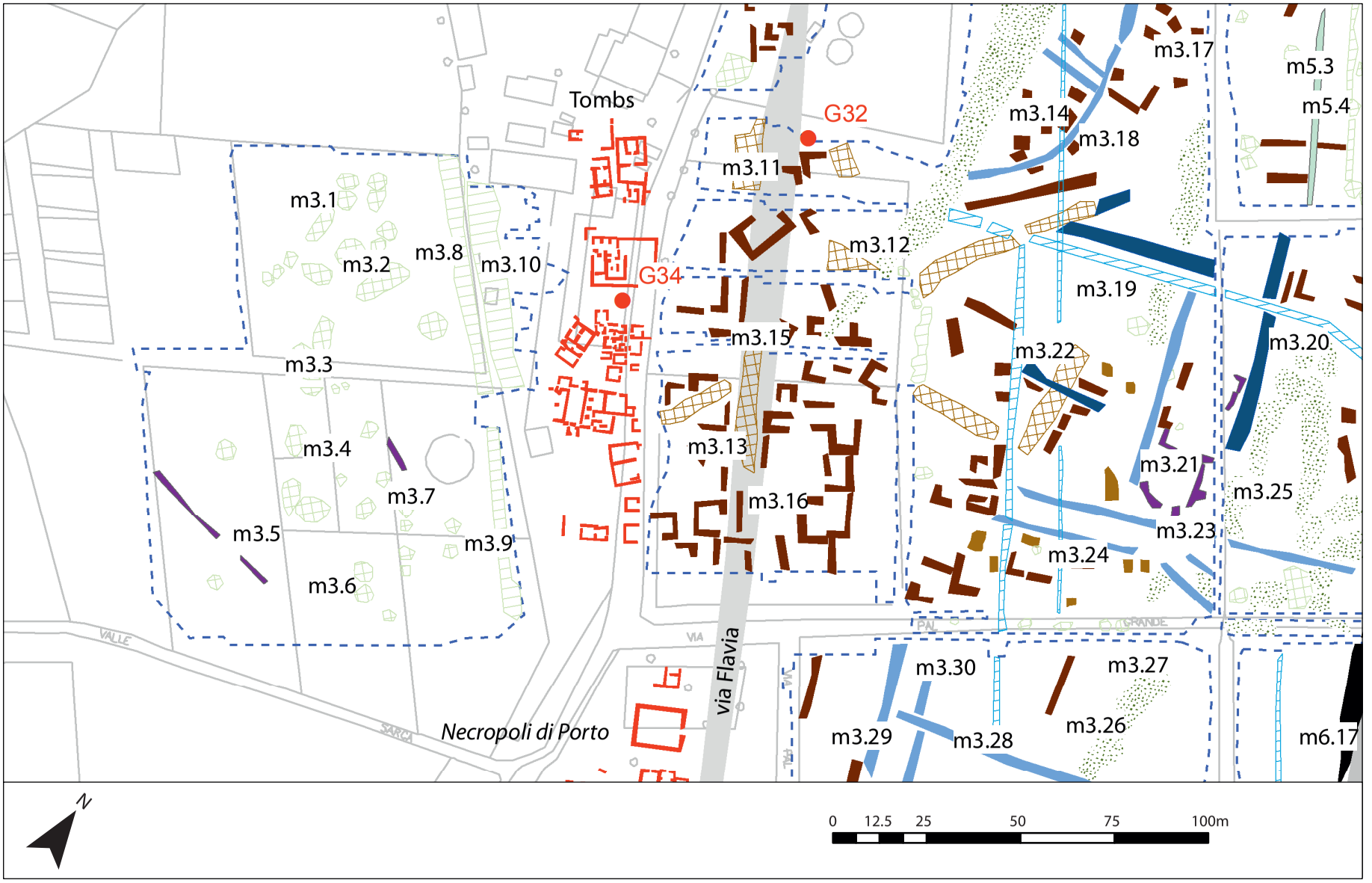


Figure 4.8. *Plan of Area 3 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

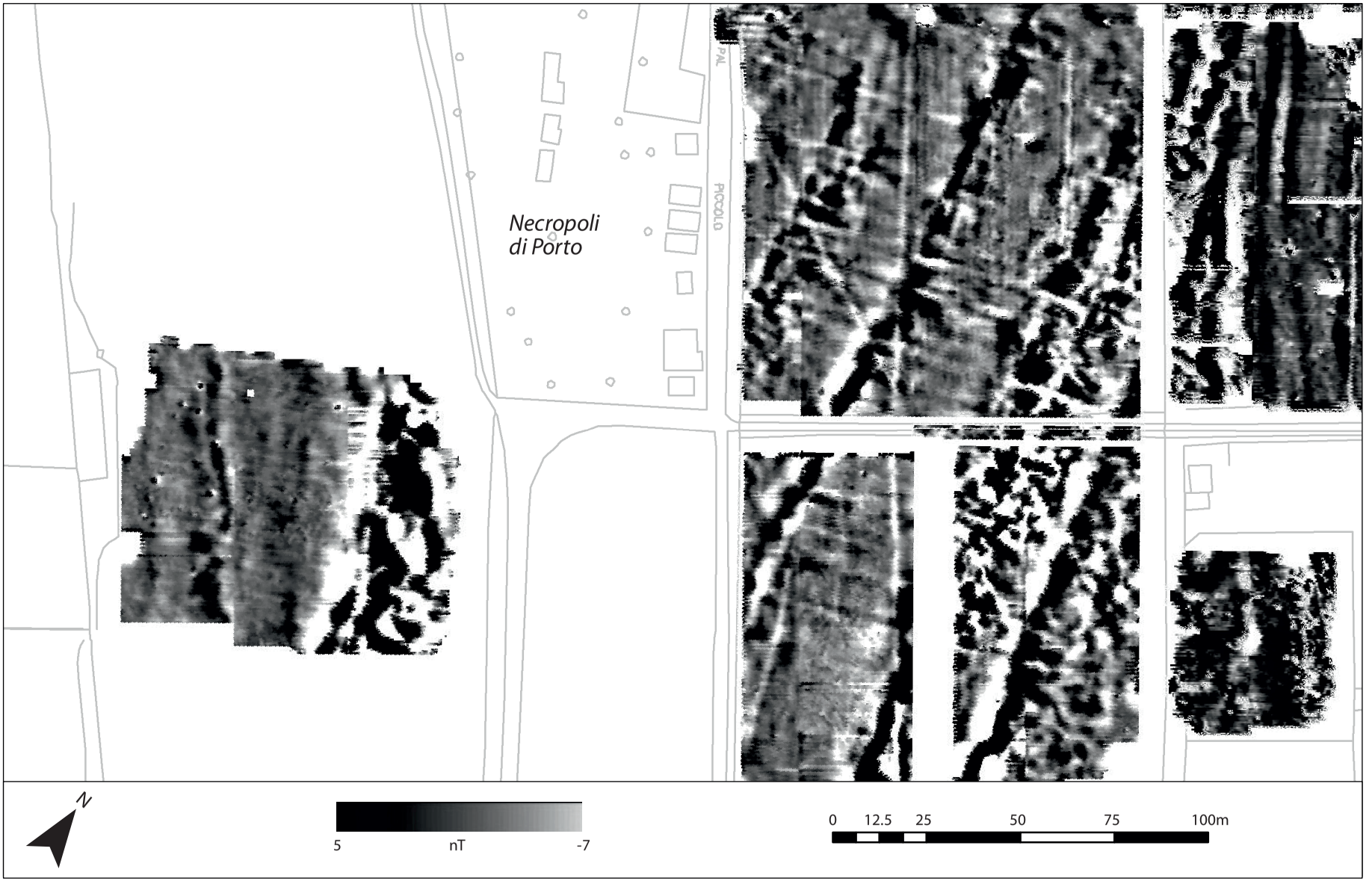


Figure 4.9. *Plan of Area 4 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

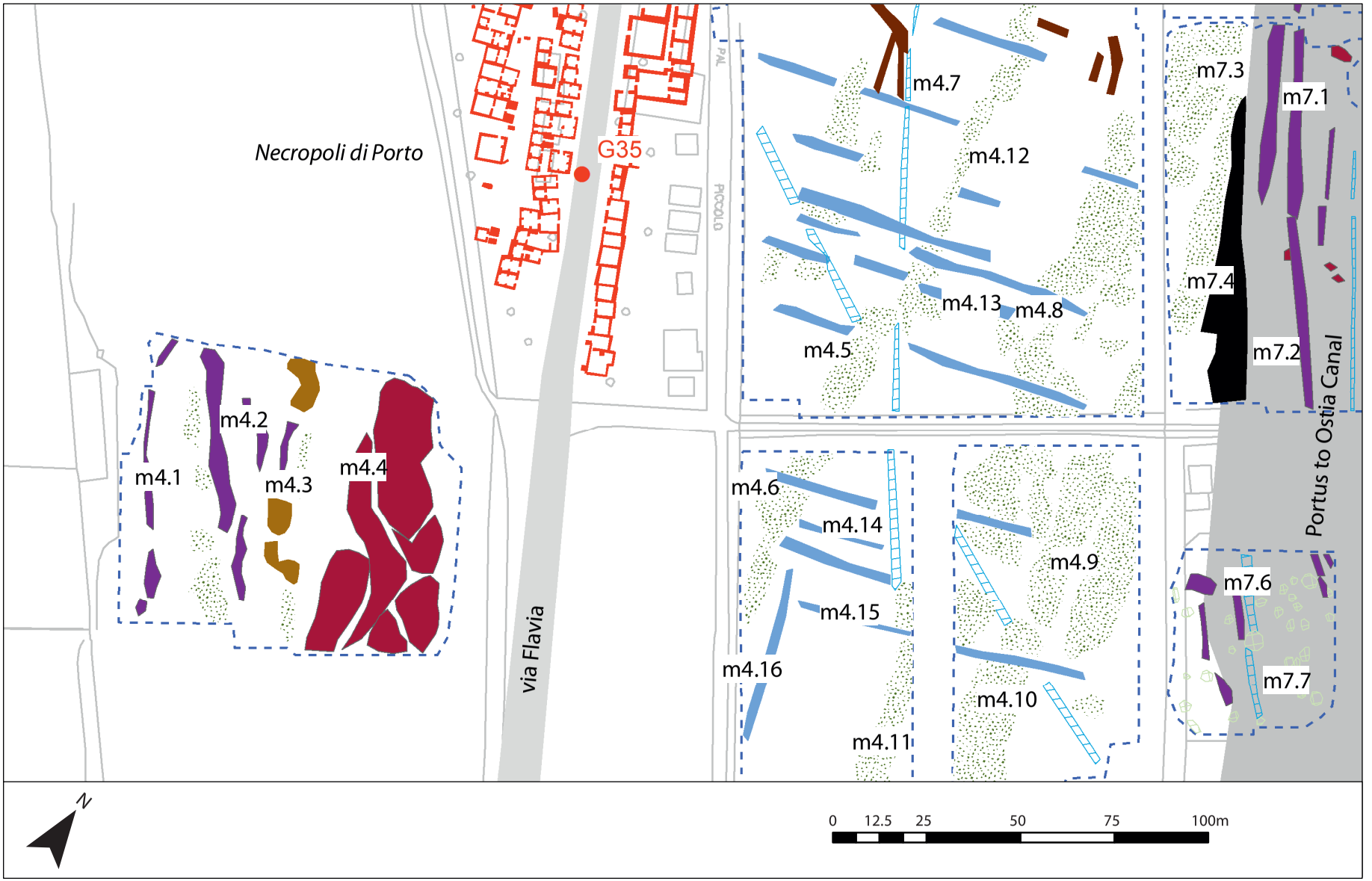


Figure 4.10. *Plan of Area 4 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

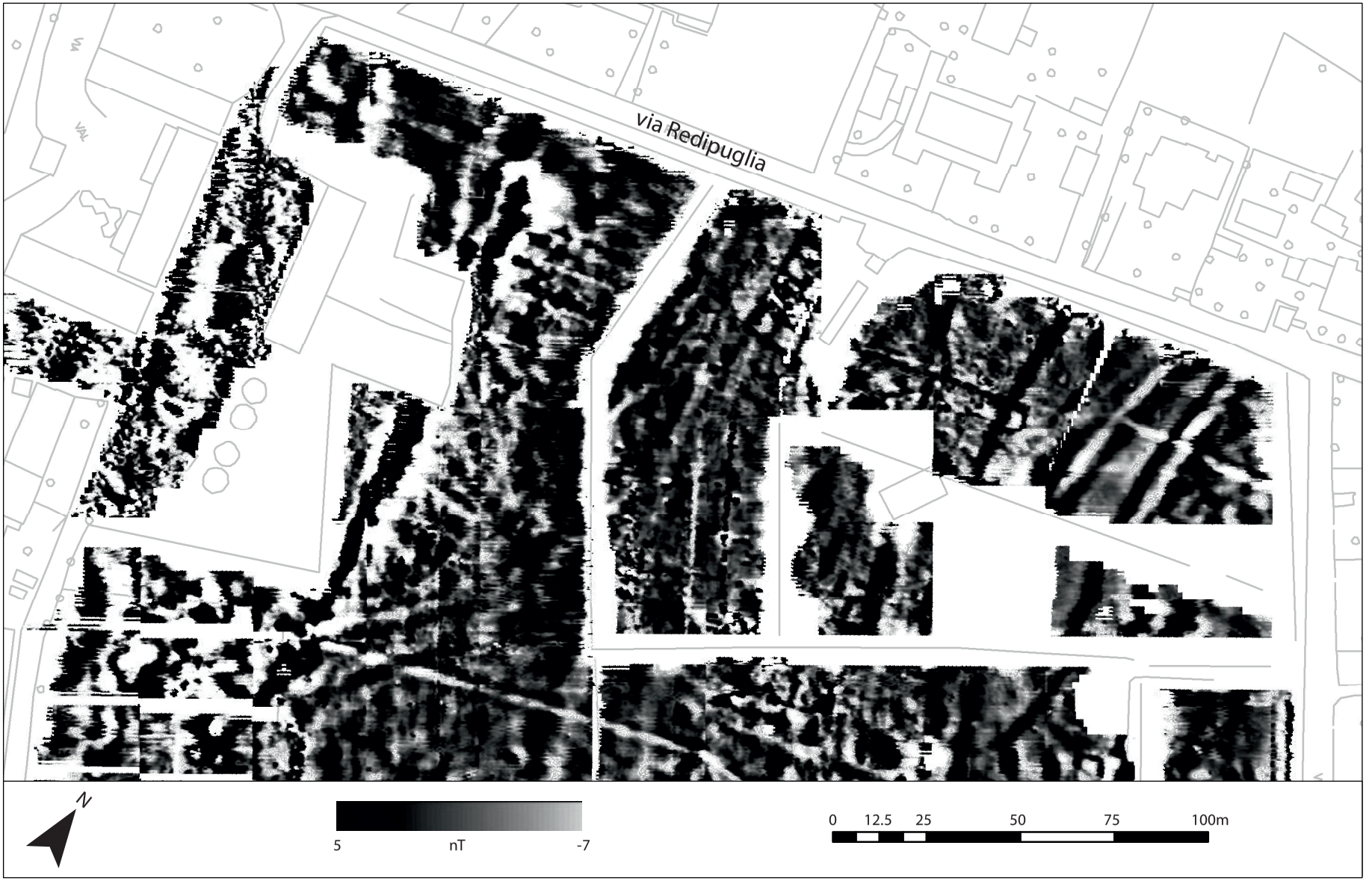


Figure 4.11. *Plan of Area 5 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

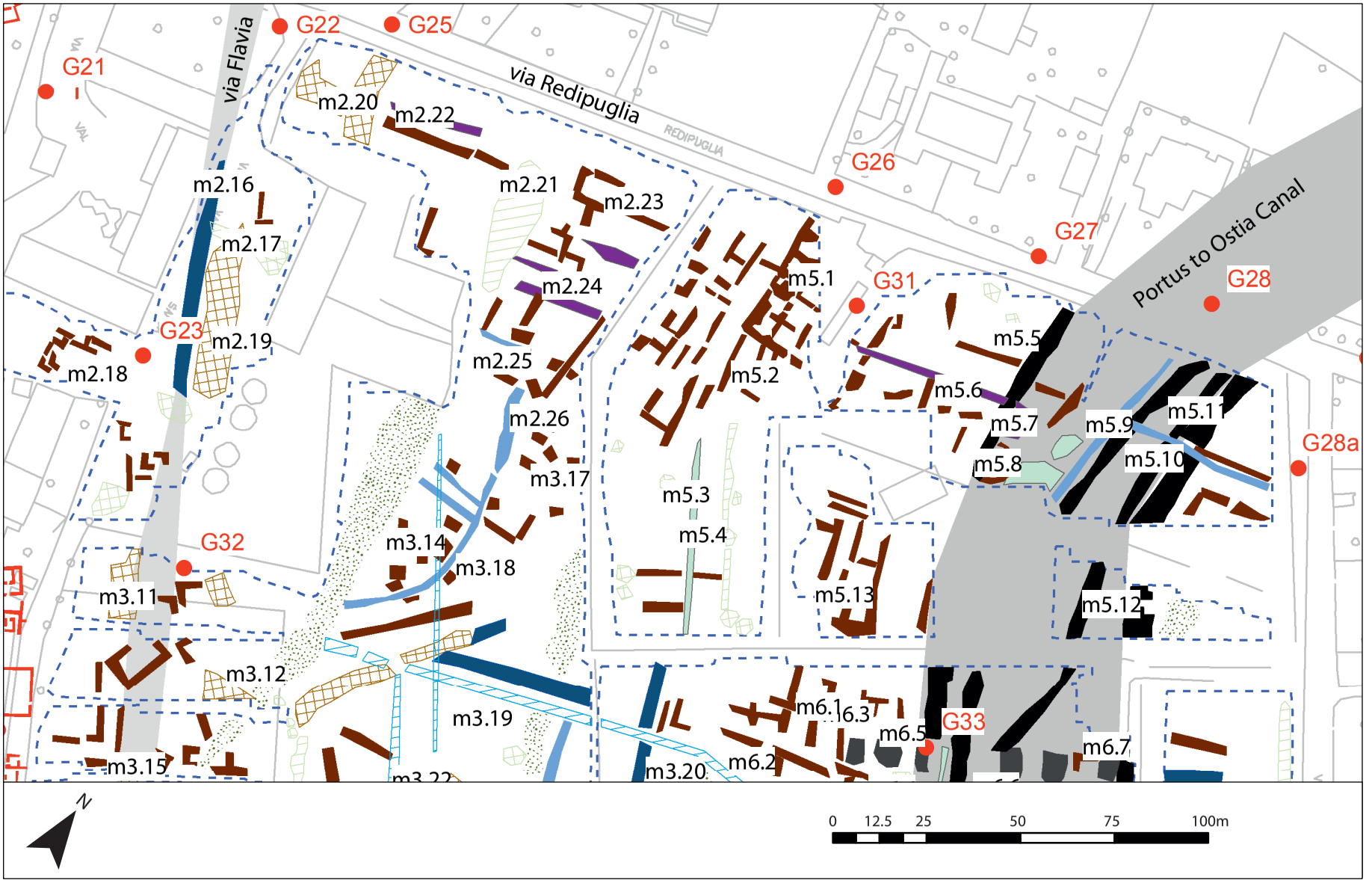


Figure 4.12. *Plan of Area 5 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

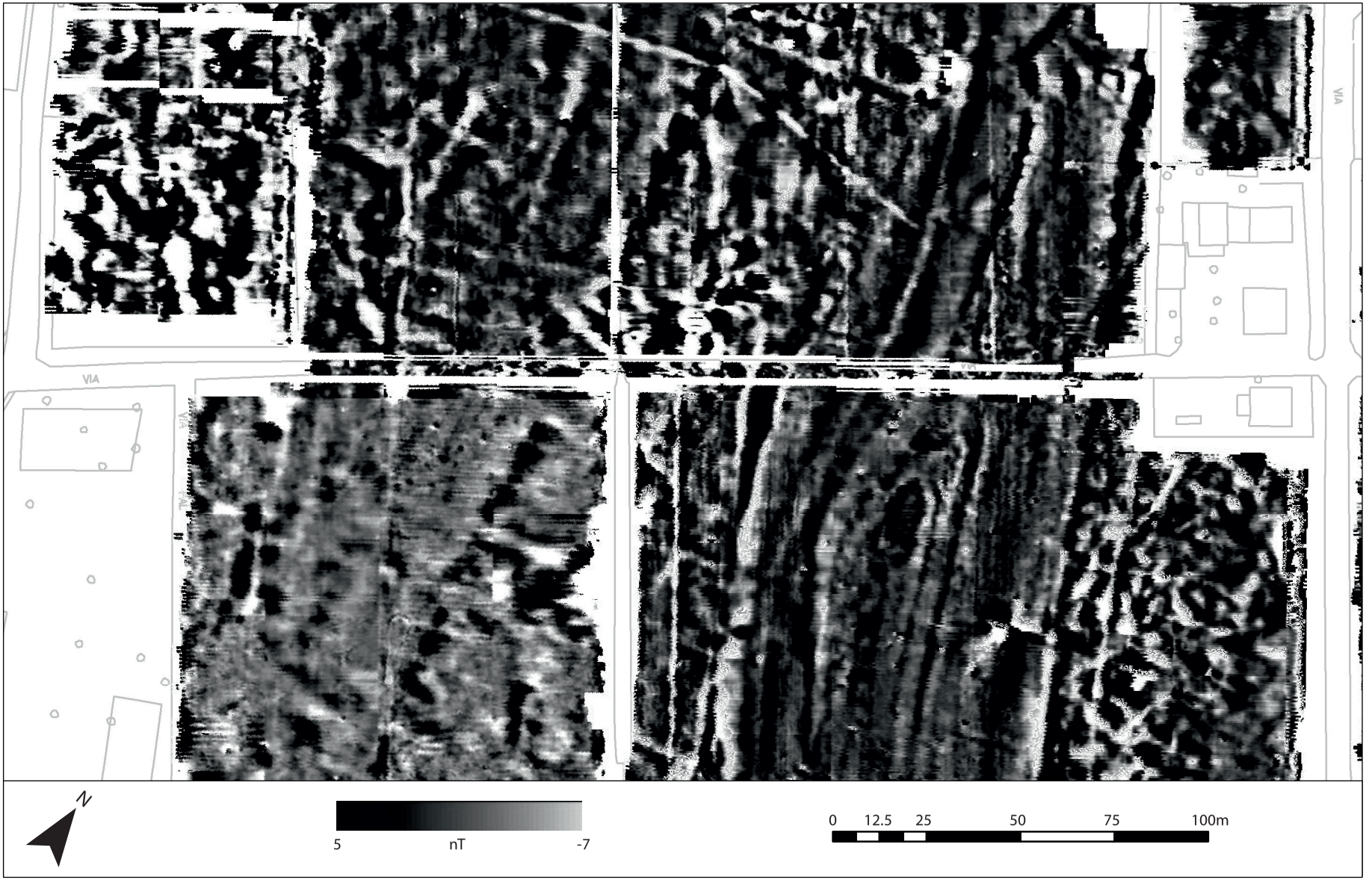


Figure 4.13. *Plan of Area 6 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

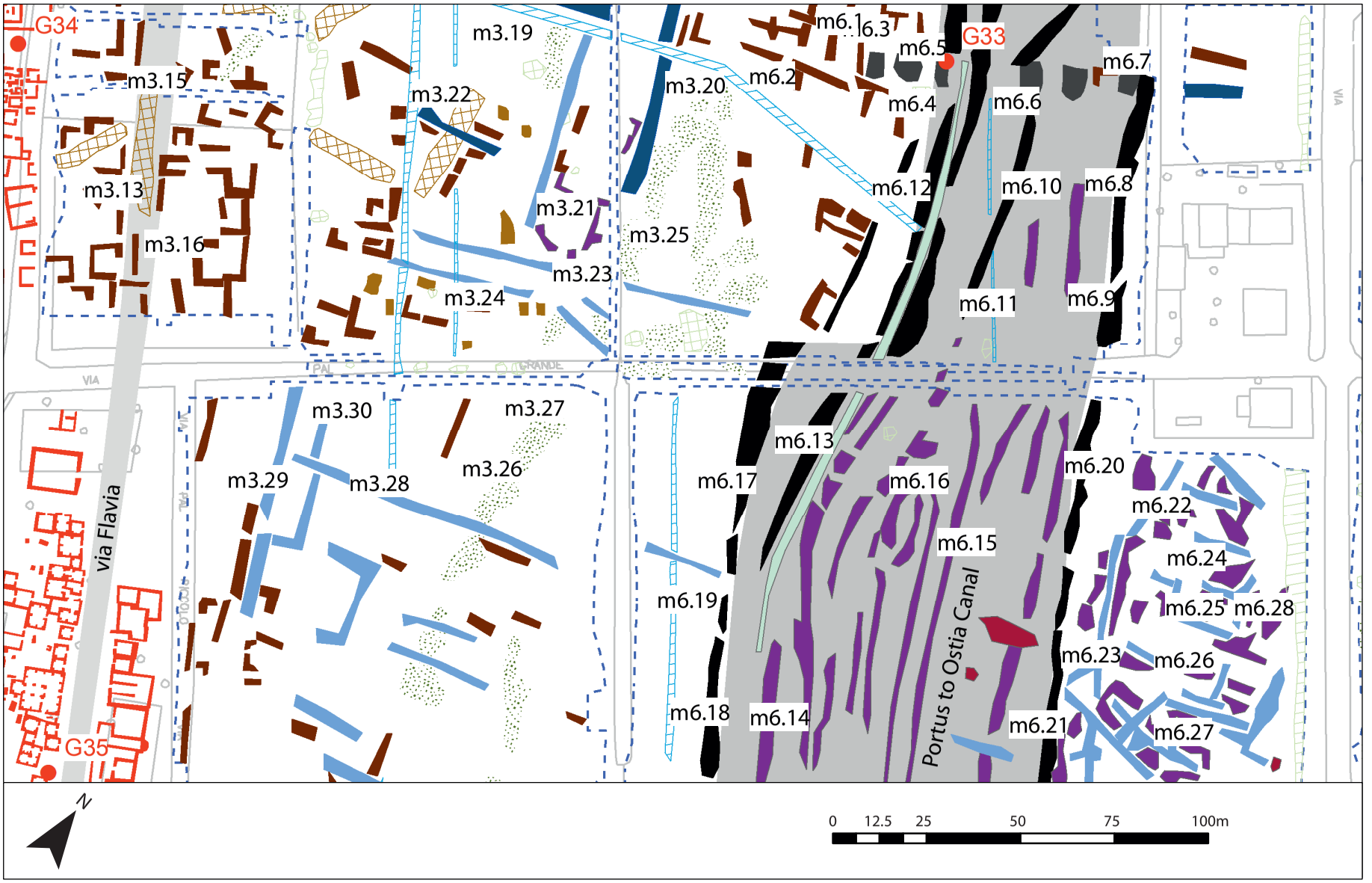


Figure 4.14. *Plan of Area 6 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

aligned from east to west and cut a broad north–south band of positive readings [**m6.3**]. A line of separate rectangular positive features [**m6.4**, **m6.5**, **m6.6** and **m6.7**], each measuring *c.* 8m by 6m, runs from the west to east across the course of the canal; in the middle of this line there is a substantial block of standing *opus caementicium* with *opus testaceum* facing, incorporating evidence for vaulting (**G33**). This suggests that these anomalies represent the remains of piers to support a bridge crossing the canal (pp. 151–52).

In the northern part of the area, the eastern side of the canal is clearly defined by a broken linear band of positive readings [**m6.8** and **m6.9**]. Bands of positive readings [**m6.10** and **m6.11**], parallel to this and to the west, probably mark fluvial deposits within the canal. A strip of negative readings [**m6.12** and **m6.13**] indicate a small channel running through these canal fills. A further pair of negative linear features within the channel to the east [**m6.14** and **m6.15**] surround an irregular feature [**m6.16**] measuring 20m by 10m that seems to have been a small island.

The western side of the canal to the north is poorly defined. To the south, however, it is clearly marked by a line of positive and negative features [**m6.17** and **m6.18**] which cut through underlying geological deposits on the western edge. A negative linear feature [**m6.19**], immediately to the west of the canal, is a ditch that represents a continuation of the field system noted in Area 3 to the west (p. 37; pp. 151–55). A series of positive and negative deposits [**m6.20** and **m6.21**] *c.* 90m to the east indicate the continuation of the eastern side of the canal southwards, running parallel to the western side.

To the east of the canal there is a concentration of negative linear features which form an irregular pattern. One of these [**m6.22**] runs north–south, and then changes direction to follow the line of the canal [**m6.23**]. Other linear anomalies [**m6.24**, **m6.25** and **m6.26**] are aligned with the east–west field boundaries on the western side of the canal. Further irregular features continue to the southern edge of the area [**m6.27–m6.28**].

Area 7 (Figs 4.15 and 4.16)
Area 7 is located between Areas 6 and 8, overlapping with Area 4 to the west, and has the Portus to Ostia Canal running across the centre of it. In this area, the canal measures *c.* 80m across with the western part of the canal marked by two broad positive anomalies, [**m7.1** and **m7.2**] that run northwest–southeast. A series of strong dipolar features, situated to their west [**m7.3**], indicate the presence of dune deposits, with the canal edge marked by a strong linear dipolar anomaly [**m7.4**]. The eastern side of the canal is marked by a strong northwest–southeast linear anomaly [**m7.10**]. A linear feature [**m7.5**] to the east shows the continuation of the field system noted in Area 6 to the north. The south-eastern part of the area is marked mainly by strong dipolar anomalies [**m7.6** and **m7.7**] caused in the main by scatters of modern ferromagnetic material. These features continue to the east where much disturbance is evident [**m7.8** and **m7.9**] obscuring any earlier features.

Area 8 (Figs 4.17 and 4.18)
Area 8 is situated to the south of Area 7 and abuts Area 15 to the south. The Portus to Ostia Canal continues its course northwest–southeast across the centre of the area. In the east, a broad zone of dipolar anomalies [**m8.1**, **m8.2** and **m8.3**] runs from north to south. These are geomorphological features that are associated with a series of earlier coastlines and can also be traced to the south and east [**m8.12**, **m8.13** and **m8.14**]. A series of negative linear features mark the lines of ditches defining a system of rectilinear fields that occupy the area to the east of the canal [**m8.4–m8.11**, **m8.15–m8.18**]. These respect the line of strong dipolar anomalies [**m8.19**, **m8.20** and **m8.21**] which mark the eastern edge of the canal. This is matched some 60m to the west by a similar series of anomalies [**m8.22**, **m8.23** and **m8.24**] indicating its western side. Positive linear anomalies [**m8.25**, **m8.27** and **m8.28**] indicate bands of sediment in the centre of the canal, and are cut by a later ditch [**m8.26**] and plough marks to the south [**m8.29**], the latter extending across an area of 48m by 47m.

To the west of the canal, a series of negative linear anomalies mark a rectilinear network of land divisions [**m8.30–m8.37**, **m8.40–m8.41, m8.42–m8.43**]. These cut through the natural dipolar anomalies [**m8.38–m8.39**] that represent former coastlines. Close to the line of the via Flavia at the southwestern edge of the survey, a series of positive anomalies [**m8.44** and **m8.45**] may indicate an enclosure and bank or wall bordering the road.

Area 9 (Figs 4.19 and 4.20)
Area 9 lies between Areas 6 and 10 and to the north of Area 11, overlapping the latter two. A large part of its northern side is overlain by modern buildings and was unavailable for survey. In the western part of the area is a group of strong dipolar anomalies caused by the proximity of modern fences or modern ferrous material [**m9.1**, **m9.2**, **m9.4**, **m9.5**, **m9.8** and **m9.10**]. A smaller anomaly [**m9.3**], was produced by variations in the natural sediments. A little to the east, a series of broad dipolar features become visible [**m9.6** and **m9.7**] running in a north–south direction into the south-west corner of the field. They measure some 40m across and

extend for over 70m before reaching the modern road to the west and mark a band of sediments.

A linear feature [**m9.9**] measuring some 25m in length represents a ditch that cuts across the field from north to south. Another ditch represented by negative linear anomaly [**m9.11**] runs north–south across the area for a distance of 120m. This is aligned with the system of rectilinear property boundaries noted in other areas (pp. 151–55) that continues to the east across this area. Another ditch [**m9.12**] running northwest to southeast for a distance of over 130m does not seem to be part of this system. Its cuts a broad dipolar geological feature [**m9.13**]. To the east, the pattern of rectilinear boundaries is continued by another ditch [**m9.14**], which runs on a similar alignment to another linear negative feature [**m9.15**] which lies to the north. This ditch system is continued further to the east by two parallel anomalies, the first [**m9.21**] being a negative anomaly some 45m in length, while the second [**m9.22**] is positive and indicates a band of sediment, perhaps a bank, running parallel and a little to the east. Two large positive linear anomalies [**m9.20**] lying to the west appear to form part of the same system, with the larger of the two turning south and running for over 20m. Finally, there is a ditch perpendicular to the others [**m9.23**], the line of which is continued in Area 10 [**m10.14**].

To the north, a broad dipolar anomaly [**m9.17**] runs across the area, continuing further to the south [**m9.18**] and marking a band of magnetic sediment in the background geology. A second similar band of sediment [**m9.19**] is visible a little to the east. This is continued towards the southern edge of the area [**m9.25**], with a positive linear feature [**m9.26**] adjacent to it. Two discrete dipolar maculae together with a linear dipolar feature [**m9.24**] mark a modern drainage ditch.

Area 10 (Figs 4.21 and 4.22)
Area 10 lies close to the north-east corner of the Isola Sacra, bordered to the north-east by part of the *statio marmorum* (**G28a**) and the southern bank of the '*Fossa Traiana*'. It is situated to the east of Area 9 (with which it overlaps) and to the north of Areas 11 and 12. Much of the zone is marked by strong dipolar features. A band of disturbance [**m10.1**] marks the edge of a modern road, while a dipolar linear band of readings [**m10.2**] runs roughly parallel to the '*Fossa Traiana*' for a distance of over 65m, marking a possible modern drainage feature or pipeline. Some 15m to the north of this lies a positive linear anomaly [**m10.3**] which indicates the presence of a revetment and structures running along the edge of the '*Fossa Traiana*'; the band of positive readings [**m10.4**] immediately to the east probably represents a continuation of this.

The edge of the field immediately to the south is obscured by strong dipolar responses caused by the field boundary [**m10.5**]. A negative linear anomaly representing a ditch cuts across the area [**m10.6**]. It runs for *c.* 20m before merging with the background of the results, then reappears further to the east [**m10.7** and **m10.8**]. It runs for a total distance of 70m and forms part of a single stretch of the system of ancient land divisions that is visible in Area 9 to the west and elsewhere on the Isola Sacra (pp. 151–55). A negative linear anomaly lying further to the south of this [**m10.14**] represents another stretch of this ditch system. Two bands of dipolar variation [**m10.9** and **m10.10**] that cut across the area from north to south, mark changes in the sedimentary deposits; two further dipolar anomalies mark similar deposits to the south [**m10.11** and **m10.12**]. A negative linear feature [**m10.13**] located immediately to the east of these, marks the line of a modern drain.

Area 11 (Figs 4.23 and 4.24)
Area 11 lies to the south of Area 9, to the east of Area 7 and to the west of Area 12. Much of it was unavailable for survey. However, towards the centre of this area were identified a series of drainage or ditch features that bear an orthogonal relationship to one another. The northern edge of the central field is masked by a dipolar response to the field boundary [**m11.1**], whilst a band of magnetic sediment relating to the underlying geology [**m11.2**] cuts across the area from north to south. A second band of geological material [**m11.9**] cuts across the area further to the east.

A series of negative linear features which represent ditches continues the rectilinear pattern of land divisions identified in other areas. One series of anomalies [**m11.3**] (continuing the line of [**m9.14**]), and [**m11.10**] is on a north–south alignment. Lying perpendicular to these are a set of closely spaced parallel negative features [**m11.4**, **m11.5** and **m11.6**]. The line of the anomaly [**m11.4**] continues to the east for a distance of 20m [**m11.7**] and is on the same alignment as [**m11.14**] further to the east.

In the eastern part of the area, some of the detected anomalies comprise dipolar responses caused by the modern field boundaries [**m11.12**], whilst an adjacent group of dipolar maculae [**m11.13**] mark a ditch backfilled with modern ferrous material. A negative linear anomaly running from north to south [**m11.15**] probably represents a continuation of the system of land division, as is also be the case with anomaly [**m11.17**]. The former feature cuts a rectilinear negative anomaly [**m11.16**] which measures some 20m by 30m. A series of positive linear striations [**m11.18**] cover an area of 25m by 25m to the south of this.

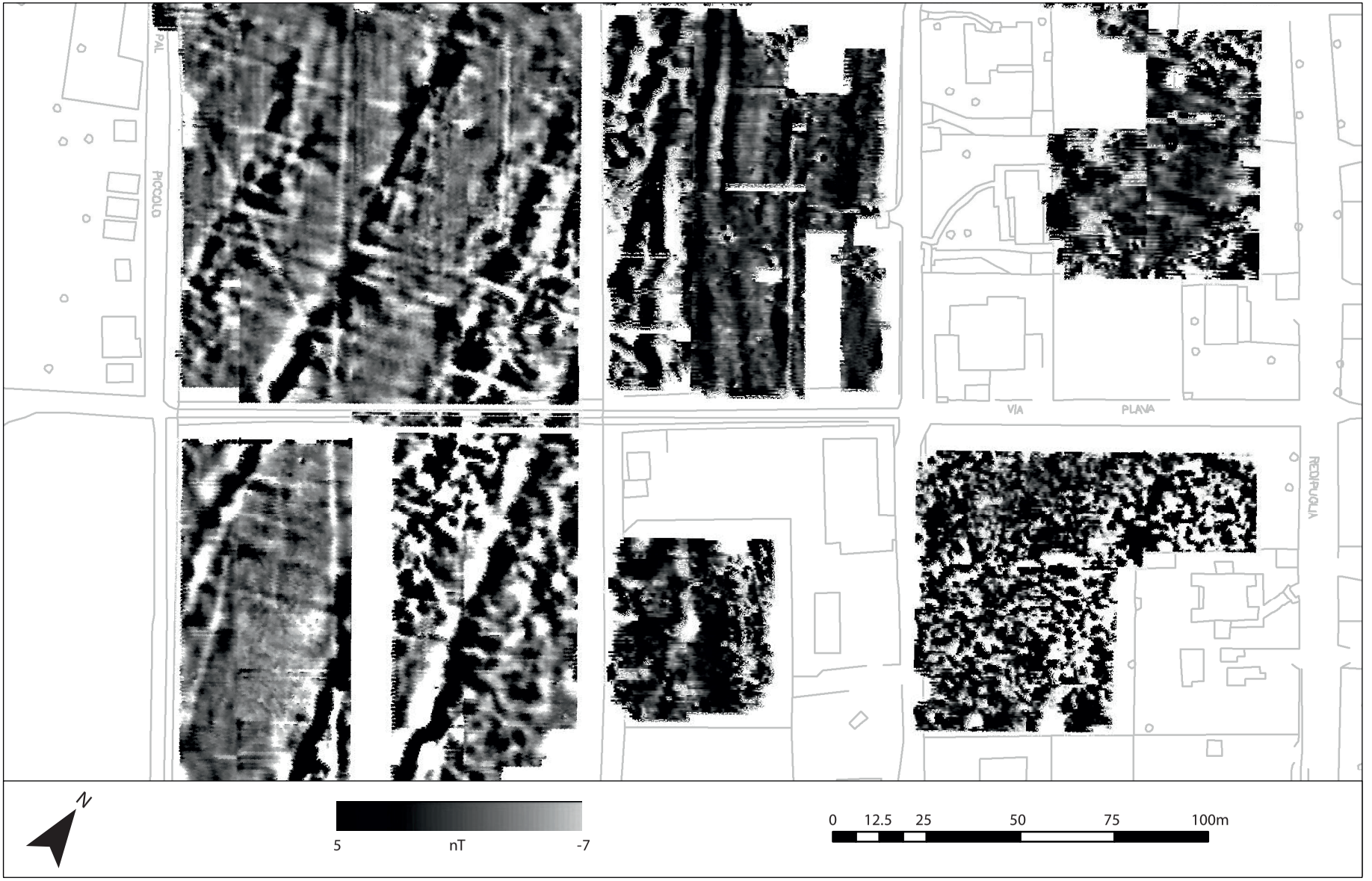


Figure 4.15. *Plan of Area 7 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

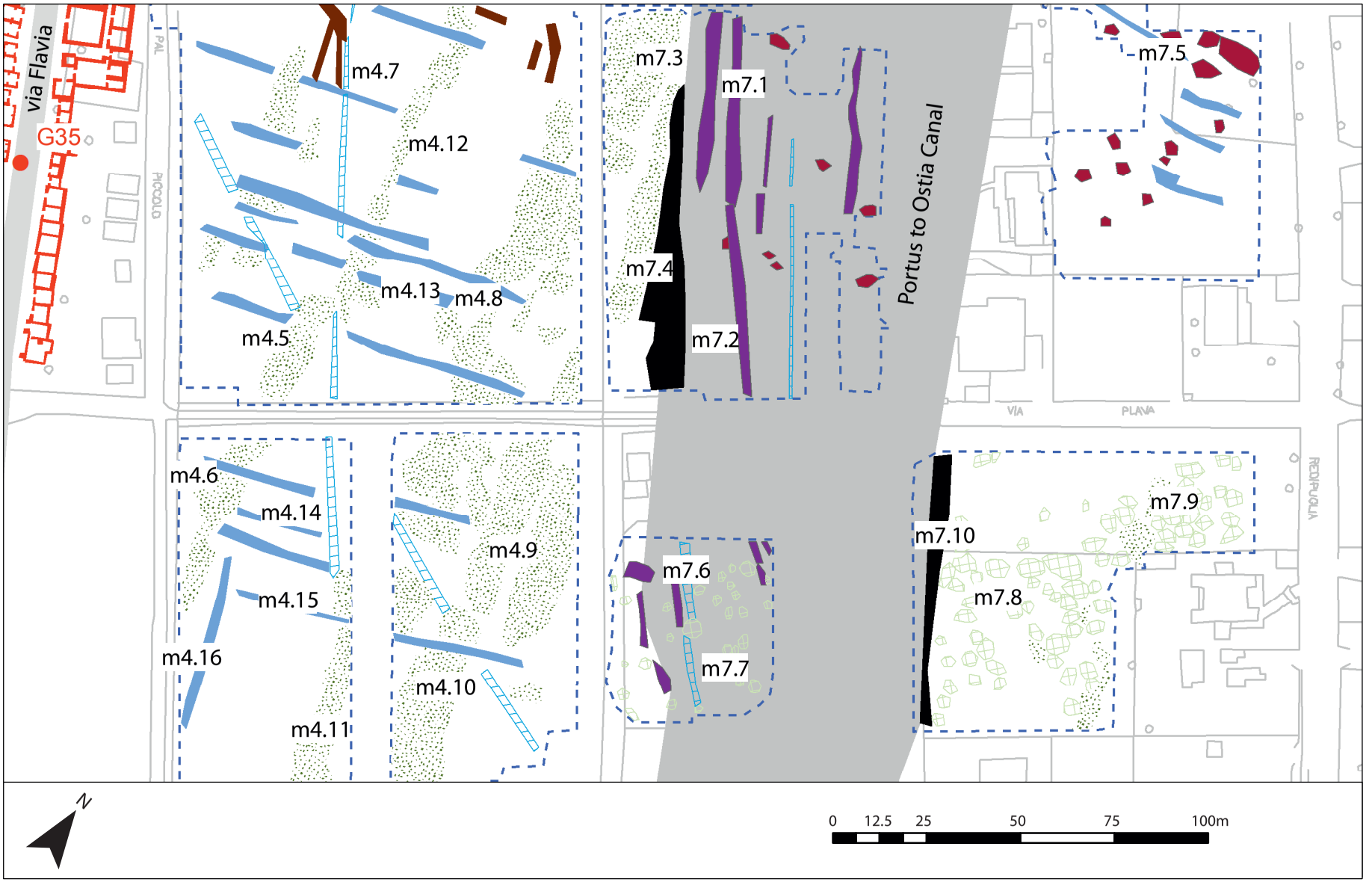


Figure 4.16. *Plan of Area 7 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

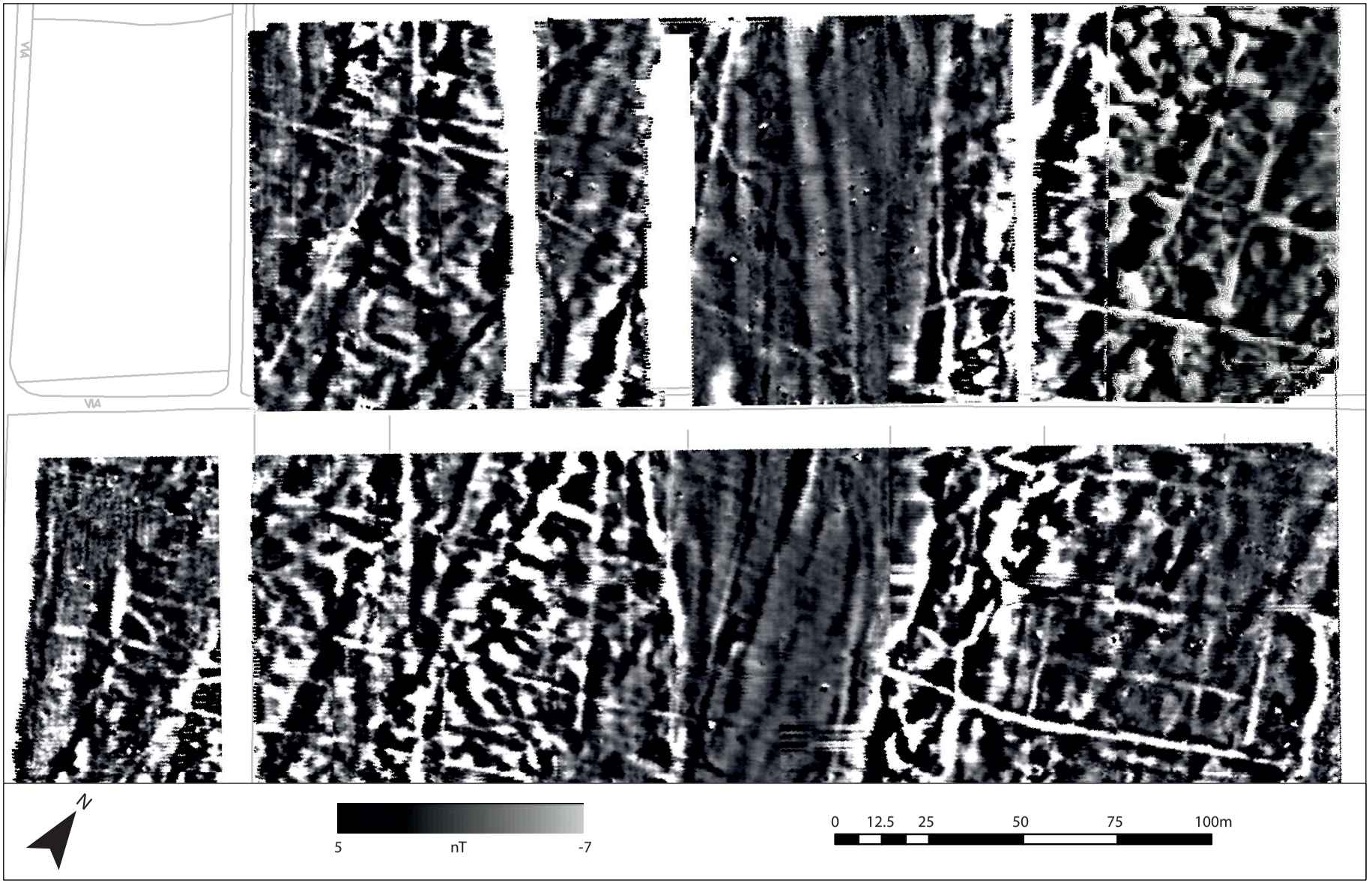


Figure 4.17. *Plan of Area 8 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

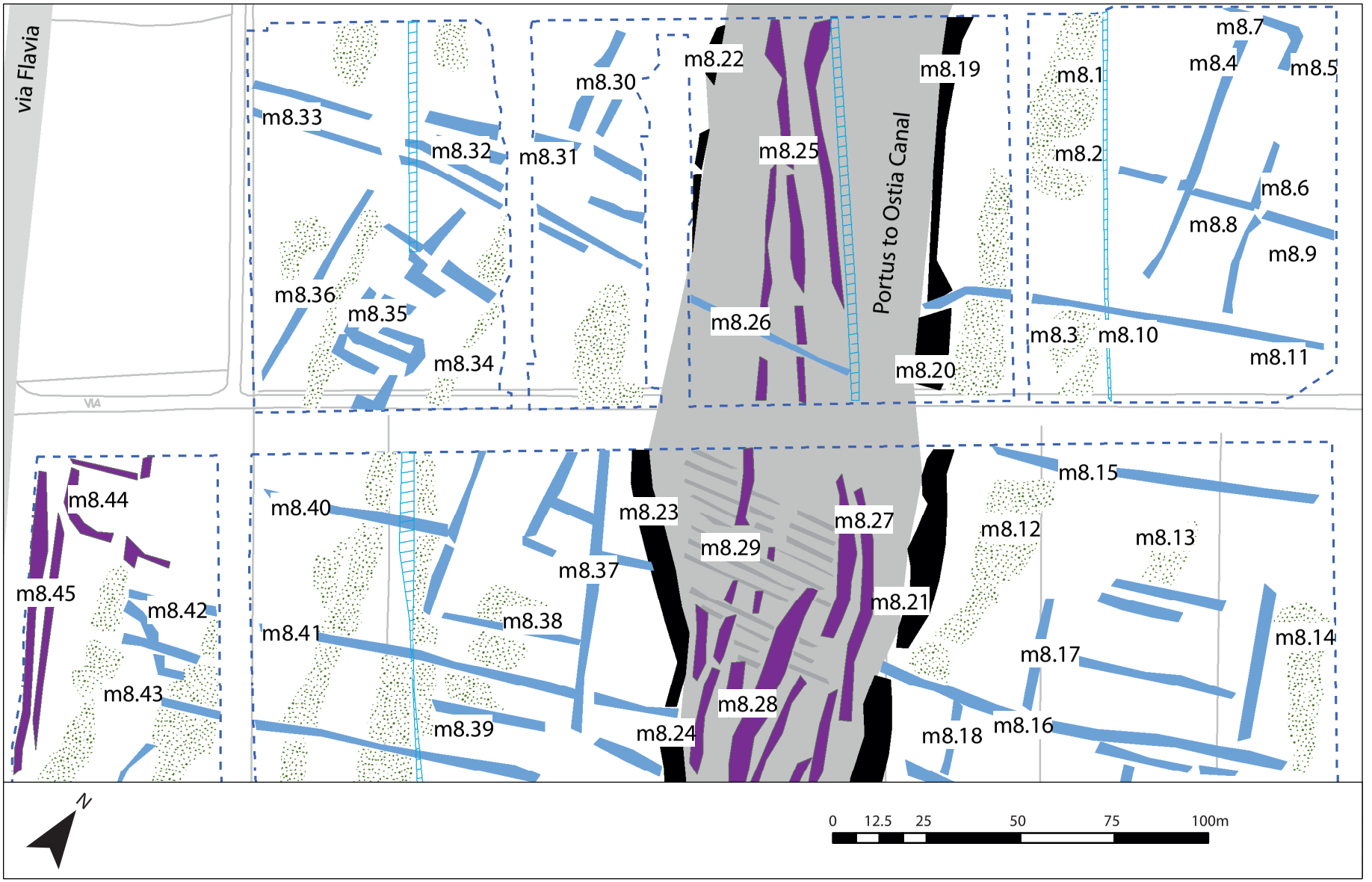


Figure 4.18. *Plan of Area 8 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

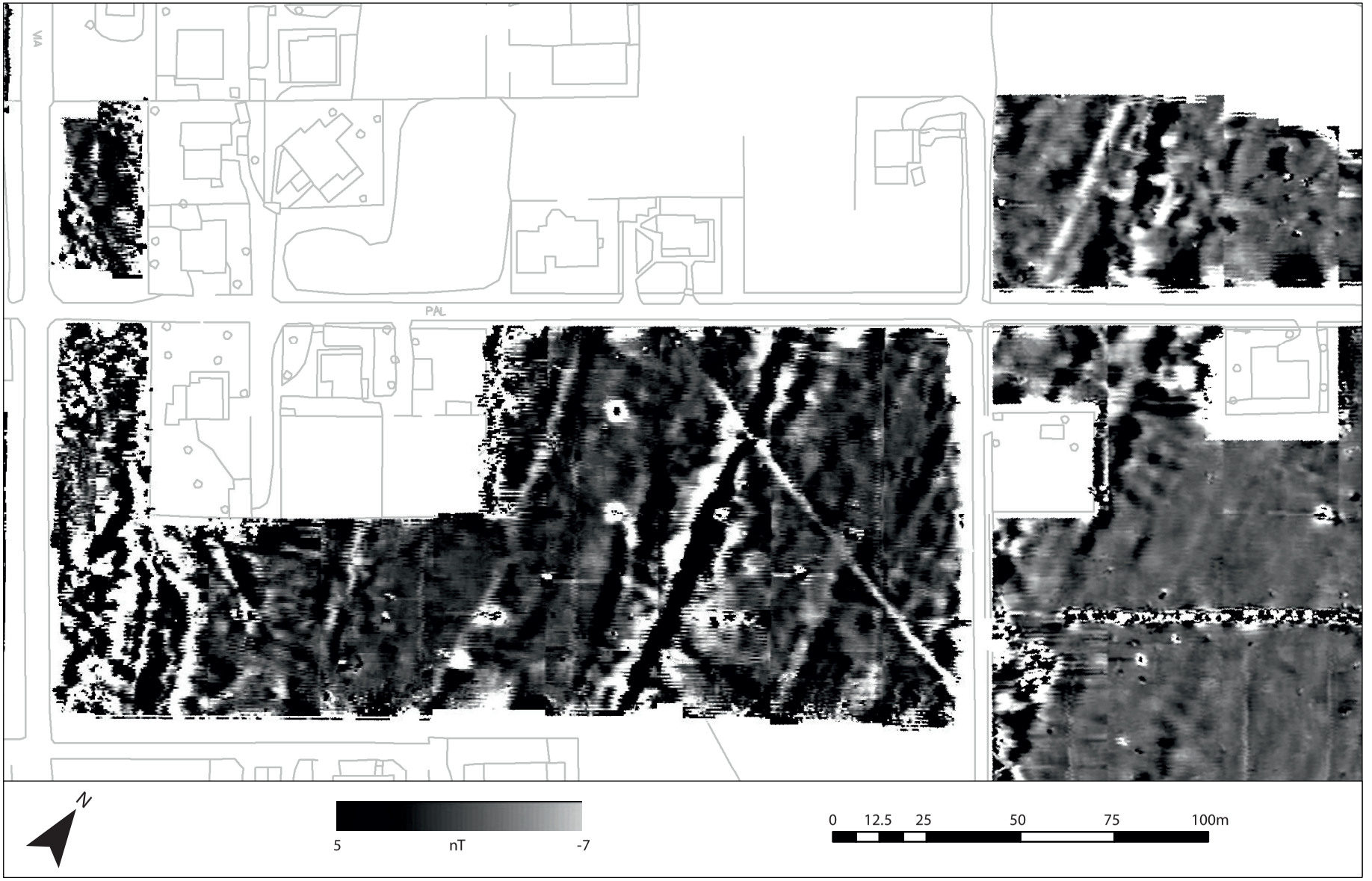


Figure 4.19. *Plan of Area 9 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

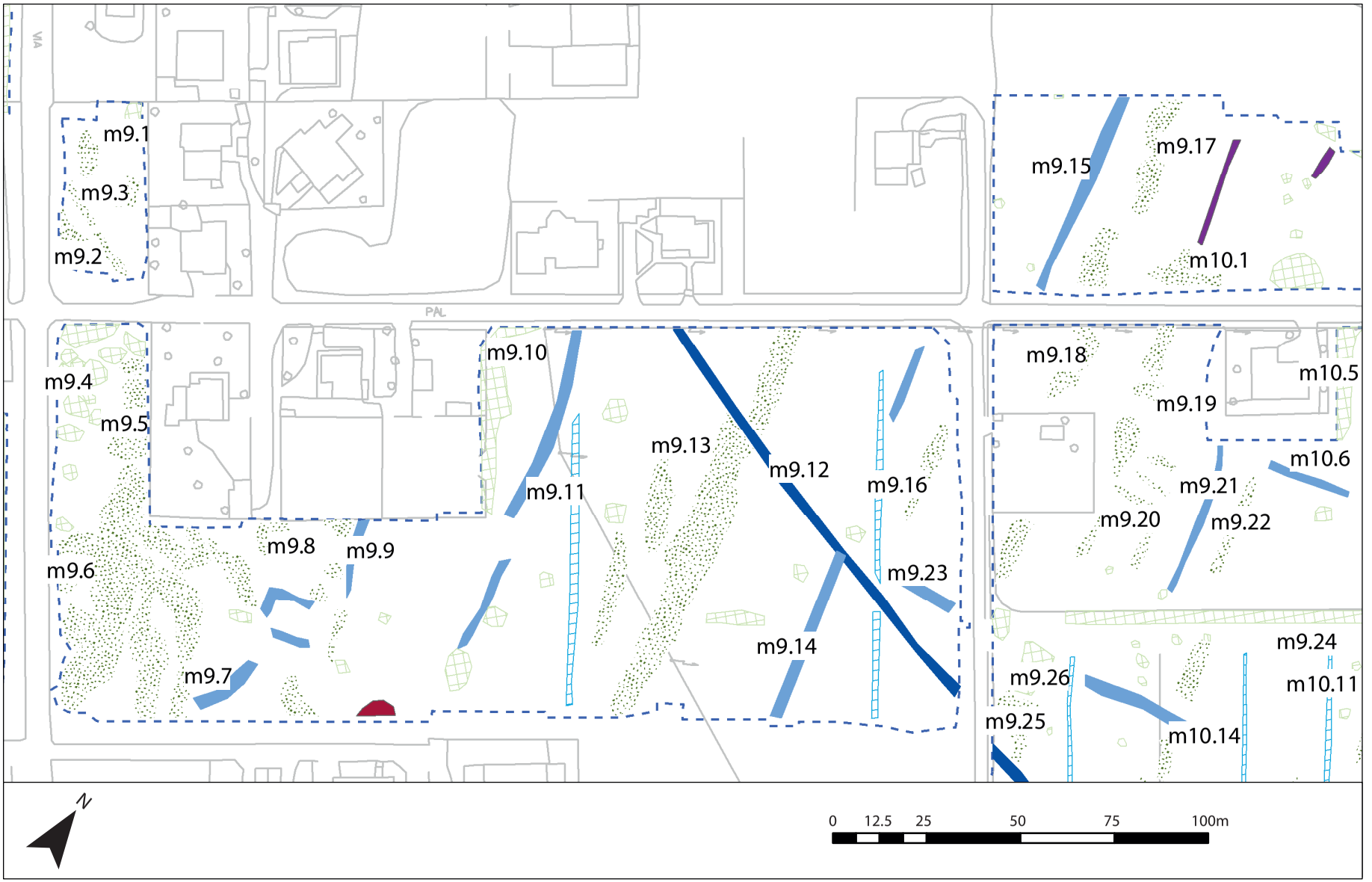


Figure 4.20. *Plan of Area 9 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

Figure 4.21. *Plan of Area 10 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

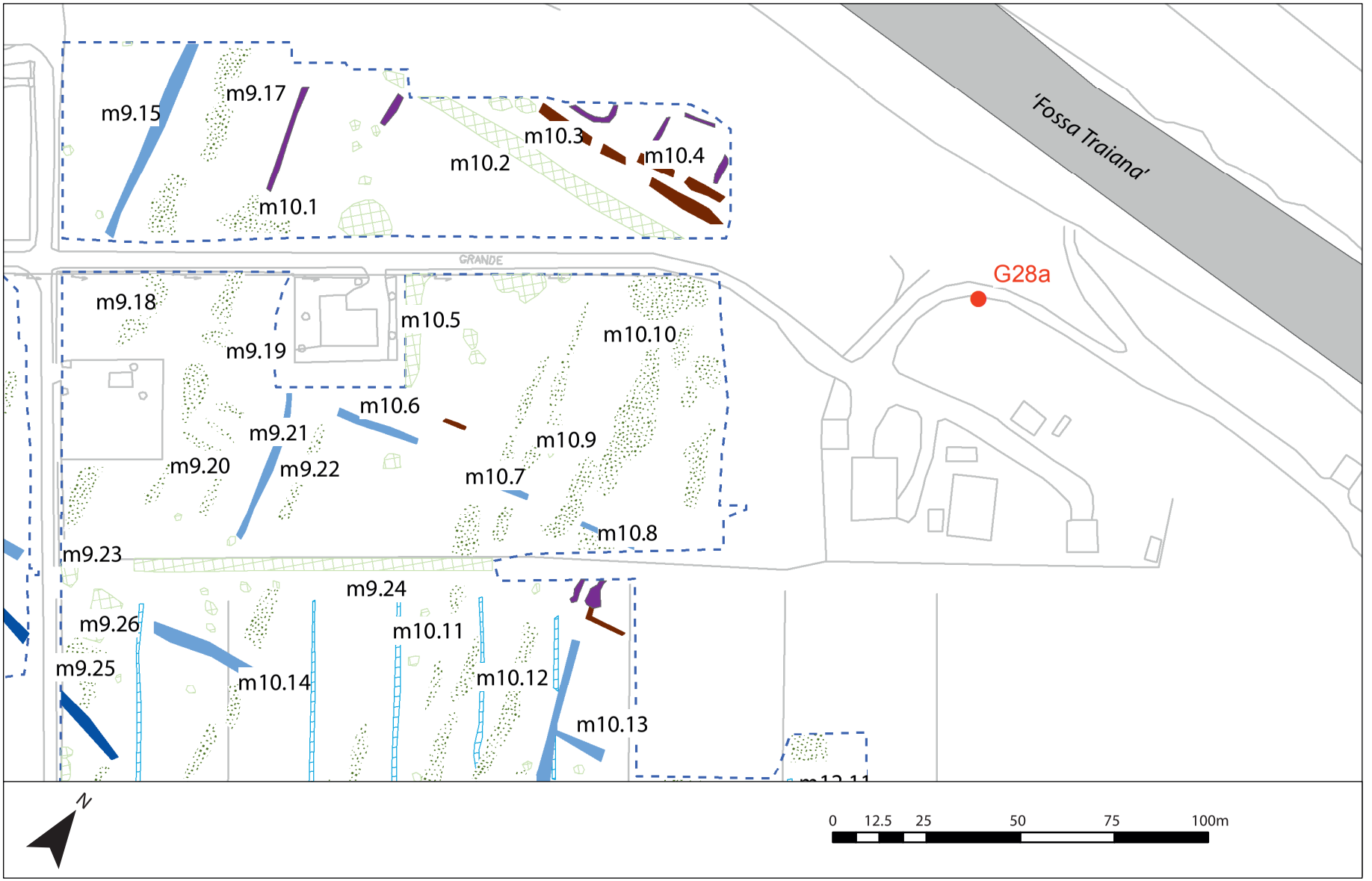


Figure 4.22. *Plan of Area 10 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

Figure 4.23. *Plan of Area 11 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

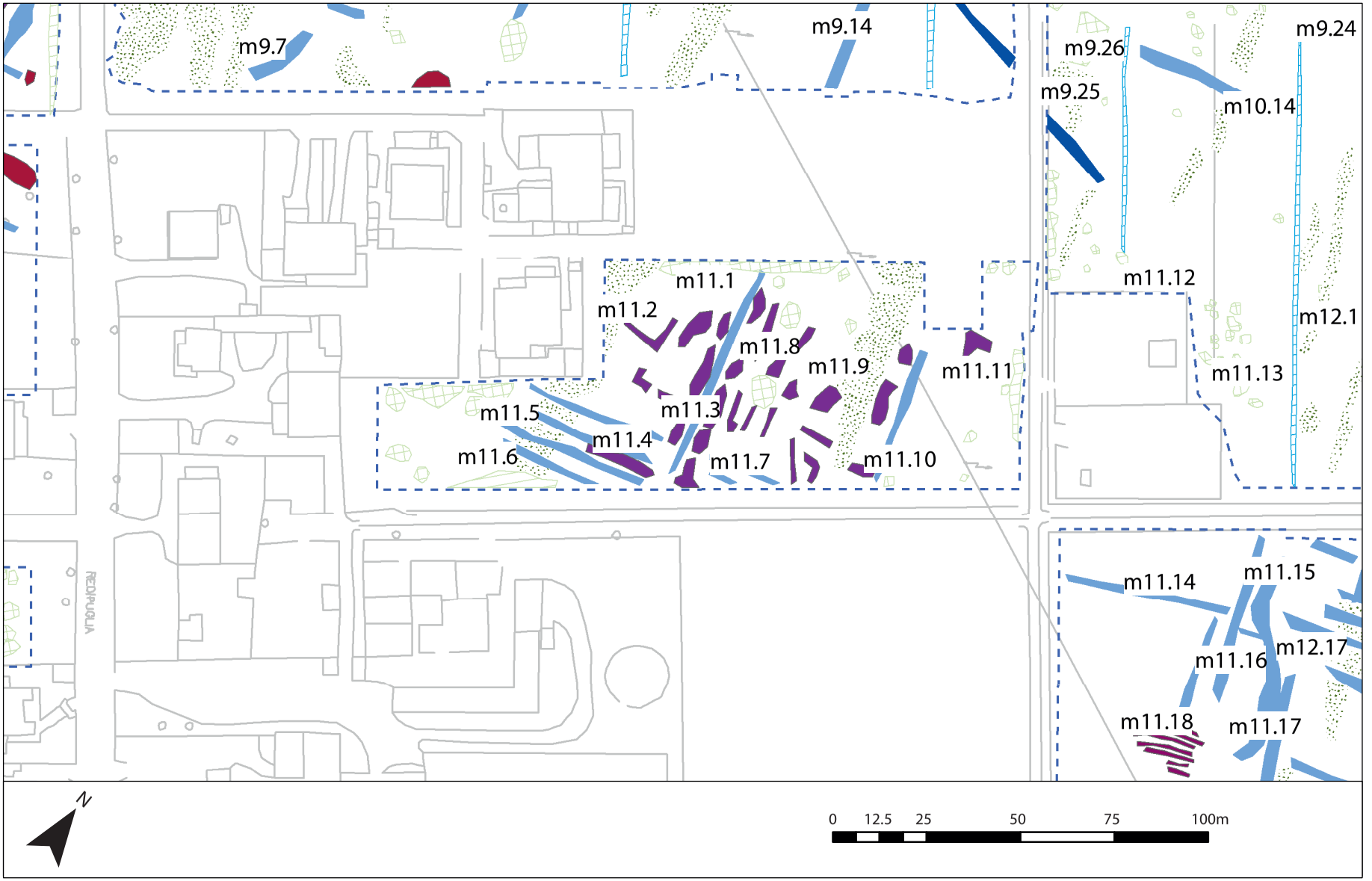


Figure 4.24. *Plan of Area 11 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

Area 12 (Figs 4.25 and 4.26)
Area 12 is located between Areas 10, 11, 13 and 16. The results continue the pattern of linear features recorded elsewhere. Sets of strong dipolar bands run across the area from north to south [**m12.1–m12.4**, **m12.6**, **m12.7**, **m12.9**, **m12.10**, **m12.22** and **m12.23**], all caused by variation in the geological sediments. Overlying these is a series of negative linear features. Most obvious are the regularly spaced drainage ditches of the *bonifica* that run perpendicular to the modern road system [**m12.11–m12.14**]. These are regularly spaced in the northern half of the area but are only represented by a single feature [**m12.19**] in the southern half.

Beneath these lie the alignments relating to the system of rectilinear land divisions that have been observed elsewhere across the survey area (pp. 151–55). Thus [**m12.15–m12.18**, **m12.20**, **m12.24**, **m12.25** and **m12.28**] are on an east–west orientation, with others set perpendicular to them [**m12.5**, **m12.6**, **m12.8**, and [**m12.26**]. Finally, a linear feature [**m12.21** and **m12.27**] that runs from east to west running for a length of over 140m, seems to cut diagonally across the earlier land divisions.

Area 13 (Figs 4.27 and 4.28)
Area 13 lies to the south of Area 12, to the north of Areas 14–15 and overlaps with Areas 16–17 to the east. The results of the survey reveal extensive disturbance along the modern field boundary at its northern edge [**m13.1** and **m13.2**]. Several bands of dipolar readings caused by the underlying geology run from north to south [**m13.7**, **m13.19**, **m13.20**, **m13.35** and **m13.38**], while there are two further areas of similar dipolar features [**m13.8** and **m13.9**].

The system of rectilinear land divisions noted in other areas (pp. 151–55) continues across the whole area. Ditches and bank features running north–south are marked by anomalies [**m13.3**, **m13.13–m13.16, m13.32–m13.34** and **m13.37**], whilst boundaries running east–west are also evident [**m13.4**, **m13.5**, **m13.10–m13.12**, **m13.17**, **m13.18**, **m13.21–m13.23**, **m13.25**, **m13.30** and **m13.39**]. There are several other features apparently associated with this system. A positive linear feature [**m13.6**] terminates along the southern edge of anomaly [**m13.5**], while to the south, there appear to be small enclosures within some of the rectilinear divisions: [**m13.24**] measuring 15m by 20m; [**m13.26**] measuring 28m by 30m; [**m13.27**] measuring 25m by 28m and with its western edge formed by a positive linear feature [**m13.28**], and rectilinear feature [**m13.31**]. A broad dipolar [**m13.36**] anomaly to the east marks underlying geological deposits**.** The whole area is cut by a negative linear feature [**m13.40**, **m13.41** and **m13.42**] that runs diagonally towards the edge of the survey area. A strong dipolar linear feature cuts along the edge of one field [**m13.43**] marking the line of a modern pipe or field drain.

Area 14 (Figs 4.29 and 4.30)
Area 14 lies between Areas 15 and 17 and overlaps with Area 13 to the north. A line of discrete dipolar anomalies [**m14.1–m14.5** and **m14.7–m14.10**] running from southwest to northeast is caused by modern telegraph poles, whilst a large discrete feature [**m14.6**] just to the south is the result of modern ferrous material. Bands of readings to the south of these relate to geological deposits associated with past coastlines. Three of these [**m14.11–m14.12**, **m14.13–m14.14**, **m14.21** and **m14.22**] continue the alignments of anomalies mapped in Area 13 [**m13.19–m13.20**, **m13.35** and **m13.38** respectively]. Similar deposits are indicated by a large band of negative readings [**m14.23**], further to the east.

A series of parallel negative linear features [**m14.15–m14.20** and **m14.27**] represents east–west ditches in the rectilinear system of land divisions noted elsewhere across the survey (pp. 151–55), alongside north to south ditches [**m14.25**, **m14.26** and **m14.28**] belonging to the same system. A large dipolar discrete feature [**m14.24**] to the south of this is caused by modern ferrous material.

Area 15 (Figs 4.31 and 4.32)
Area 15 is situated to the east of Area 8, to the south of Area 13 and to the west of Area 14. The north-western corner of the survey is marked by strong dipolar responses related to the modern field boundary [**m15.1**]. Bands of dipolar features [**m15.8**, **m15.10**, **m15.11**, **m15.12**, **m15.16** and **m15.17**] are geological in origin and relate to past coastlines. The other linear features relate to the rectilinear system of ditches noted across much of the survey area (pp. 151–55). Some of these anomalies run from north to south [**m15.2**, **m15.4** and **m15.15**], while others [**m15.3**, **m15.5** and **m15.6**] are clearly aligned from west to east. Two linear negative anomalies [**m15.18**] abut one another orthagonally. Two dipolar discrete anomalies that are situated to the south [**m15.9**] are probably representative of modern ferrous material. A positive linear feature [**m15.13**] cuts across the south part of the survey area from north to south for a distance of *c.* 50m. A negative linear anomaly [**m15.14**] cuts across the field system at an angle.

Area 16 (Figs 4.33 and 4.34)
Area 16 covers the north-east corner of the island at the Capo Due Rami, the point where the '*Fossa Traiana*' and the river Tiber meet. It lies to the east of Areas 12 and 13, and to the north of Area 17, and is characterised by scattered marble blocks deriving from the site of the

statio marmorum (**G28a**). The area is marked by one large dipolar anomaly [**m16.1**] of geological origin, together with a series of similar dipolar bands that runs on a north to south orientation [**m16.8**, **m16.9–m16.11**, **m16.13**, **m16.14**, **m16.16**, **m16.17**, **m16.21**, **m16.26** and **m16.27**]. Two positive linear anomalies [**m16.2**] mark possible banks. Strips of negative readings [**m16.8**, **m16.12**, **m16.22**, **m16.23**] are associated with some of these. Other dipolar maculae mark the presence of ferrous material buried in the plough soil [**m16.3**, **m16.14** and **m16.15**], whilst a broad spread of dipolar features [**m16.4**, **m16.5**] indicates the line of a modern in-filled ditch containing ferrous material. Two field drains are also visible [**m16.6** and **m16.7**], some 70m in length.

The eastern portion of the area provides clearer evidence for the presence of archaeological features, although most of them follow the grain of the underlying geology. Two parallel positive linear features [**m16.18** and **m16.19**] cut across the area for a distance of over 40m. A further negative anomaly [**m16.20**] is situated to the east of these. Further to the east, a pair of positive linear anomalies [**m16.24** and **m16.25**] cut through the geological features, indicating the corner of a structure close to the bank of the '*Fossa Traiana*'. To the south, a positive rectilinear feature [**m16.29**], formed of two parallel linear anomalies, suggests the presence of a structure or enclosure of some kind. Two further linear features [**m16.30**] mark one side of an adjacent enclosure, the western edge of which is obscured by the magnetic response of the underlying geology. A small rectilinear feature [**m16.31**] is situated to the south, measuring some 14m across. Finally, two linear anomalies [**m16.28**] mark the northern side of a further structure. These enclosures probably represent *mausolea* fronting onto the bank of the Tiber where it meets the '*Fossa Traiana*', which would have been a prominent location. There are parallels for *mausolea* in this position on the Tiber bank a little further upstream (Keay *et al.* 2005: 134). Alternatively, but less likely, they could be associated with buildings related to the *statio marmorum*, as evidenced by the marble blocks recovered from this area in the 1920s and during works in 1995 and 1999 (**G28a**). (These issues are discussed further below, p. 159).

Area 17 (Figs 4.35 and 4.36)
Area 17 lies on the Tiber bank immediately to the south of Area 16 and adjoins Areas 13 and 14 to the west. Bands of dipolar readings representing geological deposits continue across it [**m17.3**, **m17.4**, **m17.7–m17.9**, **m17.13–m17.17**, **m17.27** and **m17.28**]. The ends of two modern field drains are visible in the north of the area [**m17.1** and **m17.2**]. Four discrete dipolar anomalies [**m17.19**, **m17.20**, **m17.21** and **m17.22**] run southwest–northeast across the area, marking a line of telegraph poles.

The possible funerary structures [**m16.28** and **m16.31**] noted above for Area 16, continue into the northeast corner of this area, with an enclosure [**m17.5**] measuring 30m by 28m characterised by an internal structure [**m17.6**] *c.* 14m wide. To the south of this there are several features which continue the system of rectilinear land divisions noted elsewhere across the island (pp. 151–55). These are mostly defined by what appear to be east–west ditches and banks [**m17.18**, **m17.23**, **m17.24**, **m17.25** and **m17.26**]. An enclosed area measuring 30m across defined by three anomalies [**m17.10**, **m17.11** and **m17.12**] seems to be integral to this.

Area 18 (Figs 4.37 and 4.38)
Area 18 lies in the west of the survey area, situated between Areas 8 (with which it overlaps) and 19, and to the west of Area 21. Two areas of dipolar readings [**m18.20** and **m18.21**] mark geological deposits towards the east. The Portus to Ostia Canal running from northwest–southeast across the Isola Sacra cuts through its centre. A large dipolar anomaly [**m18.8** and **m18.9**] marks its edge to the west, while a similar linear anomaly [**m18.14** and **m18.15**], defines it to the east, indicating that the width of the canal at this point was *c.* 60m. Positive linear anomalies running from north to south [**m18.10**, **m18.11**, **m18.12** and **m18.13**] are indicative of deposits within the canal, and may possibly post-date its use.

On either side of the canal, linear negative anomalies relate to the rectilinear system of boundary ditches noted elsewhere across the survey (pp. 151–55). To the west, features [**m18.1–m18.7**] define a series of small enclosures, while to the east the fields are larger [**m18.16–m18.19**]. On both sides, the ditches intersect with the canal edge.

Area 19 (Figs 4.39 and 4.40)
Area 19 is located between Areas 18 and 20, and to the west of Area 23 and is traversed by the line of the Portus to Ostia Canal. A series of broad dipolar bands of readings is visible running from north to south, as well as discrete anomalies. These mark geomorphological features related to earlier coastlines [**m19.1**, **m19.2**, **m19.11–m19.13**, **m19.28–m19.31**, **m19.34–m19.40**, **m19.47**, **m19.48**, **m19.52–m19.55**, **m19.57** and **m19.58**].

The dipolar anomalies [**m19.14**, **m19.15**, **m19.41** and **m19.42**] mark the western edge of the canal and a possible build-up of material derived from its construction. Its eastern edge is shown as a band of dipolar readings [**m19.26**, **m19.27** and **m19.44**]. The width of the canal varied between *c.* 60m in the north and *c.* 47m in the south, with its fill being clearly visible

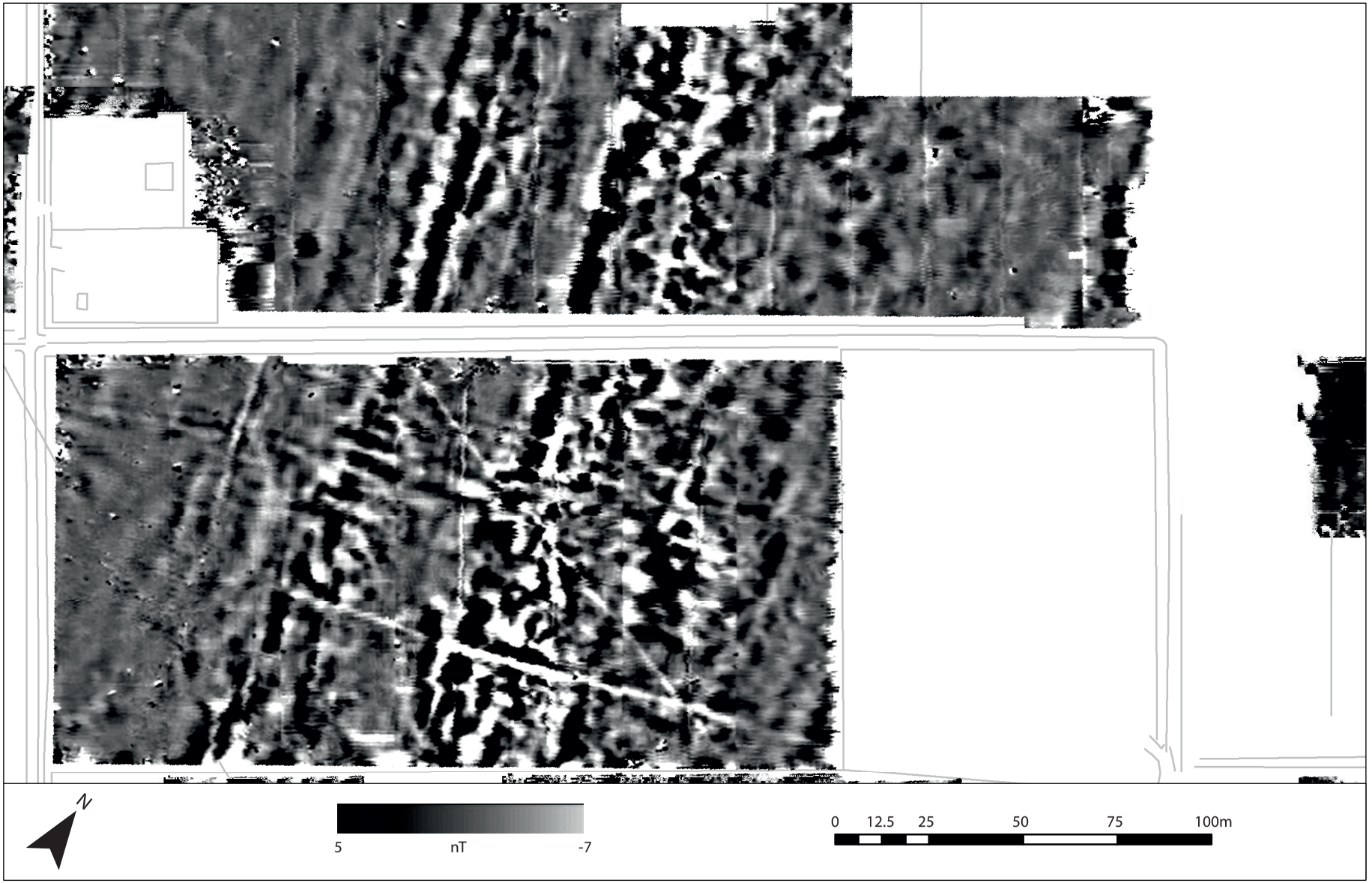


Figure 4.25. *Plan of Area 12 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

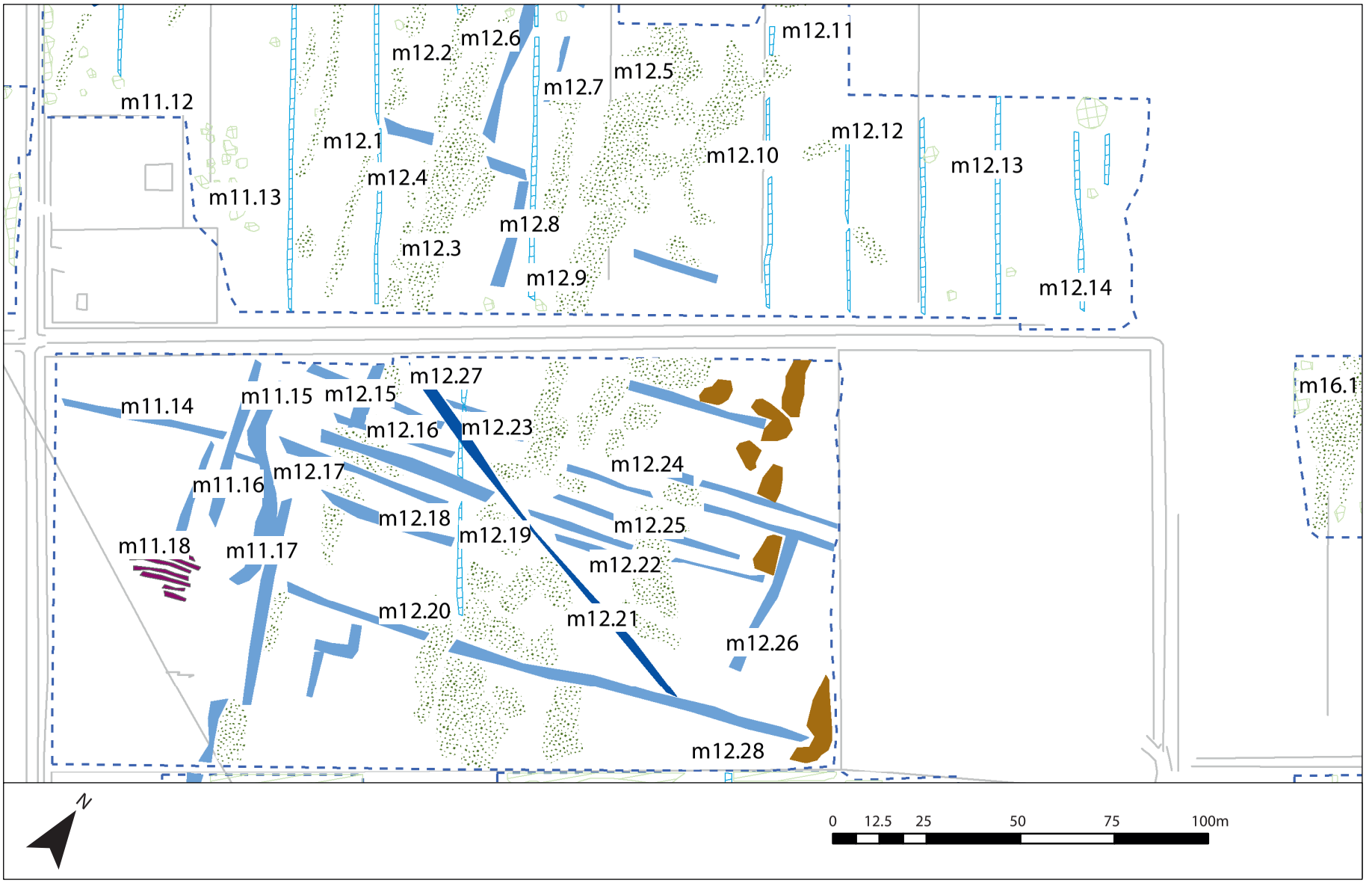


Figure 4.26. *Plan of Area 12 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

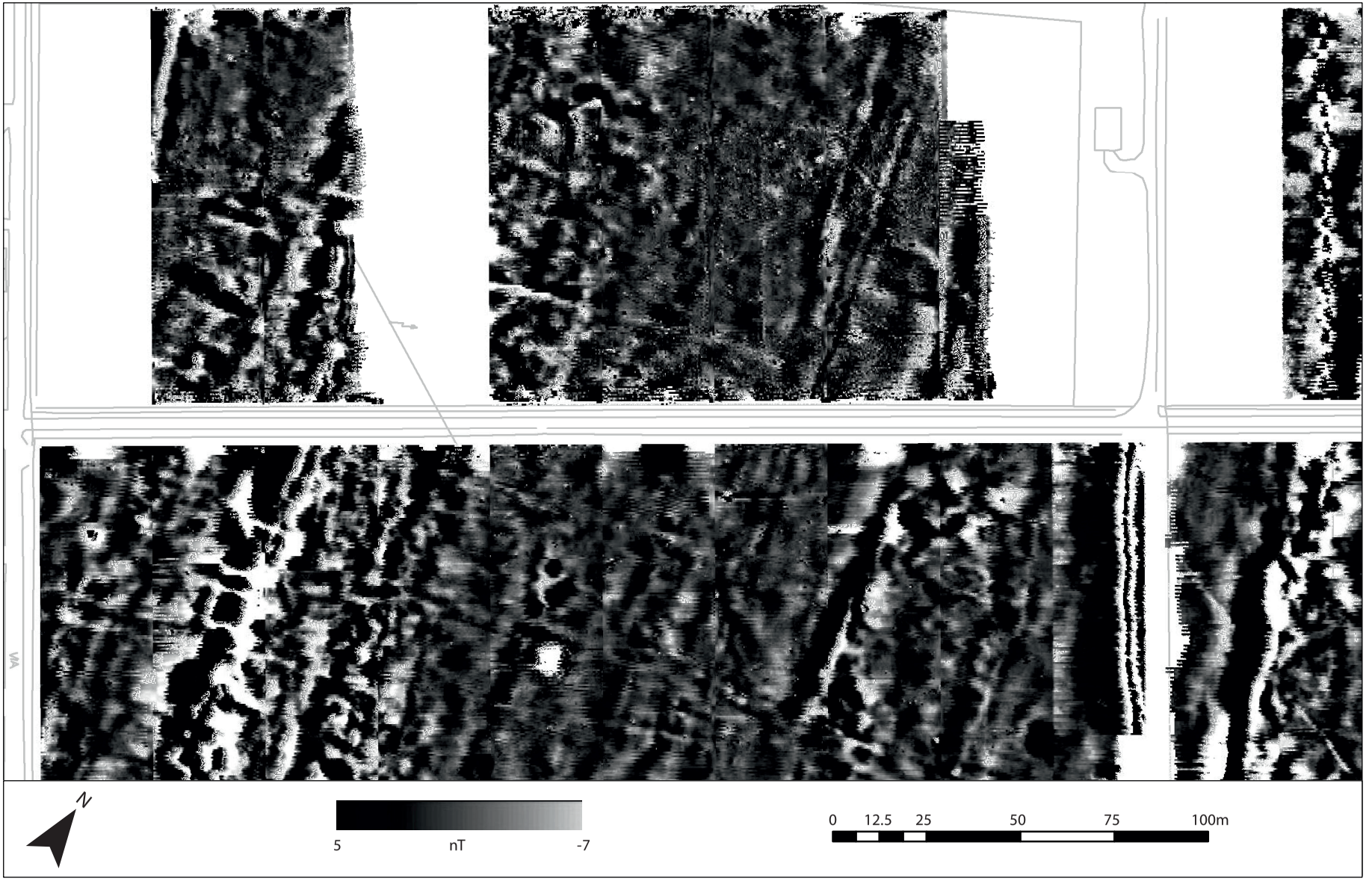


Figure 4.27. *Plan of Area 13 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

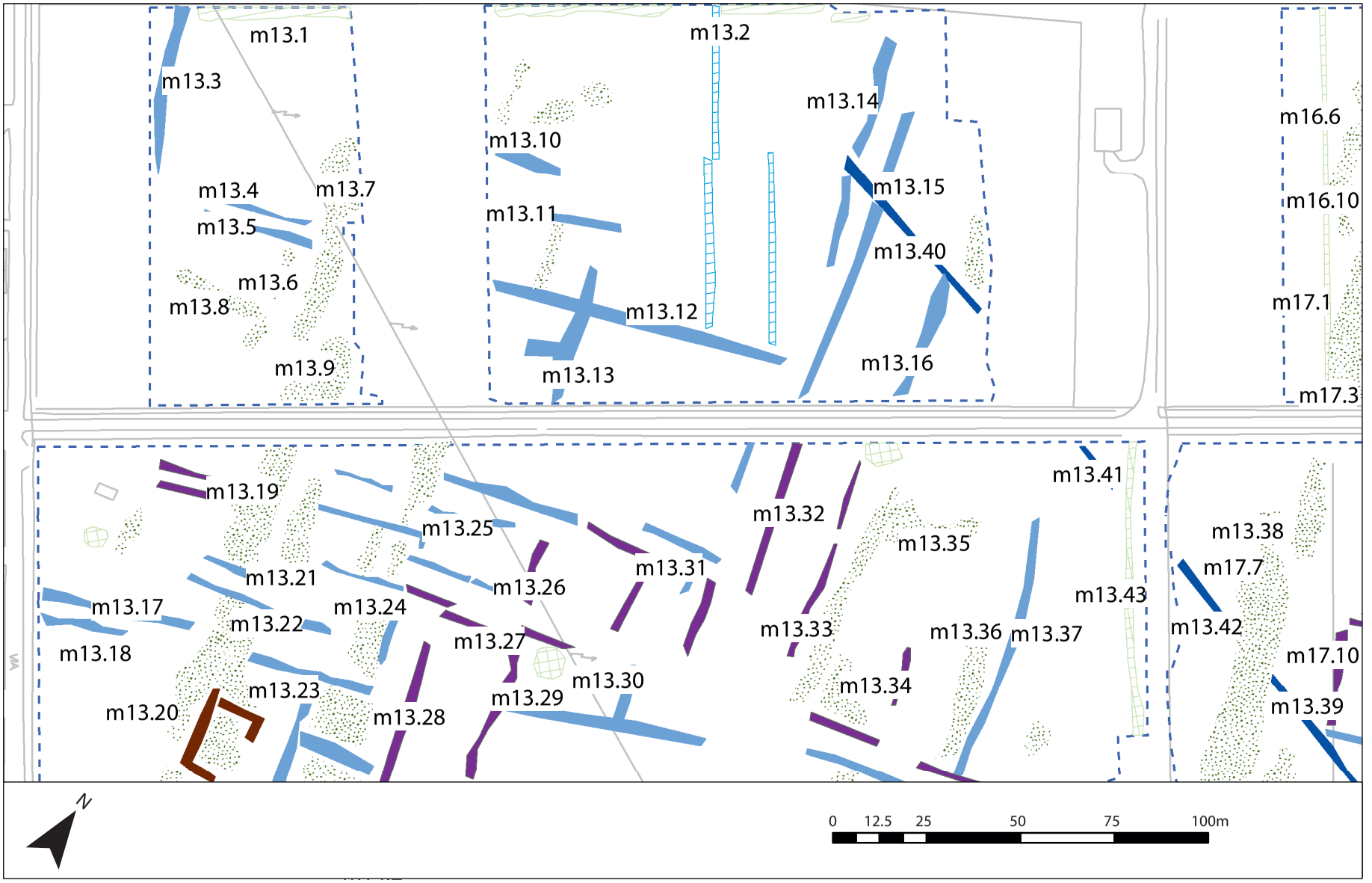


Figure 4.28. *Plan of Area 13 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

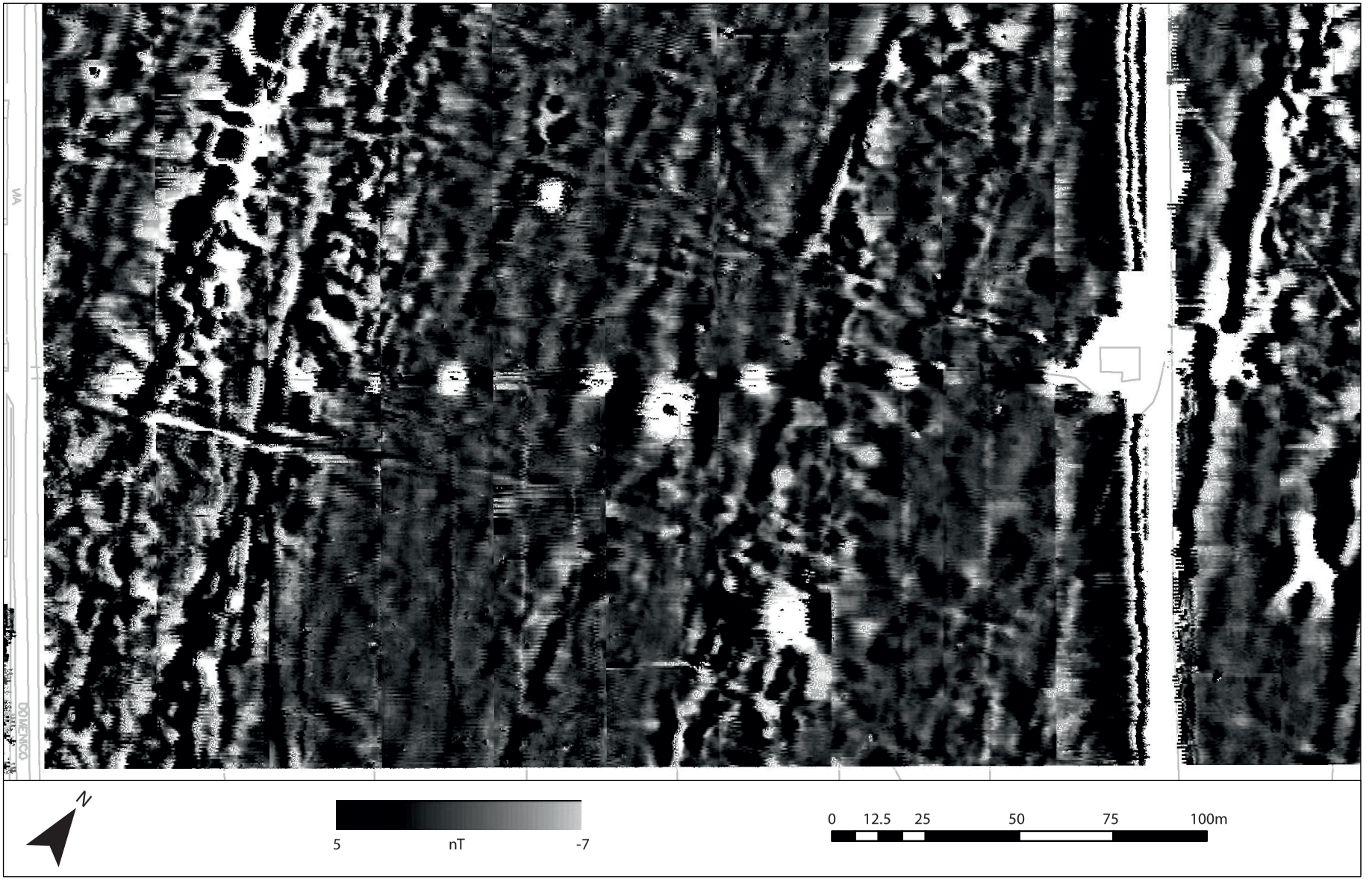


Figure 4.29. *Plan of Area 14 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

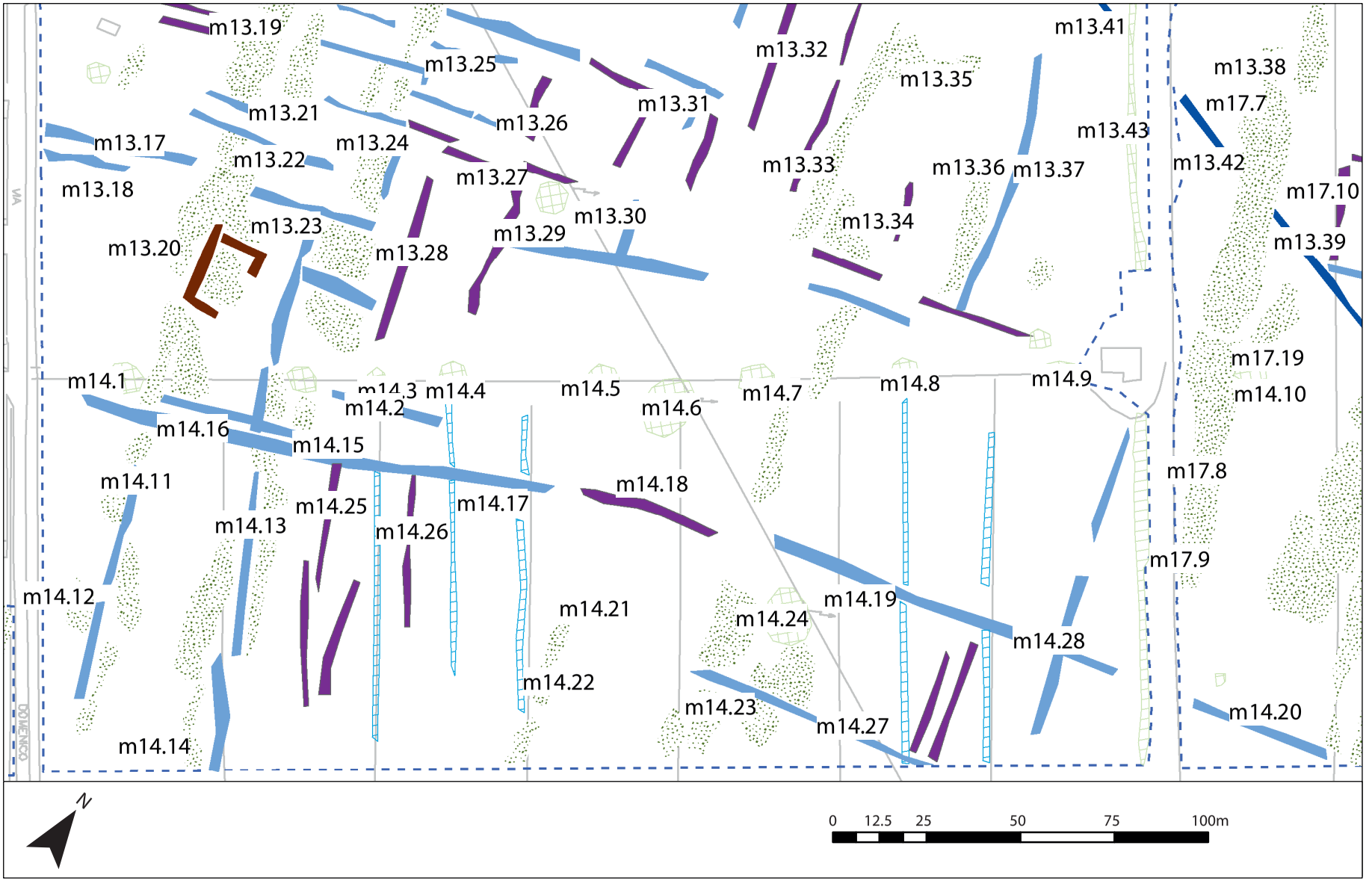


Figure 4.30. *Plan of Area 14 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

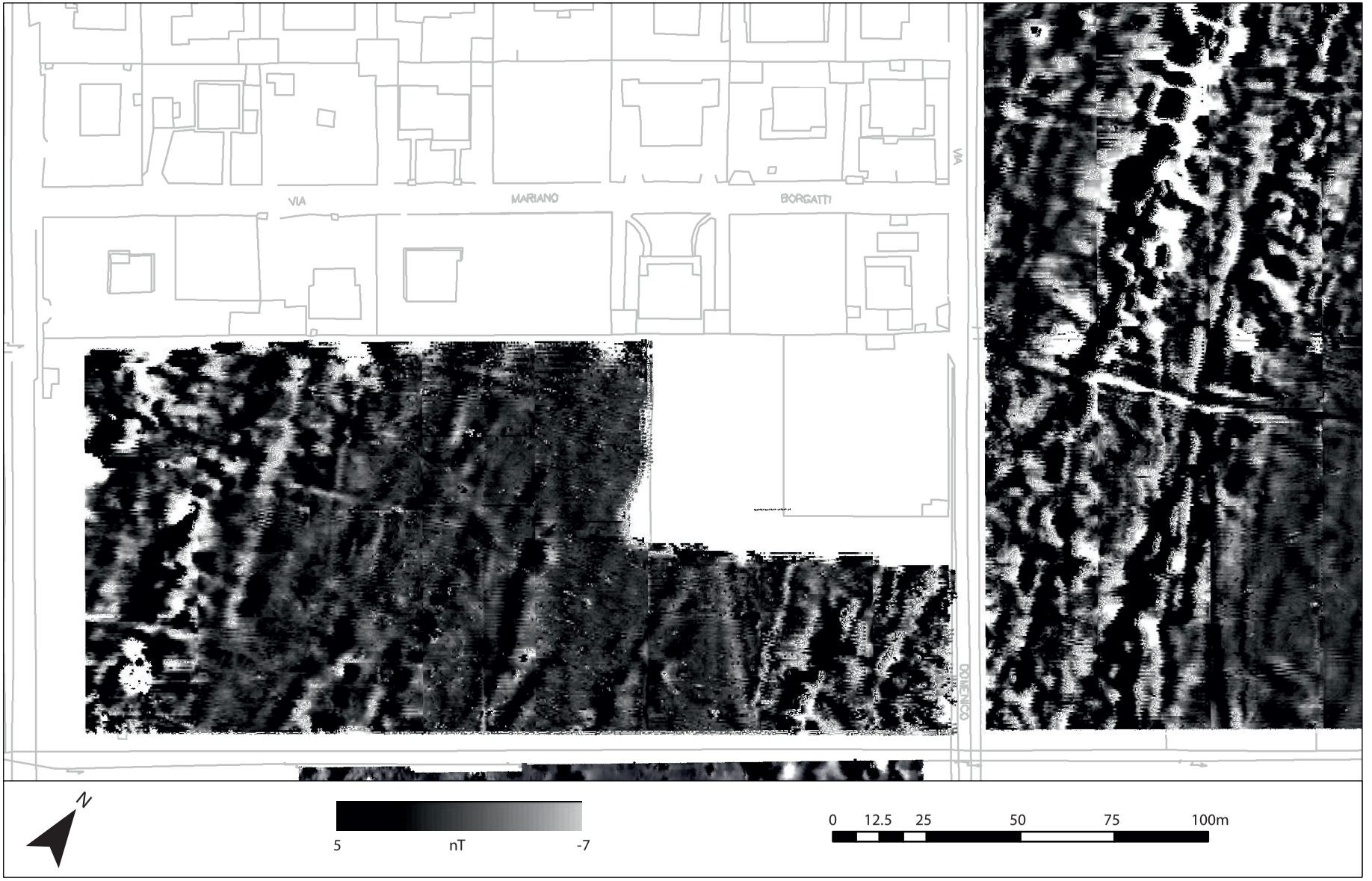


Figure 4.31. *Plan of Area 15 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

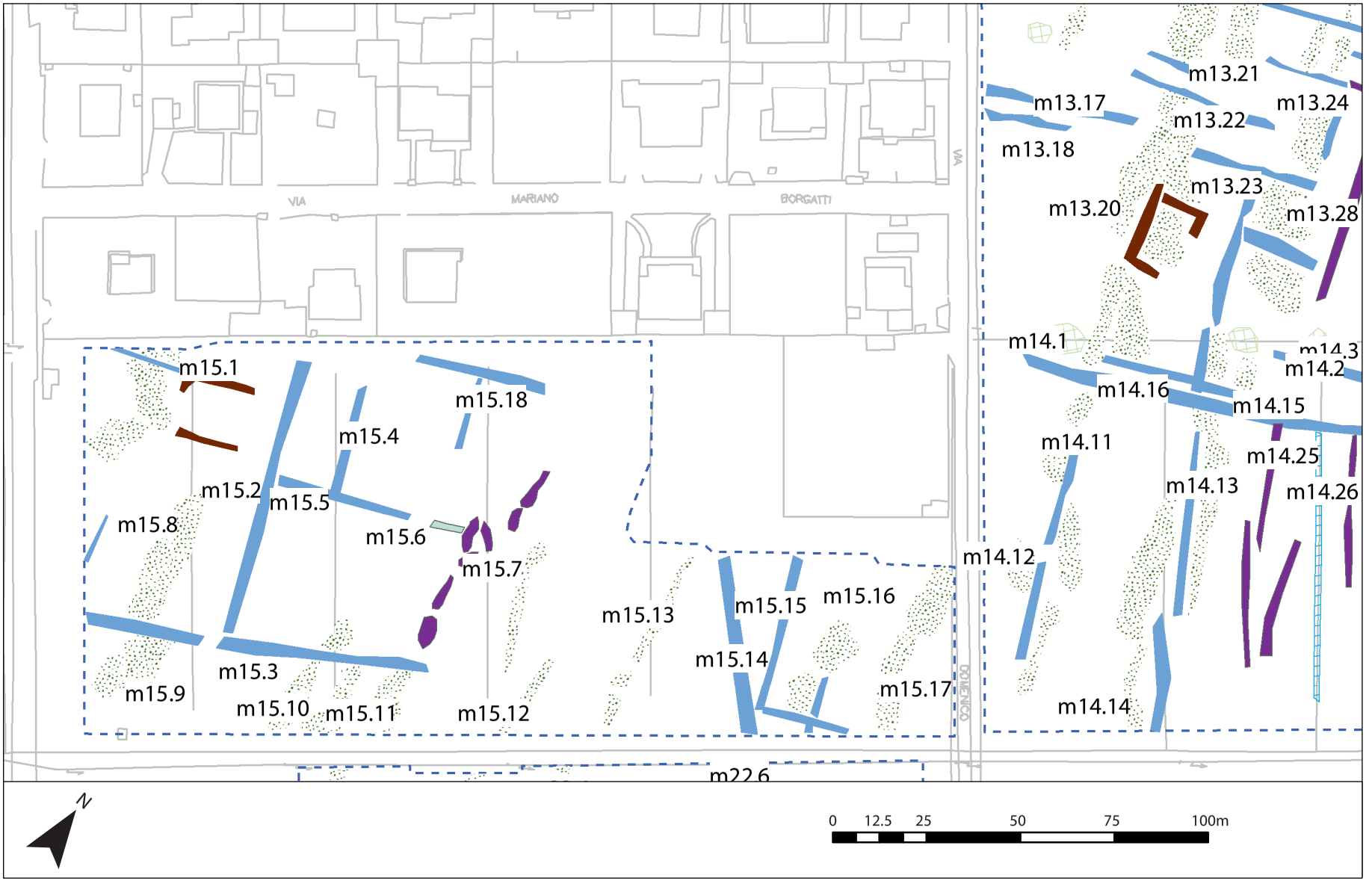


Figure 4.32. *Plan of Area 15 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

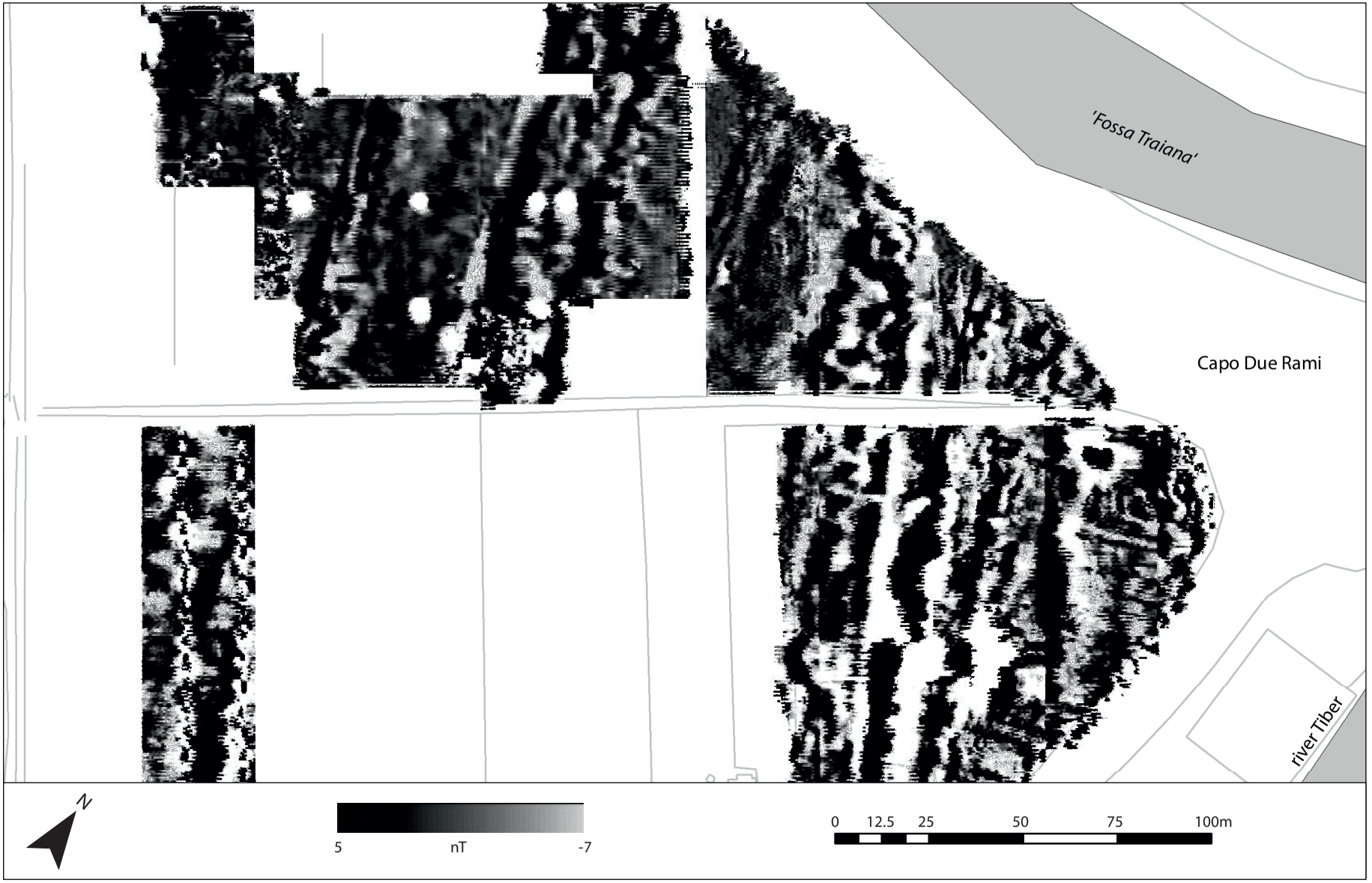


Figure 4.33. *Plan of Area 16 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

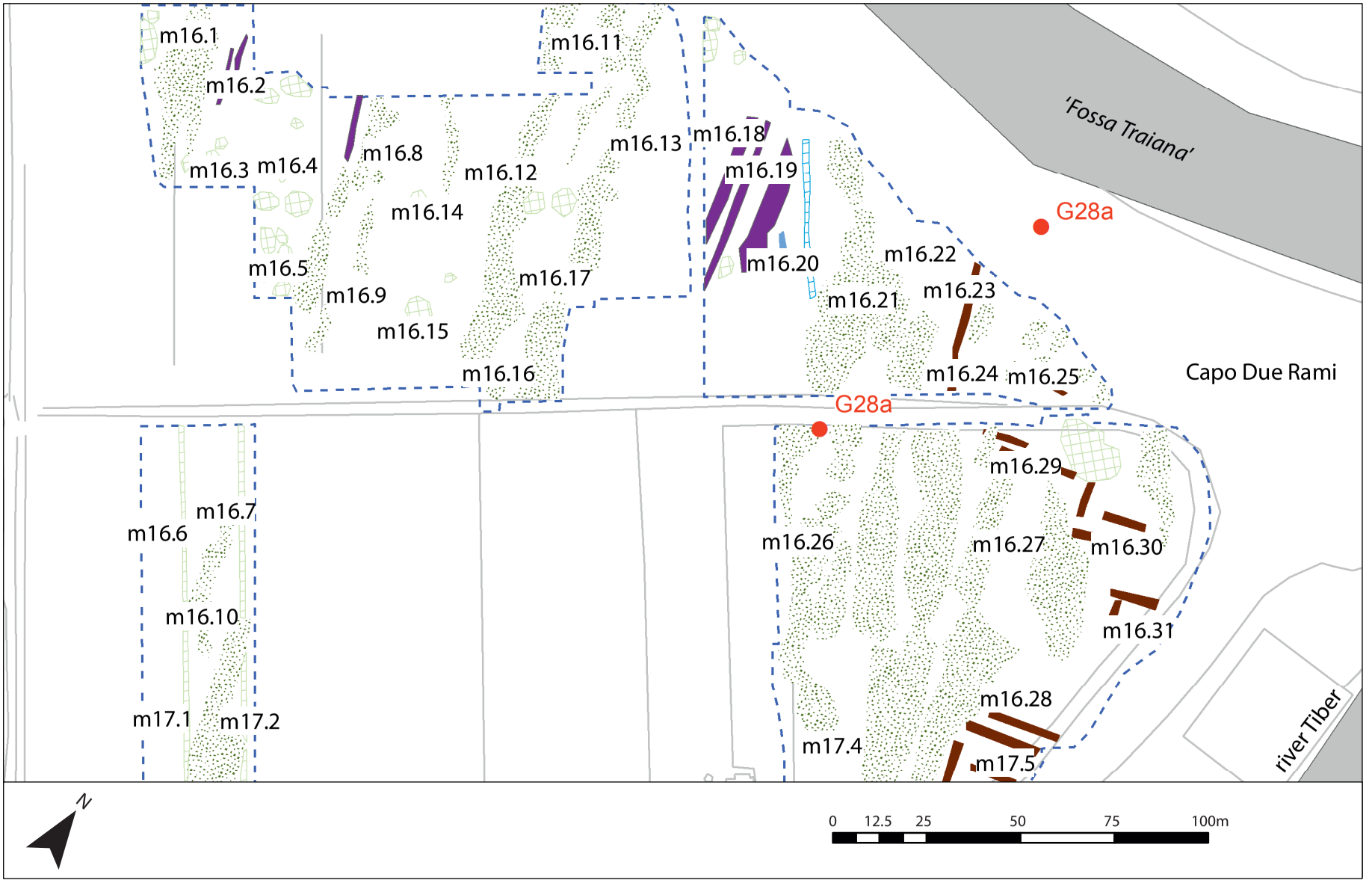


Figure 4.34. *Plan of Area 16 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

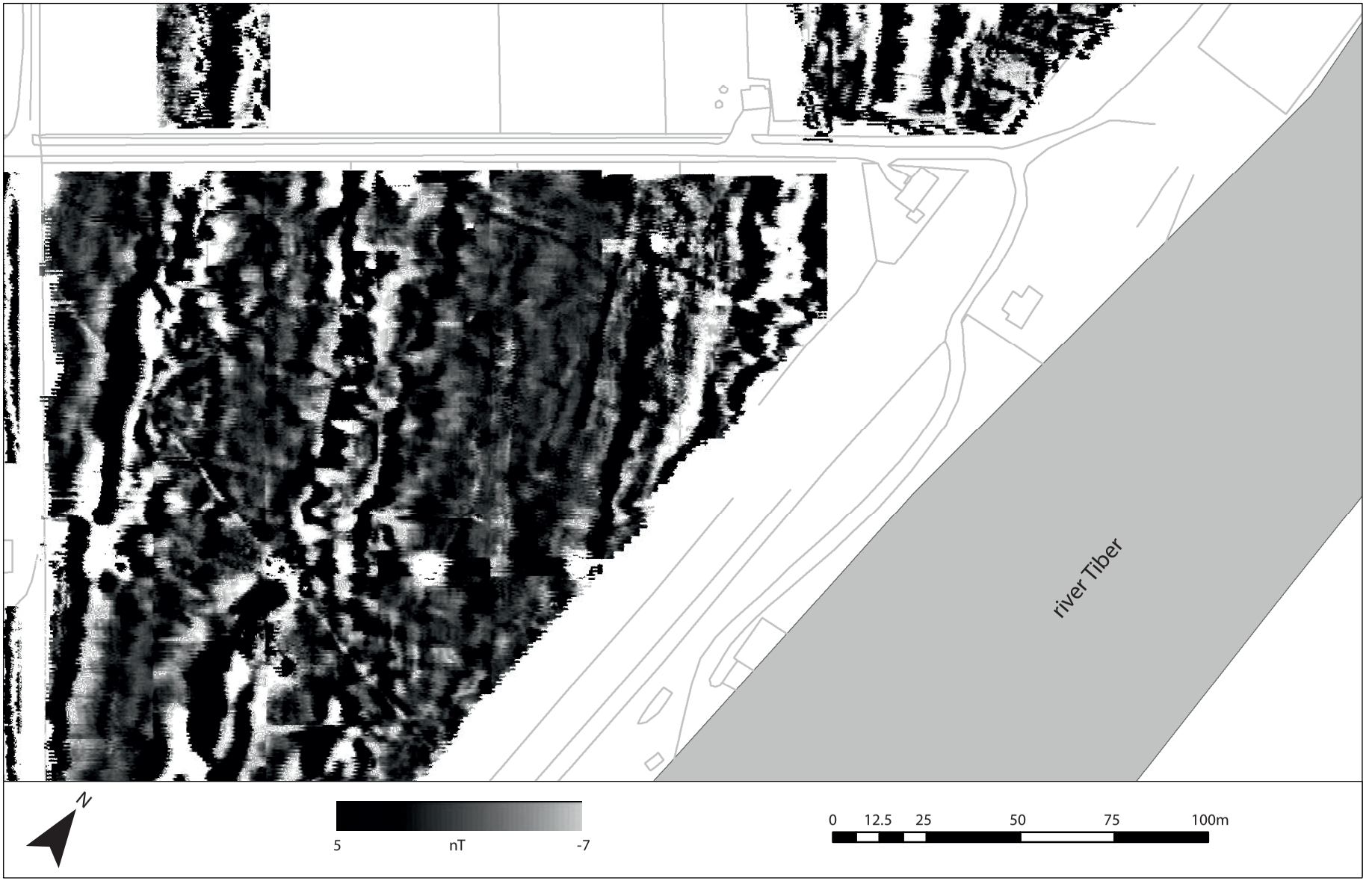


Figure 4.35. *Plan of Area 17 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

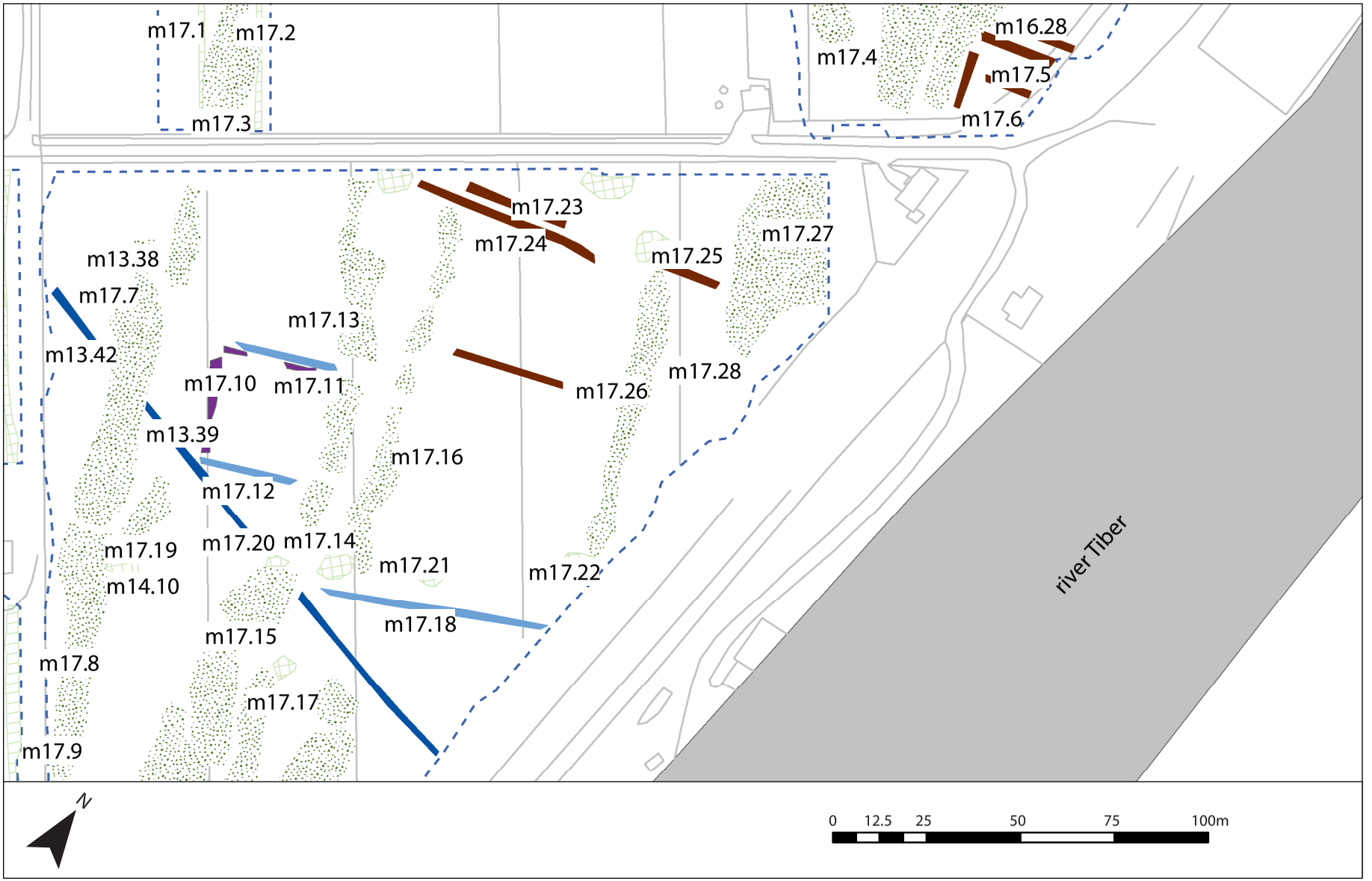


Figure 4.36. *Plan of Area 17 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

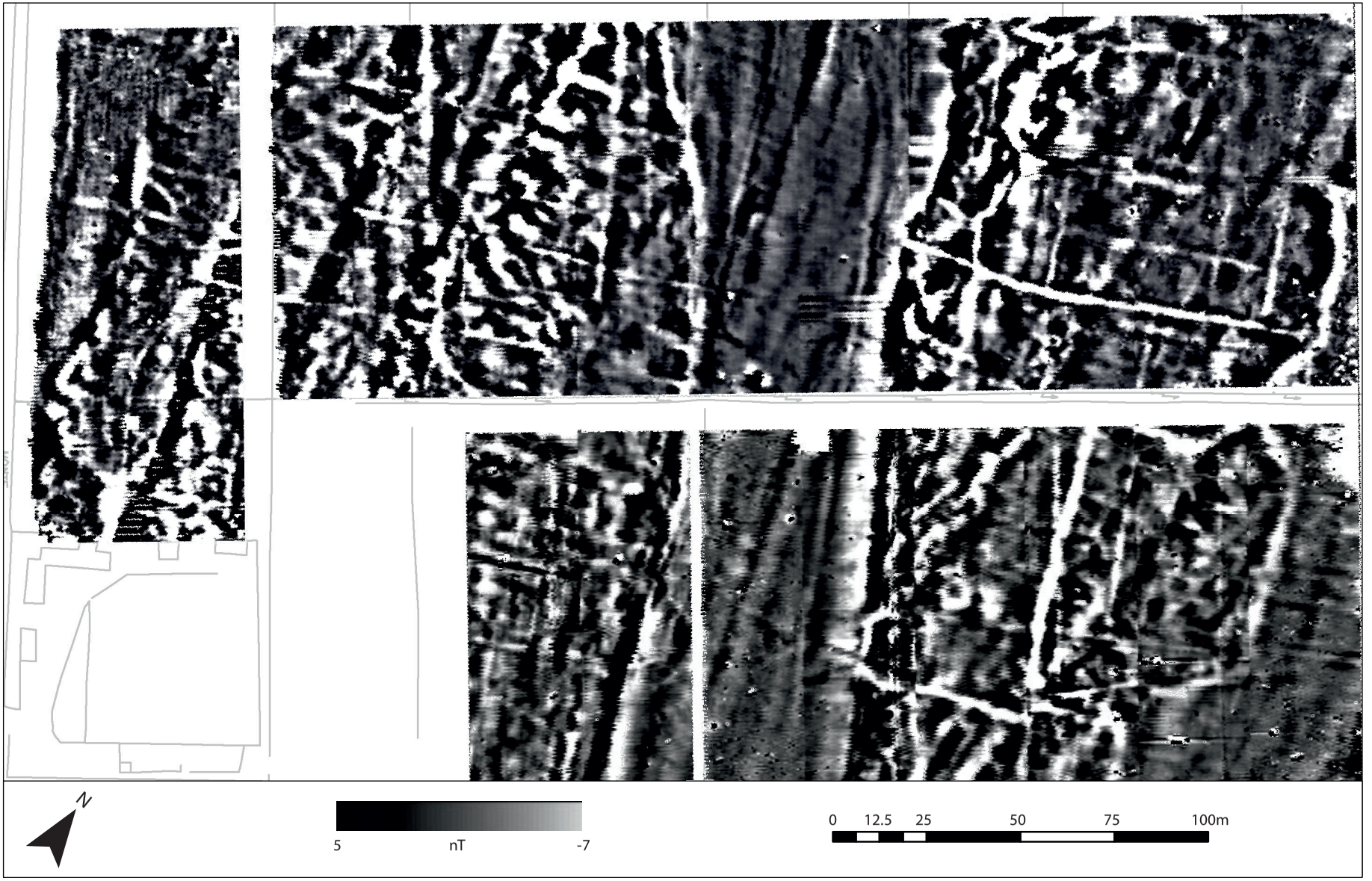


Figure 4.37. *Plan of Area 18 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

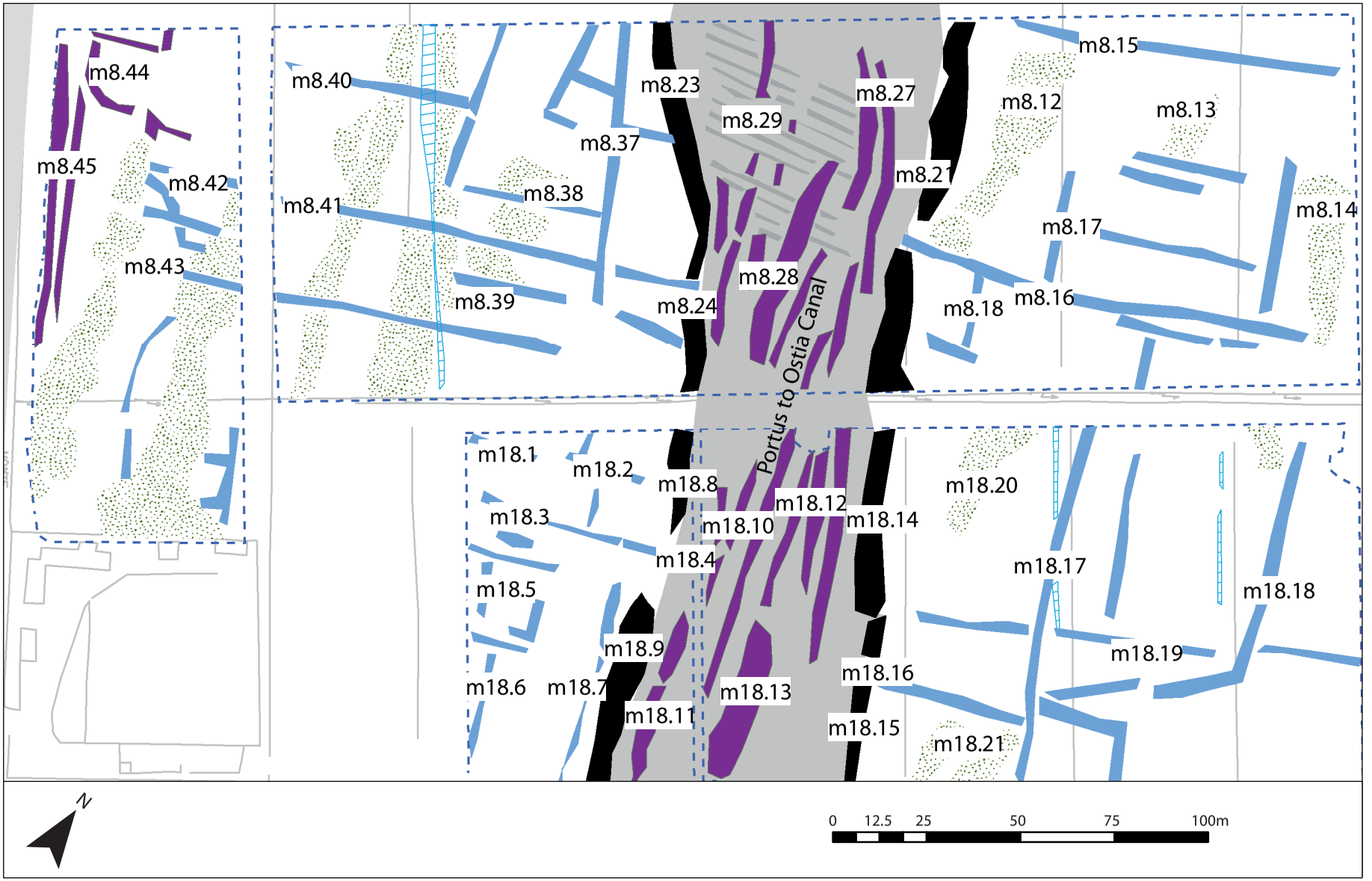


Figure 4.38. *Plan of Area 18 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

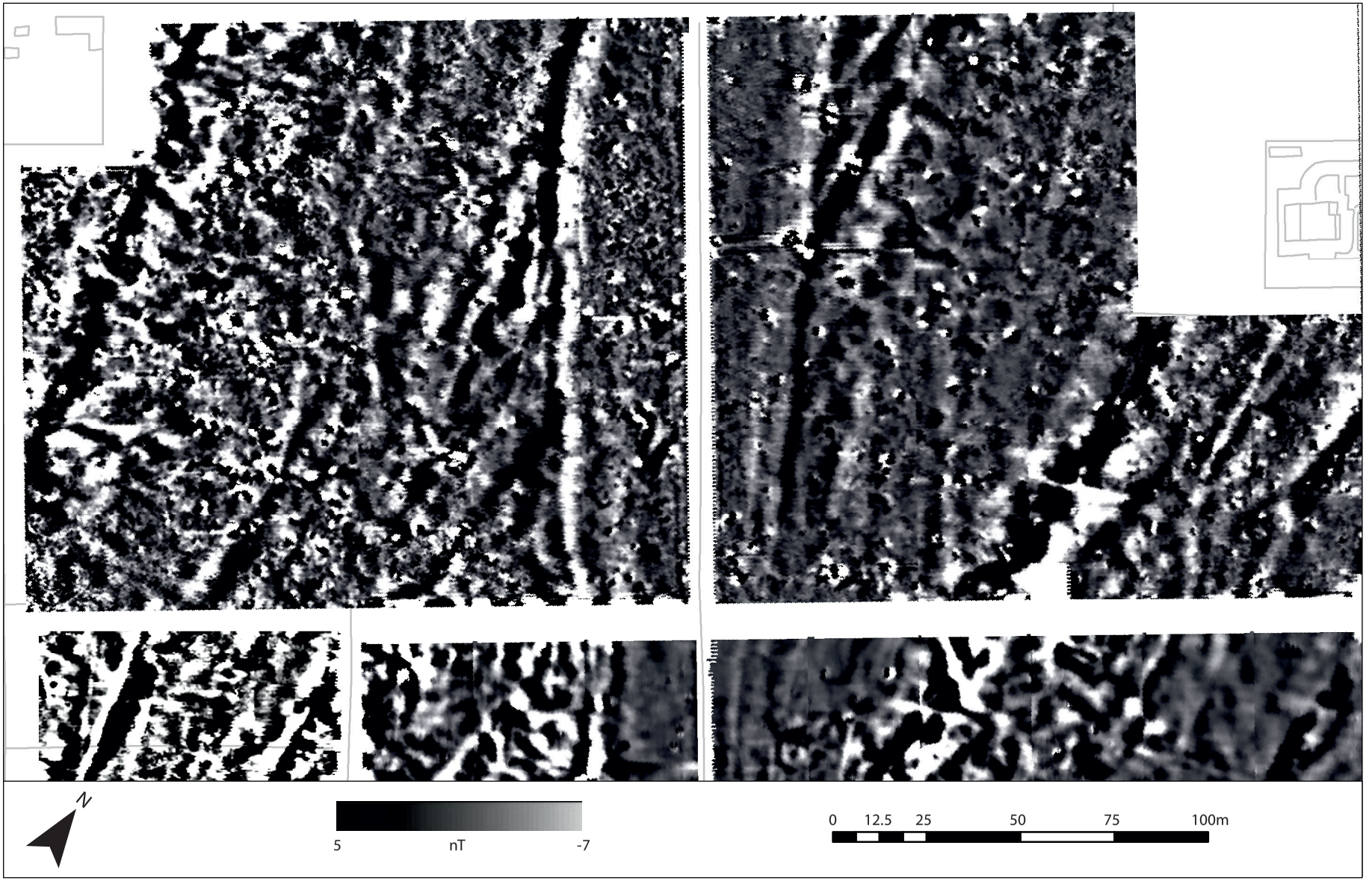


Figure 4.39. *Plan of Area 19 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

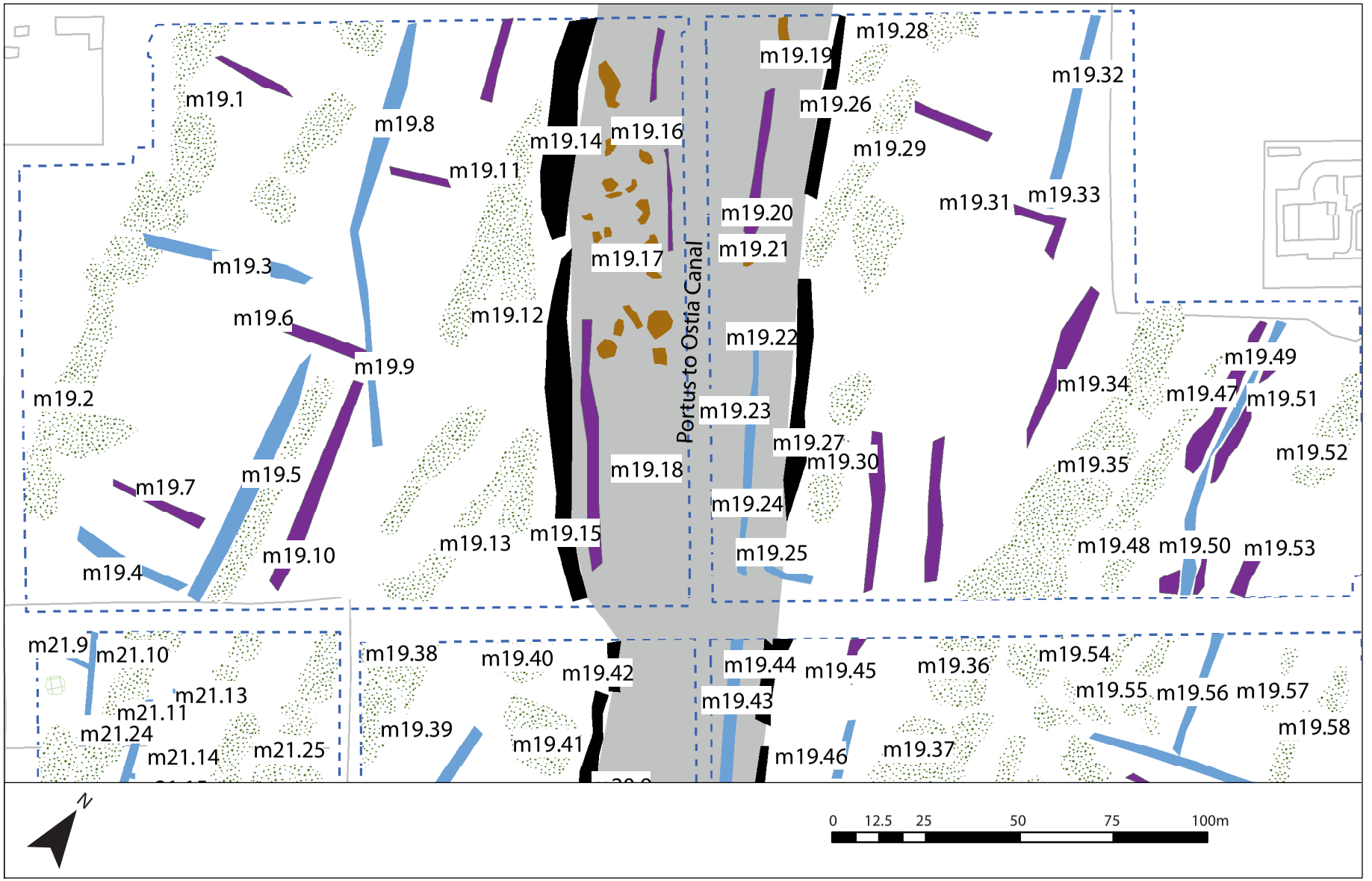


Figure 4.40. *Plan of Area 19 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

[**m19.16–m19.18**]. A band of positive anomalies relating to infill deposits were also identified [**m19.19–m19.22**], while a small channel and its offshoot are identifiable as a negative linear anomaly [**m19.23–m19.25** and **m19.43**] further to the south. A pair of positive dipolar anomalies [**m19.45** and **m19.46**] run parallel to the eastern edge of the canal.

Other linear anomalies lying on both sides of the canal represent ditches associated with the rectilinear system of land division noted elsewhere across the survey area [**m19.3–m19.7**, **m19.10**, **m19.32** and **m19.33**]. Two other sets of linear negative anomalies [**m19.8–m19.9** and **m19.49–m19.50**] on the west side of the canal are on slightly different alignments and are perhaps related to other phases of activity.

Area 20 (Figs 4.41 and 4.42)
Area 20 also straddles the line of the canal, and is located to the south of Area 19, to the east of Area 21 (with which it overlaps) and to the west of Area 23; a gap separates it from Area 25 to the south. Geological features representing earlier coastlines are evident as dipolar linear anomalies [**m20.18**, **m20.22**, **m20.50–m20.52** and **m20.63**] along with several related discrete anomalies [**m20.23**, **m20.30–m20.32**, **m20.34–m20.36**, **m20.42**, **m20.43**, **m20.50, m20.53–m20.55**, **m20.61** and **m20.62**].

The western edge of the canal [**m20.8**, **m20.37** and **m20.38**] is visible as a strong set of linear positive anomalies, continuing the line of [**m19.42**]. Within the canal, a large dipolar discrete anomaly [**m20.9**] measuring some 10m across is located along its western edge, and a linear positive anomaly [**m20.10**, **m20.39** and **m20.40**] measuring 5m across and 60m in length marks variations in the deposits within the canal. A similar band lies to the east [**m20.11**]. The eastern edge of the canal is also faintly visible [**m20.12** and **m20.14**] but is more clearly defined further south [**m20.41**], where the canal was *c.* 40m across.

To the west of the canal there are few archaeological features, all of which are associated with a single complex that is situated beside the canal. Two parallel anomalies [**m20.1** and **m20.3**] and a connecting feature [**m20.2**] define a square structure measuring some 24m by 23m, with several positive discrete anomalies lying within it. At some distance to the west, a broader dipolar anomaly [**m20.4**] runs from north to south before turning a right angle to run for *c.* 46m to the east, possibly marking the cut of a shallow channel. Two faint linear anomalies [**m20.5** and **m20.6**] running parallel to this are located immediately to the south, together with two discrete positive anomalies [**m20.7**].

The area to the east of the canal contains a series of features that can be mostly associated with the rectilinear system of land divisions observed elsewhere in the survey (pp. 151–55). Most of the ditches in the northern half follow the north–south [**m20.13**, **m20.17**, **m20.45–m20.48**] and east–west orientation [**m20.14–m20.16**, **m20.19**, **m20.21**, **m20.24–20.29** and **m20.44**] described in other areas. To the south, the ditch direction gradually changes, with those running north–south [**m20.20**, **m20.33**, **m20.49**, **m20.58**, **m20.59** and **m20.60**] being orientated more towards the southwest–northeast. Finally, the dipolar readings to the east of the survey area [**m20.56** and **m20.57**] mark the presence of modern ferrous material running along the field boundary.

To the west of the main area, the results are dominated by bands of dipolar readings [**m20.64–m20.67**] along with a number of discrete dipolar anomalies [**m20.68–m20.70**] marking modern ferrous material in the ploughsoil. A band of dipolar readings [**m20.71**] are also visible relating to the modern fenceline along the eastern edge of the field.

Area 21 (Figs 4.43 and 4.44)
Area 21 extends to the west of Areas 19 and 20. Two parallel linear positive anomalies [**m21.1** and **m21.2**] mark the edges of the via Flavia in the north of the survey area, and are visible more faintly to the south [**m21.7** and **m21.8**]. These anomalies correspond to a stretch of the via Flavia that was partly excavated (**G36**) revealing a road make-up of rammed pebbles, soil and mortar, and defined along its eastern side by an *opus reticulatum* wall. This perhaps corresponds to anomaly [**21.6**]. Broad bands of negative readings and dipolar linear anomalies [**m21.3–m21.6**] mark variations in the natural sand deposits beneath the road.

In the field to the south-east a series of linear negative anomalies show a continuation of the system of boundary ditches recorded elsewhere. An east–west ditch [**m21.9**] runs for 16m and abuts a north–south ditch measuring 28m in length [**m21.10**]. A further, longer linear feature [**m21.11–m21.12**], measuring 75m in length, indicates another ditch traversing the area. A number of east–west ditches extend to the east [**m21.13–m21.23**]. These are located alongside areas of substantial dipolar anomalies [**m21.24–m21.26**] marking the geomorphological deposits found elsewhere across the survey area.

Area 22 (Figs 4.45 and 4.46)
Area 22 lies to the south of Area 15, to the north of Area 24 and to the west of Area 23. Bands of positive and dipolar readings marking natural deposits cut across the area [**m22.1**, **m22.3**, **m22.6**, **m22.7**, **m22.11**, **m22.13–m22.15**, **m22.17**, **m22.18**, **m22.21**, **m22.24–m22.31**, **m22.38** and **m22.41**], together with associated discrete deposits [**m22.2**, **m22.4**, and **m22.5**]. Ditches associated with the rectilinear system of land divisions

(pp. 151–55) continue across the survey area. Those running on a northwest–southeast orientation [**m22.16**, **m22.34**, **m22.35** and **m22.40**], are less frequent than those running northeast–southwest [**m22.9**, **m22.10**, **m22.19**, **m22.20**, **m22.22**, **m22.23**, **m22.36**, **m22.37** and **m22.39**]. On a slightly different orientation, two ditches [**m22.8**] 61m long, and [**m22.32** and **m22.34**/**m22.35**], the latter some 95m in length, may represent a different phase.

Along the western side of the survey area several dipolar discrete anomalies [**m22.12**] mark the presence of modern ferrous material.

Area 23 (Figs 4.47 and 4.48)
Area 23 lies between Area 22 (with which it overlaps) and the Tiber, to the south of Area 14 and to the north of Area 25. Bands of dipolar readings [**m23.1**, **m23.2**, **m23.3**, **m23.9**, **m23.11**, **m23.12**, **m23.13**, **m23.15** and **m23.17**] run from north to south across the area and mark natural features in the alluvium. Superimposed upon these are ditches associated with the rectilinear system of land division noted elsewhere across the Isola Sacra (pp. 151–55). The east–west ditches are clearest [**m23.4**, **m23.5**, **m23.6**, **m23.7**, **m23.8**, **m23.10**, **m23.14** and **m23.18**]. The only north–south features are narrow positive linear anomalies [**m23.16**, **m23.19** and **m23.20**] which may possibly be natural.

Area 24 (Figs 4.49 and 4.50)
Area 24 is situated to the south of Area 22, to the east of Area 20 (with which it overlaps), to the west of Area 25 and to the north of Areas 26 and 27. Linear bands of natural deposits extend across it [**m24.1, m24.5–m24.10**, **m24.12**, **m24.13**, **m24.16–m24.19, m24.23–m24.32**, **m24.34–m24.36**]. Linear anomalies on north to south [**m24.2**, **m24.3**, **m24.11**, **m24.17** and **m24.20**] and east to west [**m24.4**, **m24.21**, **m24.22** and **m24.38**] orientations indicate ditches associated with the system of land divisions, noted elsewhere in the survey area. A linear dipolar anomaly [**m24.33**] which cuts from west to east across the area on a slightly different alignment hints at the existence of a further ditch of a different phase.

Area 25 (Figs 4.51 and 4.52)
Area 25 is located beside the Tiber between Areas 23, 24 and 27. It overlaps with Area 24 to the west. The dipolar bands of natural deposits continue across the area [**m25.1**, **m25.6–m25.8**, **m25.9**, **m25.10**, **m25.12–m25.14** and **m25.17**]. A negative band of sediments [**m25.4** and **m25.5**] measuring 100m in length and 10m across, also crosses the area. A series of ditches cuts through these features [**m25.2** and **m25.11**], although these are too fragmentary to assess whether or not they relate to the rectilinear system of land division noted elsewhere across the Isola Sacra**.** Several discrete positive anomalies are also visible [**m25.3**]. A series of positive anomalies marks the possible walls of an enclosure overlooking the Tiber [**m25.15** and **m25.16**], measuring some 25m by 10m in size, and may perhaps be a *mausoleum*.

Area 26 (Figs 4.53 and 4.54)
Area 26 extends between Areas 20/24 and 27 and 28. The eastern edge of the Portus to Ostia Canal (pp. 155–57) must lie just beyond the survey area to the west. The bands of dipolar responses, that may mark natural features, that have been noted elsewhere continue across this area [**m26.1**, **m26.2**, **m26.5–m26.18**, **m26.24–m26.28**, **m26.30–m26.32**, **m26.34–m26.36**, **m26.43–m26.46**], although their orientation gradually curves to the south towards the southern part of the survey area (pp. 136–37).

Two ditches [**m26.3** and **m26.4**] in the western part of the area are probably associated with the rectilinear system of land division, noted elsewhere across the Isola Sacra (pp. 151–55). To the south, narrow positive linear anomalies [**m26.21** and **m26.22**] seem to mark the presence of walls that may form part of the same system. Other discrete areas of positive signals [**m26.19** and **m26.20**] mark possible dumps of material and there is a scatter of modern ferrous material [**m26.23**]. Further east, a negative linear anomaly [**m26.29** and **m26.39**] marks a northwest–southeast ditch, which turns to the east [**m26.40**]. At the turn, it is joined by another ditch indicated by a negative anomaly [**m26.41** and **m26.42**] which continues for a distance of 120m to the southwest. Further stretches of ditch are also visible in this area [**m26.38, m26.41** and **m26.42**].

Area 27 (Figs 4.55 and 4.56)
Area 27 is located between Area 26 (with which it overlaps) and the river Tiber, with Areas 24/25 lying to the north and Area 29 to the south. A band of dipolar readings marking natural deposits continue across this area [**m27.1** and **m27.2**], with similar discrete anomalies [**m27.3**, **m27.4**, **m27.6**, **m27.7** and **m27.8**] lying to the south and east. A positive linear anomaly [**m27.5**] behind the bank of the Tiber marks a possible wall, similar to other enclosure walls located along the river (p. 159). To the south, a major ditch [**m27.9** and **m27.10**] continues the line of anomaly [**m26.40**] to the west, while a positive linear anomaly possibly indicates another enclosure beside the Tiber [**m27.11**].

Area 28 (Figs 4.57 and 4.58)
Area 28 lies to the south of Area 26 and to the west of Area 29. A complex of dipolar anomalies marks natural features, but the regular pattern on a north–south alignment known from elsewhere across the Isola Sacra is shared by only a few linear anomalies [**m28.7**,

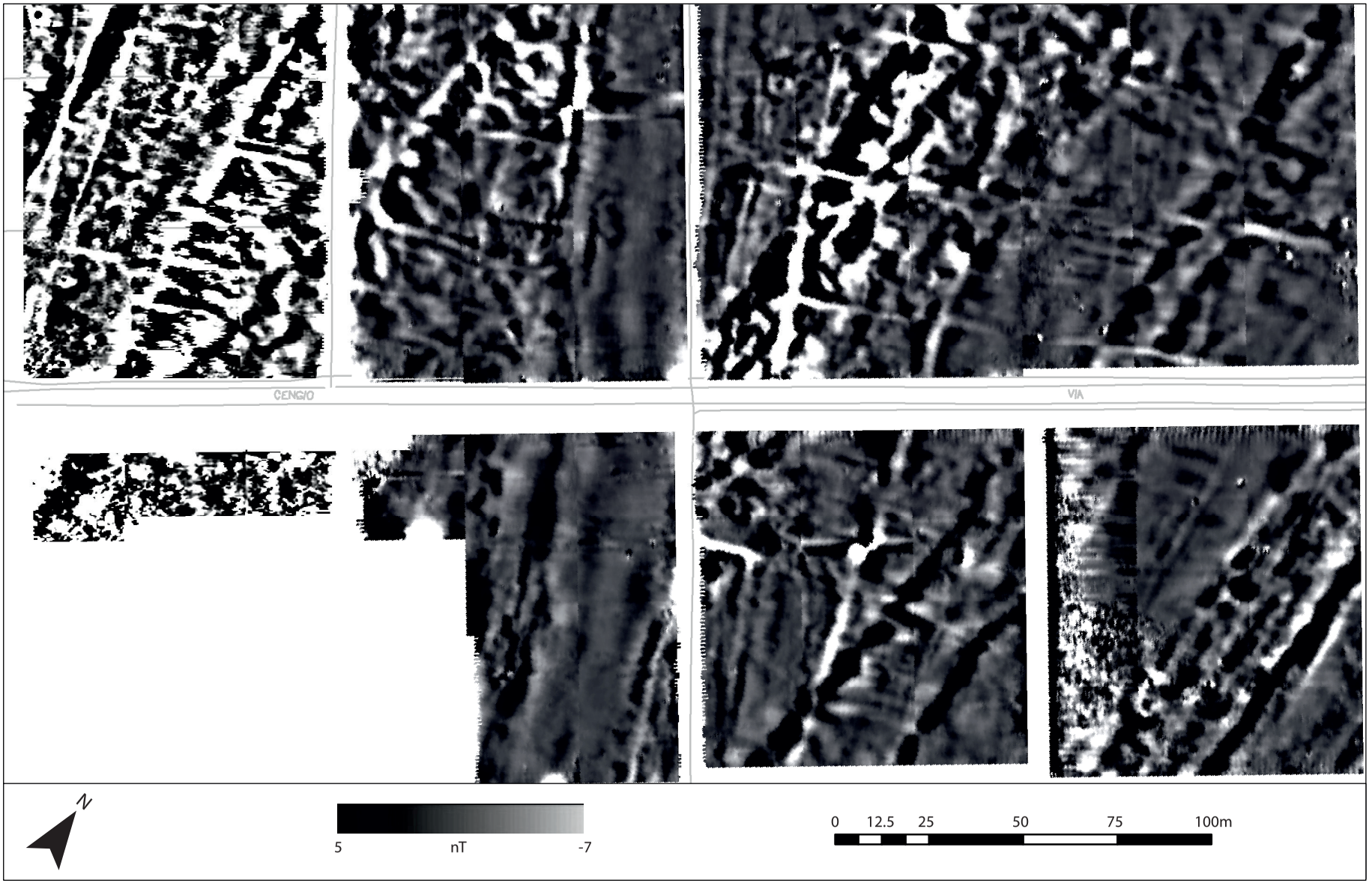


Figure 4.41. *Plan of Area 20 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

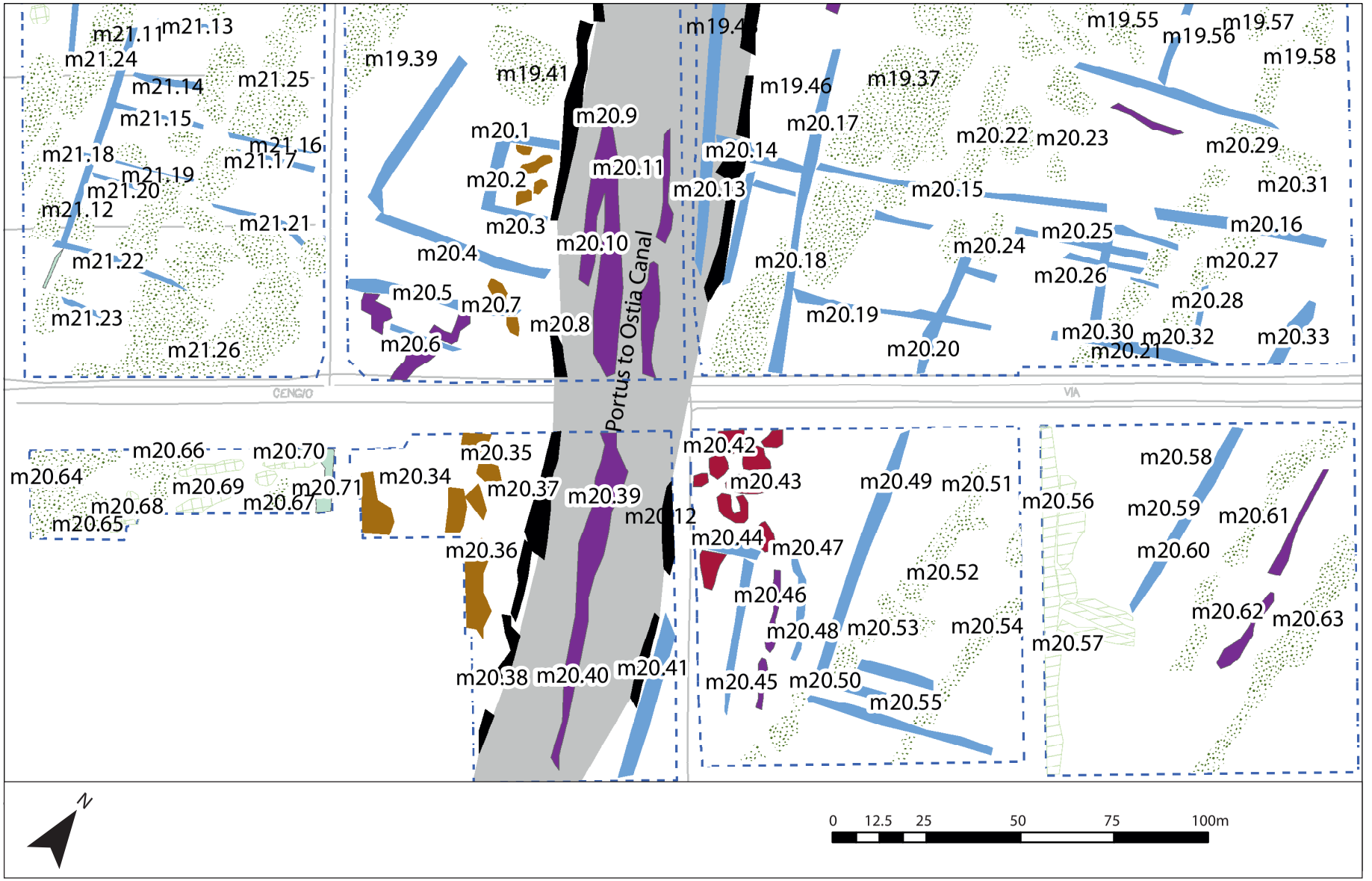


Figure 4.42. *Plan of Area 20 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

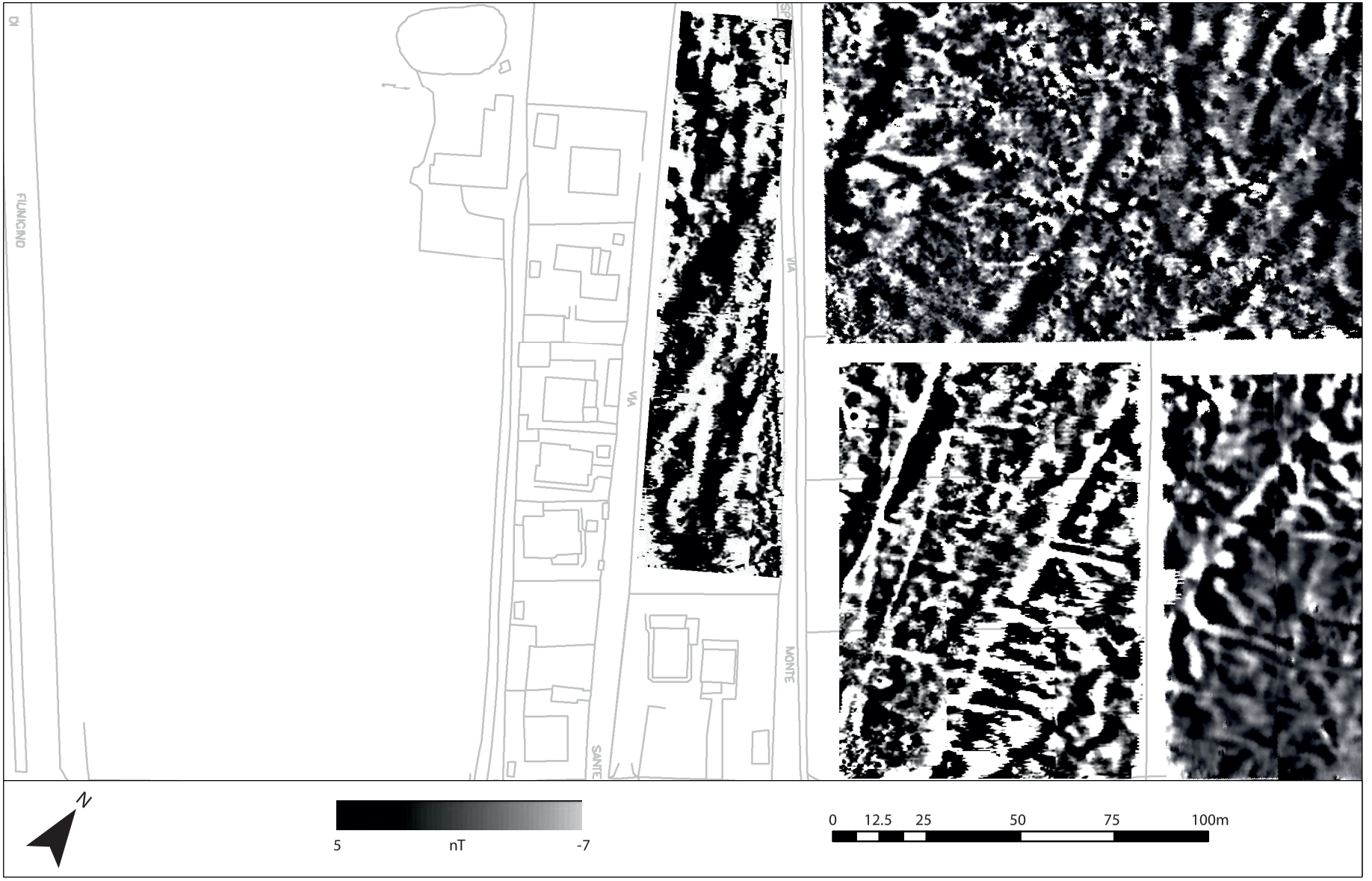


Figure 4.43. *Plan of Area 21 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

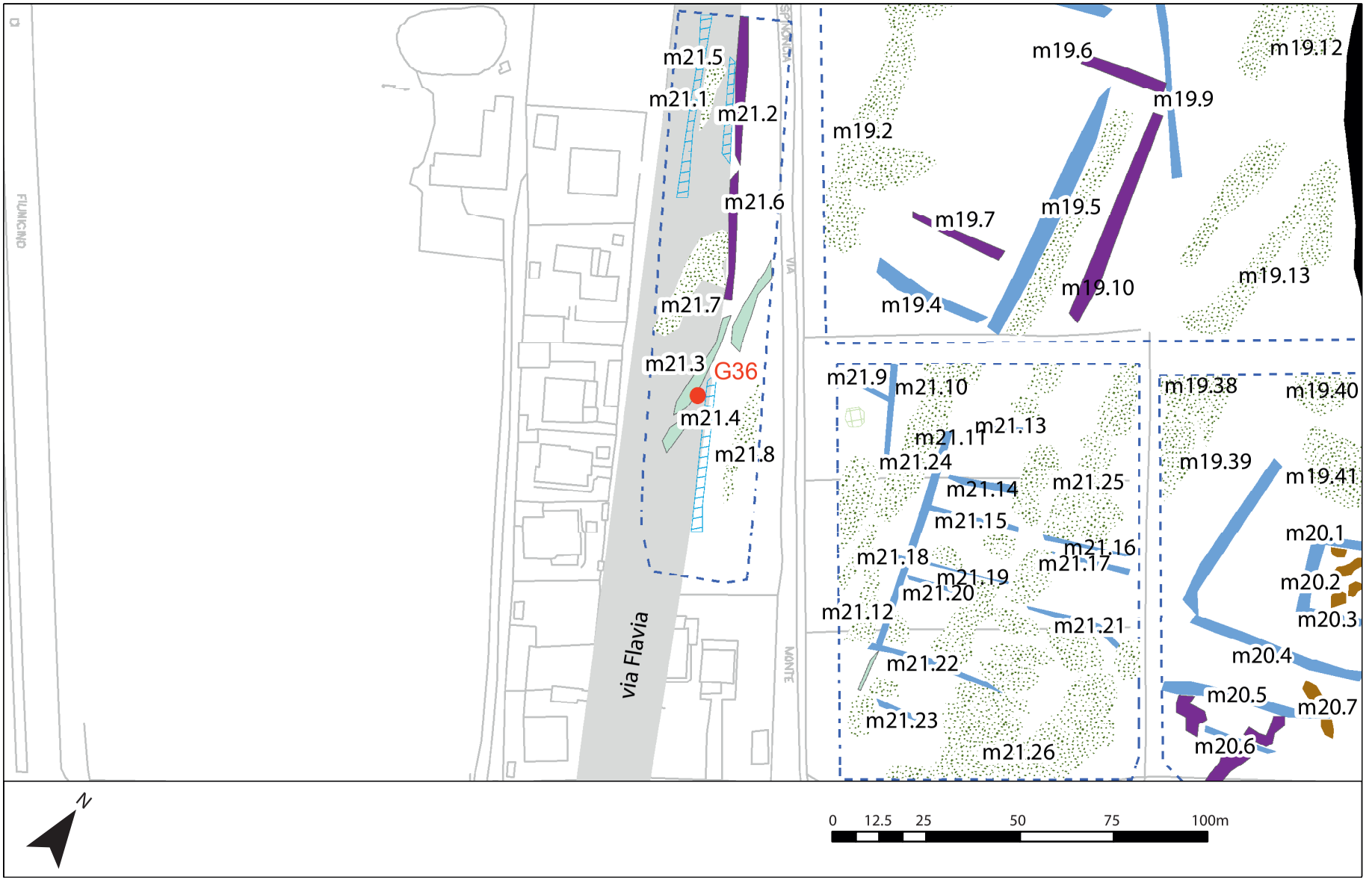


Figure 4.44. *Plan of Area 21 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

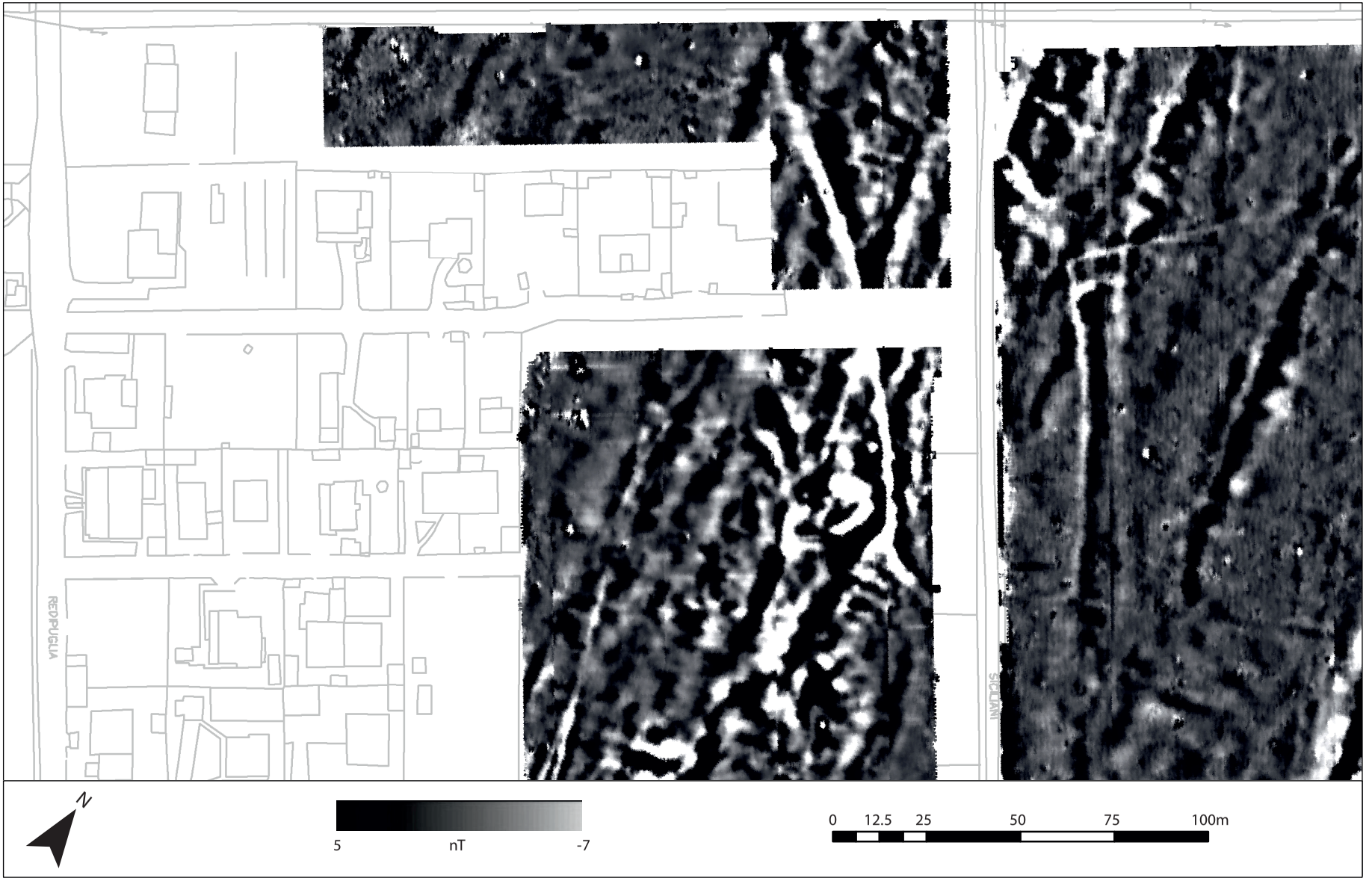


Figure 4.45. *Plan of Area 22 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

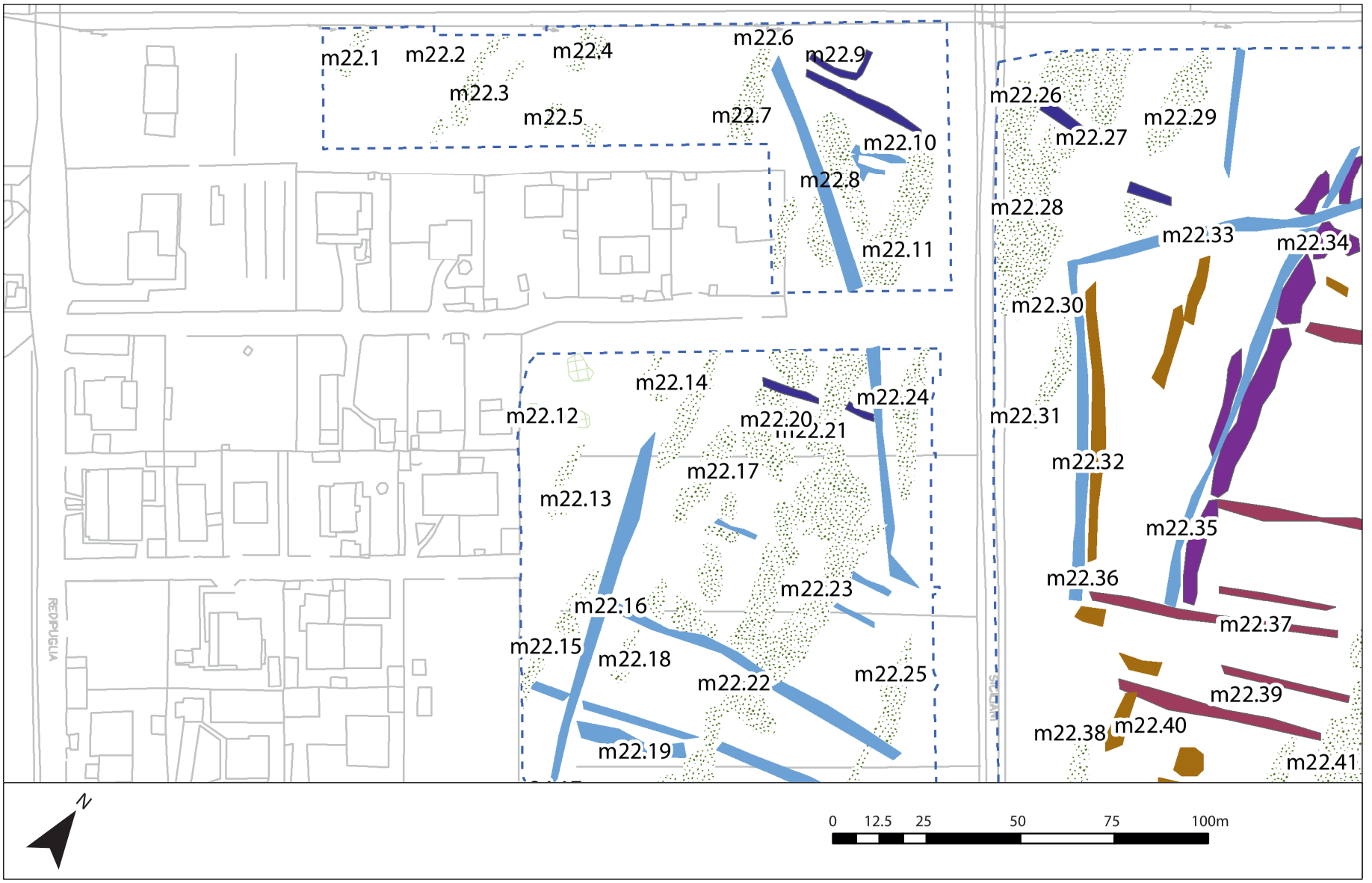


Figure 4.46. *Plan of Area 22 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

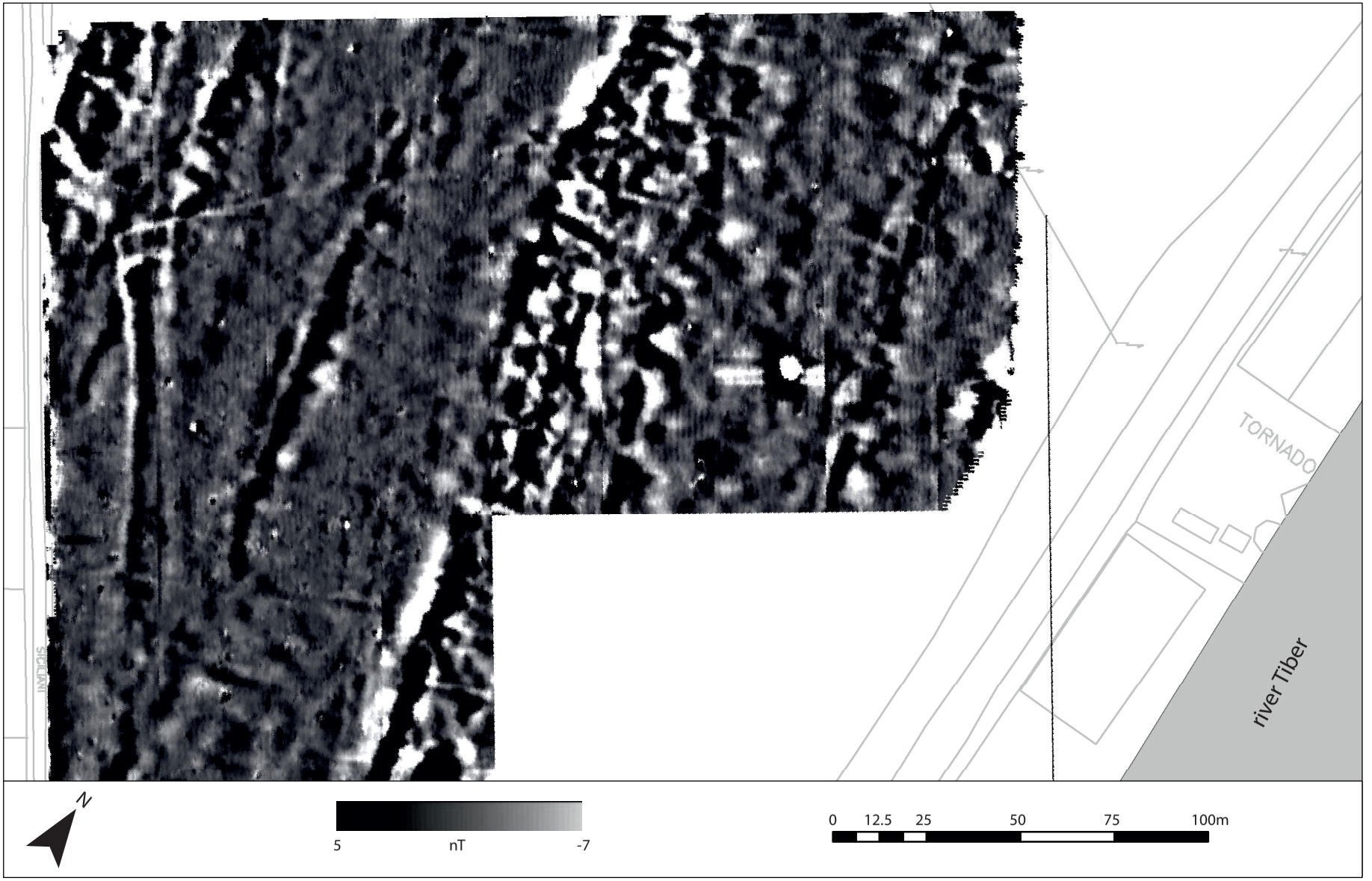


Figure 4.47. *Plan of Area 23 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

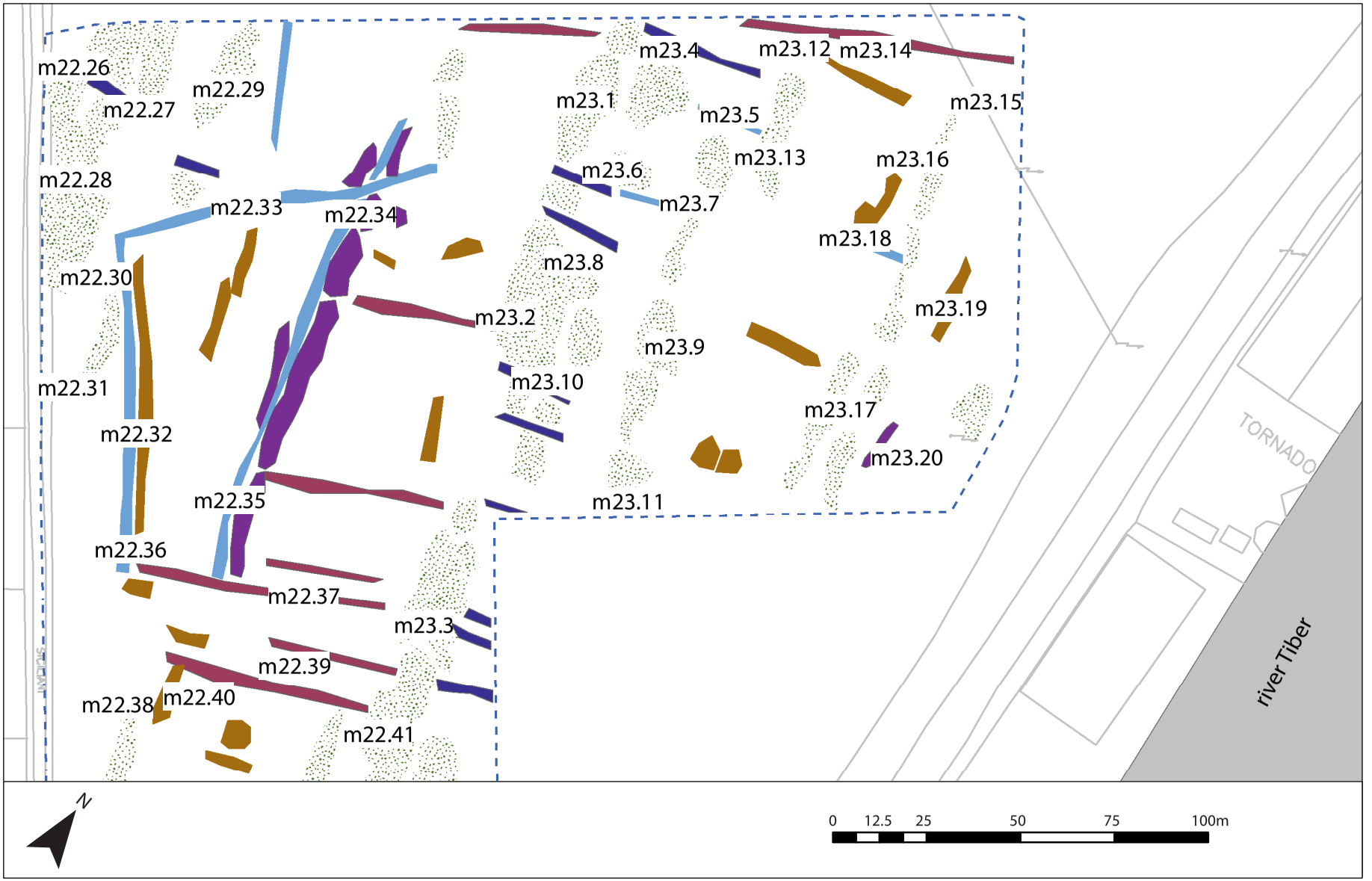


Figure 4.48. *Plan of Area 23 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

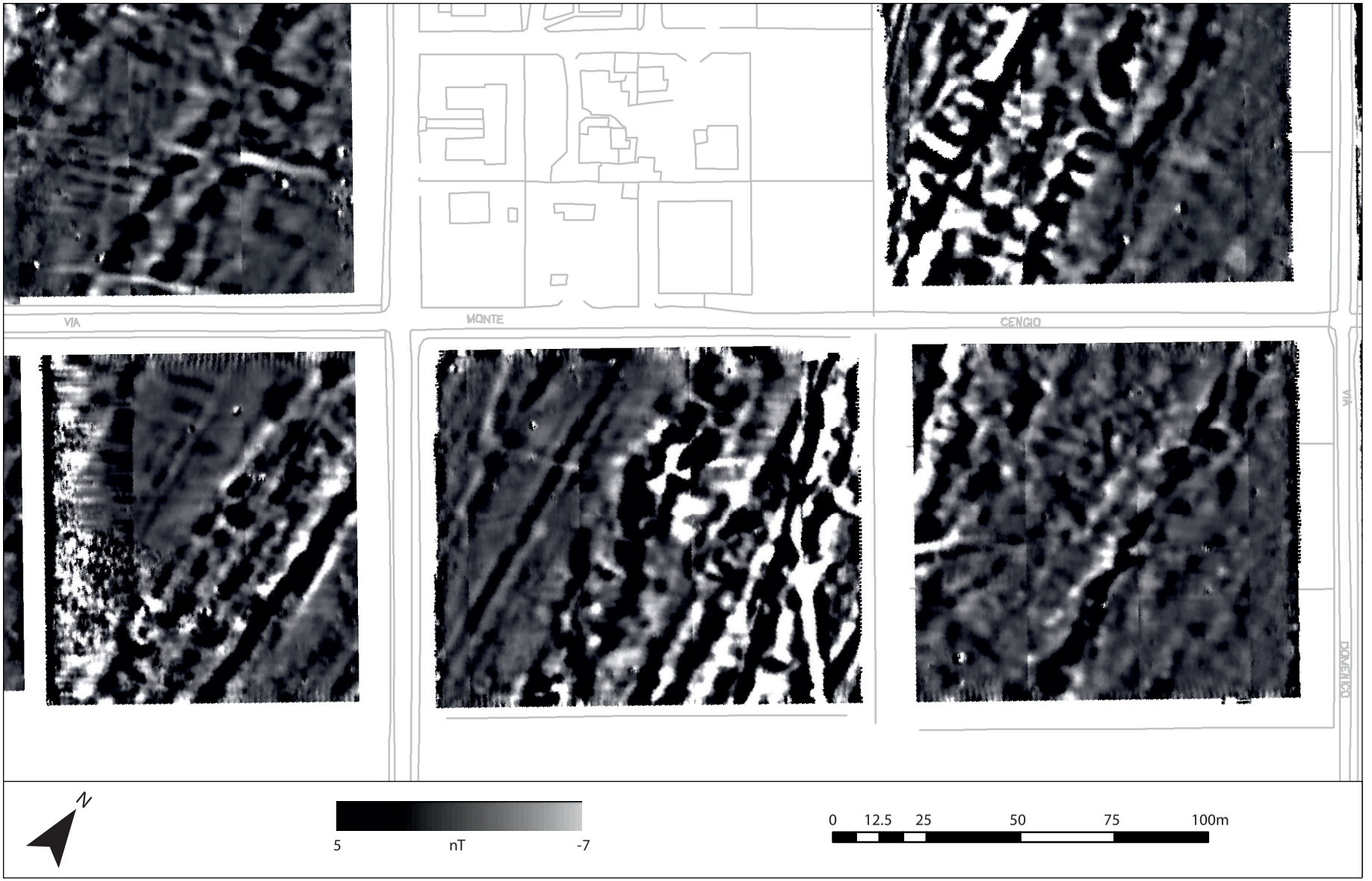


Figure 4.49. *Plan of Area 24 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

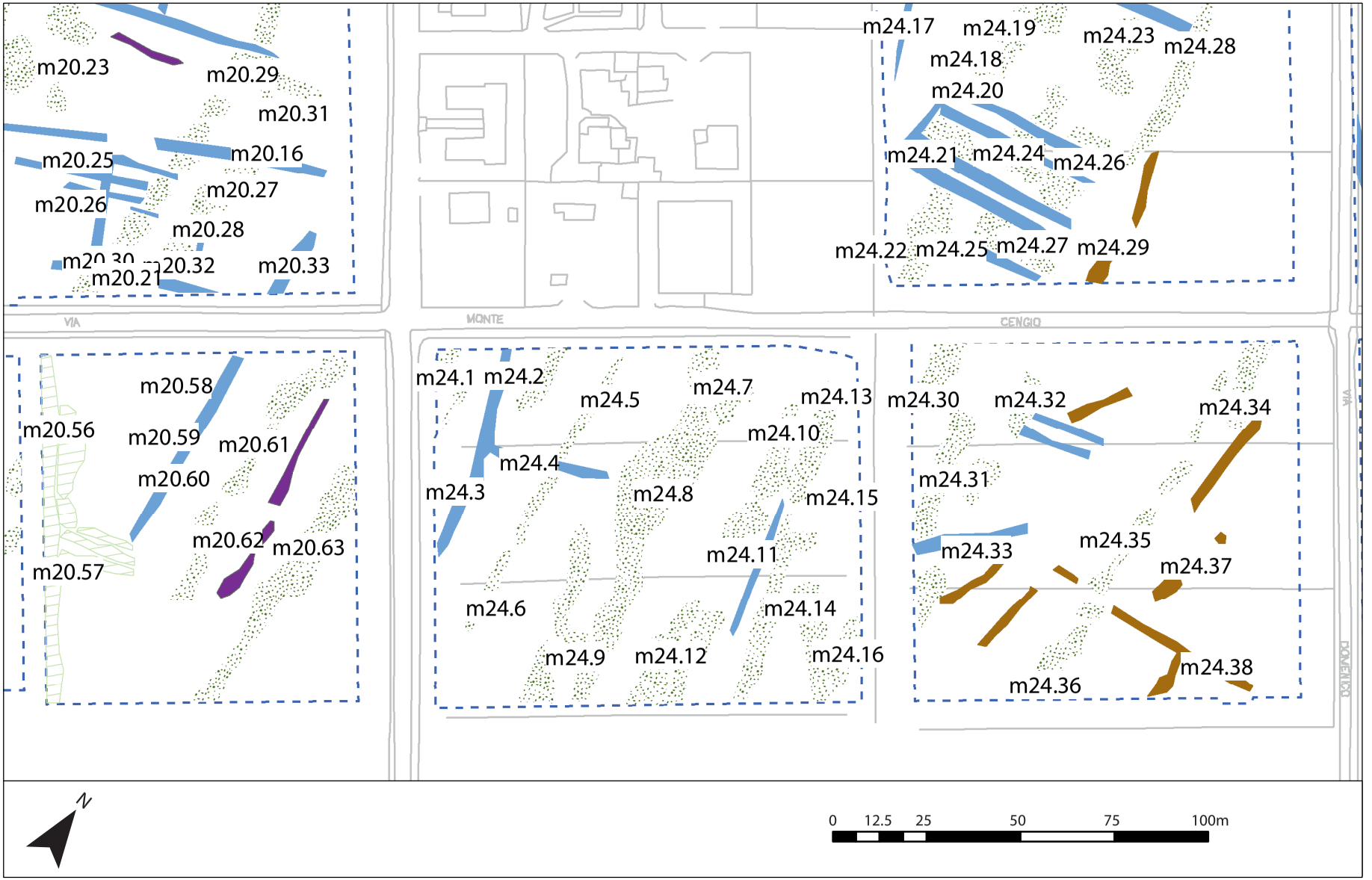


Figure 4.50. *Plan of Area 24 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

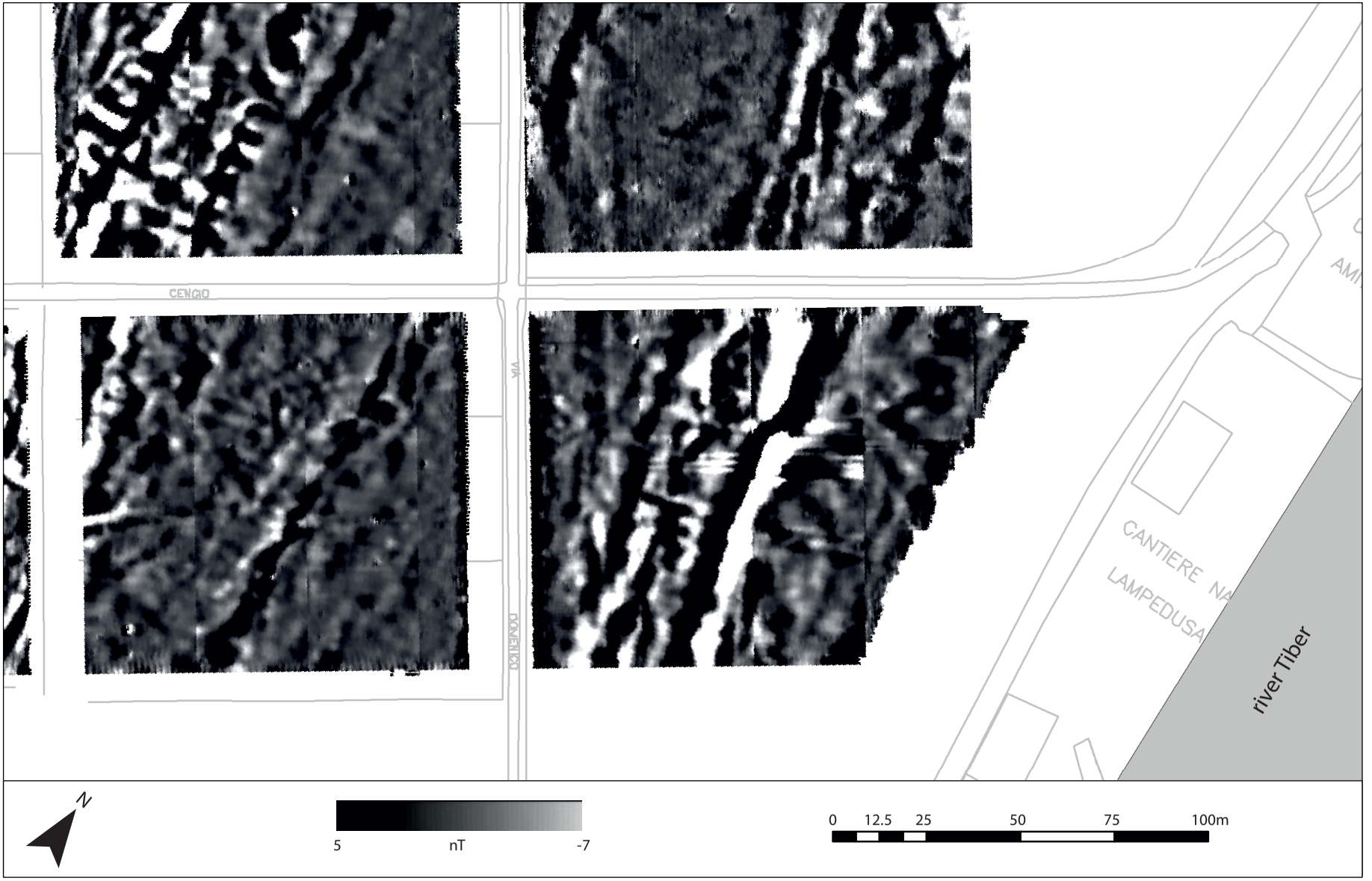


Figure 4.51. *Plan of Area 25 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

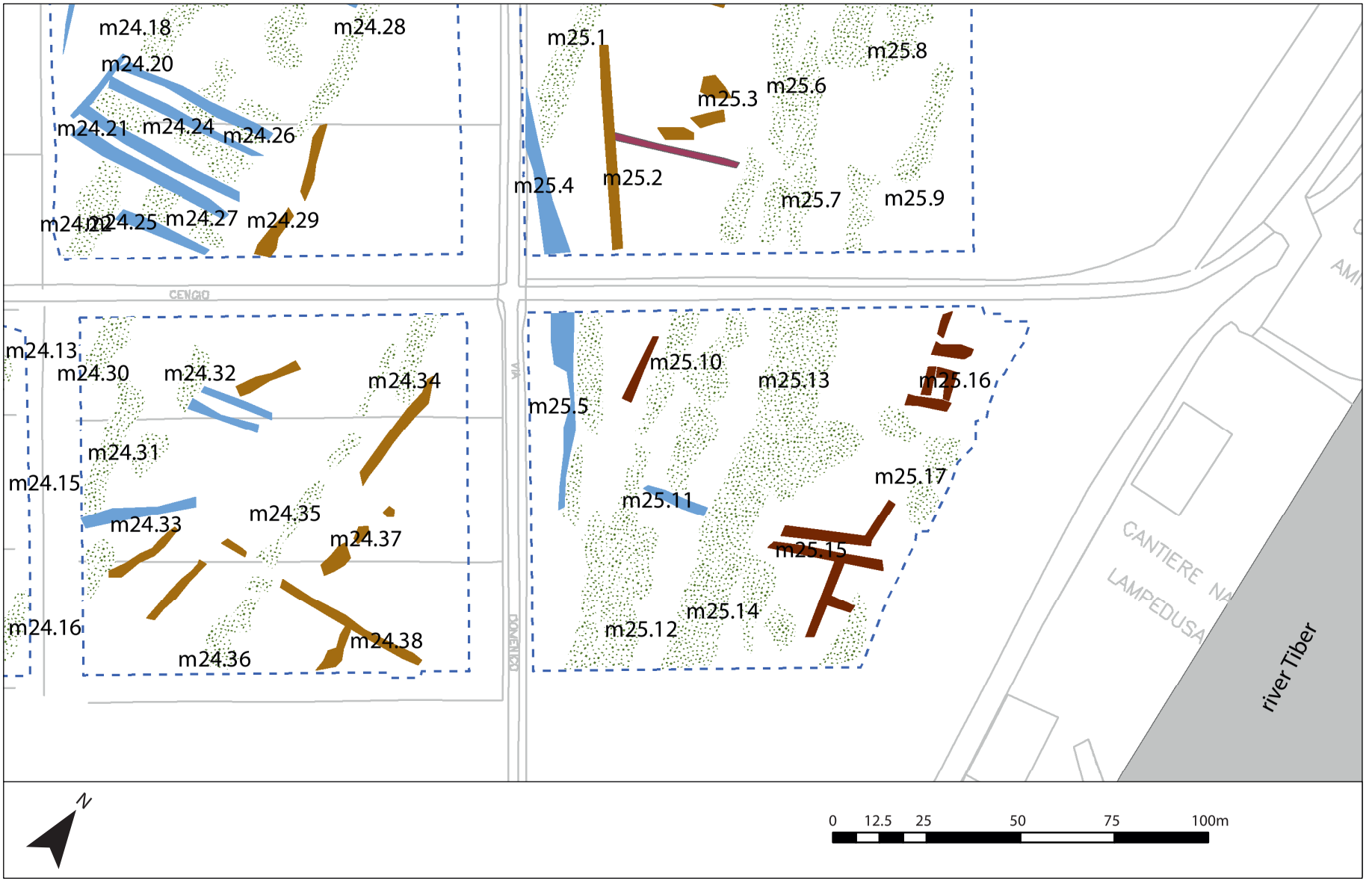


Figure 4.52. *Plan of Area 25 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

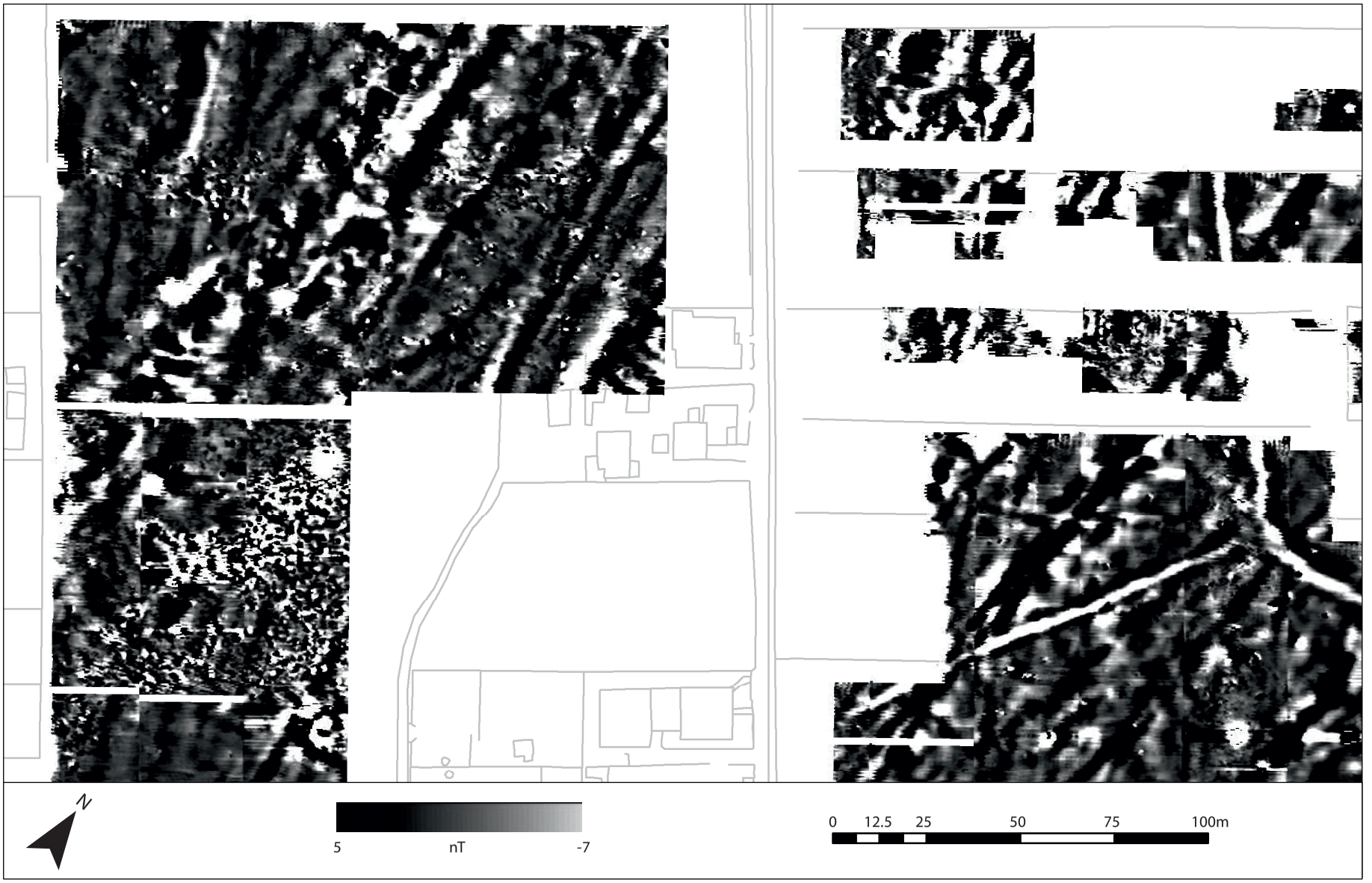


Figure 4.53. *Plan of Area 26 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

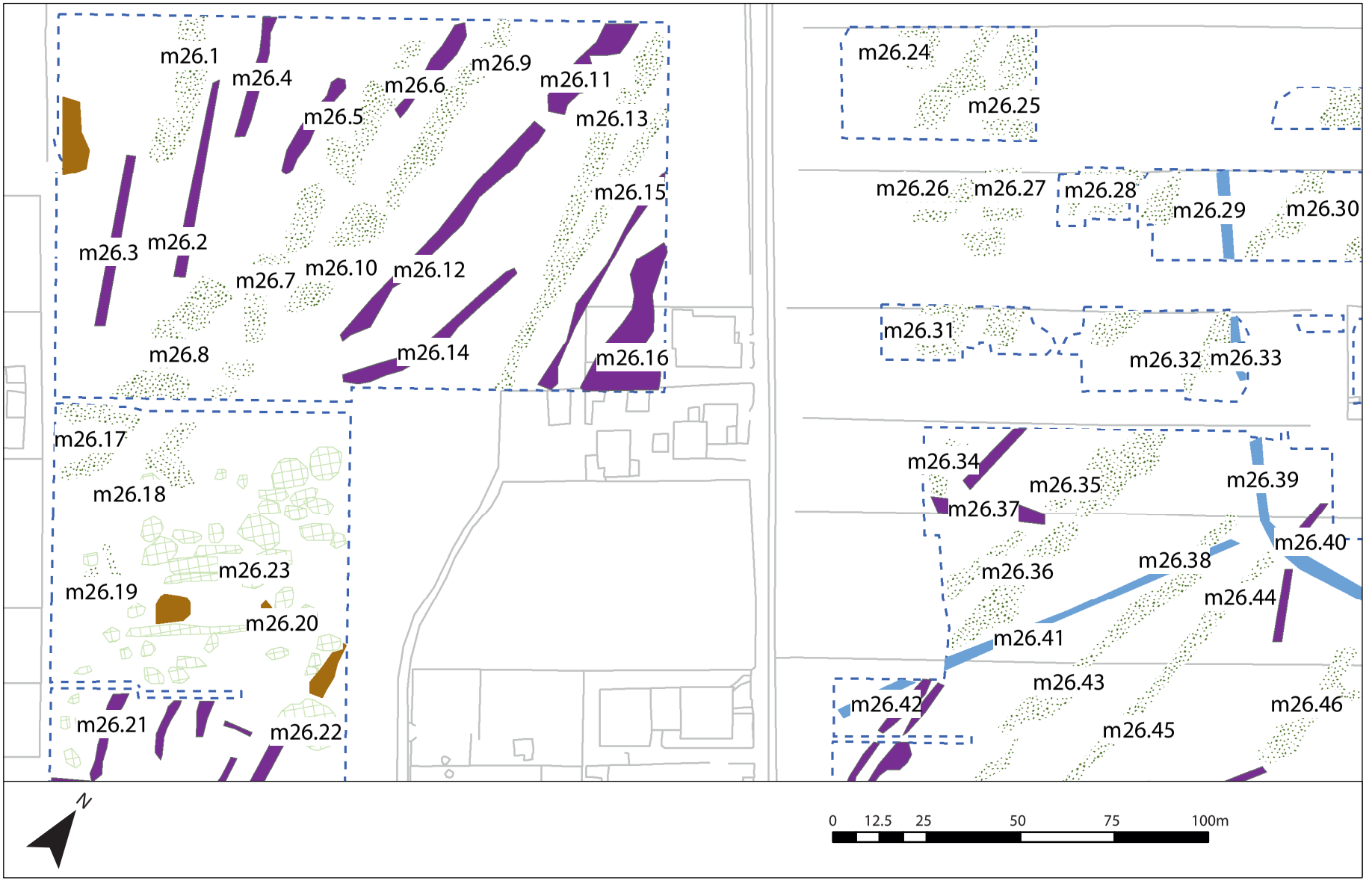


Figure 4.54. *Plan of Area 26 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

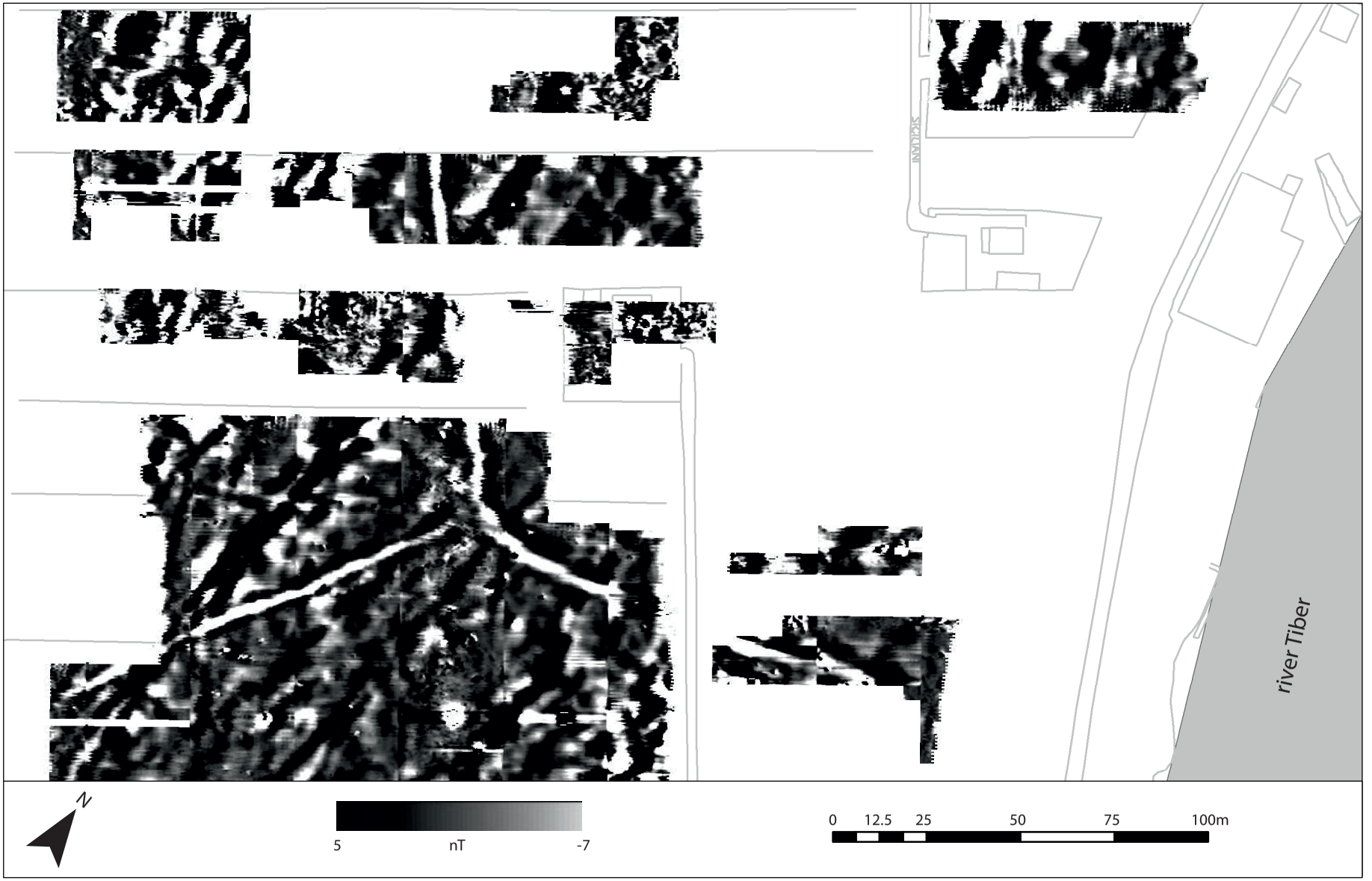


Figure 4.55. *Plan of Area 27 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

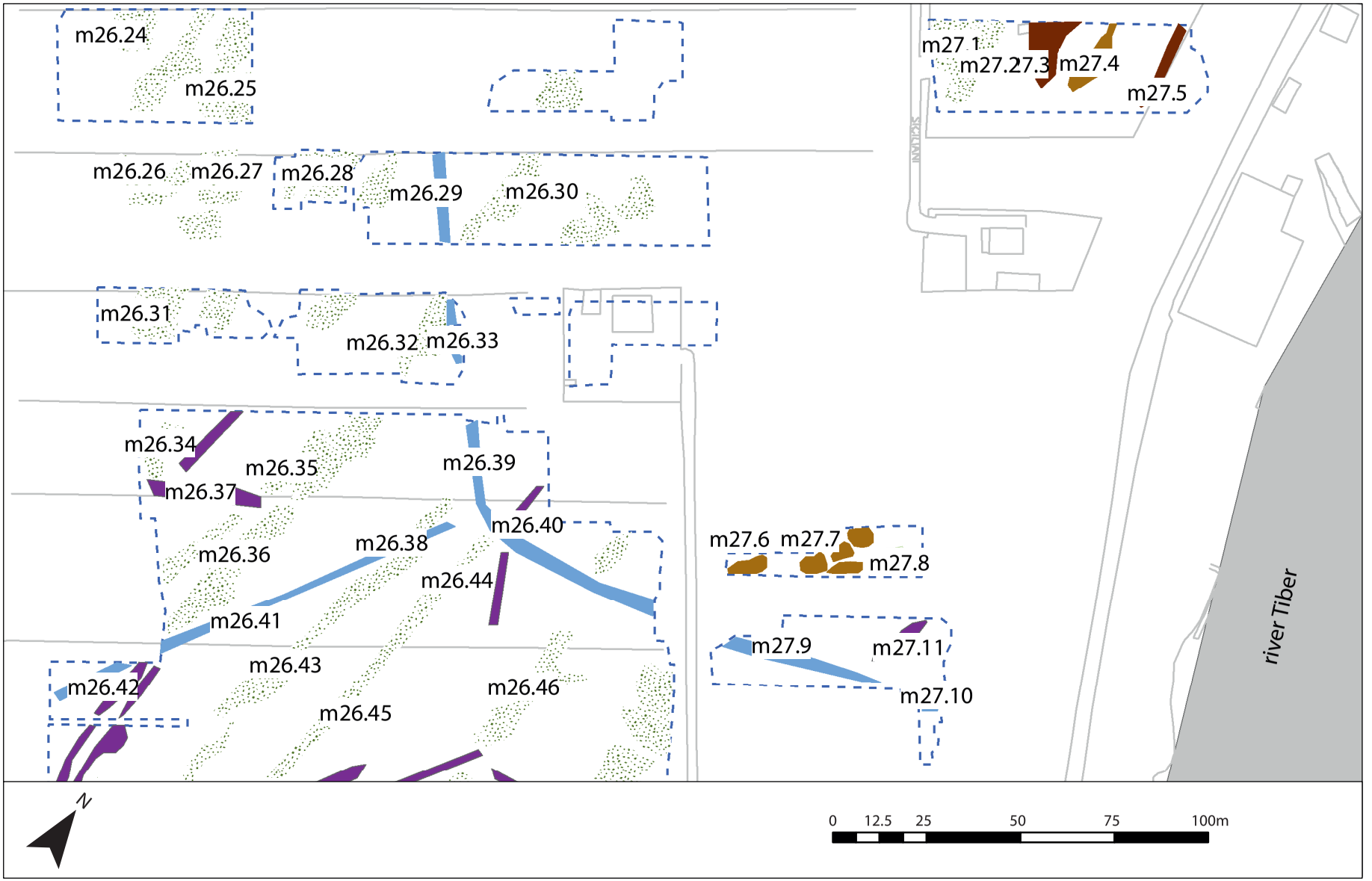


Figure 4.56. *Plan of Area 27 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

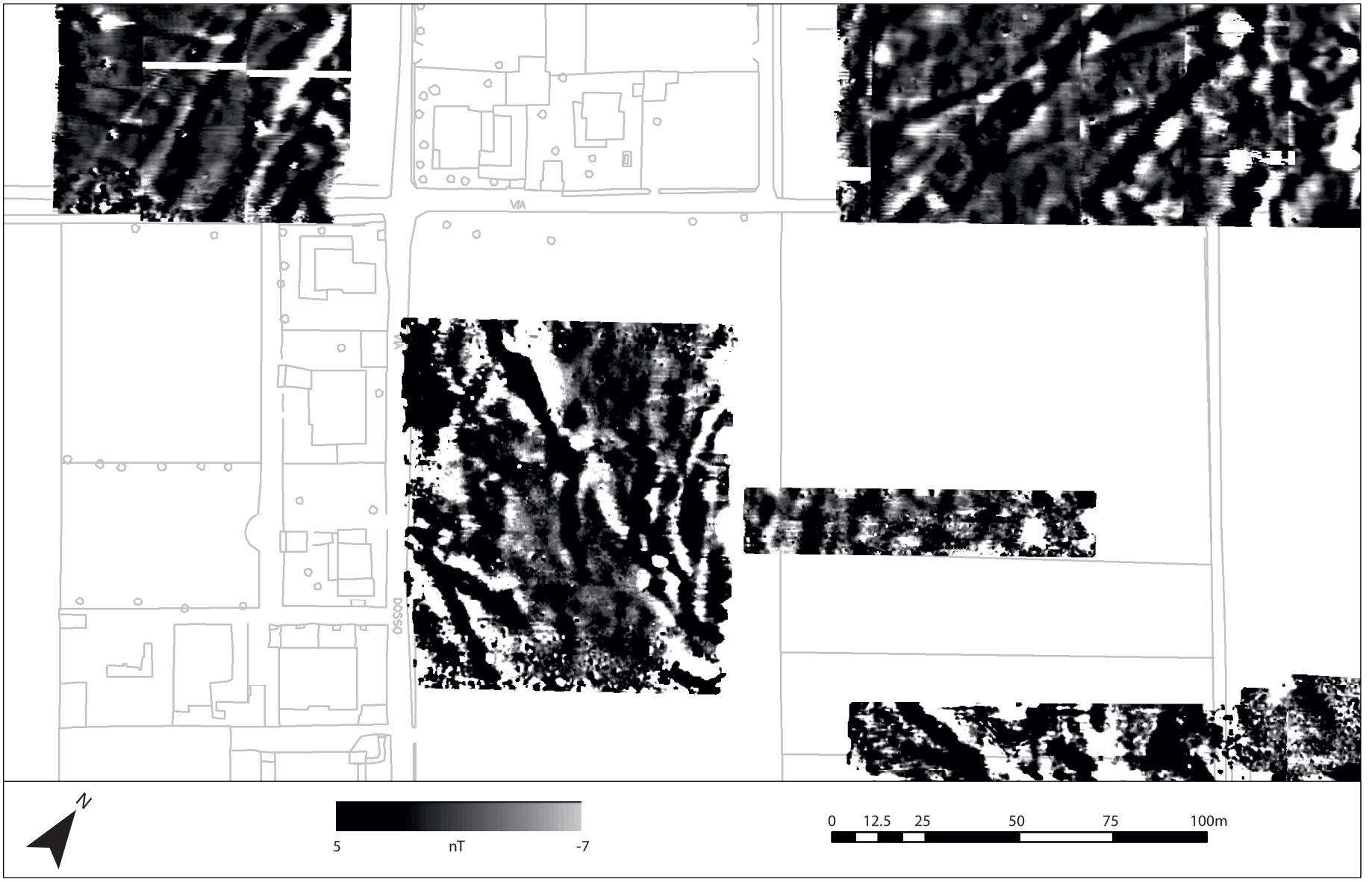


Figure 4.57. *Plan of Area 28 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

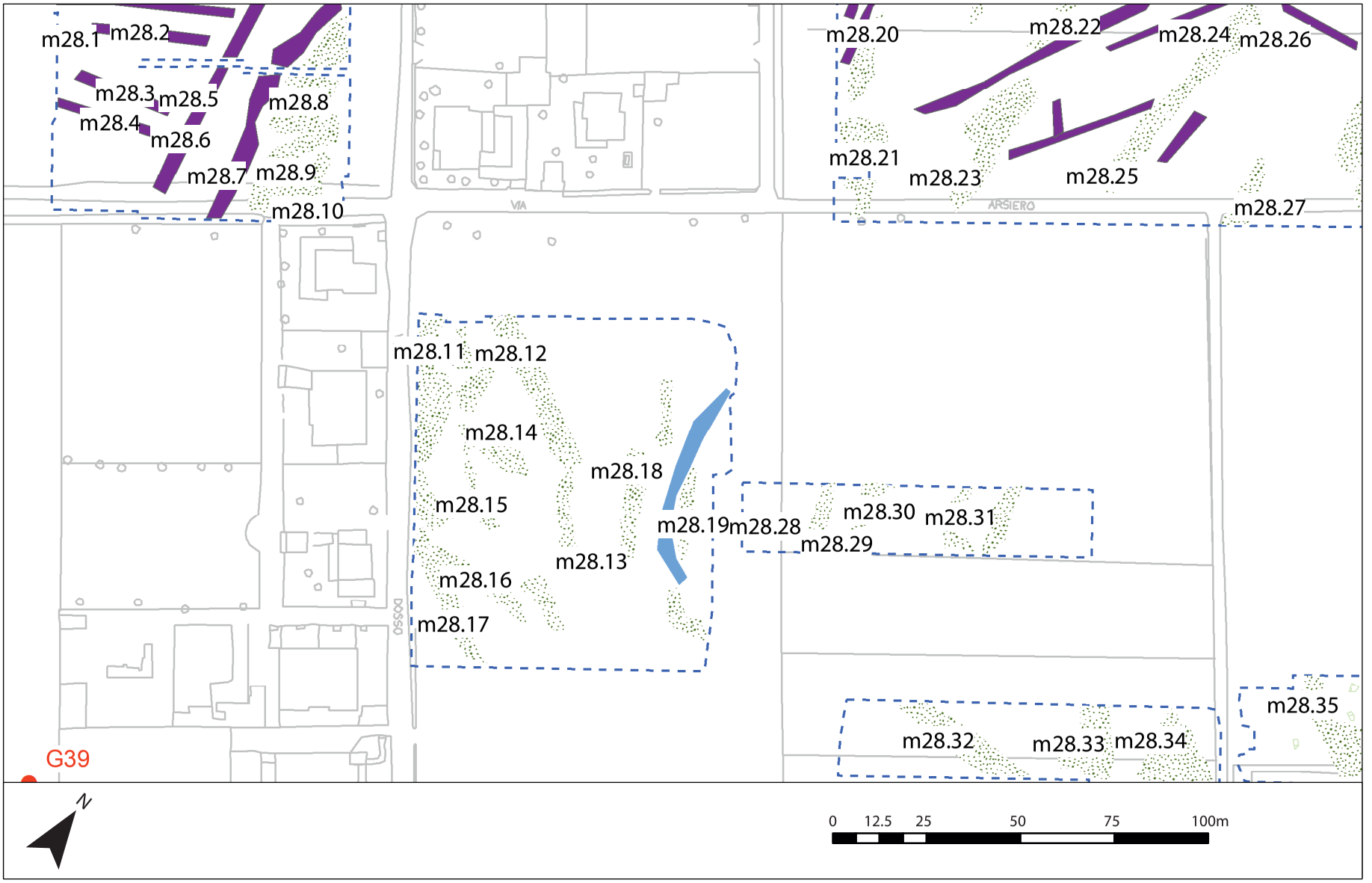


Figure 4.58. *Plan of Area 28 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

m28.11, **m28.13**, and **m28.18**]. Different alignments are represented instead. In the northeast of the area, they tend mostly to be oriented towards the southwest [**m28.20**–**m28.23**, **m28.25**–**m28.27**], whilst to the south several run in a south-easterly direction [**m28.12** and **m28.17**] or from east to west [**m28.16**, **m28.32, m28.33** and **m28.35**]. Elsewhere, the smaller anomalies do not exhibit any predominant directional trend [**m28.1**, **m28.8**–**m28.10**, **m28.14**, **m28.15** and **m28.34**].

At the northwest corner of the area, a series of positive linear anomalies [**m28.2**, **m28.3** and **m28.4**] marks the line of walls running from west to east, and probably define an enclosure on alignment with the system of land division (pp. 151–55). They are part of the same structure as [**m26.22**] (see above) and may relate to the Portus to Ostia Canal (pp. 155–57) that lies only a short distance to the west. Further to the east are two positive linear anomalies [**m28.22** and **m28.24**], which run from northeast to southwest, and probably indicate the presence of walls. Several linear anomalies elsewhere [**m28.19**, **m28.28**–**m28.31**] may possibly indicate the existence of ditches, although they are too fragmentary to be certain.

Area 29 (Figs 4.59 and 4.60)
Area 29 lies between Area 28 (with which it overlaps) and the river Tiber. Two dipolar bands [**m29.1** and **m29.2**] mark natural deposits to the north, with similar west–east bands to the south [**m29.4**] and a scatter of dipolar discrete anomalies [**m29.5** and **m29.6**] marking modern ferrous material. The only possible archaeological features are indicated a group of discrete positive anomalies [**m29.3**] behind the Tiber embankment.

Area 30 (Figs 4.61 and 4.62)
Area 30 lies beside the Tiber and is situated a little south of Areas 28 and 29, and to the north of Area 31. Broad bands of dipolar readings associated with natural alluvial deposits run in an arc across the area, indicating a difference in the geomorphology when compared with areas further to the north. They seem to mark a channel that was defined to the north by anomalies [**m30.6**, **m30.7**, **m30.27**, **m30.28** and **m30.29**], and to the south by anomalies [**m30.14**, **m30.15**, **m30.24** and **m30.32**]. Two bands of deposits [**m30.10**, **m30.11**, **m30.22**, and **m30.23**; **m30.12** and **m30.13**] lie within the channel between these, while other positive and dipolar bands of measurements [**m30.30** and **m30.31**] mark other features within it. Dipolar bands of readings to the south [**m30.25** and **m30.26**] indicate further natural deposits to the south.

Several definite archaeological features are superimposed upon these geological features. In the north-west corner of the area two parallel positive linear anomalies [**m30.1** and **m30.2**] mark parallel walls or rubble-filled ditches which extend for a distance of *c.* 35m. A comparable arrangement of anomalies to the south [**m30.3** and **m30.4**] indicates the presence of similar walls that were arranged perpendicularly to these. A rectilinear structure *c.* 20m by 14m whose position was marked by positive anomalies [**m30.5**] lay to the north-east of these. Further east and parallel to this were a series of positive linear striations [**m30.8** and **m30.9**] that indicates the presence of ditches. Further east was a series of broad linear positive anomalies [**m30.16**–**m30.18**], perhaps to be identified as walls, which run from north to south and west to east. Two parallel linear anomalies [**m30.20** and **m30.21**] nearby suggest the presence of further ditches cutting across the area for a distance of *c.* 115m. A pair of dipolar linear anomalies [**m30.19** and **m30.33**] mark modern fencelines, while the area to the east shows evidence for scatters of modern ferrous material [**m30.34** and **m30.35**].

Area 31 (Figs 4.63 and 4.64)
Area 31 is located to the south of Area 30 (with which it overlaps) and to the north of Area 32, with the river Tiber lying to its east. In contrast to the areas lying further north, there is no evidence for major geomorphological features crossing this area, and the background readings are relatively quiet. A long linear dipolar anomaly [**m31.15**] indicates the course of a modern pipeline, with a further dipolar discrete anomaly lying immediately to the west [**m31.16**], while other dipolar anomalies [**m31.12** and **m31.13**] mark the presence of modern ferrous material. A discrete positive anomaly [**m31.6**], measuring 12m across, indicates the presence of a possible dump of building material.

In the southern part of the area, a straight linear dipolar anomaly marks the line of a substantial wall 4-5m wide [**m31.1**–**m31.3**] running eastnortheast–westsouthwest and which is interpreted as part of a defensive wall circuit (pp. 163–65). To the south of this are two further walls, one of which [**m31.5**] runs parallel to it, and another [**m31.4**] which is perpendicular to them both. To the north of these, there is a series of features on the same alignment that occupies a block of land that extends across the centre of the area. Closest to the defensive wall was a substantial rectilinear positive anomaly [**m31.14**] some 74m across which may suggest the presence of a walled enclosure. Parallel positive linear features running across the area further north [**m31.7** and **m31.10**] indicate the possible existence of walls running from north to south. A pattern of faint linear positive and discrete anomalies [**m31.8**, **m31.9** and **m31.11**] mark the site of possible structures closer to the line of the Tiber, whilst there are also traces of faint, broader positive anomalies [**m31.17**] to the south,

which suggest that deeper deposits may mask other buried features in this area. A series of linear negative anomalies [**m31.18**–**m31.24**] cut across Area 31, with some extending as far as 200m in length. These indicate ditches of the modern *bonifica*.

Area 32 (Figs 4.65 and 4.66)
Area 32 is located at the southeast corner of the Isola Sacra, beside the bend in the course of the river Tiber, with Ostia Antica lying opposite on the bank of the river further to the south. It lies to the south of Area 31 and to the east of Area 33. The area is occupied by a very extensive complex of archaeological features. In the north, the defensive wall noted in Area 31 continues [**m32.1** and **m32.2**] for *c.* 230m eastwards up to the limit of our survey area. On its northern face, a pair of massive rectilinear anomalies [**m32.3** and **m32.4**], each measuring *c.* 8m by 10m, represent external towers. To the south of this defensive wall and parallel to it, are positive linear anomalies that represent five walls [**m32.5**/**m32.6**, **m32.13**, **m32.14** and **m32.7**], one of which continues into Area 31 [**m31.5**]. A large but more irregular anomaly [**m32.15**] running from east to west indicates the presence of another wall. Several faint positive anomalies [**m32.16**] seem to indicate further walls or deposits of some kind. Perpendicular and adjoining the south side of the defensive wall, are three further walls [**m32.17**, **m32.18** and **m32.20**]; these are comparable to anomaly [**m31.4**] to the west and may define another series of substantial enclosures. A further less regular positive linear anomaly [**m32.19**] may indicate the boundary of another enclosure.

To the south of these enclosures a series of very large buildings face onto the Tiber to the south. Interpretation of some of these is constrained by the fragmentary coverage of the survey in this area. Two parallel positive linear anomalies [**m32.8** and **m32.9**] measuring 30m in length and running west to east, mark the north side of a building defined by a corridor or portico. Further south towards the river, a further set of two parallel linear anomalies [**m32.10** and **m32.11**] running from north to south mark walls that define the western side of a building with a similar kind of corridor, which may well form part of the same complex. A double line of linear anomalies [**m32.12**] immediately to the east of these reflects the existence of a range rooms measuring 7m by 5m and suggests that the building to which they belonged was a warehouse with a central courtyard to the east. These structures clearly belonging to same wing of the building were excavated a short distance to the south in 1968 (**G42**).

Further to the east what is probably the opposite wing of the building can be identified, although the layout is complex suggesting several phases of construction. A wall [**m32.38**], measuring 56m in length continues the line of [**m32.8**–**m32.9**] and defines the northern side of a series of rooms [**m32.39**] with a further range continuing south [**m32.40**]. The layout of further rooms to their south-west [**m32.41**, **m32.42** and **m32.43**] suggests the presence of a courtyard between them and the western range [**m32.10**–**m32.12**].

To the northeast is a further series of rooms which appears to form the corner of another courtyard warehouse. Its northern limit is formed by a wall [**m32.37**] which continues the lines of [**m32.36**] to the west. Its courtyard [**m32.22**] is flanked to the north by a portico [**m32.21**] which turns to the south and has a range of rooms lying to its east [**m32.23**]. There is also an outer portico facing to the east [**m32.24**], perhaps suggesting the presence of a further courtyard. The relationship of this to the warehouse lying to its southwest remains unclear.

There are walls belonging to other buildings lying to the southeast [**m32.25**, **m32.26** and **m32.27**], which indicate the presence of smaller buildings on a slightly different alignment, but whose layout is unclear. The walls of [**m32.25**] are on a different orientation from the other buildings in this area which might be explained by the presence of the Tiber frontage, but may also reflect a longer history of development in this area. A building of first century AD date with *opus reticulatum* walls was uncovered during excavations here in 1968 (**G43**), but it is difficult to relate this to the features recorded in the geophysical survey.

Further to the east is a very substantial structure measuring *c.* 70m by 65m. Along its western side are walls [**m32.28** and **m32.29**], to the east of which are a range of fairly well-defined rooms [**m32.32** and **m32.34**] that are comparable to those which define its northern side [**m32.30**, **m32.31** and **m32.33**]. These ranges enclose a very large space [**m32.35**] which contains rows of discrete positive anomalies that appear to be six lines of foundations for massive piers, up to *c.* 6m wide, arranged in a grid formation. The scale of these foundations suggests that they probably formed a substructure to support upper levels of the building. This structure relates to the stretches of walls and mosaic pavements that were found in 1959–60 and 1968 (**G44**, **G45** and **G46**). The walls at the southern and eastern edges of the survey are arranged on a slightly different alignment that is probably related to the pre-existing topography of the Tiber frontage.

Area 33 (Figs 4.67 and 4.68)
Area 33 is located to the west of Area 32 and opens southwards onto the Tiber. The survey results reveal a clear distinction between the eastern and western parts of the area. The complex of buildings identified

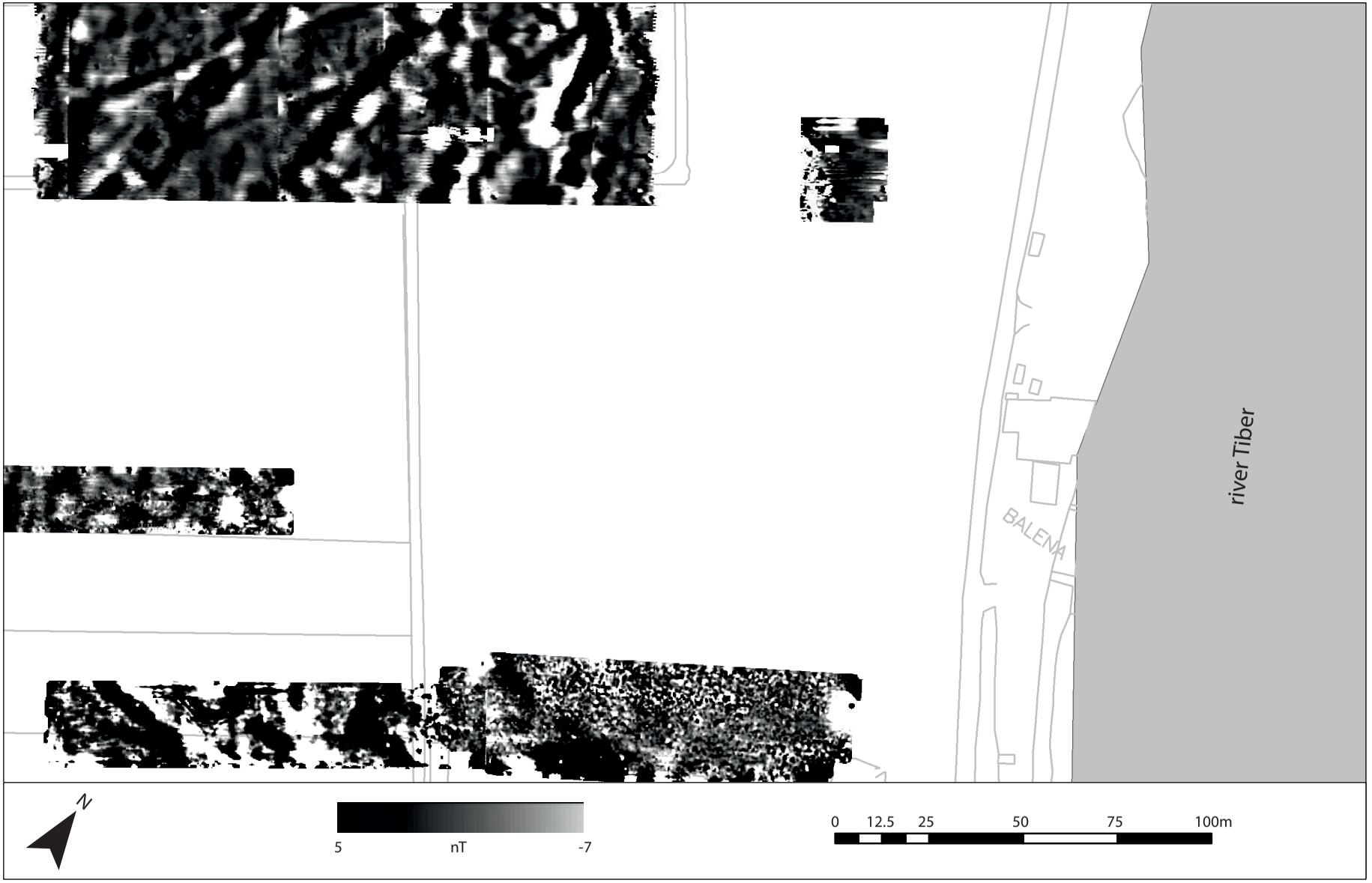


Figure 4.59. *Plan of Area 29 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

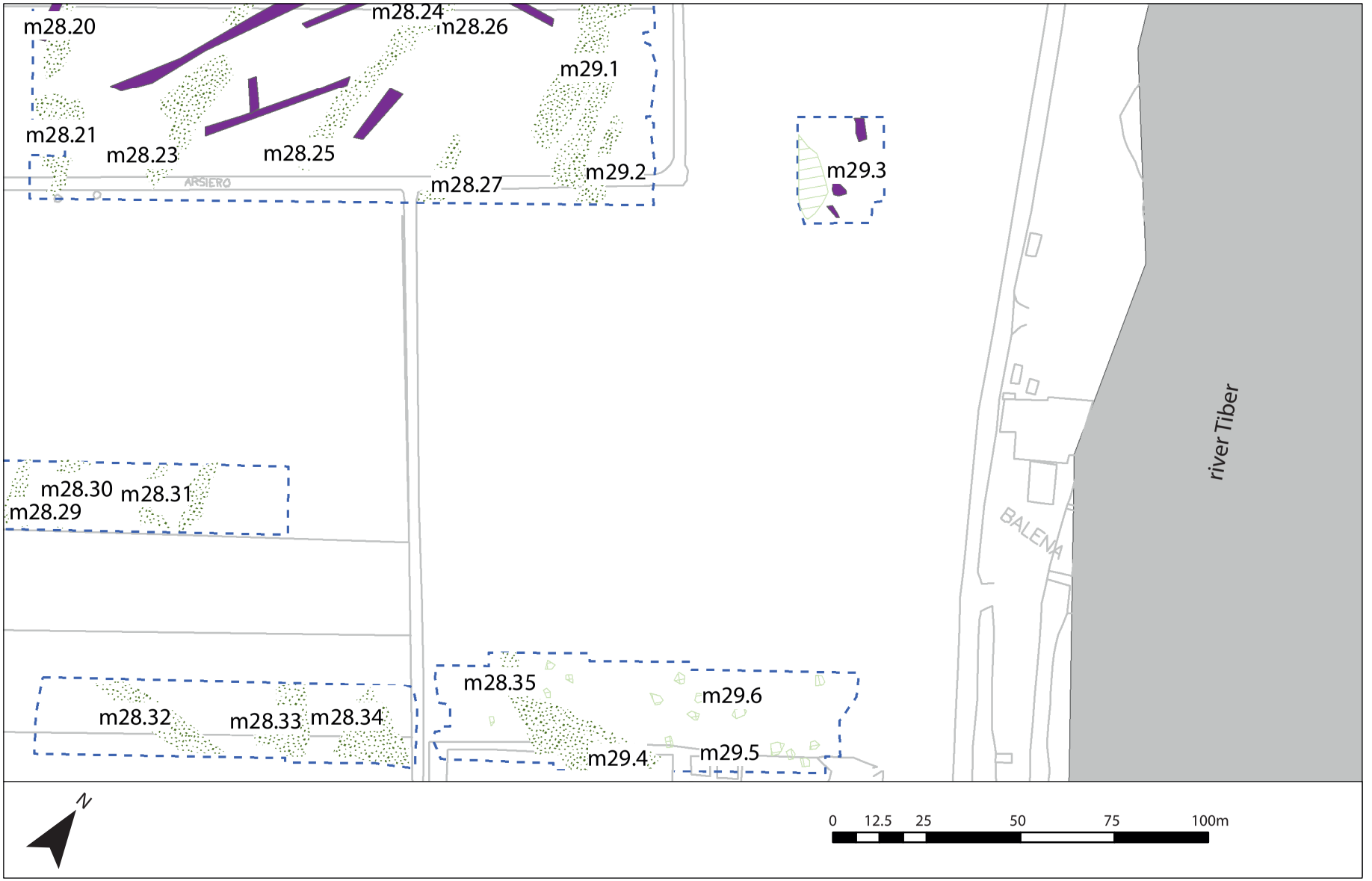


Figure 4.60. *Plan of Area 29 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

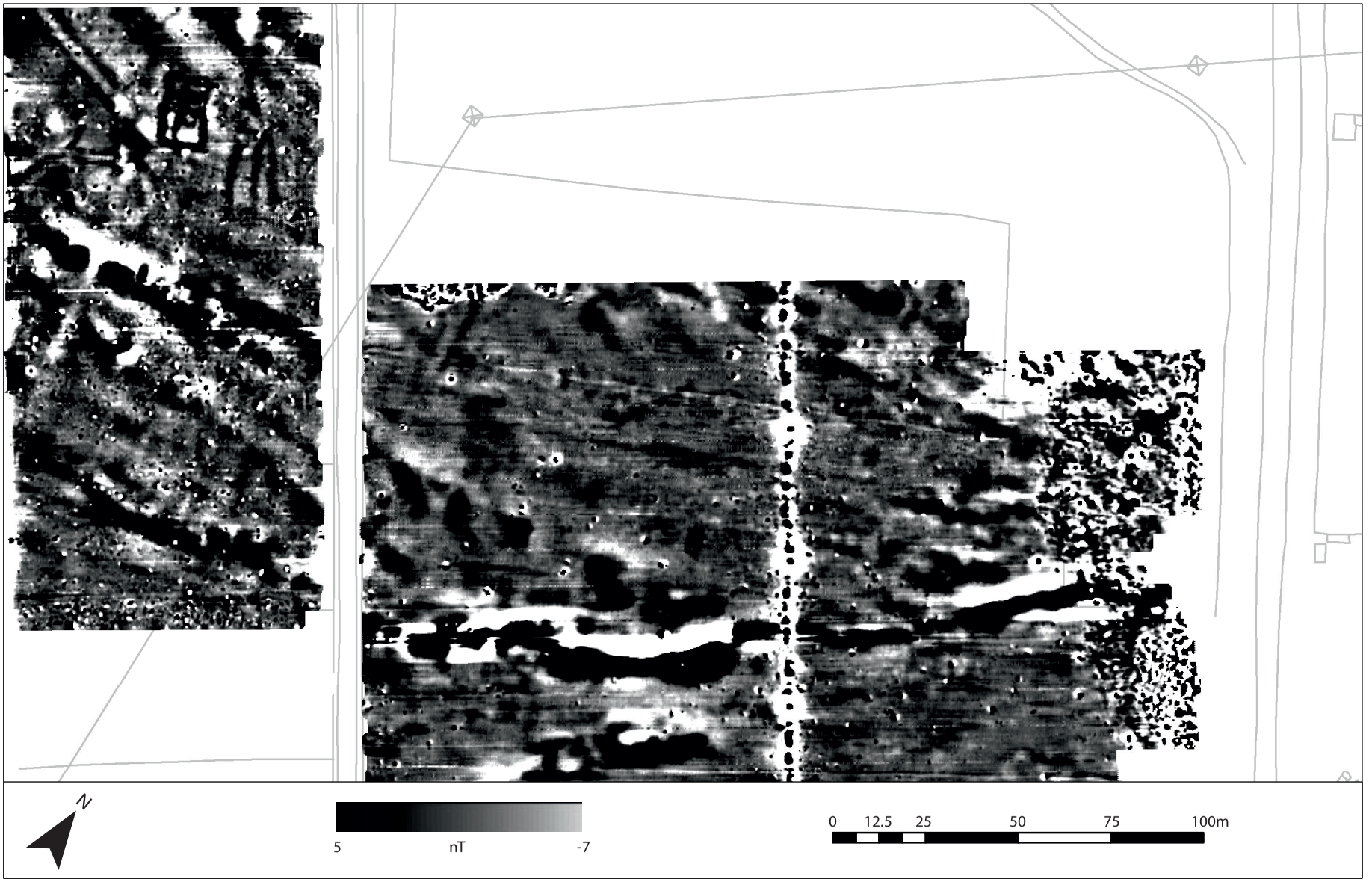


Figure 4.61. *Plan of Area 30 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

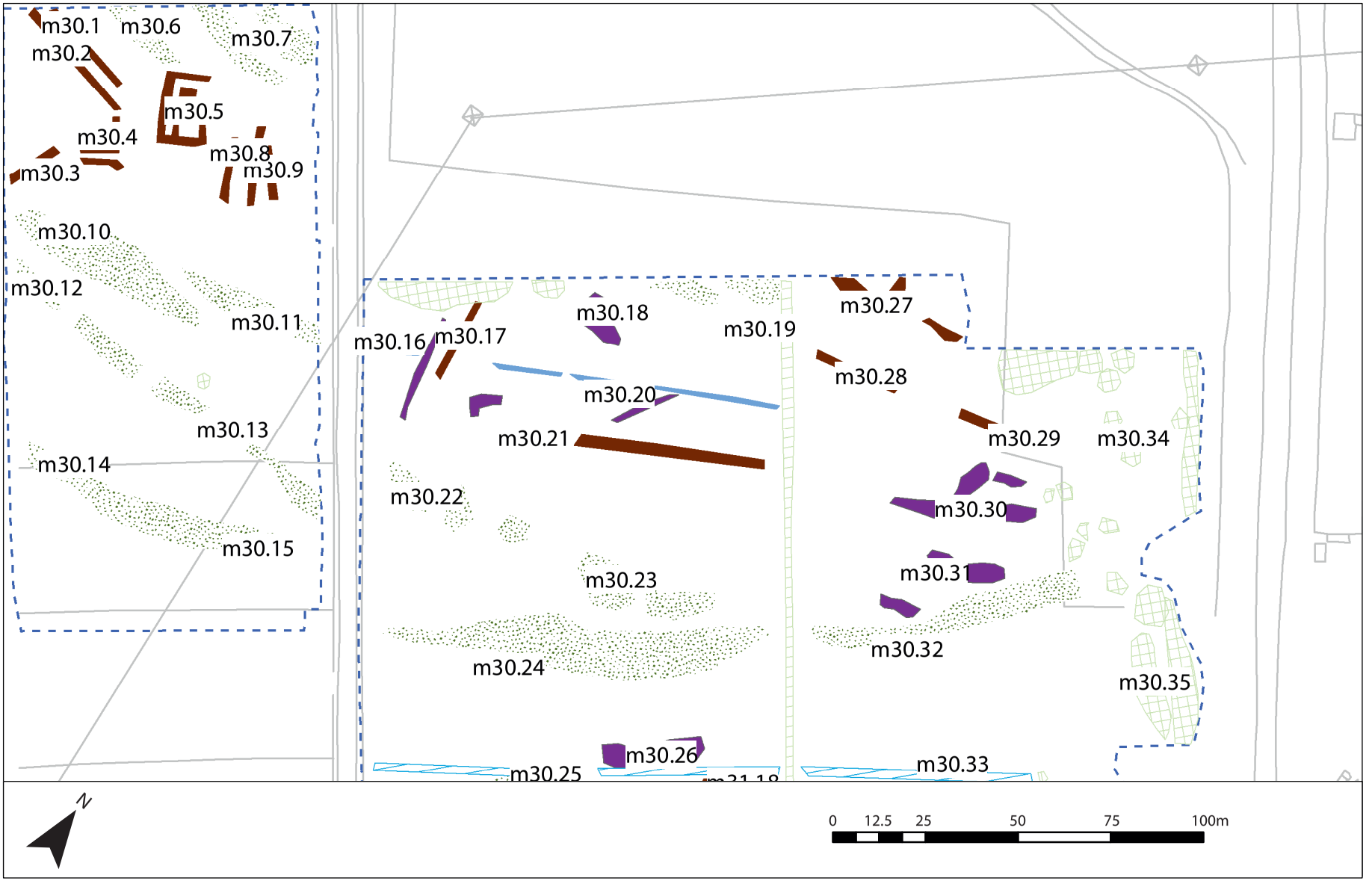


Figure 4.62. *Plan of Area 30 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

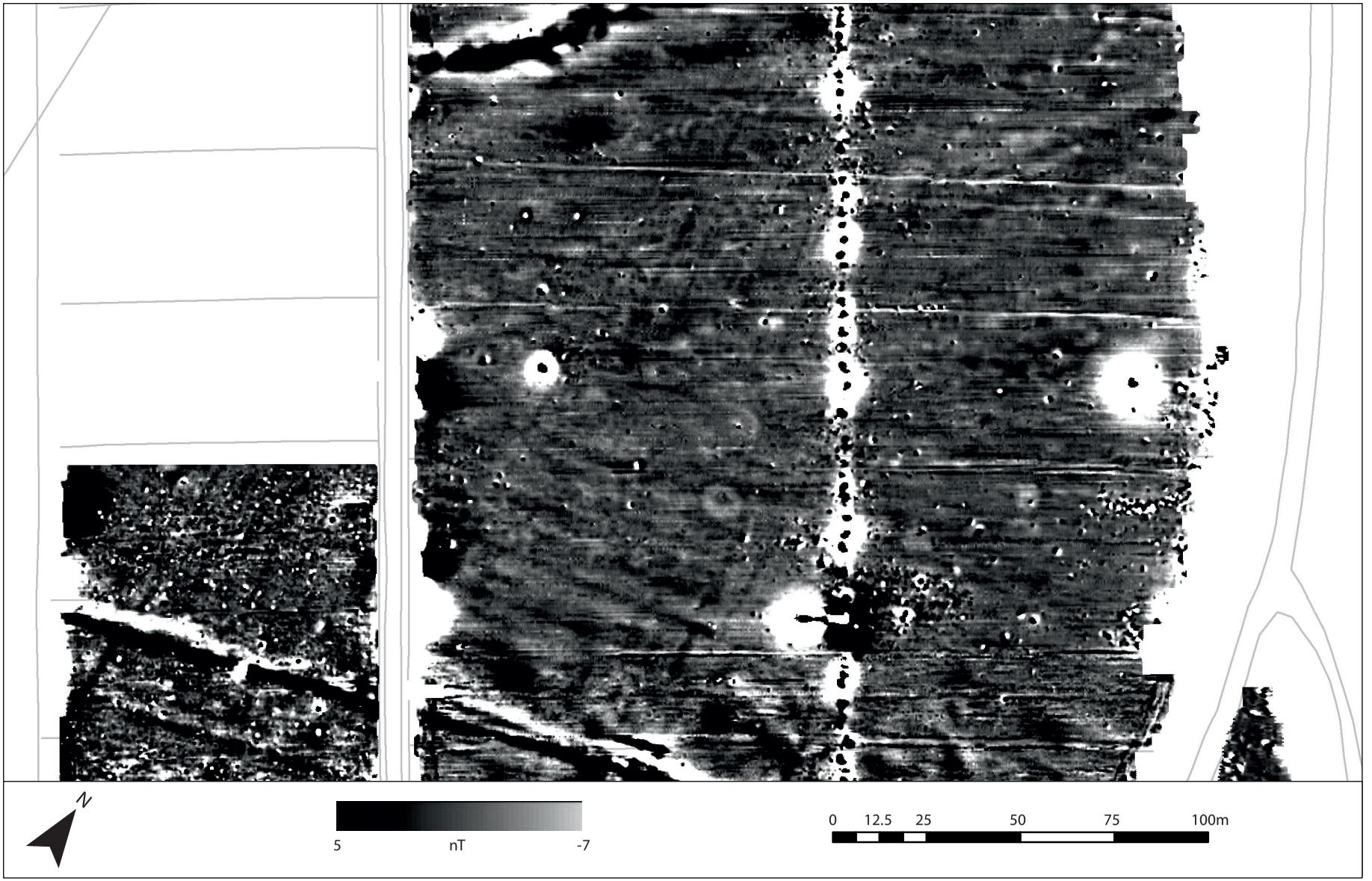


Figure 4.63. *Plan of Area 31 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

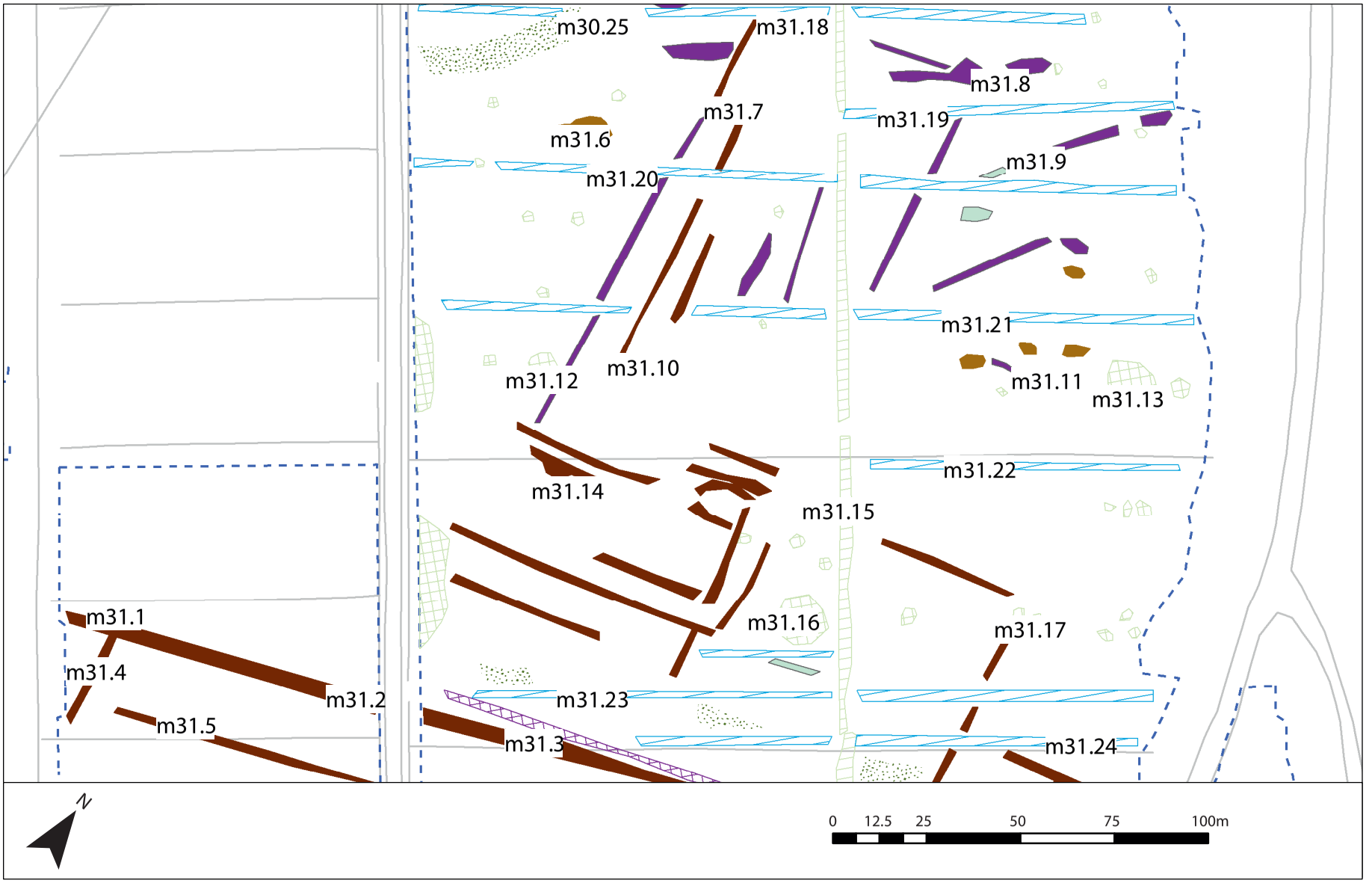


Figure 4.64. *Plan of Area 31 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

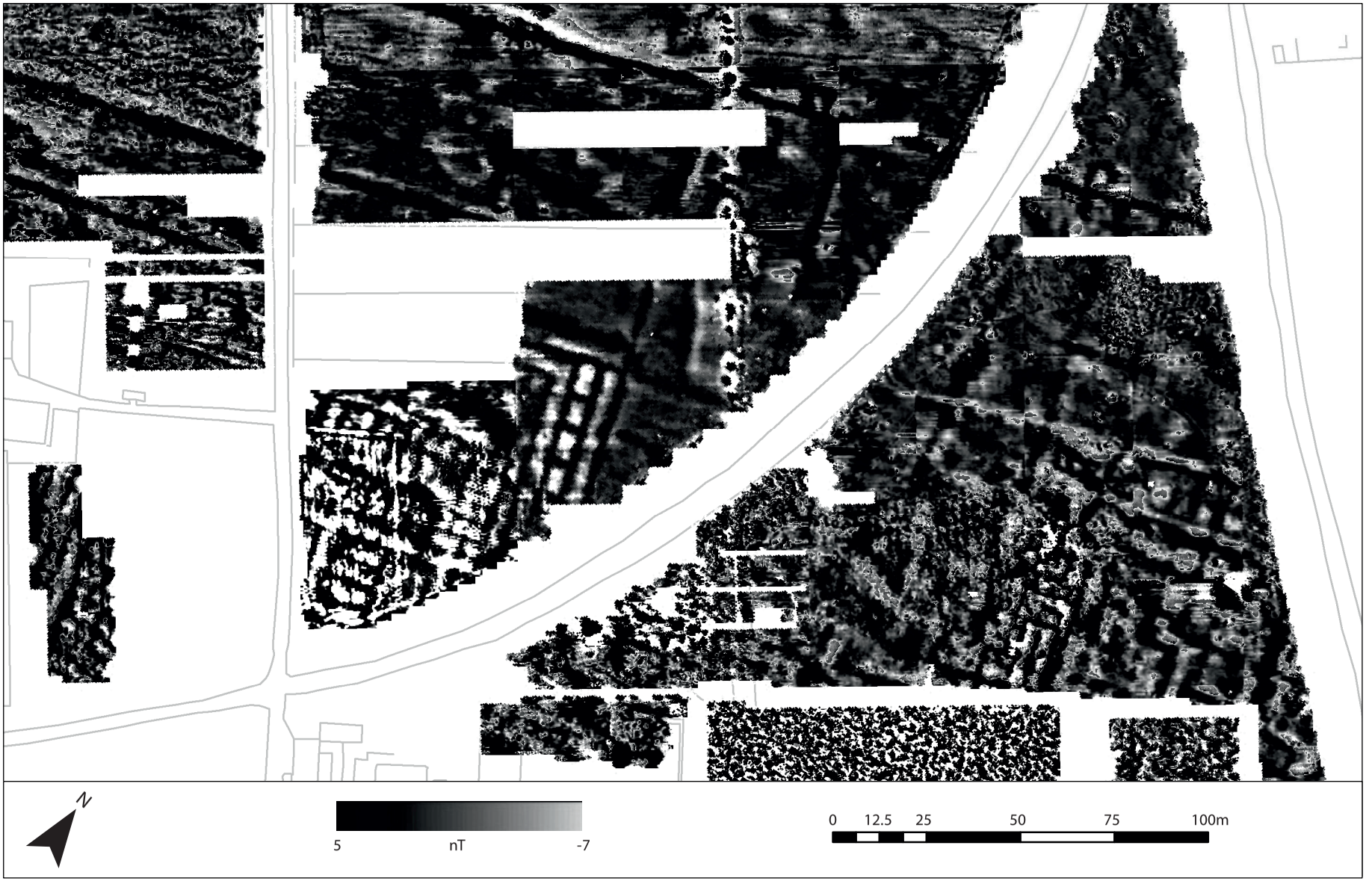


Figure 4.65. *Plan of Area 32 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

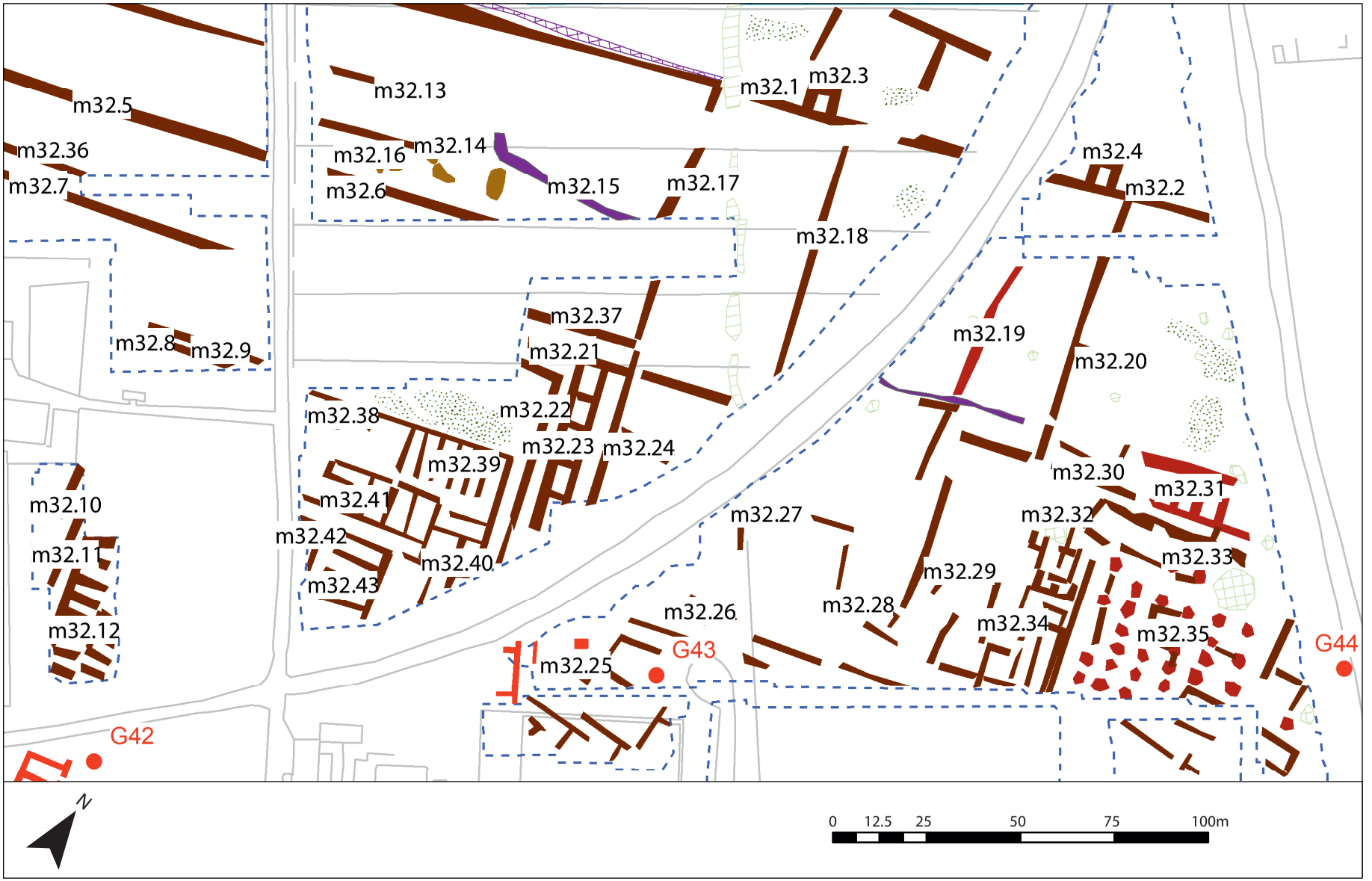


Figure 4.66. *Plan of Area 32 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

Figure 4.67. *Plan of Area 33 showing the gradiometer survey results in relation to the modern topography. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

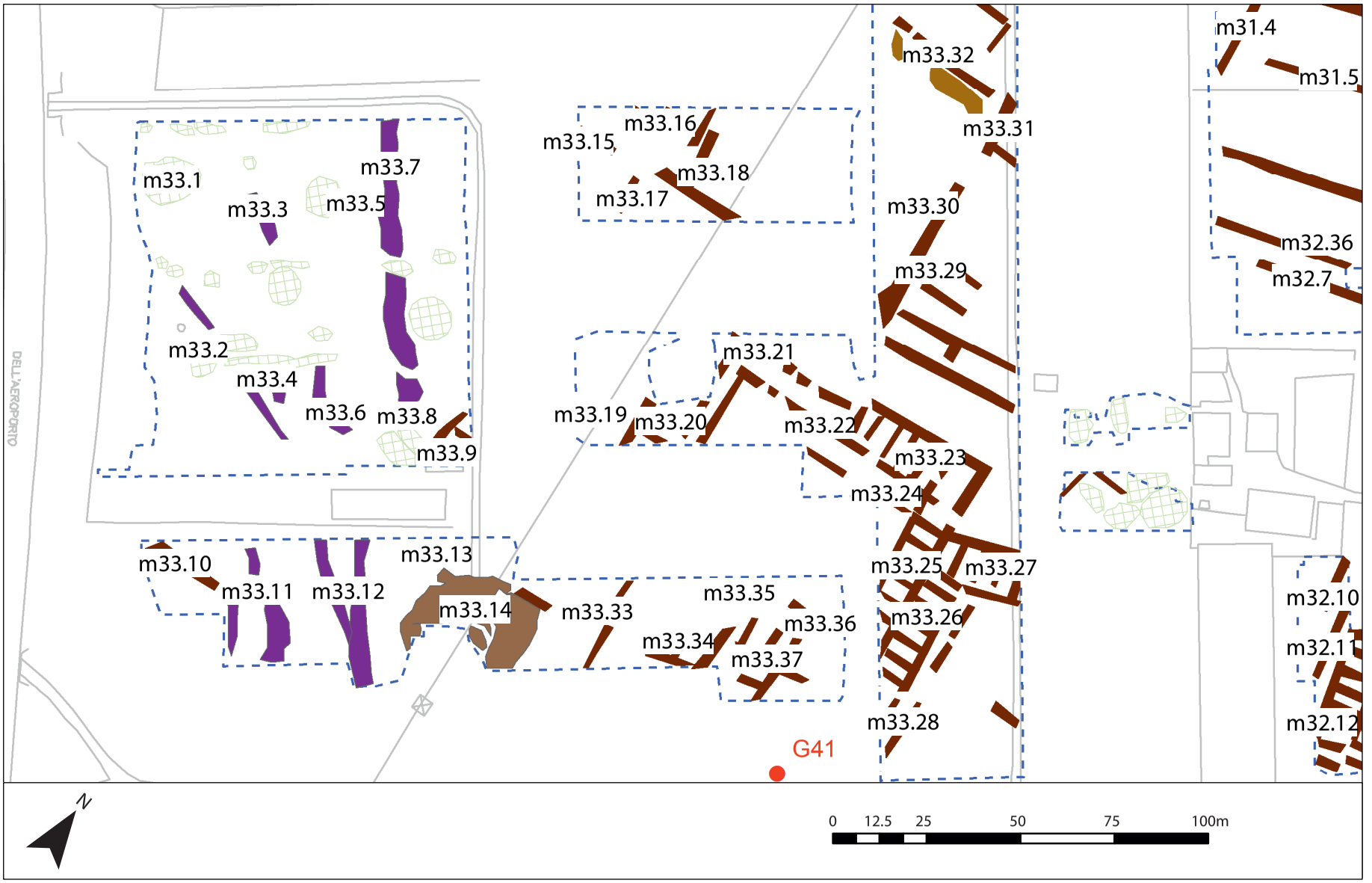


Figure 4.68. *Plan of Area 33 showing the interpretation of the gradiometer survey results in relation to the modern topography and past finds. For location see Fig. 4.2. (Drawing: Kristian Strutt.)*

Figure 4.69. *Plan showing the location and the results of the Ground-Penetrating Radar survey in the via Valle Sacra. (Drawing: Kristian Strutt.)*

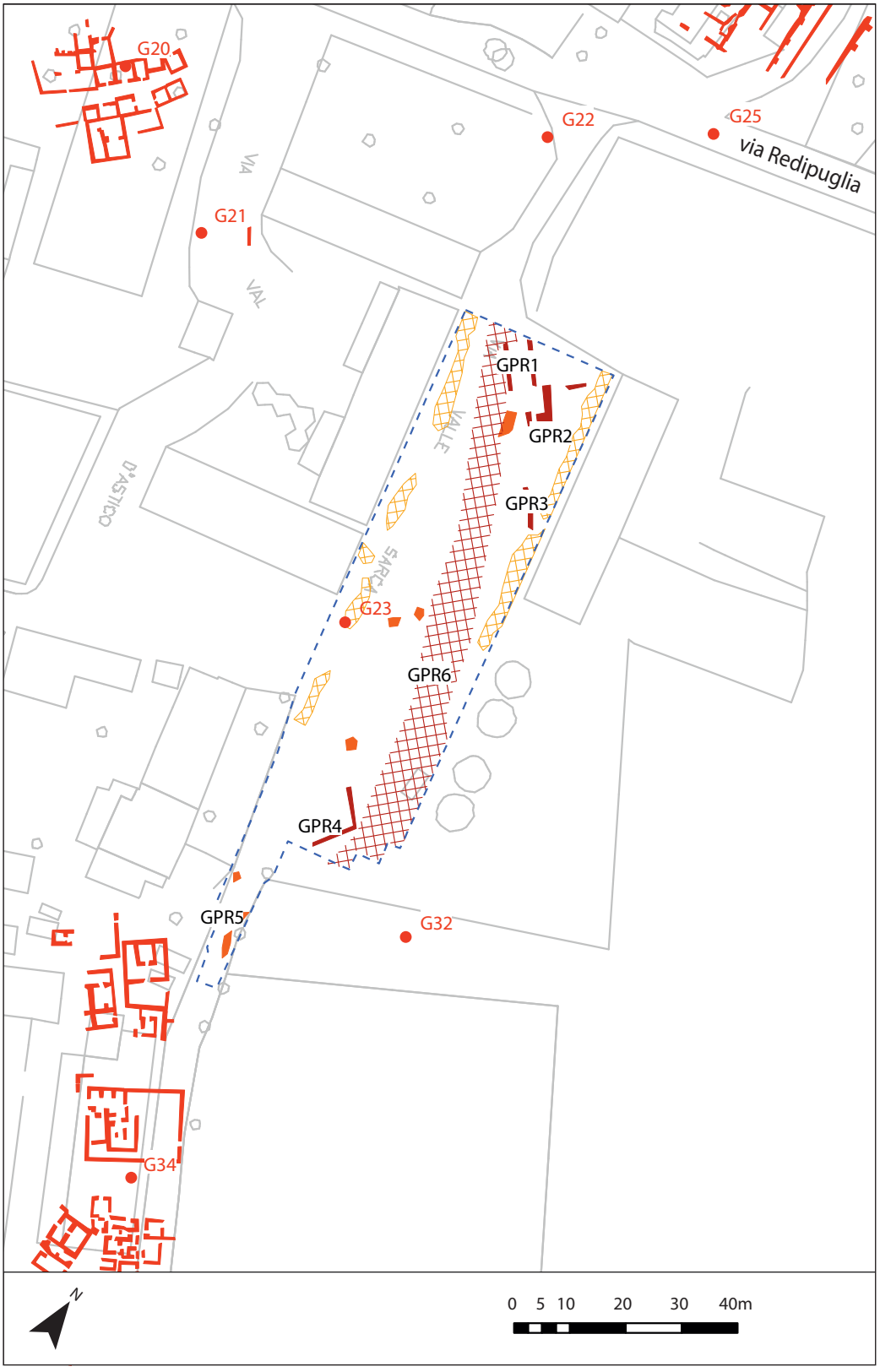


Figure 4.70. *Plan showing the interpretation of the results of the Ground-Penetrating Radar survey in the via Valle Sacra. (Drawing: Kristian Strutt.)*

in Area 32 continues in the east, while the west is relatively free of evidence for buildings and other structures. Unfortunately, however, it was not possible to access all the intervening area for survey.

Towards the west, a series of large dipolar discrete anomalies [**m33.1**, **m33.2** and **m33.5**] indicates the presence of modern dumps of ferrous material. In the space between them was a series of faint linear anomalies [**m33.3**, **m33.4** and **m33.6**] that mark the presence of ditches and possible building rubble orientated on a north-west to south-east alignment. A strong dipolar linear anomaly [**m33.7** and **m33.8**] which runs from north-west to south-east for a distance of 92m and, after a gap, continues further to the south [**m33.11** and **m33.12**], represents a wall or a line of rubble. Positive linear anomalies [**m33.9** and **m33.13**] mark the corners of a structure immediately to the east, and there is a possible wall [**m33.10**] to the west. These share the alignment of the buildings to the east. A large area of dipolar readings [**m33.14**] in the south marks an area of modern disturbance.

In the eastern part of the area, there is a series of anomalies that belongs to major warehouses and other structures, although the spatial relationship to the warehouses detected in Area 32 is masked by a strip of land that was unavailable for survey. The main building is a courtyard warehouse defined by rooms which are clearly visible on at least three of its four sides [**m33.19**, **m33.20**, **m33.21**, **m33.22**, **m33.23**, **m33.24**, **m33.25**, **m33.33**, **m33.34**, **m33.35**, **m33.36** and **m33.37**], with a central open courtyard. The organization of the southern side of the building perhaps suggests a complex sequence of development. These warehouses relate to material discovered during excavations in 1968 during the construction of pylons for overhead cables (**G41**) which included a tufa gutter associated with a colonnaded portico. Further anomalies adjoining the eastern side of this courtyard building indicate the existence here of a similar warehouse [**m33.26**, **m33.27** and **m33.28**], comprising rooms arranged around the western and northern sides of a courtyard.

To the north of these buildings, the defensive wall noted in Areas 31 and 32 was detected [**m33.30** and **m33.31**] as running southwards in the direction of the northern side of the warehouses. Because it was not possible to access some of the land in this area, it is not clear whether the anomaly [**m33.18**] further to the west represents a change in direction westwards, or whether the defensive wall continued southwards to abut the northern façade of the warehouse, which it then incorporated as part of a continuation of the defensive circuit to the west. South of the defences, the boundary walls noted in Areas 31 and 32 [**m32.8** and **m32.9**] continue up to the back of the defensive wall [**m33.29**]. Further positive linear anomalies [**m33.15**, **m33.16**, **m33.17**, **m33.18** and **m33.32**] indicate the presence of walls belonging to two sets of structures which probably lay outside the defensive circuit.

Geophysical survey 2: ground-penetrating radar

As part of a spring season of geophysics on the Isola Sacra in 2011, a small area was surveyed using ground-penetrating radar (G.P.R.). This survey was located along the northern extent of the via Valle Sacra, immediately to the south of where it joins the via Redipuglia, *c.* 80m to the south of the *Basilica di S. Ippolito* (**G14**), and 160m to the north of the *Necropoli di Porto* (**G35**), corresponding to Areas 2 and 3 in the magnetometry (Fig. 4.69). The survey was undertaken with a GSSI 400 MHz antenna and SIR 3000 system (Fig. 3.5) and covered approximately 0.3ha of the hard standing and compacted earth of the via Valle Sacra. The results (Fig. 4.70) indicate a large amount of modern disturbance and rubble resulting from the construction of the farm buildings and silos dating to the first half of the twentieth century. However, a number of anomalies indicate the presence of likely tomb structures along the projected line of the via Flavia. Two parallel high amplitude anomalies [**GPR1**] indicate possible walls, and a further series of high amplitude responses [**GPR2**] seem to indicate the existence of a structure measuring some 6m across. To its south, a further linear anomaly [**GPR3**] indicated a further possible wall. A linear anomaly with return [**GPR4**] and two areas of rubble [**GPR5**] may also be indicative of the remains of tombs. The line of the via Flavia is not immediately evident in the G.P.R. survey results. However, the central portion of the survey area revealed a band of relatively low amplitude responses [**GPR6**] which may relate to the line of the Roman road. It is very likely that any road paving has been robbed, although it is also possible that the road surface was made from compacted gravel, as was the case elsewhere nearby (**G38**).

Air photographic evidence

The air photographic evidence for the Isola Sacra consulted for this study comprises several sets of photographs taken during the 1940s and 1950s. The earliest air photos from the balloon flight over Ostia Antica in 1911 (Shepherd 2006, 16) included the southernmost area of the Isola Sacra, together with the area to the west of the Fiume Morto. The swaths of photographs from the 1940s and 1950s represent the most complete selection of material for the Isola Sacra, and are represented by air photos taken by the Italian Aeronautica Militare (A.M.) in 1941 and 1957 (Fig. 4.71), and Royal

Table 4.1. *Principal air photographs consulted in this study.*

Organization	Year	Photo ID	Source	Figure
Aeronautica Militare	1941	AM_1941_149_2_3749	Istituto Centrale per il Catalogo e la Documentazione	
Aeronautica Militare	194 1	AM_1941_149_2_3750	Istituto Centrale per il Catalogo e la Documentazione	
Royal Air Force	1944	RAF_149_4604_4070	Istituto Centrale per il Catalogo e la Documentazione	
Royal Air Force	1944	RAF_1944_149_36_4004_179417	Istituto Centrale per il Catalogo e la Documentazione	
Aeronautica Militare	19 September 1957	AM_1957_149_1_21_62638	Istituto Centrale per il Catalogo e la Documentazione	Composite Fig. 4.71
Aeronautica Militare	19 September 1957	AM_1957_149_1_21_62640	Istituto Centrale per il Catalogo e la Documentazione	Composite Fig. 4.71
Royal Air Force	1944	RAF_149_2152_5021	Istituto Centrale per il Catalogo e la Documentazione	
Royal Air Force	1944	RAF_149_2353_5009	Istituto Centrale per il Catalogo e la Documentazione	Fig. 4.72
Royal Air Force	24 June 1943	RAFNC_1943_149_4409_3005	Istituto Centrale per il Catalogo e la Documentazione	

Air Force (R.A.F.) photos from 1943 and 1944 (Fig. 4.72 and Table 4.1).

The archive photographs used thus provide a spread in terms of the dates of coverage of the Isola Sacra offering comprehensive coverage of the geomorphological and archaeological features in the area. The photographs give an insight into the landscape of the Isola Sacra during and after the Second World War, and prior to the construction of the houses and compounds that occupy much of the area today. The features visible in the photography can be traced across areas where geophysical survey could not be conducted, especially in those now occupied by the suburbs of Fiumicino. Composite images of the low altitude photographs were created to aid interpretation: one for the 1957 A.M. photos (Fig. 4.71) the other of the 1944 R.A.F. images (Fig. 4.72). In addition to the historical air photographs, a review of orthorectified imagery was conducted using Google Earth. This modern imagery did not generally add much information. However, additional structures between the via Redipuglia and the *Necropoli di Porto*, immediately to the east of the tombs excavated in 1938 (**G34**), were located from imagery dating to 2007. Features from all of these sources were digitised and integrated with other data to produce an integrated interpretation plot (Fig. 4.75).

LiDAR and satellite imagery

The LiDAR composite for the Isola Sacra combined the 2m by 2m resolution coastal data with those at a 1m by 1m scale from the Tiber delta in order to create a topographic background for the study area (Keay *et al.* 2014a; 2014b). The digital terrain model (D.T.M.) data for this area were used to assess the nature of the topography across the Isola Sacra. In most of the area, and across other parts of the Tiber delta in general, the LiDAR data were of limited value. The creation of the *bonifica* in the early part of the twentieth century led not only to the creation of drainage canals that cut across the landscape, but also to the formation of substantial ridges within individual parcels of land (Fig. 4.73), some measuring 20m from central ridge to furrow or drainage ditch, with a difference in elevation of *c.* 0.3m. Thus, while the topography visible in the LiDAR corresponds to a map of the modern landscape, ancient earthworks are mostly masked by twentieth-century landscaping, with a few exceptions (see below).

For satellite imagery, Worldview 2 data were accessed, comprising panchromatic and 8 band multispectral data. The panchromatic data have 0.5m resolution, and the multispectral data 1.8m. This latter

Table 4.2. *Multispectral bands in the Worldview 2 satellite imagery.*

Band Number	Classification
1	Coastal
2	Blue
3	Green
4	Yellow
5	Red
6	Red Edge
7	NIR1
8	NIR2

Figure 4.71. *Photo mosaic of the vertical Aeronautica Militare aerial photographs of the Isola Sacra taken on 19 September 1957. (Image: Kristian Strutt; Photographs Aerofototeca Nazionale – Istituto Centrale per il Catalogo e la Documentazione.)*

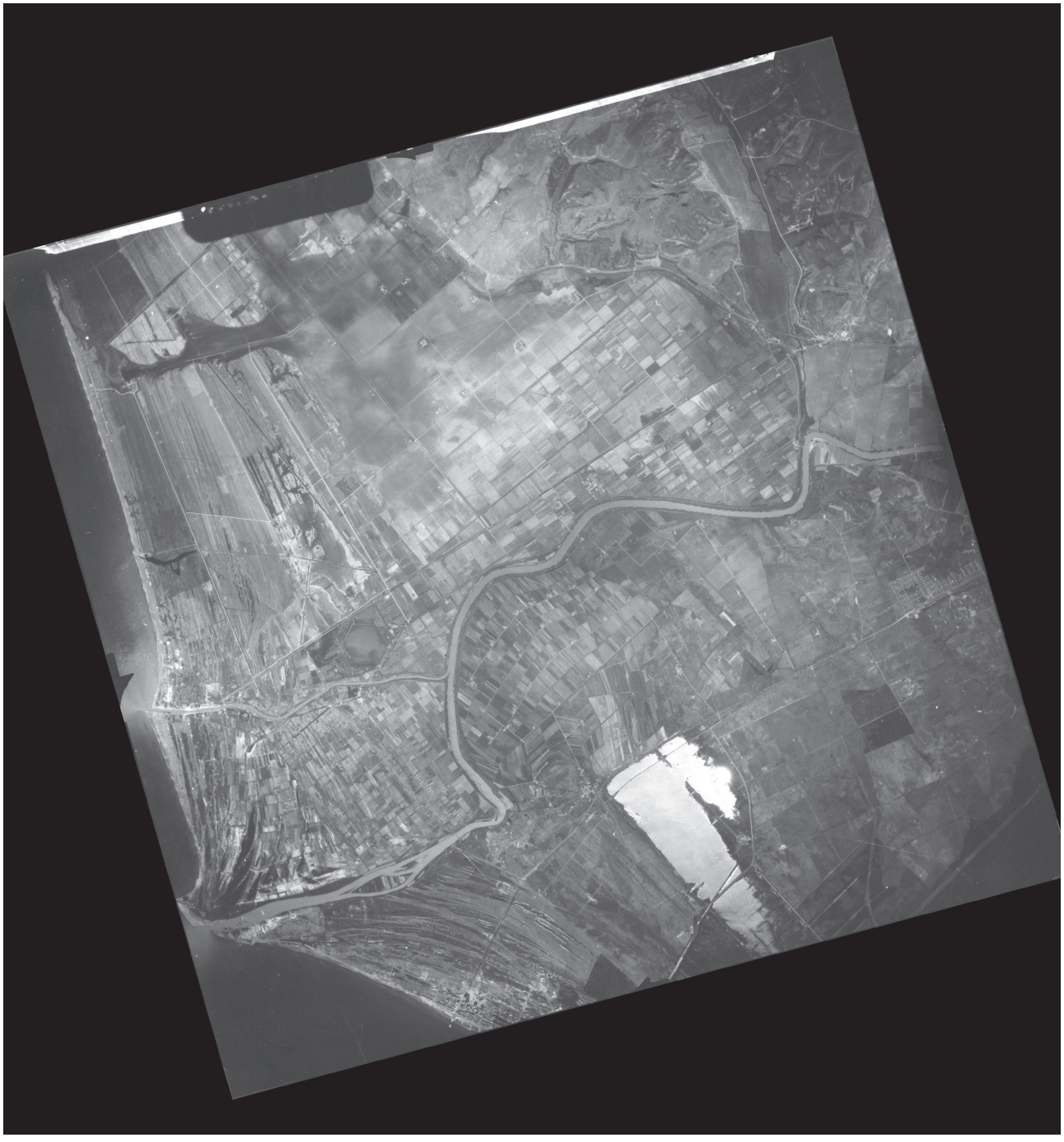


Figure 4.72. *Photo mosaic of the vertical Royal Air Force aerial photographs of the Isola Sacra taken in 1944. (Image: Kristian Strutt; Photographs Aerofototeca Nazionale – Istituto Centrale per il Catalogo e la Documentazione.)*

dataset was used predominantly for digitising geomorphological and archaeological features for the Isola Sacra. The multispectral data comprise 8 bands (Table 4.2)

Images were created using the E.S.R.I. guidelines and information on band combinations to produce images showing R.G.B. combinations for natural colour (5,3,2), false colour (7,5,3), vegetation (8,4,1) and sediment (5,4,1). These images revealed geomorphological features across the survey area , as well as the line of the canal as shown in the example illustrated here (Fig. 4.74), thereby complementing the air photographic evidence.

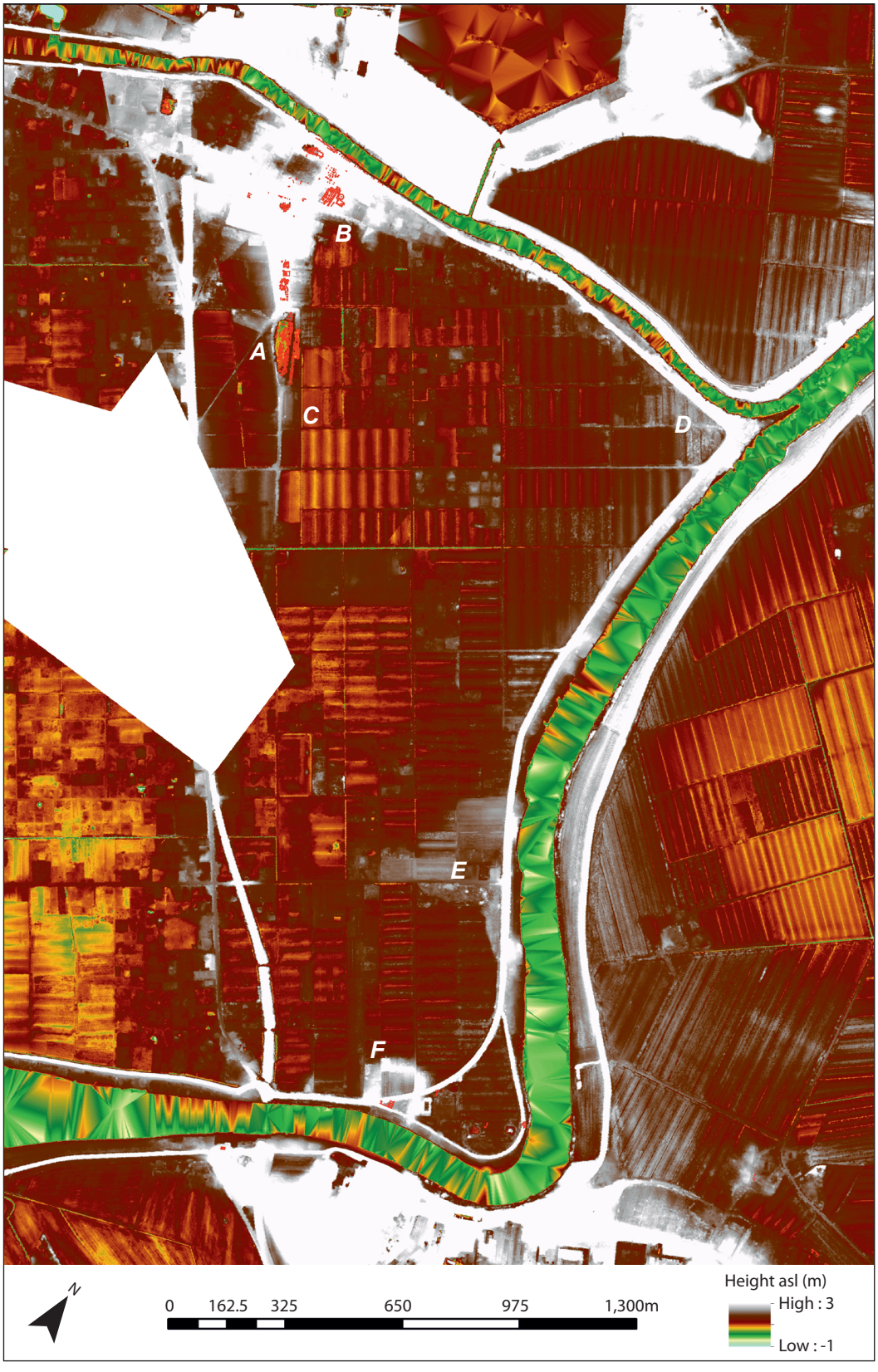


Figure 4.73. *LiDAR image of the Isola Sacra. (Image: Kristian Strutt; Data Ministero dell'Ambiente.)*

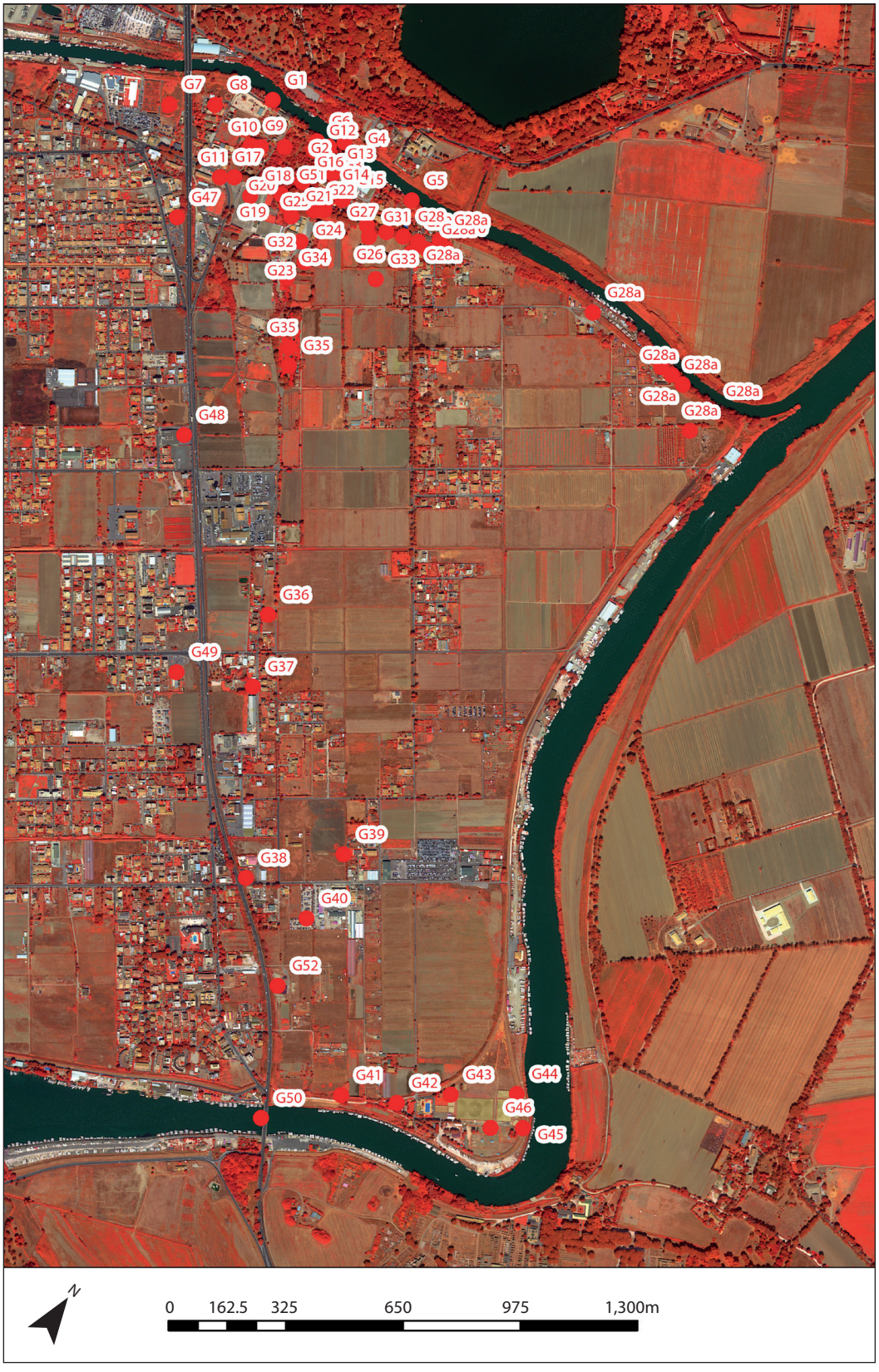


Figure 4.74. *Satellite image of the Isola Sacra. (Image: Kristian Strutt; Data Worldview.)*

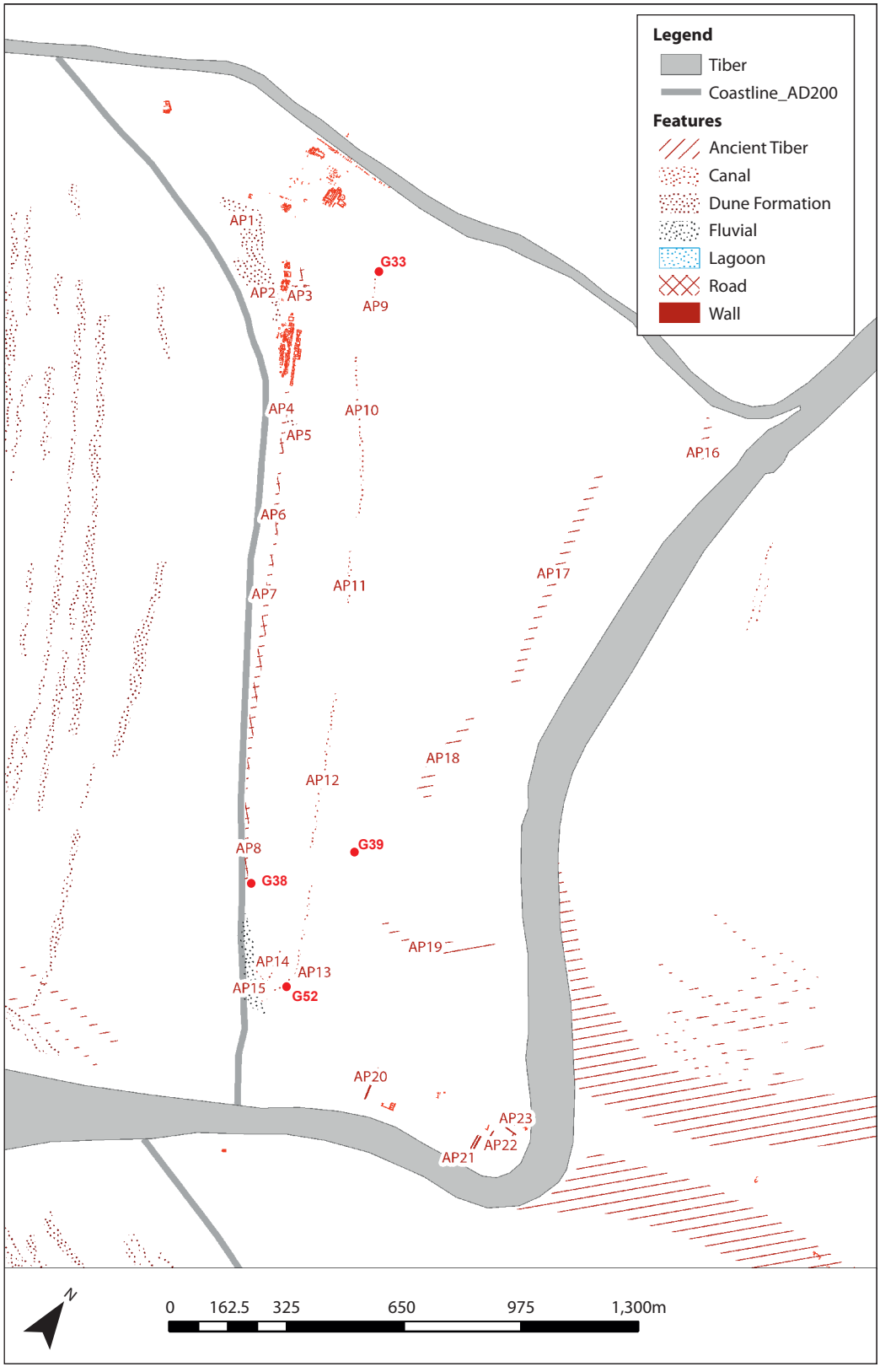


Figure 4.75. *Plan showing the features plotted from aerial photography, LiDAR and satellite imagery as mentioned in the text. (Drawing: Kristian Strutt.)*

Integration of the aerial and satellite evidence

Results of the analysis of the LiDAR data show that in the northernmost part of the Isola Sacra, the area of the via Flavia, the tombs of the *Necropoli di Porto* (**G35**) and the *Basilica di S. Ippolito* (**G14)** are all located at 3m and 4m asl. (Fig. 4.73, A and B), which is higher than the surrounding terrain which lies at *c*. 1.2m asl. This slightly higher ground extends southwards from the *Necropoli di Porto* for 230m along the line of the via Flavia (Fig. 4.73, C). The area of the *statio marmorum* (**G28a**) alongside the '*Fossa Traiana*' as far as the Capo Due Rami lies at an elevation of approximately 2.5m asl. (Fig. 4.73, D). There are two further areas in the southern sector of the Isola Sacra that are noteworthy. One is an area measuring 300m by 250m that is higher than the 1.5m asl. of the surrounding landscape (Fig. 4.73, E). The other is a rectilinear earthwork that stands at 3.5m asl. and runs *c.* 150m by 130m alongside the Tiber in the southernmost part of the Isola Sacra (Fig. 4.73, F). This seems to relate to the major structures located in the gradiometry of this area (Area 32, **m32.21**–**m32.43**).

The air photographic evidence and satellite imagery provide evidence for the pattern of geomorphological and archaeological features across the Isola Sacra, complementing the results of the gradiometry (Fig. 4.75). In the northern part of the Isola Sacra to the west of the tombs situated along the via Flavia, the air photographs indicate an area of sandy deposit [**AP1** and **AP2**], probably related to dunes, which extends *c.* 350m from northwest–southeast and up to 100m from southwest–northeast. Further to the east of this, in the general vicinity of the *Necropoli di Porto* (**G35**), the line of the via Flavia is visible together with tombs [**AP3**] on either side of the road. The line of the via Flavia can then be traced to the south of the *Necropoli di Porto* [**AP4**] running in a northwest–southeast direction for *c.* 200m, with sandy sediment [**AP5**] located immediately to its east. The line of the via Flavia can be traced for a further 1,100m in this direction [**AP6**–**AP8**], but disappears at the point where excavations in 1990 (**G38**) revealed a section of the road, with side walls and some stretches of *opus reticulatum*.

The Portus to Ostia Canal can also be traced on the air photographs with sections visible running approximately parallel to the via Flavia some 180m to its east [**AP9**–**AP12**]. This evidence provides a broader context for the anomalies identified from the gradiometry results, in the more built-up areas towards the modern Ponte della Scafa, and in the vicinity of the boat excavations (**G52**). In the northern part of the Isola Sacra, a band of sediment from the canal is visible [**AP9**] in close proximity to the bridge pier (**G33**) and can be seen to run from northwest–southeast for a length of 95m. It is traceable for a further distance of 450m to the south [**AP10** and **AP11**], and after a further break, it then reappears [**AP12**] and continues for a further 460m disappearing close to the Monte Vodice buildings and the burials (**G39**) excavated in 1999.

Other features relating to the pre-Roman formation of the landscape are visible along the eastern side of the Isola Sacra. Two bands of sediment [**AP16** and **AP17**] running from north to south in the north-eastern area, together with additional curving features [**AP18** and **AP19**] further south seem to relate to the geomorphological anomalies revealed in the gradiometry survey (Areas 14, 23, 25, 27 and 28). They probably relate to shifts in the course of the Tiber and result from the deposition of its sediments (cf. Fig. 2.1).

The aerial photographs provide some evidence for the course of the Portus to Ostia Canal at its southern end, although interpretation is difficult, especially as the relationship between the canal and the via Flavia is unclear, and the evidence is ambiguous (pp. 155–56). Two bands of sediment [**AP13/AP14** and **AP15**] are visible. **AP13** indicates the eastern side of the canal and runs north–south for *c.* 360m, before apparently curving westwards towards the line of the ancient Roman coastline. **AP14** runs parallel with the southern part of **AP13**, some 50m to the west, although only visible for *c.* 100m. These lie close to where the boats lying with the canal were excavated in 2011 (**G52**) (pp. 139–45). An area of sediment visible on the air photographs [**AP15**] may possibly indicate the point where the canal flowed into the Tyrrhenian Sea.

The remaining features from the air photography and satellite imagery pertain to the southernmost part of the Isola Sacra. A linear feature in the air photographs [**AP20**] marks the extension of a wall relating to the warehouses visible in the gradiometry (Area 33; Fig. 6.6, Building 1). To the east of this, two parallel linear features [**AP21**] mark the continuation to the south of buildings that were observed in the gradiometry results for this area (Area 32; Fig. 6.6, Building 5). Adjacent to this is an arrangement of linear features marking an area measuring some 65m by 50m [**AP22**]. A further smaller building [**AP23**] is located to its north.

The Isola Sacra Survey

The Isola Sacra occupies the land between Ostia and Portus at the mouth of the Tiber, and thus lies at the centre of the massive port complex that served Imperial Rome. This volume focuses on the results of a survey of the island completed as part of the Portus Project, complementing the previously published survey of Portus (2005) and the forthcoming publication of the German Archaeological Institute's survey of Ostia. The survey is framed by an analysis of the geomorphology of the delta, and integrated with information from past excavations. It is complemented by a programme of geoarchaeological coring and a short account of the ships excavated on the Isola Sacra in 2011.

The results make an important contribution to the understanding of the landscape of both Portus and Ostia, offering new information about the development of the delta, and the changing use of the Isola Sacra. They also provide evidence for the buildings along Isola Sacra's northern shore and the cemeteries that flank this settlement and the via Flavia (which runs between Portus and Ostia across the centre of the island). Most significantly, three completely new sets of features were revealed: a major canal that ran north–south across the island; a system of land divisions, which created blocks of fields; and a suburb of Ostia on the island's southern flank. These results are key for understanding the development of the Portus–Ostia complex, and hence the economy of the City of Rome itself.

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