

Mapping *Isca*: geophysical investigation of School Field and Priory Field, Caerleon

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INTRODUCTION

In the 2006 volume of this journal the authors published the results of geophysical and topographic surveys undertaken in Priory Field, in the south-western corner of the legionary fortress (Guest and Young 2007). Part of Cardiff University's *Mapping Isca* research project, the programme of work at Caerleon continued in 2007 and 2008 with new surveys of School Field and Golledge's Field, together with a return to Priory Field in order to complete an intensive resistivity survey of the northern part of the field and adjacent parts of the gardens of the Priory Hotel (Fig. 1). The western side of *Isca* remains largely free of modern buildings and, consequently, little archaeological work has been undertaken in this part of the fortress. Therefore, almost nothing was known about the layout of the dextral side of the fortress, though the current programme of geophysical surveys quickly began to provide important new information regarding the military buildings that lie beneath the fields immediately to the west of Caerleon.

The first magnetic gradiometer survey in Priory Field in 2006 located numerous buildings in the south-western corner of the fortress, including eight centurial barrack blocks, three large rectangular buildings recognised as military granaries, and part of a very large courtyard building tentatively identified as a *horreum*, or warehouse (Figs 1 and 2). A small 40m by 10m area of the northern part of Priory Field, extending over the northern and central granaries, was the focus of a multiple-spaced resistivity survey that produced clearer results than the gradiometer and demonstrated that the main wall foundations of these buildings lie at depths of between 1.5m and 2.3m below the modern ground surface. Moreover, apart from a few modern features, both geophysical techniques failed to locate any evidence to indicate that this part of the fortress was occupied by buildings after the Roman period, therefore suggesting that the remains of *Isca* in Priory Field may well survive relatively undisturbed by medieval and modern activity (unlike the other permanent legionary fortresses of *Deva* and *Eburacum*).

School Field is situated to the north of the *via principalis* and extends over almost an entire *insula* on the western dextral side of the fortress, between the barracks in Prysge Field and buildings in Golledge's Field that it is believed are the centurial quarters of the first cohort's barracks (Nash-Williams 1931; Nash-Williams 1933; Gardner and Guest 2007). The nature of the Roman buildings below School Field, however, was not known and modern plans of *Isca* generally leave this part blank, though it was suggested that this area of the fortress might have housed granaries to match those discovered in Priory Field.¹ The objectives of the School Field survey were to add further details to the fortress layout by locating and identifying the remains of Roman buildings that once stood there, and to look for evidence of medieval and modern occupation in this part of Caerleon.

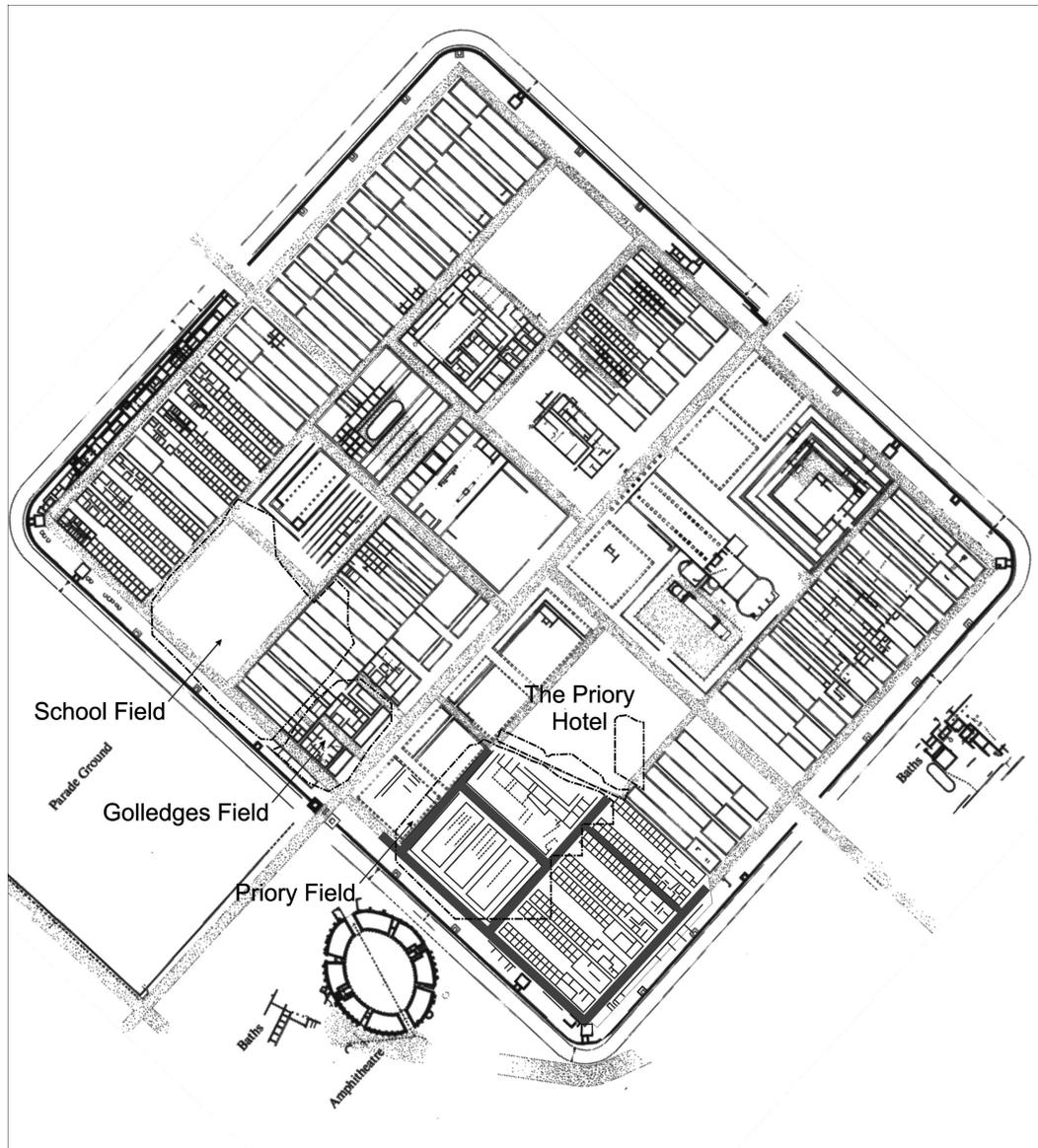


Fig. 1. Plan of the legionary fortress at Caerleon (*Isca*) showing known and presumed details of the internal layout, together with the interpretation of the 2006 geophysical surveys (after Guest and Young 2007, Fig. 12), as well as the limits of the 2007 geophysical surveys in School Field, Golledges Field, Priory Field and the Priory Hotel garden.

METHODOLOGY²

The magnetic gradiometer and ground resistivity surveys of School Field extended over 110m by 90m, covering an area of approximately 1 hectare (Figs 3 and 4),³ with an area of 50m by 40m (0.2ha) covered in the adjacent Golledges Field. The ground resistivity survey in Priory Field was undertaken over just

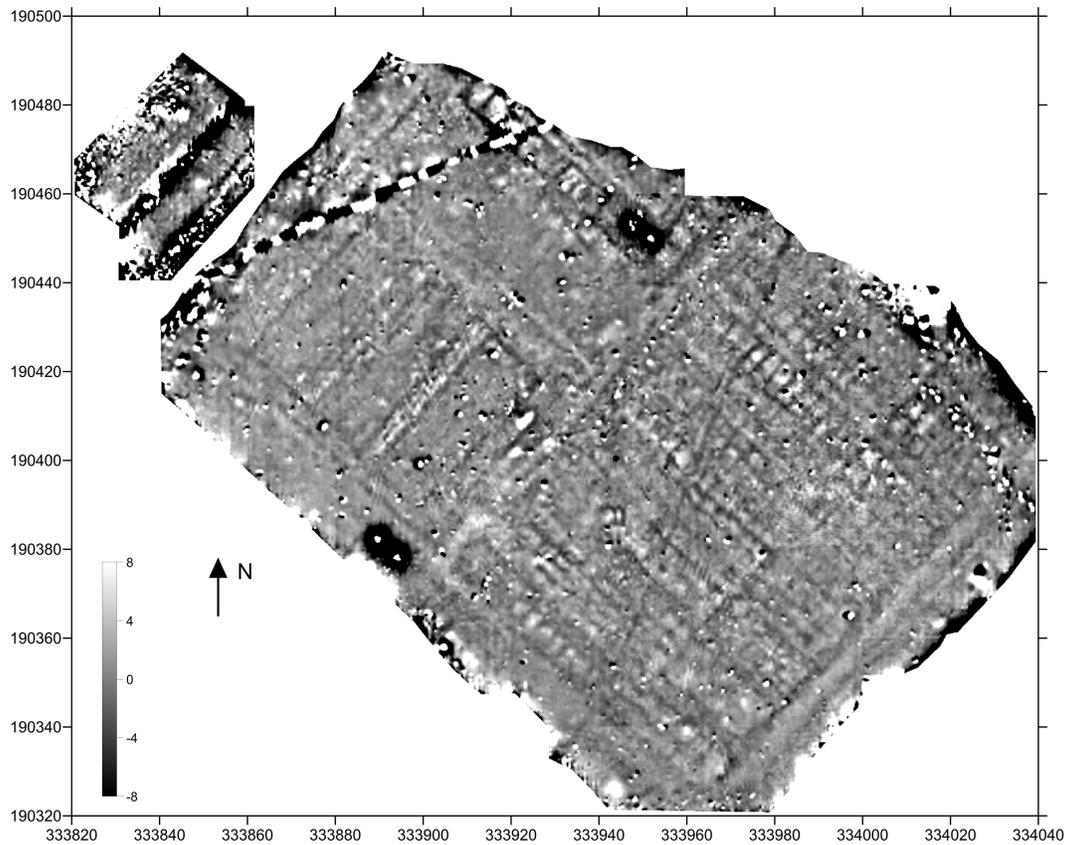


Fig. 2. Magnetic gradiometer survey results in Priory Field. (after Guest and Young 2007, Fig. 4).
Greyscale -8 nT (black) to +8 nT (white).

less than 1 hectare (90m by 107m), together with a second smaller area within the garden of the Priory Hotel.⁴ The trial multiple-spaced resistivity survey in 2006 had imaged the remains of the legionary buildings in Priory Field most clearly with spacings of 1.25m and 1.50m between the meter's mobile probes and, based on this knowledge, the larger 2007 and 2008 resistivity surveys were undertaken at 1.0m and 1.50m spacings as well as the standard 0.5m in School Field (a full 0.5m-spaced survey of Priory Field having been conducted in 2006).⁵

RESULTS AND INTERPRETATION

School Field

The results of the gradiometer survey are illustrated on Figure 3 as a greyscale image, which shows the walls of buildings as negative magnetic anomalies (black) and the roads, or areas of material deposition, as positive magnetic anomalies (grey to white).

The results of the ground resistivity surveys with 0.5m and 1.5m probe spacings are shown in Figure 6 (the 1.0m-spaced survey proved to give results very similar to that at 1.5m and was therefore not

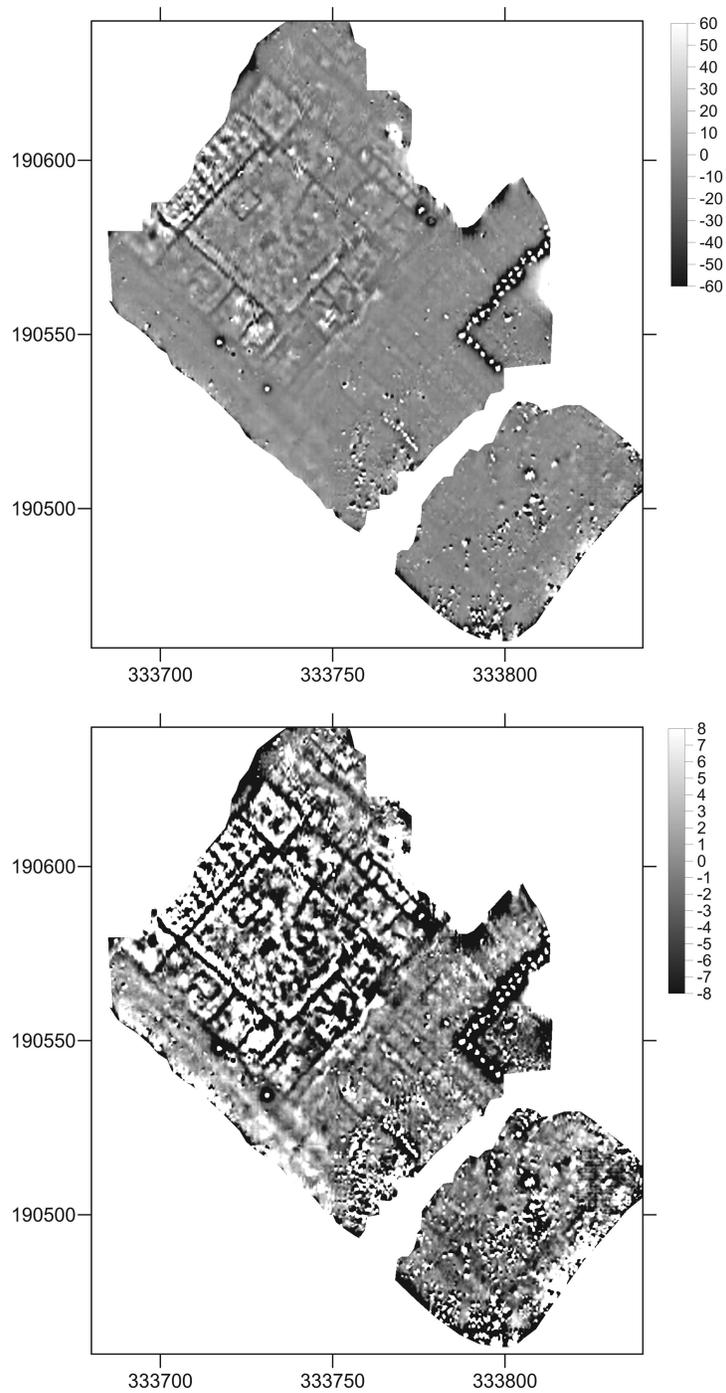


Fig. 3. School Field magnetic gradiometer survey results. The upper image has a greyscale of -60 nT (black) to +60 nT (white) permitting easier interpretation of the courtyard building. The lower image has a greyscale -8 nT (black) to +8 nT (white) as for Fig. 2, allowing interpretation of the barrack blocks.

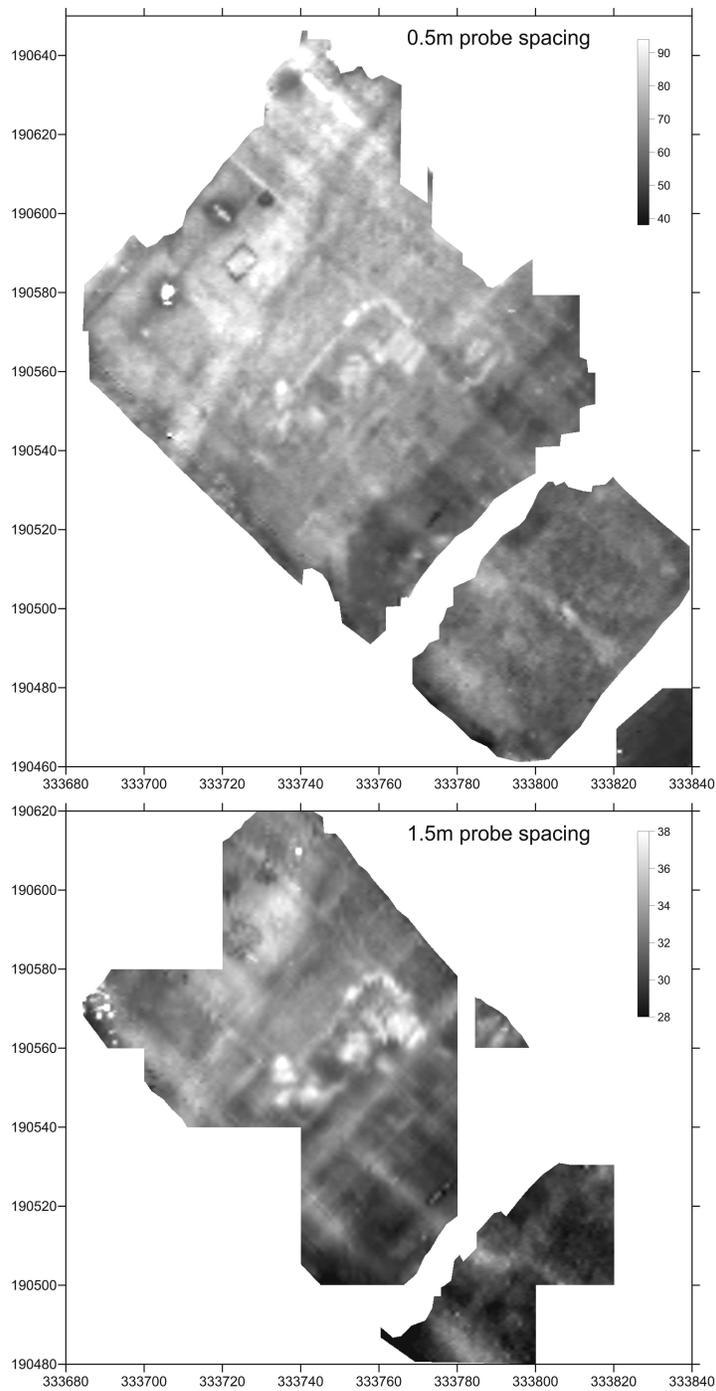


Fig. 4. School Field ground resistivity. The upper image shows the survey using a 0.5m mobile probe spacing with a greyscale of 38 Ω (black) to 93 Ω (white) measured resistance. The lower image shows the survey using 1.5m mobile probe spacing with a greyscale of 28 Ω (black) to 38 Ω (white) measured resistance.



Fig. 5. Interpretation of geophysical survey results in School Field and Golledge's Field.

completed). In these images areas of low resistivity (for example cut features and areas with damper deposits) appear dark, whereas areas with high resistivity (drier, free draining, stonier deposits etc.) appear pale. The Roman wall lines appear as both positive features (imaging the walls themselves) and negative features (probably imaging robber trenches) in different parts of the survey area.

The series of very intense anomalies in the eastern part School Field reveals the course of various metal fences that divided this part of the survey area in relatively recent times. The area between the fences and the boundary with Golledge's Field shows a lower resistivity (at 0.5m probe spacing) than the remainder of the field because of the intensive use of the area as gardens in the mid-twentieth century. Further, more subtle, indications of recent former fences lie further south of this and along the line of the Roman rampart. Prior to the expansion of the School in around 1900 a well-developed field boundary ran NE-SW across the area of School Field and this survives as a very slight earthwork. This can be seen in the resistivity results as a broad positive anomaly (the field bank) lying to the west of a narrower, negative, anomaly representing a ditch.

Apart from these features, however, the surveys produced no strong evidence to suggest that School Field was occupied by buildings after the Roman period and it appears that this part of Caerleon has been under cultivation in one form or another for a very long time.

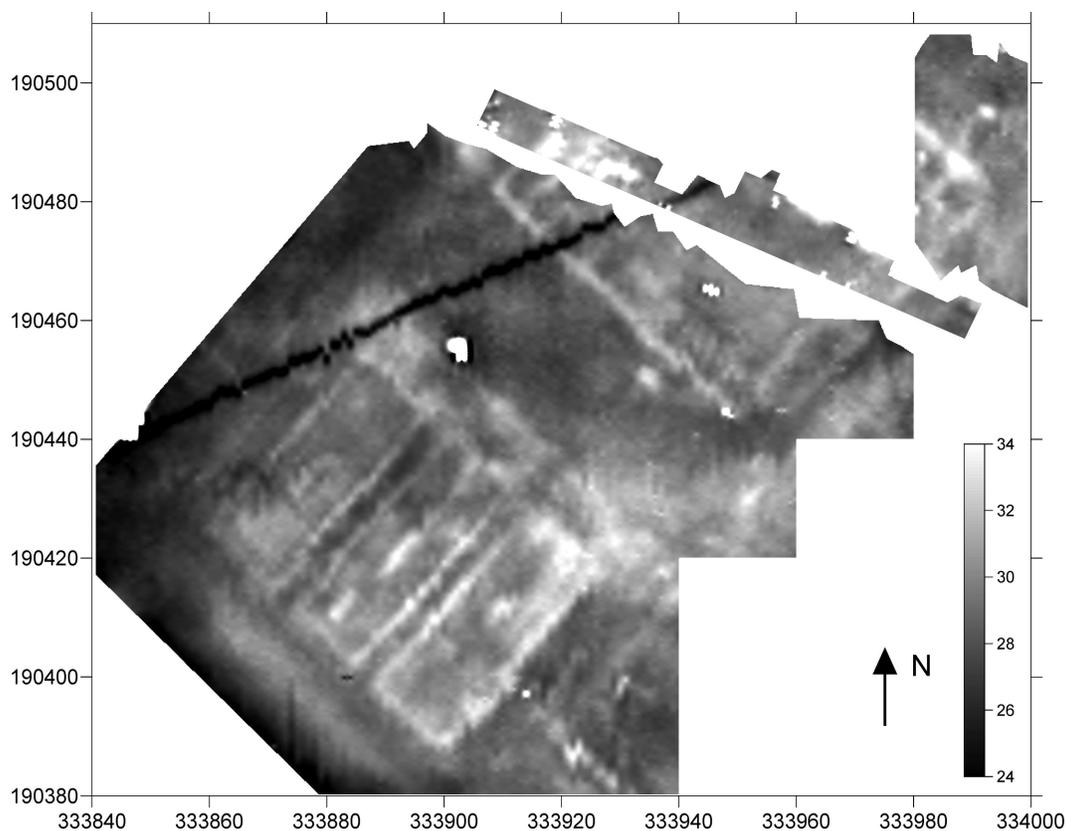


Fig. 6. Priory Field ground resistivity survey, 1.50m mobile probe spacings. Greyscale: 24 Ω (black) to 34 Ω (white) measured resistance.

The foundations of several stone structures in School Field were revealed by the geophysical surveys (Figs 3 and 4) and the proposed reconstruction of the layout of this part of the fortress is shown on Figure 5. These buildings are characteristic of military architecture in the early imperial period and the survey has produced a remarkably clear plan of the arrangement of buildings in the western part of the legionary fortress. The south-western boundary of School Field reuses the fortress' outer wall (the *intervallum* road can be seen running alongside the rampart), while the field's northern boundary appears to follow the minor east-west road that separated this part of the fortress from the Prysge Field barracks to the north. The fortress was divided into *insulae*, or blocks, by the street grid and the survey results demonstrate that School Field covers one entire *insula* (Boon's *insula* XVIII) on the dextral side of the *retentura* (Boon 1987, 12) as well as, separated by east-west and north-south minor roads, parts of at least two others (*insula* XIV to the south and *insula* XIX to the east), which were occupied by buildings of different forms and functions.

Courtyard complex – the fortress fabrica

The main feature located by the magnetometer survey in School Field is a very large square building complex that completely occupies *insula* XVIII. The building measures approximately 70m by 65m and comprises a central square courtyard, probably provided with an ambulatory, and four surrounding ranges. The gradiometer survey located a number of apparently stone-built features within the courtyard,

including a large rectangular structure close to its northern side and two circular features, one larger than the other, towards the centre.

The two circular features lie close to the line of the post-medieval field boundary and an alternative explanation for these features might be that they represent tree-throws. The resistivity survey results are complicated by the post medieval boundary crossing the centre of the courtyard, but they suggest the northern half of the courtyard may have more highly resistive surface than the southern, perhaps suggest the northern half of the courtyard was paved.

The southern range appears to be the same width as the internal courtyard and contains perhaps five rooms of varying sizes, probably including the complex's main entrance. This block shows strongly on the resistivity results, suggesting the survival of substantial masonry walls and foundations. In some areas the high resistivity of angular areas within this block (and extending southwards onto the line of the adjacent road) probably suggests areas of fallen walls, although reuse of the building footprint by a later structure cannot be excluded on the present evidence. The eastern and western ranges extend from the southern external wall (i.e. in line with and continuing the building's façade) to the northern side of the courtyard and these side ranges seem to have contained a number of larger, squarer, rooms. The *intervallum* road ran alongside the outer wall of the western range, while seventeen small, almost cell-like rooms, against the external wall of the eastern range fronted onto the parallel north-south minor road or an alley. The northern range opposite the main entrance was entirely different again, this time consisting of a long basilican hall flanked on its short sides by two large and almost square rooms that continue the eastern and western side ranges. The hall is as long as the internal courtyard is wide and three or four rows of geophysical anomalies, probably the bases of columns, run along its full length dividing the internal space into four or five aisles. Both corner rooms contained two similar column-like anomalies, while the eastern corner room is slightly longer and, therefore more rectangular, than its square western counterpart. Possible column bases are also imaged along the portico bounding the courtyard to west and north. Figure 5 shows that the magnetic readings recorded in the area of this large courtyard complex are significantly higher than in other areas of School Field (or the 2006 Priory Field surveys), indicating the presence of large quantities of highly magnetically susceptible material, particularly in the basilican hall and its flanking rooms, along the courtyard's ambulatory, and against the walls of several rooms in the other ranges.

Courtyard buildings similar to the complex located in School Field are found in many legionary fortresses throughout the empire, though they appear to have fulfilled a wide range of functions. The ground-plan of the School Field building is particularly clear and shares many architectural features with legionary *principia* (headquarters buildings), *horrea* (stores or warehouses), *valetudinaria* (hospitals) and *fabricae* (workshops), all of which can comprise a basilica and ranges of rooms around a central courtyard. Petrikovitz identified a category of building with these characteristics as *doppelhakenförmigen* (winged) *fabricae*, where craftsmen would have produced and repaired objects in metal and other materials (Petrikovits 1975, 92–4). He cites examples from Inchtuthil, *Novaesium*, *Bonna* and *Lambaesis*, although buildings associated with other roles appear to share many characteristics with the School Field complex too. For instance, the two large courtyard buildings in the *retentura* at *Carnuntum* are identified probably as warehouses (von Petrikovits 1975, 94–6; fig. 20, 6), while the building adjacent to the *porta principalis dextra* at Vetera, remarkably similar in many respects to the plan of the School Field complex, is thought to be a hospital (Petrikovits 1975, 98–102; fig. 27, 6). However, many of the large-scale excavations at legionary fortresses on the Rhine and Danube frontiers were undertaken in the later nineteenth and early twentieth centuries when the recording and publication of finds or their locations, which might indicate a building's function more reliably than its ground-plan, were not yet normal archaeological practice.

Fortunately, the results of the gradiometer survey in School Field provide an important piece of evidence not available to the earlier excavators of legionary fortresses in different parts of the Roman Empire; namely the exceptionally high magnetic readings recorded across the entire complex. This highly susceptible material may denote quantities of burnt deposits in certain parts of the buildings and rooms, especially against walls. These are unlikely to represent hypocausts or heated flues (though some rooms may have been provided with underfloor heating), and the most likely explanation for the unusual geophysical readings is that the magnetic material indicates the intensive burning of wood or coal as fuel in the manufacturing processes that took place there. The highest readings were recorded in the aisled hall and, with the possibility that the material producing the high magnetic readings includes the waste from metalworking, it possible to imagine that the smithing (and perhaps smelting too) of iron took place on almost an industrial scale in this very large space. Metalworking also requires a large volume of water and the rectangular structure in the courtyard could be where a reservoir was maintained, while the small rooms on the building's eastern side look very much like secure stores for materials and goods.

The School Field complex is similar in many ways to the timber *fabrica* excavated at the temporary legionary fortress at Inchtuthil. A central courtyard was enclosed on three sides by 12.8m wide aisled basilican wings that were apparently constructed together rather than as separate halls, while the front range consisted of five rooms including a centrally placed entrance hall (Pitts and St Joseph 1985, 105–15). Evidence for this building's use as a *fabrica* for iron-working consisted of a smithing-hearth and a slag pit in one of the halls, while a large pit associated with the building's demolition contained a hoard of ironwork including nine iron tyres and almost ten tons of unused iron nails. Another British parallel comes from the fortress at Exeter where part of the timber *fabrica* has been excavated. Here an aisled hall, 9m wide, was subdivided into individual bays and the floor had been cut into by a several shallow plank-lined troughs, some of which produced debris from iron and bronze-working including fittings for *lorica segmentata* (Bidwell 1980, 31–5). While the plan of the Exeter *fabrica* is incomplete, the excavated part suggests that the original building was probably very similar to the Inchtuthil complex, consisting of three aisled halls and a front range of rooms around a central courtyard.

Barrack blocks

The results of the School Field magnetic gradiometer survey show that the *insula* to the south of the courtyard complex was occupied by centurial barrack blocks, possibly of the legion's first cohort (Fig. 5). In 1931–33 Nash-Williams excavated a series of trenches in Gollledge's Field across a row of domestic buildings, on the southern side of this *insula* and lining the *via principalis dextra*, that he proposed were the quarters for the first cohort's centurions (Nash-Williams 1933). Geophysical imaging of this area was poor, although the outlines of the buildings, together with a few internal walls, are visible on both surveys. It is unclear to what extent these imaged features are Roman structures, as opposed to Nash-Williams' trenches. Walls of the main barracks were also uncovered by Nash-Williams, though the 2007 survey indicates that reconstructions of *Isca*'s layout, while generally accurate in this part of the fortress, require the addition of a few new walls (Fig. 5).

Priory Field

The results of the extended resistivity survey undertaken in 2007 are shown on Figure 6 as a greyscale image, which records the walls of buildings as high resistance anomalies (white) and deposits where moisture is retained as low resistance anomalies (grey to black, most notably the modern water pipe running diagonally across the northern part of the field). The remains of the three complete granaries and most of the courtyard building identified in the previous year's magnetic gradiometer survey are remarkably clear and it is possible now to describe these structures in more detail.

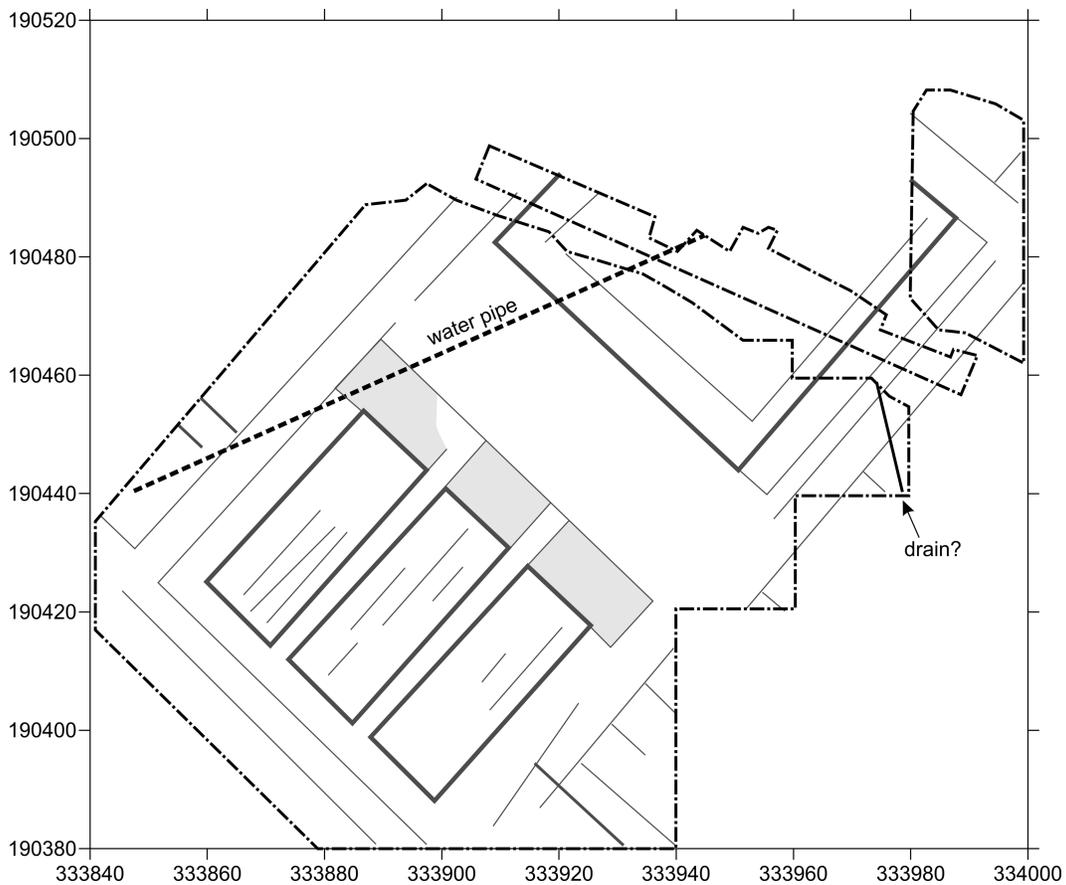


Fig. 7. Interpretation of 2007 ground resistivity survey results in Priory Field.

Military granaries

Insula III immediately to the south of the *porta principalis dextra* of the fortress at Caerleon was occupied by three large rectangular buildings set within their own compound and facing an extensive open yard. It was suggested that these buildings should be identified as typical military granaries for the storage of grain and other perishable provisions (Guest and Young 2007, 124–7). The results of the 2007 resistivity survey show that the internal areas of these buildings were each c. 42m long and 15m wide, and that dwarf walls to support the granaries' raised floors ran along the length of each building. The survey also reveals that these buildings were provided with covered loading bays, whose foundations are substantial, facing onto the open yard area. This reinterpretation of the data suggests the adjacent north-south road lies slightly further east than originally suggested. A trial trench excavated within the central granary building located a stone pier of the building's raised floor and an extensive deposit of roof-tiles at 1m depth (Gardner and Guest 2007, 3).

Courtyard building — horreum

The magnetometer survey conducted in Priory Field in 2006 identified at least one wing of a presumed courtyard building on the opposite side of the open yard area to the granaries (i.e. *insula IV*), though it

was unclear how large this building was as it extended beyond the north-eastern boundary of the field. The 2007 resistivity survey re-examined this building in Priory Field and also provided new information related to its size and layout in the grounds of the Priory Hotel on the other side of the boundary. Fortunately, the north-eastern corner of the building lies beneath one of the hotel's lawns and we now have a more complete picture of its ground-plan. The building measured approximately 60m by 60m (just slightly small than the School Field building) and consisted of a central courtyard with wings or ranges of similar sized rooms on all four sides. The main entrance appears to be in the centre of the south-western wing in Priory Field where access was gained from the extensive yard that lay between this building and the military granaries described above. It is unclear if the courtyard was provided with a covered ambulatory, though it does appear that the ranges around the central space were all architectural similar and together comprise a single structure perhaps with a single function. It was proposed that this building was a *horreum* (store or warehouse) where non-perishable goods would have been kept (Guest and Young 2007, 128–9), and the results of the 2007 survey support this interpretation. A trial trench excavated immediately in front of the courtyard building was followed by a larger excavation over the southern part of the front wing in 2008 (Gardner and Guest 2007, 3; Guest and Gardner 2008), and this work will continue in 2010.

CONCLUSIONS

The geophysical surveys in School Field, Golllege's Field and Priory Field in 2007/08 have revealed a great deal of new information about the western dextral part of *Isca* (Fig. 8). A previously unknown complex of buildings around a central courtyard, probably a *fabrica* or workshop, was located in School Field together with the ends of at least five barracks blocks, perhaps of the Legion's senior *Cohors Prima*. In Priory Field the extended resistivity survey provided more details of the granaries and courtyard store-building first identified in 2006. Neither field appears to have been occupied after the Roman period, with the remains of field boundaries and fences the only evidence of relatively recent agricultural activity.

The courtyard complex in School Field completely filled *insula* XVIII of the fortress and it is proposed, based on the ground-plan and the very high magnetic readings recorded from the buildings, that this was a *fabrica* or workshop, probably where the many metal items required by the Second Augustan Legion would have been made and repaired. The similarity of the School Field *fabrica* with those from Inchtuthil and Exeter confirms the existence of a distinctive British type of legionary *fabrica* that consisted of a central courtyard and surrounding ranges or wings, where smithing and other metalworking activities took place in large aisled basilican halls (Pitts and St Joseph 1985, 114).

Several other workshops have been identified in Caerleon, all in the same lateral row of *insulae* (*scamnum*) as the School Field complex. The large aisled hall that occupied much of the adjacent block to the north-east (*insula* XIX) was originally described as a 'spacious peristyled courtyard' by its excavator, although it would be later reinterpreted as a *basilica exercitatoria* (Nash-Williams 1929a, 142; Nash-Williams 1969, 32). Further excavations in 1986 showed that, unusually for *Isca*, the basilican hall was constructed from the outset in stone, while the large quantities of ash and metalworking slag from all phases of the building's history suggest a *fabrica* involved with iron-smithing rather than an exercise hall (Boon 1987, 54; Frere 1987, 307). To the north-east, the first *insula* on the sinistral side of the same *scamnum* (*insula* XXI) was occupied by a courtyard building at first thought to be a hospital or 'training establishment' (Nash-Williams 1929b, 246–51). However, the identification of the remains of a

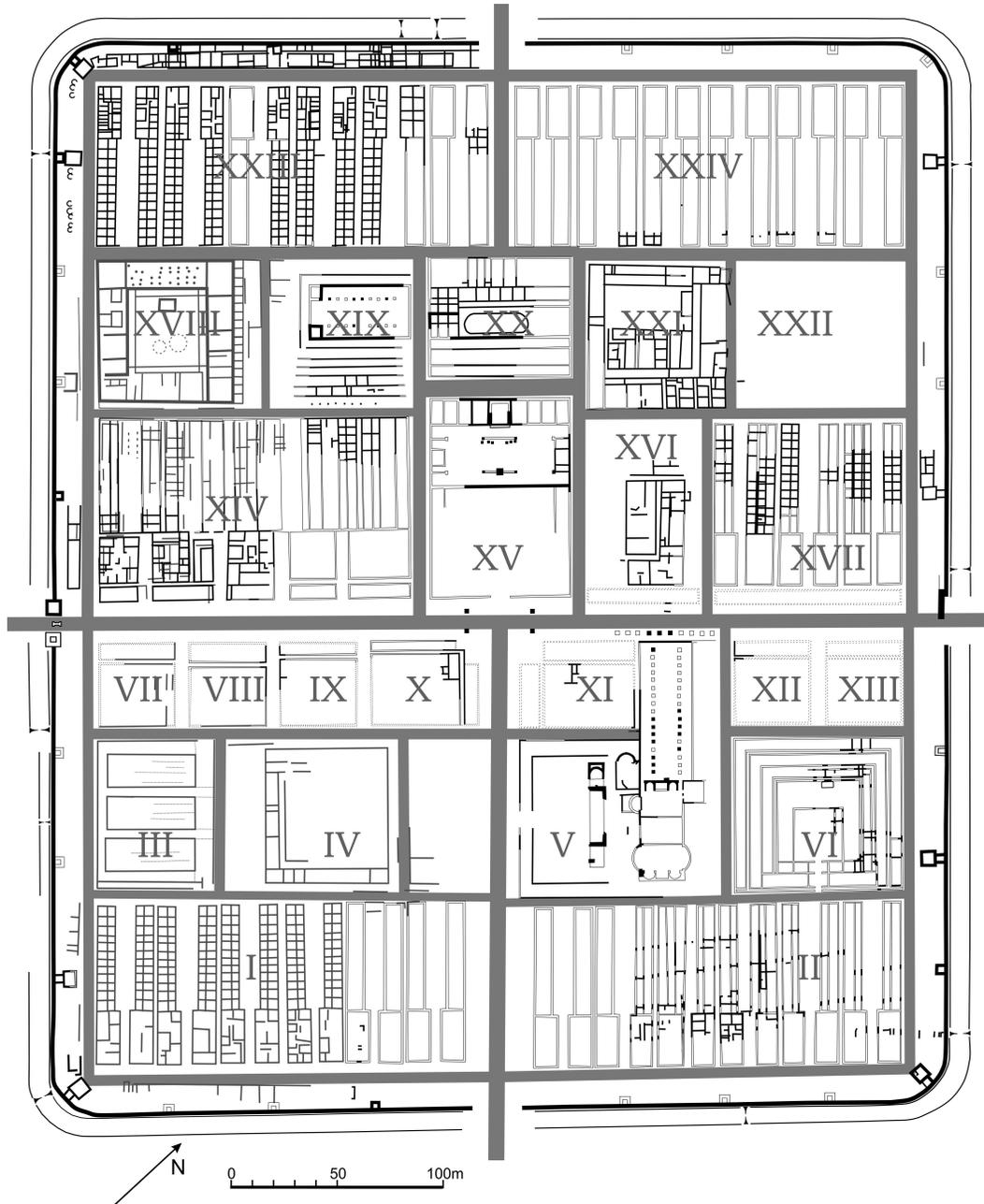


Fig. 8. Interpretation of 2007/8 geophysical survey results superimposed on the fortress plan.

steeping-tank for the preparation of leather, of which only the lead strapwork survived, suggests that this complex is better interpreted as a *fabrica*, including activities other than metalworking (later excavations produced evidence of large-scale lead working). The long narrow halls (open plan but not aisled) on at least two sides of the courtyard perhaps would have been for manufacture or storage, while two small buildings projecting into the courtyard are tentatively identified as ‘houses’ for the *fabrica*’s craftsmen and officers (Jarrett 1969, 32; Boon 1987, 54–5). Thus, at least three of the five *insulae* in the School Field *scamnum* were occupied by *fabricae* that together form a workshop ‘zone’ (perhaps *scamnum fabricarum*) at the rear of the fortress, where the manufacture of various materials and commodities took place on an almost industrial scale.⁶ The central *insula* of this *scamnum* (XX) is often claimed to be the location of the *praetorium*, though there is no direct evidence to suggest that the building here was indeed the legate’s residence. Unfortunately, the excavation undertaken in this *insula* in 1930 was not fully published and, consequently, the building is only imperfectly understood. Its plan seems to centre on a paved courtyard with a round-ended ‘pool’, while the building itself was constructed (in its later phases at least) in monumental masonry. The interpretation of this building as the *praetorium* rests on its location behind the *principia*, and the identification of pools in the *praetoria* at Xanten on the Rhine (Grimes 1935, Nash-Williams 1936, Boon 1987, 50, Evans 2004, 4). A location between two workshops seems an incongruous location for the legate’s residence and the possibility that the building in *insula* XX was, like its neighbours, also associated with manufacturing should be investigated further.⁷

The extended resistivity survey in Priory Field demonstrates that the dextral side of the fortress’ *praetentura*, closest to the *porta principalis dextra*, also contained a group of buildings in two *insulae* that together served related functions. The architectural details of the military granaries are significantly clearer, while the complete ground plan of the square courtyard building on the opposite side of the open yard is very similar to civil *horrea* in Italy (Guest and Young 2007, 128–9). If these identifications are correct, the part of the fortress in the vicinity of the gate leading directly to the port facilities on the Usk was dedicated to the storage of foodstuffs and perhaps other commodities, including perishable items, that were brought in by ship and boat. This storage ‘zone’ included three very large granaries, each about 42m long and 15m wide, which could have kept a substantial quantity of grain to keep the garrison supplied with their bread ration. It has been suggested in the past that a permanent legionary fortress might have maintained more than one group of granaries within its walls, yet at Caerleon it is difficult to imagine where another three such large buildings would fit: recognisable buildings are now known in every part of *Isca*, with the single exception of *insula* XXII.

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NOTES

1. Today School Field is used as the running track and sports field for the Caerleon Endowed Schools.
2. The surveys were directed by Dr Tim Young and Dr Alan Lane and were the practical element of the undergraduate ‘Surveying and Prospecting’ module at the Cardiff School of History & Archaeology, Cardiff University. The surveys were conducted during the Easter vacation with the kind co-operation of the Trustees of the Caerleon Endowed Schools (School Field), Cadw, Mr

Michael Haines of Broadway Farm and Mr Miguel Santiago of The Priory Hotel. We are grateful to Mr Andrew Seaman, postgraduate demonstrator, and to the students who took part in the survey.

3. The survey was laid out using a Trimble 4700/5700 RTK GPS system. For further details of the magnetic gradiometer survey methodology see Guest and Young 2007, 117–9.
4. See Guest and Young 2007, Fig. 2 for details of the 2006 resistivity survey location and grid layout in Priory Field.
5. See Guest and Young 2007, 117–9 for further details of the multiple-spaced resistivity survey methodology, and Fig. 9 for the results of the different probe spacings.
6. The *insula* closest to the *porta principalis sinistra* (XXII) lies beneath Orchard House. A geophysical survey was undertaken in the grounds in April 2008, but unfortunately the results were inconclusive and did not reveal the layout of any individual buildings. This was partly because the gardens contain numerous trees and raised beds, but also because it appears that large quantities of ash and other burnt material (not necessarily Roman) are spread across the gardens. Therefore, the layout and function of the buildings in this *insula* remain uncertain.
7. The building to the east of the *principia* (*insula* XVI), which Boon and von Petrikovits identified as a bazaar-type *fabrica*, has been recently re-evaluated by Mark Lewis who, using archaeological as well as architectural evidence, argues convincingly that this building should be identified as the legate's *praetorium* (Lewis forthcoming).

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