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Nederlandse Oudheden 20

The Roman villa at Voerendaal-Ten Hove

Excavations of a Late Iron Age enclosure, a Roman villa complex, a Late Roman-Early Medieval settlement and burials

Part I - The site

H.A. Hiddink (ed.)

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provincie limburg

LIMBURGS MUSEUM
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Part I - The site

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Willem Willems about to enjoy an ice cream, Schoeningen Lower Saxony. (source: Olivier & De Wit 2015, 7)

Preface

This substantial publication about the excavations of Villa Voerendaal has a somewhat unusual production history. It is not uncommon for excavations conducted in the period before 2002, when a reporting obligation was introduced, to have been insufficiently published. Fortunately, much has been done about this backlog in recent years, using incidental resources. Distinguished toponyms from Dutch archaeology, such as the sites of Wijk bij Duurstede-Dorestad, Nijmegen-Kops plateau, Texel-Den Burg and Valkenburg-De Woerd, are now available in scientifically sound reports. But there is still a lot of research material in depots awaiting better times. In particular, the unfinished research on the prehistoric site of Aartswoud features on many lists.

Villa Voerendaal is another name that has resonated for decades within the Dutch archaeological community. The fact that it is now being published, more than 35 years after the extensive excavation of a substantial portion of this Roman villa complex, is a cause for celebration. It puts an end to the lack of good scientific reporting. This report is likely to become a standard work for Roman villa research and the Roman period in general, not just in the Netherlands.

As said, the route to publication has been unusual, and one that is inextricably linked to the name of Willem Willems. Before Willems was appointed director of the Archaeological Heritage Agency (Rijksdienst voor het Oudheidkundig Bodemonderzoek, ROB), he was provincial archaeologist for Limburg. A court decision obliged the ROB to begin excavations at the Villa Voerendaal site, under Willems' direction naturally. As was often the case at the time, nothing was published, a fact that apparently continued to haunt Willems for many years to come.

Willem Willems passed away in December 2014 at the age of 64, following a short illness. A few days before his death, he had been in email contact with Cees van 't Veen, director of the Cultural Heritage Agency (Rijksdienst voor het Cultureel Erfgoed, RCE). Willem said that it would ease his mind if the Voerendaal excavation from the 1980s were to be picked up again. The promise made then – and repeated at the memorial occasion for Willem – is now being fulfilled.

The project to continue the excavations of the Villa Voerendaal has led to a special collaboration between the Limburgs Museum, the province of Limburg and the RCE. Many archaeologists, specialists, companies and organizations have contributed to making the scientific work possible, supplemented by activities for a wider audience. However, it is highly appropriate for me to single out one name in particular. It is thanks to the expertise, dedication and perseverance of archaeologist and project leader Henk Hiddink that this project has been brought to a successful conclusion.

And of course it seems more than appropriate to dedicate this publication to the memory of Willem Willems.

Leonard de Wit
Cultural Heritage Agency

Summary

The Roman villa of Voerendaal-Ten Hove is situated in an undulating loess basin, 5 km west of the *vicus* Coriovallum/Heerlen. In 1892-1893 the first excavations were conducted by Jos Habets, the 'keeper of records for Limburg', but his untimely death prevented the publication of the results. In the years 1947-1950 four excavation campaigns were organized by Cees Braat of the RMO at Leiden, involving the investigation of parts of the two main buildings, the baths and the *horreum*. Later, the ROB was obliged to excavate the area around the buildings dug by Braat because attempts to classify the site as a protected archaeological monument had failed. After this large-scale investigation between 1985 and 1987, led by Willem Willems, over six hectares had been excavated. Because of the layers of colluvium along the southern border of the site, several excavation levels were needed, resulting in an excavated area of some 10 hectares.

The results of the investigations by both the RMO and ROB were published in just a few articles, an unsatisfactory state of affairs because Voerendaal-Ten Hove is one of only three Dutch villas to be excavated more or less in their entirety (along with Hoogeloon-Kerkakkers and Kerkrade-Holzkuil). Grants from the State and the Province of Limburg have made it possible for a team of specialists to fully analyse and publish the structures, features and finds from 2019 onwards.

Flint artefacts are the oldest archaeological remains, dating mainly to the Late Mesolithic and the Middle Neolithic. Two clusters of pits from the Early and Middle Iron Age (period 1a-b) are the earliest features. They possibly represent just as many yards surrounding house plans that have been erased by soil erosion. A small, not fully excavated enclosure (some 90 x 90 m) existed during the Late Iron Age (period 1c). Its deep V-shaped ditch was probably combined with an earthen bank in its interior. At least two house plans were found here, with a third one just outside the ditch in the east. With their combined two-/three-aisled construction, the buildings bear a similarity to familiar house types in the south of the Netherlands (Haps type, Weert), although their width of 9-10 m is remarkably large. The complex dates between 250-100/50 BC and seems to have been abandoned long before the campaigns of Julius Caesar. The small, defended site housed an elite family operating at the local and possibly regional level.

There are no firm indications for habitation between c. 50 BC-AD 25. At least one two-aisled Alphen-Ekeren house appeared around the latter date, together with a small outbuilding, a pit and some ditches (phase 2a). Partly contemporaneous with or succeeding this 'indigenous' farm, building 409 was constructed around the middle of the 1st century AD (phase 2b). Its wall ditch, wood-lined cellar and possibly a portico set it apart from known regional building traditions. It can perhaps be interpreted as a kind of 'proto-villa'. It is important to note that our view of the post-built phase could be distorted by the large non-excavated area and the mediocre quality of the excavations around the stone villas.

The first villa was built in the second half of the 1st century AD (phase 2c). It was of modest size and consisted of a range of small rooms around a large central place. Although the building had a stone foundation, it is not clear whether it was fitted with a portico or even a tiled rather than a shingled roof. The complex also consisted of a series of wooden outbuildings, but their function is not known, as holds true for the development of the complex as a whole.

The same applies to period 3 of the larger second villa. Finds in the upper infill of the cellar in building 409, which is intersected by the foundation of stone outbuilding 403, date the start of this period around AD 125 or shortly after. Why the main building was replaced by a new one will never be known, but perhaps there was a new owner. A potential indirect cause could have been the foundation of the Colonia Ulpia Traiana at Xanten, when the Baetasian (?) territory around Heerlen and Voerendaal became part of the larger *civitas Cugernorum*. This would have given a new impetus to elite competition. In any case, the layout of the villa reflects the ambition to create an impressive ensemble. The main building as such was not especially large, but obtained a degree of monumentality by the addition of a 130 or even 160 m long portico with

3 m high columns. Furthermore, the positioning of the baths and outbuildings resulted in a symmetrical layout. The central axis was emphasized by a gatehouse and a Jupiter column. A separate wall defined a '*pars urbana*', including the main building, *horreum* and baths. Behind the villa, at least one small temple was built – its function indicated by several graffiti with names – and perhaps a second example, or else a grave monument. A special feature was a stone aqueduct, covering a distance of 1500-1800 m between the source of the Hoensbeek and the baths.

It is not certain whether the production of grain (mainly spelt) was the only source of income that paid for the monumental complex, but the available area of loess (some 200 ha) was a favourable precondition and the capacity of the *horreum* (some 100 tonnes) suggests that high yields were indeed a reality. Most finds suggest no obvious signs of wealth. For instance, there are few remains of mural paintings. However, Mediterranean marble and granite from far outside the region were used in the villa, for floor/wall tiles and basins respectively. The quantity of terra sigillata, black-slipped ware, metal objects and glass is comparable to other sites in our region. Most of the pottery for everyday use was produced in nearby Coriovallum, supplemented by vessels from the wider region. However, the range of amphorae types is relatively 'rich', not merely the well-known Dressel 20 with olive oil from the south of Spain, but also amphorae with fish sauce from the same area and South Gaul, as well as wine amphorae from the latter region.

Braat claimed to have observed a layer indicating the destruction of the villa and *horreum* by fire, but this was no longer present during the ROB excavations. Nevertheless, charred grain was found among the foundations of the latter building, radiocarbon dated between AD 250-400. The first date suggests a possible destruction during or shortly after the episode of the Imperium Galliarum. A square stone tower in the eastern part of the (former) villa fits well in the same historical context. An archaeological date for the end of 'Roman' period 3 is provided by a pair of graves, dug before c. AD 325.

A relatively small number of coins and metal objects, combined with a fair amount of pottery, date a subsequent habitation phase (4) from c. AD 375/400 onwards. The partly excavated settlement, or rather hamlet, consisted of two or three farms, surrounded by sunken-floored huts and small hearths. Similar sites are generally interpreted as 'Germanic'. Although fragments of some handmade vessels were collected, the houses are not obviously of a 'northern' character. It is possible that the population was of a different origin, from regions on both sides of the Rhine. Argonne sigillata and coarse-walled pottery from Mayen show an integration into regional exchange networks, while an amphora from the East Roman empire is indicative of connections over large distances.

Continuity cannot be proven, but the site was inhabited into the Early Middle Ages. Besides at least one modest yard, a small cemetery was laid out around the remains of a Roman stone outbuilding. The pottery, belt fittings and some weaponry show that the 6th/7th-century population consisted of 'farmer-warriors', an elite comparable to that of the Late Iron Age enclosure. The site was left shortly after 700 AD and was only used as arable thereafter.

Samenvatting

De Romeinse villa van Voerendaal-Ten Hove is gelegen in een zacht golvend lössbekken op 5 km ten westen van de *vicus* Coriovallum/Heerlen. De eerste opgravingen vonden plaats in 1892-1893 door de Limburgse rijksarchivaris Jos. Habets, maar door diens overlijden werden ze nooit gepubliceerd. In de jaren 1947-1950 ondernam Cees Braat vanuit het RMO in Leiden vier opgravingscampagnes, waarbij delen van de beide hoofdgebouwen, het bad en het *horreum* werden onderzocht. De ROB zag zich gedwongen om van 1985 tot 1985 het areaal rondom de door Braat onderzochte gebouwen op te graven, toen het niet lukte om het gehele terrein aan te wijzen als beschermd archeologisch monument, Na dit grootschalige onderzoek onder leiding van Willem Willems was ruim 6 hectare van de vindplaats opengelegd, inclusief de oudere onderzoeken. Een pakket colluvium aan de zuidzijde van het terrein maakte hier de aanleg van meerdere vlakken nodig, zodat in feite 10 hectare is opgegraven.

Van de onderzoeken van zowel het RMO als de ROB is alleen verslag gedaan in enkele artikelen, hetgeen onbevredigend was gezien het feit dat Voerendaal-Ten Hove slechts één van de drie min of meer volledig opgegraven villa's binnen Nederland is (met Hoogeloon-Kerkakkers en Kerkrade-Holzkuil). Subsidies van het Rijk en de Provincie Limburg maakten het vanaf 2019 mogelijk de structuren, sporen en vondsten met een team van specialisten uitvoerig te bestuderen en te publiceren.

Vuurstenen artefacten vormen de oudste archeologische resten. Ze dateren vooral in het laat mesolithicum en het midden neolithicum. Twee clusters kuilen uit de vroege en midden ijzertijd (periode 1a-b) zijn de vroegste grondsporen. Mogelijk lagen hier evenzovele erven rond door erosie verdwenen huisplattegronden. In de late ijzertijd (periode 1c) was sprake van een kleine *enclosure* (c. 90 x 90 m). De diepe V-vormige gracht ging vermoedelijk aan de binnenzijde vergezeld van een aarden wal. Op het binnenterrein zijn tenminste twee huisplattegronden aangetroffen, met een derde direct ten oosten van de gracht. De gebouwen vertonen door een gecombineerd twee- en drieschepige constructie verwantschap met bekende huistypen uit Zuid-Nederland (type Haps, Weert), al zijn ze met 9-10 m opvallend breed. Het complex lijkt te dateren in de periode 250-100/50 voor Chr. en waarschijnlijk is het al lang voor de operaties van Julius Caesar verlaten. De kleine versterking huisvestte een elitefamilie die zeker op een lokaal niveau opereerde en mogelijk zelfs op een regionaal niveau.

Er zijn geen concrete aanwijzingen voor bewoning tussen c. 50 voor-25 n. Chr. Rond laatstgenoemd jaar verschijnt er tenminste één tweeschepig Alphen-Ekerenhuis met een dito bijgebouwtje, een kuil en enkele greppels (fase 2a). Deels gelijktijdig met, of volgend op deze 'inheemse' boerderij werd gebouw 409 rond het midden van de eerste eeuw n. Chr. geconstrueerd (fase 2b). Door de aanwezigheid van een wandgreppel, een met hout beschoeide kelder en mogelijk een porticus is het niet in een (bekende) regionale bouwtraditie te plaatsen. Mogelijk was sprake van een soort 'proto-villa'. Hierbij moet worden aangetekend dat ons beeld van de houtbouwfase(n) onvolledig kan zijn door het toch nog grote niet-onderzochte areaal en het karakter van de oudere opgravingen rond de beide stenen villa's.

In de tweede helft van de eerste eeuw (fase 2c) is de eerste villa opgetrokken, een bescheiden structuur bestaand uit een reeks van kleine vertrekken rond een grote centrale ruimte. Het gebouw had een fundering van steen, maar het is onduidelijk of het was voorzien van een porticus of zelfs een pannendak (shingles?). Rondom bevond zich een reeks houten bijgebouwen, maar hun functie en de precieze ontwikkeling van het complex zijn niet vast te stellen.

Dit geldt eveneens voor de tweede, grotere villa (periode 3). Vondsten boven in de kelderkuil van gebouw 409, die wordt oversneden door de muur van het stenen bijgebouw 403, dateren het begin van deze periode rond 125 n. Chr. of kort daarna. De redenen voor vervanging van het hoofdgebouw blijven onbekend, al is het mogelijk dat sprake was van een nieuwe eigenaar. Een potentiele indirecte aanleiding is de stichting van de Colonia Ulpia Traiana bij Xanten, waardoor het Baetasische (?) gebied rond Heerlen en Voerendaal deel ging uitmaken van de grotere *civitas Cugernorum*. Dit zal nieuwe impulsen aan de elite-competitie hebben

gegeven. Hoe het ook zij, de opzet getuigt van de ambitie een indrukwekkend ensemble te realiseren. Het hoofdgebouw was op zich niet bijzonder groot, maar kreeg een monumentaal uiterlijk door toevoeging van een 130 of zelfs 160 m lange porticus met 3 m hoge zuilen. Voorts zorgde de plaatsing van de bijgebouwen voor een symmetrische opzet van het complex. De centrale as werd gemarkeerd door een poortgebouw en een Iuppiterzuil. Een aparte muur definieerde een '*pars urbana*', met het hoofdgebouw, *horreum* en bad. Achter de villa lag tenminste één tempeltje - aangetoond door verschillende graffiti met namen - en een mogelijk tweede exemplaar. Een bijzonder element was een stenen aquaduct van c. 1500-1800 m lang tussen de bron van de Hoensbeek en het badgebouw.

Het staat niet vast of de productie van graan (voornamelijk spelt) de enige inkomstenbron was die het monumentale complex financierde, al vormde het beschikbare lössareaal (c. 200 ha) een gunstige randvoorwaarde en de capaciteit van het *horreum* (c. 100 ton) suggereert werkelijk hoge opbrengsten. De vondsten getuigen niet direct van een grote rijkdom. Van de muurschilderingen is bijvoorbeeld weinig overgebleven. Wel blijken Mediterraan marmer en graniet van ver buiten de regio te zijn toegepast in respectievelijk vloer- en/of wandtegels en bekkens. De hoeveelheid terra sigillata, metaalglanswaar, metalen voorwerpen en glas is gebruikelijk voor onze streken. Het grootste deel van het gebruiksaardewerk is geproduceerd in het nabijgelegen Coriovallum, aangevuld met materiaal uit de omringende regio. Het amforenspectrum is wel betrekkelijk 'rijk', niet alleen de bekende Dressel 20 met olijfolie uit Zuid-Spanje, maar ook vissausamforen uit dit gebied en uit Zuid-Gallië, en wijnamforen uit laatstgenoemde regio.

Braat meende een brandlaag over de villa en het *horreum* te hebben waargenomen, maar deze is niet (meer) bij de ROB-opgravingen aangetroffen. Wel is bij het laatste gebouw verkoold graan verzameld, ^{14}C-gedateerd tussen 250 en 400 n. Chr. De eerste datum suggereert een eventuele verwoesting tijdens of kort na het tijdvak van het Imperium Galliarum. Een vierkante stenen toren in de oostelijke helft van de (voormalige) villa kan zeer wel in dezelfde context thuishoren. In elk geval zijn wordt een einddatum van de 'Romeinse' periode 3 gegeven door een tweetal graven daterend vóór c. 325 n. Chr.

Een bescheiden aantal munten en metalen voorwerpen, gecombineerd met het nodige aardewerk dateren een volgende bewoningsfase (periode 4) vanaf c. 375/400 n. Chr. Er was sprake van een gehucht - slechts half opgegraven van gemiddeld twee, hooguit drie gelijktijdige huizen, omringd door hutkommen en kleine oventjes. Vergelijkbare nederzettingen worden doorgaans als 'Germaans' bestempeld. Hoewel er scherven van handgevormd vaatwerk zijn is aangetroffen, zijn de huisplattegronden niet direct als 'noordelijk' te karakteriseren. De bevolking kan een diverse herkomst hebben gehad, van beide zijden van de Rijn. Argonne sigillata en gebruiksaardewerk uit Mayen wijst op een integratie in regionale uitwisselingsnetwerken, terwijl een amfoor uit het Oost-Romeinse rijk zelfs van connecties over veel grotere afstanden getuigt.

Continuïteit is niet aan te tonen, maar er wordt op het terrein gewoond tot in de vroege middeleeuwen. Naast tenminste één bescheiden erf is er een groepje graven dat rond de overblijfselen van een Romeinse schuur is aangelegd. Aardewerk, gordelbeslag en enkele wapens geven aan dat de zesde/zevende-eeuwse bewoners boeren-krijgers waren, een 'elite' op een niveau vergelijkbaar met dat van de groep van de Late IJzertijd-*enclosure*. Kort na 700 n. Chr. komt er een einde aan de bewoning op het terrein en sindsdien is het alleen als landbouwgrond gebruikt.

Zusammenfassung

Die römische Villa Voerendaal-Ten Hove liegt in einem sanft gewellten Lössbecken, 5 km westlich des *vicus* Coriovallum/Heerlen. Die ersten Ausgrabungen durch den Limburger Staatsarchivar Jos. Habets fanden in 1892-1893 statt, aber aufgrund seines Todes wurden sie nie veröffentlicht. In den Jahren 1947-1950 führte Cees Braat vom RMO in Leiden aus vier Grabungskampagnen durch, bei denen Teile der beiden Hauptgebäude, des Bades und des *horreums* untersucht wurden. Das ROB war gezwungen, das Gebiet um die von Braat von 1985 bis 1985 untersuchten Gebäude freizulegen, da es nicht gelungen war die gesamte Gelände zu einem geschützten archäologischen Denkmal zu verwandeln. Letztendlich dieser Kampagnen unter Führung von Willem Willems war mehr als 6 Hektar ausgegraben, einschließlich. Das Kolluvium entlang der Südseite des Geländes erforderte hier mehrerer Ausgrabungsflächen, so dass tatsächlich 10 Hektar ausgegraben wurden.

Über die Untersuchungen sowohl des RMO als auch des ROB wurde nur in einige kürze Artikeln berichtet, ungenügend angesichts der Tatsache, daß Voerendaal-Ten Hove nur eine der drei mehr oder weniger vollständig ausgegrabenen Villen in den Niederlanden ist (mit Hoogeloon-Kerkakkers und Kerkrade-Holzkuil). Fördermittel des Landes und der Provinz Limburg ermöglichten es ab 2019, die Strukturen, Befunde und Funde mit einem Team von Spezialisten umfassend zu studieren und zu publizieren.

Feuersteinartefakte sind die ältesten archäologischen Überreste. Sie stammen hauptsächlich aus dem späten Mesolithikum und dem mittleren Neolithikum. Zwei Gruppen von Gruben aus der frühen und mittleren Eisenzeit (Periode 1a-b) sind die frühesten Spuren. Möglicherweise gab es ebenso viele Höfe, deren Hausgrundrisse durch Erosion verschwunden sind. In der Späteisenzeit (Periode 1c) gab es eine kleine befestigte Anlage (c. 90 x 90 m), umgeben durch ein tiefe V-förmige Graben, der ursprünglich vermutlich von einem Erdwall begleitet wurde. Spuren von mindestens zwei Häuser wurden im Hof gefunden und von ein dritter unmittelbar östlich des Kanals. Durch eine kombinierte zwei- und dreischiffige Bauweise sind die Gebäude mit bekannten Haustypen aus dem Süden der Niederlande (Haps, Typ Weert) verwandt, obwohl sie mit 9-10 m auffallend breit sind. Der Komplex scheint von 250-100/50 v. Chr. zu datieren. und wahrscheinlich wurde es lange vor Julius Caesars Operationen aufgegeben. Die kleine befestigte Siedlung war der Wohnplatz eine Elitefamilie auf lokaler, möglicherweise sogar regionaler Ebene.

Konkrete Hinweise auf eine Besiedlung zwischen c. 50 v. Chr.-25 n. Chr. gibt es nicht. Ungefähr erscheint mindestens ein zweischiffiges Alphen-Ekerenhaus mit einem kleinen Nebengebäude, einer Grube und einigen Gräben (Phase 2a). Gleichzeitlich oder kurz danach wurde das Gebäude 409 um die Mitte des 1. Jahrhunderts erbaut (Phase 2b). Aufgrund des Vorhandenseins eines Wandgräbchens, eines holzverkleideten Kellers und eventuell eines Portikus kann es nicht in eine (bekannte) regionale Bautradition eingeordnet werden. Es könnte sich um eine Art ‚Proto-Villa' handeln. Es sollte aber beachtet werden, daß unser Bild der Holzbauphase(n) aufgrund der Umfang des unerforschten Areals und der Art der Beobachtungen rund um die zwei Steinbauten unvollständig sein kann.

Die erste Villa wurde in der zweiten Hälfte des 1. Jahrhunderts (Phase 2c) erbaut. Es war ein bescheidener Bau, der aus einer Reihe kleiner Räume um einen großen zentralen Raum bestand. Das Gebäude hatte ein steinernes Fundament, aber es ist unklar, ob es einen Portikus oder sogar ein Ziegeldach (Schindeln?) gab. Es war von einer Reihe von hölzernen Nebengebäuden umgeben, deren Funktion unbekannt ist. Dasselbe gilt für die genaue Entwicklung des Komplexes.

Dies gilt auch für die zweite, größere Villa (Periode 3). Funde oben in der Kellergrube des Gebäudes 409, die von der Mauer des steinernen Nebengebäudes 403 durchschnitten wird, datieren den Beginn dieser Periode um 125 n. oder kurz danach. Die Gründe für den Ersatz des Hauptgebäudes sind unbekannt, obwohl es vielleicht einen neuen Eigentümer gegeben hätte. Ein möglicher indirekter Grund ist die Gründung der Colonia Ulpia Traiana bei Xanten, wodurch das Baetasische (?) Territorium um Heerlen und Voerendaal in der größeren Civitas Cugernorum eingegliedert wurde. Dies wird dem

Elite-Wettbewerb neue Impulse gegeben haben. Wie dem auch sei, der Aufbau zeugt von dem Wunsch, ein beeindruckendes Ensemble zu realisieren. Das Hauptgebäude selbst war nicht besonders groß, erhielt aber durch einen 130 oder gar 160 m langen Portikus mit 3 m hohen Säulen ein monumentales Aussehen. Darüber hinaus gab die Positionierung der Nebengebäude den Komplex einen symmetrischen Grundriss. Die Mittelachse wurde durch ein Torhaus und eine Jupitersäule betont. Eine separate Mauer definierte eine Art *pars urbana*, die Hauptgebäude, *Horreum* und Bad enthielt. Hinter der Villa befand sich mindestens ein kleiner Tempel - bezeugt durch verschiedene Graffiti mit Namen - und ein mögliches zweites Beispiel. Eine Besonderheit war eine steinerne Wasserleitung von etwa 1500-1800 m lang zwischen der Quelle des Hoensbeek und dem Bad.

Es ist nicht sicher, ob die Getreideproduktion (hauptsächlich Dinkel) die einzige Einnahmequelle war, die den monumentalen Komplex finanzierte, obwohl die vorhandene Lössfläche (ca. 200 ha) eine günstige Voraussetzung war und die Kapazität des *horreum* (ca. 100 Tonnen) wirklich hohe Erträge vermuten läßt. Die Funde weisen nicht direkt auf großen Reichtum hin. Von den Wandmalereien ist zum Beispiel wenig übriggeblieben. Mediterraner Marmor und Granit überregionaler Herkunft sind aber in Boden- und/oder Wandfliesen bzw. Becken verwendet. Die Menge an Terra Sigillata, Metallglanzware, Metallgegenständen und Glas ist in unseren Regionen üblich. Der Großteil der Gebrauchskeramik wurde im nahegelegenen Coriovallum hergestellt, ergänzt mit Material aus der umliegenden Region. Das Amphorenspektrum ist relativ ‚reich', nicht nur das bekannte Dressel 20 mit Olivenöl aus Südspanien, sondern auch Fischsauce-Amphoren aus dieser Region und aus Südgallien, sowie Weinamphoren aus demselben Gebiet.

Braat behauptete eine Feuerschicht über der Villa und dem *horreum* beobachtet zu haben. Diese ist jedoch bei den ROB-Ausgrabungen nicht (mehr) festgestellt. Aus dem letzten Gebäude wurde verkohltes Getreide gesammelt, das mittels die ^{14}C-Methode zwischen 250 und 400 n. Chr. datiert ist. Das erstgenannte Jahr deutet auf eine mögliche Zerstörung während oder kurz nach der Epoche des Imperium Galliarum hin. Ein quadratischer Steinturm in der östlichen Hälfte der (ehemaligen) Villa könnte gut in diesen Kontext gehören. Ein Ende der ‚römischen' Periode 3 wird jedenfalls durch ein Gräberpaar gegeben, das aus der Zeit vor c. 325 n. Chr. stammte.

Eine bescheidene Anzahl von Münzen und Metallgegenständen, kombiniert mit eine beträchtliche Menge Keramik, datieren eine nachfolgende Siedlungsphase (Periode 4) von c. 375/400 n. Chr. Es gab ein Weiler - nur für die Hälfte untersucht - von durchschnittlich zwei, höchstens drei gleichzeitigen Häusern, mit Rundum Grubenhäuser und kleinen Öfen. Ähnliche Siedlungen werden generell als „germanisch" bezeichnet. Obwohl Scherben von handgeformtem Geschirr gefunden wurden, können die Hauspläne nicht direkt als „nördlich" bezeichnet werden. Die Bevölkerung kann unterschiedlicher Herkunft gewesen sein, von beiden Seiten des Rheins. Argonnesigillata und rauhwandige Keramik aus Mayen weisen auf eine Einbindung in regionale Handelsnetze hin, eine Amphore aus dem Oströmischen Reich zeugt sogar von Verbindungen über weitaus größere Distanzen.

Kontinuität läßt sich nicht nachweisen, aber bis ins Frühmittelalter lebten hier Menschen. Neben mindestens einem bescheidenen Hof gibt es eine Gruppe von Gräbern, die um die Überreste einer römischen Scheune herum gebaut wurden. Keramik, Gürtelbeschläge und einige Waffen weisen darauf hin, daß die Bewohner des 6./7. Jahrhunderts ‚Bauern-Krieger' waren, eine Elite vergleichbar mit dem Bewohner der befestigte Eisenzeitsiedlung. Kurz nach 700 n. Chr. Die Besiedlung des Geländes endet und wird seitdem nur noch als Ackerland genutzt.

Part I - The site

1 Introduction

Henk Hiddink

1.1 The relevance of Voerendaal-Ten Hove

This publication presents the results of the excavations of a Roman villa near Voerendaal (province of Limburg; Fig. 1.1-1.2). The village of Voerendaal is situated 2 km west of Heerlen and 15 km northeast of Maastricht, in the centre of the small Dutch part of the loess belt that extends into the German Lower Rhine area and the Belgian Haspengouw/Hesbaye (Fig. 3.2). The site of the Roman villa lies 1 km west of the historical centre of Voerendaal, just north of a small road, the Steinweg, which roughly delineates the border between a loess ridge and the valley of the Hoensbeek (Fig. 2.6-7). The archaeologists called the site Ten Hove, after a nearby eighteenth-century courtyard farm building. An alternative could have been to name

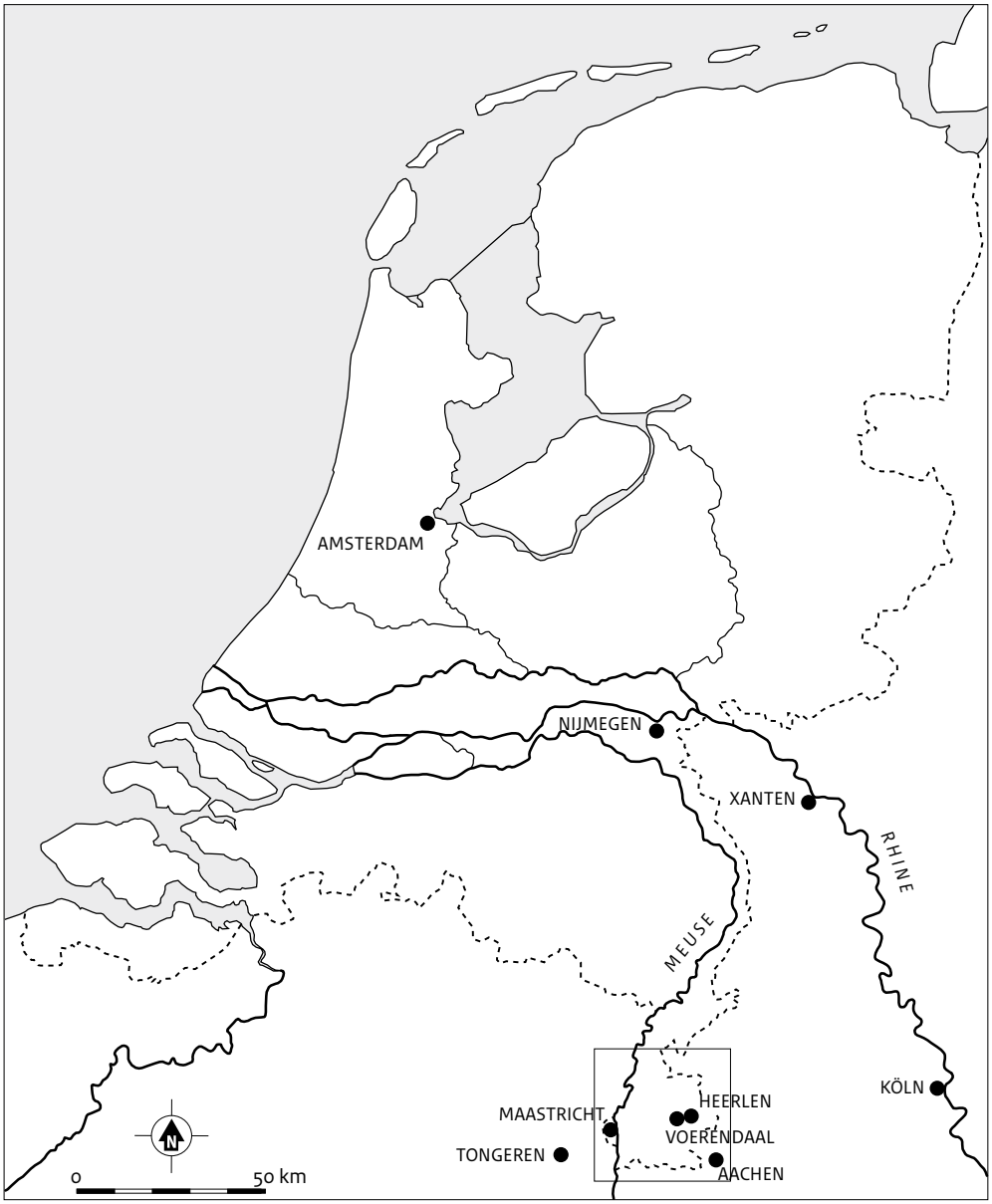


Fig. 1.1 The location of Voerendaal in the Netherlands; in the box location of figure 1.2.

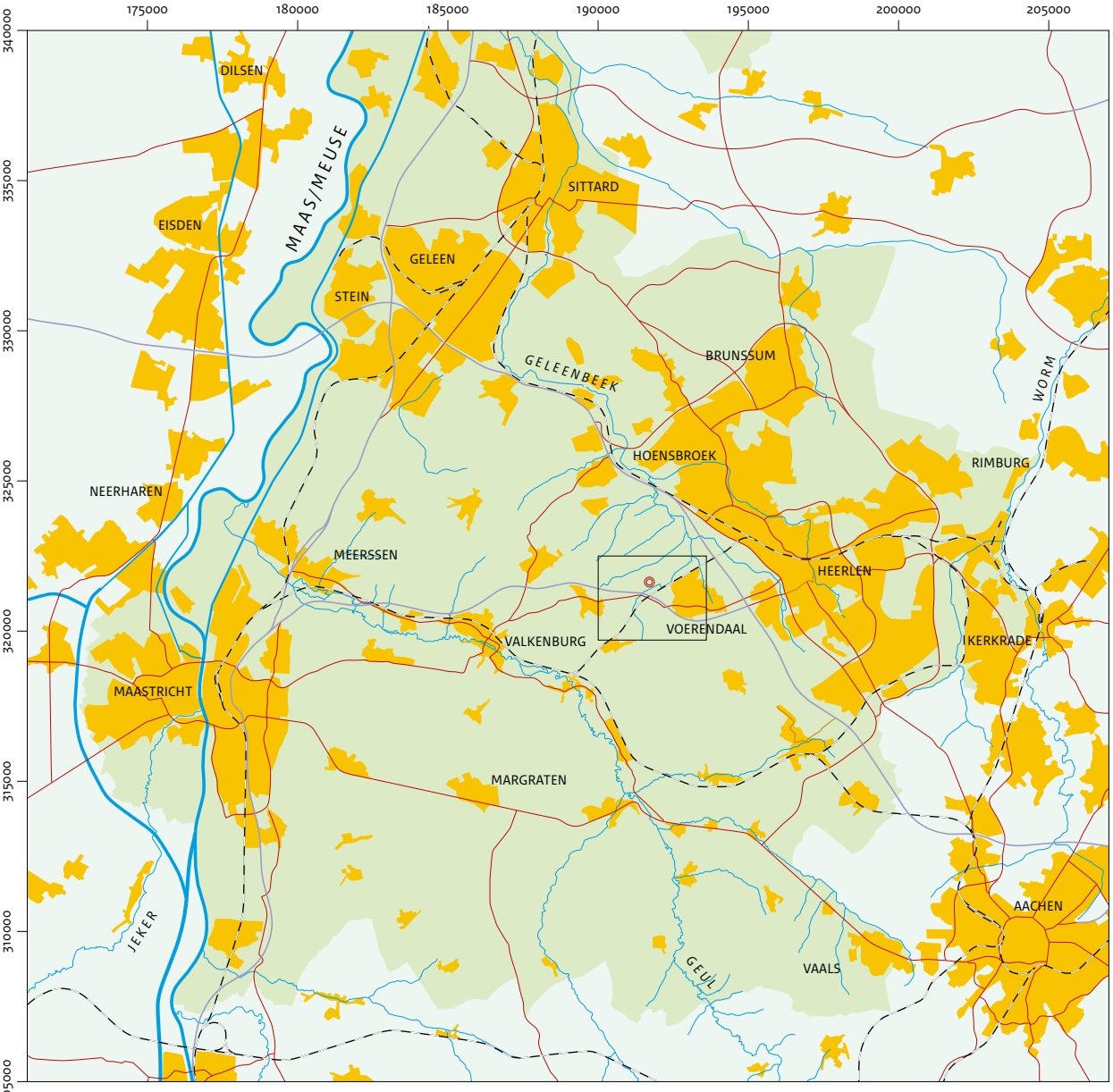


Fig. 1.2 Zuid-Limburg and surroundings, with the location of Voerendaal-Ten Hove (red dot) and in the box the area of figure 2.6-7 and 4.1-2.

it after the fields on the loess ridge (*Putterveld*), but this did not happen.[1]

Parts of the site were excavated in 1892-1893, 1929, 1947-1950, 1985-1987 and 2004. Although the results of all these investigations are the subject of this report, the main focus is on the large-scale excavations carried out in the 1980s by the State Service for Archaeological Investigations (ROB), directed by the late Dr W.J.H. Willems. Even after more than 30 years, the results of the ROB excavations are important and worthy of full publication.[2] In the Netherlands, only three villas – including Voerendaal – have been investigated in their entirety, not just the main building as in most other cases but also the outbuildings and other elements of the complex. The most recently excavated example, Kerkrade-Holzkuil, was published in 2005, only three years after the fieldwork was completed.[3] Like Voerendaal, the Hoogeloon-Kerkakkers site was excavated in the 1980s (1980-1987) and had to wait more than

1 After Puth castle at the eastern end: Tranchot map sheet 74E/75.
2 The most important preliminary reports are Willems & Kooistra 1987; 1988; Willems 1986; 1987; 1988; 1989; 1990; 1992.
3 Tichelman 2005; appendix XX, fig. 5.

30 years for publication.[4] Hoogeloon is interesting because it is an 'atypical' villa, situated in the heart of the coversand area and surrounded not by outbuildings but by seemingly autonomous farmhouses. Kerkrade is comparable to Voerendaal in size and is also located in the loess area but was less monumental than the latter. Our site at Ten Hove is also relevant because of the monumentality of the villa in its heyday – from a Dutch perspective at least. It was still very modest in size compared to villas elsewhere, such as Haccourt or Anthée in Belgium. An interesting aspect is the long occupation history of the site. There are features from the Iron Age, an enclosure and farms from the Late Iron Age, traces of Early Roman occupation and a predecessor to the large villa. The latter was followed by Late Roman to Early Medieval houses, sunken huts and burials. Such a long and varied use of the site is not attested for Kerkrade and Hoogeloon, which were only occupied during the Early and Middle Roman period.[5] Voerendaal also stands out for the extensive sampling and analysis of archaeobotanical remains, the results of which were published 25 years ago.[6]

1.2 Some comments on the publication

To do justice to the importance of Voerendaal-Ten Hove, this publication includes a comprehensive description of all structures and a large number of features, combined with discussions of the finds and dating evidence. The finds were studied by a team of some twenty specialists. As many objects as possible are illustrated to provide a representative overview of the material culture of a multi-period site in the Dutch loess area. Wherever possible, the structures, finds and occupation history of Voerendaal are viewed in the context of the wider region. Unavoidably, this report has various flaws, mainly as a result of time pressure and the magnitude of the task. What hadn't been accomplished in 35 years – the analysis and publication of an old and 'analogue' excavation of a large site – now had to be done in three. Although feasible in itself, the project was hampered by the fact that the finds were kept in three locations and by the constraints of the Covid-19 pandemic, making these locations as well as libraries temporarily inaccessible. These factors called for considerable improvisation and generated some disorder. Moreover, the multi-period character of the site posed a challenge. For example, the vast array of relevant themes and topics spanning a period of over 1000 years meant that the parallels cited are somewhat anecdotal in nature and that some decisions as to what should be discussed or left out are perhaps arguable. Decisions also had to be made about the composition of the text and the content of individual chapters. For instance, we decided to discuss all post-built structures in a single chapter in order to highlight this group of buildings. An alternative would have been to treat them in 'period-specific' chapters, but we chose not to do so because of the problems dating them. Ideally, several groups of find materials should be discussed in a single chapter, such as all pottery or at least Middle Roman versus Late Roman ceramic groups. However, we decided against this because of the number of specialists involved, the vast intervals between the submission of texts and their considerable length. If the project were one year longer, more editing could have been done, thereby restricting the size of the publication. Despite of all these shortcomings, however, a comprehensive presentation of structures and finds is available at long last.

We decided from the outset to make the report available to the international archaeological community. Because neighbouring 'villa countries' such as Belgium, France, Germany and Luxembourg use different languages, English was chosen as the modern lingua franca of archaeology. Although it took considerably longer, the vast majority of participants wrote their contributions in English.[7] It is not explicitly stated that citations from non-English literature are translations, but this follows from the language of the publications from which they originate. It is obvious, for instance, that Braat's publication from 1953 or the preliminary reports of Willems and Kooistra are in Dutch. Regarding topography, only the names of major rivers (Rhine, Meuse, etc.) are given in English. The same applies to the

4 Hiddink 2014a; 2015a.

5 The terms Early, Middle and Late Roman used in this publication are in accordance with the Dutch chronological system; see section 5.1 with fig. 5.1.

6 Kooistra 1991; 1996.

7 Only chapters 32 and 37, and appendices I and III, were translated in their entirety by Sasja van der Vaart-Verschoof; the English of chapter 17 was corrected by Maaike Groot. We would like to thank them both, as well as Annette Visser, who corrected the English of the remainder of the book.

names of regions if they are scholarly 'constructs' (e.g. the MDS area, Lower Rhine area), but most are given in their original language (Condroz, Aldenhovener Platte). The latter also holds true for place names. In fact, the only place with a common English name is Cologne/Köln, and here the German name is retained.[8] Unless stated otherwise, places in the Netherlands are situated in the province of Limburg and those in Germany in Nordrhein-Westfalen. For other places, the province or '*Land*' is given.[9] The Roman names of cities and *vici* are also mentioned. The location of the most relevant regions and selected sites can be found in Figure 3.2.

This publication is organized as follows: Part I, with Chapters 1-13, is devoted to the research history, the physical and cultural landscape of the area around Ten Hove, the phasing and formation processes of the site, as well as the various (types of) structures and features, such as post-built structures, the villa's main buildings, outbuildings, graves, etc. Part II forms the 'synthesis', where the site's different periods and phases are placed in the context of regional history and archaeology.[10] Chapter 14 discusses the 'pre-villa period', Chapter 15 the villa from c. AD 70 to 270 and Chapter 16 the site's Late Roman and Early Medieval habitation. Part III contains Chapters 17-39, with the results of the specialist analyses of the different groups of finds and samples. Part IV (Chapters 40-46) describes the structures and features and discusses the dating evidence. Part V contains a series of appendices and is not printed but published only in digital form. The appendices include elaborations on the databases used, tables with additional data (marked with * in the text of parts I-IV), notes on quantitative models, a considerable number of photos of finds and pottery fabrics, as well as additional plans of villas and post-built settlements used in comparisons.

1.3 Acknowledgements

Many people have contributed to the successful completion of the project and this publication, for which we wish to express our sincere thanks. Leonard de Wit initiated the project as a tribute to the excavator Willem Willems and to fulfil the latter's desire to get the site published. Leonard's colleagues at the Cultural Heritage Agency of the Netherlands (RCE) – Roel Lauwerier, Jos Deeben, Fred Brounen and Tessa de Groot – were responsible for preparing an Action Plan. Marc Driessen (Leiden University) was also involved during the initial stages of the project. Peter Schut (RCE) contributed to the project grant application and found important additional documentation, in particular the microfilms of some lost field drawings. The grant application proper was made by the Limburgs Museum, Venlo. Benoit Mater wrote the final application and represented the Museum for the first year and a half. Her successor was Anja Neskens (senior project manager exhibitions at the Limburgs Museum), who coordinated various exhibitions and events related to the Voerendaal project. Fokko Kortlang (ArchAeO, Eindhoven) coordinated the project in a practical sense, controlling the finances and contracts.

During the project, the finds and documentation of Ten Hove were made available by the staff of several museums and other organizations. Firstly, we would like to thank Sjeng Kusters, René Theunissen, Anke Dallinga and Carlos Trenado for their help and hospitality at De Vondst, Heerlen. At the National Museum of Antiquities, Leiden, the finds and documentation of the older excavations were made available by Heikki Pauts (collections registrar) and Robert Ritter (collection manager). Some finds on loan to the Limburgs Museum could be drawn and photographed thanks to Bibi Beekman (curator). Niels Stoffels (Restaura, Heerlen) provided x-rays of metal finds and Harry van Enckevort (Municipality of Nijmegen) successfully located a number of Argonne sigillata sherds in the legacy of Jan Thijssen. Wim Dijkman (Centre Céramique, Maastricht) dated most of the roller stamps on this sigillata and his colleague José Peeters brought to light some information on a bronze statuette. Frits Laarman (RCE) provided the original determination data on the animal bone. Sanne Palstra (CIO Groningen) assisted with the analysis of new radiocarbon/isotope data and the retrieval of old sample forms. So too did Klaas van der Borg (department of physics,

8 And it would simply sound wrong to name a famous villa 'Cologne-Müngersdorf', for example.

9 Abbreviations can be found in the list preceding the references at the end of part IV.

10 See further sections 3.1-2.

Utrecht University) with respect to old AMS data. Prof. Corrie Bakels (emeritus professor at Leiden University) provided valuable comments on Chapter 17. Finally, Bas and Marc Vervuurt gave us a tour of the Kunrader Steengroeve and provided information on the geology and working of the local limestone.

Obviously, this project could not have succeeded without the dedication of the team members, the specialists. Everyone put in many extra hours and made a substantial contribution to a better understanding of the site. The project also benefited greatly from the input of the scientific advisory committee: Nico Roymans (Vrije Universiteit, Amsterdam), Laura Kooistra (BIAX consult, Zaandam), Karen Jeneson (curator of the Thermenmuseum, Heerlen) and Tessa de Groot (RCE). Their comments helped to improve the text considerably and it goes without saying that we are responsible for any remaining errors. Tessa was also responsible for the project at the RCE during its final stages and for authorizing the manuscript.

2 The excavations at Ten Hove

Henk Hiddink and Diederick Habermehl

The investigations at Voerendaal-Ten Hove have a long and complex history. In this chapter we will describe the various excavations, the people involved and the research methods used. Besides published sources, we will use letters, notes and drawings from the archives of the National Museum of Antiquities, Leiden (RMO) and the former State Service for Archaeological Investigations (ROB).

2.1 Investigations by Habets 1892-1893

2.1.1 Course of the excavations

On 1 October 1891, a short article was published in the newspaper *Het Nieuws van den Dag*: 'Foundations, probably belonging to a Roman villa, were discovered near the leased farm of Ten Hove, Voerendaal (Limburg), owned by the widow of Eug. Van Oppen from Maastricht. Excavations will be carried out at the location next year.'[11]

We know from a letter that Jos Habets had suspected the presence of a Roman villa in this field for quite some time.[12] Habets was 'record keeper at the state archives' for the province of Limburg, as well as an expert on the region's antiquities (box 1). Now that the actual discovery of foundations had proved his suspicions correct, an initial trial excavation was planned for 1892. This excavation was financed with the help of several interested parties.[13] Two members of the Van Oppen family were closely involved from the start: Dr Jan Matthijs August van Oppen (rector of the gymnasium in Maastricht) and his nephew Leonard Joseph Van Oppen (a lawyer).[14]

Shortly after excavations began in the summer of 1892, the extent of the foundations proved to be far greater than expected. A newspaper article in the *Nieuwe Rotterdamsche Courant* of 20 August 1892 reported that by then a hypocaust and a cellar had been discovered (Fig 2.1A). The article also mentions Habets' intention to request funding from the Ministry of the Interior to continue the excavations.[15] Letters reveal his success in this matter. He was initially given a grant of 150 guilders. However, all the money was spent before the summer was over, while the excavations remained unfinished. He reported that the grant had made it possible to excavate 125 m of a building with a total length of 189 m and that 'More extensive foundations from the Roman period have not been found until now in Limburg and the size of this villa far exceeds our expectations.' He added '...it would be so sad for the history of our country if the remains of this villa were not studied thoroughly. Circumstances are highly favourable at present.' He asked for no less than 500 guilders. The Ministry granted him 250 guilders for 1892, emphasizing that he could apply for more in 1893 if need be.[16]

After the first newspaper articles, the discoveries at Voerendaal came to the attention of Willem Pleyte, who had been appointed director of the RMO in Leiden in 1892.[17] Following the initial contact, he remained involved and corresponded with Habets about the first excavation results. They agreed that Pleyte would visit the excavations in October 1892. However, Habets' health was deteriorating by then. In a letter addressed to Pleyte he writes: 'I cannot say if I will be recovered enough to accompany you on Tuesday. That depends on my "fragile body" and the weather conditions.' Pleyte visited the excavation, took notes and drew sketches of the foundations (Fig. 2.2) as well as of the finds held in nearby Haeren castle, which included a metal sieve, an iron sickle, decorated Samian ware and a 'Frankish knife' (sax).

On 20 April 1893, Habets again wrote to the Ministry of the Interior. This letter, untidily written with many deletions, can probably be seen as a sign that his health was deteriorating further (Fig 2.1B). In the letter Habets first described the results of the 1892 excavation, speaking of '...this remarkable excavation, the most extensive ever in the Netherlands.' He continued: '350 guilders are needed to finish the excavation, 250 guilders of which are to compensate the tenant of the land for disturbing and occupying his fields and 100 guilders for the remaining excavation itself.'

Unfortunately, Habets' days were numbered. On 22 June 1893 he passed away as the result of a heart condition. Soon after, director Pleyte wrote to the family to offer his condolences, at the same time telling them

[11] The widow in the article was Antoinette Gertrude van Oppen-Boots (1840-1928), who had lost her husband J.M. Eugène van Oppen, a daughter and a son in a gruesome murder in 1885 (Blok & Molhuysen 1933; Gerards 2000, 23). The Ten Hove farm was part of castle Haeren, owned by the Van Oppen family since 1882. For a detailed genealogy, see https://genwiki.nl/limburg/index.php?title=Van_Oppen (accessed 27-1-2020).

[12] In a letter to the Ministry of the Interior (20 August 1892) Habets writes: 'For quite some time I have suspected the presence of a Roman villa in Voerendaal on the parcel belonging to the widow Van Oppen.' (Jamar 1986, 97-98).

[13] See Jamar 1986.

[14] Leonard Joseph is called *'doctorandis in juribus'* in a letter by Habets and a 'student' in the newspaper articles. Because he was 51-year-old man, the newspapers used *doctorandus* in the sense of 'he who should become a *doctor*'.

[15] Cf. Jamar 1986.

[16] Jamar 1986, 99.

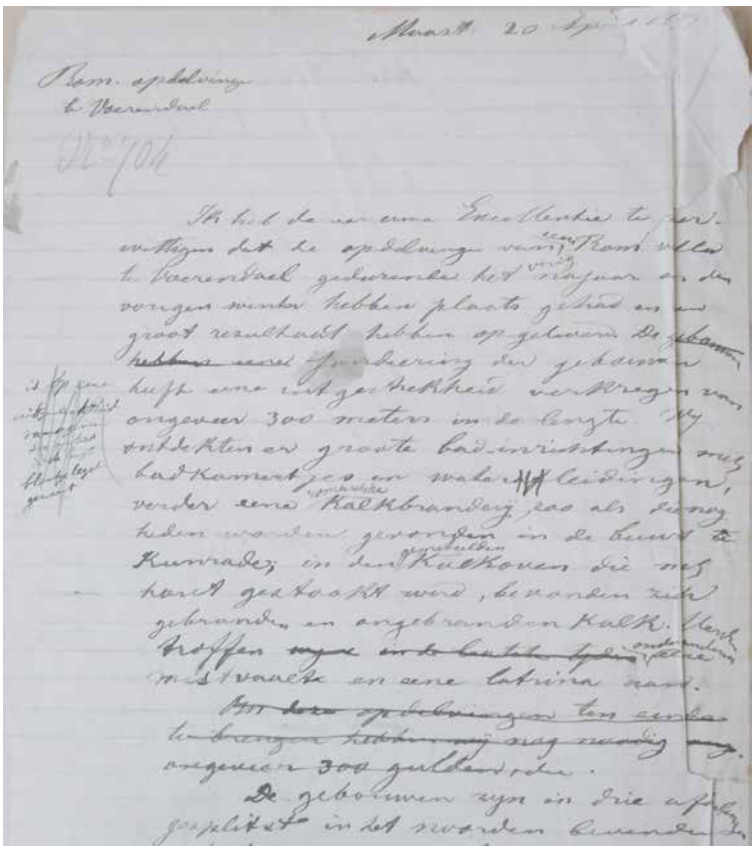
[17] RMO, Pleyte archive I, 69-75.

A

Wetenschappelijke Berichten.

Onlangs werd gemeld, dat bij Voerendaal (Heerlen), op de pachthoeve van mevrouw Van Oppen, een Romeinsch gebouw was ontdekt. Door de loffelijke bemoeiingen van de heeren Habets, rijks-archivaris, dr. Van Oppen, rector van het gymnasium te Maastricht, en J. van Oppen, jur. student, die Woensdag met den heer Serolea, ingenieur te Heerlen, op het terrein aanwezig waren, is thans met de opgraving dezer villa een aanvang gemaakt. Doch daar het blijkt, dat men te doen heeft met een gebouw van grooten omvang en de opgravingen met groote kosten gepaard zullen gaan, heeft de heer Habets het voornemen, bij de regeering eene subsidie aan te vragen. Men hoopt, dat dit verzoek zal worden ingewilligd. Reeds een gedeelte blootgelegd, o. a. het hypocaustum, eene kamer, die onder den vloer, op zuiltjes van tichelsteenen rustende, verwarmd werd; thans is men bezig met den kelder op te delven. Tot de gevonden voorwerpen behoort een sera, hangslot, zooals er een, doch in grooter formaat, te Rome in een graf gevonden is, en een ander in het Britsch museum bewaard wordt.

B



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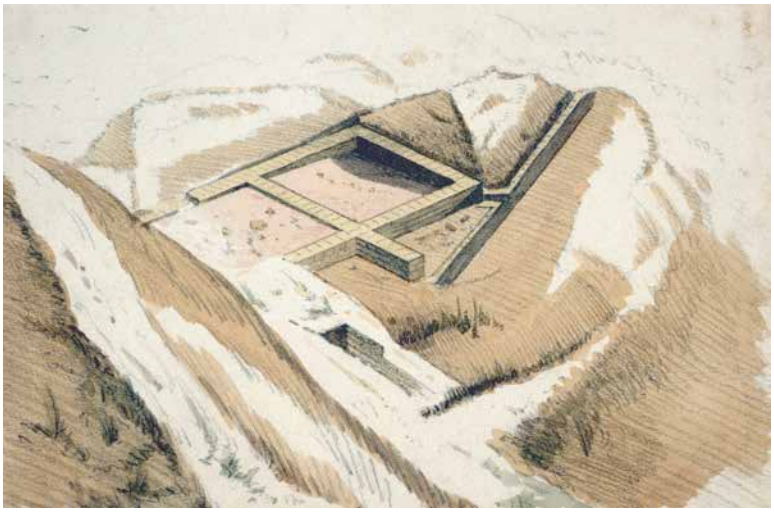


E

Fig. 2.1 Voerendaal-Ten Hove. Documents relating to Habets' excavations. (source: RMO, Leiden)
A newspaper clipping from the NRC; B part of the letter by Habets of the 20th of April, 1893; C some of Habets' finds, drawn for the annual report of the RMO; D drawing by C. Hoffmann of drain β/328, connected to room 7 (piscine) of the baths; E portrait of Jos. Habets from his prayer card.

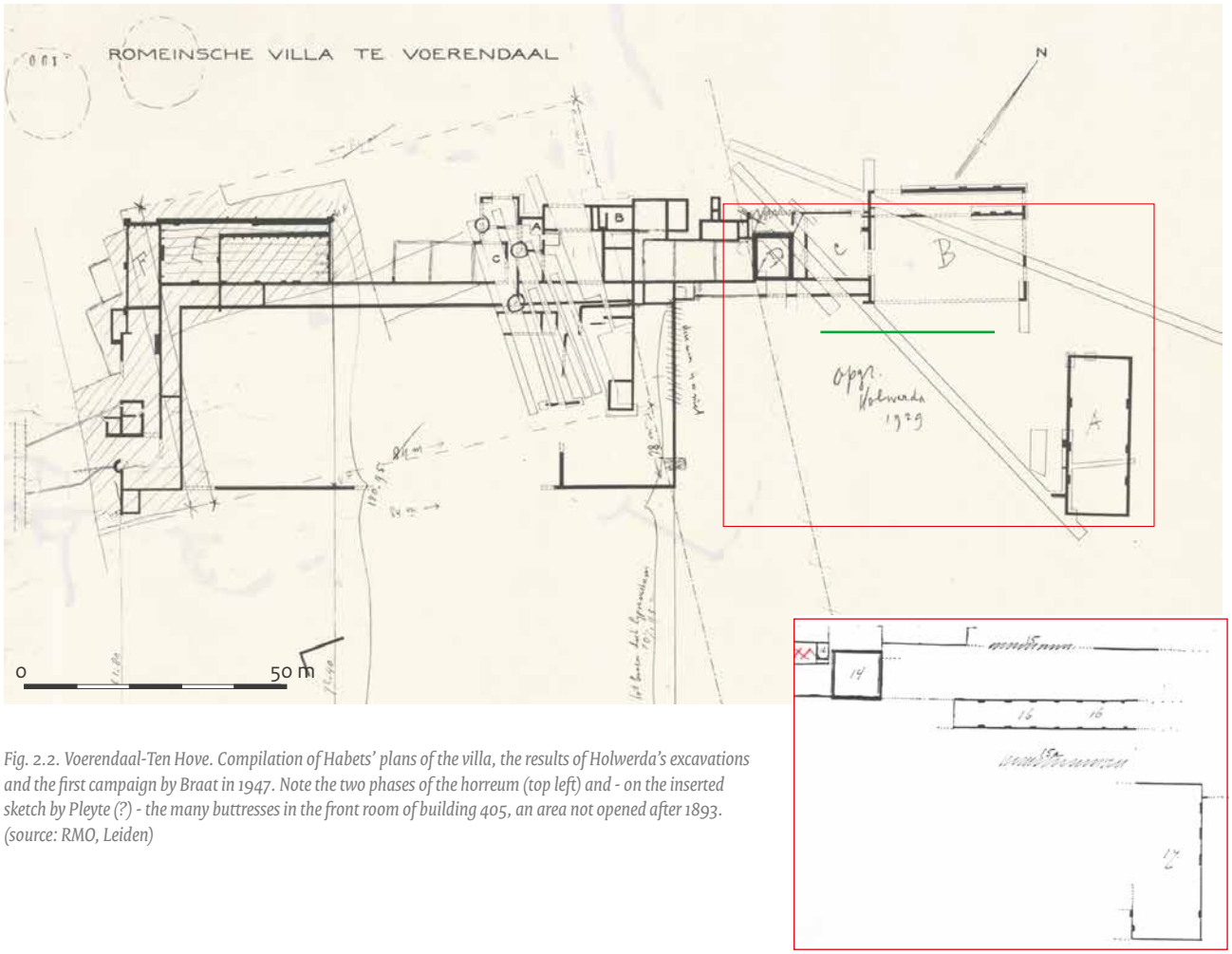


Fig. 2.2. Voerendaal-Ten Hove. Compilation of Habets' plans of the villa, the results of Holwerda's excavations and the first campaign by Braat in 1947. Note the two phases of the horreum (top left) and - on the inserted sketch by Pleyte (?) - the many buttresses in the front room of building 405, an area not opened after 1893. (source: RMO, Leiden)

whom to contact regarding the Voerendaal excavations. Habets' brother replied that Van Oppen would be his contact. In another letter of the same date, Dr Van Oppen reported that the excavation pits were closed after the last drawings were completed. The descriptions of the find material, however, remained unfinished. It was agreed that the new archivist of Limburg, A.J.A. Flament, would take responsibility for these descriptions.

2.1.2 Excavation method and available documentation

Habets' method for excavating Voerendaal was probably the same as the one he used in 1879-1880 at the villa of Heer-Backerbosch. There, some areas were excavated with spades, others explored by tracing foundations and floors with a probing rod: 'For that reason [the 2 m thickness of parts of the topsoil-HAH] we confined ourselves to partially uncovering the walls and floors; we also determined the outlines of the foundations with the help of the probing iron.'[18] This explains why they were able to investigate more than 100 m of the villa in a few months. At the same time, some parts of the villa, such as the cellar and part of the baths, were uncovered entirely. These features are shown in six drawings in lead pencil and colour made by G. Hoffmann (Fig. 2.1D; 43.5).[19] The drawings are a kind of substitute for photographs, which do not appear to have been taken at the time.

Although Habets' methods were crude by modern-day standards, causing considerable

[18] Habets 1895, 268.
[19] Rijksarchief Limburg K-455-3-01 through 03 (pencil); RMO Archives, picture box 37 (colour).

damage to the stratigraphy and features next to the walls, he was an attentive observer, as is shown by his reports on other excavations. He mentioned, for example, the presence of snail shells in the hypocaust of the villa at Hoensbroek, concluding that the ruined building had not been levelled after a fire;[20] he identified the wood used in the hypocaust as oak and pine.[21] At the same site he collected not only finds, but also animal bones.[22] He did the same at Ten Hove and Heer-Backerbosch and in the latter instance Habets consulted a veterinarian and mentioned the presence of cut marks.[23]
The daily supervision and management of the finances at Voerendaal was probably in the hands of Joseph van Oppen.[24] He sketched, for example, part of the excavated baths, including a cross-section of drain β/328 (the same area as in Fig. 2.1D). Beneath the sketch he wrote: 'Next Saturday I will tell you more about it.'
The manual labour was carried out by workmen, probably three on average, each earning one guilder a day.[25]

Because of his untimely death, Habets made no written record of his work in Voerendaal. However, the RMO archives include ten plates with finds from the 1892 and 1893 campaigns. Both the descriptions and drawings of the finds were published in the Museum's 1895-1896 annual report (Fig. 2.1C).[26] A number of finds are mentioned and illustrated by Braat in his 1953 publication.[27] In addition to the six drawings mentioned above, there are five excavation plans. One is a kind of sketch of the eastern half of the complex, held in the Pleyte archives in the RMO.[28] It is not clear whether it is a neat version of a sketch made by Pleyte himself, or of one sent to Leiden by Habets. Its relevance lies in the written interpretation of the function of rooms and the representation of some details of outbuildings 402 and 405, not shown on the other plans (for the locations of these buildings, see Fig. 5.4).[29] Three versions of the excavation plan are kept in the State archives.[30] The first and third are simple drawings of all the remains, with measurements noted on the latter. The second plan shows more detail, but only depicts the western half of the main building, the *horrea* and the baths. Finally, a fifth plan was published as Figure 9 in Braat's 1953 report and differs from the other plans in details.[31] The original seems to be lost, but a modified version is preserved in the RMO archives.[32] The part with the baths is still solely based on Habets' plans and the same holds true for that of the *horrea*, although with different details and proportions. At the same time it shows the results of Holwerda's excavations and those of Braat in 1947 and 1948.

Box 1 Limburgers and Hollanders in search of Roman villas

Joannes Josephus (Jozef/Jos) Habets (Oirsbeek, 27-11-1829 – Maastricht, 22-6-1893) is a typical representative of the kind of people involved in archaeology at a local and regional level in the nineteenth and early twentieth centuries.[33] He came from a middle-class background, his father being a headmaster, and obtained an education and an opportunity to spend time on history and archaeology through the church. Habets studied at the minor seminary in Rolduc and a seminary in Roermond. He was ordained a priest in 1856 and worked, among other things, as a chaplain in Bunde (1859-1862) and Berg en Terblijt (1862-1878), and thereafter as a priest in Wolder (1878-1881). He conducted several villa excavations in the region, such as Houthem-Rondenbosch (1865),[34] Meerssen-Onderste Herkenberg (1865),[35] Steenland-Op den Billich (1870-1876),[36] Hoensbroek-Schuureik (1885),[37] Wilre/Wolder-Louwberg (1879) and Heer-Backerbosch (1879).[38]
Although these excavations were important, the methods used were primitive and the results sometimes no more than a number of finds and an incomprehensible villa plan (e.g. Meerssen). Habets was one of the founders of the Limburgs Geschied- en Oudheidkundig Genootschap (Historical and Antiquarian Society of Limburg) and a member of the Koninklijke Nederlandse Akademie van Wetenschappen (KNAW; Royal Dutch

20 Habets 1887, 328.
21 Habets 1887, 320.
22 Habets 1887, 328-329.
23 Habets 1895, 292. The bones from Voerendaal have inventory number 1895/12.124.
24 Jamar 1986, 98.
25 Jamar 1986, 99.
26 The descriptions can also be found in the RMO's inventory books, under December 1895 (third section), l(imburg) 18]95/12.17-124. Most finds were given a specific inventory number, with only a few being included together.
27 Braat 1953, figs 69-70, figs 12-13, nos 1-38; See below, section 2.2.3.
28 Scale approx. 1:1900.
29 Concordances of the characters and numbers for structures can be found in tables 3.2, 82.1, 83.1, 84.1.
30 Rijksarchief Limburg 455, blad I-III (scale 1:550, 500 and 480).
31 With the note 'Surveyed April 1895'.
32 RMO Archives: 'Romeinsche villa te Voerendaal'; ROB Archives: Ovz. 3, scan 1990-19105; reproduced without trench outlines as Willems & Kooistra 1988, fig. 9.
33 Van Riemsdijk 1894; https://nl.wikipedia.org/wiki/Jozef_Habets; http://www.rijckheyt.nl/sites/rijckheyt/files/pdf/persoonsdocumentatie/Habets%2C%20Jan%20Joseph.pdf (accessed 26-1-2020); for a number of publications about and by Habets (about the Middle Ages), see www.dbnl.org.
34 With H. Schuermans and L.J.F. Janssen (Schuermans 1867; Habets 1871).
35 Habets 1871.
36 Habets 1878b; 1882.
37 Habets 1887.
38 Habets 1895a (Wilre); 1895b (Heer).

Academy of Arts and Sciences). From 1881 onwards he was an archivist/record keeper and did a lot of useful work organizing the multitude of archives in Limburg, historically divided across many secular leaders and ecclesiastical institutions.

It is telling that Willem Pleyte (1836-1903) was also educated as a clergyman, albeit in the Protestant church.[39] After waiting two years for a parish to invite him to become a minister, he began to teach himself Egyptology and in 1869 he was appointed a curator at the RMO, where he engaged mainly in museum work and compiling an inventory of archaeological sites in the Netherlands. Finally, he was appointed director of the RMO in 1891. It is interesting to note that at this time the director of the museum, a son of protestant 'Holland', was highly reliant on a priest from Catholic Limburg.[40] That region had tried to become part of Belgium early in the nineteenth century, was later involved in the early formative stages of Germany and only in 1866 did it become a regular province of the Kingdom of the Netherlands. However, while some antagonism in the relations between Limburg and 'Holland' continues to the present day, Habets' membership (since 1880) of the KNAW and his attendance at the annual meetings in Amsterdam is an example of the early cultural integration of the province, or rather, its elite.

In the first half of the twentieth century, villa research in Limburg was mainly conducted on behalf of the RMO in Leiden. The first important figure was Jan Hendrik Holwerda (Schiedam, 3-12-1873 – Nijmegen, 4-3-1951), who obtained his PhD degree in classical languages at Leiden University in 1899 (Fig. 2.4B). From 1904 on he was curator at the RMO, where his father was director; in 1910 he himself became director. Holwerda conducted many excavations on sites from every period and almost everywhere in the Netherlands, except for the northern provinces. At the beginning of his career, he had fairly progressive views on the role of museums and exhibition design. However, he is mainly remembered for his quarrels with Van Giffen, an employee and later a prominent archaeologist, for his untenable theories – barrows constructed as wooden *tholos*-like domes and the non-existence of the Bronze Age in the Netherlands – and his preconceived interpretations of excavation results. In Limburg he conducted excavations at Valkenburg-Heihof (1906),[41] Groot-Haasdal-Billich (1907),[42] Bocholtz-Vlengendaal (1913)[43] and Voerendaal (see below).

In a number of excavations, Holwerda cooperated with Dr Johannes Wilhelmus Hubertus Goossens (Berg en Terblijt, 3 April 1869 – Maastricht, 9 November 1933). He gained a PhD in history and moral philosophy (Leuven) in 1862 and became a priest and teacher at the seminary of Rolduc in that same year. After 1927 he was record keeper in Maastricht, a position once held by Habets. When the latter served as a priest in Berg en Terblijt, Goossens had been one of the altar boys! In the 1920s, Holwerda left a number of villa investigations to August Eduard Remouchamps. During World War One he was involved in the '*Groot-Nederlandse beweging*' in Belgium, which aimed to emancipate the Flemish, reconnect with Dutch culture and, as an unintended effect, collaborate with the German occupiers. He therefore fled to the Netherlands after the war, started working at the RMO and acquired Dutch nationality.[44] He excavated at Ubachsberg/Colmont-Stockveld (1922 or 1923),[45] Valkenburg-Vogelenzang/Ravensbosch (1922-23)[46] and Stein (1925-1927).[47] Remouchamps' excavations already show some improvement compared to those of Holwerda. Remouchamps excavated some main buildings in their entirety, not merely by means of trenches. Sadly though, this talented archaeologist died at the age of only 35; Holwerda suggested that the terrible weather conditions of 1927 played a part in this.[48]

39 Amkreutz 2018.
40 The term 'Holland' is used by the inhabitants of Noord-Brabant and especially Limburg as a scornful epithet for everyone and everything from the west of the country, somewhat comparable to the way in which 'Dutch' is used in many English expressions.
41 Holwerda & Goossens 1907.
42 Goossens *et al.* 1908.
43 Goossens 1916.
44 Eickhoff 2003, 157.
45 Remouchamps 1923.
46 In cooperation with Holwerda and Goossens; Remouchamps 1925.
47 Remouchamps 1928; cf. Bogaers 1986.
48 Holwerda 1928b.

2.2 The RMO excavations

2.2.1 Holwerda and Goossens 1929

Holwerda, director of the Museum of Antiquities in Leiden (RMO), started an excavation at Ten Hove in the summer of 1929, in cooperation with Goossens, like Habets a record keeper in Maastricht. They investigated buildings B, E and F (402, 405 and 406) at the east of the villa complex. As in nearly every (villa) excavation of those days, they started with two 90-100 m long radiating trenches, with the aim of quickly identifying the traces of walls and other features (Fig. 2.3). These trenches made surveying easy and allowed for the use of a simple plane table with alidade (*draaibord met vizier*) and measuring tapes. After another long trench and some shorter ones following walls were dug, but a conflict with the tenant ended the investigation. It was probably for that reason that no levels or photographs were taken.[49] The finds from this excavation were not collected by context but were all put together.[50]

2.2.2 Braat's excavations 1947-1950

After the premature end of the 1929 excavations, Voerendaal-Ten Hove was not forgotten at the Museum of Antiquities. Almost twenty years later, the Museum returned in the person of Cees Braat, by then a seasoned curator at the RMO and experienced in excavating Roman villas (Fig. 2.4-5; see box 2). In 1947 the Leiden museum lost its licence to excavate and had to obtain permission from the newly founded State

[49] Braat 1953, 49.
[50] Braat 1953, 68. In the inventory book of the RMO, twenty numbers were registered as l(imburg 19)32/11.1-20. Only five of these refer to specific objects, the others to find groups (sigillata, coins, building material etc.).

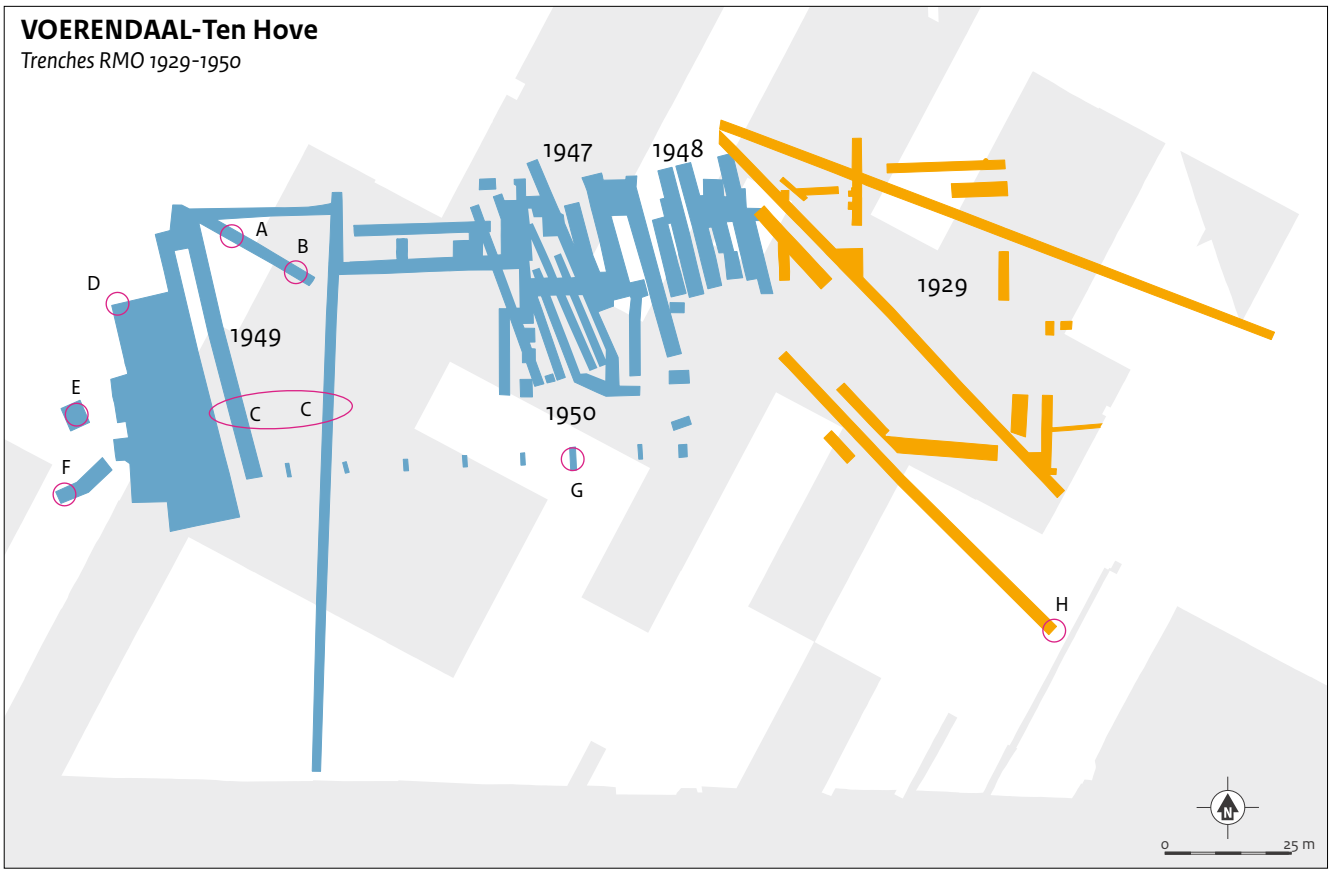


Fig. 2.3 Voerendaal-Ten Hove. Trenches dug by Holwerda and Braat between 1929 and 1950.
A first horreum wall not observed at all; B idem, mortar on top missed; C ditch 308 not observed; D drain 316 partly destroyed and missed; E-F end of 328 and 330 damaged; G part of drain 318 destroyed; H wall of 401 just not reached.

A

B

Den Weledelzeergeleerden Heer P.Glazema
Rijksdienst voor het Oudheidkundig Bodemonderzoek
,,Mariënhof'' Kleine Haag 2 AMERSFOORT

Amice

De opgraving te Voerendaal heb ik verleden week Vrijdag al kunnen beëindigen,veel eerder dan ik oorspronkelijk dacht (maar men moet altijd een marge houden voor als er nog eens onverwachte dingen voor den dag komen). Ik reken dat uiterlijk 11.Woensdag alles weer dichtgekomen is,wat ik aan de voorwerker heb overgelaten die de aannemer Ch.Lemmens te Brunssum mij had geleverd. Ik heb de heer Lemmens geschreven dat hij de rekening naar Amersfoort moest sturen.
Wil je de graafvergoeding van f 100 aan de pachter,de heer Keyhets (hoeve Ten Hove,Steenweg Voerendaal) uitbetalen? Over Plug ben ik weer buitengewoon content. Van de 10 man,die ik in dienst heb,heb ik er Vrijdags van de eerste week drie weggestuurd,die vrijwel niets uitvoerden en de 7 goeden gehouden,waarmee ik toen al zag,dat ik gemakkelijk klaar zou komen. Volgens mijn berekening moet dus de loonrekening als volgt worden (met inbegrip van de reisvergoeding rekent Lemmens 10 uur per dag inpl.van 8½ uur, á f 1.50 alles inbegrepen).

C

Fig. 2.4 Voerendaal-Ten Hove. Documents regarding Braat's excavations and his portrait. (source: RMO, Leiden)

A Braat (left) with a visitor standing in the porticus of the baths, with room 8 and 9 in front and the excavation tent of the RMO at the far left; B Braat and his director J.H. Holwerda; C part of a letter by Braat to Glazema, the director of the ROB, concerning some financial matters.

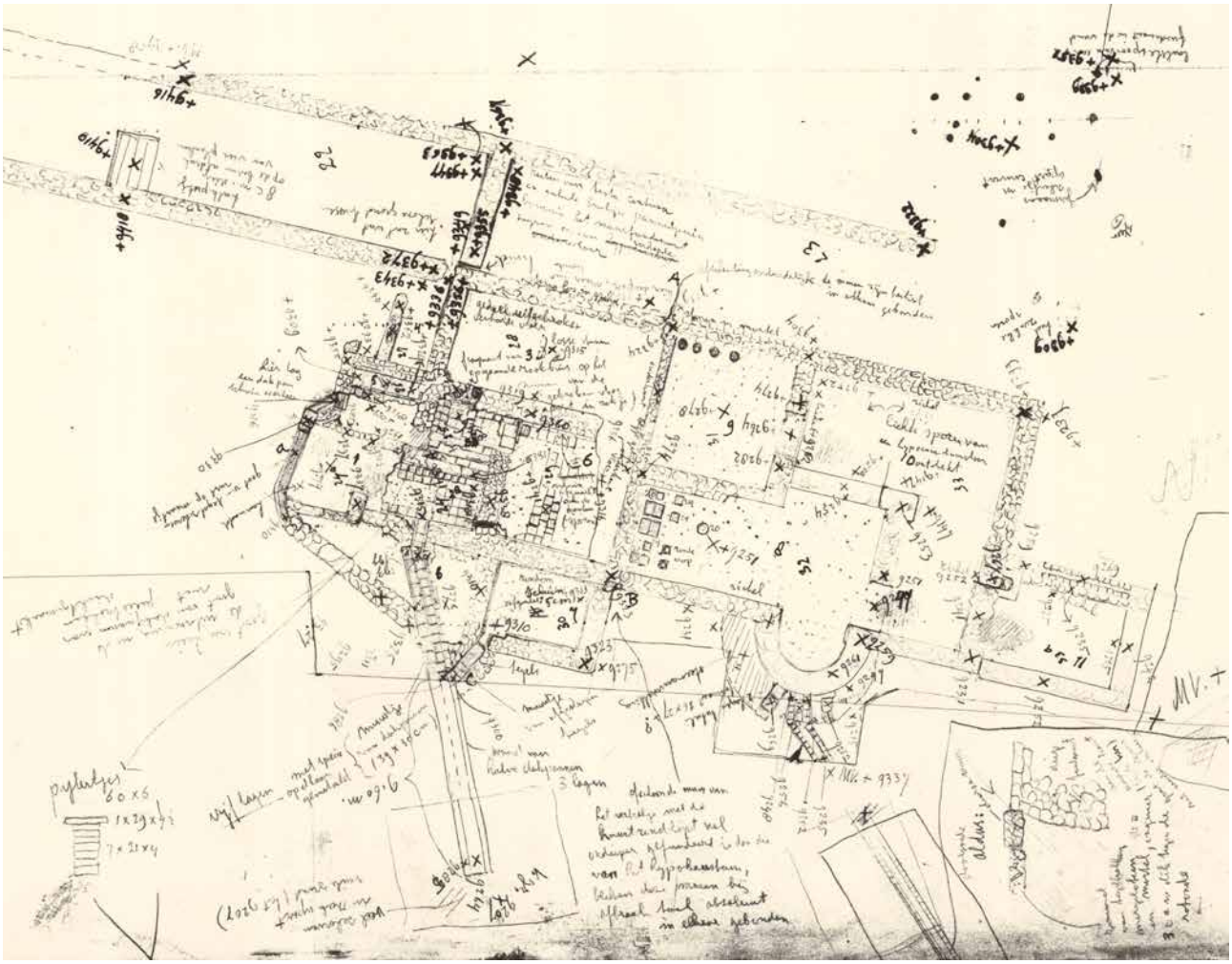


Fig. 2.5. Voerendaal-Ten Hove. Part of a field drawing by Braat, showing the bath at c. half of original size. (source: RMO, Leiden)

Service for Archaeological Investigations (ROB) in Amersfoort.[51] This somewhat painful situation is reflected in Braat's frustrated remark that '...no longer working with the excavation budget of the Museum of Antiquities, we, as modest 'guests of the State Service for Archaeological Investigations', had to work with an excavation grant given to us by the Limburgs Genootschap.' Braat further suggests that these scarce funds prevented him from making larger trenches.[52] However, this was not completely true because some parts of the villa and the baths were excavated almost in their entirety, thanks to the ROB's help.

During the first campaign in 1947, Braat investigated the central part of the main building and in 1948 the eastern part (Fig. 2.3). The narrow trenches were not completely adequate for recording the better preserved rooms in 1948. The baths could be excavated in 1949 by means of larger trenches, made possible by Van Giffen, the director of the State Service, who provided for a larger team of labourers. In the same year, the *horreum* was investigated using narrow trenches. Braat's strategy and observations are something of a mystery here because he completely missed a wall of the smaller first phase of the *horreum* (Fig. 2.3, A-B) on this spot.[53] In 1950 the investigation was completed by excavating the predecessor of the main building and its surroundings.

In 1947, Braat was assisted by foreman A. Scholten, who had been present at the excavation in 1929. After his retirement, Scholten was replaced by Van Veen, who was actually the museum's photographer and who worked in that capacity at the excavation, besides leading the workers.[54] Braat's initial plan was to finish the Voerendaal excavation in 1949. To accomplish this, he proposed working with another curator of the museum, H. Brunsting. Unfortunately for him, this plan could not be realized as Brunsting was needed elsewhere. Because he still wanted to excavate the baths in their entirety, Braat needed a large team of men at the very least. He asked ROB director Van Giffen for some fifteen

51 Van Es 1972, 24-28; Eickhoff 2003, 206ff.

52 Braat 1953, 50-51.

53 This building with buttresses is even present on the plan shown in figure 2.2, mentioned earlier, which must have been made in 1947, for it shows the museum's trenches of that year. RMO Archives: 'Romeinsche villa te Voerendaal'; ROB Archives: Ovz. 3, scan 1990-19105; reproduced without trench outlines as Willems & Kooistra 1988, fig. 9.

54 Braat 1953, 51.

men with an experienced foreman: '...if they are workers organized via the *Dienst Uitvoering Werken*, I would like a boss to be included. This is absolutely necessary in my experience as you won't get any work out of these people without constant threats of dismissal or wage cuts.'[55] Van Giffen sent A. Meier, employed by the State Service, to be foreman. In a later letter Braat expressed his satisfaction with Meier's work.

Braat ultimately had sixteen workmen at his disposal in 1949. They were from Heerlen and had indeed been arranged through the *Dienst Uitvoering Werken* (and the *Heidemaatschappij*). Other factors also worked against Braat, adding to the already complex excavation. He wrote in a letter: 'This week's progress is slower than last week's as I lost more than half of my men – the best ones – to a large project in Born. I am now left with some ten semi-disabled workers.' He also lost his photographer Van Veen to Brunsting, who by then had started excavating in nearby Rimburg. In a letter, Braat asked Van Giffen for a few extra weeks for the 1949 campaign.

The 1950 campaign started on 2 October and lasted for only about three weeks. This time, no workers were available through the *Dienst Uitvoering Werken* and they had to be arranged through the contractor Lemmens in Brunssum. This doubled the costs while failing to solve Braat's problems with the workmen.[56] He wrote: 'Of the ten men I have employed here, I sent away three who did nothing on Friday. I kept the seven good ones, with whom I saw that I could finish the job.' (Fig. 2.4B). On the bright side, the ROB sent foreman G. Plug to assist Braat. A letter from the RMO director to the director of the ROB shows that for the 1950 campaign the workmen worked for 8.5 hours a day and earned 1.50 guilders per hour. The tenant Keybets – actually his widow – was paid 100 guilders as compensation for damage to the crops and fields.

2.2.3 Braat's excavation method, documentation and publication

From the above and the published plan, it is clear that Braat dug different kinds of trenches (Fig. 2.3). We see a long and narrow exploratory trench from north to south, from the *horreum* to the Steinweg. The main building was excavated in a multitude of trenches, almost uncovering the whole area, but leaving baulks in between.

Table 2.1. Voerendaal-Ten Hove. Comparison between a series of levels taken by Braat and the ROB.

Feature	Level Braat (m NAP)	Level ROB (m NAP)	Difference
Main building			
Cellar floor	93.67	90.50	-3.17
Floor hypocaust room 14	94.93	91.72	-3.21
Southwest corner 'tower'	94.96	91.73	-3.23
Floor hypocaust room 13	95.20	91.79	-3.41
Near baths			
Wall 114.027/32	94.48	92.38	-2.10
Wall 114.032 near chalk pit	94.18	92.16	-2.02
Baths			
Southwest corner piscina 114.025	93.23	91.34	-1.89
Corner drain α/327	93.10	91.32	-1.78
End drain β/328	92.64	90.90	-1.74
End drain γ/330	92.12	90.26	-1.86

[55] *Dienst Uitvoering Werken* (DUW) means 'Service for the execution of works'. After the Second World War the authorities founded the DUW to put hundreds of thousands of unemployed to work, for example, clearing the rubble of ruined buildings and reclaiming heathland.

[56] Part of the funds for that year were provided by the *Nederlandse Anthropologische Vereniging*.

The baths were unearthed in their entirety in a single large trench. Finally, wall 419 was traced by means of almost a dozen test pits and some bath drains by means of small trenches.

It is unsurprising that this relatively large series of trenches, dug over four years, led to mistakes in surveying (like the drawing, done by Braat himself). We do not know whether a theodolite was used or only a plane table with an alidade, or whether steel measuring tape was used or something more rudimentary; in any event, however, not all the trenches were positioned correctly.[57] A likely source of errors was the rather large distance between a single base line – the Steinweg and fences alongside – and most trenches, over 100 m to the north. There are also serious errors regarding the levels. They should refer to the same Dutch Ordnance Datum (NAP) as today, but a comparison with the levels taken by the ROB shows that they are approx. 3.20 m too high in the main building, some 2 m in the portico near the baths and 1.75-1.90 in the baths proper (Table 2.1).[58] Braat's field drawings deserve some comment. There are some 20 sheets, some improved versions ('*nieuwe opname*') of earlier drawings. The paper does not have centimetre/millimetre squares and a normal (thick) lead pencil was used for drawing, at scale 1:100 (Fig. 2.5)! The levels and notes were scribbled everywhere, in different directions. One wonders whether the problems managing the unwilling workers contributed to the rather chaotic documentation, or whether Braat's abilities as a field technician were simply not up to par.

Whatever the case, the quality of the work done by the RMO was quite inadequate. Besides the problems with surveying and levelling, as well as the untidy drawings and missing the first *horreum* phase, Braat's work was downright destructive in some places. For example, parts of drains 316, 318, 328 and 330 were damaged severely in the small trenches (Fig. 2.3, D-G).[59] It is a stroke of luck that his long trench to the south was not aimed at building 403, as one of Holwerda's trenches had missed 401, leaving both buildings untouched for later investigations. Perhaps he was checked by the presence of the thick top/colluvium layer towards the Steinweg, which was unfavourable for non-mechanical excavations. In hindsight, one wonders why an unthreatened villa site had to be investigated only a few years after World War Two, when the country was still under reconstruction (leaving Braat with unsuitable labourers!) and fighting a colonial war in the Dutch East Indies! Did the RMO staff want to prove that they were still able to conduct large, relevant excavations in order to get their licence back?

In 1953 Braat published his findings in the *Oudheidkundige Mededelingen*. In some thirty pages, he describes the features and finds, supplemented by a phasing and interpretation. The results of Holwerda's excavations are included but are not discussed in much detail because of the negligible amount of data collected in 1929. We will not comment here on various aspects of Braat's publication as this will be done in later chapters of this report. But it is important to note that the finds from the 1892/93 excavations presented by Braat are only a small selection. He does not seem to have known about or consulted the nineteenth-century RMO inventory book because a number of interesting finds are left unmentioned (like several amphora stamps, finds associated with the scramasax). Only 16 finds are described and 15 illustrated from over 100 find numbers.[60] All in all, the way in which the finds are treated is typical of *OMROL*, the Museum's journal of the time: short descriptions and a fairly small number of illustrated finds. The finds from Braat's own excavations are summed up very much in the order of the find/inventory numbers.[61] Although 16 of the 21 find numbers refer to locations, only a few of these are specific contexts, such as '3. robber trench between room 8-8a' or '10. postholes k near bath'. The remainder apply to large areas, such as '1. room 8-16 [east part villa-HAH]' or '5. finds middle part large villa and from building H'.

57 See also section 3.3.1.
58 That is not to say that the latter are completely accurate (see below).
59 Cf. chapter 41.
60 Braat 1953, 69-70, fig. 12, nos 1-15.
61 In the RMO inventory: l(imburg 19)53/2.1-20.

Box 2 Cees Braat. Roman and Medieval archaeology from the Wieringermeer to Voerendaal, from Olst to Middelburg

Wouter Cornelis (Cees) Braat (Delft, 04-02-1903 – Oegstgeest, 28-03-2000) read history and art history at Leiden University, where the renowned historian Johan Huizinga was one of his teachers.[62] From 1928 onwards he was one of Holwerda's assistants, soon becoming curator of the departments of Classical and Dutch (protohistory) Archaeology. In 1932 he defended his PhD thesis on the archaeology of the Wieringermeer polder, which had had be drained only two years earlier, in a certain sense instituting the investigation of Medieval rural settlement in the Netherlands.[63] Because pre- and protohistoric archaeology were not yet autonomous academic disciplines, his PhD supervisor was the historian Colenbrander. Holwerda himself gave his curators an archaeological education and sent Braat to Dragendorff in Freiburg for one semester and to Zahn in Berlin for another. Braat always continued to work on Medieval archaeology, excavating in towns, strongholds and castles.[64] He wrote on material culture,[65] as well as on general themes.[66] In the context of this publication, Braat's excavations of several Roman villas are of more interest. Apart from Voerendaal, he investigated sites in Lemiers (1929), Overasselt (1930), Vaesrade/Thull (1931), Mook (1931),[67] Kaalheide-Krichelberg (1936) and Simpelveld (1937, 1947).[68]

Braat's excavation methods for these villas were quite traditional and not far evolved from Holwerda's 'trench method' (*sleuvenmethode*). His 1934 publication, however, shows signs of rebellion – albeit implicit – against his teacher Holwerda.[69] Referring to the work of Oelmann on the villa from Stahl, he opted for a roofed central room at Lemiers and Vaesrade, while Holwerda still believed that it was open. The archaeologists of Holwerda's generation thought that the villa was a phenomenon brought to the north by Roman colonists.[70] In 1934 Braat did not yet question this interpretation, writing: 'One has to assume that the Roman colonists built their villas in the different regions of Gaul and Germania according to Italic tradition. Otherwise, more influences from local indigenous building traditions would have been evident.'[71] Shortly before 1930, however, significant observations were made during villa excavations in Germany. Post-built predecessors of the villa were found at Mayen-Im Brasil (from 1922/23 onwards) and in Köln-Müngersdorf (from 1926).[72] Oelmann thought that the inhabitants at Mayen were indigenous: '... on the contrary, it is probable that the Celtic farmer who lived here during Caesar's time stayed after the conquest and bequeathed the farm to his kin. At some time they adopted the superior civilization of the Italic rulers, became ever more *Roman* ['*zu Romanen geworden*' in the original wording-HAH] and because of that have modernized their way of building in particular.'[73] Fremersdorf, familiar with Oelmann's writings, interpreted Müngersdorf in the same way.[74] In his synthesis on the villas of Belgium, De Mayer expressed identical opinions: 'The result of the Roman conquest was a metamorphosis of the Celtic farm into a Roman villa, when the owner or inhabitant was sufficiently romanized ['*geromaniseerd*' in the original text-HAH].'[75]

When writing the 1953 article about Voerendaal, Braat was familiar with the literature mentioned. He suggested that the builder of the stone villa of Voerendaal was probably an enterprising pioneer from Gaul, a reference to the '*levissimus quisque Gallorum*' (reckless adventurers from Gaul) settled in the so-called *agri decumates*.[76] Braat mentioned an alternative interpretation, of an indigenous farmer constructing a stone building after becoming wealthy. However, he preferred the former interpretation and did not see the then recently discovered post-built structure under the villa of Kaalheide-Krichelberg as an indigenous farm.[77] He considered this house with its square posts and (post) pits to be more advanced than the 'more primitively built' houses known from other parts of the Netherlands. Therefore, the involvement of a Gallic pioneer was more likely.[78] It is a pity that Braat did not comment on the apparent absence of a post-built predecessor at Voerendaal.

In his concluding remarks, Braat wrote briefly on romanization (although, unlike De Mayer, he did not use this word) and the socioeconomic aspects of the villa system.[79] 'One gets the strong impression that the foreign Gallo-Roman elements and the indigenous people did not merge very much. Here, the situation would be like that in other parts of the Roman empire, which the written

62 For a biography of Braat, see Moerman 2001; Eickhoff 2003, 60-62; 234-236.
63 Braat 1932.
64 Braat 1941b; 1942; 1945; 1954a; 1957; 1961; 1964.
65 Braat 1947; 1954b; 1960; 1973.
66 Braat 1954c; 1959.
67 For all four, see Braat 1934.
68 Braat 1948; cf. several plans in appendix XX.
69 See further below, section 8.2.3.
70 Cf. Holwerda 1907, 99; 109; Goossens *et al.* 1908, 44.
71 Braat 1934, 34-35.
72 Oelmann 1928; Fremersdorf 1933.
73 Oelmann 1928, 137.
74 Fremersdorf 1933, 47-49.
75 De Mayer 1937, 248; however, land that was not owned could come into the hands of immigrants (1937, 249).
76 Braat 1953, 75; cf. Tac.*Germ.* 29.3.
77 Brunsting 1950.
78 Braat 1953, 76.
79 Braat 1953, 76.

texts inform us about, namely that the land was mainly in the hands of rich city-dwellers, while those working the soil, poor *coloni*, had a life full of worries. Sadly, this situation, reminiscent of the Russia of the Tsars, could not be resolved. As in that country in our time, it led to violent uprisings in the Roman period.'[80] According to Braat, this unrest combined with Germanic raids led to the destruction of the villa at Voerendaal and the end of Roman civilization in the north.
He thought that the site was not inhabited in the fourth century AD because he identified only one sherd from that period.[81]

2.3 The large-scale ROB excavations 1984-1987

2.3.1 Background

The excavations led by Willem Willems between 1984 and 1987 were ultimately rooted in a legal dispute.[82] In the 1970s, the State Service for Archaeological Investigations (ROB) in Amersfoort sought to obtain the status of protected archaeological monument for a number of Roman-period sites (Voerendaal, Nijmegen-Canisiuscollege, Leiden-Roomburg) and parts of a reallotment area with rich Bronze Age remains (Het Grootslag in the province of North Holland) because of their major scientific potential.[83]
The owner and tenant of the fields in which Voerendaal-Ten Hove was situated appealed to the Council of State (*Raad van State*), claiming that such protection would impede the successful operation

80 Braat 1953, 76. Here he appears to be giving a kind of Marxist explanation, with an implicit reference to the concept of '*Verelendung*'!
81 An Alzey 27: 1953, 72, fig. 13, no. 54.
82 See Klok 1981 for a detailed account.
83 E.g. JROB 1976, 53; 1980, 133.

Fig. 2.6 Voerendaal-Ten Hove. Extent of the proposed (orange) and protected (red) archaeological monument with the trenches of Braat (black).

of their farm. The Council of State asked the ROB to clarify whether it was known for certain that important remains were present in all parts of the terrain and whether it was possible to limit the protection period. To answer the first question, Tom Bloemers, the provincial archaeologist for Limburg at the time, carried out a two-day systematic field survey in March 1977.[84] On the basis of this survey, the statement that the entire terrain was part of the villa complex could be further substantiated, albeit without the possibility of establishing the exact boundaries. As an estimate for the dimensions and structure of the villa, reference was made to well-known sites such as Mettet, Rognée and Anthée in Belgium. The ROB also noted that features of post-built houses could be expected, as well as rubbish pits, wells and ditches. With regard to the second question, ROB replied to the Council that a timeframe for future research could not and should not be determined, as this would at least partly depend on developments in the archaeological discipline and the research questions emerging from this.[85] In 1980 the Supreme Administrative Council ruled that only the part of the site for which the presence of stone foundations was proven would be protected (approx. 1.5 ha; Fig. 2.6).[86] The surrounding area of eight hectares was given protection for ten years maximum, until 1990. This was a huge setback for the ROB, which was already involved at the time in a number of large-scale projects (Nijmegen, Wijk-bij-Duurstede, Valkenburg (Z.H.).
The excavation at Ten Hove started in 1985, providing a maximum of five years for the project.

2.3.2 Aims

The first objective of the investigations in Voerendaal was obvious: the 'preservation *ex situ*' of the archaeological remains, by recording the features and collecting the finds.[87] However, the ambitions were set higher. The excavation was made part of a larger project studying the Meuse valley from Nijmegen to Maastricht, a kind of supplement to the existing Eastern River Area project.[88] The aim of the project was 'not so much a historical reconstruction, but above all an exploration of the social and economic developments during the Roman period: how were society, agriculture, trade etc. organized? What was the relationship between town and country and other questions of this nature. Also important is the study of these matters in a long-term perspective and the mutual influence of indigenous and Roman society. For a better understanding, the Late Iron Age and Early Middle Ages are also to be studied.'[89]

2.3.3 Organization

Following the Council of State's disappointing ruling, plans and preparations were made to excavate. In late 1982, Willem Willems contacted the Registry of the province of Limburg to discuss matters regarding the intended excavation. In his letter, he sketched a project plan with three excavation campaigns lasting five or six months each. This would mean investigating some 2.7 ha a year, between spring and autumn. About ten untrained workmen would be needed for the work. The State Service could provide a field technician, he wrote. In addition, an archaeologist was required for three whole years, including the preparations and data analysis. The early 1980s were characterized by an economic crisis and high unemployment. Consequently, the best way to realize a substantial excavation was to turn it into an employment project, hiring unemployed workmen from the ground, road and hydraulic construction sectors (*GGW-werklozen*). Eventually, the Regional Employment Agency provided fourteen unemployed labourers.[90] Additional financial and practical support was given by the municipality of Voerendaal and the province of Limburg.

As Willem Willems was the provincial archaeologist for Limburg and was appointed assistant director of the ROB in 1985, it is understandable that he frequently inspected the excavation, although probably only once a week at the most. The person present throughout the three years of the excavation was the field technician, Fedor van Kregten, who was responsible for the surveying, levelling, the field drawings, all the records and for managing the labourers. Until 1980 Van Kregten was employed at the Vrije Universiteit, Amsterdam, where he gained experience excavating the villa of Hoogeloon-Kerkakkers.[91] His work was meticulous, resulting in a data set of high quality,

84 JROB 1977, 133; Klok 1981, 31-35. A survey had apparently been conducted some years before (Klok 1974, fig. 16).
85 Klok 1981, 35.
86 The monument's ID is 46105 in the 'State monuments' (*Rijksmonumenten*) register.
87 Willems 1986, 143-144.
88 *JROB* 1985, 32.
89 Willems 1986, 143.
90 As a WVM (*Werk Verruimende Maatregel* or employment facilitating measure). Students and amateur archaeologists added to the number of workers during some periods.
91 Hiddink 2014a, 20.

92 Such as H. ter Schegget (head of field technicians ROB), A. Buisman and P. Grim (assistant technicians). A.J. (Fons) Horbach, assistant to the provincial archaeologist from 1982 onward, also worked as an assistant technician and made many find drawings, which are included in this publication.

93 Milikowski 1985.

94 The Landbouwhogeschool was the predecessor of Wageningen University; Stiboka (STIchting BOdem KArtering) was the Foundation for Soil Mapping, also based in Wageningen.

95 Kooistra 1996; Bakels 1996a.

which made our task much easier. During holidays and busy periods Van Kregten was substituted or assisted by other ROB staff.[92]

Key members of the team were two specialists. Laura Kooistra assisted with the archaeobotanical sampling, processing and analysing the material. She started as a volunteer in 1985 and later joined the staff of the ROB archaeobotanical laboratory. Jan Thijssen analysed the many thousands of finds that were collected during the excavation. However, Jan only became involved after the first stages of the project because Efraim Milikowski was initially appointed as a field archaeologist. It seems that Milikowski did not work well with Willems and Van Kregten and he left the ROB in 1985. The decision was made to not seek a new field archaeologist but a finds specialist instead.

Behind the scenes, a larger number of specialists were consulted, for example in database design and archaeobotanical sampling.[93] More specialists became involved once the excavation began. Palynologists Prof. C.R. (Roel) Janssen and Frans Bunnik (Utrecht University) would do further research into the pollen record in the vicinity, while soil scientists Willem van de Westeringh (Landbouw Hogeschool Wageningen) and J. Poelman (Stiboka) would investigate soils and phosphate levels in the region and at the site.[94] For various reasons, however, most participants left the ambitious research programme. Only Kooistra's research was concluded successfully and resulted in a PhD thesis, while Prof. Corrie Bakels (Leiden University) conducted an analysis of the pollen in a core from the Hoensbeek valley.[95]

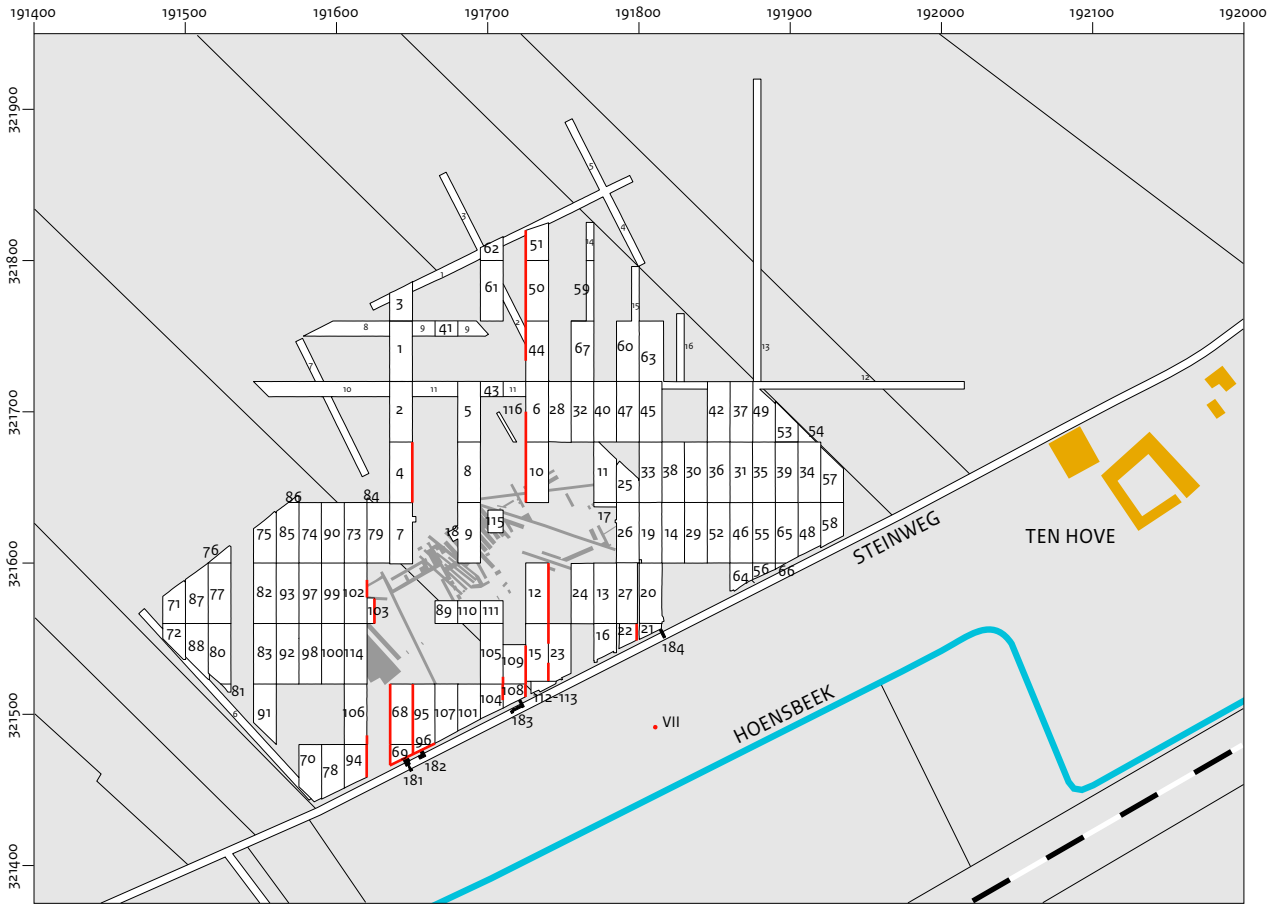


Fig. 2.7 Voerendaal-Ten Hove. Trenches by the RMO (grey), ROB (white) and Grontmij (black), with the sections/side views of walls and boring VII in red.

2.3.4 Excavation strategy. Location of trenches

The investigations started in December 1984 with the digging of trial trenches, a phase that was concluded in April 1985. Trenches 1 to 11 (now 121-131) were used to explore the northern part of the site, which appeared to contain almost no features.[96] This was later confirmed by the large 'regular' trenches 1 and 2 (Fig. 2.7). The excavation proper took place in 1985, 1986 and 1987, from March to December each year. In the first year, trenches 1-27 were opened. These trenches were situated in the central part of the site, running from the aforementioned northern part of the site to the Steinweg in the south. Trenches 9 and 18 were situated in the main building. The aim of excavating in this protected area was to check the results of earlier excavations and to take botanical samples.[97] It proved impossible to open all the planned trenches because the wet summer slowed the work down. Some low-lying trenches near the Steinweg were covered by 10 cm of mud several times after rain showers. In 1986 trenches 28-90 were investigated. Because of the low number and density of features in the (north) eastern part of the site (roughly trenches 30-66), only two of the expected six hectares had to be opened. It was possible to turn attention to the other side of the site. The number of features in the western periphery was also quite modest, making it possible to conclude the project in 1987. That year saw the opening of trenches 91-116, with the investigation of outbuilding 403 and pond 413 near the Steinweg, the central part of the '*pars rustica*'.[98] Moreover, Braat's observations in *horreum* 408, bath 404 and 'tower' 407 were checked, in combination with archaeobotanical sampling (trenches 102-103, 114, 115).

Even a superficial glance at Figure 2.7 shows the regularity of the trenches. According to ROB standard procedures, almost all were aligned with the Dutch grid system.[99] This makes good sense for surveying purposes but it has disadvantages when working on a slope with a different orientation, as in Voerendaal. In principle, each trench measured 40 x 15 m. This length fits easily on a DIN A0 drawing (scale 1:50), while the width was determined by the reach of the excavator jib (doubled, with a spoil heap along both sides of the trench). The ROB excavated a net area of almost six hectares, or more than nine hectares if the extra levels are included. During the RMO excavations in 1929 and 1947-1950, almost half a hectare had been opened (Table 2.2). Three quarters of this area was later incorporated into the ROB trenches.

2.3.5 Excavation method

The base lines for surveying were fixed by steel rods in a 50-100 m grid. The outlines of trenches were marked out with the help of a double prism and ranging poles. First, the topsoil above each trench was removed using an Atlas AB 1602 excavator (on tracks) and the first level was then created by the same machine, using its grading bucket. A metal detector was used systematically during and after the digging of each new level. The levels were finished by skim-shovelling (Fig. 2.8A). After the skimming, the field technician or an assistant marked the outlines of features (and other lines to be drawn) with a chaining pin. With the help of the simple surveying tools mentioned above, three or four parallel measuring lines were brought into the trench (max. 5 m apart). The features were drawn at scale 1:50 using measuring tapes and a

Table 2.2. Voerendaal-Ten Hove. Summary of the excavated areas.

Trench	Net surface (m²)	Gross / extra levels (m²)	Total
RMO trench 141-179	3393	1189	4582
ROB trench 1-116	52196	33600	85796
ROB trench 121-136	7428	230	7658
Total	**63017**	**35019**	**98036**

[96] Trial trenches 12-13 (now 132-133) were dug later in 1985 and 14-15 (134-135) in the summer of 1986. The site is listed as no. 62BN-91 in the Archis site database (observation nos 30786, 38712, 38911).

[97] Willems 1986, 145.

[98] For this term, see section 8.2.4.

[99] As trench supervisor for nine months in 1986 and 1987 at the ROB excavation Valkenburg-Marktveld and excavation director for three months in 1997 and 1998 in Groesbeek-Klein Amerika and Boxmeer-Maasbroekse Blokken, the first author is familiar with these procedures.

A

B

C

Fig. 2.8 Voerendaal-Ten Hove. Impressions of the excavation-methods.
A a trial trench dug out by the excavator, with four workmen skimming the excavation level; B 5 by 5 m squares inside building 401, with workers spitting and metal-detecting for finds; in the back - with blue trousers - mr. Van Kregten; C preparations for drawing a section of wall by mr. Ter Schegget (left) and two assistents.

3 m wooden surveyor's rod. The measuring tapes were also used to take levels at 5 m intervals, about 36-45 per trench. The levelling was done with an automatic engineer's level, using specific steel tubes of the measuring grid as datum points.

In most trenches, the next level was made by the excavator after the relevant features were sectioned (see below). The method used was a mix of 'arbitrary'/'planum' and 'stratigraphic' excavation.[100] In most ROB excavations, the first method was used, with 20 cm between each level.[101] In Voerendaal, the levels followed the relief to a certain extent but the stratigraphy was ignored. The next level within a trench was made some 5-15 cm deeper if postholes and pits were already visible and 15-30 cm deeper if natural or man-made layers were present. In areas with layers, it was often necessary to create two to four levels before the virgin soil was reached.

As just mentioned, not all features were sectioned at the first level in which they appeared. Clear post-pits and narrow ditches were nearly always sectioned at the first level where they were visible, but larger pits and wide ditches only at a second or third level. Sometimes this proved to be too late. There are instances of only 5-10 cm being left of pits when the section was ultimately made, losing decimetres of their depth and thus information as well. The pits of sunken huts were never sectioned at all![102] Sections to record the stratigraphy were studied in a limited number of trench walls (Appendix XXIII). Stone walls and foundations were seldom cut through and they were drawn at one level only, leaving them blank on the drawings of lower levels. The only side views of walls drawn were those of the better preserved ones of buildings 401 and 403.

In the Netherlands, and hence in Voerendaal, sectioning is nearly always done with spades rather than trowels, skimming the infill of half the feature. This is because the Dutch 'bedrock' consists of sand, loam or clay. Trowels are only employed when many finds, animal bone or wood are present. Large features are normally investigated using the excavator bucket, as was done at Ten Hove. Finds from layers were often collected by digging spits of approx. 20 cm deep in squares of 5 x 5 m (Fig. 2.8B). Archaeobotanical sampling was intensive in Voerendaal: in principle, every feature was sampled, with larger features being sampled multiple times.[103] Some 1051 samples were taken and 657 were analysed. The number 1,051 represents only 25% of all features, but if we exclude natural and recent features, foundations and suspicious (post)pits, every second or third feature was sampled on average.

2.3.6 Available documentation

The field drawings are the most important data source for feature analysis (Fig. 2.9). Each level per trench was drawn at a scale of 1:50 on a large sheet of Ao graph film. The section drawings were added later at 1:20. A number of trench walls or parts thereof were drawn at 1:20 on separate sheets. The colour and inclusions of each feature or layer were noted in the field and the drawing was inked and coloured, often much later in the winter.[104] It is important to note that colours were interpreted, not 'measured' by means of a Munsell card. If a draughtsman other than Van Kregten was responsible, their interpretation while colouring the drawings could differ. On some sheets, for example, we see quite a light grey colour where the description reads 'dark grey'.

The features were numbered in one continuous series per trench, with the numbers in red dots. These numbers were added at a later stage, as shown by the fact that the lowest feature numbers are those containing finds. Locating features is therefore often a laborious task. Only higher feature numbers with no finds attached are given in logical paths through the trench. Another peculiarity is the fact that section drawings are referred to by characters, not feature numbers. Find numbers are given in a new series for every level. The level number is therefore an essential part (and the trench number too of course). For instance, 16-1-4 and 16-2-4 refer to completely different contexts and locations. When referring to samples, MZ is added, for example 16-3-15MZ.[105]

As already stated, the levels were taken in a 2.5-5 x 5 m grid. All stone foundations were levelled, as can be seen on the 1:50 field drawings. It is not clear, however, whether all the

[100] On the planum method, see Barker 1986, 90-101, fig. 35; Rahtz 1996.

[101] The features were sectioned each time to a depth of 20 cm and additions to the section and drawing were made from the next level (if the feature was still present). The steel rods of the measuring system were hammered down 20 cm before the excavator started working.

[102] See the catalogue, chapter 44.

[103] Kooistra 1996, 146-147.

[104] In principle, the original drawing was inked and coloured, but data were traced onto a fresh sheet when it became too dirty.

[105] M(onster) = sample and Z(aden) = seeds. The codes F(osfaat) = phosphate and P(ollen) were also used.

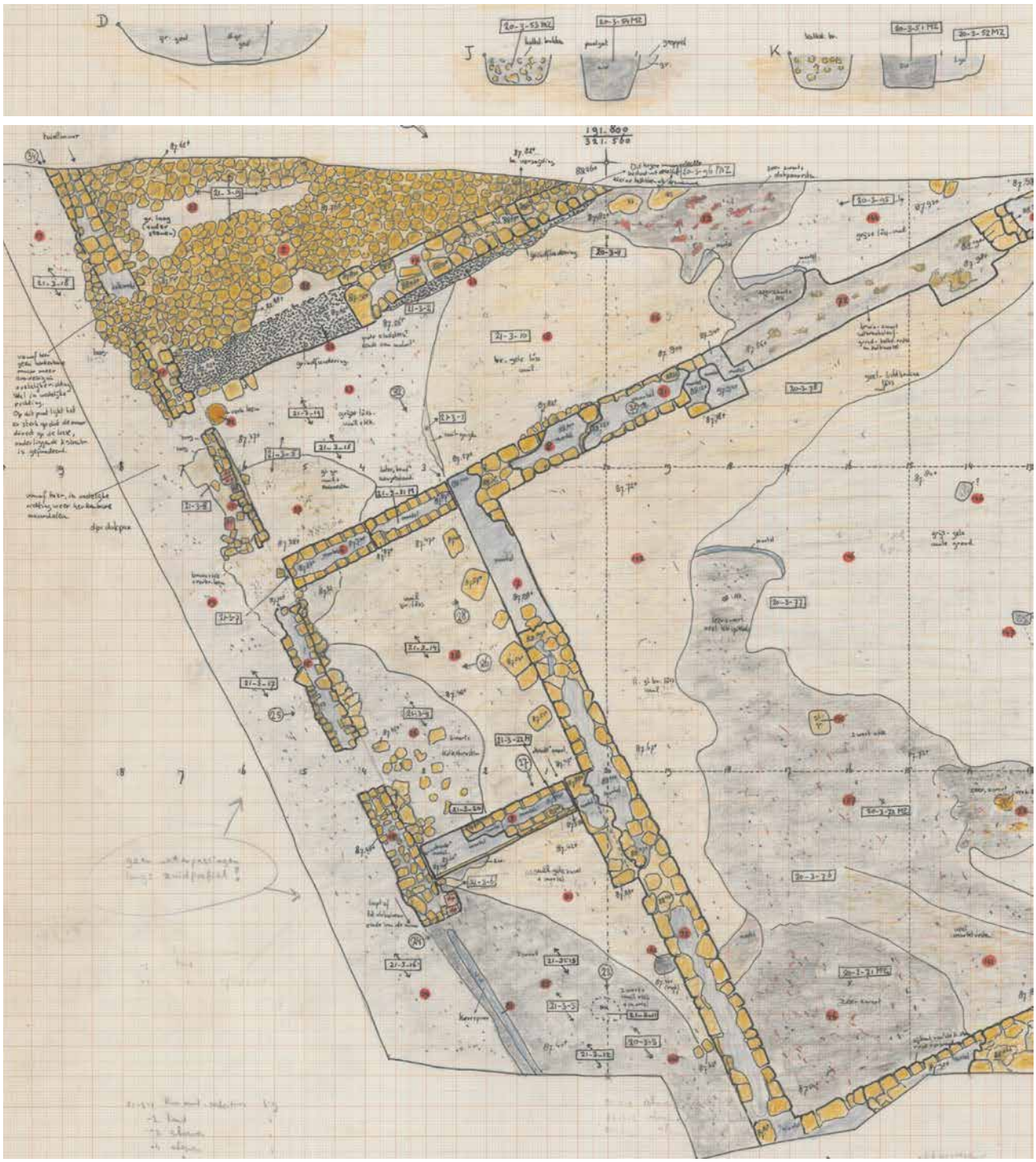


Fig. 2.9. Voerendaal-Ten Hove. Part of a field drawing: level 3 of trench 20-21 (building 401 and threshing-floor) with sections of features at the top.

other features were levelled separately, or whether their altitude was calculated from the grid.[106] When the field technician went on holiday in July 1985, his assistant forgot to take levels. Therefore, we have no information for trenches 16/level 5, 19/2 and 20/1. It is possible that part of the levels taken are slightly off, as appears from comparisons with the modern AHN data.[107] This is not surprising given the 1980s equipment and in particular the likelihood that some readings were incorrectly converted. In our analysis, no attempts were made to correct this because the levels 'intra-excavation' seem quite consistent.

During some ROB excavations in the 1980s, one or more cameras were part of the equipment used by the field technician or trench supervisors. To record the more important features, a photographer was called in from Amersfoort. It seems that he was the only person taking images in Voerendaal. Those still kept were in digital form, with slides as a source (shown by the discolouration of some images). Of the printed photographs, only low-quality contact prints were available. Each image, or series of images of a feature or situation, was numbered (year-serial number) and noted on the field drawings with an arrow showing the direction in which the photo was taken. Images missing from the digitized set were probably slides used by the excavator for lectures.

In ROB projects, a daily report (*dagrapport*) was usually written about the activities,[108] supplemented by a more interpretative weekly report (*weekrapport*). However, these reports – if they were ever made – are missing from the digital data set of scanned documentation. The only document available is a typed report by Milikowski, with a description of activities and observations made in the trial trenches and trenches 1-11 (up until April 1985).

Box 3 Willem Willems. A *cursus honorum* in Roman archaeology and national/ international CHM

Willem Johannes Hyacinthus Willems (Blerick, 19-7-1950 – Amersfoort, 13-12-2014) studied at the University of Amsterdam, obtaining his BA in cultural anthropology in 1974.[109] He then moved to the Instituut voor Prae- en Protohistorie under Professor Willem Glasbergen and spent a year at the University of Michigan, obtaining his MA in 1977. Meanwhile– from 1973 on – he worked as a (student) assistant and later researcher at the ROB, where his work was partly funded by the Dutch Research Council (ZWO, now NWO). Willems worked mainly on surveys and other activities in the Dutch Eastern River area (ERA) as part of his PhD research and the 'Archaeological Map of the Netherlands' project. The annual ROB reports show, however, that he also spent considerable time assisting the provincial archaeologist for Limburg, Tom Bloemers.[110] In 1980 Willems himself was appointed provincial archaeologist, a position he held for five years. He then rose through the ranks at the ROB, becoming assistant director in 1985 and director in 1989. In 1999 Willems left the ROB and transferred to the Ministry of Education, Culture and Science. He then became Chief Inspector for Archaeology at the State Inspectorate for Cultural Heritage, monitoring the development of contract archaeology in the Netherlands (until 2006).

It would be wrong to assume that Willems' academic career ended when he became (assistant) director of the ROB. In 1986 he obtained his PhD with the influential dissertation *Romans and Batavians. A regional study in the Dutch Eastern River Area*.[111] This work was followed by books on Nijmegen and the limes for a wider audience.[112] In 1990 he was appointed professor of Provincial Roman Archaeology at the University of Leiden and in 2006 professor of Archaeological Heritage Resource Management, combined with the deanship of the Faculty of Archaeology. His commitment to the archaeology of Nijmegen resulted in two more publications.[113] He published numerous books and articles on heritage management, was involved in many boards and committees – the European Association of Archaeologists and the ICOMOS

[106] The levels of the features are included in the original databases.

[107] Actueel Hoogtebestand Nederland, Netherlands up-to-date elevation data; the ROB levels seem a little too low.

[108] This included recording the staff/workers present, the machine's working hours and the area opened/ backfilled, visitors and agreements made with stakeholders.

[109] It was not possible to obtain a BA in archaeology at that time.

[110] Johan Hendrik Frederik (Tom) Bloemers ('s-Gravenhage, 31-12-1940) studied classical archaeology, prehistory and ancient history in Groningen and was provincial archaeologist for Limburg from 1967 until 1981. In 1982 he was appointed professor in Prehistory and Provincial Roman Archaeology at the IPP, Amsterdam; from 2001 archaeological heritage management became his field of study.

[111] Willems 1981; 1984; 1986.

[112] Willems 1990b; Bechert & Willems 1995.

[113] Willems *et al.* 2005; Willems & Van Enckevort 2009.

International Committee on Archaeological Heritage Management, among others – and travelled to many countries across the globe.

The fact that Willems studied at the IPP in Amsterdam, which boasted several specialist departments, partly explains the attention given to archaeobotanical and other environmental research (pollen, soils, phosphate) at Voerendaal.[114] That same background meant that he was well educated in a thorough 'provincial-Roman' archaeology, with an emphasis on both historical sources and material culture. At the same time, his BA in anthropology and his time in Michigan meant that he was well informed about the 'New Archaeology' of the 1980s. Although not very evident in the few lines on the research goals for Voerendaal,[115] this is very clear in his PhD thesis.[116] Here we see influences from geography and systems theory, as well as anthropology, history and other 'modern' elements in archaeology. A geographical approach is also reflected in a contribution to the volume *Roman and native in the Low Countries*,[117] in which several researchers presented their view on the study of romanization. The volume was edited by Willems' friend Roel Brandt and by Jan Slofstra, who conducted the other large-scale Dutch villa excavation of those years, Hoogeloon-Kerkakkers.

In the light of Willems' impressive curriculum vitae, it is understandable that the results of the Voerendaal excavations were never completely analysed and published. He was still the provincial archaeologist when the fieldwork started and later, in 1985, he became assistant director of the ROB (Fig. 2.10). Moreover, from 1986 to 1995 he directed the large excavations – 11 hectares – of Roman army camps on the Kops Plateau near Nijmegen (like Ten Hove, a site that could not be protected as a monument in its entirety).[118] There were other reasons why a full report failed to appear, however. In the last two decades of the second millennium, the ROB was flooded with large-scale excavations and other activities, leaving no time or capacity to analyse all the investigations. Throughout Dutch archaeology, excavation data were 'shelved'. It is hard to imagine these days, but 'computerization' was still in its infancy when Voerendaal was excavated.[119] Although databases were used, even entering data was a complex matter, let alone retrieving them and making queries. The processing of both field and find drawings was particularly laborious, involving multiple stages of photographic scaling and tracing with ink pens. Finally, another factor may have hampered the publication of Voerendaal. The excavation was very dear to Willems's heart; a large watercolour of the villa complex decorated the wall of his living room! Did he envisage Voerendaal as a project to undertake after his retirement? Whatever the case, Willem Willems passed away after a short illness at the age of only 64. It is ironic that he died at almost the same age as Habets and, like Habets, did not get the chance to publish his excavations at Ten Hove.

2.4 Trenches in the Steinweg 2004

In November 2004 a small-scale investigation was carried out by Grontmij, preceding a reconstruction of the Steinweg.[120] The main aims of the investigation were twofold: to establish whether the Steinweg was Roman in origin and to determine the dimensions of building 403. Four small trenches, 1.5-4.5 m wide, were dug through the road surface and the grass shoulder (Fig. 2.7).[121] Trench 181 was 9 m long and this is where the southwestern corner of building 403 was found; its length was therefore about 28 m. The position of the wall of the building, also recorded in trench 182, suggests that the modern Steinweg does not follow the course of a Roman road. Nor were any traces of a Roman road found in the other two trenches further to the east. In trench 183, a row of tree trunks was laid on the surface of a dirt track in the not very distant past. Many wheel ruts were observed in the colluvium beneath it, similar to those already found in the ROB trenches. During the Grontmij investigation, four plans of trenches and five sections/trench wall drawings were made. The published data do not allow an accurate positioning in the overall

114 Although this kind of research was firmly rooted in other Dutch universities as well (Groningen, Leiden).
115 Cf. section 2.3.2.
116 Especially in chapters 10 and 11.
117 Willems 1983.
118 Willems *et al.*, JROB 1986, 42-49; 1987, 36-39; 1988, 34-35; 1989, 43-47; 1990, 42-44; Willems 1990, 23-30; Willems & Van Enckevort 2009, 35-41. On the research history of the site, see Van Enckevort 2014.
119 As described for the case of Hoogeloon-Kerkakkers in Hiddink 2014a, 25-26.
120 Geraeds 2005. Archis 62BN-314 / 431713.
121 These trenches 1-4 are numbered 181-184 in our database.

A

B

Fig. 2.10. Voerendaal-Ten Hove. Willem Willems shows Cees Braat the newly discovered features near the Steinweg in 1985.

A both next to drain 317; B in trench 16 (level 6), with Fedor van Kregten at the drawing table.

excavation plan; the deviation is perhaps some 10-20 cm.

2.5 Plans for reconstructing the villa

When the excavations were finished, an initiative was taken in around 1990 to study the feasibility of rebuilding the villa – the 'Foundation for rebuilding the villa rustica of Voerendaal'. Huub Strous, the mayor of Voerendaal, was the chairman of the foundation; the ROB was represented by Willem Willems and Wim van Es (the director at that time). The aim was to realize a scientifically sound reconstruction that gave the general public an experience of Roman life and struck the right balance between recreation and education. A feasibility study was carried out by Heritage Projects (York) together with the Archeoplan (Delft). It was financed by the Industriebank, the municipality of Voerendaal and the regional employment agency. Although the project had potential, a fairly high number of visitors was needed to make it viable.
Many possible financiers therefore doubted its feasibility and declined to take part. Because several grants were also cancelled or were not applicable, it was ultimately decided to cancel the project.

3 The Voerendaal project 2019-2022

Henk Hiddink

This chapter discusses the project to analyse and publish the results of the excavations at Voerendaal. The project formally started in 2019 but preparations began some years earlier. The background and organization of the project are discussed in the first section. The second section is devoted to the project's research aims and the third to various practical aspects.

3.1 Background and realization of the project

When Professor Willems became terminally ill in 2014, work on the publication of another villa in Limburg, that of Maasbracht, was well under way.[122] Although he was very pleased about this, he expressed his regret at never having published Ten Hove to his former colleague Leonard de Wit at the Cultural Heritage Agency of the Netherlands (RCE). With this in mind, staff at the RCE and Leiden University, the latter working on Maasbracht, organized a brainstorming session with a number of experts to explore whether and how a publication could be achieved as a fitting tribute to Willem Willems.[123] Because nobody had a clear overview of the state of affairs, two archaeologists experienced in the analysis and publication of villas were called upon. They were asked to make an inventory of the documentation and find material, to explore its potential for answering various research questions and to design scenarios for the analysis and publication. An Action Plan (*Plan van Aanpak*) was completed at the end of 2016.[124] The RCE planned to start a tender procedure among Dutch archaeologists and material specialists, but it was clear that this would be a complex process. Moreover, funds were lacking at the time for a project of several years' duration involving a large number of participants.

Fortunately, additional money for archaeology became available at the end of 2017 following a general election and the formation of a new government. It was now possible to apply for a state grant, albeit on the condition of matching from other bodies. The Province of Limburg was prepared to supply these additional funds provided that they were partly spent on activities for a wider audience. A request for funds was drafted by the RCE and the Limburgs Museum in Venlo.[125] The budget estimate and planning in the original Action Plan was slightly altered but a thorough revision was not necessary. After the request was approved in December 2018, the Limburgs Museum became responsible for the project. The Museum was represented by Benoit Mater until 2020 and by Anja Neskens to the present. Two external project coordinators were hired: Fokko Kortlang for contract supervision and Beatrice de Fraiture for public-oriented activities. The project formally began on 1 March 2019, with Henk Hiddink (project director) and Diederick Habermehl (assistant director) in charge of the archaeological analysis and publication, as well as directing the specialists.

From January 2018 onwards the later project director compiled the (digital) excavation plan and a new database to enable an immediate start on the analysis once the project officially commenced. The first half year of the project was used to compile a definitive inventory of the finds still held by the Provincial Repository for Archaeological Finds in Heerlen. The process of contracting specialists started in the late summer of 2019 and work on the most relevant find categories began in January 2020. The outbreak of the Covid-19 pandemic had implications for the project's progress. Some finds at the RMO and the Heerlen depot were temporarily inaccessible, as were workplaces and libraries, resulting in a delay of two to three months. The first versions of the specialist contributions were not received as planned in September but in October-December 2020. During this period and in the first few months of 2021, texts were edited and the remaining find categories were handed over to other specialists. This included the flint artefacts, which only became available after the stone material had been analysed. Furthermore, a research proposal to update Kooistra's 1996 archaeobotanical analysis could only be drafted once the date and periodization of the sampled contexts were fixed.[126] It was decided that an isotope analysis would be highly relevant, with the implication that samples had to be selected and submitted before the contribution could be written. Although all the work was able to

[122] Vos *et al.* 2017. Although only the main building was excavated, Maasbracht is important because of the many fragments of mural paintings found.

[123] The meeting was held on 20 April 2015. Those present were Nico Roymans (Vrije Universiteit, Amsterdam), Rien Polak (Radboud University, Nijmegen), Roel Lauwerier, Tessa de Groot (RCE), Sjeng Kusters (Provincial Repository for Archaeological Finds, Heerlen), Hilde Vanneste (regional archaeologist Parkstad Limburg), Laura Kooistra (BIAX, Zaandam) and Mark Driessen (Leiden University).

[124] Habermehl & Hiddink 2017.

[125] The *Projectplan uitwerking archeologisch onderzoek en publieksprogramma Romeinse villa Voerendaal-Ten Hove* was written by Benoit Mater (Limburgs Museum), assisted by Peter Schut (RCE).

[126] See chapter 17.

proceed, it continued to be hampered by the pandemic. Visits to the Heerlen depot had to be kept to a minimum and sessions with specialists to take a closer look at some of the finds had to be postponed, while libraries closed again until the late summer of 2021.

In the second half of 2021, the focus shifted from analysis to the final editing of the publication. A first version of the manuscript was submitted to the members of a scientific advisory committee in October of that year. Their comments were processed, leading to a revised version of the manuscript in January 2022. In the meantime, the lion's share of the 'technical' editing of texts and illustrations was completed. The completed manuscript was submitted for authorization in April 2022, marking the start of turning it into a report in the *Nederlandse Ouheden* series.

3.2 Aims and research questions

Obviously, the primary aim of the 'Voerendaal project' was to present the archaeological data, including descriptions and illustrations of the features and finds.[127] This was clearly long overdue and considerable knowledge was already lost with the passing away of key participants; some of the documentation was also no longer available. Another goal of the project was to analyse and interpret the data in terms of dates, functions and the provenance of features and/or finds. A number of specialists were therefore involved in the analysis. Naturally, this would be not enough for such a unique site – from the perspective of Dutch archaeology – as Voerendaal-Ten Hove. Comparative data from the wider region would have to be considered in the interpretation.

The Action Plan contained over 200 research questions, including suggestions on how to tackle them. These questions were listed under a dozen themes (landscape, architecture, social structure, economy, water supply, etc.).[128] The number of questions and themes is quite extensive because they were intended to inform and inspire specialists who were less familiar with the site, region and/or villa studies. For this reason, the intention was never to answer all the questions, quite apart from the fact that many cannot be answered. If we compare the present research themes and questions with those proposed by Willems more than 30 years ago,[129] we see that they are essentially identical.
Like most Dutch archaeologists in the 1980s, Willems was influenced by 'processual archaeology', although he never lost sight of the specific historical context and cultural aspects of the societies studied. The approach adopted in our project is similar: no specific 'paradigm' or archaeological theory has been chosen, but it is still 'theoretically informed'. Most important is an awareness of the manifold dimensions of the phenomena and developments studied; an attempt must be made to integrate them in the interpretations.

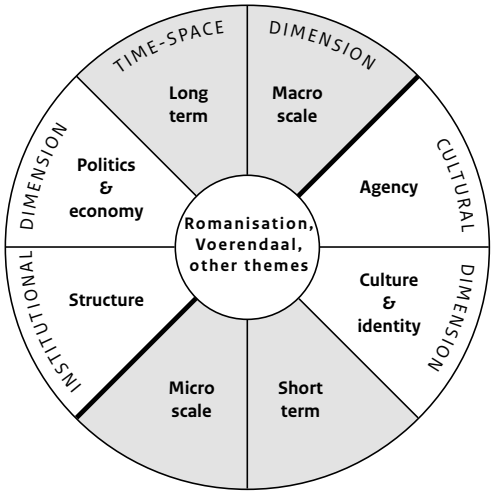


Fig. 3.1 Model of a dimensional analysis of Romanisation (also applicable to other themes or sites). The thick diagonal line separates the theoretical orientations of processual (left) and post-processual archaeology (right). (source: modified after Slofstra 2002, fig. 1)

A useful and inspiring model of 'dimensional analysis' was designed and discussed by Slofstra in an article on 'romanization' in the Lower Rhine area (Fig. 3.1).[130] He stressed the importance of not focusing too one-sidedly on the institutional dimension (e.g. the Roman tax system, patronage, type of economy) or cultural dimension (agency, construction of identities by persons or groups), as in processual versus post-processual archaeology. To quote Slofstra: 'It is precisely the dialectic between structure and

[127] A second important aim was transmitting the project results to the general public by means of exhibitions, lectures and postings on the internet/social media. These activities are not dealt with here; some are highlighted on the website of the Limburgs Museum, Venlo (https://www.limburgsmuseum.nl/nl/). Two exhibitions were organized, one in De Vondst, Heerlen (19 June 2021-9 January 2022) and another in the Limburgs Museum (20 May-4 September 2022).
[128] Habermehl & Hiddink 2017, 63-67; this publication, appendix I (slightly altered).
[129] Section 2.3.2.
[130] Slofstra 2002, 20-23, fig. 1.

Fig. 3.2 Regions and a selection of sites mentioned in this report.
1 cities and vici; 2 stone-built sites, predominantly villas; 3 post-built sites, all periods; 4 major lignite mining areas abbreviated as FR Frimmersdorf/Garzweiler; HA Hambach; WW Weisweiler/Inden (overlapping with the Aldenhovener Platte).

agency that shapes history.'[131] The importance of the temporal dimension is obvious in archaeology. Assigning features and finds to certain periods – Iron Age, Roman, Middle Ages – requires a major effort, especially at a site showing activity over more than 1000 years. However, this does not even mark the beginning of an explanation. First, one has to consider whether 'discontinuities' are historically 'real' or simply archaeological constructs (periods, phases). Some phenomena can only be understood if viewed in a long-term perspective,

[131] Slofstra 2002, 21.

for example the impact of Caesar's actions on settlement in the Roman period or the Early Medieval agricultural regime influenced by erosion in preceding periods.

Equally important as the temporal dimension is the spatial dimension (Fig. 3.2). This study constantly takes account of several levels: the local level of the site (including its fields, water sources etc.), the regional level of the Heerlen Basin and Zuid-Limburg (Figs 1.2; 4.7) and the supra-regional level. This latter level was the Eburonean territory in the Late Iron Age, the province of Germania inferior in the Roman period, while in the Early Middle Ages it included parts of northern Austrasia (Figs 14.3, 15.1, 16.9).[132] All these units cover two major geographical areas of relevance to us. On the one hand, this is the loess belt of Zuid-Limburg, the German Rhineland and the Belgic Hesbaye and Condroz regions (including the forelands of Ardennes and Eifel). On the other hand, the sandy soils of the Meuse-Demer-Scheldt (MDS) area are important (Fig. 3.2). Some phenomena and developments can be better understood by comparing the data from both zones. Moreover, the MDS area is comparatively well investigated and can therefore supplement the data on the loess belt, for instance when we consider house types and habitation history in general.

3.3 Some practical aspects of the analysis

Although the way in which the data from the archaeological excavations at Ten Hove were processed and analysed is fairly standard when compared with other excavations in the south of the Netherlands, some matters require further comment. Below we discuss the process in general and the choices made and we explain the limitations of the data/documentation.

3.3.1 Compiling the general plan

The starting point for every analysis of an excavation is a high-quality general plan of the features. Although a plan has been available since the late 1980s, it was not in a digital form and therefore no longer suitable.[133]

The 116 trenches dug by the ROB had some 270 separate levels in total, of which about 250 had already been digitized in AutoCad by students at the Vrije Universiteit, Amsterdam for training purposes.[134] The quality of the information in the files ranged from near perfect – with all lines, feature and find numbers, levels – to incomplete and rudimentary. Every file was accompanied in Adobe Illustrator by a high-resolution scan of the original field drawing at 1:50, after which missing lines were vectorized. Feature numbers, a registration mark and coordinates were added. Some 20 drawings had to be digitized completely from scratch. Trenches 15, 23, 112 and 113 were a special case because the A0 field drawings were lost before the scans were made. Fortunately, the microfilms were still present in the RCE archives.[135]

The preparation of digital versions of the field drawings involved the first step in the analysis, a preliminary classification of the lines/features, symbols and numbers.[136] Figure 3.3A illustrates one reason for this: the chaotic, quite incomprehensible image resulting from simply superimposing all the drawings. It had to be possible to make specific lines and numbers (in) visible. The next step was to compile the general plan, by reducing the 1:50 trench plans to 1:500 and transferring them to their proper position. Positioning the first seven of the 16 trial trenches was done slightly differently. Because they were positioned at an angle respective to the Dutch grid system (RD) and their drawings did not have coordinates, the files were combined using a scan of the 'analogue' plan, provided with coordinates and then placed in the 'master file'.

Although somewhat laborious, this was less complex than integrating the drawings of the RMO excavations (cf. Fig. 2.5). The information on the position of the trenches was unintelligible and the surveying was far from perfect. With the help of walls and other features from the ROB drawings, the RMO drawings could be positioned provisionally. The walls in trenches 9 and 18 (main building), 10 (building 405), 102-103 (*horreum* 408), 89, 110-110 (garden wall) and 114 (drains of the bath) were quite useful here. Some 'disturbances' recorded in the 1980s were in fact Braat's trenches, which also proved helpful as reference points. Despite all these leads, specific

[132] For the meaning of 'Heerlen basin', see chapter 4.

[133] The plan drawn in ink on film (scale 1:200) was called '*alle sporen kaart* (ASK)' or 'all features map'.

[134] In around 2009 by Astrid Bos, Herman de Bruine, Michael Chchetlov, Lars Hopman, Sam Leeflang, Joeri Louw, Renée Meijboom, Robin Stoots, Theo van der Tier and Bette Vertelman.

[135] Recovered by Peter Schut, a former head of the department responsible for excavation records.

[136] Appendix XI, table 1.

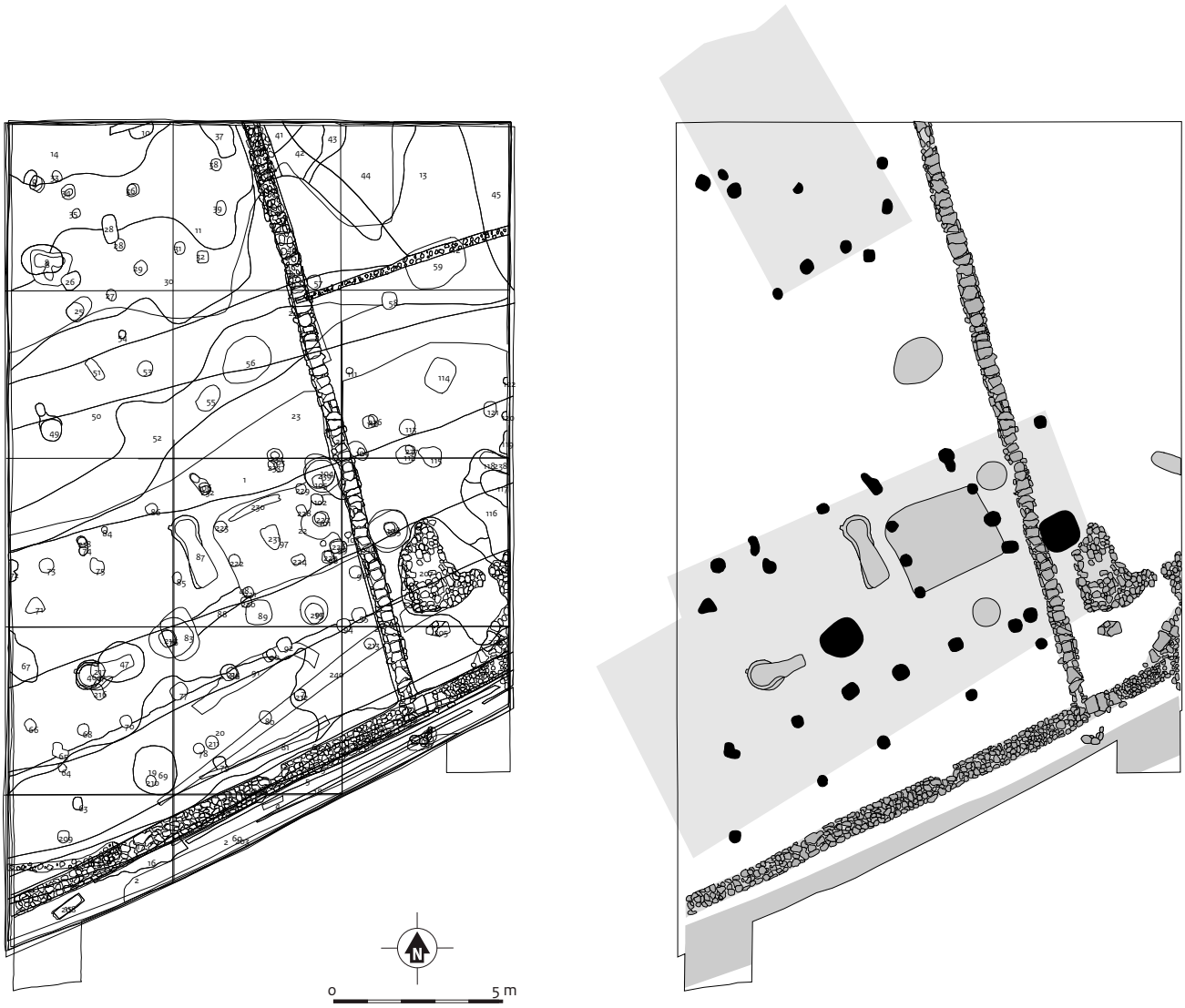


Fig. 3.3 Voerendaal-Ten Hove. Trench 16 with all vectorised lines (left) and an edited version with the main structures (right).

RMO trenches or parts thereof needed some free scaling and rotating, or in other words, fiddling or 'data massage'. Some features had to be relocated by 20-25 (incidentally 50) real-world centimetres. Strictly speaking, the parts of the plan with Braat's features should only be reproduced on a scale of 1:500 or 1000.

3.3.2 A new feature database. Structure numbers

Information about the features and related find numbers was available in an Excel CSV (comma separated values) format at the start of the current project. Both the feature database (SPRALL) and the database showing relationships between feature and find numbers (VNDALL) were incomplete, however.[137] Moreover, some test queries applied to the latter database showed that it was corrupt, assigning far too many find numbers to some features. Because adding, checking and correcting thousands of records in several tables would be a Herculean task, it was decided to make a new, elementary but reliable database. Its main objective was the linking of features, structures and finds. Therefore, all features present on the field drawings were entered in an Access database, combined with the level at which they first appeared, the type and depth, as well as section and find numbers.[138] The new database contains over 5,000 feature numbers and over 4,000 find numbers.

[137] Cf. Habermehl & Hiddink 2017, 16-17.
[138] Appendix XII.

To avoid double trench numbers, trial trenches 1-16 were renumbered as 121-136. The old RMO trenches were given the numbers 141-176 and the features were numbered. The next step involved combining features into structures. A structure can be a building, a combination of a number of postholes or walls, but in the context of the database also a feature such as a long ditch, comprising different sections with separate numbers. The trenches themselves are also considered features; they make up the 1-199 series. In the last of the preliminary reports on the ROB excavations and Kooistra's PhD thesis, characters were assigned to a number of important features. For ditches, graves and drains, a-t were used, translated here to the numbers 301-321.[139] Buildings and structures (mainly in stone) A-P and C1 were numbered 401-418. The main building and its predecessor were numbered 400 and 399. Numbers also had to be assigned to sunken-floored huts (501-520), granaries and other (possible) wooden structures (201-262), as well as to the Early Medieval graves (381-388). Numbers in the 600 and 700/800 series were used for hearths and pits respectively (Table 3.1).

[139] Willems & Kooistra 1988, fig. 2. The letters i and o were not used originally.

Table 3.1. Voerendaal-Ten Hove. Structure numbers used in this report and old designations, mainly those of Willems & Kooistra 1988, fig. 2; Kooistra 1996, fig. 24.

Structure	Former designation	Description
1-116	1-116	trenches ROB
121-136	1-16	trial trenches ROB
141-179	-	trenches RMO
201-262	-	post-built structures
241	W	building
301-308	a-h	ditches
309-310	i-j	graves
311-313	k-m	ditches
314	n	well
315	(h)	pit/grave (1987, fig. 2)
316	p	aqueduct
317-318	q-r	drains
319	s	basin
320-321	t	graves
322-325	-	planting holes
326	-	annex
327-330	α, β, -, γ	drains baths
331-333	-	ditches
334	-	drain
335	-	lime pit
336	-	basin
337	-	ditch
338	-	lime pit
381-388	-	graves M, L, N, U
399	-	first villa
400	-	second villa
401-412	A-L	stone buildings
413	M	horse pond
414	N	Iuppiter column?
415	-	first phase 408
416	-	wall
417	P	gate
418	C'	post-built building
419	-	wall
420	-	threshing floor
501-520	-	sunken-floored huts
501	12	sunken-floored hut
511	8	sunken-floored hut
514	10	sunken-floored hut
601-653	-	hearths/kilns/furnaces
610-613,649	3	hearths 'in' 405
627	13	hearth
701-811	-	pits
718	1	pit in 401
736	14	pit
738	11	pit
765	(e)	pit e Braat
755	7	pit
757	-	cellar/sunken hut
901-926	-	(sub)recent features

3.3.3 The analysis, description and illustrations of structures

The procedure used to analyse and describe the structures and features of Ten Hove is largely identical to the one used in our previous projects.[140] An important aspect is that the illustrations for the publication – plans of buildings and graves, sections of graves, ditches and pits – are made by the archaeologist describing and analysing them. He or she is thus made fully aware of any missing or problematic data, alternative interpretations, etc. In principle, the finds are also determined – albeit provisionally – at this early stage in order to gain an impression of possible functions and dates. However, this step was postponed because of the rather chaotic way in which the finds were stored.

Specific issues relating to the way in which certain kinds of structures/features are described or illustrated can be found in the catalogue, Chapters 40-46. For example, solutions had to be devised for the representation of stonework (Chapter 40) – documented differently through time – or the reconstruction of sections through graves (Chapter 42). Some aspects of the excavation method were rather crude, even for the 1980s, affecting the quality of the documentation and analysis.[141] For example, the pits of sunken-floored huts were not sectioned at all (Chapter 44) and for the majority of pits and postholes, finds were not kept separate per layer/sub-context (such as packing soil and post pipes for the latter). As some larger features were only sectioned at a deeper level, substantial parts of sections sometimes had to be reconstructed.

Following the reconstruction of buildings and other structures, the numbers of the features involved were linked in the database via an entry form and stored in the TABEL_SPOOR table. The feature numbers in this table form the link to the find numbers because they can also be found in the TABEL_LAAG table.

3.3.4 Finds locations, distribution maps

To enable the production of distribution maps, the coordinates of find numbers obviously have to be entered in the database. Although such a database had been created in the past (VNDALL), it was also incomplete (with 3,083 records against the present 3,930). Because that table could also be faulty, we decided to make a new one. Moreover, the aim was not to plot each individual find number, but those associated with specific structures as one as it were, plotted at a location at their centre of the structure.[142] Therefore, the position of all find numbers respective to a trench's zero-point was measured and converted to national grid coordinates with the help of an Excel spreadsheet. Six days of measuring resulted in the 3,930 coordinates mentioned above. The Excel file was stored in a CSV format and imported into the new database (ND). The distribution maps were made from simple queries of the Access finds database, linked with the coordinates. After converting the query into a CSV file, this was edited and, once coordinate registration marks were added, plotted in Qgis, exported as dxf-file and finally placed in the Adobe Illustrator excavation plan.

3.3.5 The finds database

When processing finds from an excavation, the best procedure is to organize everything all per structure, feature or find number, make provisional determinations and enter these in a database (including numbers and weights) before handing them over to the specialists. In the case of Voerendaal, however, it seemed preferable to use the existing finds database as a starting point and work the other way round. The main reason for this was that all finds had been analysed in the 1980s by the late Jan Thijssen, an archaeologist with a vast knowledge of archaeological material. It seemed unwise to try to determine all the finds anew, although many adjustments would be necessary. A second reason was that many relevant finds (brick and tile, stone) had been discarded and we suspected that others were lost.[143] Like the feature database, the existing finds database (KERALL) was created some years after the excavations. Although not corrupt, it soon proved incomplete; trenches 0 (finds without context), 29, 46, 52, 94 and 95 were missing. Fortunately, copies of the original prints were still available, enabling us to add more than 1100 records, some 10% of the

[140] E.g. Hiddink 2005a, 27-28.
[141] Cf. section 2.3.5; 5.2.
[142] For long ditches, such as 301-303 or 308, the find numbers from each trench were in principle positioned at a single point.
[143] Habermehl & Hiddink 2017, 26-28.

total. Even once the database was 'complete', 'new' finds were discovered from time to time in the depot.

Because of the limitations of databases and storage media (floppy disks!) 30 years ago, the structure of the original database (OD) was very compact, with a description of the material in just four fields! MATERIAAL (material), the first field, is already very specific, containing for example: TER.SIG (terra sigillata), DIKW (thick-walled), RUWW (coarse ware), METAAL (metal) and BAKST (brick). A disadvantage is that it was impossible to make a simple and quick selection of all prehistoric, Roman or Medieval pottery. CATEGORIE (category), the second field, contained (sub)categories of materials, as well as forms and 'wares', for example AMFOOR (amphora), TEGULA (tiles), BOTTEN (bones), SLAK (slag), IJZER (iron) or TECH.A (orange-red on white). TYPE, the third field, referred to type designations in the strict sense, such as CH(enet)320 or N(ieder)B(ieber)89. However, even subcategories, materials and forms could still also be found at this level, such as BEWERKT BRONS (worked bronze) and NAGEL (iron nail). Finally, some very relevant data were stored in a fourth field, OPMERKINGEN (comments).

The rather inconsistent content of the fields and other drawbacks prompted the decision to use a new database (ND), with more fields and with no essential information left in the comments field. This database is described in Appendix XII. The existing fields in the OD were incorporated into the ND, after which identifications were 'translated' into new codes (ter.sig > ts; kalkst > ska) and assigned to new fields where necessary. The determinations were sometimes slightly altered and specific objects were often given their own record. For instance, the 21 iron fragments mentioned in a single 'comments' field were split up over five separate records, four for a 'bell, collar, chain and axe', the fifth for the remaining sixteen unidentified objects. Animal bone had also been entered into one record per find number and therefore divided into species and bone/skeletal region (with the help of the original paper forms). Many 'new' objects were discovered during the analysis, especially objects from the investigations by Habets, Holwerda and Braat. Together with new records created by specialists (see Section 3.3.7), the 10,000 records in the OD increased to over 14,000 in the ND.

Because many objects had the same find number, an 'auto ID' field was added, providing a unique number for each record. The weight we entered for each find/ID was used to show that a find still existed, as an indication of its size and as a means of identification. Four different Niederbieber 89 jars with find numbers 110-2-7 (basin 319) were stored in four records (13806-13809) and can be identified by their weights: 48, 54, 28 and 34 g. Illustrated finds were also assigned a number, consisting of the structure combined with an item/running number, e.g. 722-3 for the third find from pit 722.

4 The natural and cultural landscape

Henk Hiddink

This chapter is devoted to the landscape in which the site is situated. The geology, soils and past vegetation of the (micro) region are discussed in the first section. The second section addresses the relief, loess subsoil and the theme of erosion and deposition. Finally, the third section comprises a short overview of the archaeological sites in the Heerlen Basin. In practice, this concerns Roman-period sites as not much is known about either the prehistory or Medieval period in this area.[144]

4.1 The physical landscape of the site's surroundings

4.1.1 Geology of the Voerendaal area

Zuid-Limburg, the loess-covered area of the Dutch province of Limburg, borders on the northern fringe of the Ardennes, formed during the Variscan orogeny (380-250 million years ago). The so-called 'Variscan front' runs through the Aachen area.[145] Only in the Geul and Worm/Wurm valley near the borders of Belgium and Germany are there small outcrops of Carboniferous rocks. At Voerendaal, only 10 km to the north, deposits of this period are found at a depth of 200 m.[146] In the Cretaceous, large parts of the Netherlands subsided and a transgression occurred, reaching Zuid-Limburg late in this period (about 100-65 million years ago). Because the influx of clastic material from surrounding areas was low, predominantly bioclastic calcareous material was deposited in the shallow tropical sea.[147] In the subsoil of Voerendaal, sediments of the Maastricht Formation are found as the Kunrade limestone facies (Fig. 4.1, MT; Table 4.1).[148] The top of the deposits lies some 60 m below the surface at the excavated site (but see below).[149] During the Tertiary, marine sedimentation continued, resulting in a 40 m thick layer of sands and clays of the Tongeren Formation and clay of the Rupel Formation (Fig. 4.1, TO(GO), RU).[150]

A major tectonic element of the Southern Netherlands is the Roer Valley Graben, running through the provinces of Limburg and Noord Brabant. It is demarcated by the Peel Boundary Fault (east) and the Feldbiss Fault (west). South of the latter are a number of shorter faults, probably from the late Carboniferous. The Kunrade Fault is most relevant for us. It runs 600-700 m south of the excavation in a west-east direction (Fig. 4.1). The top of the Maastricht Formation south of the fault is situated 100 m higher than north of the fault and the Tertiary sediments are completely eroded away in the former area.

Whereas the elevation south of the Kunrade Fault quickly rises from about 105 to over 135-145 m above sea level (NAP), to the north the present-day elevation lies between 105 and 75 m. The high area south of the fault is called the Ubachsberg Plateau, the lower-lying area to the north the Heerlen Basin (Fig. 4.1; 4.7). The basin was formed by headward erosion of the plateau from the Geleenbeek and its tributaries.[151] In the area around Voerendaal, eroded gravel and limestone from the plateau south of the fault was deposited in the valleys. These deposits can be found just south of the villa under the present-day Hoensbeek valley, in the form of a 1.7 m thick gravel layer at 7.3 m below ground level.[152] The valleys where the alluvial fans originated are still recognizable as dry valleys (*droogdalen*) today.

Almost the whole of Zuid-Limburg was covered with loess during cold phases of the Saalian and Weichselian (Fig. 4.1, BXSC).[153] Loess is a fine aeolian sediment, with 75% of the particles in the clay and silt of size classes (2-63 µm). In large parts of the region the loess was later eroded, sometimes almost entirely. At Voerendaal, at least some 8 m remained according to a subsurface model and the geological map.[154] The erosion of the loess in the Heerlen basin was caused by the same process that affected the Tertiary and Cretaceous sediments: headward erosion of a number of small streams. It is important to note that although the streams cut deep into the loess, they did not go through it entirely. Therefore, at least a couple of metres of loess still remain in the valleys and over 8 m on the ridges. Our villa is situated between the Hoensbeek and Retersbeek, and further north there are the Luiperbeek, Bissebeek and Hulsbergerbeek. The streams are tributaries of the Geleenbeek, originating south of Heerlen and ending in the

144 These periods are discussed in chapters 14 and 16.
145 Kuyl 1980, 17; Vleeshouwer & Damoiseaux 1990, 13; De Jager 2007, 8-9; Van Buggenum & Den Hartog Jager 2007.
146 Geologische kaart 62W/O, section C-C'/G-G'.
147 Felder 1980, 49-54; Felder & Bosch 2000; Vleeshouwer & Damoiseaux 1990, 14-16; Herngreen & Wong 2007, esp. 127, 138-142.
148 Cf. section 33.2.1.
149 Geologische kaart 62W/O, section C-C'/G-G'.
150 Kuyl 1980, 54-60; Vleeshouwer & Damoiseaux 1990, 15-16.
151 Vleeshouwer & Damoiseaux 1990, 55.
152 Core B62B0311 at 191.940/321.365 starting at 86.10 m NAP and with gravel from 78.82-77.10 (www.dinoloket.nl > ondergrondgegevens > geologisch booronderzoek).
153 Kuyl 1980, 97-100; Vleeshouwer & Damoiseaux 1990, 22-25. The loess is classified lithostratigraphically as the Schinnen Member of the Boxtel Formation (Schokker *et al.* 2005)
154 Boring 62B4102 and 4104 show loess to a depth of at least 5 m (www.dinoloket.nl>ondergrondgegevens); see also sections C-C' and G-G' with the Geological map 62W/O.

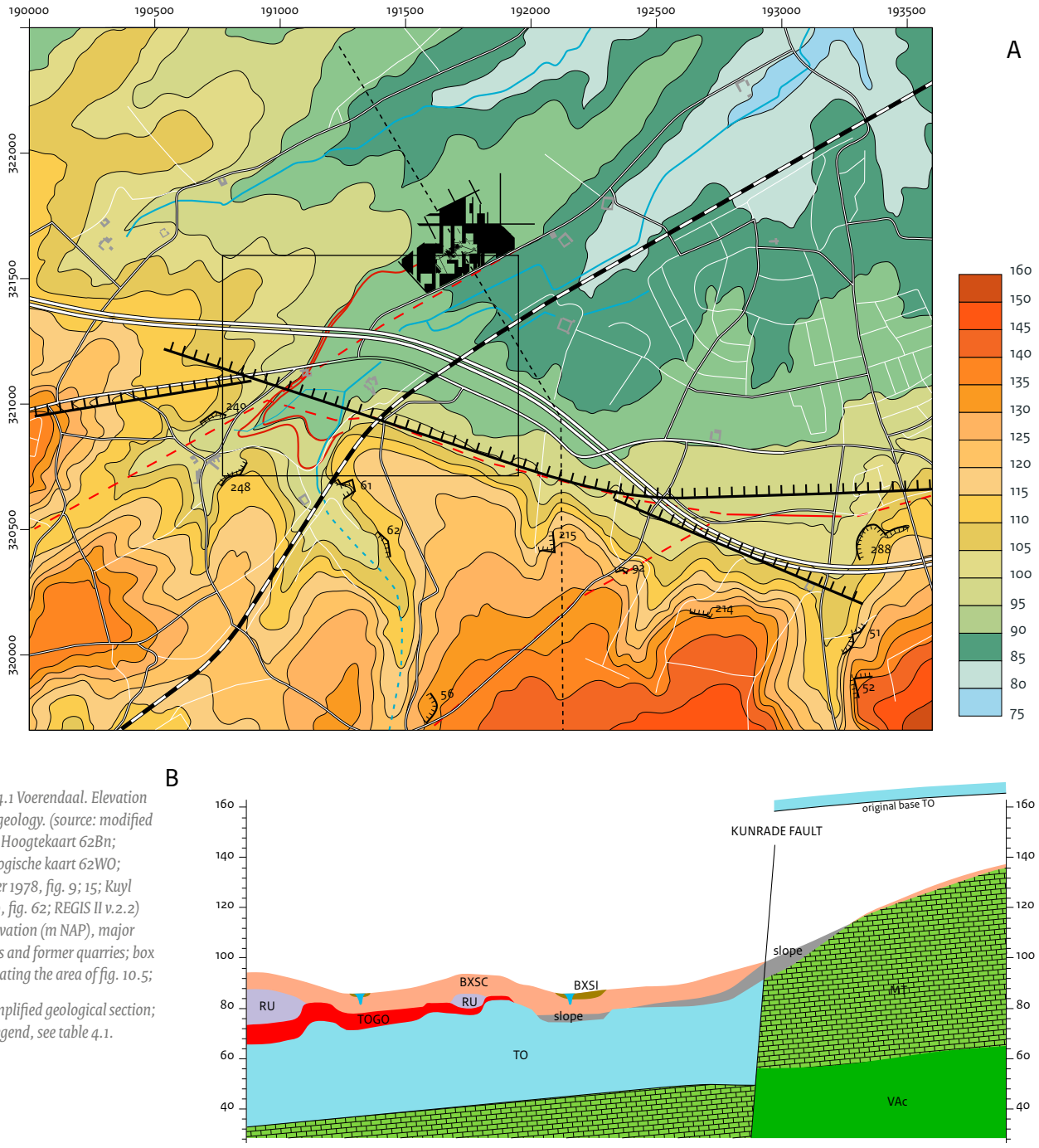


Fig. 4.1 Voerendaal. Elevation and geology. (source: modified after Hoogtekaart 62Bn; Geologische kaart 62WO; Felder 1978, fig. 9; 15; Kuyl 1980, fig. 62; REGIS II v.2.2) A Elevation (m NAP), major faults and former quarries; box indicating the area of fig. 10.5;

B Simplified geological section; for legend, see table 4.1.

Table 4.1. Units in the simplified geological section of figure 4.1B.

Code	Unit	Lithology	Date
BX	Boxtel Formation	sand, silt, loess, peat	Late Pleistocene-Holocene
BXSL	Idem, Singraven Member	silt, peat	Holocene
BXSC	Idem, Schimmert Member	loess (silt)	Saalian-Weichselian
Slope (deposits)	-	loess, gravel	Late Pleistocene
RU	Rupel Formation	clay, sandy clay (k2/z3)	Middle Oligocene
TO	Tongeren Formation	fine silty sands (z3/z2)	Early Oligocene
TOGO	Idem, Goudsberg Member	clay	Early Oligocene
MT	Maastricht Formation	limestone	Late Cretaceous
VA	Vaals Formation	fine silty sands	Late Cretaceous

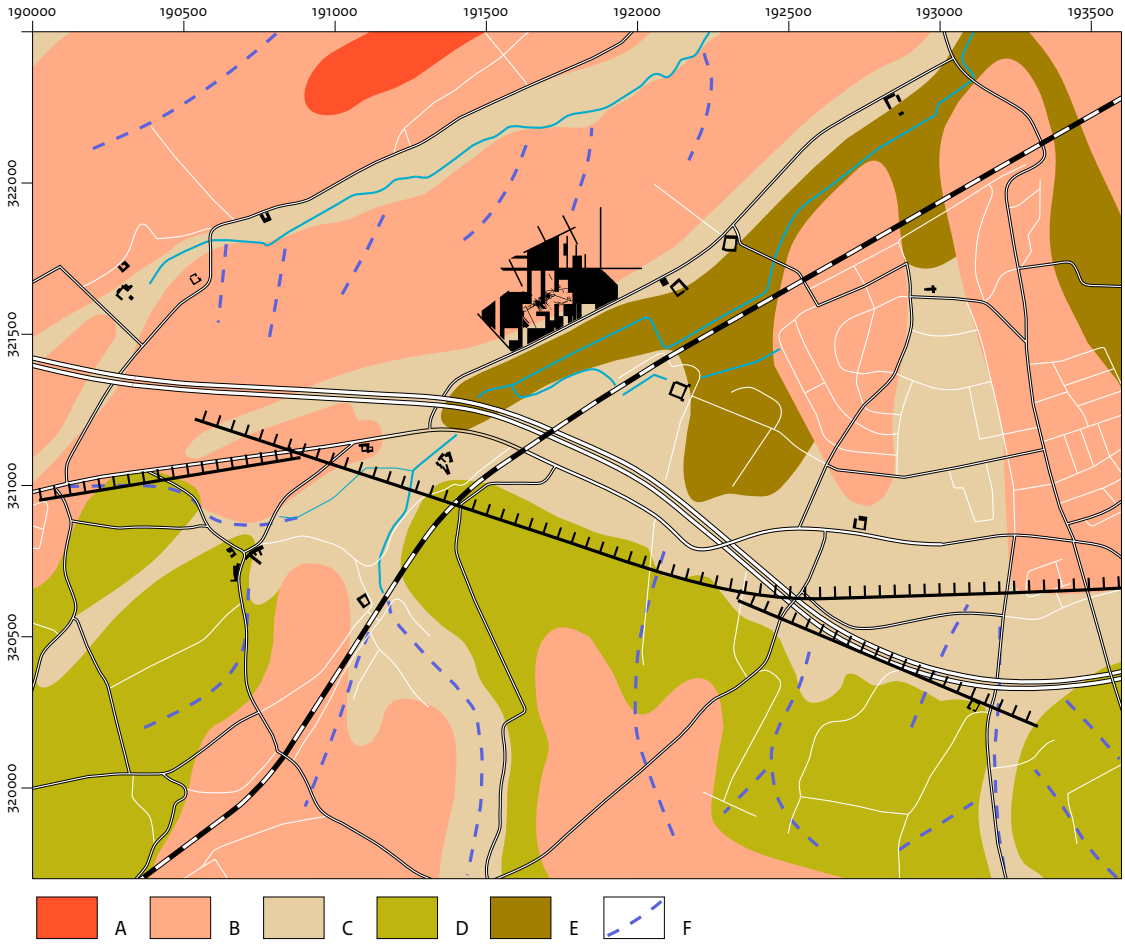


Fig. 4.2 Voerendaal. Simplified soil map. (source: modified after Bodemkaart 61-62W/E, 1990)
A radebrik-soil; B bergbrik-soil; C colluvial soils; D soils in weathered limestone, on slopes; E peat; F dry valley.

Meuse near Stevensweert, some 35 km to the north. For much of the Holocene, drainage was obstructed and a lake formed in the valley, slowly filling with gyttja and peat (see Section 4.1.3).

The location of our villa is significant because of its proximity to a number of natural resources. As stated above, the Kunrade Fault runs only a few hundred metres to the south. Limestone (Kunrade limestone) was available here and used in the Roman period.[155] The hard banks provide excellent building material and the 20-30 cm thick layers are easy to transform into building blocks. Several small quarries of Kunrade stone were in operation near Voerendaal and Craubeek until well into the twentieth century (Fig. 4.1; cf. 33.3), but today only parts of some quarry faces remain exposed,[156] and there is one new quarry, the Kunrader Steengroeve.[157] A second important resource is drinking water. At the site itself, it could be obtained from wells dug between about 13 m (near the villa) and 2-3 m deep (in the Hoensbeek valley). A number of springs, called the *Zevensprong* ('Seven Sources'), were present near the Kunrade Fault, and the aqueduct of the villa Ten Hove probably originated there.[158] (Rain) water infiltrates at the Ubachsberg plateau, flows northwards through the limestone and springs where it is blocked by fine-grained Oligocene sands and clays north of the fault. The third natural resource in the direct surroundings of the villa that is linked to the geology is peat in the Hoensbeek valley (Fig. 4.2, E). In theory, this peat could have been used as fuel in the past.[159]

[155] See section 33.2.1.
[156] See section 33.2.3.
[157] Just northwest of 62B-51 in fig. 4.1.
[158] Section 10.3.
[159] Bakels 1996a; see sections 4.1.3 and 15.6.1.

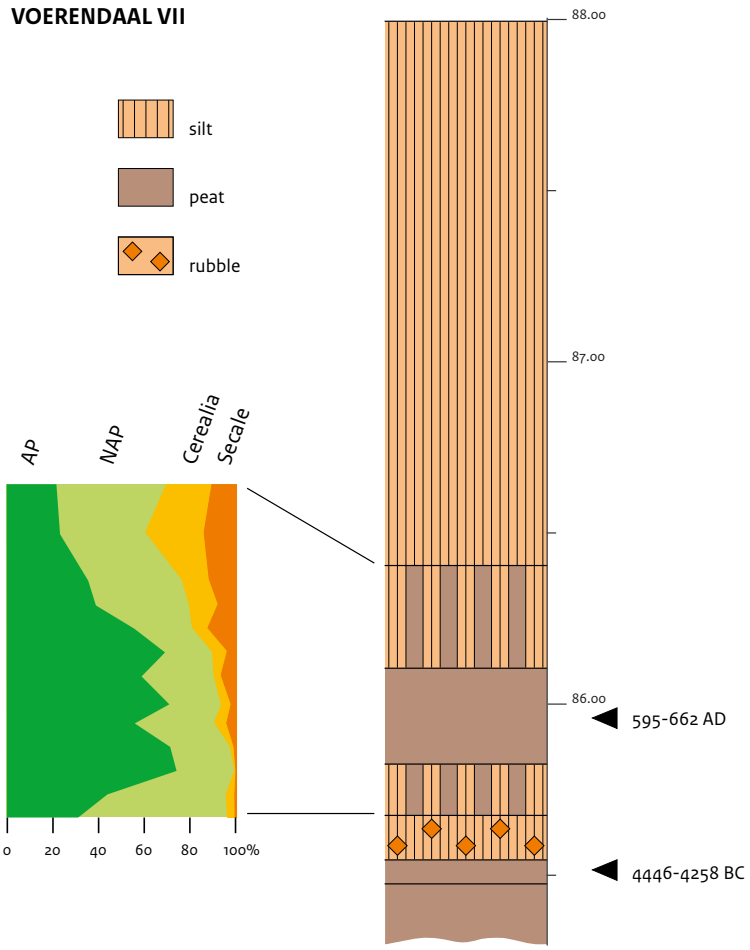


Fig. 4.3 Voerendaal-Ten Hove. The upper 2.7 m of boring VII in the valley of the Hoensbeek (location in figure 2.7), with two radiocarbon dates (triangles) and a simplified pollen diagram. (source: based on data Bakels 1996a)

4.1.2 Soils at and near the site as indicated on the soil map

When the climate grew warmer after the last ice age, soil formation in the loess began. In the early phases a humic A horizon was formed under the vegetation – initially that of arctic tundra, later a deciduous forest – and the parent material started to decalcify.[160] Subsequently, clay got in dispersion under the influence of acids, it leached from the upper levels of the soil and illuviated at 50-60 cm and below. The resulting argillic, or Bt(exture) horizon, is a defining element in the Dutch soil classification of a group of soils called the '*brikgronden*' (luvisols). The name refers to the hard, bricklike character of the argillic horizon and is comparable to the English term 'brickearth' and the French '*terre à briques*'.[161]

Two types of *brikgronden* are important for the Voerendaal area: the *radebrikgronden* and *bergbrikgronden*, shown as BLd6 and BLb6 on the 1:50,000 soil map of the Netherlands.[162] The latter type is present at the excavation site and on most of the loess ridges in the area (Fig. 4.2). Both the A and E horizon are eroded and the more resistant Bt horizon lies at the surface, or in practice is largely incorporated in the ploughsoil, with the remainder just beneath it. These soils develop on slopes with a low (soil map slope class B: 2-5%) or moderate (C: 5-8%) inclination. The *radebrikgronden* still have part of the original E horizon and cover only some of the highest, relatively flat areas of the loess ridges (A: slope < 2%). According to the soil map, an area with this soil is present north of the Retersbeek (Fig. 4.2).

The southern strip of the ridge in which our villa is situated is mapped as a third type of loess soil: a dry colluvial soil on a footslope with a low inclination (colluvic cambisol).[163] This colluvium or 'secondary loess' is the product of the erosion that truncated the soil higher up the slope. The inclination of this footslope is given as between 2 and 5% on the soil map (class B). Below about 4% only sheet erosion occurs, while rill erosion by many small gullies is possible at a higher inclination.[164] In the loess area of Zuid-Limburg, most of the colluvium is the result of human

160 Vleeshouwer & Damosieaux 1990, 66-69; Ampe 2015, 310-312.
161 De Bakker & Schelling 1989, 89.
162 Bodemkaart 61/62WO, 1990. *Rade-* is a dialect word referring to clearing, appearing as a suffix in place names such as Wijnandsrade, Weustenrade and Kunrade. *Berg* literally means 'mountain', used in the Netherlands for features a few feet above the surrounding area (ranging from grave mounds, motte castles to hills). The meaning of the soil map codes is B(rikgrond)-L(oam)-d/b(dry/'bricklayer')-6(silt).
163 Vleeshouwen & Damoiseaux 1990, 93ff. Ldh6 (L(oam)d(ry) h(elling=slope)6(silt). This is a kind of 'ooivaaggrond' in which the element 'vaag' = 'vague' points to the absence of clearly developed soil horizons (azonal soil).
164 Berendsen 1997, 22.

activities.[165] It is traditionally classified as either 'old colluvium' with some traces of illuviation and fine organic material, or 'recent colluvium' without these characteristics. On the basis of Janssen's pollen analyses, the old colluvium was attributed from the Late Neolithic to the Roman period and the young colluvium to the tenth century AD and after.[166] The latter was the result of an average soil loss of 50 cm on slopes between 2 and 8% inclination.[167] The fact that most colluvium is relatively young and post-Roman is affirmed at Ten Hove (see below) and also at the villa of Meerssen-Onderste Herkenberg.[168]

On the fringes of the plateau south of the Kunrade Fault, two other types of soils are mapped (combined in Fig. 4.2). The first is 'sticky earth' (*kleefaarde*), a clay-rich soil originating from weathered limestone.[169] The second soil type is 'chalk slope soil' (*kalkhellinggrond*), including various mixtures of loess and chalk on slopes.[170] A last soil type in the vicinity of the villa, already mentioned above, is the peat in the valley of the Hoensbeek, covered at present for the most part by a layer of colluvium (cf. Fig. 4.3).[171]

4.1.3 Vegetation

At a local level, data on past vegetation are available in the first place in the form of pollen diagrams. Regrettably, those situated close to our site, published by Janssen, are not radiocarbon dated and therefore not easy to interpret.[172] A diagram by Bakels from boring VII, taken 50 m south of the excavation, is dated but covers only a part of the period in which Ten Hove was inhabited and mainly provides information on the Late Roman period and Early Middle Ages (Fig. 4.3).[173] Kooistra's work on the archaeobotanical remains at Ten Hove is of course another important data set at the local level, although once again it does not cover the Iron Age.[174] Because our main aim is to illustrate general long-term trends in vegetation, Bunnik's research on the German Lower Rhine loess area is used as a framework. Two of his diagrams have been adapted to illustrate trends in the wider region. One is from Boslar near Jülich (30 km from Voerendaal) and the other from the Worm valley near Herzogenrath, 12 km away (see Fig. 4.4).[175]

The Early and Middle Iron Age, Bunnik's period C (c. 700-250 BC),[176] shows a decrease in the tree cover in comparison to earlier periods, with AP percentages between 60 and 80%.[177] The woods on the dry soils of loess plateaus and slopes, consisting mainly of oak and beech, were increasingly reduced in size for agricultural purposes. The latter cause is reflected in the continuous, higher values of grain pollen in combination with weeds, indicating intensive grain farming, and ruderals, suggesting long fallow periods. The pollen record further shows the development of grasslands in the stream valleys that were potentially suitable for cattle. Heath developed on some higher grounds, the result of overgrazing according to Bunnik.

Period D1 covers the Late Iron Age and a large part of the Roman period (250 BC-AD 220).[178] The contribution of trees to the pollen record continued to decline, with the remaining woods consisting only of oak, but even these gradually dwindled in size. The highest grain pollen levels were reached during this period, especially from c. AD 50 onwards. There are again indications of substantial fallow periods, and grasslands remained quite important. The reappearance of pine in the pollen record indicates erosion at the edges of valleys, exposing the infertile sands and gravels that were once covered by loess. The heaths developing here do not appear to have been used intensively for the grazing of sheep and goats.

An observation by Bunnik that is much referred to in the literature concerns a temporary regeneration of forest: 'Remarkable in this respect is the Pinus peak around the beginning of the first millennium in the Boslar diagram, contemporary with a NAP (non-arboreal) minimum, a small Fagus peak and a short but clear increase in the Alnus values (not represented in the regional diagram). These signs indicate a sudden decreasing economic pressure (*Wirtschaftsdruck*), leading to a local regeneration of forests in the marginal areas (the alder marshes and heaths). [...] probably the result of the Roman invasion by Caesar.'[179] This conclusion is probably too far-fetched because the phenomenon is observed in one diagram only and is not dated with enough precision.[180]

165 Bouten *et al.* 1985, 195.
166 Janssen 1960; Bouten *et al.* 1985, 196.
167 Bouten *et al.* 1985, 207.
168 Huisman *et al.* 2017.
169 Code KK on the soil map.
170 AHk.
171 Ldh6v: peaty material at a depth over 80 cm and still present at 120 cm and kVb/III: eutrophic peat, groundwater stage III.
172 Janssen 1960.
173 Bakels 1996a.
174 Kooistra 1996.
175 Bunnik 1995; for a discussion of some diagrams near Kerkrade, see Kooistra *et al.* 2004, 6-8.
176 Bunnik 1995, 334-335.
177 AP: arboreal or tree pollen.
178 Bunnik 1995, 335-337.
179 Bunnik 1995, 336.
180 The Pinus rise between about 150-147 cm is dated 2030 ± 60 (Bunnik 1995, table 1), which is 197 cal BC-126 cal AD (2 sigma)! At 143-142 cm in the core (c. second century AD), there is another Pinus peak, as high as the first.

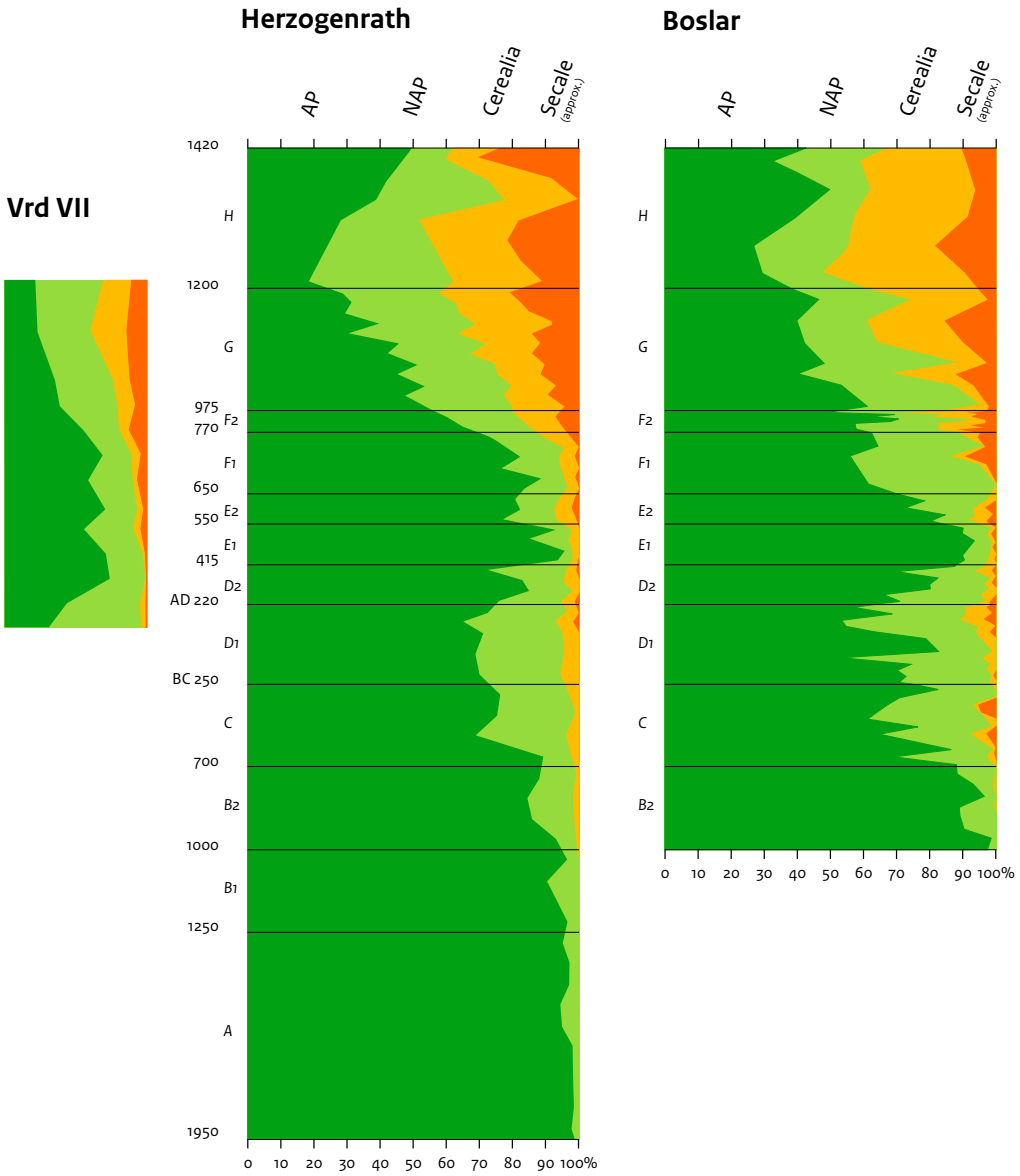


Fig. 4.4 Worm-Rur loess area. Pollen diagrams of Herzogenrath and Boslar, given the same height per period in both; values for rye only indicative. The approximate position of the diagram of figure 4.3 is also indicated. (source: modified after Bunnik 1995, fig. 2 and 4).

In the Roman silt/colluvium layer in the Hoensbeek valley, directly south of Ten Hove, little pollen was present. However, it fits in with the general picture as presented by Bunnik, with grasses and wheat-type pollen (probably spelt, including some chaff of this grain), ruderals and grassland species, as well as walnut and chestnut pollen.[181] Obviously, much more data were obtained for the Roman period by the study of charred seeds and fruits, as well as nitrogen isotopes.[182] The occurrence of a few charred seeds of wild plants growing on limey soils in the archaeobotanical samples of Ten Hove prompted Kooistra to formulate the hypothesis that part of the arable of the villa was situated at the far, south side of the Hoensbeek valley.[183] This is a relevant theory as it has a bearing on the reconstruction of the domain of the villa at Ten Hove. In itself, it could be possible, although the area in question consisted partly of steep slopes. One wonders if there are other explanations for the plant remains, such as the presence of limed fields around the villa.[184] Liming is a practice mentioned by Varro: 'When I was in command of the army in the interior of Transalpine Gaul near the Rhine [...] where they fertilized the land with a white chalk which they dug.'[185] Pliny also gives a lengthy description of the use of 'marl'.[186]

During Bunnik's phase D2 (c. AD 220-415) the tree vegetation regenerated, starting with the appearance of birch, hazel and later hornbeam.[187] Trees also reappeared in the wet valleys, the grasslands being transformed back into alder marsh again. The heaths gradually

[181] Bakels 1996a, 140-141.
[182] Kooistra 1996, 158-171; Kooistra/Brinkkemper contribution in chapter 17.
[183] Kooistra 1996, 170. It concerns Orlaya grandifloria, one in sample 11/20-4-8 (table 30), three in 15/22-7-2; cf. Lathyrus nissolia, three in 53/102-1-38. The plant occurred until the nineteenth century in some areas of the Rhineland and grew on (fertile) chalk and loam soils (Knörzer 1971, 470; Pals & Hakbijl 1992, 294).
[184] Kooistra herself puts the matter in perspective later: '...and the proportion of lime-loving species was small even in period 3.' (1996, 173).
[185] Varro, *rust.* 1.7.8.
[186] Plin., *nat.hist.* 17.42-48.
[187] Bunnik 1995, 337-338.

changed into oak-birch woods. Agriculture did not end in the region, however, as shown by some ever-present grain pollen. The association of ruderals typical of the preceding periods did disappear, pointing to changes in the type of agriculture. The forest regeneration continued during period E1 (c. AD 415-550), with the AP again reaching levels of over 95%. Even then, there are some indications of cultivation.[188] In period E2 (AD 550-650), the tree cover became less dense again, due to reclamations for agriculture.[189] Besides other grains, rye was grown from this time onwards; the area taken up by grasslands also increased once more.

The most informative part of core VII near Ten Hove can be roughly correlated to period D2-G in Bunnik's diagrams (Fig. 4.3-4). The regeneration of the woodland can be seen clearly; the lower AP percentages compared to the diagrams further to the east can be explained by the very wet conditions in the Hoensbeek valley, where trees disappeared and new peat was formed.[190] At least at a (micro) regional level, agriculture never stopped, as indicated by grain and rye pollen and later also hemp. Higher up in the diagram, the upland trees decline again; the remaining woods were probably situated on slopes in the vicinity (like those south of the Hoensbeek), composed of species such as ash, elm, maple, cherry and hornbeam.

4.2 Soil horizons in trench walls, relief and the question of erosion

4.2.1 Introduction

The soils at the site were recorded in 1:20 drawings of nearly 500 m of trench wall and in the 1:50 drawings of the excavation levels, on which layers were recorded and described. Although the length of recorded trench walls is impressive, it represents only 15% of all walls at best and is therefore insufficient as a basis for a detailed soil map (Fig. 2.7). The descriptions of all layers were made by the field technicians, who did not use soil science terminology. Soil scientists were involved in the project and visited the site several times, but they do not appear to have compiled any reports.[191] The only (indirect) record of some of their observations can be found in an interim report by E. Milikowski, covering the period up to April 1985.

[188] Bunnik 1995, 338-339.
[189] Bunnik 1995, 339.
[190] Bakels 1996a, 144-145.
[191] J.G.N. Poelman of Stiboka, Wageningen and W. van de Westeringh, Landbouw Hogeschool, Wageningen.

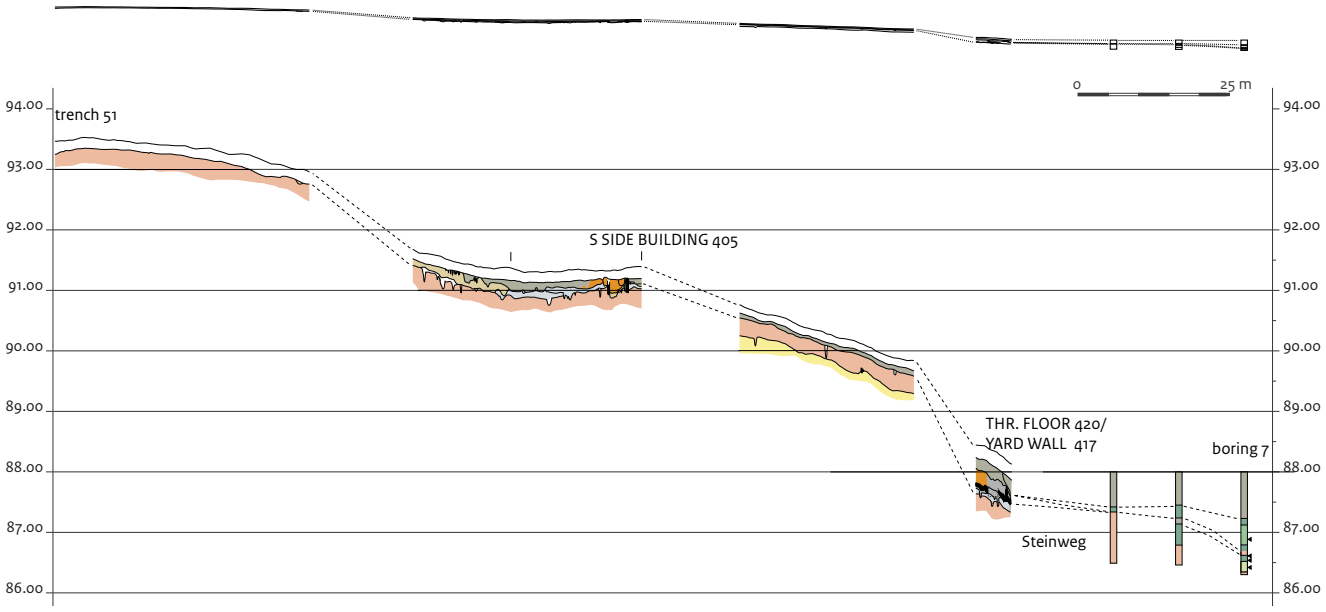


Fig. 4.5 Voerendaal-Ten Hove. Ten times exaggerated section from trench 51 (north) towards 23 and core 7; with the non-shortened section overhead, both corrected to be perpendicular to slope.

The most complete section across the excavation is that from trench 51 in the north to 23 in the south, covering a distance of 300 m, albeit with some gaps (Fig. 4.5; Appendix XXIII). Only a 40 m long section in trench 4 also shows the conditions higher on the loess ridge. A number of recorded trench walls offer a detailed picture of the situation downslope, near the Steinweg (most relevant are trenches 22, 68, 69). The problem with all the sections is that they are orientated exactly north-south and are therefore not perpendicular to the slope of the ridge, but some 20-30° off. Another thing to bear in mind is that the sections offer a limited picture of the conditions downslope. They end at the Steinweg, whereas the slope originally continued into the valley of the Hoensbeek. A number of borings were made there, but they are 20 m apart and not easy to correlate with the drawn sections.

According to the sections in the trench walls, the modern ploughsoil on most parts of the site has a thickness of some 20-45 cm. At the higher parts of the site, some areas have a separate grey-brown arable layer, for example, in trench 12/15 (5-15 cm under a modern ploughsoil of 20 cm). In trench 6/10 this older arable layer has a maximum thickness of 30-35 cm, under a plough layer of about 30 cm. In trench 4 the layer is about 20 cm thick and contains many tile fragments (therefore coloured red). The ploughsoil often rests directly on the loess, however. High up on the ridge, in trenches 4 and 10, the top of the loess is lighter, greyish in colour. Described as an 'eluviation' layer, it is probably the E horizon of the original soil, an interpretation supported by the level respective to the foundations of building 405 and the rubble around it in trench 10.[192] That the soil map indicates a '*bergbrikgrond*' rather than a '*radebrikgrond*' (see above) is unremarkable, considering its scale (1000 times less detailed than the field drawings).

At most locations higher up the ridge and on its slopes, the E horizon is missing and the subsoil consists of brown loess.[193] Although at least some erosion must have taken place, in theory it can be slight. The material of the original soil horizons might not have been transported downslope, but incorporated in the ploughsoil and thus not visible anymore. The drawings often note the presence of animal burrows and traces of tree roots. Nowhere is the argillic Bt horizon recorded, however. This is a pity because it could have provided a benchmark to assess the level of erosion. Downslope, in the southernmost 25-30 m wide strip of the excavated area, the loess of the subsoil is covered by a layer of colluvium of 1.5 m or more (including the ploughsoil). The lighter, greyish layer or E horizon beneath it, in the top of the brown loess, is described as the 'pre?-Roman level' on the field drawings. At some locations, the Roman surface seems more or less intact. We will return to this later, when discussing the levels of erosion/deposition. First, we will describe the site's relief.

4.2.2 Relief of the site

The elevation map of the modern surface – or rather, that of the 1980s – is based on a 1:1,000 plan with levels taken in 1985 and 1986 (Fig. 4.6). Some 370 measurements were made in a 20 x 15 m grid. The elevation of the subsoil was mapped with the help of the many levels on the 1:50 Ao-drawings of the trenches. Each level or planum of a standard 15 x 40 m trench was levelled in four transects, with the measurements taken each 5 m, resulting in 36 levels. Only ten of these were transferred to a 1:1,000 map: the levels at 0, 10, 20, 30 and 40 m along the sides of the trench. If virgin soil was not reached at a certain level, the first next level where it did appear was used. The contour lines were drawn by hand and smoothed in the final digital version. Perhaps the whole procedure seems somewhat crude, but a greater precision is undesirable. If all the levels were used, the contour lines would oscillate strongly as a result of slight differences in the height of excavation levels in adjoining trenches, as well as the effect of working with a backhoe.

The modern surface higher on the slope has an elevation of at least 93.50 m above Dutch Ordnance Datum (NAP), and even one of 94.50 m in the northwest corner of the investigated area. The lowest point of the terrain alongside the Steinweg is situated slightly above 87.50 m NAP, some 7 m lower. The virgin soil in the trenches was found between 94.50 m NAP near the top of the ridge and 86.50 near the Steinweg, a difference in height of 8 m. At most places the

[192] The light grey layer in the sections of trenches 102 and 103 is probably also the E horizon. Only the colour is given on the drawings, not the interpretation of 'eluviation' or 'pre-Roman' layer.

[193] In trenches 12 and 15 'sandy loess' is present under 50 cm of brown loess, in trench 23 grey loess with spots of lime under 130 cm of brown loess.

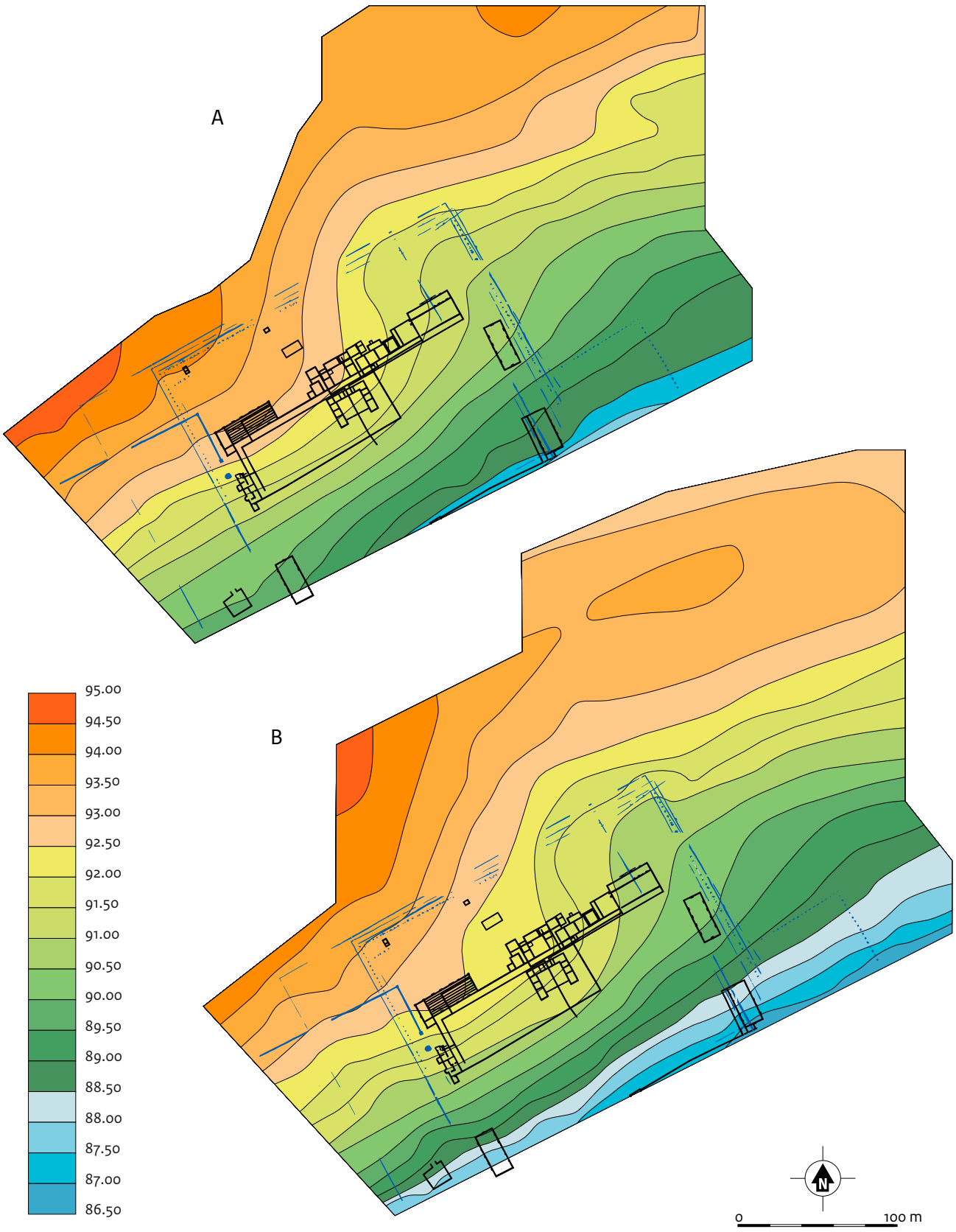


Fig. 4.6 Voerendaal-Ten Hove. Elevation map (height in m NAP, interval 0.5 m).
A ground level in 1985-1986; B top of loess/C-horizon in trenches.

subsoil was situated roughly 50 cm beneath the surface. At the higher parts of the ridge the slope has a gradient of around 2% and in the lower, southern parts of 4.5-5.5%. Most significant are some details in the central area of the site.
The main building was situated on the edge of a small 'cape', a relatively prominent position. As no trench wall sections are available for this area, we do not know whether the flat area was man-made or a natural feature. The area east and northeast of the cape is quite flat, with an inclination of only 1.7%. This was the location of building 405 and it explains why a rubble layer in a shallow depression was preserved here.
As stated earlier, the relatively flat areas were prone to sheet erosion only, the steeper ones to a certain amount of rill erosion (threshold at about 4%). Important questions are the extent of the erosion (and deposition) and the rate in specific periods. We will discuss these topics in the following sections.

4.2.3 The height of walls and floor levels as indicators of erosion and deposition

A first question regarding the level of erosion at the site is the difference between the original and present-day surface. The former ground level around Roman buildings is often reconstructed with the help of the *hypocausta*. As a rule of thumb, it is assumed that the upper floor of a hypocaust was likely to be situated some 80 cm above the bottom floor (60 cm for the *pilae* and 20 for the concrete upper floor and tiles).[194] The bottom floor of rooms 13 and 14 in the main building are at levels of 91.79 and 91.95 m NAP, suggesting an upper floor level at about 92.60-92.75 m NAP. The ground level in this area at the time of the excavation was approx. 92.20-92.25, some 40-55 cm below the suggested Roman level. That erosion did indeed take place accords with the fact that little remained of the foundations: in both rooms their top was only 13 and 20 cm above the floor of the hypocaust. At other locations in trench 9, some 5 to 30 cm of stonework remained.

In rooms 8 and 9 of the baths, the difference between the bottom floor of the hypocaust and the top of the remaining walls is 46-72 cm maximum, implying better preservation in this area.[195] This is of course also shown by the presence of an intact hypocaust in room 2, which was however only 55-60 cm high in total, not the 80 cm used above (due to the small size of the room?). The state of the drains also points to a better preservation of the baths. All this can be explained by their position further downslope respective to the main building, a less exposed position than that of the latter on the 'cape'.
If we look at the remaining height of the foundations of other buildings, the picture is less clear. The foundation of the north outer wall of the *horreum* west of the main building was still 60 cm high, but this wall was part of the second phase and dug in deeper. Of the foundations of the first phase, only 30 cm remained and of the portico only 15-20 cm. The ploughsoil on top of the foundations was only 20-30 cm thick, pointing to erosion. The foundations of the northern aisle of building 405 east of the main building were still 40 cm high under a ploughsoil of 25 cm. Although at first sight comparable to the situation at the *horreum*, the erosion must have been less severe here because the original surface – especially north of the building – formed a kind of depression and even in modern times is quite flat. Building 402 halfway down the slope opposite the baths had foundations of 16-29 cm. The north end of buildings 401 and 403 further down had foundations of 16 and 38 cm high respectively. The difference from the other buildings is still negligible. Only at the very foot of the slope are the walls clearly better preserved. There, the foundation of 403 was 55 cm high and topped by a layer of mortar, suggesting the beginning of the upstanding stonework. At the south end, the wall of building 401 was 85 cm high (markedly higher than the 16 cm at the north end).

The data suggest that, with the possible exception of the baths, the foundations are significantly better preserved only at the very foot of the slope. This is obviously caused by a larger amount of colluvium, as already implied by the difference between the level of the virgin soil in the trenches and the ground surface.
A more relevant question concerns the periods in which the erosion and deposition of colluvium happened.

[194] The 60 cm for the *pilae* is not only mentioned by Vitruvius (*arch*. 5.10.2) but actually found at many sites (Hiddink 2014a, 190-191; 664-665).

[195] Levels of 92.51/93.23 and 92.78/93.24 m NAP (levels by Braat, not comparable to those of the main building and other structures!).

4.2.4 Dating the colluvium

In principle, erosion of the loess ridge could have started in the Iron Age, when the site was inhabited and agriculture must have been practised. As stated earlier, the slopes in most parts of the site are not steep and only sheet erosion can be expected. During the Roman period, agriculture was intensive and erosion could therefore have been more serious. It is important to realize, however, which part of the landscape we are considering here. During the Roman period the excavated area was not in the middle of the arable, where erosion possibly occurred, but in the villa yard. The boundaries of the yard, with ditches and trees, formed the first barrier against erosion. The villa and adjoining buildings themselves then formed a second barrier, a kind of retaining wall. Finally, the vegetation around the villa (gardens) and pavements provided further protection of the surface.

Near the Steinweg, there are some indications of the level of the original surface. For example, a light grey 'pre-Roman' layer was recorded in the east wall of trench 22, the west wall of 23 and the south wall of 69/96, probably the remainder of the E horizon (cf. above and Appendix XXIII). The E and A-horizon in a '*radebrikgrond*' are sometimes no more than 35-40 cm thick in total.[196] In trench 22, the top of the threshing floor 420 lies about 30 cm above the base of the E horizon, suggesting that there was no deposition in the period before its construction (perhaps even a slight erosion in the direction of the Hoensbeek valley). In trench 23, the combined thickness of the E horizon and the dark layer on top of it – perhaps a ploughed or trampled rather than an intact A horizon – is 40 cm, again suggesting no deposition. In trench 96, the supposed Roman ground surface near the east wall of building 403 lies 40 cm above the base of the E horizon, therefore in line with the other observations. Finally, the supposed Roman layer with tile fragments of colluvium in the valley of the Hoensbeek is also thin, again suggesting just a moderate degree of erosion.

In the same section of the wall of trench 22, the top of the threshing floor matches the level at which sunken-floored hut 512 appeared, suggesting no considerable raising of the terrain until the Late Roman period. At the other side of the site, the interior of building 403 seems to be raised by a layer of 'clean' grey soil, some 25 cm thick.[197] A possible explanation is that the exterior of the building became higher as the result of some deposition, making it necessary to raise the interior in order to keep it dry. Hearth 619 inside the building also appeared some 10-20 cm above the original surface, suggesting only a little deposition in this area. Although the area near the Steinweg may have received some colluvium in the Late Roman period and Early Middle Ages, it could not have been very much.

Most of the colluvium is undoubtedly the result of erosion from the (Late) Middle Ages onwards, probably mainly in the last few centuries. Up to 20-35 cm above the Roman surface around building 403, there is a layer of dark material, mainly the combined (trampled and tilled) result of Roman activities, the destruction of the building and some deposition up to the Early Middle Ages or even later.[198] The dark and/or rubble-containing layers in trench 22 near building 401 are 35 cm thick, covered by 85 cm colluvium and topsoil. A final important source of data for the reconstruction and dating of the erosion are the cores obtained from the Hoensbeek valley, in particular the dated number VII discussed earlier (Fig. 4.3). The Roman colluvium layer with rubble is no more than 15 cm thick, and the radiocarbon dated Early Medieval peat is situated 30 cm higher. The 2 m of colluvium above the dated level was clearly deposited in the High Middle Ages and later.

4.3 The Roman cultural landscape of the Heerlen Basin

4.3.1 The Heerlen Basin

For a meaningful discussion of the cultural landscape around Voerendaal, we have to consider a slightly larger area than the immediate surroundings of Ten Hove. An elevation map offers the best impression of the landscape in and around the Heerlen Basin, where Voerendaal is situated (Fig. 4.7). The land below 90-100 m NAP (greens and blues) is the

[196] De Bakker & Edelman-Vlam 1976, 66-77; Bodemkaart 61/62WO, 70, fig. 32; 76.
[197] See chapter 39 and appendix XIII.
[198] Cf. section 16.4.2.

basin proper, originating from headward erosion of the Geleenbeek, the (lower course of the) Caumerbeek and their tributaries. South of the Kunrade Fault, more or less coinciding with the Roman road (see below), the land quickly rises to an elevation of 50-80 m above the basin. These hills with a limestone subsoil form the watershed with the Geul-Gulp catchment area to the south. East of Heerlen, the land rises to an elevation of about 150 m (cf. Fig. 4.7). Here the subsoil is formed by fluvial sediments of the Late Tertiary and Early Pleistocene, and is not eroded because of the uplift of this area just west of the Feldbiss Fault. This area is bounded some 10 km east of Heerlen by the valley of the Worm, which forms the border between the Netherlands and Germany (outside the mapped area).

4.3.2 Main roads

Heerlen is obviously the most important archaeological site in the vicinity of Voerendaal. This rural centre (*vicus*) was situated 5.5 km to the east at the watershed of the Geleenbeek and Caumerbeek. Its name appears as '*Cortovallio*' on the *Tabula Peutingeriana*, between Atuatuca (Tongeren) and Iuliacum (Jülich).[199] It is also mentioned in the *Itinerarium Antonini*.[200] Today,

199 *Tab.Peut.* I, 5 (Stuart 1993).
200 *It.Ant.* 377-378 (Byvanck 1931, 540-541).
201 Hiddink 2004, 34-39.
202 The prefix '*Here-*', '*Heer-*' or '*Heir-*' in the name means 'army' or 'crowd/legion' (cf. the town of Hereford). It is often taken as an indication of a former Roman road, but is not proof as such. E.g. the Heerstraat south of Cuijk/Ceuclum (fig. 15.4) had a military function in the

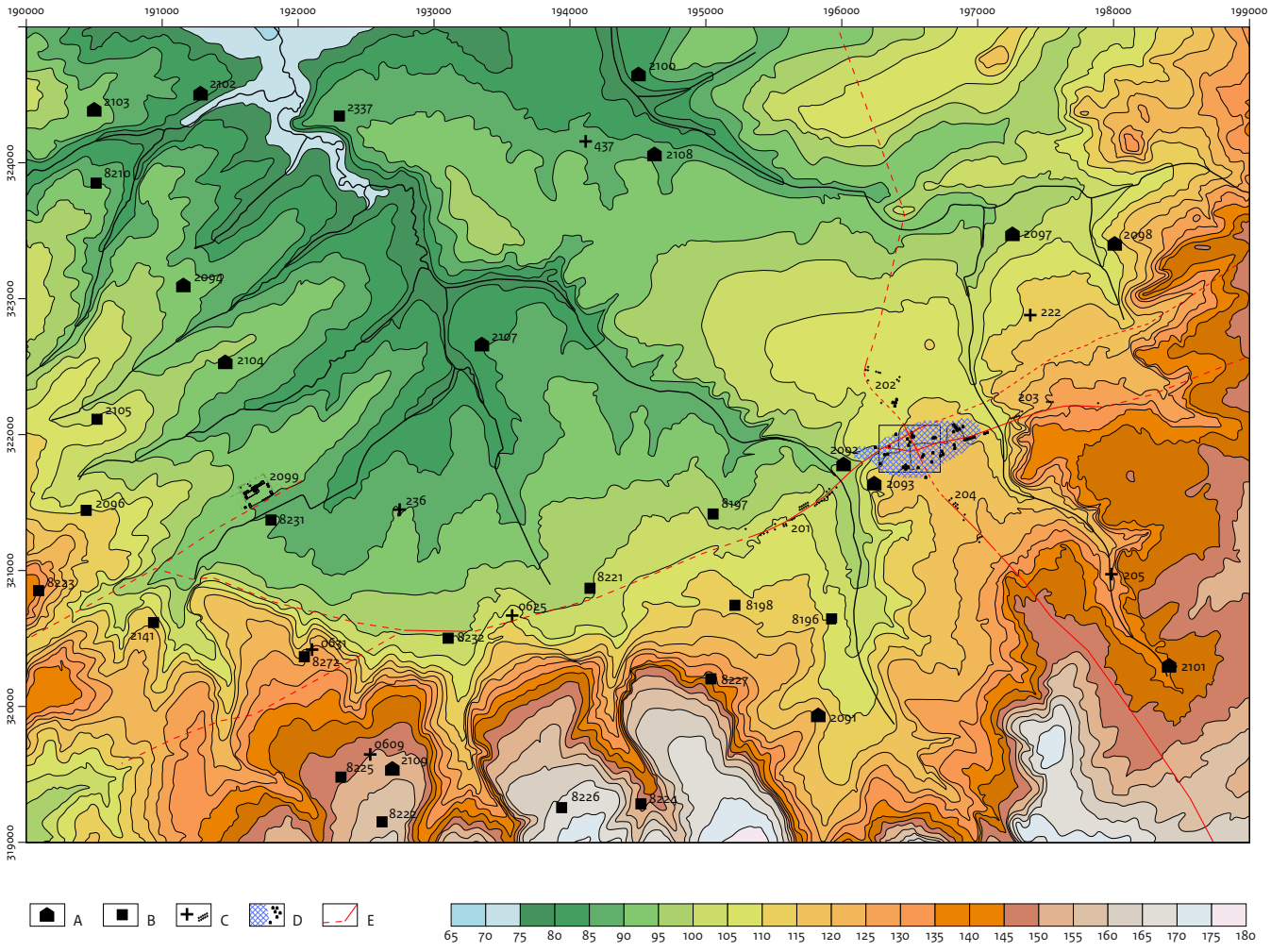


Fig. 4.7 Heerlen Basin. Elevation map (m NAP) with archaeological sites and (possible) Roman roads. (source: based on data Hoogtekaart 62Bn, 62Bz)
A villas/stone buildings; B other rural settlements; C cemeteries; D vicus with pottery kilns; E (possible) Roman roads.

the route between Tongeren and Jülich is often designated as the 'Via Belgica'.

On both sides of the *vicus* the location of the road is well known through archaeological observations and the presence of cemeteries. Further to the east, the situation becomes complicated because there are two possible routes (cf. Fig. 4.7).[201] The one to the north follows the old *Hereweg* across the Nieuwenhagen Plateau,[202] while an alternative route runs south of the plateau. In any case, the Via Belgica crossed the Worm river near the *vicus* of Rimburg. West of Heerlen, the road was found in Kunrade next to the historic road to Valkenburg (Oude Midweg).[203] Traces of gravel and a line on aerial photographs suggest the presence of the road up to 1 km further to the west, but it is then lost.[204] It may have changed direction to the southwest in or near present-day Klimmen, going on to cross the watershed between the Heerlen basin and the Geul Valley. It could have passed near the Goudsberg, where a Late Roman *burgus* was situated at the edge of the valley.[205] If the road changed direction near Klimmen, this may also have been the location where a *diverticulum* towards Ten Hove began. The name Steinweg ('stone road') suggests a Roman origin, as Steenakker ('stone field') can be indicative of Roman villas in the Low Countries. Despite sightings of gravel layers under the Steinweg when a water main was laid, there are no indications of a paved Roman road.[206]

As well as the west-east road, a north-south road ran through Heerlen, nowadays designated as the 'Via Traiana'. North of the crossroads, its presence is suggested by wooden structures in the Caumerbeek and by the presence of graves. According to the *Itinerarium Antonini* it ran in the direction of Teudurum/Tüddern and Mederiacum/Melick, ending at the Colonia Ulpia Traiana/Xanten.[207] North of Melick, almost 40 km from Heerlen, the road is still well preserved over a distance of some kilometres.[208] The stretch south of Coriovallum in the direction of Aquae Granni (Aachen) is not mentioned in the *Itinerarium*, but has been well documented at several locations in recent years.[209]

The construction date of the 'Via Belgica' can be deduced from early finds at places alongside it. The street grid of Tongeren, with the same alignment as the road, seems to have been surveyed by the Roman army in the last decade BC, while civilian habitation is attested from the late Augustan period onwards.[210] At Maastricht, fragments of Italic sigillata point to activities in the first decade AD, while stamps on sigillata from Southern Gaul suggest a rapid expansion of habitation from the fourth decade onwards.[211] The same chronology seems to apply to Heerlen (see below). At Rimburg, the next *vicus* to the east, at least one plate of Italic sigillata from the period c. 15 BC-10 AD was found.[212] Indications of the later use and maintenance of the road are two milestone fragments used in the Medieval church tower of Eygelshoven.[213] The fragments in Nivelstein sandstone bear the name of emperor Constantine the Great, who restored the road in the fourth century AD.

4.3.3 Coriovallum

The position of the *vicus* Coriovallum/Heerlen, at the watershed of two small streams and the crossroads of two roads, was described in the last section. Most archaeological remains were found in an area of about 8 ha, but if the location of the pottery kilns is taken as an indication of the area with activity in general, it measured some 25 ha (Fig. 4.8A; 15.4). The cemeteries along the 'Via Belgica' are situated west of the Geleenbeek and east of the Caumerbeek, 1.3 km apart. Those along the 'Via Traiana' are only 800 m apart.

Although Roman material had been collected earlier, the number of observations rose from the 1920s onwards.[214] The main cause is the growth of the small town of Heerlen after the opening of the Oranje Nassau I-IV mines and the operation of their coal trains and those of the Wilhelmina mine at Terwinselen in the Heerlen shunting yard. Many finds were collected by Peters, a schoolmaster and later curator of the municipal museum.[215] According to Peters and others, Coriovallum was a military base with three phases, an idea that was rejected by Van Giffen, who was involved in the final stages of uncovering the Roman baths in 1941.[216] Only two deep ditches north and south of the baths remained as part of an, albeit quite late, defensive structure. Van Giffen concluded on the

seventeenth century and was therefore not necessarily directly related to the Roman road (see Hermans 1895, 16-27). On the *Heerweg* name further south: Janssens 2011, esp. 37-39.

203 Janssens 2009.

204 Demey 2003, 31ff.; map 3. An alternative route is under or parallel to the present-day Midweg, further to the east (fig. 3.2, A).

205 Holwerda 1916; Bazelmans *et al.* 2004.

206 Cf. Braat 1953, 49; In 2004 only a much younger 'road' of wood beams was found (section 16.4.2).

207 *It.Ant.* 375-376 (Byvanck 1931, 537-538).

208 De Groot & Prangsma 2008; Luys 2012.

209 E.g. at the crossing of Bekkerweg and Ruys de Beerenbrouckstraat, 500 m south of the baths (Keijers 2017) and 5 km south of Heerlen at De Locht, near the Dutch-German border (Meurkens 2015).

210 E.g. Vanderhoeven 2001; 2002.

211 Panhuysen 1984, 29-36; 1996, 33.

212 Bloemers 1973, 250-252; Veldman 2014, 40-41. The plate is of the type/variant Conspectus 12.2.2 (Ettlinger 2002, 72-73).

213 Brunsting 1946, 34-35, fig. 10; Nesselhauf & Lieb 1959, 216, nos 266-267; *CIL* 17/2.592-593.

214 Cf. Byvanck 1947, 27ff.; Jeneson 2020, 13-14.

215 Pieter Jozef Martin Peters, 15-10-1865 – 7-01-1940; http://www.rijckheyt.nl/cultureel-erfgoed/peters-piet-conservator-en-archivaris (consulted 12-11-2019) For examples of his sketches of archaeological remains, see Eggen 1987, 17-20.

216 Van Giffen 1948, esp. 203-206.

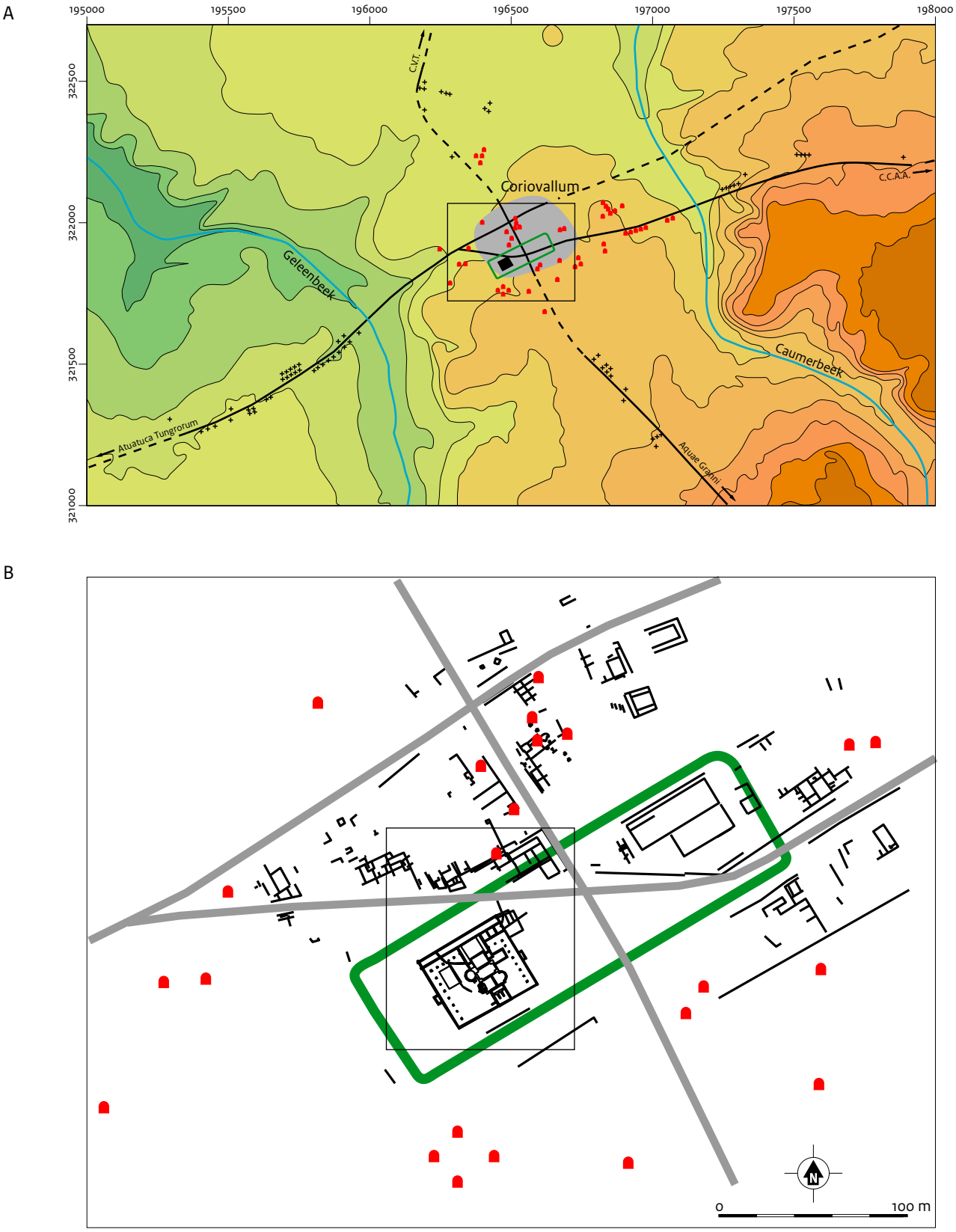


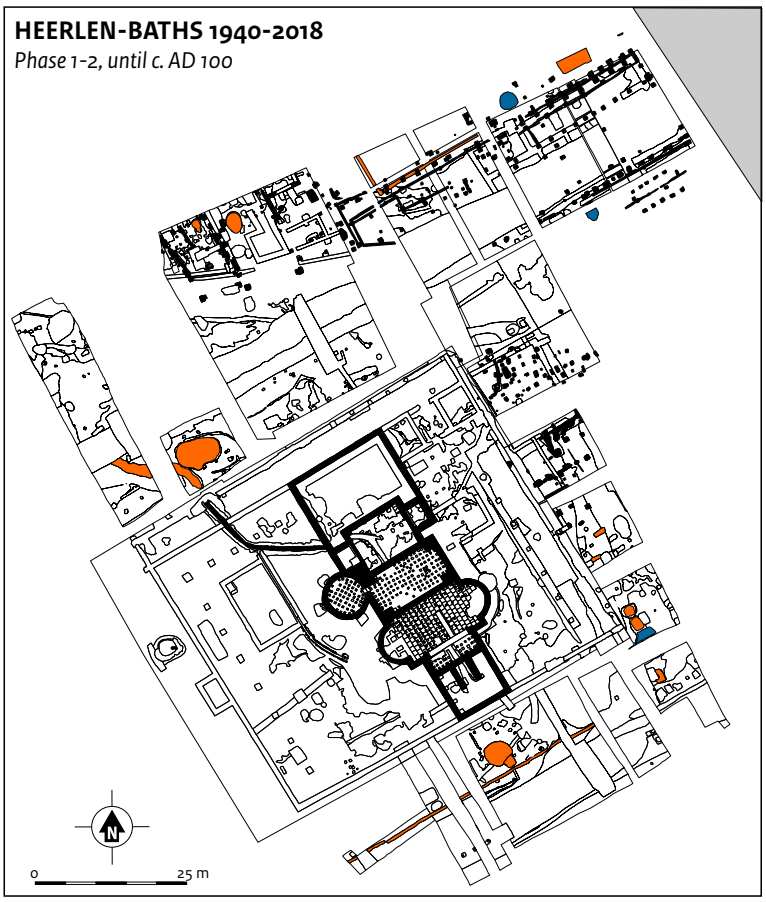
Fig. 4.8 Heerlen-Coriovallum, the vicus, its cemeteries and the road-system in the Roman period. (source: modified after Putker 1987, fig. 2; Jeneson & Vos 2020, fig. 10.3) A the core of the vicus, with most architectural remains in grey, pottery kilns in red and cemeteries as crosses; in the box the area of B; B Roman remains of the core of the vicus, with walls in black, kilns in red and Late Roman ditches in green; in the box the area of fig. 4.9.

basis of the terra sigillata (analysed by Glasbergen) and coins (Daniëls) that the baths were built and that systematic habitation commenced around the middle of the first century AD. Activities continued until the end of the fourth century.[217] Finds of Italic sigillata in general, especially northeast of the baths, showed that activities in Heerlen had already begun in the Late Augustan-Early Tiberian period.[218] It is tempting to connect these finds with a military presence along the Via Belgica. This is also suggested by the find of a gravestone in 1873, close to the southern cemetery. It was erected for Marcus Iulius, a veteran of *legio V Alaudae*. The absence of a cognomen in his name is taken as an indication of a date prior to c. AD 40, while the legion itself was active in the Rhine area before 69 AD.[219] Coriovallum may have been the location of a *statio* of the *beneficiarii*.[220]
The size and early date of the baths probably also reflect military involvement in Coriovallum. Although based on much more material, a recent analysis of the features and finds of the baths and its immediate surroundings confirms Van Giffen's idea that it was constructed around the middle of the first century AD. The finds point to the Claudian-Neronian period,[221] the type of bath to the late-Neronian phase (it possibly had a more modest predecessor).[222] Excavations near the baths by the ROB in 1952 produced plans of several buildings of the *vicus*, but only some stone-built examples were published.[223] The recent analysis shows the first glimpse of Heerlen's earliest, wood-built occupation, with a large rectangular building northeast of the baths (Fig. 4.8B-4.9A).[224]

As in most *vici*, the inhabitants of Heerlen were involved in many trades. There are finds related to the production of (objects of) bronze, iron and lead,[225] of marrow, fat and glue, as well as tanning.[226] Making pottery seems to have been the most important activity, judging by the number of kilns found (at present about 45).[227] Production commenced around the middle of the first century AD and increased in the Flavian period; it continued well into the third century.[228] Until recently, the impression was that a small range of pottery forms were made, such as late Gallo-Belgic beakers, colour-coated pottery (beakers, plates), smooth-walled ware (flagons, 'honey pots'), coarse-walled ware (Niederbieber 87, 89 pots) and mortaria. New analyses show that the range of products was far greater than previously thought, comprising around 200 types.[229] The vast majority of artisanal activities were conducted by families of low status or in any case with only modest assets. Artisans were probably involved in different trades in different seasons, and were even active as farm labourers at villas during harvest time. [230]
There were certainly wealthy families living in Coriovallum, however. For example, four ash chests were found in the eastern cemetery in 1920, dating to the second century AD.[231] One contained the remains of textile with gold thread and seven amber objects, another seven glass vessels and a small gold flagon. Some of the wealthier inhabitants of Coriovallum probably owned a villa somewhere in the surrounding region. Obviously, the richest villa-owning families would have had a *domus* in the *civitas* capital, Xanten, rather than in Heerlen. This does not rule out them investing in the *vicus*, however. One of the *decuriones* of the *colonia*, Marcus Sattonius Iucundus, paid for repairs or alterations to the baths at Heerlen, sometime in the second or third century AD.[232]

Even after the recent extensive research, it is not clear just how Heerlen fared in the third century AD and later in terms of continuous or discontinuous habitation. This is mainly because many older excavations are still awaiting a thorough analysis. In general terms, however, finds cover the period up until AD 400.
The material culture of the area with the baths has the same characteristics as in many other cities and *vici*. After the reign of Marcus Aurelius the number of coins dropped markedly, but this follows a general pattern caused by a decreasing supply.[233] The terra sigillata and other pottery bear witness to activities until the end of the second or the first half of the third century AD,[234] but provide almost no clues about later decades, let alone about the scale. The baths were reduced in size and transformed from a row type to a block type in a fourth phase.[235] This may have been the repair or reconstruction funded by Marcus Sattonius, but it is unknown if this was necessitated by neglect or destruction by Germanic warrior bands. In the Late Roman

217 Van Giffen 1948, 226-236; Glasbergen 1948.
218 Van Hommerich 1961, 9-11; Vanvinckenroye 1967/68, 4; Gielen 1985; 1987b, 26-27, 35; Niemeijer & Polak 2019, 10-11, 43-53. In addition to terra sigillata, early mortaria have now also been published (Van Kerckhove 2019b, 27, fig. 10).
219 M(arcus) IVLIUS M(arci) F(ilius) / MISSVS LEG(ionis) V / H(ic) S(itus) E(st) / H(eres) F(aciendam) C(uravit); *CIL* 13.8711; Bogaers 1962/63, 76, no. 108.
220 Cf. Bogaers & Rüger 1974, 173.
221 Jeneson *et al.* 2020, 169; for the coins, see Beliën 2020; *s.a.*; pottery, see above.
222 Jeneson *et al.* 2020, 162-168.
223 Bogaers 1959, fig. 10; Bogaers & Rüger 1974, fig. 69.
224 Vos 2017; 2020.
225 Gielen 1987b, 28-30.
226 Groot 2020; *s.a.*, esp. 20-25.
227 Even though the original number of kilns must have been much higher, the group involved in pottery production should not be overrated; in theory, it could have been just a few families (cf. Hiddink 1991, 213).
228 An overview can be found in Gielen 1987a. See also Gielen 1971a; 1971b; 1978; Bloemers & Haalebos 1973; Hoevenberg 1996 (with list of sites); Veldman 2007.
229 Van Kerckhove & Boreel 2014; Van Kerckhove 2020; *s.a.*, tables 1-2; this report, chapter 23.
230 Hiddink 1991, 213-220; cf. section 15.7.
231 Peters 1920; De Grooth & Mater 1997b, 51-59; Holwerda 1930.
232 FORTVN(a)E [Recvci] / M(arcus) SATTONIVS I[vcvn] / DVS DEC(urio) C(oloniae) V(lpiae) T(raianae) BALIN[eo] / RESSTITVT[o] V(otum) S(olvit) L(ibens) [M(erito)] (Nesselhauf & Lieb 1959, no 247). Bogaers 1957.
233 Beliën *s.a.*, 15-17.
234 Niemeijer & Polak 2019, 40.
235 Jeneson *et al.* 2020, 181-184.



A

B

Fig. 4.9 Heerlen. Plan of the baths and surrounding area. (source: modified after Jeneson et al. 2020, fig. 9.12; 9.14) A initial state of the baths and traces of (partly older) wooden buildings; B the baths with added palaestra, natatio and porticus with stone buildings of the vicus surrounding it; the Late Roman ditches are added (in green); in reality they intersect the large stone building in the northeast.

period, the baths were situated in the western half of a defensive structure. Two ditches of 5 m wide and some 2.5 m deep surrounded an area of about 60 x 220 m (the exact nature of the rampart and/or wall inside is still unknown).[236] Some alterations were made to the baths between c. AD 390 and 540 according to a radiocarbon date,[237] but this does not prove that they retained their original function;[238] perhaps they were transformed into some kind of barracks. East of the baths, the north-south road seems to have run through the middle of the fortress, guarded by gates of the *clavicula* type. Remains of buildings were found in the eastern half, but their construction date is uncertain. A large quantity of iron slag in this area suggests artisanal activity on a rather large scale, interpreted by the excavator as an indication of a *fabrica* (!).[239] Although the ^{14}C date just mentioned suggests a continuing, fifth-century occupation of parts of Coriovallum, an idea supported by pottery finds and many late fourth-century coins,[240] there is a conspicuous lack of Argonne sigillata with Christian symbols (group 8), at least in the area of the baths.[241] Moreover, there are virtually no Early Medieval finds from Heerlen.[242]

4.3.4 Rural settlement

It is very difficult, if not impossible, to obtain an adequate picture of the Roman rural habitation in and around the Heerlen Basin. Only some of the original sites are known. One reason is that the area north and southeast of Heerlen formed the 'Eastern coal district' of the Netherlands, with collieries in Hoensbroek, Brunssum, Heerlen and Kerkrade. Its landscape was built over rapidly between c. 1900 and 1970. Without doubt, many archaeological sites disappeared completely, even though some were observed during construction works. A second 'problem' concerns the rest of the Zuid-Limburg loess area, where the agricultural use of the land kept the number of archaeological excavations low.

In the area of Figure 4.7, only a handful of villas besides Voerendaal are known (Table *4.2).[243] When using the term 'villa' in the context of mapping sites, we need to clarify what we mean by the term. For the present, we define a villa as a farm, a site in a purely rural setting, of which at least the main building was – entirely or partially – built in stone.[244] When dealing with sites found in surveys/fieldwork, it is important to collect not only tile fragments (also found near post-built structures) but building stone proper. Ideally, a site should not be too small to exclude grave monuments or small shrines, while a location close to a road could in some instances be a *mansio* or *statio* rather than a villa.[245] Peters' investigation of the villa at Heerlen-Bovenste Caumer (2101) offers a good illustration of pre-World War Two practice: only part of the main building was excavated and the remains were described in just a short article. The excavations at Welten (2091) and Meezenbroek (2097) also targeted main buildings, but here the plans and finds were never published. More recent investigations merely consisted of trenches, with the purpose of assessing the state of preservation of sites. At Swier-Kickenweg (2094) the presence of a villa seems established, but at Wijnandsrade-Biesseweg (2102), in addition to post pits, only the square stone foundations of a building were found. Was it a villa or another type of site?

It is often difficult to establish the reliability of older reports of (non-excavated) stone buildings. Are foundations or stones found at the surface really Roman or could they be Medieval or younger? Older find reports never give the exact quantity of building stone and roof tiles. In *Archis*, the Dutch archaeological database, the quantity of building material is mostly stated as '99' or '9999', or in words: 'unknown'. Illustrative here is Archis record 15732 (Craubeek, site 2141). Some hundreds of sherds were found there (with six types specified), and 9999 stones with one or more possible fragments of a column, but no tile fragments are mentioned. Even the fragments of a column are not evidence of a stone building because they could be pick-ups from elsewhere, secondarily used as grinding stones.[246] For sites with only tile fragments, we may simply be dealing with post-built structures. It has been clear for several decades that rooftiles are often found at these sites, not necessarily indicating a villa. At present, several examples of post-built settlements are known from 'villa landscapes'. Kerkrade-Winckeln and Heerlen-Trilandis were excavated in Zuid-Limburg outside the Heerlen

236 Van Giffen 1948, pl. 2; Jamar & Van der Vin 1976; Tichelman 2020b, 106, fig. 64.
237 Tichelman 2019, table 39; 2020b, 118.
238 Because the deep defensive ditch likely cut off the water line/aqueduct supplying the baths.
239 Boreel 2020; Tichelman 2020b, 242.
240 Van Kerckhove 2019b; 2020; Beliën *s.a.*; 2020b.
241 At least according to Niemeijer & Polak 2019, appendix 3. In comparison to Ten Hove, there are relatively many examples of group 1-2.
242 Cf. section 16.3.2.
243 Tables marked with an asterix (*) can be found in appendix IX.
244 For the problem of defining villas in general, see further section 15.5.1.
245 On the problems of interpreting sites in the loess belt on the basis of scarce data and interpreting them, see Jeneson 2013.
246 Examples of columns used for sharpening tools, although 'quarried' at the original Roman site: section 33.2.2.

Basin (Fig. 4.10) and Veldwezelt and Kesselt in Belgic Limburg (Appendix XXI, figs 1-2).[247]
In addition to these sites, consisting of somewhat scattered Alphen-Ekeren style buildings, there were also post-built sites with a more regular plan, such as Pulheim-Brauweiler with a main building (?) and a single outbuilding (Fig. 14.11).

We can conclude from the above that some of the 'possible villas' in Figure 4.7 could be settlements with only post-built structures. At the same time, a few 'possible (post-built) settlements' could represent villas not yet identified. Combined with the fact that only a portion of the Roman settlements in our study area are known, we cannot give a reliable picture of the settlement density and settlement system. We should therefore not take the picture presented in earlier publications on Voerendaal at face value.[248] According to that picture, each loess ridge between two brook valleys in the western part of the Heerlen Basin was the territory of a single villa (200-250 ha). Even if this were the actual situation in Roman times, it is unlikely that all of these villas were equal in size. Also for the area of 4.7 in general, some supposed villas could be 'simple' post-built settlements or sites of other types. Moreover, there must be many undiscovered sites, especially in the post-built category. A greater population density than presently known is a likely option, suggested by the situation elsewhere in the loess region (Fig. 15.5).[249] Although the ROB conducted some field surveys around Voerendaal, less than about 5% of the area of Fig. 4.7 was covered.

4.3.5 Burials and cemeteries

Most burials in the Heerlen basin were found in the cemeteries along the major roads outside Coriovallum, already mentioned in Section 4.3.3. In a western direction, burials are found at least 1 km past the Geleenbeek. A possible cemetery at Voerendaal-Pontstraat (625) may also have been situated along the 'Via Belgica',[250] although it less likely that it was used by occupants of the *vicus*.

Apart from the handful of graves from Ten Hove itself,[251] the cemetery closest to the villa is Voerendaal-Kolonie (236).[252] It is not clear how many graves were found here and what the basis is for the published date in the second quarter (!) of the first century AD. More information is available about an intriguing site a good kilometre south of Ten Hove (631). The head of a woman sculpted in Nievelstein sandstone was found during the construction of a lime kiln in 1917 (Fig. 3.3), together with other worked sandstone, two pieces with leaves and one with mouldings.[253] These finds suggest the presence of a large grave monument,[254] which may have been visible from the Via Belgica and could in theory belong to Ten Hove. A complication is the nature of the other finds: a small building (3.2 x 1.9 m) constructed of roof tiles, showing traces of fire. Was it the hypocaust of a villa or a kiln, possibly built much later with Roman material?

Nearly one kilometre to the south, near Winthagen (609), there is another findspot with sculpture fragments. It concerns two images of lions – on blocks of approx. 40 by 60 cm – with their prey (a ram), also in (Nievelstein) sandstone.[255] This grave monument was situated close to the site of a supposed villa (2109).
There are only two other sites with graves in the area of Figure 4.7. The first is near Schaesberg (222), where a possible *tumulus* was partly destroyed in 1837 when a new road was built.[256] The finds interpreted as a grave inventory were three bronze (knife) handles, fibulae, an earthen lamp and at least four pieces of pottery.
Two stamps on sigillata bowls suggest a date in the first half of the second century. The second cemetery, near Vrank (437), was possibly also related to a villa. Here a grave from the late first or second century AD contained two bronze basins, a knife, a spearhead, a bronze openwork belt fitting and some pottery.[257]

All in all, the number of known cemeteries and graves is quite low compared to the number of settlements in the area. One explanatory factor is erosion, illustrated by the conditions of graves 309 and 310 at Ten Hove (Section 13.1). At the same time, others could no doubt still be hidden under fields and built-up areas.[258]
The known graves in the rural areas around Heerlen tell us little about the population as a whole. Most belong to rather well-to-do people and burials of 'commoners' seem underrepresented.[259]

247 Dijkstra 1997 (Kerkrade-Winckeln); Tichelman 2014 (Heerlen-Trilandis); Vanderhoeven 2015, 190-197, figs 2-3 (Veldwezelt, Kesselt). Even in the non-villa landscape of the Dutch coversand area, tens of hundreds of kilos of tile are found in almost every settlement (for examples, see Hiddink 2018a, 37, no. 79).

248 Willems 1987, 50, fig. 1; Kooistra 1996, 106, fig. 22b.

249 E.g. Jeneson 2013; see further section 15.2.

250 Pottery, including a complete coarse-walled Stuart 210 bowl and Brunsting 37 mortarium, seen by the author on 12-10-2019.

251 See section 13.1 and chapter 42.

252 Van Doorselaar 1964, 336 ('brandgraven' from c. AD 25-50); Archis 38863, 38864.

253 Goossens 1917; Anon. 1917. For the findspot, see fig. 4.7, no. 215. On the topographical map of 1913 (CTK 2006), sheet 767, Simpelveld: 'Kalkovens' top centre/left half of the map sheet. This lime kiln was one of many built during World War One when the supply of better quality lime from Germany and Belgium stagnated (Nillisen 1989, 188-192).

254 Cf. Panhuysen 1980, 97, fig. 19 (dated in IIc). See further section 13.1.1 and fig. 3.2, A.

255 De Vries 1999; Archis 46290.

256 Isings 1959; Van Doorselaer 1964, 330 (Schaesberg II).

257 Willems 1988.

258 A small cemetery was recently discovered at Heerlen-Trilandis-Domeinen (Weekers-Hendrikx 2018, 24-31, 77-89).

259 Rare examples from Limburg of larger cemeteries with excavated, not particularly rich graves are Geleen-Janskamperveld (Wesselingh 1992) and Linne-Ossenberg (Hiddink 2005d). For more examples of graves near villas, see section 13.1.

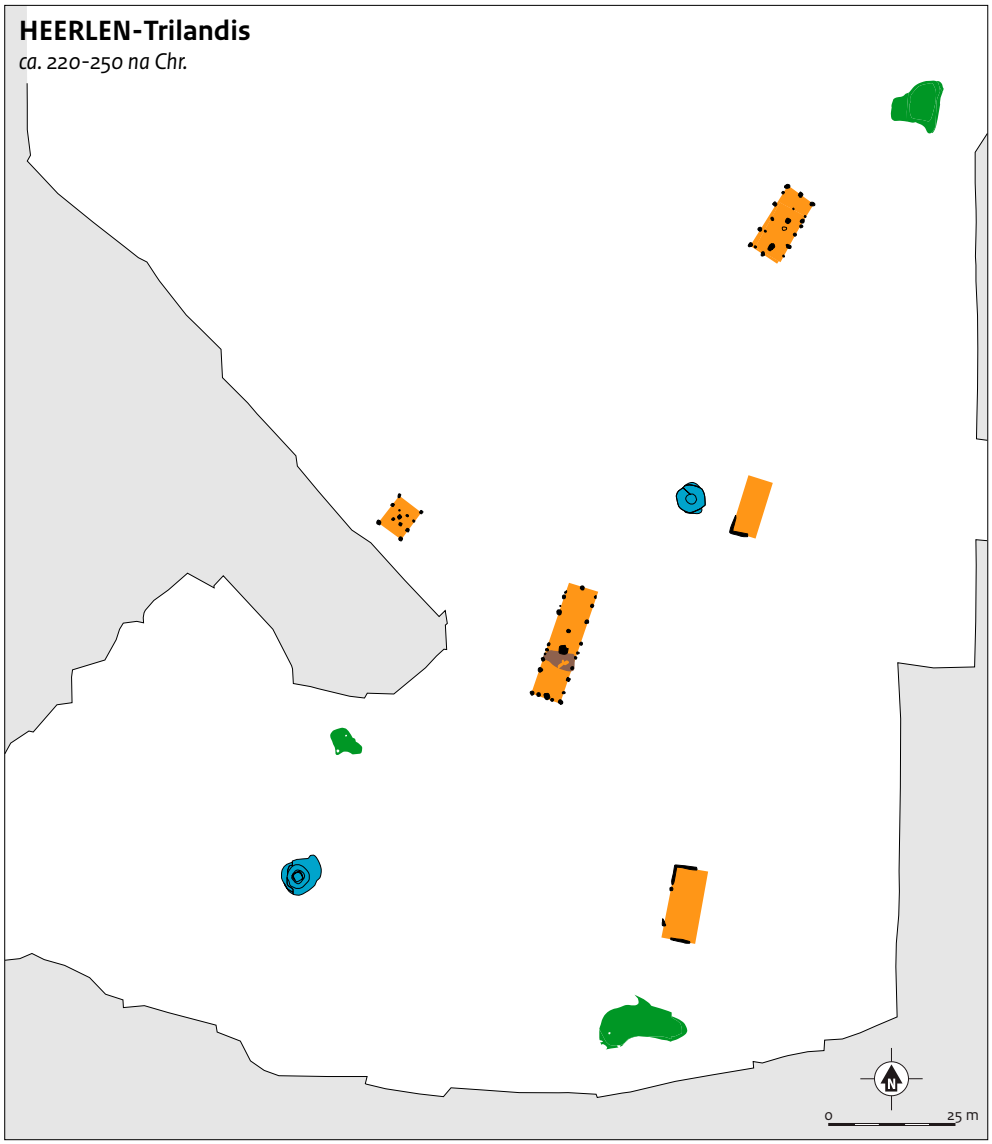


Fig. 4.10 Heerlen-Trilandis. Plan of the settlement in the third century AD. (source: modified after Tichelman 2014, fig. 6.1; 14.9)

5 The site. Questions regarding its development, formation processes and dating evidence

Henk Hiddink

The discussion about the archaeological remains really takes off in this chapter. Firstly, the existing view of the site's development is presented and compared with the new one. This provides a 'quick tour' of the site and some of its issues. Secondly, the formation processes are discussed further, focusing on possible biases in the chronological and spatial distribution of features and finds. Awareness of these issues is crucial to understanding problems regarding the dating and interpretation of structures and features. The third section presents the results of two specific dating methods: relative dating by means of intersections and absolute dating with the help of radiocarbon measurements.

5.1 The former and present views on the site's development

The former view of the periodization and development of habitation and related activities was largely based on the results of the excavations by Braat and the ROB. After the latter excavations, it was presented on plans in preliminary reports and in Kooistra's PhD thesis, all based on an initial provisional analysis of the features and finds, however. Four distinctive periods were distinguished (Table 5.1; Fig. 5.1; 5.2-5.5).[260] They are maintained in this report, although dated differently and subdivided into phases.

5.1.1 Prehistoric habitation and activities

No period number was assigned to the oldest finds and features at Ten Hove in the publications just mentioned. Although the presence of flint artefacts or flakes was reported, no dates were proposed. The analysis presented elsewhere in this report shows that material from the Late Mesolithic and Neolithic in particular is present in our period 0.[261]
The excavators reported the presence of Iron Age pits and quite a large amount of handmade pottery, the latter in part attributed to the Early Roman period. As a result of our analysis it is clear that period 1 covers the Early and Middle Iron Age, represented by a number of pits, as well as the Late Iron Age, with an enclosure and a number of buildings (next section).

Table 5.1. Voerendaal-Ten Hove. Comparison between the former and actual periodization of the site.

	Willems/Kooistra			This publication	
Period	**Characterization of the site**	**Date**	**Period/phase**	**Characterization of the site**	**Date (approx.)**
-			0	stone age camps/activities	Late Mesolithic/ Neolithic
-	(pits)	(before 50 BC)	1a-b	pits (houses lost)	775-250 BC
1	enclosure	50 BC-AD 50	1c	enclosure with houses	250-100(/50) BC
-			2a	post-built house(s)	AD 25
-			2b	'proto villa'?	middle 1st century AD
2	first main building/ villa	AD 50-100	2c	first main building, post-built outbuildings	late 1st/early 2nd cent.
3	villa in its heyday	2nd-3rd/4th cent.	3a-b	second main building outbuildings (partly) in stone	AD 125-260/270
-			3c	remains of villa(?), tower, two graves	AD 275-325
4	Frankish settlement	3rd/4th-7th cent.	4a-b	post-built settlement	375/400 -
	Merovingian burials		4c-d	Merovingian burials	- 7th century AD
-			5	arable	AD 700-present

[260] Most clearly presented by Kooistra 1996, 129-137, fig. 24a-d. These figures are presented here in modified form, with the addition of structures illustrated in Willems & Kooistra 1987, fig. 2.
[261] Chapters 37-38.

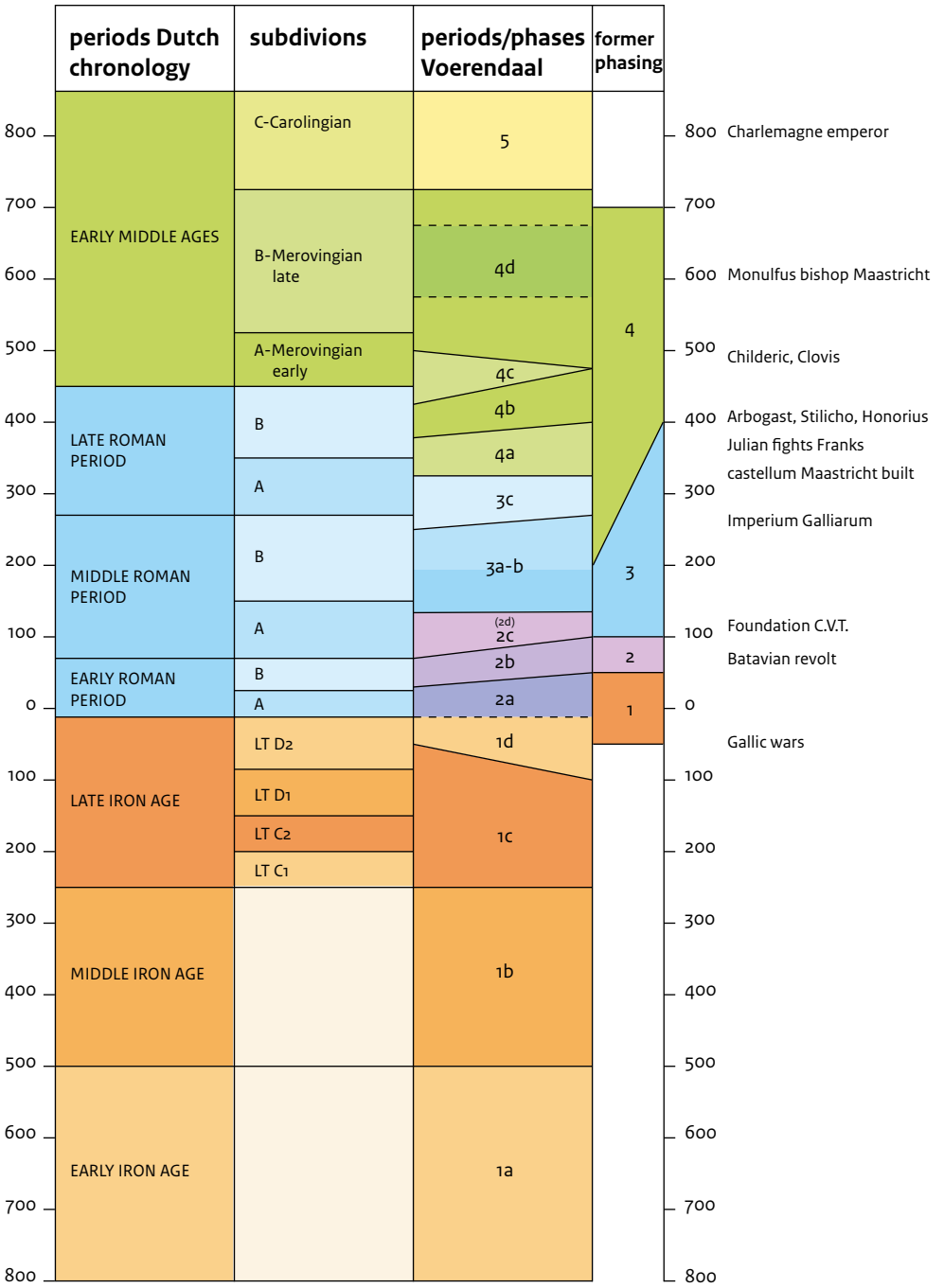


Fig. 5.1 Timescale including Dutch periodization and the periods/phases of Voerendaal-Ten Hove.

5.1.2 Period 1. An enclosure

The most conspicuous feature of the Late Iron Age is ditch 308/h, with a V-shaped section (Fig. 5.2). It formed an enclosure of 82 by at least 70 m, probably with a bank at the inside. That the ditch was one of the oldest features of Ten Hove was immediately clear during the excavations because of intersections, for example by ditches 302/b and 303/c of the villa yard.[262] Ditch 301/a was also considered a feature of period 1, but still in use in period 2.[263] Some ten small buildings were indicated as buildings of period 1 in outline on the plans. Some of them were compared to the small structures inside the Late Iron Age enclosure of Eschweiler (Fig. 5.2, A; 6.12). The presence of more buildings – even larger ones – was considered, both in the unexcavated areas[264] and hidden among the many features not yet analysed.[265]

[262] For an overview of old vs new structure characters and numbers, see table 3.1.
[263] Willems & Kooistra 1987, 31.
[264] Willems & Kooistra 1987, 31.
[265] Willems & Kooistra 1988, 138.

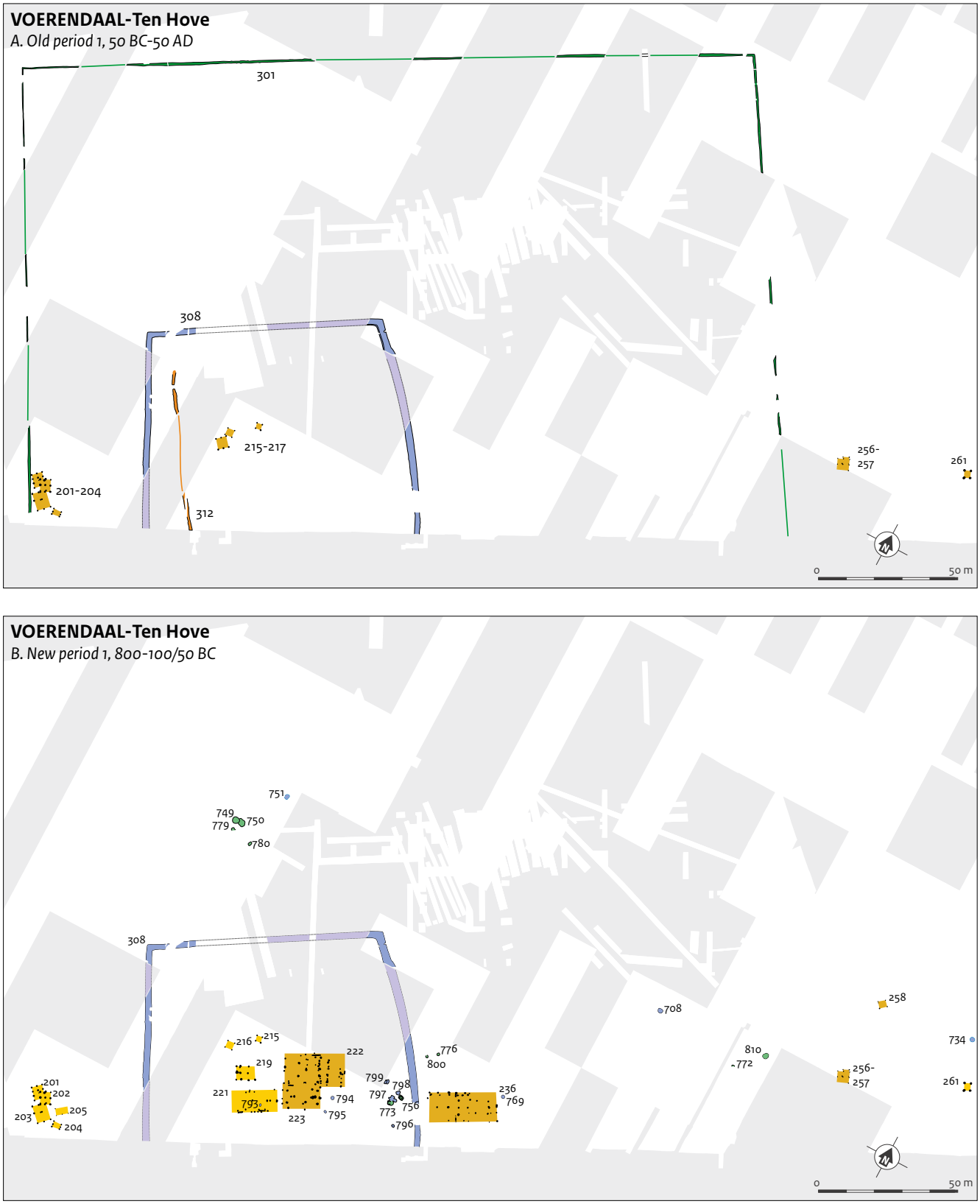


Fig. 5.2 Voerendaal-Ten Hove. Structures and features of period 1, according to the preliminary (A) and present full analysis (B). A post-built structure; B idem, date uncertain; C ditch; D pits.

The first result of our analysis is that a number of building plans inside the enclosure have been reconstructed, three of them (222, 223 and 236) remarkably large for the period.
A second important new insight is that the enclosure must be dated much earlier than previously thought, from c. 250-100/50 BC (pre-Caesarian) instead of c. 50 BC-AD 50.
The former date was partly based on the idea that handmade pottery was still common in the Early Roman period,[266] whereas three decades later we know that it was not. Moreover, we now know far more about typochronology, pushing the assemblage at Ten Hove back in time.
We have assigned the Early Roman finds referred to by the excavators to the very beginning of our era, period 2a.

5.1.3 Period 2. The first villa

The first villa, building 399, was a structure of 26.5 x 20 m with a quite unusual plan (Fig. 5.3) because the central space was divided by a central wall in Braat's reconstruction. In our view, this wall is instead part of drain 318 from period 3. Braat dated this villa to the end of the first/beginning of the second century AD, among other things on the basis of a sherd of South Gaulish sigillata (399-2/1953-2.8), as well as a coin of Trajan.[267] Although our dating is essentially the same, the dating evidence presented by Braat must be refuted because it concerns 'stray finds'.[268] During the ROB excavations, another South Gaulish sherd was found in the topsoil close to the building (89-0-0/8128) and 'This could mean that the first villa is somewhat older than assumed up until now, but it could also imply the presence of a wooden (?) predecessor underneath or next to it.'[269]

While the latter is clearly possible, it cannot be tested by means of further excavations at this archaeological monument. However, the results of our analysis confirm the idea that there was an older phase for other parts of the site; there were probably even two. At least one post-built Alphen-Ekeren house (208) is assigned to a new phase 2a and building 409/I to phase 2b.
A rectangular, cellar-like pit in 409 was formerly believed to be filled up around AD 100.[270] This date is now set at AD 125 or slightly later, but the building itself was probably in use decades before. It would be going too far to discuss this here in full, however.[271] Some other post-built structures should be mentioned here. Building 418/C' is still placed in phase 2c of the first villa, although its interpretation as a stable is doubtful.[272] Another result of the current analysis is that far more post-built outbuildings belonging to villa 399 have been identified, although their fragmentary state hampers reconstruction.

The remaining features assigned earlier to period 2 are still thought to belong to that period. For a number of ditches this follows from them being intersected by stone buildings of period 3 (Fig. 5.2) This applies to ditches 304/d and 305/e (under building 401/A), 306/f (under 405) and 307/g (under *horreum* 408). Ditch 301/a is currently no longer placed in period 1, but rather in 2 and (part of it) in 3. Three groups of features associated with artisan activities are also still linked to the first villa.[273] Three circular ditches (614-616) under the *horreum* and another (617) further to the east were – and still are – thought to be connected with the production of iron.[274] A rectangular pit and one or more kilns were found northeast of the villa (646-648). A role in pottery production has been suggested,[275] but assigning a function is impossible to our opinion. Finally, a group of hearths with fired walls and a charcoal-rich fill (607-613, 649) was found 'in' building 405/E. They are not firmly dated and could belong to periods 2-4, although we suspect that they were used during period 3.[276] Their function is not established.

266 E.g. Willems 1986, 146; Willems & Kooistra 1987, 29.
267 Cf. chapter 19, 22, 84 and below, section 5.2.4.
268 See chapter 43.
269 Willems & Kooistra 1987, 31-32.
270 Willems & Kooistra 1987, 32.
271 See further section 15.3 and chapter 43.
272 Willems & Kooistra 1988, 140. Cf. chapter 39 for a discussion of the significance of phosphate levels.
273 All described in chapter 45 and discussed in section 9.6.
274 Willems & Kooistra 1988, 140-141.
275 Willems & Kooistra 1988, 141.
276 Cf. section 9.6.4 and chapter 45.

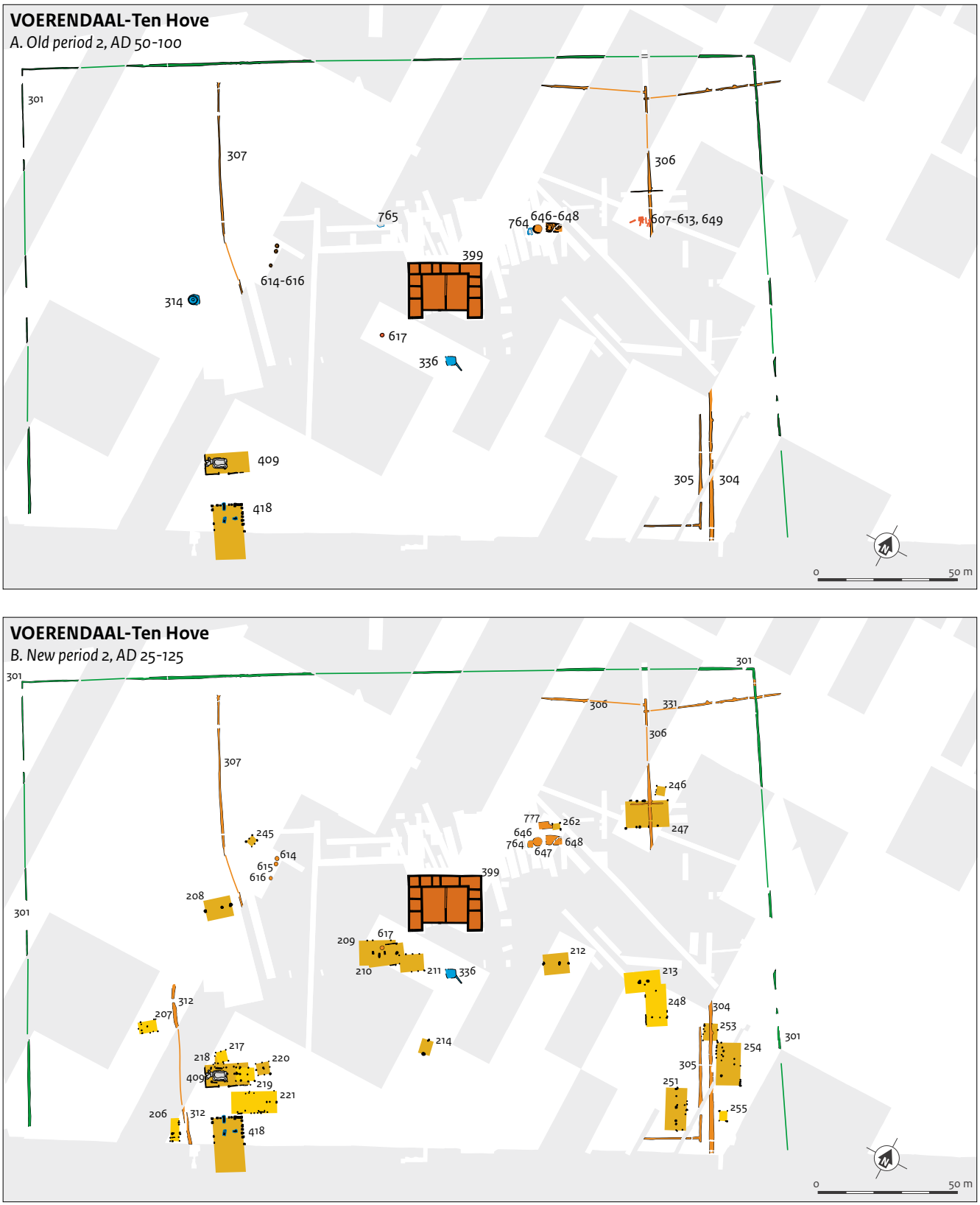


Fig. 5.3 Voerendaal-Ten Hove. Structures and features of period 2, according to the preliminary (A) and present full analysis (B); for legend, see figure 5.4.

5.1.4 Period 3. The second villa

All the stone build1ings and other features that belong to the second villa (400) constitute period 3 (Fig. 5.4). Our analysis has no serious implications for assigning structures to this phase. However, as stated earlier, the begin date of this period is slightly altered and is primarily based on the upper infill of building 409. The end date will be discussed at the end of this section. Structures with a role in water supply and drainage are well 314, aqueduct 316 and drains 317, 318 and 334.[277]

The main building had several phases, which regrettably are not dated as such. A number of heated and unheated rooms added to the east side stand out, together with broad foundations of a tower (structure 407).[278] The major buildings of period 3 form a highly structured, quite symmetrical ensemble. The idea that the complex was designed as a whole has not changed.[279] Its nucleus was formed by the main building, *horreum* 408/H and the baths 404/D. The first and last were evidently for the owners' private use, while the *horreum* stored their primary source of wealth. A wall (419) separated this nucleus from the rest of the yard as a kind of '*pars urbana*'. It is still not clear whether there was or a wall or fence in the east, connecting building 402/B with wall 419. There are also unanswered questions about the phasing of the portico between the main building and 405. The villa's baths (404) were excavated entirely by Braat. He thought that they were built in the early second century AD, more or less at the same time as the main building.[280] In a second phase the size of the heated areas/rooms both to the south and north of the building was reduced,

277 Chapter 10.
278 Both main buildings and tower 407 are discussed further in chapter 8.
279 Willems & Kooistra 1988, 141.
280 Braat 1953, 52-53, 73. Cf. section 8.4 and chapter 43.

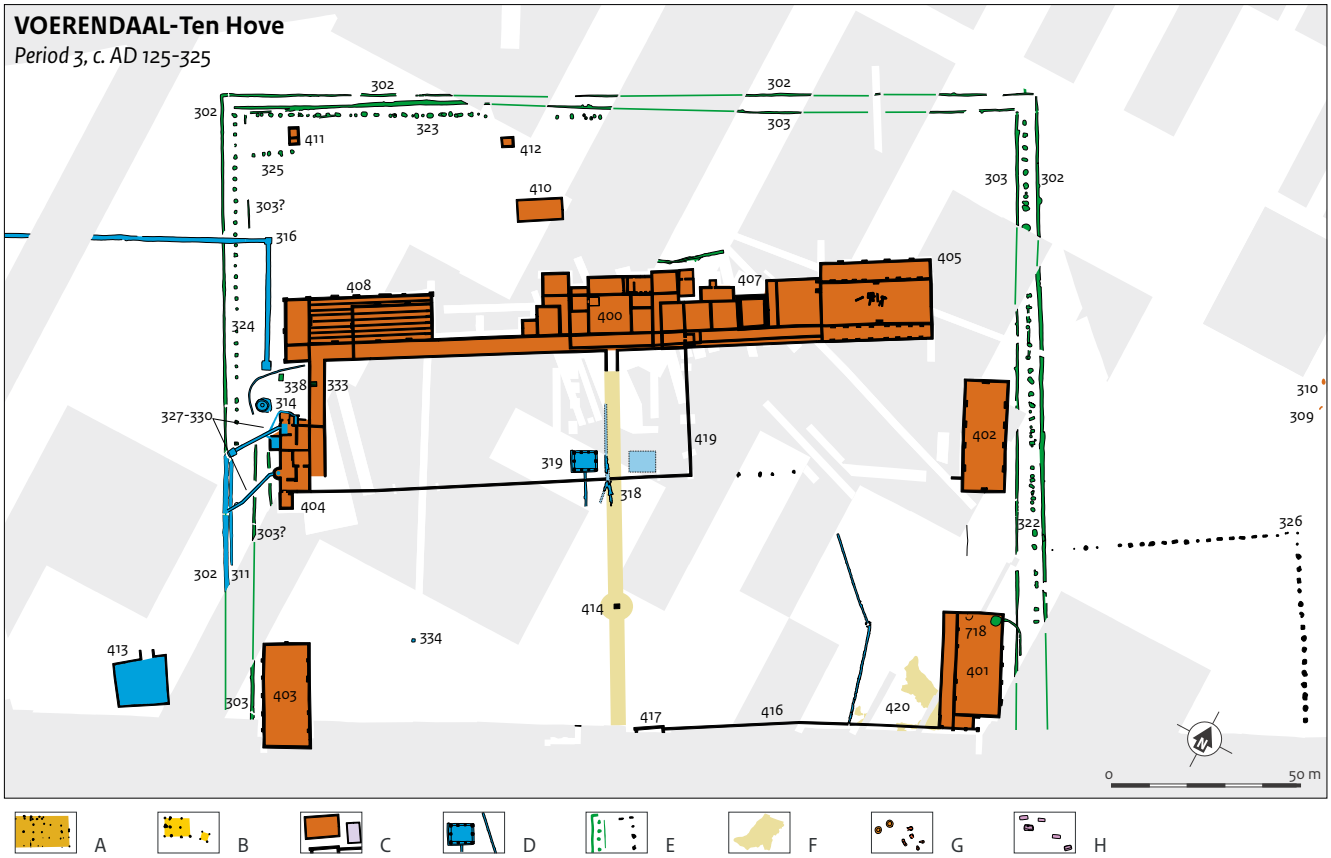


Fig. 5.4 Voerendaal-Ten Hove. Structures and features of period 3.
A post-built structure; B idem, date uncertain; C walls, stone-built structures, idem partly standing (lilac); wall; D water-related features; E ditches, planting holes, post-holes; F stone pavement; G furnaces, hearths; H burials.

in combination with a rearrangement of the rooms and the addition of a lavatory.

Building 408, the *horreum*, had a smaller first and an enlarged second phase. Strangely, Braat completely ignored the smaller building, although this had already been documented by Habets (and again by the ROB). The function of the building is immediately clear from the floor-supporting walls. Moreover, a large quantity of charred spelt grains were present in the botanical samples at this location. Our analysis of building 405 shows that this was probably a second storage building, although it remains unknown what was stored there.
The first building in the east wing of the complex is 402/B and it lacks indications of its function. South of it was building 401/A, with a stone paved area in front (420). Charred botanical remains suggest that the latter was a threshing floor, implying that 401 was used to store both the unprocessed harvest and – temporarily – the freshly threshed grain.[281] The present report notes the possibility that it also had a residential function. During the excavations, it was thought that 401 had been a stable in an early stage,[282] but after evaluating the evidence we doubt that it was. The counterpart to 401 at the west side of the yard was building 403/C. While its predecessor 418 was interpreted as a stable, 403 was – in the late second/third century AD at least – a smithy according to the excavators. 'Both inside and directly north of C large numbers of iron objects, or fragments thereof, were found, as well as iron slag. The entire upper infill of the cellar of building B [409-HAH] contained charcoal, iron waste, slag, etc.'[283] In our view, it was 418 instead that was a smithy, or used as such, while the evidence for a stable function could be interpreted differently.[284] A last agriculture-related structure to be mentioned here is 413/M, situated outside the yard. Its walls were lined with clay and it had a stone paved floor. The suggested function of a cattle or horse pond is very likely.[285]

In Roman times, a visitor would have approached the complex via a *diverticulum* and entered it through a gatehouse (417) in a wall (416).[286] A rectangular foundation (414) was found at the line of the supposed path to the main building, probably the base for a Jupiter column. Entering the '*pars urbana*', the visitor would pass a basin (319) that must have been part of a garden. Inside the enclosed area at the rear of the villa, three more buildings were found. There are no indications of the function of 410/J. Structure 411/K could theoretically have been a grave monument but was probably a small shrine.[287] The latter interpretation is certain for the small structure 412/L, as it is such an unassuming building but has a large number of terra nigra bottles – some with graffiti – associated with it.[288] Beside the wall in front of the yard, the boundaries of the villa complex were marked by ditches 302/b and 303/c, in combination with rows of trees (planting holes 322-325).[289]

The reader will have observed that the old periodization shows a considerable overlap between periods 3 and 4, the entire third and fourth centuries AD. In Kooistra's thesis, this overlap marked the uncertainty about the end date of 3 and start of 4, because a thorough analysis of the excavations was lacking (and see below). In any case, period 3 represented the habitation by 'the (last) Gallo-Roman villa owner(s)' and 4 the village of 'Frankish *laeti* or *foederati*'.[290] Our analysis, based on several existing and some new radiocarbon dates, combined with a better knowledge of the habitation history in the wider region, suggests that the end of the villa probably came between c. AD 260 and 275.[291] The villa may have been destroyed by fire, as Braat claimed. Tower 407 was possibly constructed during this period, but a date up to AD 325 cannot be ruled out. The latter date is based on that of graves 320 and 321, located 150 m northeast of the tower (Fig. 5.5), with grave goods indicating the presence of a 'Gallo-Roman' elite until this period.[292]

5.1.5 Period 4. The Frankish village and Merovingian burials

In the short preliminary reports, the founding of the post-built 'Frankish' settlement in the southern part of the villa yard was dated around AD 350 or the second half of the fourth century AD.[293] Kooistra had some reservations and considered an earlier start,[294] because this was suggested by a ^{14}C date for charred grain from

281 Kooistra 1991; 1996, 158-164.
282 Willems & Kooistra 1987, 32-33.
283 Willems & Kooistra 1987, 35. Cf. chapters 34 and 84.
284 Chapter 39.
285 Willems & Kooistra 1988, 144-145.
286 The idea that the Steinweg was a section of the 'Via Belgica' has been abandoned (cf. section 4.3.2). All structures mentioned in this section are discussed in chapter 11.
287 Willems & Kooistra 1987, 36; 1988, 145.
288 Willems & Kooistra 1988, 145-146.
289 The features of annex 326 were, on the contrary, postholes of a fence.
290 Willems & Kooistra 1988, 146; Willems 1989, esp. 151-152.
291 Section 16.1.3.
292 These graves were published by Willems (1989) and discussed in section 13.1.
293 Willems 1989, 143; Willems & Kooistra 1988, 146.
294 Kooistra 1996, 135; 137.

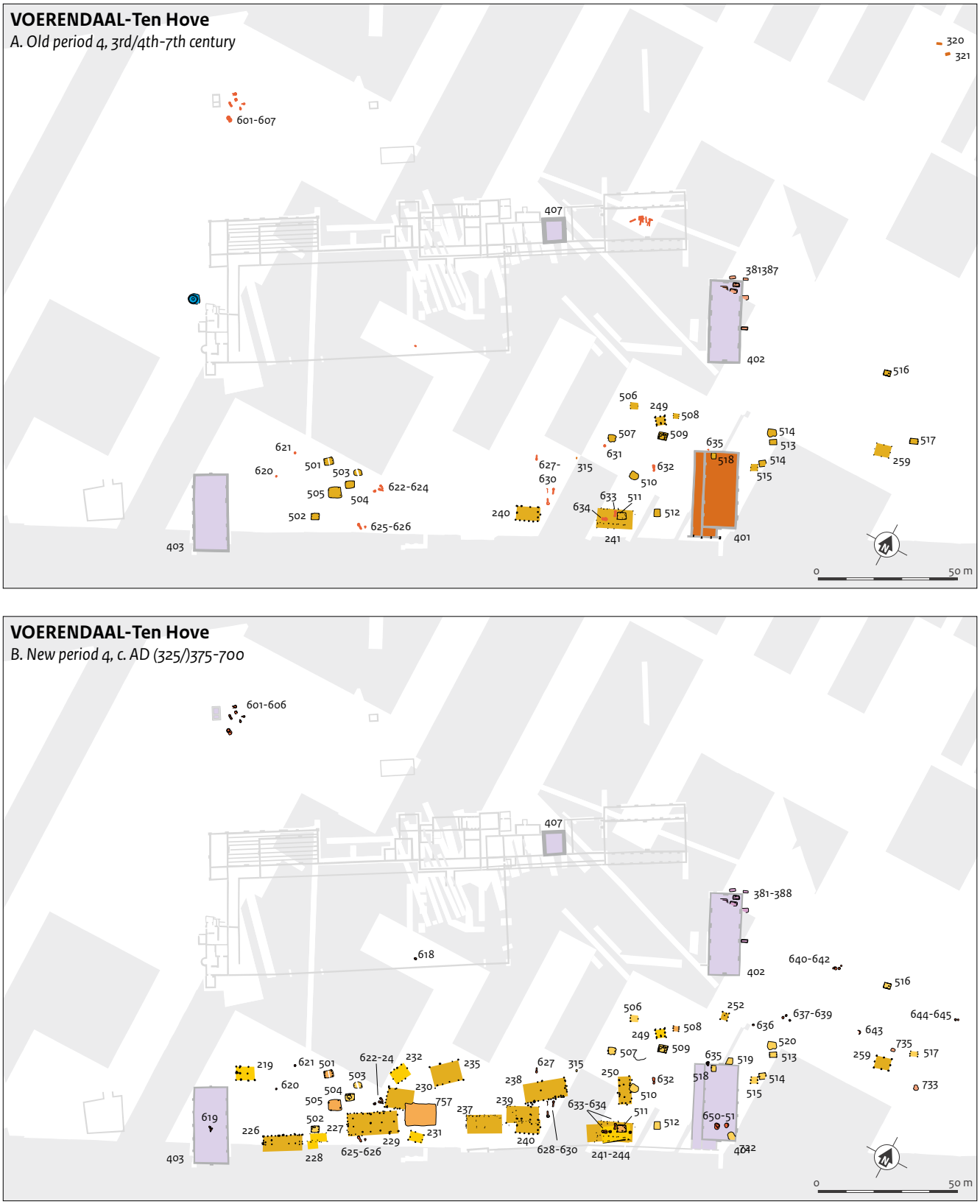


Fig. 5.5 Voerendaal-Ten Hove. Structures and features of period 4, according to the preliminary (A) and present full analysis (B); for legend, see figure 5.4.

building 241/W. It is now clear that radiocarbon dates can be residual from period 3, and the analysis of coins, Argonne sigillata and other pottery suggests that the settlement started around AD 400.

Buildings 240 and 241/W were two post-built structures already identified during the excavations, both rather small with a length of around 13.5-18 m (Fig. 5.5). Other structures are 20 sunken-floored huts (501-520), several dozen small hearths (601ff.) and a series of pits.
The main achievement of our analysis is that the number of house-plans has risen to about a dozen. With a few exceptions, however, it is impossible to date them accurately. The excavators believed that the old Roman outbuilding 401/A was still in use: '...it could be concluded with certainty that the building was not destroyed in the late third century AD, unlike the rest of the villa according to Braat. On the contrary, the building was in use until around 400 and only then, as indicated by red-burnt chalk in its walls, did it catch fire and its roof collapse.'[295] The only 'evidence' for this scenario seems to be the presence of structures in this area. There is no doubt that the building, like buildings 402, 403 and probably tower 407, was still visible.[296] Quite a number of features and finds from the Late Roman period and Early Middle Ages were found around and in the remains of buildings 401-403.

A significant group of features around building 402 belong to a small cemetery, dated previously to the early seventh century,[297] now from c. AD 575 to 675. The graves were found around and in alignment with the walls.[298] At least one small wooden building (259) and some pits belong to the same period. Habitation in the excavated parts of the site ended around AD 700.

5.2 Site formation processes

This section discusses formation processes, in particular their potential influence on the spatial and chronological distribution of features and finds. The process of erosion and the deposition of colluvium have already been addressed in the previous chapter. Below we will elaborate on issues concerning different types of structures; those relevant to specific structures are dealt with in the catalogue (Chapters 40-46).

5.2.1 Excavated and unexcavated parts

It is perhaps obvious but we still cannot stress enough that Voerendaal-Ten Hove was not excavated in its entirety. While a glance at the plan of the villa in period 3 might suggest otherwise, some 39% of the area of almost 4.5 hectares enclosed by ditch 301 was not excavated (Fig. 5.2). There are fairly large non-investigated areas both at the rear and in front of the villa.[299] This was the result of deliberate decisions by the excavators, based on quite 'empty' trenches nearby, but it must be noted. In particular, the 'blank spots' in the villa yard are somewhat unsatisfactory because Roman garden features and graves, for instance, may have been missed. In the Merovingian period there may have been several dispersed houses/yards between and beyond the excavated trenches. Further, the extent of the Medieval cemetery around building 402 is not known because it is located within the archaeological monument.[300] Another, more serious problem is that it was not possible to excavate the Steinweg and a strip along its south side. Therefore, probably half of the area enclosed by ditch 308 was not uncovered, nor a strip of 30-35 m of the settlement of period 4, leaving us with only half a site.

Returning to the villa, it is important to realize that the investigations of a substantial portion of the buildings were below par.
The information gathered by Holwerda and Goossens in the northeastern part of the yard was minimal, with sketchy drawings, no levels and no photographs.[301] Although Braat opened a larger area and was able to identify postholes in the same area, for example near the baths, he completely missed ditches 308 and 302. In the area of both main buildings, the excavation by means of narrow trenches with baulks of 1-1.5 m in between, reduced the chances of observing post-built features, such as those of a hypothetical predecessor to the villa. Although their protected status made it unavoidable that the ROB would uncover as little as possible of the villa buildings, this fact must be stressed because the general plan of the villa gives the false

295 Willems 1986, 147.
296 Willems & Kooistra 1988, 147.
297 Willems 1986, 149.
298 Willems 1986,149.
299 It would be interesting to know why so much attention in relative terms was given to the area north and northwest of ditches 301-303 (e.g. trenches 1, 2, 4, 44, 45, 47, 67), since the trial trenches showed that this part of the site was not very relevant. The square metres excavated could have been better invested inside the yard. However, the highly relevant graves 320 and 321 were found in the otherwise fairly empty area in trenches 60 and 63.
300 Section 2.3.1.
301 See section 2.2.1.

impression that it was a complete excavation. It is regrettable that the baths were not recorded again in 1987, thereby missing the opportunity to document the lavatory, for example, in more detail and to correct Braat's levels. Although main building 400 was documented fairly well in trench 9, the virgin soil was only reached in one third of the area. Perhaps the infill of one of Braat's trenches should have been removed to check the level just beneath it for features of post-built structures. The kilns in trench 115 were not investigated, an understandable decision but it left unresolved the questions about function and dating (also relevant for the general chronology of the site).

5.2.2 The spatial distribution of features and finds

The pottery finds, for the time being taken as indicative of all materials,[302] are unevenly distributed over the site (Fig. 5.6). Moreover,

[302] We use pottery here because this category is the most quantifiable in terms of both numbers and weight, and consists of quite a number of fragments from all periods, thereby providing a fairly reliable sample. For the distribution of other categories, see the maps in part III, e.g. figures 19.3 (coins), 31.9 (window glass), 32.15 (brick/tile) and 34.4-5 (slag).

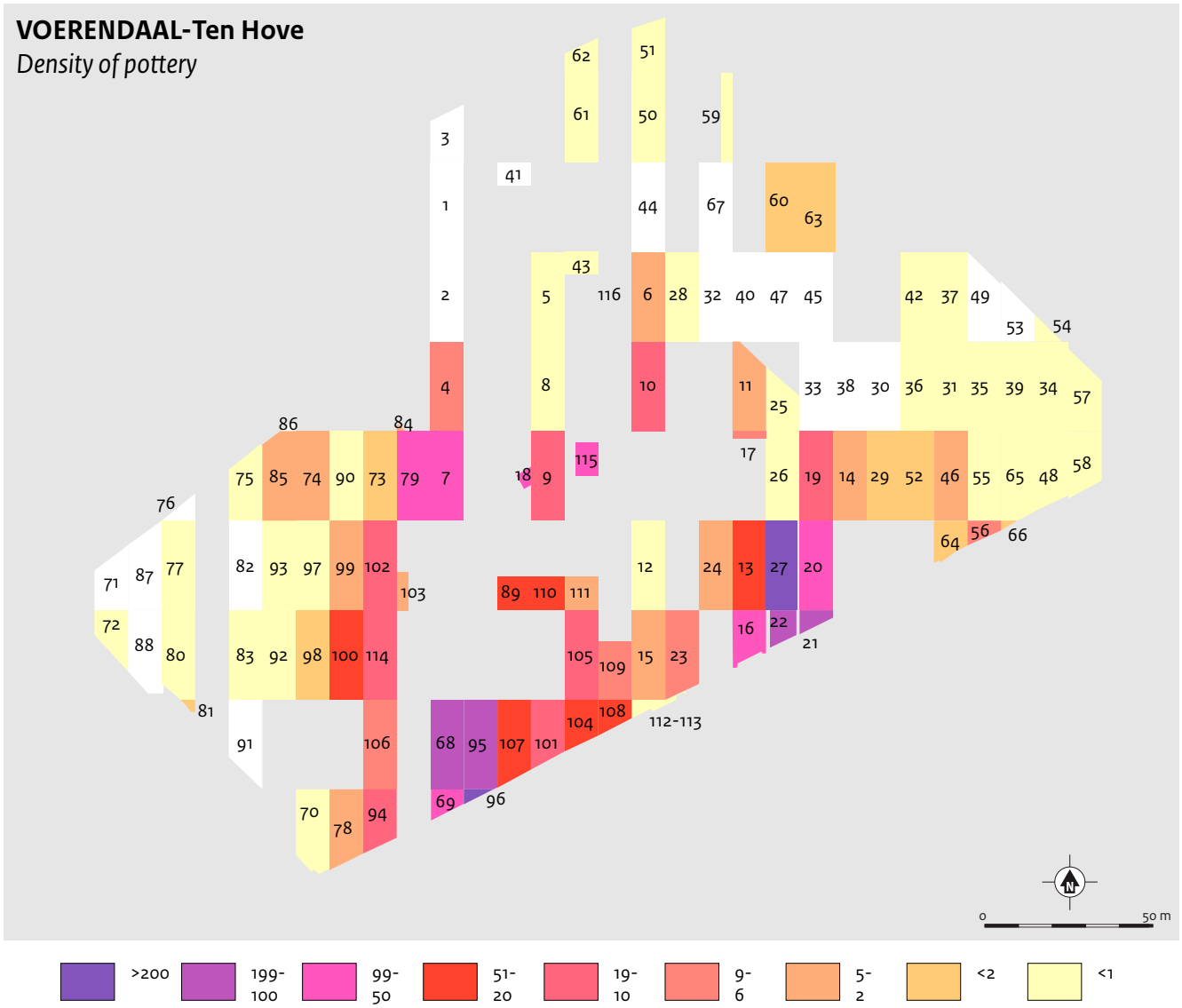


Fig. 5.6 Voerendaal-Ten Hove. Density of pottery finds per trench (g/m²).

the distribution of sherds over the trenches is utterly skewed (Fig. 5.7; Table *5.2).[303] Of the 116 ROB trenches, 23 (20%) yielded no sherds at all. The next 80 trenches yielded a relatively low sherd weight – up to about 10 kg – in total accounting for 25% of the finds. About half the total weight of pottery was collected in four trenches – 20, 95, 68 and 27 – with 20% of the total weight in the latter trench alone! Such a skewed distribution is not uncommon but the situation in Voerendaal is quite extreme, as is shown in a comparison with Hoogeloon-Kerkakkers (Fig. 5.7).[304]

The general distribution of features and layers within the site is easily explained. Firstly, the level of activities was apparently low outside the villa yard, resulting in relatively few features and finds from the more peripheral trenches in the west, north and east. Secondly, erosion combined with agricultural activities destroyed many shallower features on the higher parts of the site, including the northern half of the villa yard. Thirdly, the areas downslope near the Steinweg are relatively well preserved (Fig. 4.6). All this would suggest that most structures and finds were documented and/or collected in the trenches along the Steinweg, their number rapidly diminishing to the north. However, this is only partly true, as Figure 5.6 shows. Although many of the 'richest' trenches are indeed situated in the south, some are located elsewhere. We will return to the explanation later.

For erosion and sedimentation to be a factor in the find density, one would at least expect a positive correlation between the density and more, thicker layers being present between the modern topsoil and the virgin soil.[305] This holds true, for example, for trenches 7 and 79. In both, 30-35 kg of pottery sherds were collected, of which 74 and 62% came from layers.

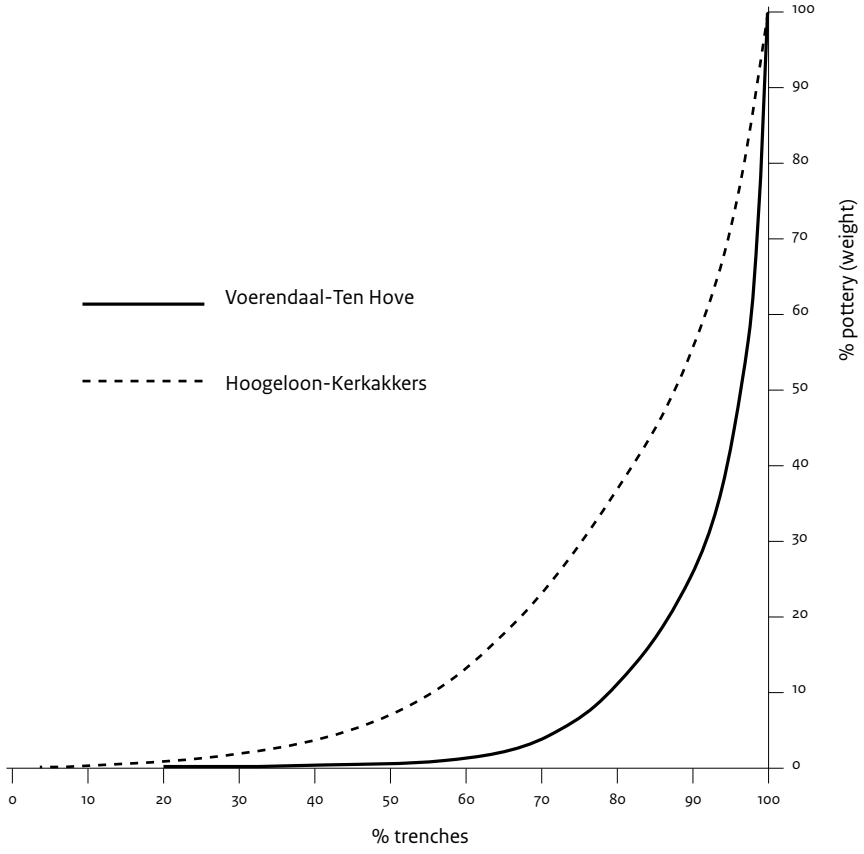


Fig. 5.7 Voerendaal-Ten Hove. Cumulative distribution of pottery (% of weight) over the trenches, compared to that of Hoogeloon-Kerkakkers.

[303] Tables marked with an asterisk (*) can be found in appendix IX.

[304] Many comparisons in this report are with Hoogeloon-Kerkakkers rather than Kerkrade-Holzkuil because the quantity of finds is comparable and good quantitative data were readily available for the former site.

[305] In trench 18 all sherds came from layers (= the fill of the cellar) and in 115 nearly 85%, both in fact showing how much material was left by Habets and Braat!

Downslope, there is a high find density in most trenches with layers, with 70-97% of the pottery deriving from these (21-22, 27, 68-69, 95- 96, 107). Trench 20, with only 40% from layers, is an exception (see below). Nevertheless, the presence of many finds downslope is related to, but not primarily caused by, erosion. As pointed out in the previous chapter, the slopes at Ten Hove are gentle, which means that in principle only 'sheet erosion' occurred. Most finds were probably not transported downslope 'embedded' in eroded loess. It appears more significant that the colluvium offered conditions favourable to the preservation of material. Finds that lay at certain moments at or near the surface were time and again covered by fresh, thin protective layers of loess.

Another potential factor affecting the number of finds from specific trenches is the excavation method. In some trenches with layers, such as 22, 27 and 16, finds were collected in 'spits' within 5 x 5 m squares, resulting in 60-70% of the total pottery weight of each trench. However, in the aforementioned trenches 7 and 79, for instance, finds were apparently not collected in spits but just behind the excavator bucket. Careful observation and the gathering of finds probably worked here just as well.

In a number of trenches both up and downhill, the presence of features – rather than a series of layers –had a positive effect on the number of finds. The part of pit/cellar 757 in trench 108, for example, contained some 4.5 kg/65% of the sherds from that trench. Ditch 302 in trench 100 yielded 7.4 kg/57% and basin 319 no less than 8.3 kg/ 97%.[306] Apart from 40% from layers, the majority of sherds in trench 20 came from several features. In particular, pit 722 with 12.4 kg/30% accounted for a large proportion of the sherds and pit 772, with 6.7 kg, for 16%. The total amount is to a large degree accidental as the features date from different periods. Pit 772 is from the Iron Age, a number of ditches and pits are Roman, while sunken-floored huts and other pits – including 722 – are Late Roman.

5.2.3 The general chronological distribution of the finds

The finds are not only unevenly distributed over different parts of the site, but there are also biases concerning their chronological distribution. Figure 5.8 gives an impression of the quantity of finds per period, again based on the largest find category, the pottery. Because the chronological resolution of the majority of the pottery is not as high as we would like, resulting in many uncertainties about the precise dating of periods/phases, the graph is partly based on intuition and the pottery is quantified in the easiest way: by the number of sherds.[307] A graph based on the minimum number of individual vessels (MNI) or weight would have been quite similar, however. The graph ignores intra-period variations and possible discontinuity; only the curve of the Late Roman period is refined with the help of roller-stamped sigillata.

It is immediately clear that the Middle Roman pottery dominates the assemblage. Even if the Iron Age and Late Roman habitation were discontinuous or had a much shorter duration, the picture would remain essentially the same. The insignificance of the Early Medieval period in terms of pottery is remarkable. Obviously, this does not necessarily imply a smaller scale of habitation than during the Late Roman period. Farms could have been more dispersed – as in the Iron Age – and/or the supply of pottery organized differently. The Middle Roman pottery (and other categories) of periods 2 and 3 is somewhat overrepresented, with little found in contemporaneous features, in Late and post-Roman features (see below).

Some find categories, such as glass and the metal objects, show an essentially similar chronological distribution to the pottery. However, the vast majority of coins are Late Roman. Some other find categories also show a specific chronological distribution. All the durable building material – limestone, sandstone, brick and tile – was brought to the site in the Middle Roman period. Obviously, some of it was (re)used during period 4 and this perhaps even holds true for some millstones. The conditions for the preservation of animal

[306] For descriptions of all features mentioned in this chapter, see the catalogue, Part IV of this publication.

[307] Cf. table 18.1.

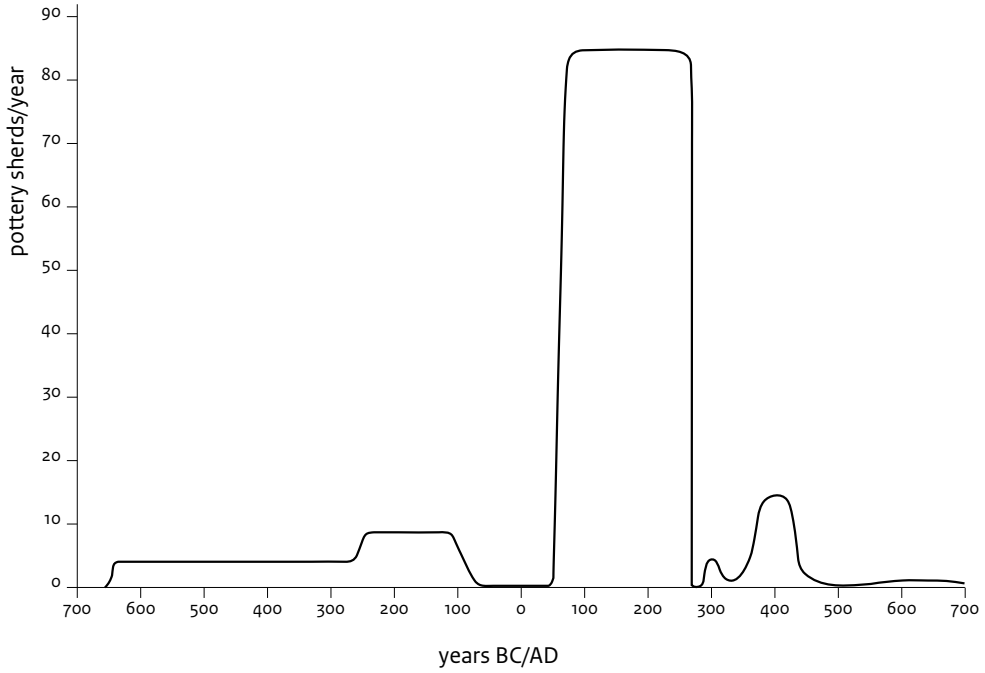


Fig. 5.8 Voerendaal-Ten Hove. Simplified representation of the chronological distribution of the pottery (sherds/year).

bone will have changed through time. Most unburnt animal bone from the Iron Age decayed in the decalcified loess. Roman and later bone was better preserved in the chalk of building stone, although only at specific locations near (the ruins) of buildings.

5.2.4 Possible pitfalls at a multi-period site

At a multi-period site such as Voerendaal, inhabited for a time span of more than a thousand years, it is difficult to keep the features and a portion of the finds from different periods separate. One factor creating false impressions about dates is the occurrence of intrusive finds or 'intrusive features', not really belonging to a feature. Instances are a posthole with Medieval finds as part of prehistoric granary 202 (bearing in mind the possibility of administrative errors) and features with (late) Roman material amidst those of Late Iron Age buildings 222 and 223. Complications of this sort are caused by humans leaving sherds, objects and vegetal matter behind, in combination with digging postholes, ditches and pits over and over again in the same area. Part of the intrusive material comes from animal burrows, such as the many dug by moles (cf. Fig. 12.4B). Some intrusive finds are easily recognizable, such as part of a post-Medieval clay pipe in prehistoric pit 756. Others are not, leaving us with the question of whether the Late Roman dated bone from building 219, for example, is intrusive or contemporaneous.

Another complicating factor for dating is the deliberate re-use of older material. In Voerendaal, probably not much from the Late Iron Age was reused in the Roman period, although metal objects could have been melted. It is likely however that a fair portion of the enormous quantities of stone, brick and tile, wood, metal, glass and pottery of villa period 2/3 was reused in the Late Roman period and thereafter.[308] Illustrative here are the sandstone column drums secondarily used as sharpening tools. Reuse is seldom easy to detect, however. The presence of old objects in features can be a matter of 'unintentional residuality', of material once lost or left behind, ending up in a feature by chance or natural processes.

Particularly in large 'artefact traps', such as the sunken-floored huts from period 4, a considerable number of period 2-3 finds can often be present (Table *5.3). In hut 514, more than half of the pottery sherds and 11(!) coins

[308] Cf. section 12.4.

affirm that the context dates to period 4. Still, almost 40% of the sherds, some pieces of glass and brick fragments belong to period 3 or earlier. The same probably applies to a piece of lead and most of the iron, such as a large T-shaped clamp (514-10). This object and the lead may have been used in period 4 but this cannot be proven. While some late features contain much older material, others do not. Examples are sunken-floored huts 507 and 520 (?) with only pre-period 4 material, leaving the feature type as the single dating element.

The feature type obviously provides no help in dating pits (some examples in Table *5.4). Several period 4 finds were often collected from period 4 pits, as well as a considerable amount of older material. Here the example of 713 offers a cautionary tale because the period 4 date depends on just two sherds. It is not hard to image that - were the latter overlooked or simply absent - the feature would have been dated to period 3. Therefore, even pits such as 740, 752 and 702, which seem to belong to period 2 or 3 on the basis of several finds, could equally be younger. Obviously, there is little to substantiate this idea, apart for example from grinding marks on a column fragment from 702. As such, it is still possible that pits were dug by farmers in the Middle Ages to bury rubble on their fields (if it was too much work to carry everything to the edges of the fields).[309] There are other examples in Zuid-Limburg of farmers demolishing villa buildings and disposing of the rubble.[310] Whatever the case, the point we wish to make is that the majority of feature dates are termini post quem only. The problem of residuality is addressed again below, concerning radiocarbon dates for grain (Section 5.3.2).

5.2.5 Additional comments on context types and find collecting

Obviously, context types other than sunken-floored huts and pits have specific formation processes and dating problems. Ditches, for instance, may have complicated 'biographies', such as 308 belonging to the Late Iron Age enclosure.[311] Finds from the time in which ditches were used are often scarce or absent because the lower levels silted up quickly with 'clean' soil or were re-dug. Once ditches fell out of use, they were often not filled up entirely, remaining present for decades or much longer as hollows where material from subsequent periods ended up (cf. the cellar of 409). Concerning postholes, finds from the packing soil, the post pipe and/or extraction pit should ideally be collected separately. Because these sub-contexts were often not visible, this was seldom done during the excavations at Ten Hove. However, experience teaches us that the majority of finds come from post pipes and extraction pits, and date instead to the end phase of a structure or beyond. A major obstacle in the dating of stone buildings at Ten Hove is that the relationship between walls/foundations and layers is seldom clear. This is the combined result of the distance to trench wall sections, the intervals between excavation levels, the sloping terrain and the 5 m intervals between the levels taken.[312] However, a more meticulous excavation method would probably not have led to more clarity in the end. The same holds true for the implications of the find collection methods. Because the excavation levels cut 'natural' layers somewhat arbitrarily and because of the intervals between them (and the spits from them), this introduced an unavoidable imprecision regarding the (vertical) position of finds.

5.3 Relative and absolute chronology

The dating of specific (categories of) finds, structures and features will be discussed in other chapters. Below we present only general dating evidence, namely the intersections and stratigraphy, as well as the radiocarbon dates.

5.3.1 Relative chronology

At Voerendaal-Ten Hove, a considerable number of intersections between structures/features occur. Those presented in the Harris matrix in Figure 5.9 are only a selection, albeit of the most significant ones. Intersections do not in general offer crucial dating evidence but they support the dates suggested by the feature types and finds. For instance, the relatively early date of ditch 308 is shown by a number of intersections,

309 Habets (1871, 379) mentions a spoil heap at the edge of the field at Meerssen-Onderste Herkenberg.

310 E.g. at Schaesberg-Overstenhof: '...this spot was known for the large amount of rubble in the arable. Over half a century ago [c. 1870-HAH], we were told that it was thoroughly cleared up. Cartloads of the annoying stones and roof-tile pieces were dumped in the pond near the farm.' (Peters 1922, 103). At Hoogeloon-Kerkakkers, the remaining smaller rubble of the villa was dumped in the pond (cf. section 9.4) after c. AD 1300 (Hiddink & De Boer 2014d, 869-876).

311 Cf. section 41.2.

312 See for instance chapters 39 (building 403 and 418) and 84, esp. fig. 43.22 (cellar of building 409).

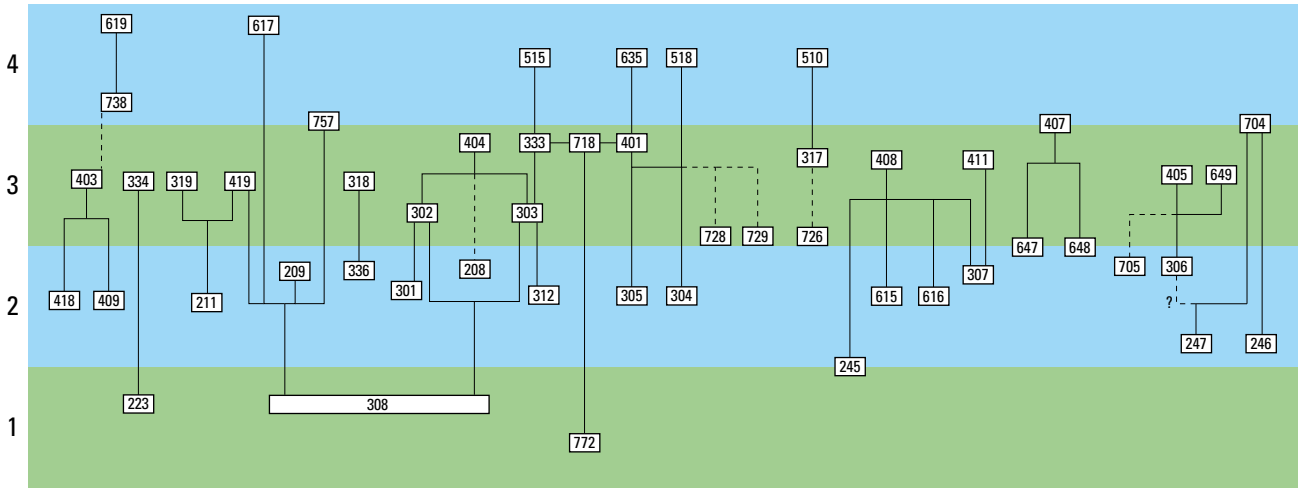


Fig. 5.9 Voerendaal-Ten Hove. Harris matrix containing key features.

those with ditches 302 and 303 (period 2/3) being especially interesting. For the Roman period, the relationship between buildings 409(/418) and 403 in particular is very significant for the chronology of the second large villa. Concerning the ditches, the fact that 304-307 and 312 are older than several buildings of period 3 is worth mentioning here. The stratigraphic position of furnaces 615 and 616, under the *horreum*, is also quite relevant. Finally, there is the high/late position in the matrix of sunken-floored huts 510, 515 and 518, as well as hearths 617, 619 and 635. A late date for these features is to be expected on the basis of their type and the confirmation by the intersections is reassuring. At first sight, it might seem remarkable that no layers are included in the matrix. There are several reasons for leaving them out. Firstly, many of the 'layers' recorded on the field drawings are not distinct layers proper, but soil horizons or other parts of the subsoil with a specific colour, e.g. the result of bioturbation or trampling. Obviously, these layers were time and again cut by features, but only in a few instances do they themselves separate features of specific phases. A second, practical reason for the limited relevance of layers is the way in which they were recorded: mainly at arbitrary levels and seldom in sections.

5.3.2 Radiocarbon dates

In the late 1980s and early 1990s, 23 samples were dated by means of the radiocarbon method, and another 19 samples in 2020.[313] A reason to date an additional series of samples was to check the older samples using new methods and because some context data were initially missing.

Older samples

As early as 1986, five mortar samples were submitted and analysed by the CIO of Groningen University (Table *5.5).[314] The dates obtained are of no use at all because of their very wide range, as well as their unknown provenance. The year in which they were submitted and part of their numbers, 20-22 referring to the trenches, show that mortar from building 401 and possibly wall 416 was sampled. However, the numbers are nowhere to be found on the field drawings and the Roman numerals indicate that the original sample/find numbers were 'lost in translation' at the ROB.

There were also problems concerning the exact provenance of a substantial number of samples more relevant to the present analysis, those containing archaeobotanical material from structures and features (Table 5.6, nos 1-14). These samples were discussed in Kooistra's PhD thesis, albeit without the date proper.[315] These dates became available thanks to the information provided by the ^{14}C laboratories.[316]

[313] Excluded here are four samples from cores in the Hoensbeek valley (Bakels 1996a).

[314] Mentioned in a letter from J.F. van Regteren Altena (ROB) to Prof Dr J. van der Plicht (CIO), 11-3-1991. These dates were published by Lanting & Van der Plicht 2010/2011, 375.

[315] Kooistra 1996, 137, table 20.

[316] We wish to thank Dr S.W.L. Palstra (CIO Groningen) and Dr K. van den Borg (former Utrecht laboratory) for the data.

This allowed new calibrations, including both 1 and 2 sigma ranges. During the analysis, the provenance of some samples was still not entirely certain because the sample (find) numbers were also not published by Kooistra and not all the structures/features could be identified with the help of her text or the rather crude plans.[317] The original sample numbers were not found until long after the analysis was concluded, fortunately without serious consequences for the dating of features.

Dates obtained in 2020

In the course of our analysis, 19 additional samples were submitted to obtain radiocarbon dates (Table 5.6, nos 15-38). Four of the samples were of burnt (animal) bone, the others of charred grain. The latter group was partly selected to check the dates obtained in 1991-1992 because other dating techniques and equipment are now used. In the 1990s all samples were analysed with the then novel AMS method (UtC labcode), which still had quite high standard deviations. This was why Kooistra submitted four samples from contexts dated by AMS in 1992 to the CIO, to compare them with the 'traditional' method (GrN labcodes). Samples are currently measured with a new AMS system, MICADAS (MIni CArbon DAting System). The results are more accurate, as primarily expressed in lower standard deviations. In some cases, we initially selected other contexts for dating, but there were not always enough grains still available.[318]

In an effort to obtain samples from, for example, ditch 308 and more post-built structures, alternatives were sought for the grain still kept at the ROB (mainly from pits and sunken-floored huts). There was really nothing else available for 308, but the original sieve residues were also kept for a multitude of other structures. We refrained from dating charcoal because of the risk of unintentionally sampling the core of old trees. A possible alternative was burnt animal bone. Besides a substantial amount from pit 794, only tiny pieces were present from sampled postholes for a number of buildings and granaries. All these pieces were picked from dozens of bags, resulting in samples from some 15 structures. During the selection, it was observed that many residues consisted of loess, charcoal and burnt bone, but sometimes of pieces of mortar and brick. This is indicative of either a late(r) date for the features or intrusions by tree roots or animal burrows. Because of the latter possibility, only three samples of this kind were submitted in the end.

A first sample of tiny bone particles is from building 236. The date obtained is as expected: probably Late Iron Age, with a possible Middle Iron Age date as the result of 'wiggles' in the atmospheric ^{14}C content rather than a reality. For pit 794 the date accords with the find material (likely before c. 100 BC). Surprisingly – because no intrusive material was observed – small pieces of burnt bone from building 219 date to the Late Roman period. In any event, the dating of this building was already problematical.[319] The Late Roman or Early Medieval date of building 226 simply confirmed what was expected.

Concerning the radiocarbon dates of grains, the dates obtained in 1991 and 2020 are more or less identical. The former often show a somewhat wider date range, sometimes resulting in apparently quite old/too old dates.[320] For threshing floor 420, building 241 and sunken-floored hut 512, this is indicated by grey bars in Figure 5.10. A number of features for which a Late Roman date was expected appear instead to be Middle Roman according to the radiocarbon dates (e.g. sunken huts 509, 512, 513 and hearths 632, 650). Clearly, this is the effect of residual grains. In sunken hut 514, the new date is much older than the old one. The newly dated material is obviously residual, but that is even possible for the material that was dated in the 1990s!

317 Kooistra 1996, fig. 24.

318 The selection was made on the basis of an inventory of samples/find numbers of archaeobotanical material kept at the RCE, Amersfoort, kindly provided by Otto Brinkkemper. He also prepared the samples for shipment to the CIO.

319 See chapter 40.

320 Of course, there is always a certain chance that a radiocarbon date obtained is incorrect.

Table 5.6. Voerendaal-Ten Hove. Radiocarbon dates of samples of charred seeds (cs) and burnt bone (cr).

No.	Structure	Find no.	Mat	Date (yr. BP)	Labcode	Date (cal years AD; 1 sigma)	Date (cal years AD; 2 sigma)
1a	pit 718	20-1-3	cs	1880±70	UtC-1575	61-225	39 BC-260, 280-325
1b	pit 718	20-1-3	cs	1900±40	GrN-19134	53-138, 200-206	23-222
2a	sunken hut 512	22-7-1	cs	1880±50	UtC-1576	72-176, 191-212	19-246
2b	sunken hut 512	22-7-1	cs	1885±35	GrN-19135	69-140, 159-166, 196-208	55-226
3	hearth 610	10-2-27	cs	1870±50	UtC-1570	80-180, 186-214	25-252, 305-311
4	building 241	16-5-15	cs	1810±50	UtC-1572	131-254, 303-315	84-335
5a	thr. floor 420	22-5-18	cs	1810±50	UtC-1577	131-254, 303-315	84-335
5b	thr. floor 420	22-5-18	cs	1825±55	GrN-19136	94-96, 125-252, 307-311	70-335
6	building 243	16-5-38	cs	1780±50	UtC-1573	145-150, 170-194, 210-265, 271-332	129-381
7	pit 775	16-5-10	cs	1740±50	UtC-1574	241-354, 366-380	141-197, 209-402
8	sunken hut 511	16-6-3	cs	1740±50	UtC-1571	241-354, 366-380	141-197, 209-402
9a	horreum 408	102-1-38	cs	1720±50	UtC-1578	255-302, 316-385	145-150, 170-194, 211-423
9b	horreum 408	102-1-38	cs	1710±35	GrN-19137	259-282, 324-388	246-401
10	sunken hut 514	20-3-63	cs	1600±50	UtC-1581	407-474, 485-536	344-569
11	pit 737	68-4-26	cs	1570±50	UtC-1582	427-539	395-595
12	sunken hut 501	107-2-48	cs	1520±50	UtC-1580	433-489, 532-601	424-632
13	hearth 627	23-3-10	cs	1460±80	UtC-1579	474-485, 535-659	409-688
14	pit 736	62-2-2	cc	1125±45	GrN-14137	880-986	775-995
20	building 236	15-1-21	cr	2155±35	GrM-23107	349-310, 207-148, 137-111 cal BC	356-279, 257-247, 233-91, 79-54 cal BC
21	pit 794	101-2-23	cr	2075±40	GrM-22626	153-42, 8-4 cal BC	197 cal BC-23 cal AD
22	sunken hut 513	20-3-24	cs	1852±22	GrM-23719	133-140, 160-190, 201-234	128-238
23	sunken hut 512	22-5-13	cs	1825±30	GrM-23718	171-183, 203-250, 295-311	127-255, 285-325
24	hearth 650	20-1-50	cs	1823±22	GrM-23784	208-248, 300-302	131-144, 155-254, 288-322
25	hearth 632	13-3-25	cs	1822±21	GrM-23723	209-247	132-142, 157-192, 199-254, 288-322
26	sunken hut 509	13-3-4	cs	1816±26	GrM-23716	210-250, 295-311	131-144, 156-258, 282-329
27	thr. floor 420	22-5-5	cs	1801±22	GrM-23785	228-252, 291-319	210-259, 280-330
28	sunken hut 511	16-5-4	cs	1783±22	GrM-23717	240-254, 287-324	224-262, 276-339
29	sunken hut 514	20-3-63	cs	1769±21	GrM-23720	247-256, 284-327	236-264, 274-348
30	building 241	16-5-17	cs	1763±21	GrM-23710	247-258, 280-332	237-352
31	granary 249	13-1-57	cs	1759±21	GrM-23712	248-260, 279-299, 306-336	238-361
32	horreum 408	102-2-17	cs	1739±21	GrM-23787	252-290, 320-361	247-384, 398-401
33	sunken hut 515	20-3-57	cs	1723±30	GrM-23721	257-283, 328-384	250-296, 309-410
34	building 219	68-2-76	cr	1685±50	GrM-22629	258-280, 332-421	245-440, 453-479, 495-535
35	building 226	107-3-21	cr	1670±40	GrM-22632	263-276, 346-427	255-286, 325-441, 450-479, 495-535
36	sunken hut 501	107-2-48	cs	1583±24	GrM-23715	435-466, 474-502, 507-516, 530-538	424-547
37	hearth 635	27-4-18	cs	1532±21	GrM-23724	540-580	437-463, 476-499, 531-600
38	hearth 631	24-3-1	cs	1292±21	GrM-23722	675-702, 741-771	666-774
39	pit 813	95-4-26	cs	1923±22	GrM-28442	65-130, 144-155	30-42, 59-205

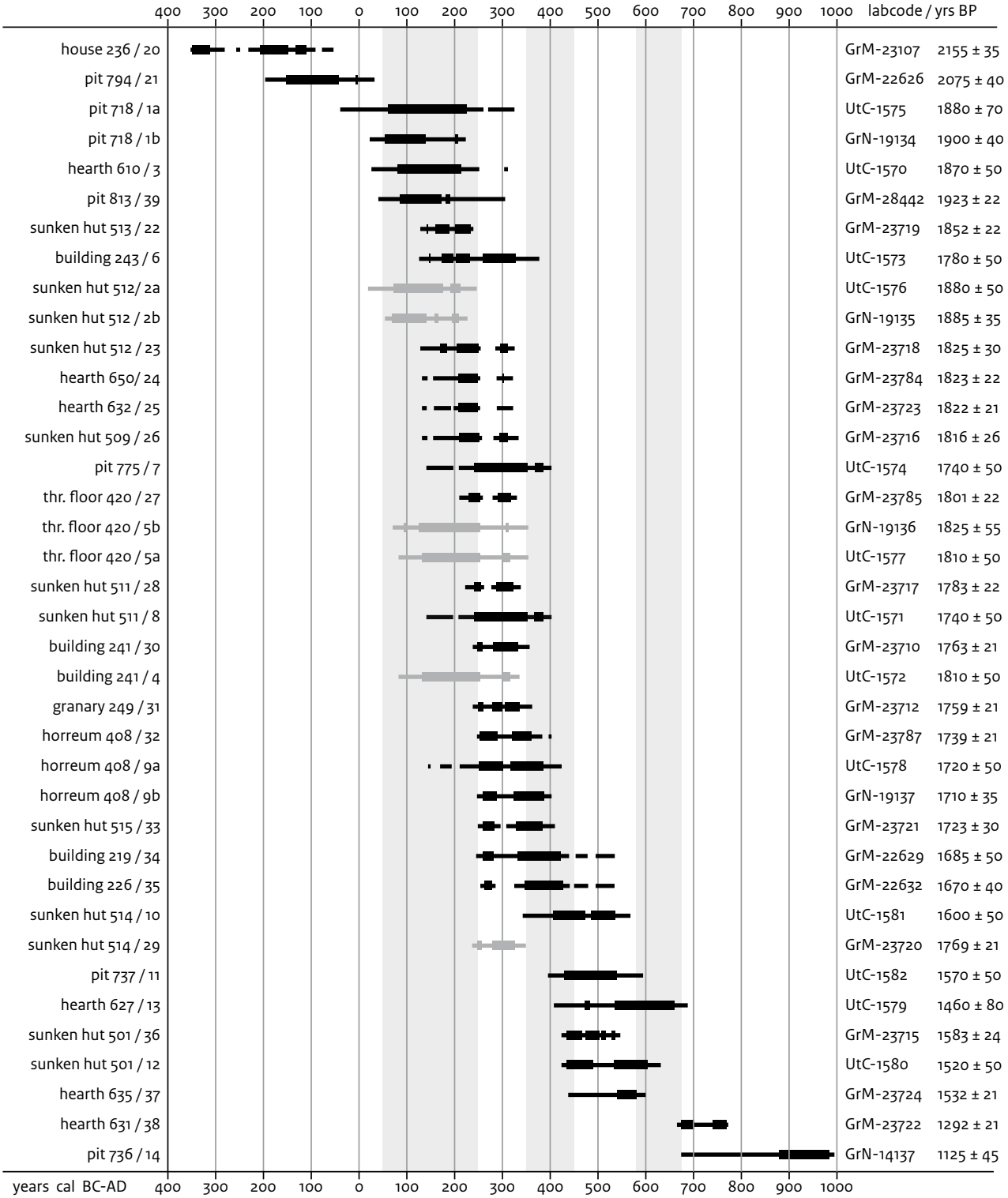


Fig. 5.10 Voerendaal-Ten Hove. The calibrated 14C-dates, with their 1 sigma (broad line) and 2 sigma (line) ranges.

6 The timber buildings

Henk Hiddink and Diederick Habermehl

6.1 Introduction

This report describes and discusses more than sixty post-built buildings, structures with their main roof-bearing posts dug in (Fig. 6.1).[321] Sunken-floor huts are therefore excluded, as are buildings with stone foundations that might have been timber framed.[322] Sixty buildings represent four times the number of those indicated in the plan in the second preliminary report.[323] This is the first reason for presenting this largely new dataset in its entirety in a separate chapter. The second is to highlight some extraordinary building types (Sections 6.2 and 6.4). The third reason is that only a minority of the post-built structures are dated, by finds, radiocarbon or building type. If presented in Chapters 7, 9 and 12, which are devoted to specific periods, many buildings would either vanish in some sort of 'cover-up', or require a lot of explaining later on. Although chronological order is maintained wherever possible in this chapter, our approach is pragmatic and somewhat arbitrary. Some plans are taken together on the basis of their presumed date or function, others on the basis of their construction and/or size.

By presenting all post-built structures here, readers can judge for themselves whether our reconstructions are plausible. The reason why only a dozen structures were illustrated in the preliminary report is their fragmentary character. The excavators were aware of the presence of many more buildings but seem to have been somewhat hesitant to reconstruct them before the excavation results were thoroughly analysed.[324]

[321] For these descriptions, see chapter 40.

[322] For the sunken-floored huts, see section 12.3 and chapter 44; for the 'stone' outbuildings, 9.1-3 and 84.

[323] Willems & Kooistra 1987, fig. 2. The larger buildings 240, 241, 259 and 409, as well as ten granaries, are shown here.

[324] Willems & Kooistra 1988, 138.

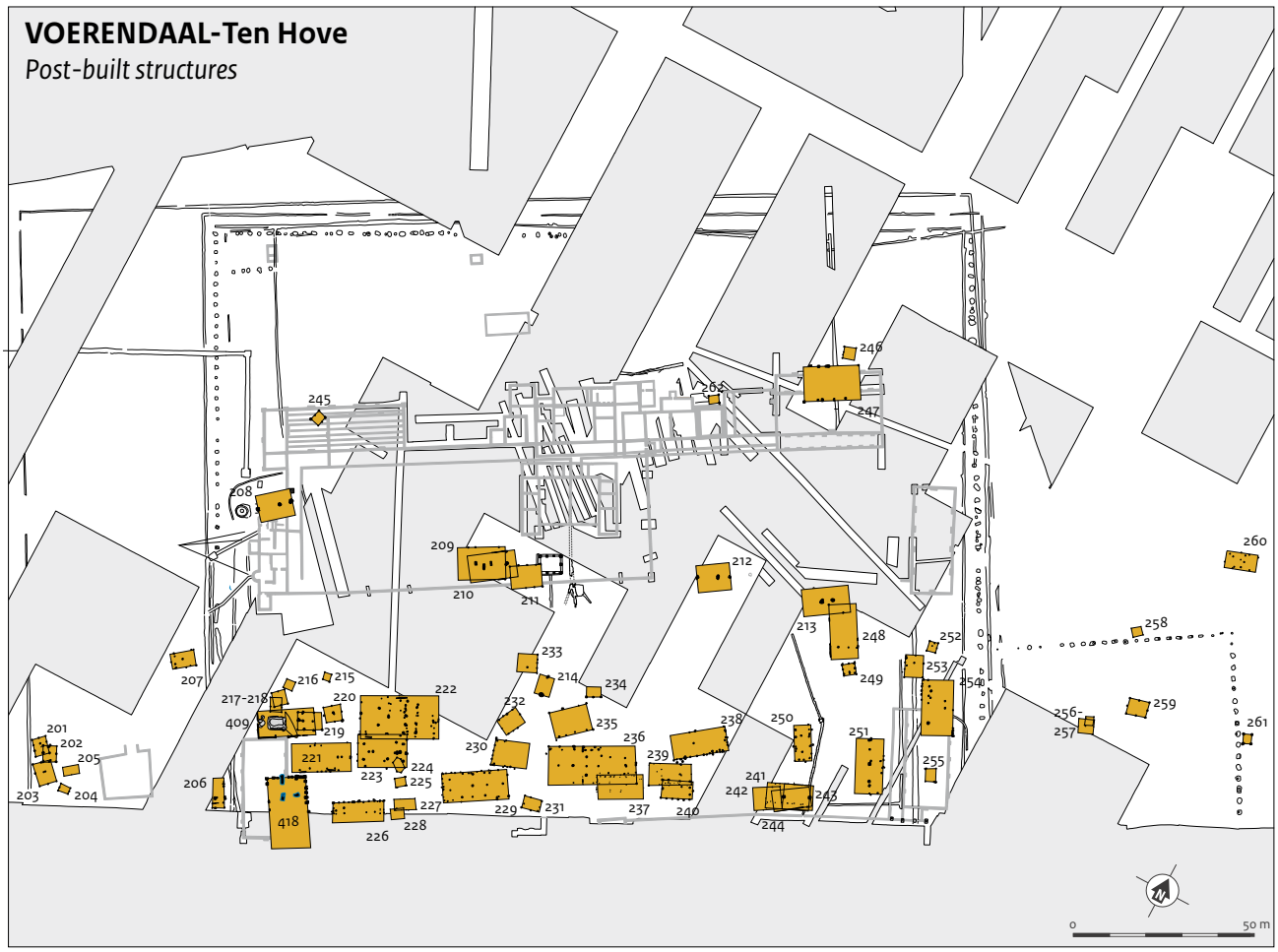


Fig. 6.1 Voerendaal-Ten Hove. The post-built structures with their numbers.

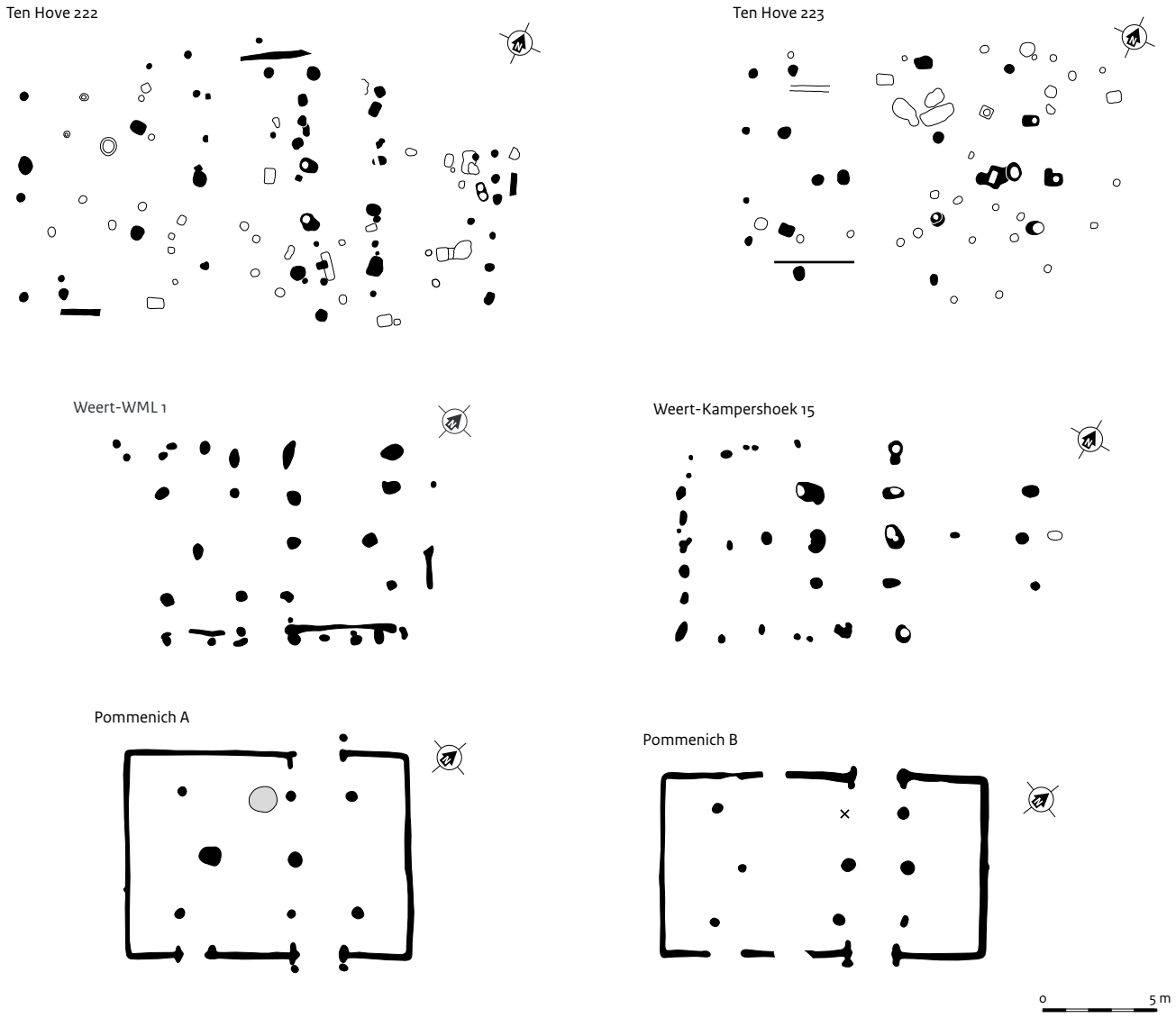


Fig. 6.2 Voerendaal-Ten Hove. Building 222 and 223 with houses from Weert and Pommenich for comparison. (source: in part modified after Coolen 2008, fig. 5; Tol 1996b; Geilenbrügge & Franzen 2015, fig. 1)

Moreover, knowledge about wooden buildings was still fairly limited at the time, especially for the Late Roman and Early Medieval period. Nevertheless, many house plans referred to below are from the sandy soils of the MDS area and the northern Meuse valley rather than from the loess area because the number of examples from the first two areas far exceeds that from the last.

6.2 Large buildings from the Late Iron Age

Buildings 221, 222, 223 and 236 probably date to the Iron Age on the basis of the find material, although some features, especially 222 and 223, contained younger finds. We think that these are either intrusive or come from features that do not belong to the building. Despite the dating difficulties, it seems important to present the buildings as Late Iron Age because it may help to shed light on the problem of defining the late prehistoric house types of the loess region. The possible houses known so far are rather small and differ from those on the adjacent sandy soils of the MDS area (cf. below, Section 6.7).[325]

The combined two- and three-aisled construction of 222 and 223, most clearly visible in the latter, bears a resemblance to some Late Iron Age house plans found at sites near Weert (Kampershoek Zuid, Klein Leuken, WML-terrein; Fig. 6.2).[326] The main load-bearing posts inside these buildings form various configurations of three, placed in rows – resulting in four aisles – or a triangular pattern. Houses with some similarity to those at Weert were recently found in the German loess area near Pommenich

[325] Hiddink 2014c, 193-195, 207, figs 20-21.

[326] See also Hiddink 2014a, 191-192. Weert 15 is in fact only the eastern half of a 'double house' (14/15).

(Fig. 6.2).[327] However, all plans mentioned – with a maximum width of 8.5-9 m – are much narrower than those from Voerendaal, 9.6-10/11.4 m wide. Houses of 10 m wide are not known from prehistory and even formed an exception until the advanced Roman period (later second and third century AD).

Building 236 at Ten Hove resembles the house type Haps/Oss-Ussen 4, of which Oss 27 is a characteristic example in respect of the shape of the entrances (Fig. 6.3). Haps houses date to the middle and first half of the Late Iron Age, while the latter period is suggested for 236 by a ^{14}C dating (Table 5.5, no. 20). Representatives of the house type are in principle two-aisled, but variants are combined two/three-aisled or even completely three-aisled. In examples belonging to the latter variants, mainly known from the western part of Noord-Brabant and Flanders, some of the central and inner posts are not aligned. Although these variants of the Haps type are comparable to Voerendaal 236, the problem is again the width. House 236 is 10 m wide, whereas the examples from Ekeren and Brecht (B/AN) in Figure 6.3 are only 8.6 and 8.7 m wide. The latter houses are chosen because they are wider than most examples (only 7-8 m).[328] A building from Olen (B/AN) is 9 m wide, still not quite comparable to Voerendaal 236.[329]

There is a possibility that building 221 also dates to the Late Iron Age, based on the proximity to 222- 223 and the fact that the five sherds in its features are handmade. However, the building is narrower than 222-223 and two iron slags are present in a feature. This 'circumstantial evidence' suggests an alternative scenario in which 221 belongs to the same phase as building 409. In that case, it would belong to the group of post-built villa outbuildings discussed below (Section 6.6).

6.3 Buildings of the Alphen-Ekeren type

Six buildings from Voerendaal can be classified as Alphen-Ekeren-type buildings (208-210, 213-214, 243; Fig. 6.4-6.5). This was the principal building type in the MDS area during the Early

[327] Geilenbrügge & Franzen 2015. See below, section 6.4. Pommenich was situated in the east of the WW lignite mine area (fig. 3.2).

[328] Some typical examples that are 7-7.75 wide are Brecht-Ringlaan 2.3 and 3.22 (Bracke *et al.* 2017, 315-324); Breda-Bagven 4 and 5 (Kranendonk *et al.* 2006, 476-482, figs 12.24-25).

[329] Janssens 2017, 166, fig. 1

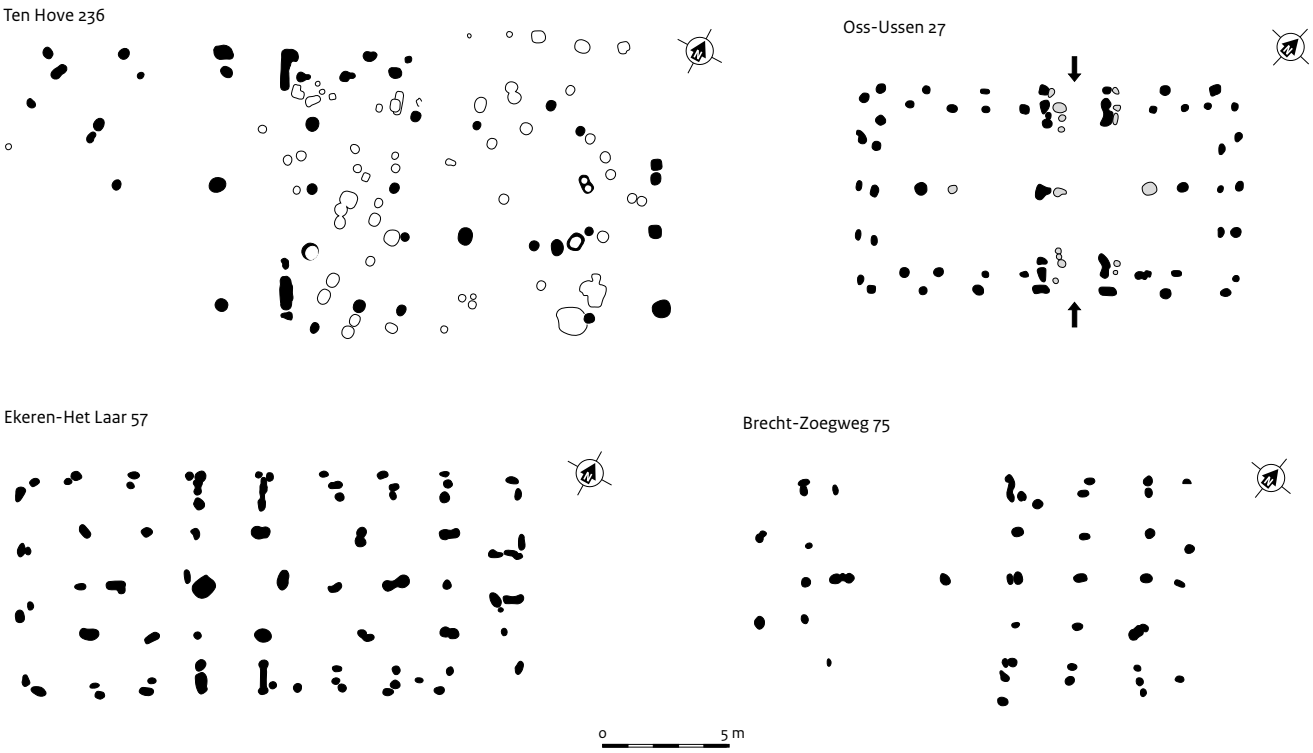


Fig. 6.3 Voerendaal-Ten Hove. Building 236 with three variants of Haps-houses. (source: in part modified after Schinkel 1998, fig. 68; Delaruelle & Verbeek 2004, fig. 5; 20)

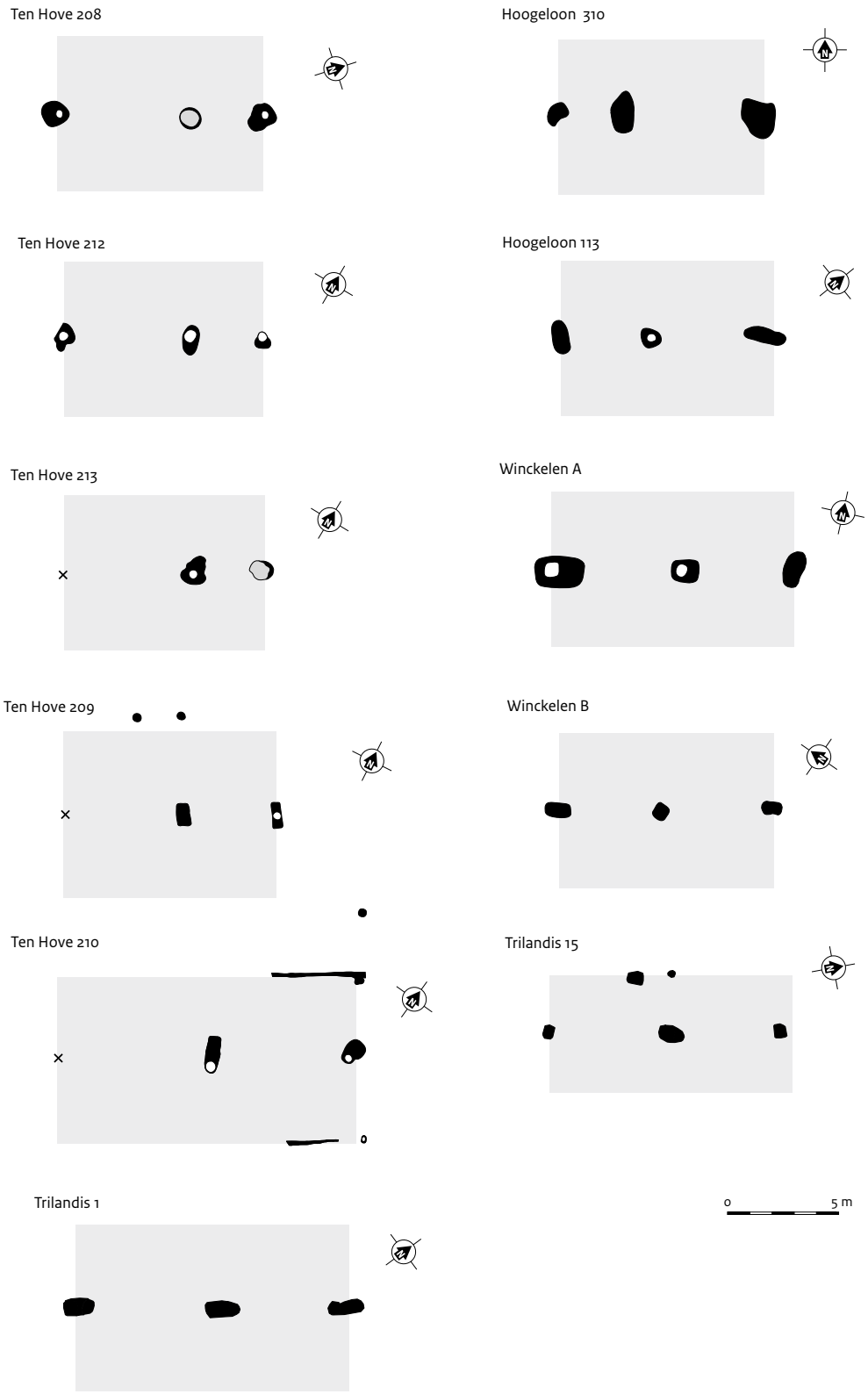


Fig. 6.4 Voerendaal-Ten Hove. Alphen-Ekeren type buildings with similar examples from other sites. (in part modified after Hiddink & De Boer 2014b, fig. 35.12; 2014e, fig. 39.3; Tichelman 2014, 406-407, 430; Dijkstra 1997, fig. 4)

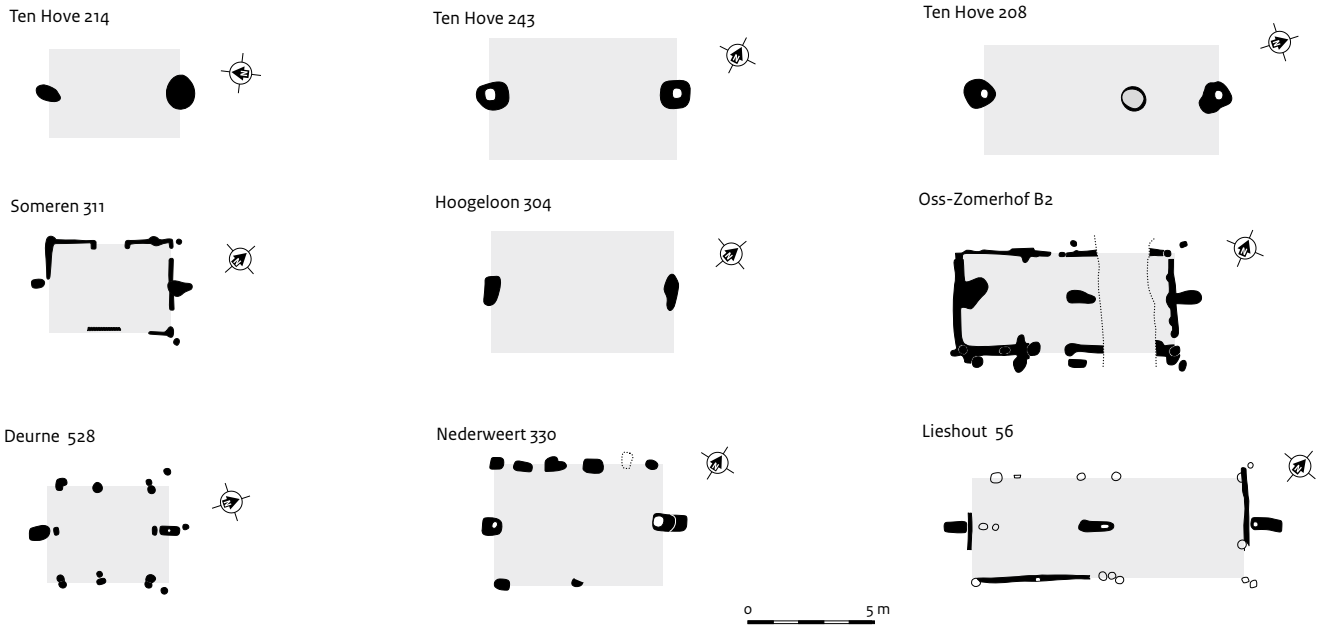


Fig. 6.5 Voerendaal-Ten Hove. Outbuildings comparable to Alphen-Ekeren houses. (in part modified after Hiddink 2005a, fig. 18.26; 2005b, fig. 19.24; 2008, fig. 18.38 (Deurne-Groot Bottelsche Akker); Hiddink & De Boer 2009, fig. 12.11; 2014e, fig. 39.1; Wesselingh 2000, fig. 55)

and Middle Roman period. In principle these were byre-houses, with one row of three or more central roof-bearing posts, placed in quite large postholes.[330] The walls consisted of wattle and daub panels, placed between posts that were dug in or joined to base plates. In either case, the 'foundations' of the walls were often quite shallow, resulting in the total absence of features in excavations. For two decades after the first plan was identified, the type was only found on the sandy soils of the MDS area, at present represented by many hundreds (>500).[331] It has since become clear that the house type was also common in the loess regions, with most examples found in smaller, non-villa settlements such as Veldwezelt, Kesselt (both B/LI), Kerkrade-Winckelen and Heerlen-Trilandis (Fig. 4.10).[332]

Half of the buildings at Ten Hove are probably incomplete, which hampers their interpretation. Furthermore, they are dated differently: (probably) Early Roman (208, 214), Middle Roman A (209, 210, 212) and third century or later (243). The different length of the bays of buildings 208 and 212 is typical of Alphen-Ekeren buildings from the first and second century AD. Although they may theoretically have had a fourth central post outside the trenches, they are probably complete. Still, their length of 9.3 and 9 m is the absolute minimum for houses of this type.[333] Hoogeloon-Kerkakkers 113 and 310 are comparable in terms of the location of the posts and the length (Fig. 6.4). In the context of the (villa) settlement which they belonged to, their function as byre-houses is not certain; they may simply have been outbuildings. The smallest examples on the loess, such as Kerkrade-Winckeln A and B, are at least 10 m long; their bays were approximately the same length. If Voerendaal 209 and 212 also had three central posts (see below), their length was roughly the same as that of 208 and 214. It is unlikely that the three small postholes of 209 were part of the walls because the building would then have been very wide (9 m). Voerendaal 210 was 8 m wide and thus somewhat larger, comparable for instance to Heerlen-Trilandis 1 or 33.

In theory, the plans with only two central posts could have been houses, but it is more likely that they were outbuildings (Fig. 6.5). Voerendaal 214 had only two posts and its length of 5.2 m is comparable to that of buildings on the sandy soils, such as Someren-Ter Hofstadlaan 311 and Deurne-Groot Bottelsche Akker 528. These examples of 'mini Alphen-Ekeren plans' were certainly outbuildings, as the location of the walls and therefore their width is known. It is uncertain whether Ten Hove 209 and 213 with two posts were excavated entirely and whether,

330 Much larger than those in Haps houses. The section of the pits is often asymmetrical or 'holster-shaped', allowing the post to be inserted diagonally and set vertically in a second stage.

331 Number according to the site database of the first author in 2019.

332 See Vanderhoeven 2015, 192-193, figs 2-3 (Veldwezelt, Kesselt); Tichelman 2014 (Trilandis); Dijkstra 1997, 12-15, figs 3-5 (Kerkrade-Winckeln). The latter site was perhaps part of the Kerkrade-Julianaterrein villa site.

333 For the sake of convenience, we assume that the length of the houses equalled the distance between the first and last central posts, implying a saddle roof. If one or both short walls were located beyond these posts, the length would obviously have been greater and the roof hipped.

therefore, they were houses or outbuildings. To complicate matters, outbuildings with three central posts are also known on the sandy soils. Their maximum width of 4 m suggests that they were not houses, but some were longer than Ten Hove 208 and 212! Finally, building 243 can be considered an Alphen-Ekeren house or outbuilding on the basis of its large postholes for heavy posts. The finds give a terminus post quem of 200 AD and although Alphen-Ekeren houses were still common in the third century AD, the building is probably much younger in the light of its association with 241 and 242.

6.4 Building 409 with wall ditches and a cellar

Building 409 (/219) is a remarkable structure and something of an enigma (Fig. 6.6). On two sides, parts of the walls are preserved in the form of narrow trenches for base plates. Wall posts are present at a few locations. The reconstruction of the inner framework and the dating pose problems, as described in more detail in the catalogue. In the western half of the building is building 219, a rectangular configuration of twelve posts. At first sight it seems to be part of 409 but it must have been a granary, either of the Late Iron Age or Late Roman period.[334] Therefore, no features remain that could have been part of the core of 409 in its eastern half. In the western half four posts are located at the corners of a cellar, suggesting a three-aisled construction. Two of the posts, the upper fill of the cellar and the fill of the pits west of it contain Roman material, while the cellar proper – the lower layers of its fill – has yielded no finds.
The building itself probably dates to around the middle of the first century AD, while the upper part of the former cellar was finally filled up around AD 125 or slightly later.

The resemblance of building 409 to, for instance, Pommenich building B was mentioned earlier (Fig. 6.6). The width of the core of that building equals the distance between the posts

[334] See the catalogue, chapter 40.

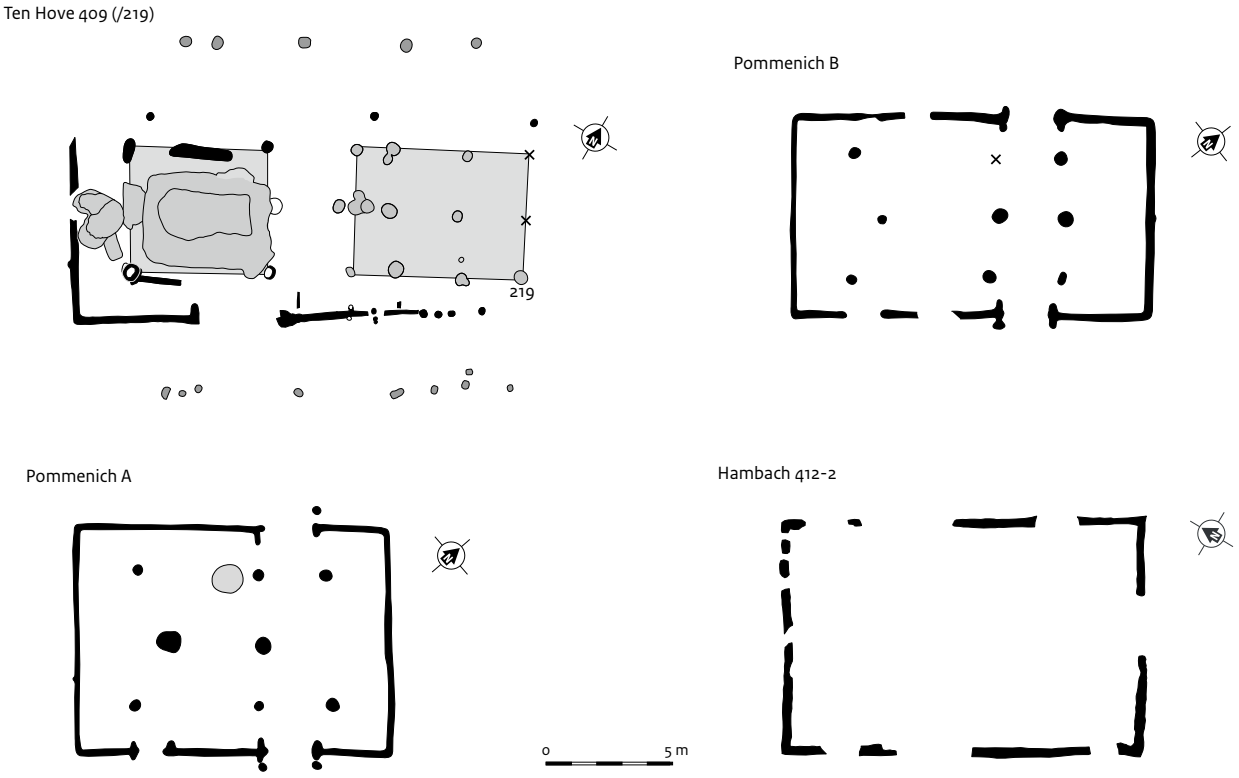


Fig. 6.6 Voerendaal-Ten Hove. Building 409 with wall-ditch buildings from Pommenich and Hambach 412. (in part modified after Geilenbrügge & Franzen 2015, fig. 1; Kießling 2008, pl. 38)

next to the cellar of 409. The total width of the building from Pommenich is exactly the same as that of building 409, while those from Weert are also comparable in this respect (Fig. 6.2). The latter buildings are considered pre-Roman, although some are associated with Roman settlements, which suggests a continuity of this building tradition. The settlement of Pommenich is not yet published in full, but there the finds cover both the Late Iron Age and the Early Roman period.[335] It is interesting to note that timber buildings such as Voerendaal 409 and those from Pommenich seem to be 'translated' in some way into later buildings with gravel foundations. Pommenich 'B' has the same length as Hambach 412-Grundriß 2 and 'A' has the same width (Fig. 6.6). Perhaps all these buildings had 'Roman' dimensions. Ten Hove 409 seems to have a width of approx. 24 *pes monetales* (*p.m.*), while its length could have been at least 46 and possibly 54-60 *p.m.* (see also below).

6.5 Building 418 with large, square postholes

Building 418 is the only example in Voerendaal of a particular building type defined by quite large, square postholes. Usually, the posts are very regularly positioned, but our building is a bit skewed and the posts in the long walls do not appear to be positioned exactly opposite each other. However, the building was excavated in different trenches and its position on a slope was probably also not very helpful for producing a more regular plan. While building 418 was post-built, some examples elsewhere had gravel foundations. Kerkrade-Holzkuil 1 for instance, had foundations 1 m square, placed 1-1.5 m apart (Appendix XX, Fig. 5). Building 15 at Hambach 132 was post-built in its first phase, and the posts were then removed and the post pipes backfilled with gravel (Appendix XX, Fig. 4).[336] Pad or staddle stones were placed on the resulting gravel foundations, each provided with a hole for an upright post and two extra in the sides for the horizontal beams of the framework.[337]

Building 418 measured 10.6 by at least 10 m; the width was 36 *pes monetales* and the length possibly 60 or 72 *p.m.* (17.75 or 21.15 m). The width of building 418 equals that, for instance, of Kerkrade-Holzkuil 1, as well as Frimmersdorf 131 and Jüchen-Neuholz F (Fig. 6.7). It is somewhat larger than Hambach 132-15 and Hambach 412-7 (Fig. 6.7). It is evident that the length of these buildings could differ considerably; there are examples from about 18 m up to 30 m. The building type probably had no fixed function. Kerkrade-Holzkuil 1 was one of the largest outbuildings at the site and may have been a *horreum* for grain and/or other goods (it had a cellar-like pit at one end).[338] Building F at Jüchen-Neuholz had a large cellar at its centre and was possibly the main building of the later first-century phase.[339] In this respect the post-built structure beneath the villa of Neuss-Weckhoven (18 x 8.7 m) is a significant find (Fig. 6.7).[340] Although it was quite small (length 11 m) and probably two-aisled, like the wooden predecessor of the villa at Kaalheide-Krichelberg, it is reminiscent of the building type discussed here (Fig. 15.14).[341] Still, most buildings like Voerendaal 418 were outbuildings, with no special features or finds suggesting specific functions.[342] A partly excavated building from Alt-Inden/WW 122 is illustrated here because it has a configuration of features somewhat similar to the rectangle of postholes or pits at the north end of 418 (Fig. 6.7). The function is unknown in both cases.

The building type discussed here dates from the middle of the first century AD onwards. The handmade and Early Roman wheel-turned pottery of Hambach 417-7 date to the first half of that century[343] but provide a terminus post quem only. The same holds true for the finds associated with intersecting building 3 (mid-first to end of the second century AD). However, Jüchen-Neuholz E and F belong to the second phase of that site, placing them in the second half of the first century AD.[344] The building of Neuss-Weckhoven (G) must belong to the same period.[345] Frimmersdorf 131 was preceded by a smaller post-built structure, in a settlement founded around the middle of the first century AD. This implies a date for Frimmersdorf 131 early in the second century, which is supported on the basis of the finds. Dendrochronological dates of two wells nearby also point to building activities from around AD 100 onwards.[346] Hambach 132-15

335 Geilenbrügge *et al.* 2015, 95.
336 Brüggler 2009, 41-45, figs 15-19, buildings 12-13.
337 Brüggler 2009, 39, fig. 13, pl. 126-129; Tichelman 2005, 156, fig. 5.4.8. Sometimes staddle stones were used without a foundation (Frank & Keller 2007, 322).
338 Tichelman 2005, 103; Schubert 2016, 241-244. See also section 9.2.2.
339 Building F succeeded the somewhat smaller G, also with a cellar (see below and fig. 6.7). For the settlement plan, see fig. 14.11.
340 Chantraine *et al.* 1984, 90-91, fig. 56.
341 Tichelman 2005, 52-53 (building 22). Heimberg (2002/2003, fig. 22) also shows some (partly) post-built main buildings, of which Frimmersdorf 131 and Hambach 224 have dimensions comparable to Voerendaal 418.
342 Cf. Kießling 2008, 112 (Hambach 412-7) or Brüggler 2009, 53-55 (Hambach 132-15).
343 Kießling 2008, 113.
344 Frank & Keller 2007.
345 Chantraine *et al.* 1984, 91.
346 Köhler 2006, 50, 104-105, 195; catalogue 67; Well 99 dated 96 ± 5 AD and 210 dated 100 + 20 ± 5 AD.

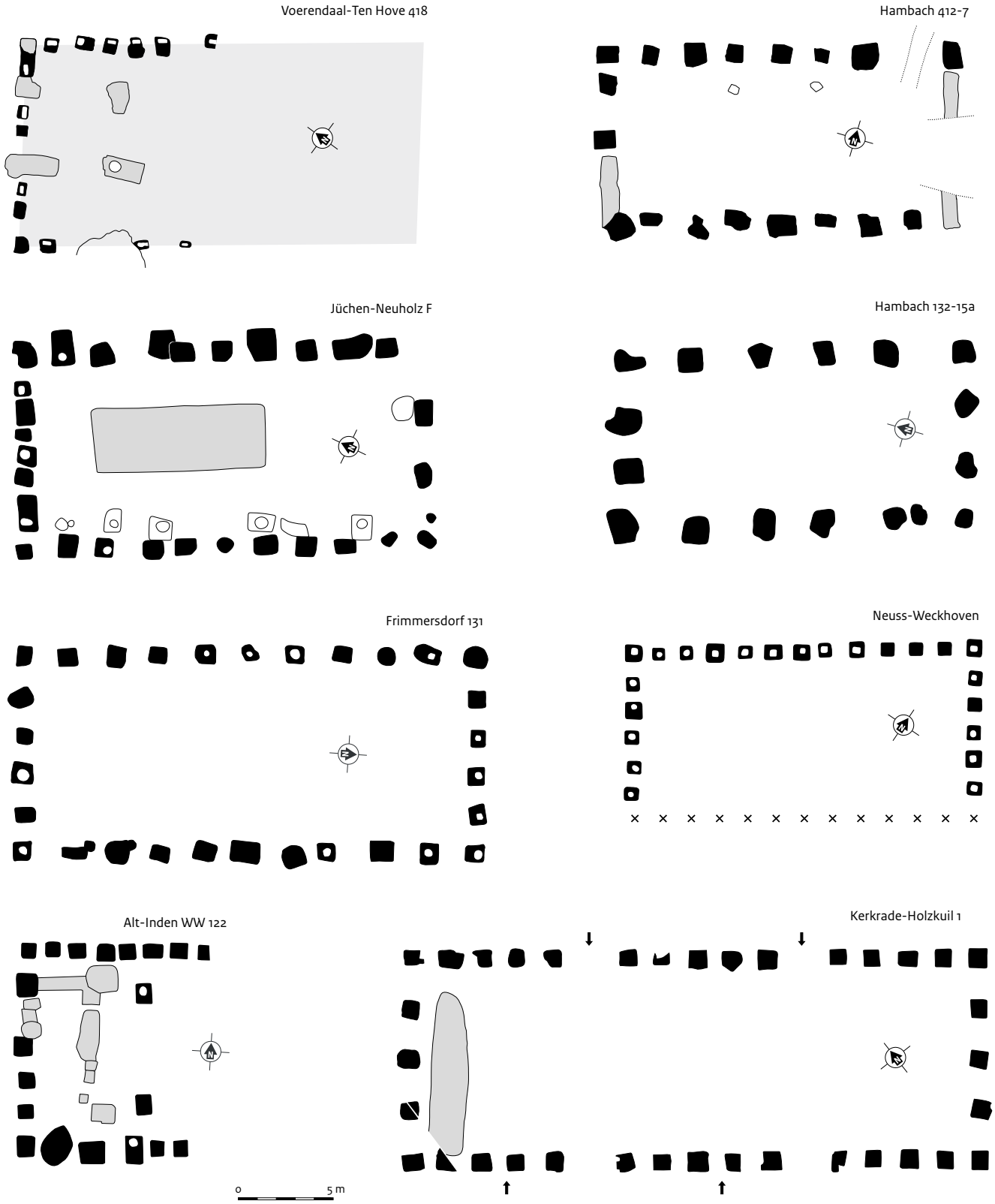


Fig. 6.7 Voerendaal-Ten Hove. Building 418 with parallels of structures with large, square post-holes. (in part modified after Kießling 2008, pl. 50; Heimberg 2002/2003, fig. 13; Brüggler 2009, fig. 20; Köhler 2006, plan FR131; Chantraine et al. 1984, fig. 56; Dodt & Päffgen 2010, fig. 2; Tichelman et al. 2005, fig. 5.3.1)

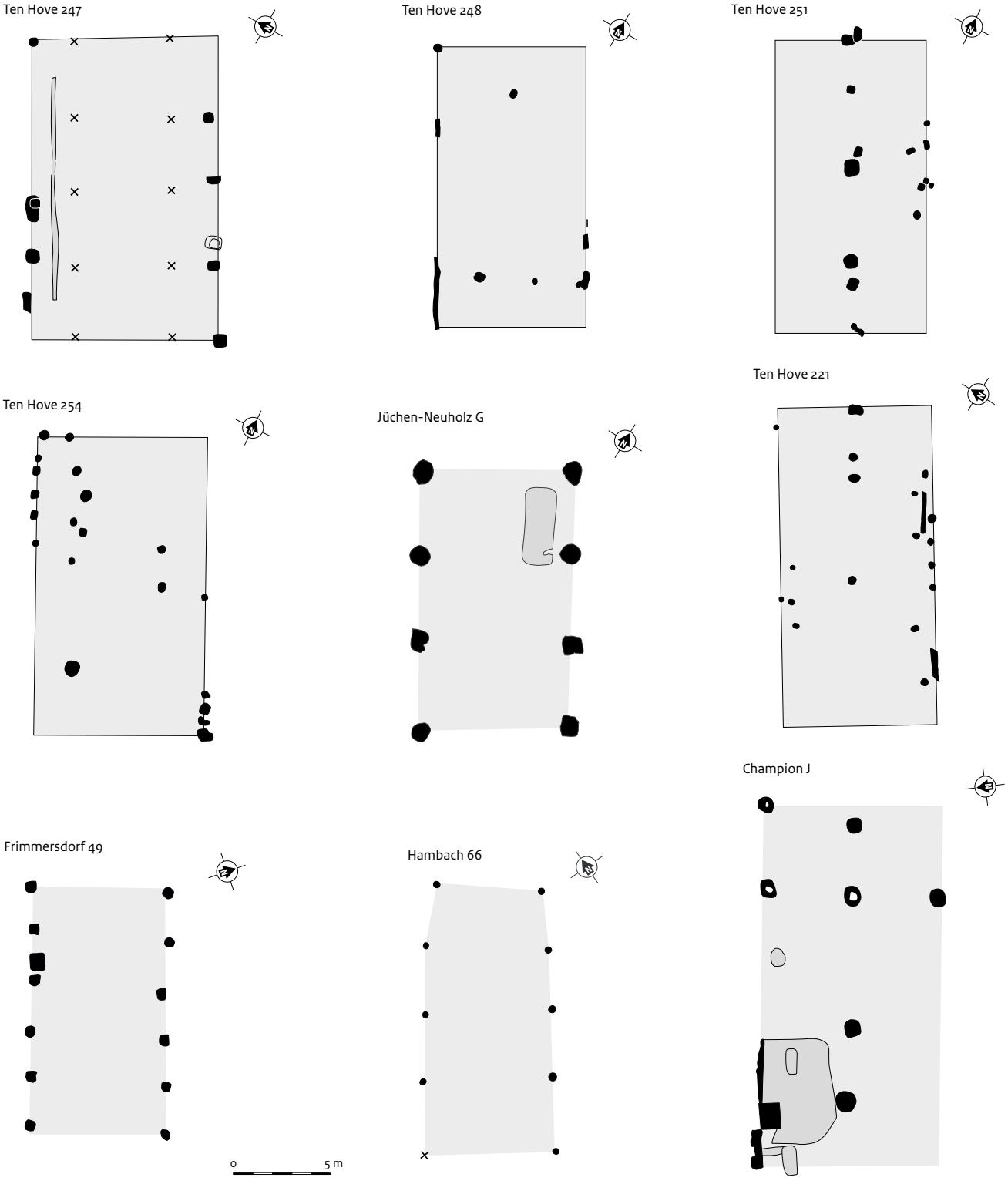


Fig. 6.8 Voerendaal-Ten Hove. Other timber built outbuildings of the villa, with examples from other sites for comparison. (in part modified after Rech 1983, fig. 1; Köhler 2006, Gesamtplan FR49; Frank & Keller 2007, fig. 264; Van Ossel & Defgnée 2001, fig. 95)

also had a predecessor and dates to the second century AD, possibly even to the second third of that century.[347] Finally, Kerkrade-Holzkuil 1 is not dated by finds but – as the successor to building 2b – was attributed to the fifth, third-century phase of the settlement.[348] As its two predecessors are not firmly dated, it is possible that building 1 was somewhat earlier.

6.6 Other outbuildings of the villa

A handful of fragmentary post-built structures are possible outbuildings of the villa, especially of phase 2c and possibly early in 3a.
The interpretation is primarily based on their orientation, more or less identical to that of stone buildings in the vicinity. This is illustrated by building 247 respective to 405 (Fig. 6.8).
At first sight, the former may merely represent additions to the latter (shed on the outside, extra supports or wall on the inside), but the stratigraphy suggests that we are dealing with a separate building.[349] Its dimensions are in the same range as Voerendaal 418, Hambach 132-15, Hambach 412-7 and others. Moreover, its width can be expressed in round *pedes monetales* (32; length unknown, perhaps 52 *p.m.*). An issue is the position of the posts, which in 247 are not placed opposite each other. One scenario is that they were only wall posts and that the internal supports were positioned more regularly, but not visible in the excavation because they were located beneath (or even destroyed by) the later walls of building 405. However, the building was not particularly wide and internal posts were perhaps not necessary. Their uneven spacing may have been less important if a longitudinal beam were placed on top of them.

The other four buildings in this group stand out for their distinctive orientation, at right angles to most other wooden buildings at the site and parallel to stone buildings 401 and 402. Perhaps the dimensions of these structures were also in *pedes monetales*. It is impossible to prove this, however, because the exact dimensions of most are not known and because of the question of where to take measurements (outside or inside, at the centre of the features?). The length of the somewhat hypothetical outbuildings 251 and 254 could have been in the range of 52-54 *p.m.* (like 247). They are approx. 26 and 29 *p.m.* wide, the latter size obviously not a round number. Fragmentary buildings 221 and 248, the former perhaps prehistoric and the latter even more hypothetical,[350] are about 26 *p.m.* wide, like building 251. Perhaps their length was some 48 *p.m.*. But again, it is impossible to prove the use of Roman feet and all or some of them may have been based on some kind of 'indigenous' foot not very different from the *pes monetalis*.

Building 254 was three-aisled, while 251 was two-aisled and 248 perhaps had an internal framework that combined the two. Although a two-aisled construction is also a feature of Alphen-Ekeren-type buildings, building 251 is not considered to belong to this type. The reasons are the irregular position of the central posts and their limited depth (combined with the distinctive orientation). Two-aisled barns are found in villa yards elsewhere. A number of examples are located in Belgium, such as the buildings at Champion, but these follow a different construction principle, with some central posts being replaced by or combined with heavy posts in the walls. A two-aisled outbuilding at the villa of Bocholtz-Vlengendaal – apart from its construction in stone – is considerably wider than Voerendaal 251.
Because its walls were founded on a base plate, building 248 shows some similarity to 221.
The latter building is not firmly dated and could belong to either the Late Iron Age or the Early Roman period.

6.7 Post-villa buildings

Like most post-built structures discussed in this chapter, those (probably) dating from the time after the villa fell into ruin are incomplete and cannot be dated with the desired precision (Fig. 6.9). The buildings of this group have different plans, hampering a classification according to types. Another complication in a quest for parallels is the large time span to which the buildings in Voerendaal could belong, a period of 300-400 years. Influences from Germania and several regions in Merovingian Gaul could in principle have played a role during

347 Brüggler 2009, 45; W197.
348 Tichelman 2005, 103; 317, fig. 121.
349 A posthole of building 247 is intersected by ditch 306 and the latter is older than 405.
350 For 221, also see section 6.2; 7.2.2.

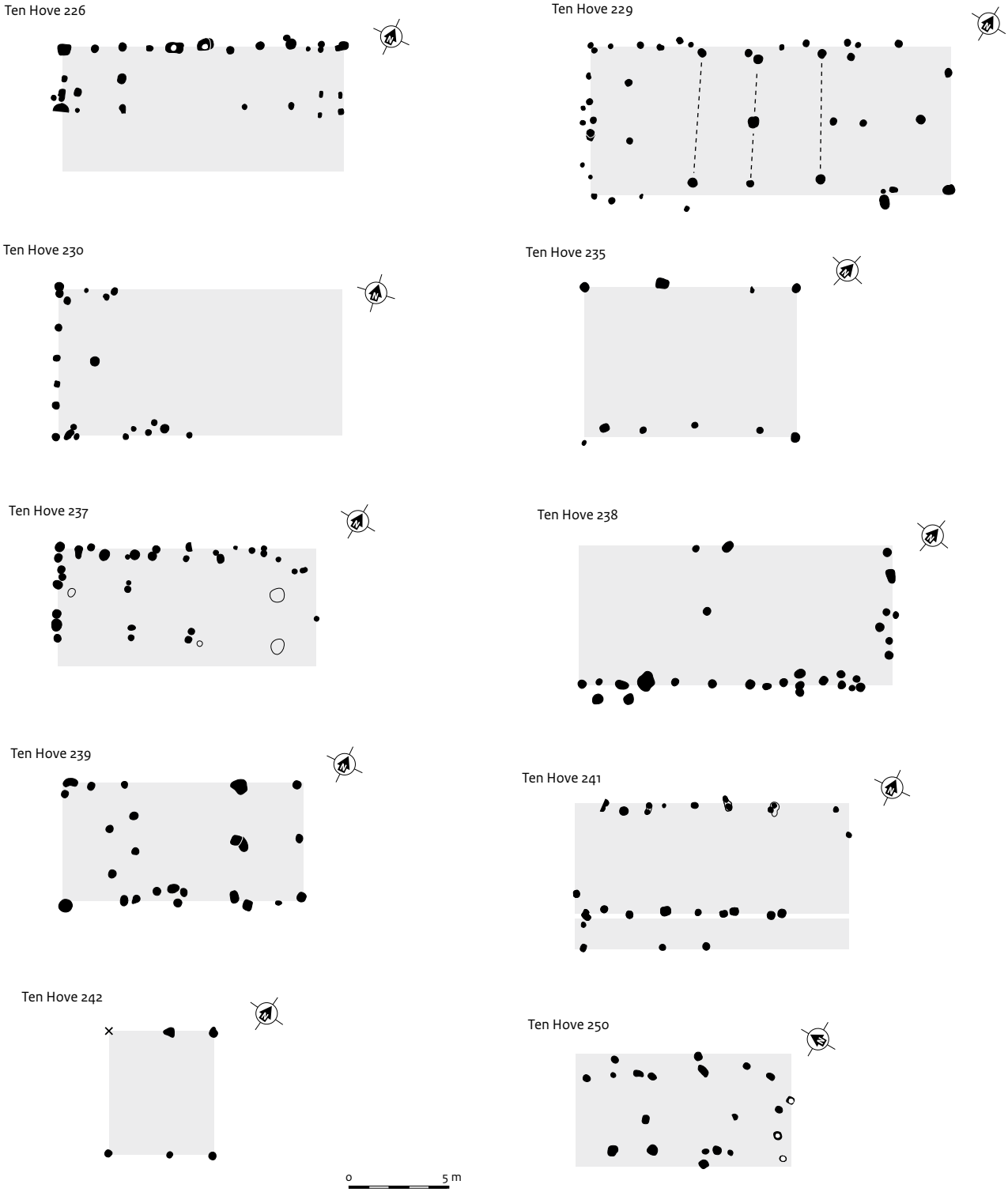


Fig. 6.9 Voerendaal-Ten Hove. Late Roman and Early Medieval buildings.

this long period. Within the framework of our project, it would be impossible to consider the enormous set of buildings that could be potentially relevant. The text below therefore includes a limited survey only.

For the Late Roman period, mainly the part between c. AD 350-450 or 'Late Roman B' in Dutch chronology, the literature often refers to parallels from Germania north and east of the (Lower) Rhine because the new settlers supposedly originated there.[351] Indeed, a number of buildings from the Southern Netherlands show characteristic features of 'Germanic' byre-houses, the most conspicuous being a considerable length and three-aisled core construction, with indications of byres in the eastern part. Examples are Goirle-Huzarenwei 1 and Gennep-Stampelberg B (Fig. 6.10; cf. Table *12.3).[352] Some plans have rounded corners, most clearly seen in smaller buildings such as Geldrop-'t Zand B (Fig. 6.10) or Helden-Schrames H4, 6 and 8 (Appendix XXI, figs 4 and 6).[353] These are designated shorthouses, being considerably shortened versions of long byre-house types.[354]

However, while some Late Roman buildings south of the Rhine are based on Germanic types, most are not or only partly at most. For example, a long byre-house from Neerharen-Rekem is only three-aisled in the east (byre), the western part being rather similar to an Alphen-Ekeren building (Fig. 12.8). Buildings such as Geldrop-'t Zand A and Gennep-Stamelberg C do not seem to belong to a specific 'Germanic' type, being simple one-aisled (?), rectangular structures. The latter shape, a rectangle with sides about twice as long as the width, is similar to many Late Roman and Early Medieval houses in the south of the Netherlands and adjoining regions. Different construction principles can occur alongside one another in a single settlement, such as one-, two- and three-aisled cores, or combinations thereof, sometimes with double wall posts as at Alphen-Kerkakkers (Fig. 6.10). In the Merovingian period, the broad variation in house construction remained.[355] Many show a simple single- or two-aisled plan, such as Breda-Steenakker 70 or Nistelrode-Zwarte Molen 2-11 (N/NB; Fig. 6.10). The posts tend to be placed in neat (paired) rows as in the examples illustrated, although there are exceptions. Often, an extra bay was present on several sides of the rectangular core. However, the features of these are regularly shallower and (partly) lost.

Although shorter than Goirle-Huzarenwei 1 and Gennep-Stamelberg B, most houses from Voerendaal were not too small to include byres (except for 242 and 250; Fig. 6.9). As in the Alphen-Ekeren houses discussed above, probably only some of the livestock was kept indoors, the majority staying out in the open all year round. Only one half of building 226 was excavated, but it was probably 6 m wide (and 14 m long). The most distinct feature are the evenly spaced wall posts, such as in Gennep-Stamelberg C, Baelen-Nereth A and Alphen-Kerkakkers 2 in Figure 6.10. Some features in the interior suggest a two-aisled core and extra posts at the west side seem to be part of an internal division, as found in Voerendaal 239 and Nereth A. Building 226 is dated to the Late Roman period by both a pottery sherd and radiocarbon (Table 5.6, no. 35).

Voerendaal 229, 230 and 238 appear to have been two-aisled; none are well dated. The wall posts are evenly spaced in the west wall of 230, but most wall posts in this plan and the two others follow a rather irregular pattern. A few instances of possible pairs can be observed, possibly pointing to a more substantial roof-bearing role. This kind of feature can also be observed in Geldrop-'t Zand A and Alphen-Kerkakkers 6 (Fig. 6.10). Building 229 had six principal posts in its interior, close to the long walls. This is similar to building types from the northern province of Drenthe. Wijster C and Peelo B have such posts in the living part, Eursinge also in the byre section.[356]

House 237 had a peculiar three-aisled core, with doubled posts. We are not familiar with parallels for this type of construction. Building 241 is essentially single-aisled but with double posts in the long-walls. It perhaps bears some similarity to Geldrop-'t Zand A in this respect. Three postholes hint at an extra bay along the south side, but there may have been an insignificant annex only. Single-aisled buildings 235 and 242 were relatively wide. This kind of proportion is typical of the Early Middle Ages, although only 242 has regularly placed posts as, for instance, in Breda-Steenakker 70 (Fig. 6.10). Building 239 has already been mentioned above

[351] For building types from this area, see among others Van Es 1967; Huijts 1992; Waterbolk 2009; Van der Velde 2011.

[352] On the settlements to which these buildings belong, see section 12.6; table *12.3 can be found in appendix IX.

[353] De Winter 2010, 109-110, 383-387 (Helden).

[354] Cf. Van Es 1967. Some examples have hearths, suggesting that they were indeed houses rather than outbuildings.

[355] See e.g. Theuws 2014.

[356] Waterbolk 2009, 73-87.

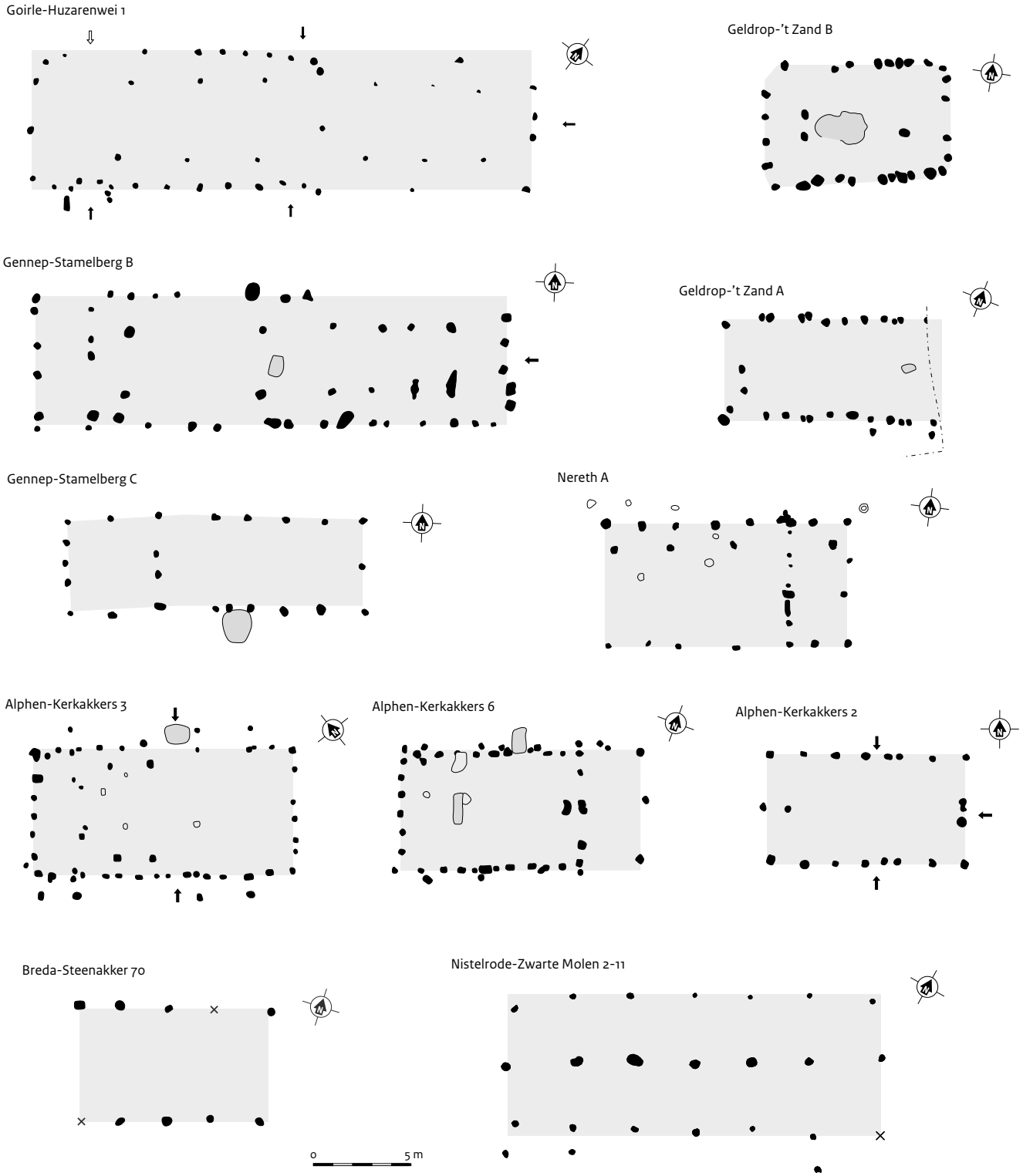


Fig. 6.10 Late Roman and Early Medieval buildings from other sites. (source: modified after Bink 2005, 37, fig. 19; Heidinga & Offenberg 1992, 78; Hanut et al. 2012, fig. 1; Bazelmans 1990, fig. 9; 1991, fig. 48; De Koning 2005, fig. 14, 16, 22; Berkvens & Taayke 2004a, fig. 16.2; Hensen & Janssens 2016, fig. 7.10)

as a possible two-aisled building; the four posts in the western half may not belong to it. Finally, there is building 250, dated to the Merovingian period or later by finds and the fact that it intersects a sunken-floored hut. The exact nature of the construction remains a question; on the basis of its size, it could be an outbuilding rather than a house.

6.8 Small outbuildings and granaries

A number of post-built structures are too small to be considered houses and must have been used as small sheds, stalls or workshops (Fig. 6.11). Building 240 is Middle Roman at the earliest, but probably Early Medieval. The size of the structure and location of the posts is very similar to that of Merovingian buildings 199 and 201 from Breda-Steenakker (Fig. 6.11).[357] Ten Hove 207 is a somewhat smaller 'mirror image' of 240, but its date is uncertain; the fact that it intersects ditch 308 is the only and insignificant dating evidence. According to its size, structure 253 is also comparable to 240, although it lacks central posts. Its orientation ranks it among the outbuildings of phase 2, and some brick and limestone in its features do not necessarily hint at a post-villa date, although it could be older (early villa phases). Voerendaal 232 has central posts like 240, but outside the rectangular 'core' of the structure. Because there is no single clue about its date, this building could even be prehistoric. The latter also holds true for building 227, although its proximity to house 226 suggests a Late Roman or Early Medieval date. Structure 233 looks like an even smaller version of the buildings discussed so far, but it was only partially investigated and could well be longer or made up of three rows of posts (to the north and south). Finally, regarding the structures with more than six posts, it is tempting to interpret structure 259 as an Early Medieval house, associated with pits 733 and 735. Its size is more fitting for an outbuilding, but possibly only the core of the building was found, with the wall posts missing.

Small structures with six posts are mostly seen as granaries. However, the width of 217, 228 and 234 is relatively large, perhaps indicative of small outbuildings rather than granaries with a raised floor. The features of structure 217 had a 'clean' fill, suggesting a prehistoric date. Structures 228 and 234 could either be prehistoric or much later. Both 218 and 245 are Roman in date, the latter building intersected by the *horreum* of the villa. These structures will have been used as granaries. The same applies to the still smaller building 205 because of its proximity to 201-203. The posts of 204 are configured in a way that is reminiscent of that of sunken-floored huts but as no pit was observed it could equally have been a granary. Finally, there are structures 206 and 231, both with an incomplete plan and undated (the latter intersects ditch 308).

All buildings belonging to two other groups should in our opinion be interpreted as granaries. A first group includes five buildings with a square plan and nine posts. Variants with eight and twelve posts occur just once (Fig. 6.12). These structures have different dates: 201-203 and 257 belong to the Iron Age, 219 to the Late Iron Age or the Late Roman period, while 220 and 249 are Roman or later. Examples found on the Dutch sandy soils generally date to the Iron Age.[358] They are interpreted as granaries ('*spiekers*') because of their association with byre-houses and because their posts are relatively deeply dug in. Late prehistoric examples in the German Rhineland are often seen as houses, while 'conventional' longer (byre-)houses are missing (Fig. 7.3-7.4).[359] The sturdy posts of the buildings and parallels from the MDS area point instead to a function as granaries.

The ten structures of a second group, with four posts, are too small to have been houses and must have been granaries (Fig. 6.12). In particular, 261 has quite large features, indicating the use of sturdy posts. The extra posts in 224 may have been used to avoid a ladder slipping away or to support a small platform or part of the roof. Most of these structures are probably prehistoric, on the basis of the clean infill of the features, the total lack of finds or the presence of some handmade sherds at most. However, a nail from 215 and sherds from 252 and 262 suggest a (Late) Roman date.

[357] Berkvens & Taayke 2004a, fig. 16.6.

[358] See e.g. Wesselingh 2000, 19ff., fig. 11 (type IIA). Some examples have a core of nine heavy posts surrounded by eight lighter ones (Wesselingh, *loc.cit.*, type IIIA; Hiddink 2005a, 128, fig. 7.13).

[359] Joachim 1980, 366-367 (Eschweiler); Hiddink 2014c, 193-195, 207, figs 20-21; see also section 7.3-4; 16.2.2.

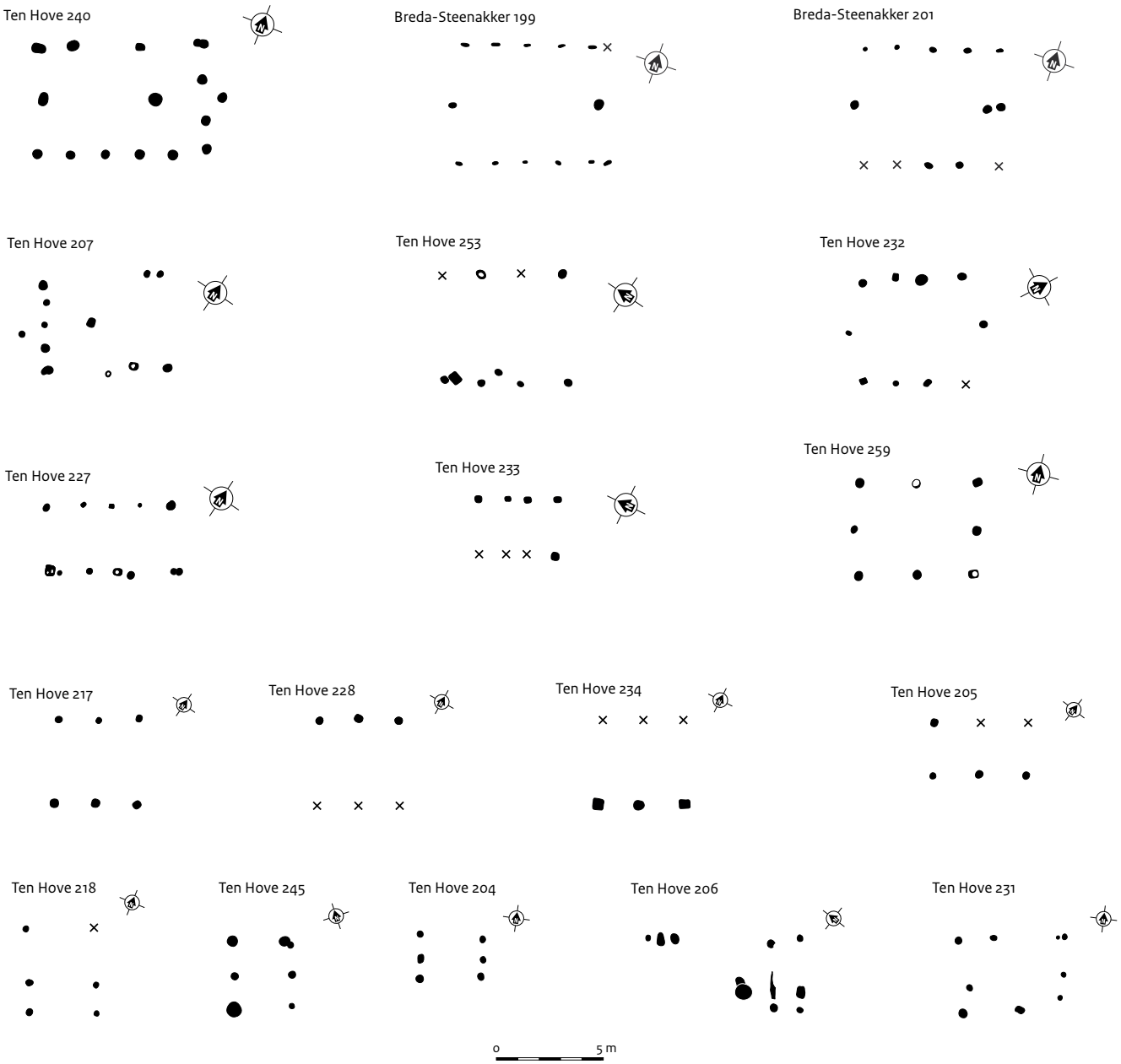


Fig. 6.11 Voerendaal-Ten Hove. Various outbuildings, including possible granaries, with two examples from Breda-Steenakker for comparison. (source: Breda after Berkvens & Taayke 2004a, fig. 16.6)

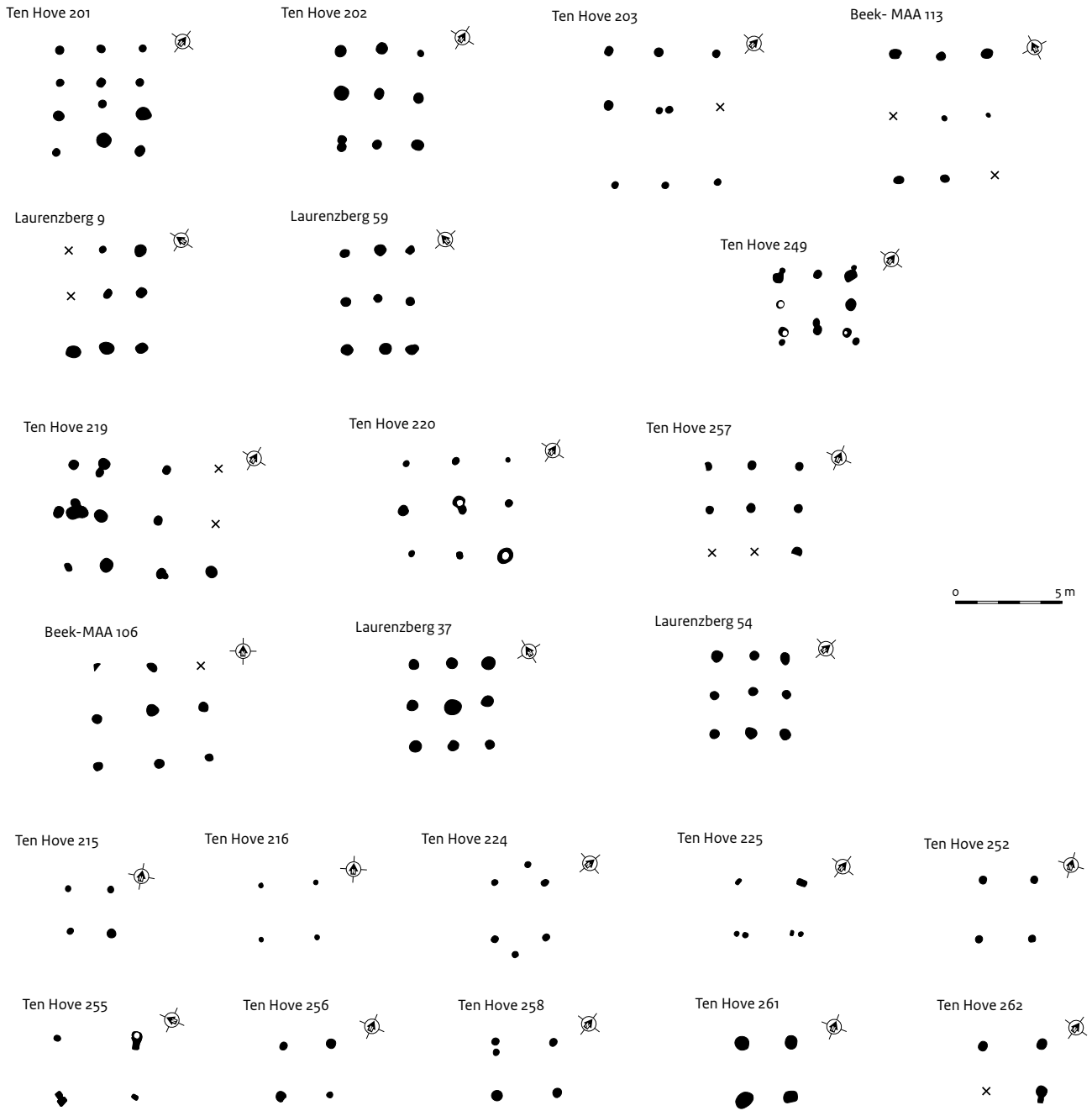


Fig. 6.12 Voerendaal-Ten Hove. Granaries, with examples of nine-post structures from other sites on the loess. (source: in part modified after Joachim 1980, 6-7; Tichelman 2005, 288; 292)

7 A Late Iron Age enclosure

Diederick Habermehl

7.1 Introduction

This chapter focuses on Late Iron Age (phase 1c) enclosure 308 and its associated features, including several timber buildings.[360]
These structures are of particular interest and importance for a number of reasons. Firstly, they are the oldest settlement features at the Ten Hove site that allow for a more or less detailed reconstruction. Secondly, well-documented features of pre-Roman habitation activity at Roman villa sites are rare, even unique within the Netherlands. Thirdly, the specific type of settlement – a fortified farmstead enclosed by a V-shaped ditch – remains a rare phenomenon in the region and deserves specific study and interpretation. All in all, the Late Iron Age complex at Voerendaal has the potential to shed new light on the Late Iron Age settlement landscape and society in the southernmost regions of the Netherlands and its surroundings.
In this chapter, we will first discuss enclosure 308 and the structures and finds associated with it.[361] Next, we will broaden our view and place the Voerendaal enclosure within a wider context. The settlement archaeology of the Netherlands, Germany, Belgium and France has developed significantly in recent decades, providing a framework to better evaluate the structure, character and function of the Voerendaal complex.

7.2 The enclosure and associated structures and finds

7.2.1 Enclosure ditch 308

Ditch 308, in the southwest of the excavated area, enclosed an area of 82-95 by at least 70 m (Fig. 7.1). Some 20 m should probably be added to the latter number. Further into the Hoensbeek valley the terrain would have become too wet and soft (peat). The interior area must have been about 8000 m² or slightly more. The V-shaped ditch had a remaining depth of 125-170 cm, and its width at the top/highest excavation level was 170-260 cm (Fig. 7.2; 41.6). After going out of use, it gradually silted up at first. At some stage, this process came to a halt and after some time (decades?) the remainder was filled in quite rapidly, probably by human intervention.
In many comparable enclosures with V-shaped ditches, internal earthen banks have either been documented or presumed.[362] In the most well-preserved examples, often still visible within the landscape, the remains of these banks or ramparts have actually been documented as (slightly) raised earthen features. For other enclosures, they have been reconstructed, mainly on the basis of a feature-free zone at the inside of the ditch.[363] For the Voerendaal enclosure, neither remains nor indirect indications of a bank – such as 'asymmetrical' layers in the ditch – were found. However, at Ten Hove it would not have been very high and would have been levelled later, probably simultaneously with the filling of the ditch.
In addition, the century-long habitation of the Ten Hove site has resulted in a high density of features, seriously hampering the identification of a possible feature-free zone. No indications of one or more entrances were found in the excavation trenches.[364] This must be due to the fact that fairly substantial parts of the ditch were not excavated. In comparable enclosures, entrances are in most instances found in the central part of the eastern side, followed by the western and southern sides. Such entrances often include bridge structures across the ditch as well as gate buildings allowing passage through the rampart.[365]

7.2.2 Buildings and other features

A number of buildings and pits were found in the area enclosed by ditch 308 (Fig. 7.1). Despite our assumption in the remainder of this chapter that at least some of these are contemporaneous with the enclosure, this cannot be definitively proven because of several dating problems.
One of the larger buildings, house 236 west of the enclosure, already discussed and illustrated in the previous chapter, must have preceded or succeeded it. The houses most likely to have been associated with the ditch are 222 and 223, although there is some younger (intrusive?) material. House 222 in particular is fairly large – or rather, wide – for the Late Iron Age.[366] A very small number of features of building 221

360 Because little is known about the settlement during the Early and Middle Iron Age, these are discussed in chapter 14.2.1.
361 Some comments on remaining issues regarding the enclosure can be found in section 14.3.3.
362 The banks will usually have been of earth, only in some cases with some kind of timber construction. They were approx. 2-3 m high and up to about 7 m wide (Wieland 1999, 42; table *7.1). At e.g. Holzhausen, the remains of a timber structure inside and a palisade on top were documented (Wieland 1999, 195 ff.).
363 At Niederzier-Hambach 382 between 5 and 6 m wide, at Elsdorf-Heppendorf about 5 m (Joachim 2009; Ciecielski & Kempken 2019) and at Kontich-Alfsberg about 4 m (Annaert 1993, 65).
364 Two interruptions in figure 7.1 are the result of Braat missing the feature and the intersection by feature 757.
365 Gate constructions at Riedlingen (building 10), Bopfingen-Flochberg (building 123; Wieland 1999, 143 ff.; 154-155), Nordheim (Hees *et al.* 2017) and Sainte Maure de Touriande (Baguenier 2014). Bridges documented at Sorigny-Montison (Poitevin *et al.* 2014) and Pocking-Hartkirchen (Wieland 1999, 187 ff).
366 Cf. section 6.2; chapter 40.

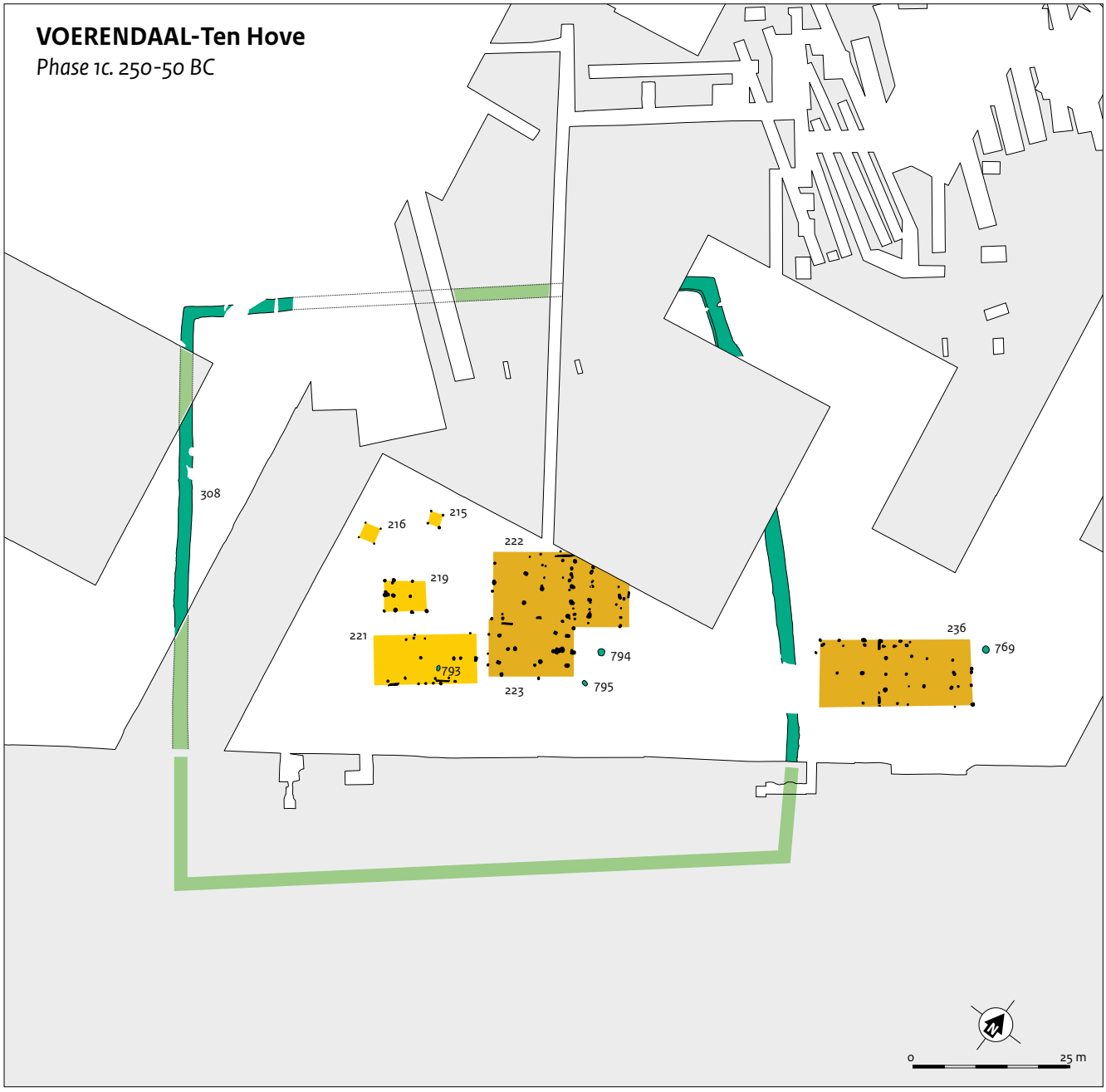


Fig. 7.1 Voerendaal-Ten Hove. Enclosure ditch 308 with other Late Iron Age-structures; date of the buildings in yellow uncertain.

remained and its date is uncertain; it may have belonged to period 2. It is in fact remarkable that the larger buildings were found at all because no Early and Middle Iron Age houses were observed. A key factor here was that erosion in the zone where they were located was probably relatively slight; some metres to the south there was no erosion at all and colluvium accumulated (see trench wall sections in Appendix XXIII). Although some small storage buildings must have accompanied the larger (farm) buildings, those in Figure 7.1 are not dated. Granaries 215 and 216 have a different orientation and are perhaps Early/Middle Iron Age or even Roman in date. The larger structure 219 could either belong to the Late Iron Age or the Late Roman period. A last category of associated features are pits. Pits 769, 793, 794 and 795 are particularly relevant as their Late Iron Age date is certain (Fig. 7.1).

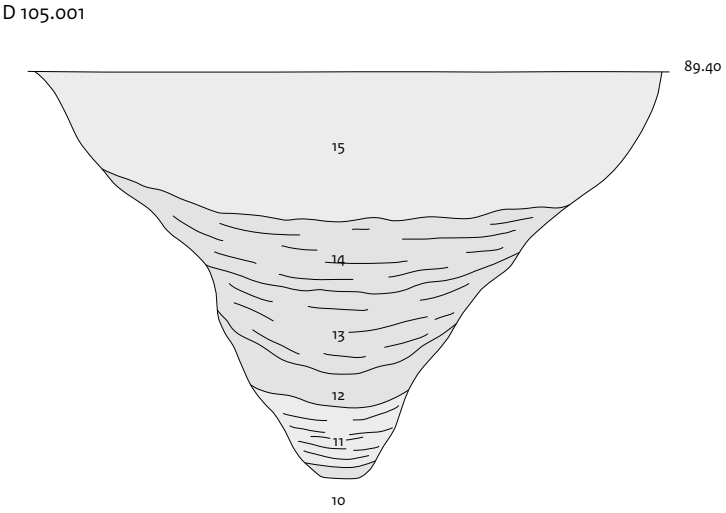


Fig. 7.2 Voerendaal-Ten Hove. The only remaining photo of a section through ditch 308, with the section drawing; for the exact location halfway the east side of the enclosure, see figure 41.6. Section drawing scale 1:30.

7.2.3 Finds and chronology

The find material associated with the enclosed farmstead includes handmade pottery and briquetage vessels, La Tène glass, stone and metal objects. The handmade pottery is most numerous and, for ditch 308 in particular, the only datable material. Sadly, there are numerous questions regarding the date of the pottery in relation to the formation processes of the ditch.[367] While the upper infill must date from the Late Iron Age, some Roman material taken as intrusive, the construction date remains elusive. At first glance, the pottery from the lower levels of the infill appears to be Middle Iron Age in date, although it could also belong to the Late Iron Age. In any event, this material suggests that the ditch was already partly filled in early in the latter period. For the sake of convenience, a Late Iron Age date is assumed for the ditch. It must have been filled in before 50 BC and – somewhat intuitively – probably several decades earlier. Handmade pottery is also the main dating element for the houses and pits. Only pit 794 can be dated more accurately, between c. 200-100/75 BC, on the basis of a radiocarbon date, part of a glass bracelet and a brooch spring. Other brooches with a Middle La Tène construction and fragments of glass bangles come from the vicinity of the enclosure.[368]

7.3 The Voerendaal enclosure in context

To further interpret and understand enclosure 308 and its associated habitation activity, it is important that we broaden our view and discuss its wider context as well as the available parallels. Below, we will first focus on the general developments taking place in our region during the last two or three centuries BC. This is because the Late Iron Age was a dynamic era of change, ending with the dramatic Caesarian and Augustan campaigns. Next, we shift our attention to the settlement landscape in the (wider) region around Voerendaal and, finally, we study the particular category of small, fortified settlements.

7.3.1 The Late Iron Age. An era of significant changes

The Late Iron Age was a dynamic era of social change.[369] Such change is reflected in the development of more differentiated settlement landscapes and more complex, hierarchical societies. Typical features were the emergence of large, fortified (and even partly urbanized) hill-top settlements – generally referred to as *oppida* – and collective sanctuaries and an increase in coin production.[370] Although these developments have traditionally been particularly associated with the La Tène cultural region – more or less the area where *oppida* occur – it has become clear that similar developments can also be observed in the more northerly regions, albeit on a lesser scale.[371] Below, we will mainly focus on developments in the settlement landscape and the ways in which these developments were linked to changes in society. More specifically, the developments discussed here include centralization, differentiation and hierarchization.

Centralization. The emergence of large-scale central places
The first large, open (unenclosed) agglomerations emerged during the third and second centuries BC.[372] Most of these large agglomerations functioned as central places for production (metallurgy, glass production and coin minting) and distribution and as nodes in interregional exchange networks.[373] Such agglomerations are found throughout France, southern Germany, Switzerland, Austria, the Czech Republic, Slovakia and Hungary. The centre closest to Voerendaal was still some 200 km away, at Bad Nauheim in Hessen. Then, from the second half of the second century BC onwards, the first of the *oppida* were constructed.[374] Archaeologists generally use the term *oppidum* to refer to large Late Iron Age fortified hill-top settlements with an area of at least 20 or even 30 hectares (smaller sites are commonly referred to as hill forts). Behind this common terminology, however, there is a heterogeneous reality with regard to habitation period, character, function and size.[375] The fortifications of the *oppida* were impressive and monumental, combining defensive and symbolic

367 See chapter 21 and especially 81.
368 See further sections 14.3.3, 20.3.15 and 31.1.
369 E.g. Roymans 1996, 2004; Roymans & Gerritsen 2002; Roymans & Scheers 2012; Haselgrove 2007; Hiddink 1999; Gerritsen 2003; Fernandez-Götz *et al.* 2014; Fernandez-Götz 2018.
370 Roymans 2004.
371 Roymans 2004, 9.
372 Fernandez-Götz 2018, 132. For the large, open agglomerations stretching from France to Hungary, see Augstein 2006; Collis 1995; Collis *et al.* 2000; Fichtl 2013; Salač 2009, 2012.
373 Augstein 2006; Salač 2009, 2012; Fernandez-Götz 2018.
374 Collis 1984, 2000; Fichtl 2005, 2012; Pierrevelcin 2012; Rieckhoff & Fichtl 2011; Fernandez-Götz 2018.
375 Woolf 1993.

functions.[376] Like the agglomerations mentioned above, *oppida* were central places for the tribal and subtribal polities of the Late Iron Age. They combined political, religious and economic central functions and as such played pivotal roles in the development of the increasingly complex Late Iron Age societies.[377]

Differentiation and hierarchization in the Iron Age settlement landscape

Besides the emergence of central places, broader processes of differentiation and hierarchization can be reconstructed within the settlement landscape. These developments include the emergence of new ways of settling the landscape, in which the increasing organization of settlement space was an important part.[378]

The well-studied region of northern France in particular allows for the reconstruction of trends and developments in rural settlement patterns during the later Iron Age.[379] There, from the La Tène C1 period onwards (cf. Fig. 5.1), the settlement landscape became increasingly differentiated.[380] More and more settlements were being enclosed and organized by means of ditches (‘*fermes indigènes*’).[381] While curvilinear enclosures predominated early on, from the La Tène D period onwards, a growing number featured a rectangular ground plan. At the same time, internal settlement space was being organized in increasingly rigid ways, often with buildings arranged along the enclosure ditches, surrounding an open court.[382] Malrain *et al.* defined four settlement types within this ever more differentiated settlement landscape, ranging from unenclosed single farmsteads to enclosed (or even fortified) and internally organized settlements, often with monumental entrances.[383]

Comparable trends can also be reconstructed in Belgium, Germany and the Netherlands, albeit on the basis of a somewhat smaller dataset and less fundamental in nature. In the well-studied region between the Meuse, Demer and Scheldt, settlements became increasingly stable within the landscape during the later Iron Age. Not all houses were still being rebuilt in different locations each generation,[384] although the pattern of ‘wandering farmsteads’ did not entirely disappear. While most settlements seem to have remained unenclosed, a handful of enclosed Iron Age settlements have also been excavated. Such settlements can be found at Oss-Almstein, Oss-Schalkskamp, Sevenum-De Krouwel and probably also at Oerle-Zandoeleseweg,[385] all in the southern Netherlands. It is important to note, however, that the ditches were too narrow and not deep enough for defensive purposes. The same holds true for most enclosed settlements in Belgium from this period, documented at Aalter-Langevoorde, Ursel-Rozestraat and Vinderhoute-Molenbrug (all B/OV).[386] In the German Rhineland, well-excavated settlements such as Eschweiler-Laurenzberg and Eschweiler-Lohn, Pulheim-Brauweiler and Jüchen-Neuholz all remained unenclosed during the Late Iron Age.[387] Only at the settlement at Jülich-Bourheim was a settlement ditch dated to the La Tène D period.[388] The other settlements with enclosures – such as those at Niederzier, Elsdorf, Bonn and Rees – can be defined as fortified settlements and will be discussed further below. Yet they are also part of the increasingly differentiated Late Iron Age settlement landscape.

All in all, it is clear that a more differentiated settlement landscape developed over a wide region during the later Iron Age. Such a landscape included large-scale central places and *oppida*, small, fortified settlements and enclosed settlements as well as simple, unenclosed clusters of farmsteads. The precise dynamics of these developments will have varied throughout the wider region, resulting in specific regional settlement landscapes. However, in many regions, and certainly including the region around Voerendaal, our knowledge of Late Iron Age settlement is still very limited. For more detailed reconstructions, much more data and study are needed.

7.3.2 The settlement landscape around Voerendaal

Compared to the settlement landscapes of northern France and the MDS region, only little is known about the later Iron Ages settlement landscape around Voerendaal. As late as 2007, data on Late Iron Age habitation in Dutch southern Limburg was lacking altogether.[389]

376 Fichtl 2010; Woolf 2006; Armit 2007; Ralston 2013; Moret 2017.
377 Collis 2007; Fichtl 2012; Fernández-Götz 2014.
378 See Haselgrove 2007 (Picardy) and Fernandez-Götz 2018.
379 See Agache 1978; Collart & Bayard 1996; Roymans 1996; Haselgrove 1996; 2007.
380 Haselgrove 2007.
381 A term introduced by Agache (1978).
382 Haselgrove 2007, 506.
383 Malrain *et al.* 2002, 137-145; see also Habermehl 2014, 52-53.
384 Schinkel 2005, 538-539; Gerritsen 2003, 60-63; 181-189; Arnoldussen & Jansen 2010, 388.
385 Arnoldussen & Jansen 2010, 388-389 (Amstein); Gerritsen 2003, 187 figs 4.27-4.28 (Schalkskamp); Dyselinck 2016, 67 (Sevenum); Hissel 2012; Van Hilst 2018.
386 See De Clercq 2009, 245-246.
387 See Joachim 1980; Frank & Keller 2007; Andrikopoulou-Strack *et al.* 2000.
388 Joachim 2006d, 379-380.
389 Meurkens & Tol 2016, 93. See also Ball *et al.* 2018.

Only in more recent years have some excavations improved this situation, although our knowledge remains limited and fragmentary. Most importantly, later Iron Age settlement features have been documented at the sites of Beek-Maastricht Aachen Airport,[390] Stein-Heidekampweg[391] and Maastricht-Landgoederenzone.[392] Several timber houses and secondary structures from the (Late) Iron Age were excavated at the site of Stein-Heidekampweg.[393] Unfortunately, however, much remains unclear about the broader settlement context. At Maastricht-Landgoederenzone only the periphery of a Late Iron Age farmstead was documented. No indications were found of the presence of a settlement ditch. Several timber buildings from the Early, Middle and Late Iron Age were documented at Beek-MAA (Fig. 14.2).[394] The size of this settlement in terms of the number of contemporaneous farms is unknown, as is its level of continuity/stability ('*Platzkonstanz*'). In any event, there are no indications that the settlement was enclosed.[395]

Across the Dutch border, some 25 km east of Voerendaal, two Late Iron Age settlements are known from Eschweiler-Lohn and Eschweiler-Laurenzberg in Germany. These settlements were dated between c. 200 and 150 BC and between 150/125 and 100 BC respectively.[396] Both are characterized by clusters of relatively small timber buildings and there are no indications of settlement ditches. At the Belgian site of Kesselt-Meulenweg (B/LI; some 20 km west of Voerendaal), a cluster of timber buildings from the La Tène C and D periods were documented, again without settlement ditches. The same applies to the Late Iron Age houses documented at the nearby site of Bilzen-Spelverstraat (B/LI).[397] Very different is the hill-top site of Caestert (B/LI), wedged in between the Jeker and Meuse valleys, only some 17 km from Voerendaal (Fig. 14.7). This site was fortified by means of a *murus Gallicus* and covered an area of about 35 hectares. As such, it could well be a Late Iron Age *oppidum*, but attempts to date the fortification have remained unsuccessful until now.[398] As a result, we cannot rule out that this complex should be interpreted as a fortification from the Early Roman period rather than an Eburonian *oppidum*.[399]

A variety of timber buildings can be found within the settlements discussed above. Traditionally, the house architecture of the wider loess region around Voerendaal has been contrasted with the more northerly sandy regions. While the latter region is characterized by long byre-houses, the loess region has long been regarded as a clearly different *Hauslandschaft* with much smaller timber buildings, often consisting of up to ten posts. Generally, this difference in architectural tradition was associated with differences in economic orientation and organization. In recent years, the validity of this traditional contrast has been called in to question. Firstly, it has been suggested that the small timber structures might actually represent the core constructions of originally larger buildings, of which the wall constructions have not been preserved.[400] Secondly, large well-preserved timber buildings from the Iron Age have also been identified in the loess region in recent years, such as at Maastricht-Landgoederenzone in Zuid-Limburg, Bilzen-Spelverstraat in Belgian Limburg, Kerpen-Mannheim, Elsdorf-Heppendorf, Pommenich (Fig. 6.2; 6.6) in Germany and now in Voerendaal.[401] These rather large houses clearly parallel the architectural traditions of the sandy regions, including well-known house types such as Haps/Oss-Ussen 4 and Oss-Ussen 5. These new findings indicate that the contrast in house architecture between sandy and loess regions was less pronounced than was presumed until recently.

Taking everything into account, our knowledge of later Iron Age settlements in the region around Voerendaal is still limited and fragmentary. Consequently, it remains impossible to paint a reliable picture of the settlement landscape during this period. On the basis of our current knowledge, the region in general seems to have been dominated by small open, unenclosed clusters of habitation, probably in part still 'wandering' through the landscape. As such, the Voerendaal enclosure is an atypical find, indicating that the settlement landscape must have been more differentiated. The possible *oppidum* at Caestert could support this idea.

390 Tichelman 2010.
391 Van Wijk *et al.* 2012.
392 Hazen & Blom 2015.
393 Van Wijk *et al.* 2012, 133 ff.
394 Cf. section 14.2.2.
395 Tichelman 2010.
396 Joachim 1980, 375.
397 Habermehl 2013.
398 Verhoeven 2008; 2010; Roymans & Scheers 2012, 26-27.
399 See Roymans & Scheers 2012, loc. cit.; Panhuysen 2015, 81; cf. section 14.4.2.
400 Tichelman 2010; Hazen *et al.* 2015; Ball *et al.* (2018, 219). See also Hiddink 2014c, 193-195 and sections 6.8 and 14.2.2.
401 Hazen *et al.* 2015 (Maastricht); Habermehl 2012 (Bilzen); Grünewald 2019 (Kerpen-Mannheim); Ciesielski & Kempken 2019 (Elsdorf-Heppendorf); Geilenbrügge & Franzen 2015 (Pommenich).

The Viereckschanze concept

The archaeological concept of the *Viereckschanze* has a complex history that deserves some elaboration here. The term, literally meaning 'rectangular fortification', was coined during the early twentieth century in southern Germany and has become prominent over the years in the archaeology of the later Iron Age.

The term is applied to relatively small rectangular or square enclosures of some 0.4-1.2 ha, characterized by a V-shaped ditch and (remnants or indications of) an internal earthen bank. Although more than 300 such *Viereckschanzen* are known, only a selection of these have actually been excavated. In southern Germany, the remnants of ditches and earthen walls can often still be observed within the landscape. As a result, these remains have been the focus of archaeological interest since the nineteenth century, the early days of the archaeological discipline.[402] After first being interpreted as military camps, in 1931, Drexel suggested an interpretation as sanctuaries.[403] From that moment on, this cultic interpretation has long dominated the debate and its effects can still be felt to this day.

It was not until 1950 that the first *Viereckschanze*, at Holzhausen near München, was excavated in any detail. The results of this excavation seemed to confirm a cultic interpretation, or at least the remains were interpreted from this perspective. The squarish timber buildings on the compound were interpreted as temples, and even identified as the predecessors of the Gallo-Roman temple.[404] Later on, during the 1980s and 1990s, several other *Viereckschanzen* were excavated in detail, some completely.[405] The results of these new excavations gave rise to doubts about the earlier interpretations.[406] A critical review of the find material from *Viereckschanzen* showed that the vast majority of finds could be associated with 'normal' settlement activity and not with specialized cultic activities.[407] Furthermore, on closer inspection, the interpretation of the timber buildings as temples did not stand up to scrutiny.[408] As a result, *Viereckschanzen* are now generally regarded as the fortified residences of families belonging to the higher echelons of society. This is not to say that all fortified complexes are by definition settlements.[409] In each case, interpretations must follow from the critical assessment of the documented archaeological features and the associated find material.

7.4 Fortified settlements. Exploring parallels for enclosure 308

Having explored later Iron Age settlement landscapes, we will now shift our focus to a specific type of settlement: small, lowland fortified settlements. These settlements generally extend to about three hectares in size and are fortified by means of deep, wide V-shaped ditches, as well as earthen ramparts, palisades or combinations thereof. They are situated in plains, on hillsides or on ridges within the landscape. By studying these fortified settlements as parallels to the Voerendaal enclosure, we aim to improve our understanding of this remarkable Late Iron Age complex.
Over the years, many Late Iron Age fortified settlements have been excavated in many regions, especially in Germany and northern France. In German archaeology, these complexes have been a focus of research for more than a century under the heading '*Viereckschanzen*'. This specific category of sites is discussed briefly in box 1. In the text that follows, however, we will opt for a broader focus, using the more general term 'fortified settlement'. The term ´Viereckschanze´ has started to lead its own life over the years and is often associated with specific ideas and interpretations. Below we will explore a selection of well-documented fortified settlements, focusing on their layout, fortifications and internal habitation, as well as their social significance and functions.

Two types of fortified settlements
Within the category of fortified settlements introduced above, two main types can be defined. The first type concerns small,

402 See Wieland (1999, 11 ff.) for a description of the research history of *Viereckschanzen*.
403 Drexel 1931.
404 Wieland 1999, 150-152.
405 See Wieland 1999, 123 ff. for a catalogue of enclosures from southern Germany.
406 For a critical review of the cultic interpretation, see Derks 1998, 181-182.
407 Although the spheres of day-to-day life and rituals are intimately intertwined. E.g. Brück 1999.
408 See Wieland 1999, 105 ff. and Derks 1998, 179-182 for a critical review of these interpretations.
409 Kuckenburg 2004.

rectangular fortified settlements with an enclosed area of some 0.3 to 1.6 ha (Fig. 7.3-7.4). Their individual sides measure between approx. 50 and 150 m in length. Voerendaal enclosure 308 also falls into this category. The second type involves somewhat larger fortified settlements with a curvilinear or oval layout (Fig. 7.5). Their enclosed area generally measures between about two and three hectares. Both settlement types are fortified by a combination of deep, wide V-shaped ditches and an earthen bank (Table *7.1).[410] In some cases, palisades or fences have been documented in association with these.[411] The enclosed compounds generally housed at least several timber buildings. Examples of small rectangular fortified settlements can be found throughout the wider region. However, they are especially well-represented in Germany and northern France (see Table *7.1 for selected sites). Until now, only a few examples have been documented in Belgium and the Netherlands. For now, it remains difficult to determine whether this situation reflects a historical reality or a research bias.

In Germany, examples of these settlements are mainly found in southern Germany and the German Rhineland. The northernmost example is the fortified settlement at Rees-Haldern-Bergwick, situated on the east bank of the Rhine, not far from Xanten. This five-sided enclosure measured 1.3 ha and was dated to the first half of the first century BC.[412] Eight buildings were documented on the enclosed compound, including a two-aisled byre-house and structures with twelve, nine, six and four posts. The complex should probably be regarded as a single, fortified farmstead. The presence of a second V-shaped ditch at this site allows for the reconstruction of two development phases for this complex.[413] Further south along the Rhine, at Bonn, two examples of fortified settlements were documented. The first, Bonn-Vilich-Müldorf, is again a five-sided fortified enclosure of 1.18 ha, dated to the Late Iron Age.[414] Some twenty timber structures were documented on the compound, both large and small. Furthermore, many other Iron Age timber buildings were found near the enclosure but their chronological relationship to the enclosure remains unclear. The second settlement, Bonn-Bad Godesberg-Muffendorf, was only fragmentarily excavated.[415] This rectangular enclosure has sides of probably about 50 m long and can be dated to the La Tène D1 period (c. 150-70 BC). In the excavated section of the compound, several post-built constructions were documented, including possibly some larger buildings. Quite close to Voerendaal, 30 km to the east, another fortified single farmstead was excavated at Jülich-Bourheim (approx. 0.6 ha), dated to the La Tène D1 period.[416]

Moving further south, many more examples of small, fortified settlements can be found. In fact, this is the core region of the *Viereckschanze* (box 1). Well-excavated fortified settlements include those at Plattling-Pankofen, Westheim and Nordheim. The first is a relatively large enclosure (1.58 ha), dated to the La Tène D1 period. Besides three wells, at least seven small and large buildings were documented on the compound.[417] Iron tools indicate both agricultural and metallurgical activities at this site. The settlement of Westheim covered an area of some 0.9 ha and housed at least five buildings and two wells.[418] Besides a V-shaped ditch and an earthen rampart, a double palisade formed part of the fortifications. Remarkably, occupation at this site did not start until the second half of the first century BC and continued into the Augustan period. At the last site, Nordheim, two fortified settlements of about 1 ha were situated only some 300 m apart.[419] Both were constructed during the second century BC and continued to be inhabited into the first century BC. The sites of Nordheim were already inhabited before the fortifications were constructed and the main timber building associated with one of the fortified settlements was rebuilt at least once.

Another series of Late Iron Age fortified settlements are known from the north of France, at approximately the same latitude as southern Germany. Well-documented examples include Roncheres-Le Bois de la Forge,[420] Sainte-Maure-de-Touraine-La Croneraie,[421] Bazoches-lès-Bray-La Voie Neuve[422] and Sorigny-Montison (see Table *7.1).[423] All these enclosures are trapezoid in shape and their areas range from about 0.5 up to 0.93 ha. Again, each of the enclosed compounds housed at least several timber

410 Tables marked with an asterisk (*) can be found in appendix IX.
411 Wieland 1999, 42-43.
412 Schletter 2019.
413 Schletter 2019, 248-249.
414 Gechter-Jones & Kempken 2006; Frank 2013.
415 Göbel 1991.
416 Joachim 2006d.
417 See Wieland 1999, 183-186.
418 Bernard 1986.
419 Hees *et al.* 2017.
420 Poitevin *et al.* 2014.
421 Baguenier 2014.
422 Nouvel *et al.* 2009, 118.
423 Poitevin *et al.* 2014.

buildings, both larger and smaller structures (in most cases up to ten). At the site of Sainte-Maure-de-Touraine (0.8 ha) no fewer than 24 timber buildings were excavated, but they represent habitation during both the Late Iron Age and Roman period. The settlements discussed here can most probably be understood as fortified farmsteads. Roman-period activities were also documented at two other settlements – Roncheres and Sorigny. At Sorigny, a villa was constructed at the site of the enclosure in around AD 70. Unfortunately, the actual degree of continuity cannot be determined.

The number of known fortified settlements from Belgium is very limited. Part of such a settlement was probably excavated at Latinne-Grandes Pieces: a 45 m long section and corner part of a 1.5 m deep, V-shaped ditch.[424] Later, during the Roman period, a villa was constructed at the site. Unfortunately, the exact (chronological) relationship between enclosure and villa remains unclear. The second settlement, Kontich-Alfsberg, was excavated in much more detail and it was possible to reconstruct a development trajectory. During the oldest, Middle Iron Age phase the settlement included one or two unenclosed farmsteads, of which only the timber secondary buildings were recovered. Next, a bipartite, palisaded enclosure was constructed, possibly housing a timber building. Annaert initially interpreted this enclosure as an elite farmstead and gathering place[425] but she later suggested an interpretation as an open-air sanctuary. This was based on comparisons with French sanctuaries and publications supporting the cultic interpretation of *Vieckschanzen*.[426] Around the middle or in the second half of the first century BC a V-shaped ditch was dug around the existing palisade and an internal rampart was constructed. According to Annaert, the enclosure remained in use during the Early Roman period and associated timber building IX was not destroyed by fire until the second half of the first century AD. This fortified site is interpreted as a refuge in times of war and uncertainty.[427]

For the Netherlands, the picture is equally poor. In fact, the Voerendaal enclosure is the only settlement that meets the criteria defined above. Nevertheless, a number of settlements are worth discussing here. The first is that of Sevenum-De Krouwel, about 60 km north of Voerendaal. Habitation at De Krouwel started in the Early Iron Age and intensified during the Middle Iron Age. Next, during the Late Iron Age, one of the farmsteads was enclosed by means of a palisade. This enclosed farmstead included several large timber buildings – interpreted as houses – and many smaller structures.[428] Two of the houses partly overlap, comparable to Voerendaal buildings 222 and 223. Furthermore, one of the houses was individually surrounded by a fence, further compartmentalizing the internal settlement space. Other relevant sites were excavated in the well-studied micro-region around the town of Oss. At the Late Iron Age site of Oss-Almstein, a settlement ditch was dug around an already existing settlement, somewhere between c. 150 and 50 BC.[429] The excavator suspected the presence of an earthen bank on the inside of this ditch. At Oss-Schalkskamp settlement space was enclosed by means of a substantial ditch during the Late Iron Age. This ditch was about 2 m wide and 1 m deep and seems to have enclosed a compound of some 125 by 125 m.[430] For another site in the sandy region of Noord-Brabant, Oerle-Zandoerleseweg, it was also suggested that the settlement ditch had been dug during the Late Iron Age.[431] A last category of fortified sites was documented much further north, at Rhee, Vries and Zeijen (N/Drenthe). These fortifications are formally different – smaller and mostly enclosed by multiple ditches – although their function could well be comparable to the enclosures discussed here.[432]

Fortified settlements of the second type – curvilinear enclosures of some 2-3 hectares – are mainly known from the German Rhineland. Over the years, examples have been found at Niederzier-Hambach, Elsdorf-Heppendorf and Kerpen-Mannheim. The first settlement at Niederzier-Hambach 382 was surrounded by a double V-shaped ditch, enclosing an oval area of about three ha (Fig. 7.5).[433] No fewer than 350 small timber structures (with four to nine posts) were documented on the enclosed compound and interpreted as houses, outbuildings and granaries.[434] The excavators reconstructed six farmsteads. The complex was inhabited for some 150 years, between the La Tène C2 period and the

424 Plumier 1987, 150. This site is mentioned in Willems & Kooistra 1988.
425 Annaert 1993, 115.
426 Annaert 1995/1996, 56-63; cf. Reichenberger (1993). The reconstructed ritual configuration of posts (1995/1996, 59, fig. 16) is not based on finds supporting this interpretation.
427 Annaert 1995/1996, 64.
428 Dyselinck 2016, 49, 58, 62.
429 Jansen & Fokkens 1999.
430 Wesselingh 2000, 172-182; Brusgaard *et al.* 2015.
431 Van Hilst 2017.
432 Waterbolk 1977; 1995; Hiddink 1999, 126-133; Harsema 2005, 550-551; Arnoldussen & Jansen 2010.
433 Gechter-Jones 1996; Joachim 2007.
434 Joachim 2007, 44.

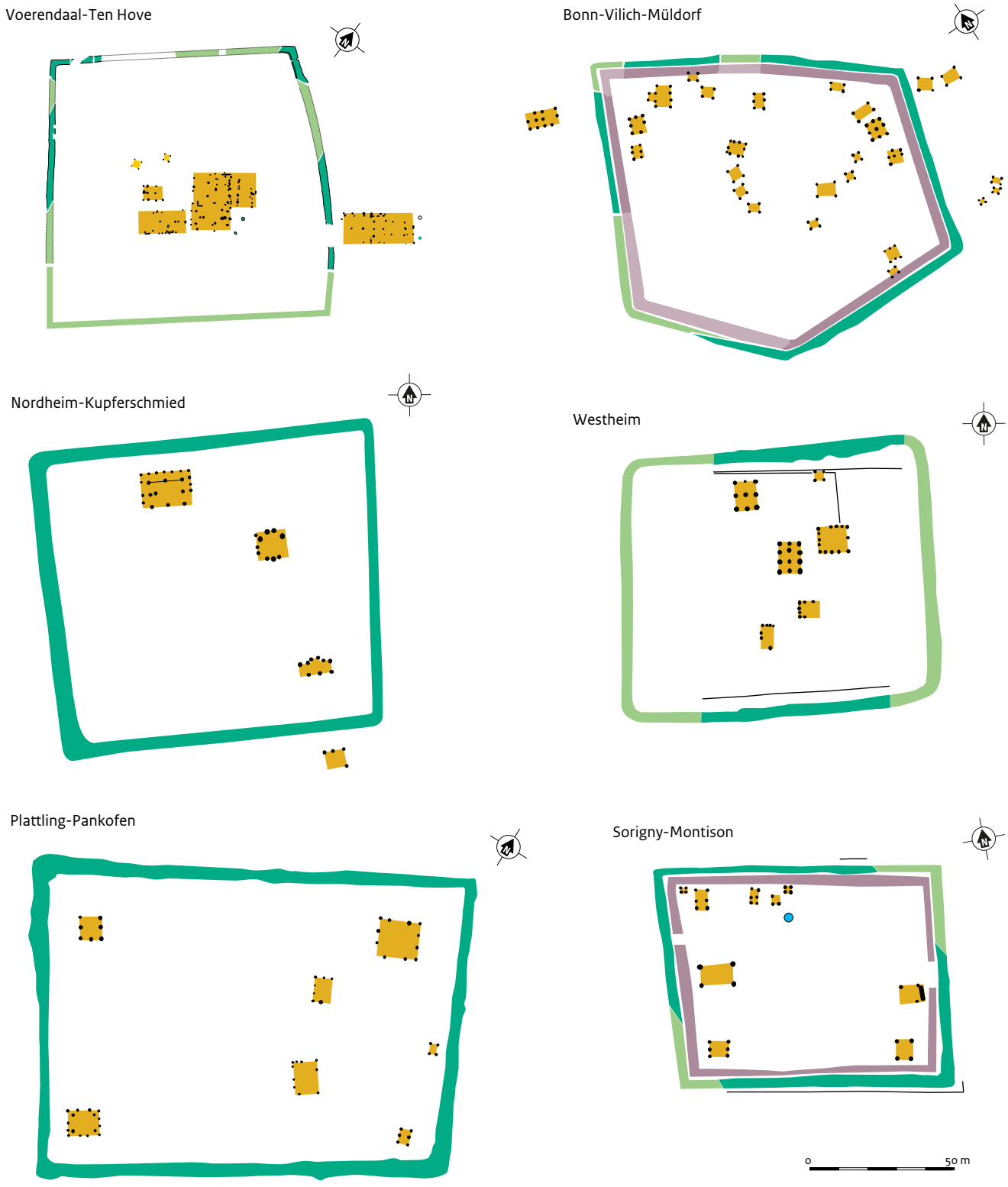


Fig. 7.3 Examples of enclosed, defended settlements from the wider region. (source: D.S. Habermehl & H.A. Hiddink, modified after Frank 2013, fig. 8; Wieland 1999, fig. 55; Bernhard 1986, fig. 11; Wieland 1999, fig. 69; Poitevin et al. 2014, fig. 3)

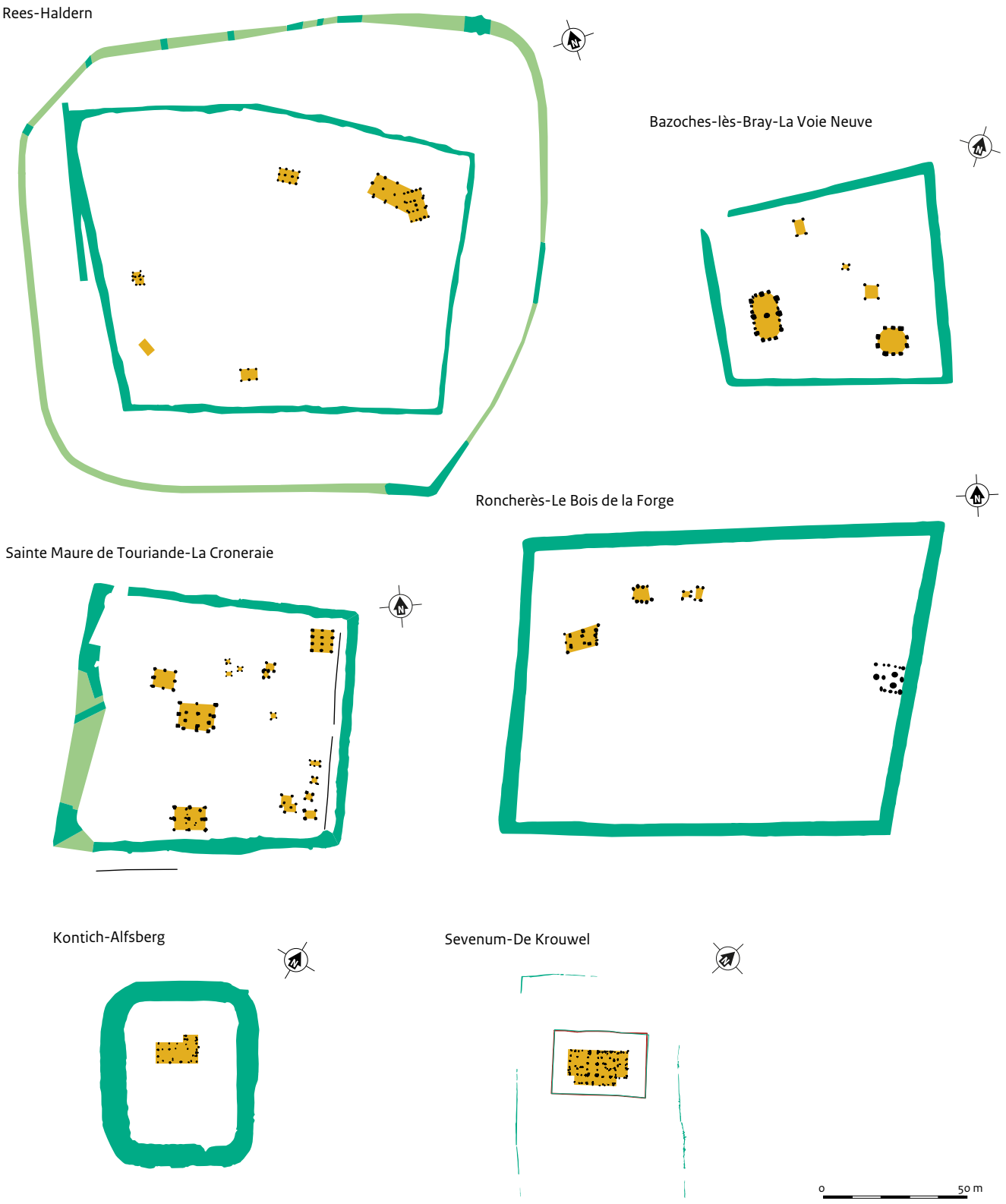


Fig. 7.4 Examples of enclosed, defended settlements from the wider region, cont. (source: D.S. Habermehl & H.A. Hiddink, modified after Schletter 2019, fig. 3; Nouvel et al. 2009, fig. 7; Malrain et al. 2010, fig. 1; Baguenier 2014, fig. 1; Annaert 1993, pl. 1; Dyselinck 2016, fig. 6.25)

middle of the first century BC.[435] A comparable complex was excavated at Elsdorf-Heppendorf.[436] During the Late Iron Age, at least one large timber building (possibly of the Haps type) was situated on this 2.5 ha fortified compound, as well as several nine- and six-post timber buildings. Several Iron Age buildings outside the enclosure might represent settlement activity preceding the construction of the fortifications. During the Early Roman period a framework building was constructed on the compound. Unfortunately, the degree of continuity between Iron Age and Roman-period activities cannot be determined. A third complex was excavated at Kerpen-Mannheim (2.3 ha). Here, possible continuous habitation activities could be reconstructed between the La Tène C and the Early Roman periods.[437] At least nine timber buildings were documented on the compound,, including larger timber buildings of the Haps and Pommenich type.

In the Netherlands, a curvilinear fortified enclosure was excavated at Weert-Laarderweg and dated to the second and early first century BC (Fig 7.5).[438] This complex consisted of an inner (about 160 x 110 m) and an outer enclosure (about 260 x 300 m). Although the interior was only excavated in part and some four-post granaries were found, the site does not appear to have been permanently occupied; it was probably more of a refuge than a settlement. The ditches were still visible in the Roman period when a settlement was founded in the space between them (grey buildings in Fig. 7.5).

7.5 Discussion

As presented above, Voerendaal enclosure 308 should most probably be understood as a fortified farmstead, dated to the Late Iron Age, most likely between c. 150 and 100/50 BC. The farmstead included a main house and several outbuildings. It was enclosed by means of a rather deep, wide V-shaped ditch and probably also by an internal earthen bank, of which no remains were discovered. The main house seems to have been rebuilt twice, a phenomenon that was also documented at several other fortified farmsteads in the wider region. Consequently, the fortified farmstead seems to have been inhabited for several generations (two-three). That the site was probably already inhabited before the construction of the fortifications is indicated by the presence of building 236, right next to ditch 308. Similar development trajectories could be reconstructed for several comparable fortified settlements.

The emergence of fortified settlements like that of Voerendaal should be understood within the context of the dynamic later Iron Age period. A number of themes deserve particular discussion: the stability and permanence of the settlement, the significance of the fortifications, the central functions of the site and by implication the way in which the emergence of the fortified settlements can be associated with developments in the later Iron Age society.

First of all, the considerable degree of permanence is a topic to consider here. The Voerendaal settlement was a well-defined and stable residence in the landscape, possibly inhabited for two or three generations. This situation was clearly different from the earlier phases of the Iron Age, and probably for the majority of Late Iron Age settlement, with farmsteads moving through the landscape from generation to generation.[439] Rebuilding the house at the same location, as documented at Voerendaal, could be regarded as 'mnemonic bridging', a strategy that served to maintain links with previous generations. This allowed the residents to construct narratives of a permanent social group with a fixed place in the world and in time.[440] Furthermore, this development can be related to the changing ways in which the farming population thought about resources and wealth. Whereas in the earlier Iron Age resources were largely considered the collective property of a local community, families during the Late Iron Age seem to have developed strategies to collect resources and wealth and pass these on from generation to generation.[441] The growing locational continuity and durability of houses reflected the increasingly permanent investment of land rights in family groups.

A second topic is the significance of the fortifications. The ditches around the Voerendaal settlement clearly exceeded the dimensions that could be expected for the simple demarcation of

435 Joachim 2007, 42.
436 Ciesielski & Kempken 2019.
437 Grünewald 2019.
438 Tol 1995, 9-14, 1996, 17-20; 1998; Gerritsen 2003, 184-186.
439 Schinkel 2005, 538-539; Severin *et al.* 2007; Roger & Catteddu 2002; Gerritsen 2003; Haselgrove 1996, 2007; Blancquaert & Prilaux 2003.
440 Gerritsen 2007, 163.
441 Gerritsen 2007, 167-168.

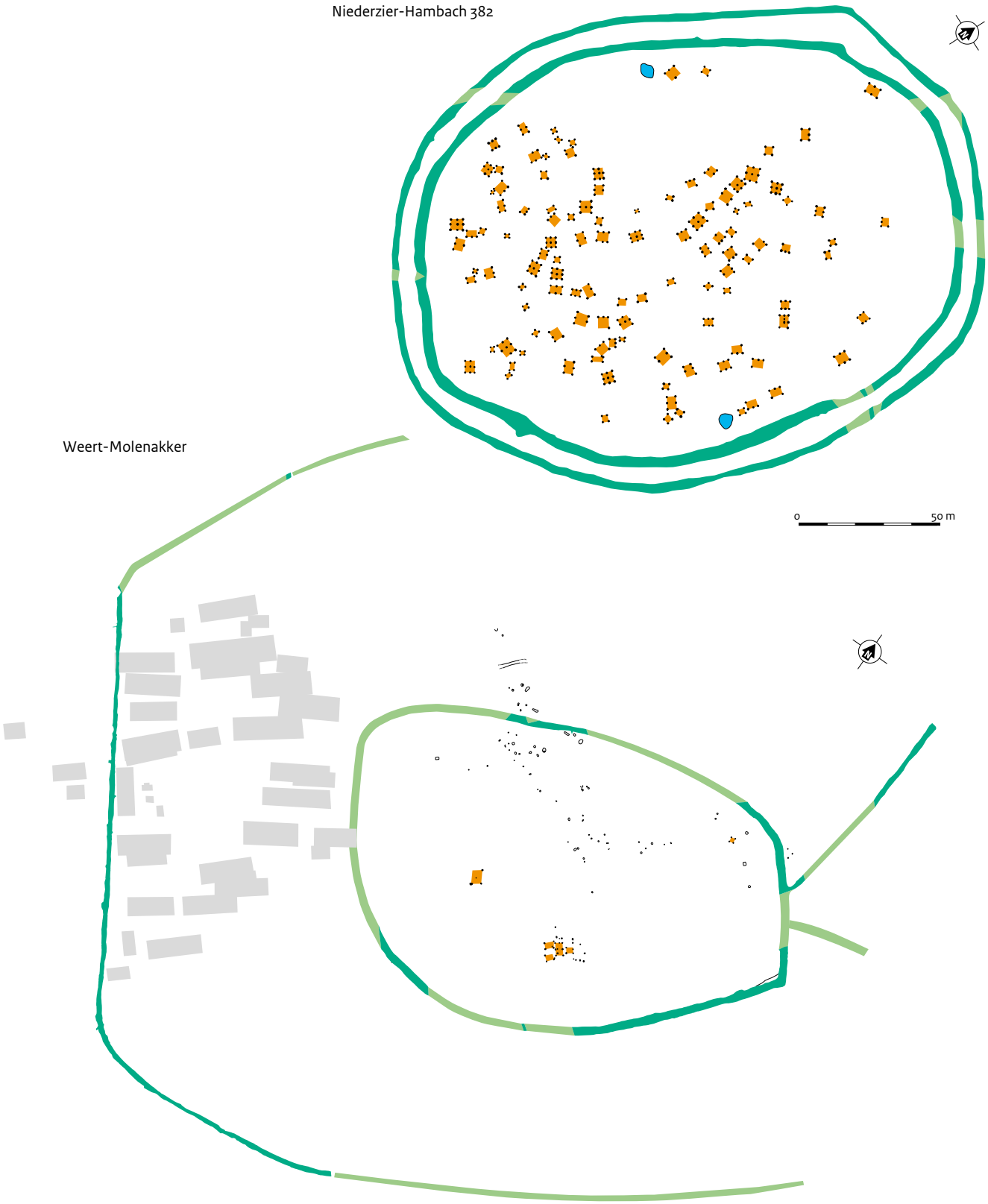


Fig. 7.5 Two larger, curvilinear enclosed sites from regions adjacent to the South Limburg loess area. (source: Niederzier after Kunow & Wegner 2006, fig. 147)

settlement space, the protection against wild animals or the keeping of cattle on the compound. Consequently, they – together with the presumed earthen bank – seem to have had some kind of defensive purpose. The significance of fortified settlements in general could be viewed in a number of ways. First of all, most fortifications were constructed during the second century BC, a period of instability and lack of safety.[442] Although later becoming a *topos* in classical texts, the wanderings of Cimbri and Teutones and settling of Germani west of the Rhine did actually happen and would have caused a certain degree of unrest.[443] At the same time, intertribal conflicts and even raiding for booty (gold, cattle) between local groups occurred frequently in the Late Iron Age, although many references in classical texts follow a *topos* of uncivilized, barbaric warrior societies.[444] The rather light fortifications of complexes like Voerendaal will have offered protection against small-scale attacks of such warrior groups but were inadequate in the event of large-scale intertribal conflicts.[445] In general, smaller fortified settlements were not strategically positioned within the landscape. Their interior would have been vulnerable to attack by ranged weapons (such as javelins, arrows and slingshot).

The significance of the fortifications will have exceeded their defensive function. As monumental features they will have been powerful symbols in the landscape, communicating (military) power, status and control over resources. In the increasingly hierarchical societies of the later Iron Age, (local) leaders would have been eager to publicly present themselves as powerful figures. The fact that new elites did indeed emerge in our region during the Late Iron Age is also reflected in the significant rise in the circulation of gold coins and jewellery.[446] Several gold and silver hoards are known, dating mainly to the first century BC. These can be understood as the accumulated wealth of elite figures, who used it for alliances with other groups and to pay warriors.

As the presumed residences of the higher echelons of (local) society, fortified settlements are often assumed to have some kind of central function at the local or microregional level.[447] The suggested functions include those of gathering places, refuges in case of emergency, (specialized) production sites and sites of (collective) rituals or feasts. At the same time, it must not be forgotten that these fortified settlements were still rural settlements, involved in agricultural production and animal husbandry.[448] Some authors even view these settlements as the prehistoric predecessors of the Roman villa, referring to them as '*Keltische Gutshöfe*' or 'Celtic estates'.[449] Although this relationship may exist in a few specific regions, the specific ethnic connotation is open to question.

The Voerendaal fortified enclosure will have been part of a differentiated settlement landscape. Unfortunately, current knowledge of Late Iron Age settlement is very limited for our region. The fragmentary data indicate that the landscape will have been dotted with clusters of unenclosed farmsteads. The Voerendaal enclosure is one of the few indications of greater complexity and differentiation. Hopefully, this fragmentary picture can be further fleshed out in in the years to come. In some other regions, the complexity of the settlement landscape can be reconstructed in more detail. For northern France, Malrain *et al.* modelled a settlement hierarchy with four settlement types, ranging from unenclosed single farmsteads to enclosed (or even fortified) and internally organized settlements, often with monumental entrances.[450] The uncritical application of this model to our region would suggest that the Voerendaal settlement should indeed be understood as an elite residence, relatively high up in the settlement hierarchy. In the Neckar valley, a well-studied region, some twelve fortified settlements were documented in an area of only about 10 x 20 km. In between them, unenclosed clusters of farmsteads were present. The author suggests the existence of some kind of dependency relationships between the two types of settlement and thus assumes that the fortified settlements had some form of central function at the local level.[451]

A final topic to be discussed, the disappearance of the fortified settlements, is also a problematic one. Most of the fortified settlements seem to have fallen out of use at

442 Wieland 1999, 70.
443 Section 14.3.1.
444 See Hiddink 1999, 173ff.; 190ff. with many references.
445 Roymans 1990, 195.
446 Section 14.3.2; 14.4.2.
447 Roymans 1990, 199; Wieland 2006, 135; Wieland 1999; Gechter-Jones 1996.
448 Unfortunately, the botanical remains from Voerendaal do not allow for further conclusions. Kooistra 1996, 151-153 and table 25.
449 Lenz 1998; Neth 2005; Wieland 2006, 135.
450 Malrain *et al.* 2002, 137-145; see also Habermehl 2013, 52-53.
451 Comparable to the enclosed Roman rural settlements of the MDS area as defined by Slofstra (1991).

some time during the first century BC. A date around the middle of the first century is often suggested, hinting at a relationship to Caesar's campaigns but generally without much proof.[452] In most cases, the chronological resolution of the associated find material is simply too low to determine an end date with any precision.
In other cases, sites of fortified settlements continued into or were reinhabited during the Roman period. Generally, it remains very difficult to determine the degree of continuity between the Late Iron Age and Roman period. At Latinne and Sorigny, Roman villas were constructed at the site of a fortified settlement. In both cases, continuity could not be determined.
For Voerendaal, there does not appear to have been any continuity of habitation between the Late Iron Age fortified settlement and the earliest Roman period.[453]

[452] Joachim 2009, 42; Ciecielski & Kempken 2019.
[453] Section 14.3.3; 14.5.3.

8 The main buildings and the baths of the villa

Henk Hiddink

The two successive main buildings of Ten Hove are discussed in the first two sections of this chapter (Fig. 8.1; 8.2). The tower-like structure attached to the second villa is the subject of the third section. The fourth and final section deals with the baths as they can be considered part of the residential area of the villa.

8.1 The first villa. Building 399

When discussing the first villa of Voerendaal-Ten Hove, called building 399 in this report, it is important to bear in mind that only parts of it were present and excavated. Nevertheless, the reconstructed plan appears to be essentially correct. The plan is quite special, with a number of features that stand out: a large central space with a dividing wall, a series of relatively small rooms surrounding it on three sides, corner pavilions not projecting to the sides and, finally, only a narrow portico at most (Fig 8.3).

8.1.1 The portico

There is no certainty that there was indeed a portico, although it is very likely. Braat believed that there was, with the colonnade in front of the south wall, like '... a less deeply founded breastwork with dwarf columns that had left no trace.'[454] A portico at this location would have been quite narrow, however: about 2.5 m with an interior space of 2 m at most. This seems rather unusual, also because it would mean that the *Eckrisalite* (rooms 3 and 6) did not project to the south. The villa of Heerlen-Bovenste Caumer, which is the best parallel for Voerendaal, offers no clues because its portico was not excavated. It may have had a front as reconstructed by Peters, as well as one between the outer walls of the *Eckrisalite*.[455]

Most villas, even very small, simple examples, had a portico of 3.5-4 m wide. If we try to fit a portico of this width into the building at Ten Hove, the foundation that was discovered may actually have been the location of the colonnade. The back wall or façade of the villa proper may have been 'inside' room 1/2, in line with the north walls of rooms 3 and 6.[456] This would result in a portico of slightly over 4 m wide. A possible objection is that no single trace of such a wall was found, but a close examination of the excavation plan shows that the foundations were poorly preserved or completely lost at the locations where the hypothetical back wall abutted the foundations of rooms 3 and 6.

If our villa did indeed have a portico in line with the southernmost walls, this would imply that no corner pavilions (*Eckrisalite*) were in fact present and that rooms 3 and 6 did not project from the front. Whatever the case, they (also) did not project sidewards as was customary. For Heimberg this feature was characteristic of a specific type of villa: 'the row type with included sides'. Although rarer than true corner pavilions, it is perhaps not the most significant aspect of Voerendaal phase 1.

8.1.2 Issues of the central room(s)

Besides the portico, an intriguing trait of the first villa is the large central room 1/2 and its possible dividing wall. However, it is far from certain that this wall ever existed. The possible presence of such a feature is shown at Bovenste Caumer, where it was part of the original design of the building, bonded with both the walls north and south of it. There, the western room was open and the eastern one roofed, according to the excavator. However, it is not completely clear why this should be proven by the different kinds of floor, but this is of lesser importance here.[457] The question is how we should envisage the use of a house with a 'divided hall'. For Smith it was possible evidence for '...the idea that such houses could be occupied by more than one household', citing both Heerlen-Bovenste Caumer and Voerendaal 399.[458] For the former villa, this is also less likely, however. The western half of the building had specific functions, with the cellar, a small bath and its *praefurnium*. In a certain sense, it had a more private character than the eastern half. If each half of the building had an entrance, visitors were probably received in the eastern one. Something similar could be true for Voerendaal, but there are regrettably no indications of the function of rooms in the form of hypocausts or a cellar.

454 Braat 1953, 53.

455 Peters 1930. This type is called *Reihentyp. Risalite seitlich eingebunden* in German (Heimberg 2002/2003, 97). Besides Bovenste Caumer, she also included Buchten and Nuth-Vaasrade in this category.

456 Reducing the size of the central room(s) to 8 x 16 m.

457 The western room had a 5 cm thick pavement of pebbles, the eastern 30 cm of tile fragments. Did Peters assume that the pebbles offered better drainage? We wonder whether the floor really did consist of tile fragments alone as we would expect the use of either rammed loam or concrete (with only some tile as tempering/aggregate).

458 Smith 1997, 43-45, fig. 9.

A

B

C

Fig. 8.1 Voerendaal-Ten Hove. Parts of the second main building in trench 9 during the excavation in 1985.
A clockwise, starting bottom left: walls of two portico phases, room 7, 6, cellar 5a, room 11, 12, 8 (nearly invisible) and 14; B room 14 seen towards the west; C room 6, cellar 5, room 11, praefurnium 12a and room 12.

Fig. 8.2 Voerendaal-Ten Hove. The area with the remains of the first and second main building (399-400), as well as the tower 407.

As mentioned earlier, the dividing wall at Voerendaal probably did not exist. It may have been part of a drain belonging to the second villa as it was aligned with drain 318 further to the south. Assuming that phase 1 had only one central space, the question remains as to whether this was open or roofed. Although Braat did not write about this with regard to the first stone villa, he would have opted for the latter (see below). It would have been a very impractical design, especially in our climate, to have a villa with its largest space exposed to the elements. Anyone wishing to access a room in the opposite wing when it was raining would have been forced to cross the open court or traverse a whole series of rooms. In the first phase of Lürken-Alten Burg, regrettably poorly preserved, the presence of a large hearth in the central space suggests that a roof was present (Fig. 8.3).[459]

Nevertheless, villas with an open court did exist, such as examples from Baden-Württemberg and Bayern/Bavaria. At Treuchtlingen-Weinbergshof (D/BW) the large dimensions of the central space in particular suggest that it was open (Fig. 8.3).[460] A kind of portico at the north side of this courtyard provided a sheltered connection between both wings of the building. Far less distant from Voerendaal, the main building of Alsdorf-Hoengen-Bachfeld supposedly also had an open court, measuring 24 x 10 m in a first phase (and later divided up; Fig. 8.3).[461] Arguments for this interpretation are not mentioned in the short report, however, and a roof may well have been present. Finally, the villa of Bilsdorf in Luxembourg is an interesting case (Fig. 8.3). The four column bases in the central space and a rectangular feature suggest a design like that of a typical Roman *atrium* house, with an *impluvium* beneath a central opening in the roof. The central feature was in reality probably a hearth rather than an *impluvium*, as Oelmann already proposed, and it is not certain what the four 'bases' really were.[462] All in all, the question as to whether Voerendaal had a single or divided open space and whether it was open or not cannot be answered with certainty. However, it is most likely that there was a single central room and that it was covered by a roof.

[459] Piepers 1981, 32-33, 42-43; fig. 8; Lenz 1999, 176-193.
[460] Koch 1993, esp. 18-19.
[461] Vogt 1992; Lenz 1999, 137-142. The base in the centre of the central space probably supported a basin as water pipes were found nearby.
[462] Oelmann 1928, 127-128, fig. 57; Ternes 1971, 61-62, fig. 62 (wrong scale); Smith 1997, 97, fig. 26.

Fig. 8.3 Voerendaal-Ten Hove. Plan of the first villa, parts found and reconstruction with two alternatives for the location of a porticus, with buildings from other sites for comparison. (source: modified after Vogt 1992, fig. 27; Ternes 1971, 61-62, fig. 62; Smith 1997, 97, fig. 26; Peters 1930, 191; Piepers 1981, fig. 8; Koch 1993, fig. 2)
A praefurnia, hearths; B heated rooms; C basins, drains; D cellars.

8.1.3 Origins of the building type, reconstruction and dating

Although an interesting question, we will not investigate in detail the origin of buildings with a plan like that of 399. Perhaps there was a relationship to the city houses of the villa owners. A modest pre-Flavian '*domus*' at Tongeren-Kielenstraat, for instance, had a U-shape.[463] If such a structure had a wall or portico along the street, the result would be a building similar to our first villa. The use of courtyards or *peristylia* in city dwellings was widespread in the Roman period, although in the northern provinces often only attested in younger, stone-built phases.[464] The question is whether the general building type became known to the people in our parts through military architecture. The typical 'tribune houses' or officers' quarters in Augustan camps had a *peristylium* with rooms surrounding it, although the plans differ from the villas in Figure 8.3.[465] Considering all the uncertainties about the plan of Ten Hove 399, all attempts at reconstruction are something of a guess. The portico could for instance have had eight columns (with seven intercolumnia of about 6.5 *p.m.*). The central room may have been covered by either a gabled or hipped roof, and the rooms around it by three lean-to/pent roofs (Fig. 8.9B, 1-2). There is no direct dating evidence for building 399. Although Braat's phrasing – 'from the foundations' – suggests otherwise, a coin of Trajan was not found in the foundation trench proper, but in virgin soil away from it, perhaps in a mole burrow or a similar natural intrusion.[466] Indirect evidence suggests that the second villa was constructed after c. AD 125, implying that 399 was built either towards the end of the first century AD if in existence for one generation, or early in the Flavian period if it was inhabited for a considerable length of time.

8.2 The second villa. Building 400

8.2.1 Introduction

Although the second main building (400) was, like the first, discovered by Habets, a complete and 'correct' plan was not published until more than fifty years later, by Braat. The ROB excavations were limited in scope and provided no fundamentally new data (Fig. 8.2). Like the first main building (399), the second had a large room at its centre. With a size of roughly 10 x 10 m it was markedly smaller than that of 399.[467] The core of the building, consisting of the central room and two tracts of rooms at each side, had a width of 22.5 m, also less than building 399. However, if we include the other rooms and hallways at both sides, as well as those at the back, building 400 measured approx. 40 x 17 m. At the east side, more (heated) rooms were added later, ultimately resulting in a 57 m wide frontage. As already appears from this short description, the main building went through several stages of development. This was already noted by Braat, who assigned the remains to three phases (four including the first main building; Fig. 8.4).[468] He stressed that his phasing was not the only possibility: 'There were certainly intermediate stages and some parts may have been built in an alternative order.'[469] In any case, his phasing is a good starting point for exploring the building and its development.

Before discussing this topic, we should mention some problems, although they may be obvious to those familiar with the archaeology of the loess area and Roman villas. Post-Roman agricultural activities and stone robbing, combined with erosion of the loess slope, have led to the disappearance of almost all masonry, leaving us with the loose stones of the foundations. Therefore, there are few opportunities for a relative dating of walls by stone types and sizes, types of mortar and the bonding versus abutting of intersecting walls. This is a problem for the majority of villas in Zuid-Limburg and the wider regions. A specific problem for our site is the research history. Although even Habets seems to have been observant about stone and probably mortar types,[470] his untimely death left us with no

[463] Vanderhoeven 1996, fig. 16.
[464] For references, see Roymans & Habermehl 2011, 91. An example from Tongeren in Driesen 2018, 180ff. For Great Britain, see e.g. Perring 2002, figs 22-23. In Zuid-Limburg and adjacent *areas*, peristylia in villas are rare, with the '*praetorium*' of Stein as a – probably late(r) Roman – example (Remouchamps 1928; Holwerda 1928a; Beckers 1928; Bogaers 1986a).
[465] Examples at Oberaden, Anreppen, Haltern along the Lippe (Kühlborn 2008, figs 56, 59, 60, 71); a Flavian example at Inchtuthil (Perring 2002, fig. 15). On these military buildings as a possible model for town houses, see Vanderhoeven 1996, 242.
[466] Chapter 43.
[467] For a more detailed description, see chapter 43.
[468] Braat 1953, 64, fig. 11. Buildings 401 and 403 are left out of figure 8.4 and 8.5 because Braat was not aware of their existence.
[469] Braat 1953, 66.
[470] See chapter 33.

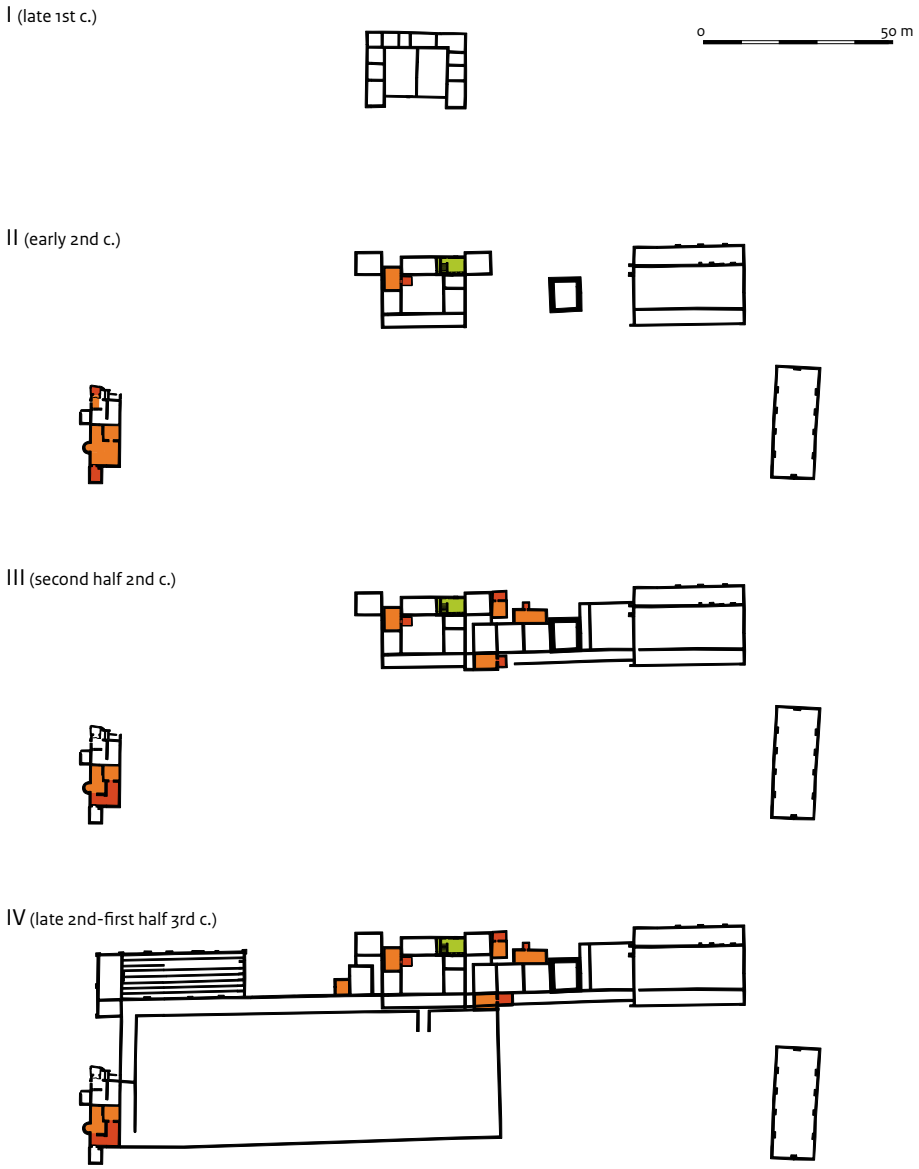


Fig. 8.4 Voerendaal-Ten Hove. Periodization of the villa according to Braat (building 401 and 403 not yet known by him); for colours of rooms, see figure 8.3. (source: modified after Braat 1953, fig. 11)

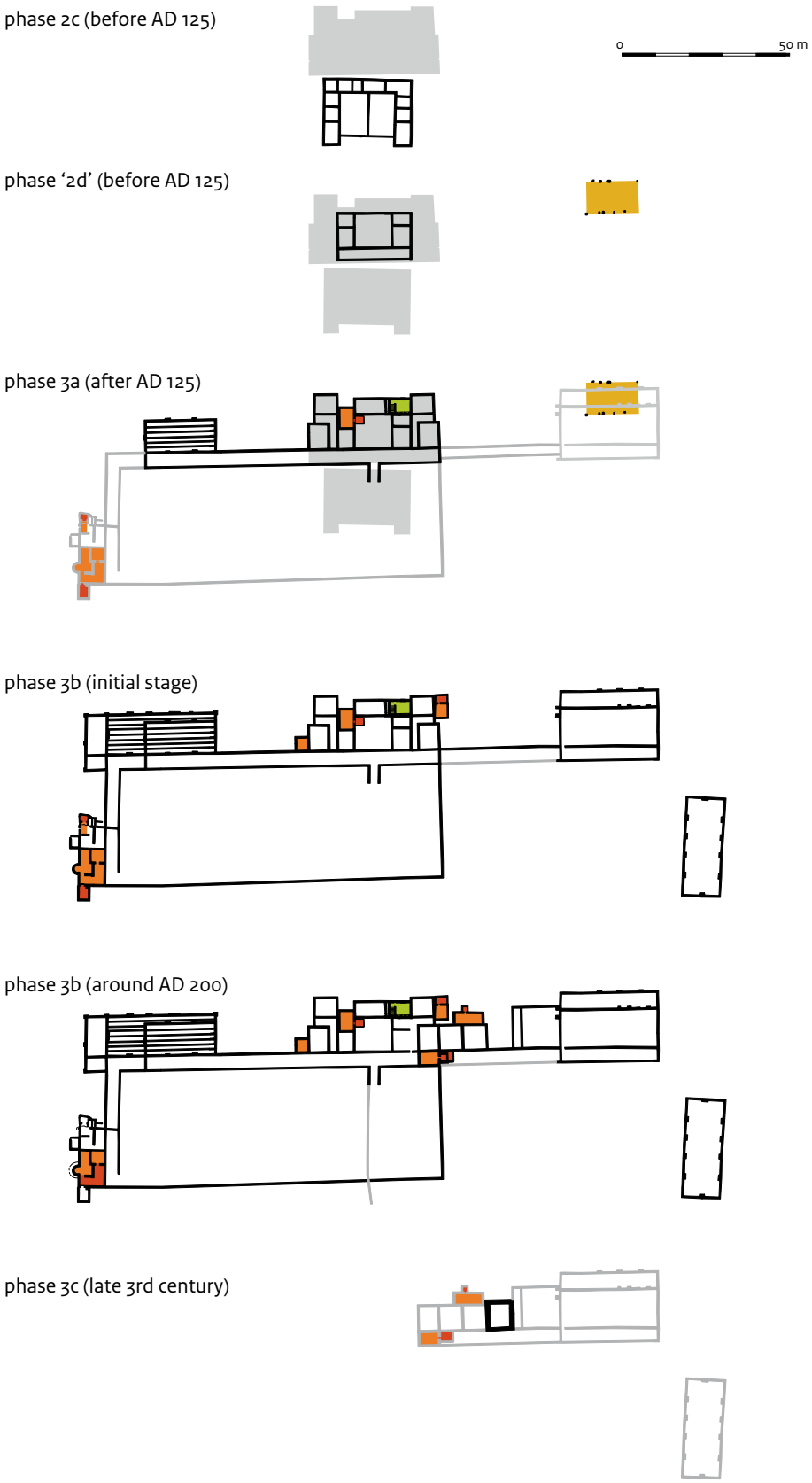


Fig. 8.5 Voerendaal-Ten Hove. A hypothetical, more probable periodization; most post-built structures left out.

information on Voerendaal. These first excavations, or rather the 'restoration' of the site and its arable afterwards, resulted in deterioration of the remains, as is shown by the fate of the cellar (Fig. 43.5-6). Also important is the fact that the methods used in the post-World War Two excavations were not optimal for studying the development of this or any building, especially for observing possible wood-built predecessors. Most trenches dug by Braat were quite narrow and although he was aware of postholes – he observed some near the baths – circumstances were unfavourable for finding and observing them.[471] The same holds true for trench 9 of 1985, which had only one level (although the 'fairly clean' loess of the subsoil was reached in much of the trench).

8.2.2 The initial phase. A hypothetical small villa

Phase II as presented by Braat, the first phase of building 400, is quite remarkable (Fig. 8.4) because 'tower' 407 was placed next to the main building (although it is Late Roman).[472] His argument for this was based on the assumption of symmetry, with the tower halfway along the main building and barn 405 (each at a distance of some 13.5 m). More important here is a second peculiar element of phase II, namely the main building. Although the width at the front is derived from portico 21, which makes sense, rooms 11 and 17 at the back should have been in existence but not 8/8a and 18/18a at the front. This is odd because *Eckrisalite* or pavilions only at the rear of a villa appear to be non-existent.[473] Therefore, either all elements must have been original, or all were later additions.

This makes a small first phase of building 400 feasible. It could have consisted of the central room 1, flanked by 2, 6, 7 and a smaller predecessor of 3, with the building as a whole fronted by portico 21 (Fig. 8.6). There is no hard evidence for this but all traces of an earlier wall may have vanished when the hypocaust in room 3 was constructed and the addition of rooms 4, 5/5a and 11 may have left no obvious traces. We also reconstructed such a small building for the villa of Hoogeloon-Kerkakkers, although this, too, was hypothetical.[474] However, the initial stage of many villas consisted of only a few rooms in a rectangular building, with a portico along the entire frontage. Gesves, Sauvenière (both B/NA) and Arquennes (B/HT),[475] for example, as well as Hoogeloon, had an arrangement of a central room flanked by two tracts of narrower rooms. It is possible that even the villas of Vaesrade and Houthem-Ravensbosch had this type of plan in a first phase.

8.2.3 A symmetrical villa

A first striking aspect of phase III as presented by Braat – going against his own emphasis on symmetry – is his idea that rooms 8 and 8a (and also 14) were added to the villa and that 18 and 18a were not (Fig. 8.4). It seems more likely that 18 and 18a were constructed simultaneously with 8 and 8a, with 14 as a later addition (Fig. 8.2; 8.5; 8.7). If this really was the case, porticos 21a and 20 must also have been in existence. We will return later to portico 20, after taking a closer look at the main building. Braat wrote the following about the nature of Voerendaal: 'Regarding its core, the large villa had [...] the type of plan of most medium-sized villas in these regions, like those at Lemiers, Vaesrade and Simpelveld and at numerous other sites, not only in Dutch Limburg but also in Gallia Belgica.'[476]

Among the examples from Limburg, Simpelveld seems to have a somewhat exceptional plan, but the other two are indeed representatives of the 'portico villa with corner pavilions/*Eckrisalite*' (Appendix XX, Fig. 13-14). Like Voerendaal, both have a large central room. When Braat published these villas, it was already generally accepted that this room was roofed and was not an open court, an idea put forward by Oelmann.[477] He had already elaborated on this in the publication of Lemiers and Vaasrade,[478] pointing to the *praefurnium* and possible central hearth in room 1 of Voerendaal as indications of a roof.[479] Braat was somewhat obsessed by this subject because he waged a petty battle with his teacher Holwerda, who adhered to the opinion that villas had an open courtyard.[480] It is a known fact that Holwerda had unusual opinions and that Braat questioned them on several occasions.[481] Eickhoff describes how Braat criticized Holwerda's

471 Imagine the chances of discovering e.g. Kerkrade-Holzkuil building 22 (two postholes and a hearth) in narrow trenches only (Tichelman 2005, 52-53; cf. fig. 15.14 in this publication). Furthermore, perhaps Braat's unskilled and unmotivated workers were persuaded to make neat, clean levels everywhere.

472 See further below, section 8.3.

473 No examples are known to us.

474 Hiddink 2014a, 181-185, fig. 8.13; 2015a, 103-105, fig. 10.

475 De Maeyer 1937, 72, fig. 15a-b (Argquennes); Lefert in Brulet 2008, fig. 461 (Gesves); De Maeyer 1937, 59, fig. 8a-b; 72 (Sauvenieres).

476 Braat 1953, 54.

477 Oelmann 1928, 117ff.

478 Braat 1934, 32-37.

479 Braat 1953, 54.

480 Goossens believed that room S at Bocholtz-Vlengendaal was open (1916, 3) but this was more than a decade before Oelmann's publication. Holwerda apparently persisted for decades with the traditional interpretation.

481 Chapter 2, box 1.

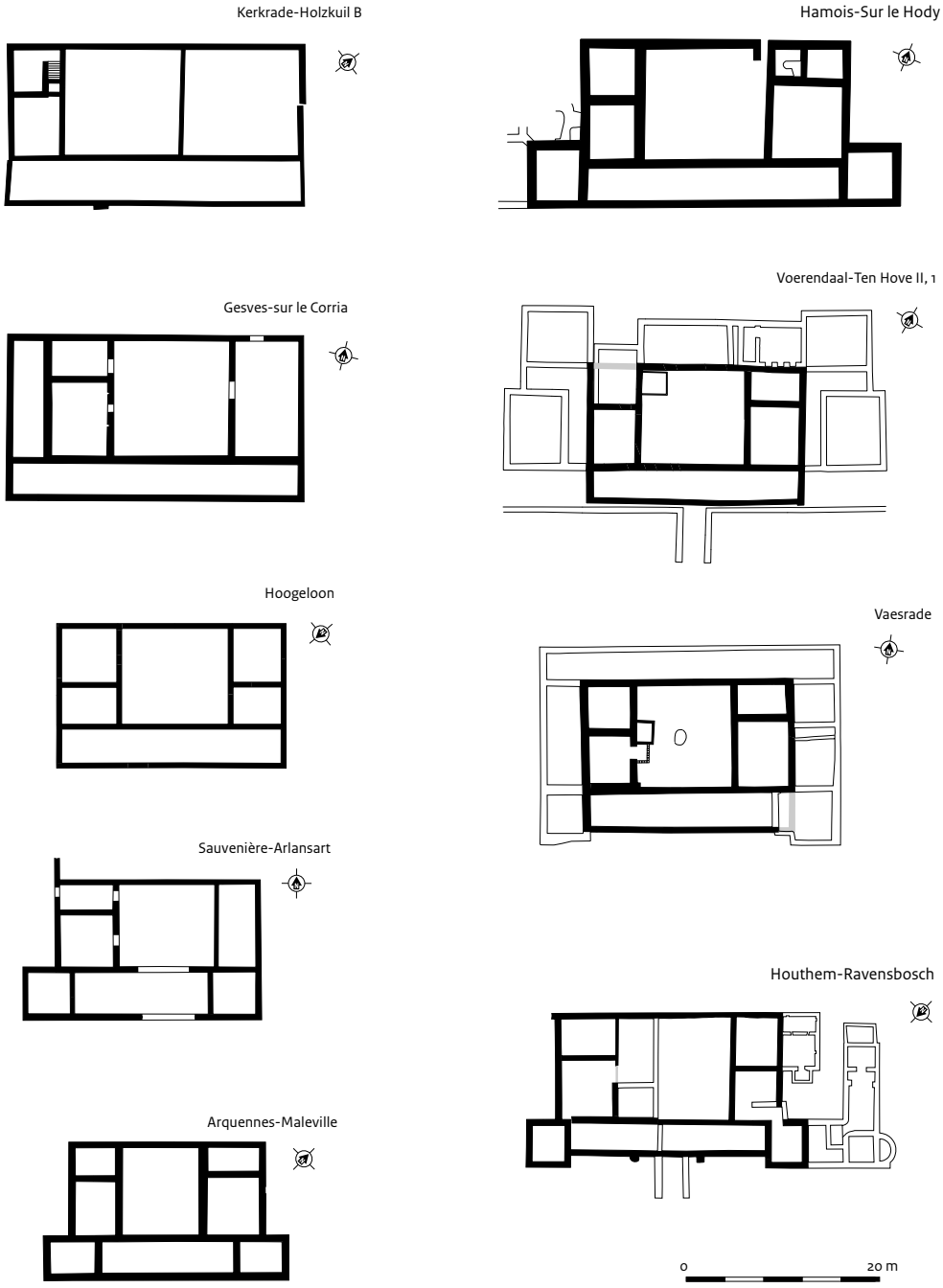


Fig. 8.6 Voerendaal-Ten Hove. Core of the second villa (central and side rooms, portico) with other small buildings for comparison. (source: modified after De Maeyer 1937, fig. 8a-b; 15a-b; Lefert in Brulet 2008, fig. 461; Lefert 2006, 69; Hiddink 2014a, fig. 8.13; Tichelman et al. 2005, 57, fig. 5.2.6; Braat 1934, 29, fig. 19; Remouchamps 1925, fig. 41)

interpretation of an open courtyard during a lecture *New excavations of Roman villas in Limburg* lecture, held in 1934 at the RMO. In 1996 Braat remembered how Holwerda saw this as a personal attack. 'He came the next day and said: "That lecture of yesterday was nice, but it is a blunder on your part to say that the central space was covered, Goossens and myself are no fools." I replied: "But I didn't say that you and Goossens are fools."'[482]

Returning to the corner pavilions, a closer inspection shows that the plan of Voerendaal had an exceptional arrangement. As explained earlier, these pavilions or *Eckrisalite* mostly project slightly forward of the portico and/or the sides of the building. Besides, the portico is always wedged in between the pavilions. At Voerendaal, rooms 8 and 18 do indeed project sideways but are placed *behind* the portico. The design of Bocholtz-Vlengendaal, for example, was modified by moving the front pavilions inwards (to the north) and the remaining stretch of side wall a little outwards (Fig. 8.7, bottom right). We are not aware of any other villa with these characteristics. The only plausible explanation is that room was made for the westward extension of portico 21 (=20) towards the *horreum* and baths, and that this was planned from the start.

Although the smaller first *horreum* and the baths may have been built a few years after the main building, this does not explain why Braat imagined the baths standing in isolation, not connected to the main building during two whole of his phases (II-III). When it rained, the bathers would have been soaked before they even reached the baths! The only possible indication of portico 20 not extending beyond the *horreum* is the short wall in line with the west wall of the latter. However, because these were foundations rather than a wall, it is possible that a passage existed.

8.2.4 The east wing of the villa and later phases

Assuming a certain degree of symmetry, building 405 in the east seems to be the counterpart of the *horreum* in the west. It is possible that there was already an outbuilding in the east before the *horreum* was constructed but, if so, this was a post-built structure (274; Fig. 8.5, phase 3a). It is not clear whether 405 was connected to the main building by a portico from the outset. The position of 'garden wall' 419, ending in line with the east wall of room 8, created a unit comprising the main building, *horreum* and baths, a kind of *pars urbana*.[483] Building 405 (and 401-403) was situated outside this compound, possibly suggesting that there was (initially) no portico leading up to it. A portico east of the main building perhaps made more sense after rooms 9, 10 and building 406 were constructed. All in all, it is feasible that they appeared only at a later stage (phase 3b). Portico 16 to building 405 was less wide than that in the west. Braat saw it in connection with the second *praefurnium* (15b) of room 14. He suggested a wider portico in the preceding phase, in line with portico 20(b) and suggested by one of the wall stubs projecting sideways from building 405. While it would be less logical that the narrower portico, in line with the portico 21 in front of the villa, was the youngest, it is impossible to determine which scenario is correct.

It is clear that heated rooms 12, 13, 14 and probably 19 were later additions to the symmetrical villa of phase 3a. The first three of these rooms are situated at the east side of the main building, together with rooms 9 and 10, which also appear to have been built later. Because tower-like building 407 is probably also a (very) late feature, there seems to have been a gradual shift eastwards of the villa's 'centre of gravity'. Although purely hypothetical, it is possible to envisage that the oldest parts of building 400 deteriorated and were finally no longer maintained, resulting in a 'third villa' to the east (Fig. 8.5, phase 3b; cf. Fig. 16.4).

8.2.5 Some comments on the function of the rooms

Introduction

When looking at the plan of any Roman villa, we often wonder what the building actually looked like (see below) and how we should envisage the decoration, furniture and function of the different rooms. Even the latter question of function is hard to answer, however. Firstly, because we also know nothing about the

[482] Eickhoff 2003, 62.

[483] In archaeological jargon, the terms *pars rustica* and *pars urbana* are often used incorrectly. Originally, the *villa rustica* was more a farm proper, managed by a *vilicus*, and was not the residence of the owner. At the other end of the spectrum, the *villa (sub) urbana* was a residence for the rich in the summer, a kind of 'rural *domus*'. If it had a farming section attached, this was called *pars fructuaria* (Boersma 1969, 300-303), mostly referred to as *pars rustica* in the literature. The villa as an estate was called *fundus*.

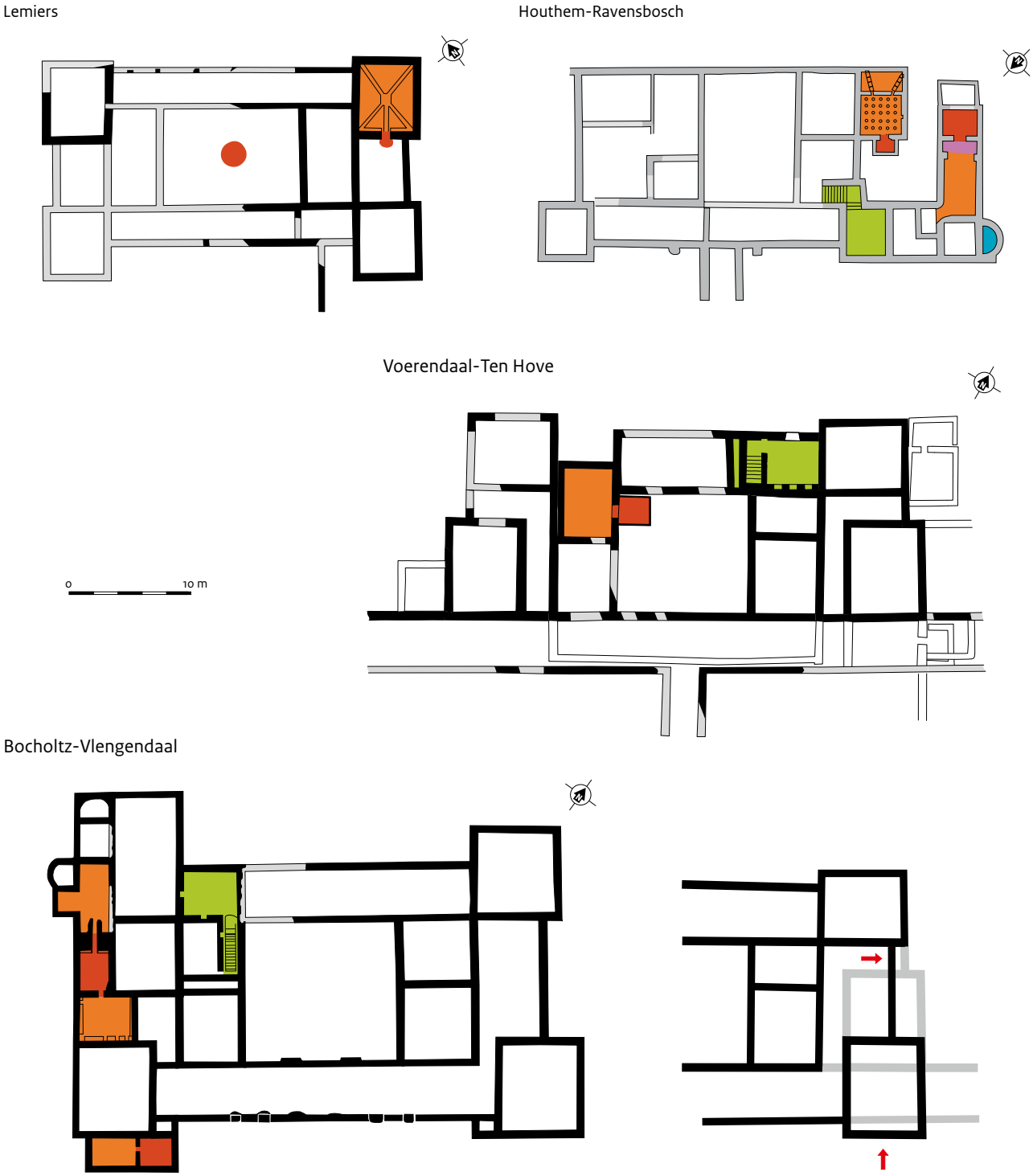


Fig. 8.7 Voerendaal-Ten Hove. The second villa in its most symmetrical form, with other villas with two or four Eckrisalite; for colours of rooms, see figure 8.3. (source: partly modified after Goossens 1916, pl. 5; Remouchamps 1925, fig. 41; Braat 1934, fig. 12)

furniture and usually very little about the decoration – wall paintings, mosaics, marble wall decoration – all we are left with in practice is our knowledge about the presence/absence of heating. A poorly preserved building like Voerendaal provides no clues about the position of doors and thus about how people moved through the rooms. Secondly, most buildings changed through time, as is well illustrated by Voerendaal. The number of rooms, and especially heated rooms, increased, implying that existing rooms changed function. Thirdly, the way the 'Romans' used spaces in residential buildings differed significantly from the way 'we modern people' do. This is illustrated by buildings at Pompeii and Herculaneum, the cities where most data about the use of space were collected.

Perhaps we tend to see both villas and larger city dwellings as a kind of palace or stately home, but they were probably less tidy in reality. In the cities destroyed by Vesuvius, rooms often seem to have had multiple functions and contained 'mixed assemblages' of artefacts.[484] The *atrium* was less of a formal reception hall than one would expect. It was sometimes used for storage and weaving, for example. All kinds of goods and furniture were stored in hallways and *peristylia*. The kitchens are interesting too; in Pompeii they were often quite small and not directly adjacent to the dining rooms.[485] One had to cross the kitchen to reach the latrine, pointing to a different sense of hygiene, or rather, a lack of knowledge about it. At the same time, house shrines were located near kitchens, suggesting that food preparation had religious connotations. Even in large houses with many rooms it is impossible to identify quarters for slaves or servants.[486] Although these could be 'concealed' from identification by archaeologists in attics or outbuildings, there are indications that servants only had improvised beds – removed during the day – in hallways, kitchens or near the door of their masters' bedrooms.

Voerendaal

The function of the large central room in the second villa was already discussed by Braat. As mentioned above, he accepted Oelmann's thesis of the central room as a roofed space.[487] In Voerendaal 400, the same indications were present as at Mayen, a central hearth – although disturbed – and a *praefurnium* for one of the adjoining rooms. Oelmann noted similarities between villas and both the Medieval English hall and historical farms in Lower Saxony, all with a large central space surrounded by smaller rooms. These analogies reveal a picture of the central hall as a multi-functional – and not per se very stately – space. This picture had been presented some years earlier by Steiner, discussing the hall at Bollendorf: '... there is ample space – more than enough for a family with many members to live and work. Agricultural activities such as threshing and more could be carried out here, cattle, tools and carts could be stalled, and crops and fodder stored...'[488] Concerning Voerendaal, Braat commented: 'In the original, simple farm, this central space would still have been a disorderly working space, where the central hearth was used for cooking and doing the washing, where all activities were done typical for those in the kitchen of a large farm, and where the *praefurnium* for room 3 was situated in the open.'[489]

Besides the 'hall', the only rooms in the core of the second villa about which something can be said are cellar 5a and room 3. The former was used for storage, probably not just of foodstuffs but also of valuable goods. The cellar was undoubtedly locked, with access strictly controlled by the villa owners. When it was still the only heated room in the building, room 3 was in all likelihood the most luxurious one, the owners' living room, a dining room where guests were entertained or a combination of both. The narrow L-shaped rooms 8a and 18a were hallways, possibly containing stairwells for accessing a first floor and/or attic. Although the specific functions of the other rooms are unknown, the location of heated rooms 12, 13 and 14 suggests that the private quarters of the owners' family were situated in the east wing of the building, at least in a later phase.[490] Perhaps 14 was a dining room, situated at the front of the building with a view over the garden. Braat suggested that central room 1 may have been tidied up in a later phase: '...rebuilt as a stately *atrium*, giving the interior more the character of a *villa urbana*, more in accordance with the

484 Berry 1997 and especially Allison 2004, 65-90.
485 Foss 1997; Allison 2004, 99-103.
486 George 1997; Joshel 2010, 136-140.
487 Oelmann 1928, 117-130.
488 Steiner 1922, 34-35.
489 Braat 1953, 65.
490 Cf. the 'peripheral' location of the heated room at Hoogeloon-Kerkakkers (Hiddink 2015a, 103, fig. 9).

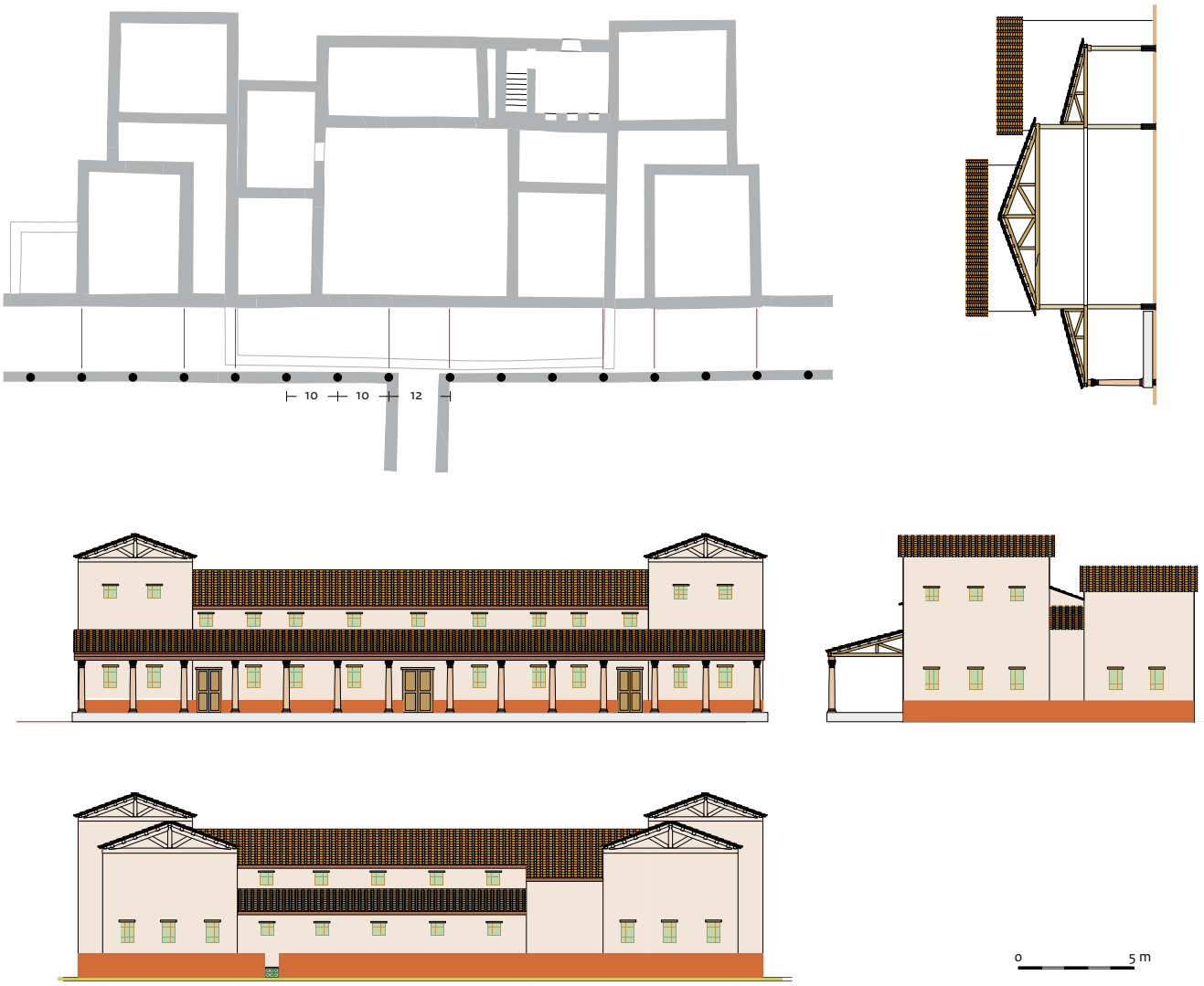


Fig. 8.8 Voerendaal-Ten Hove. Reconstruction of the façade and side of the second villa, section through the central axis; with outlines of the roof-trusses and red lines indicating which columns (more or less) line up with the walls of the building.

suggestion made by the [very broad-HAH] front of the building.'[491] This would imply that the *praefurnium* went out of use and that room 3 was no longer heated. Whatever the case, the addition of more rooms in the course of time could imply that their functions became ever more specific.

8.2.6 Reconstruction of the building

Factors such as the multi-phased development of the building, questions still open as to details and practical issues such as the distortions in the recorded plans pose extra problems for reconstructing the second villa.[492] To keep matters simple, we will only comment here on two main defining features, the portico and roof plan. Regarding the distribution of the columns in the portico, it should preferably match both the width of the first portico 21 (about 72 *p.m.*), the width of the 'symmetrical phase' (about 132 *p.m.*), the interval of columns flanking the stairs or ramp, as well as the remaining distance to the *horreum* and building 405.[493] It is likely that slightly different arrangements were used in the course of time (portico 21 is wider than 20), but only that of the 'symmetrical villa' is worked out in our reconstruction. A spacing of roughly 2.96 m or 10 *p.m.* provides the best fit if the distance between the columns flanking the stairs/

[491] Braat 1953, 65. Of course, his view of the villa's development differs from ours, as he thought that the building was not made symmetrical until a later time.

[492] The reconstruction of the cellar is treated in chapter 43.

[493] On the spacing of columns as an important aspect in reconstructing a villa, see Koster *et al.* 2002, 41ff. (Mook-Plasmolen; Kaalheide-Krichelberg); Hiddink 2014a, 177-182, fig. 8.12 (Hoogeloon-Kerkakkers).

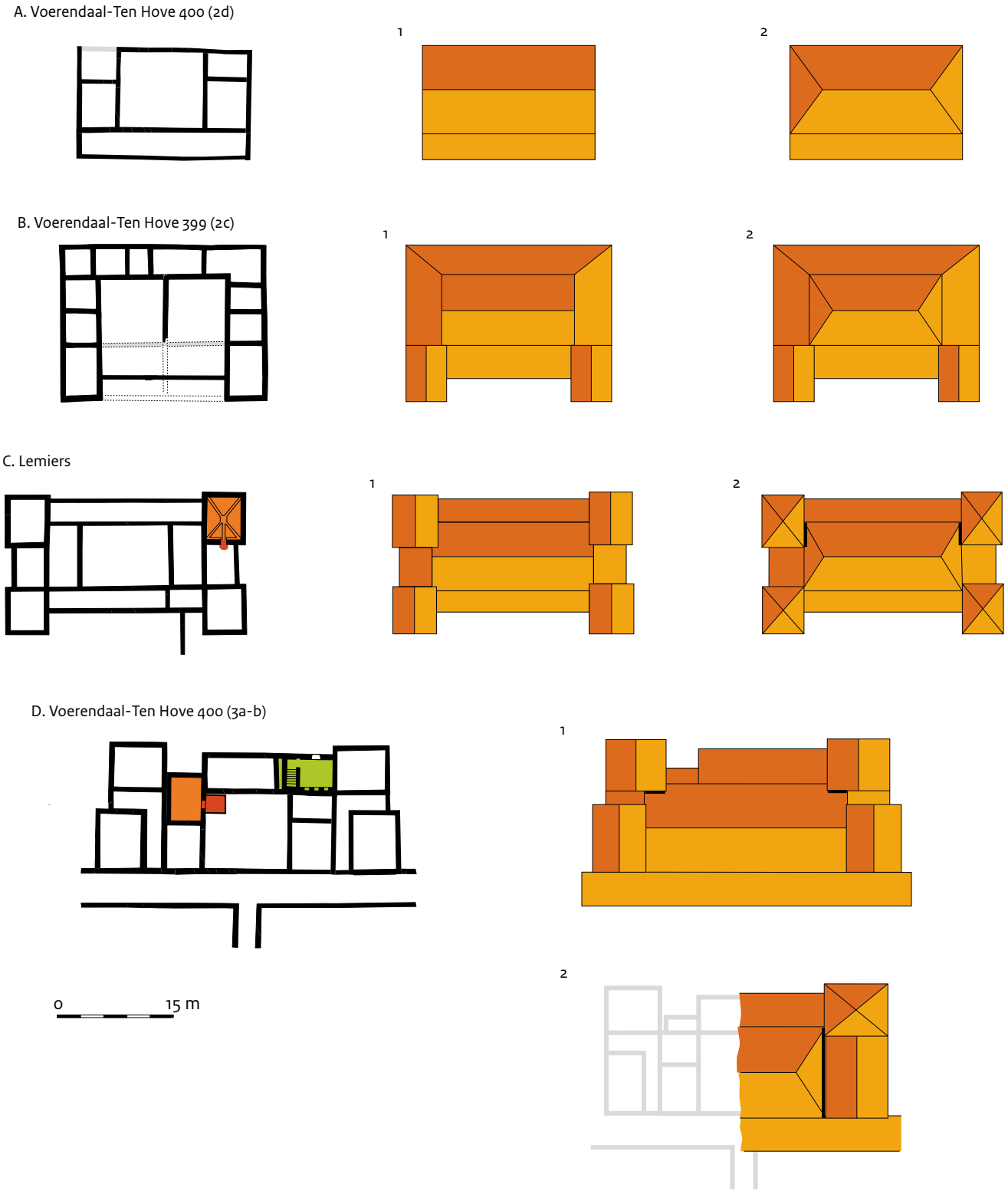


Fig. 8.9 Voerendaal-Ten Hove. Hypothetical roof plans for some phases and that of Lemiers for comparison. (source: Lemiers modified after Braat 1934, fig. 12)
A hypothetical first phase 2d of villa 400 (2 in fig. 8.5), with a gabled (1) or a hipped roof (2) over its core; B first villa 399 with hypothetical back wall of the portico in grey and a gabled or hipped roof (1-2); C Lemiers, with the 'normal' arrangement of four corner pavilions and stretches of valley gutters in case of a hipped roof (2, thick black lines); D the second villa 400 (3 in fig. 8.5) in our reconstruction with short stretches of valley gutter (1) and existing reconstructions on an invented plan with long valley gutters (2).

ramp is made slightly larger: 3.55 m or 12 *p.m.* (Fig. 8.8).

The reconstruction depicts columns of about 10 *p.m.* high with Corinthian capitals. The diameters of the column fragments in Nivelstein sandstone substantiate this kind of height, although smaller columns were also present at the site.[494] The actual capital type is not known. Only one small fragment of a Corinthian or composite column was found and although it is likely to have come from the portico, it could also have been part of the Jupiter column.[495] Therefore, Tuscan capitals in the portico cannot be ruled out. The total height of the portico is that of the columns, 'architrave' and pent roof combined. For the latter and for the other roofs, a slope of between 15 and 25 is used.[496] The total height of the building further depends on the assumption that some rooms at both sides of the central space had a second storey.

Reconstructions of the villa at Ten Hove published in the past have taken a shortcut by ignoring the lesser width of the building north of rooms 8 and 18. The illustrators suggest a reconstruction in which 8/11 and 18/17 have a similar width, 11 and 17 at the back, towering over 8 and 18 at the front (Fig. 8.9D, option 2).[497] As well as distorting the plan of the building, this results in quite a long valley gutter at the boundary between the core and the side wings. It is difficult to come up with a convincing solution for a more realistic roof plan, in which a minimum length of valley gutter is present. One possibility is to cover each of the four corners with their own roof and bring part of the L-shaped rooms 8a/18a under the roof of the core, the remainder under a small pent roof (Fig. 8.9D, option 1).

8.3 Tower-like structure 407

8.3.1 Turmspeicher and other tower-like structures

Structure 407 is situated in the east part of the second main building (Fig. 8.2). Its foundations immediately stand out because of their width of 1-1.4 m, broader than those of three neighbouring rooms to the west. Moreover, with a size of 8.5 x 9.2 m (exterior), it is somewhat larger.[498] The broad foundations were already observed by Habets (Fig. 8.2; 43.18-19). Braat thought that this structure was probably multi-storeyed and he referred to the well-known *Bau* 6 of Köln-Müngersdorf.[499] This structure was interpreted by Fremersdorf as a granary (Fig. 8.10; Appendix XX, Fig. 6).[500] The *Turmspeicher* or 'tower-granary' model had been introduced some years earlier, after the excavation of the villa of Mayen-Im Brasil. This had a small, square attachment to the main building. Oelmann thought that this was a '*turmartige Speicher*' (tower-like granary; Fig. 8.11).[501]

It is interesting to note that Oelmann referred to rather modern (nineteenth-century) examples of silos in Germany on the one hand and tower-like attachments to farms in Italy and Croatia on the other.[502] However, he could also have mentioned numerous examples from the Late Middle Ages and the Early Modern period in his home country of Germany (and for example Austria and the eastern Netherlands). Some of these structures did not differ much from regular barns, although they were sturdy. They had a stone base with a timber-framed superstructure. The largest historical examples were rather impressive towers, almost like castle keeps. Thus the historical tower granaries comprise a wide range of building types, all displaying some measure of might and prosperity, but in practice often a limited suitability for defence. The main purpose of these structures was probably to prevent thieves or marauding parties from gaining easy access to the stored goods, thereby making it possible to negotiate and buy them off, rather than to endure a siege.

Like the historical examples, the archaeological buildings regarded as 'towers' at villa sites also show a large variation. There are two basic problems concerning these structures. The first is that it is sometimes difficult to establish whether a building really was multi-storeyed. The main criterion is that the foundations should be broad and deep,[503] which in practice tends to mean in comparison with those of other buildings at a site. Relatively small foundations do not rule out the presence of more storeys, however, because a building could

[494] See section 33.2.2. The smaller columns could have been placed in e.g. the portico between the *horreum* and baths and/or portico 16 to building 405.

[495] Section 11.2.1. Corinthian capitals were used, applied in e.g. Meerssen-Onderste Herkenberg (Schuermans 1867b, pl. 8; Habets 1871, pl. 8.2).

[496] Hiddink 2014a, 197ff.

[497] This is the case in Bob Brobbel's illustration (in Bloemers *et al.* 1981, 90-91) and the watercolour by Cor van den Braber, former head of the department of monuments, municipality of Amersfoort (in Stuart & De Grooth 1987, 78-79).

[498] For a more detailed description, see chapter 43.

[499] Braat 1953, 59; Mylius 1933, pl. 16,1.

[500] Fremersdorf 1933, 36-37.

[501] Oelmann 1928, 61. Mylius based his reconstruction on Oelmann's ideas: '*Mit dem quadratischen Turm hätte ich jedoch wenig anzufangen gewußt, wenn ich nicht F. Oelmann den Hinweis auf die Speichertürme zu danken hätte.*' (1928, 150).

[502] Oelmann 1928, 61, no. 1.

[503] The depth is often not mentioned in publications and some are quite wide but not particularly deep.

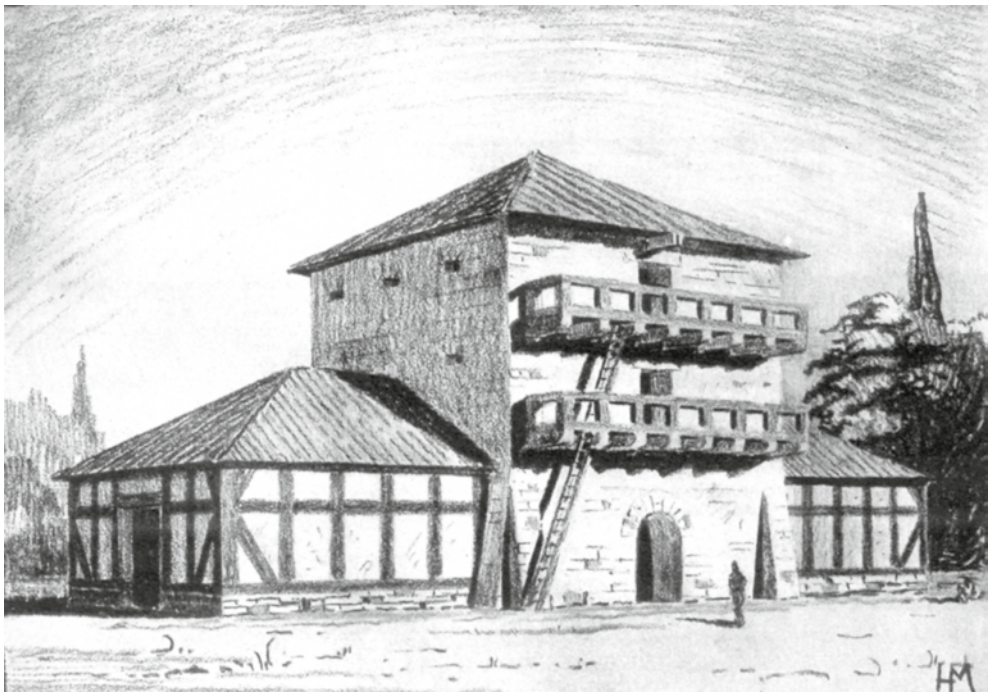


Fig. 8.10 Köln-Müngersdorf. Reconstruction of Bau 6 by Hermann Mylius (source: Mylius 1933, pl. 16.1)

be (partly) timber-framed. The second problem is one that also applies to other kinds of buildings, namely the lack of indications of the function in general. Moreover, a building can be multi-functional and its function can change through time. At present, authors include buildings of totally different sizes, shapes and contexts in the class of tower granaries (sometimes simply called 'towers' as a partial semantic solution). In order to place building 407 of Ten Hove in perspective, we will discuss a number of these 'towers' from a recent inventory by Pellegrino *et al.* (Table *8.1).[504] These examples were found north of a line from Northern France to Luxembourg, and are a phenomenon from the third century AD onwards. In Gallia Narbonensis, for example, tower-like structures existed from the late first century onwards, some with the function of '*belvedère*'.[505]

A first glance at Figures 8.11 and 8.12 instantly shows the considerable variation in the group of supposed tower-like buildings. The smallest examples, with sides of about or just under 5 m, provide an apt illustration of the problems of functional interpretation. Those of Aiseau-Presles (B/HT), Hambach 111, 125 and 132 could have had any possible function. The walls of Hambach 111 *Bau* 3 are quite narrow and it is unlikely that this structure was very high. Hambach 132 *Bau* 2 has quite heavy foundations, but in this case a function as a small shrine or grave monument is more probable.[506] At the villa of Köln-Braunsfeld, one of the *Eckrisalite* had thicker walls. The excavator interpreted it as a mausoleum because two sarcophagi were found inside, but it may originally have functioned as a kind of tower. All the structures mentioned are unimpressive compared to *Bau* 6 of Köln-Müngersdorf, over 12 x 12 m square and with 1.3 wide foundations and buttresses at the corners. Although Hambach 488 *Bau* 9/10 is also quite large, it is unclear why it should be a *Turmspeicher* as its walls were obviously rather thin respective to the overall size of the structure.

The lower part of Figure 8.11 shows the 'tower' of Voerendaal and four other examples of similar size. Although those of Rheinbach-Flerzheim and Froitzheim-Auf der Kohlstraße (D/NRW) have relatively thin walls, both structures were surrounded by ditches. Both were situated near villas and if the buildings inside were really granaries as some authors think, this was

[504] Pellegrino *et al.* 2017, fig. 8; table 1; partly based on a list by Van Ossel (1992, 157). Left out here is Lösnich-Hinterwald, not listed as a tower by Van Ossel; we added a few other interesting examples interpreted as towers by others. For comments on towers in Britain: Perring 2002, 182-183 and a recent discussion, which was published after our text was written, Dodd 2021, 130-141. Tables marked with an asterisk (*) can be found in appendix IX.

[505] Pellegrino *et al.* 2017, 185-188.

[506] Section 11.3.

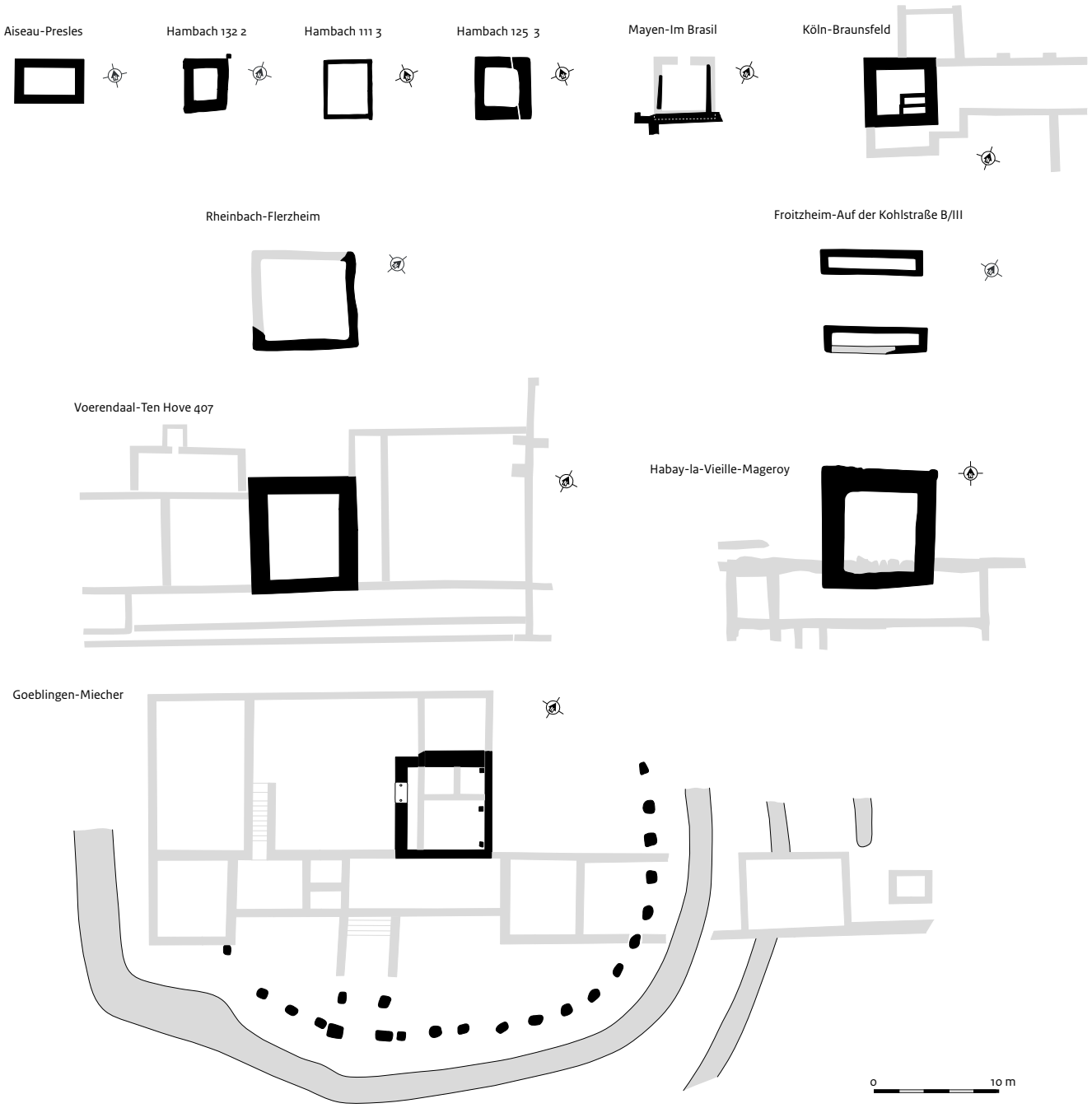


Fig. 8.11 Plans of possible Turmspeicher and other tower-like structures. (source: modified after Herinckx in Brulet 2008, 303-304; Schubert 2016, Befundkatalog; Brüggler 2009, fig. 40; Oelmann 1928, pl. 2; 7; Fremersdorf 1930, 119-121, pl. 29; Gechter 1986, 18; Barfield 1968; Zeippen & Halbardier 2006; Metzler et al. 1973)

probably an additional function, the primary one being that of a watchtower. Our 'tower' at Voerendaal did indeed have quite thick walls and was as large as some other examples. It is not certain whether the adjacent rooms were still used after the tower was 'inserted', implying the (re)construction of part of the roof. The tower could equally have been free-standing but there was no ditch (see below). At Habay-Margeroy (B/LX) other features were found in the immediate surroundings, and probably parts of the earlier main building were also still in use.

At Goeblingen-Miécher (L), a ditch was dug around the tower. This was built both on existing and new walls (in the west). The villa's main building was still in use and the complex was transformed into a kind of *burgus* by adding a palisade and three ditches. During phase 5 of the famous villa of Echternach-Schwarzuecht, a part the east wing was demolished and replaced by a new block of rooms with thick walls. According to the excavators, a function as granary was likely. In this respect, it is important to note that other parts of the villa of Echternach still in use were not as sturdily built.

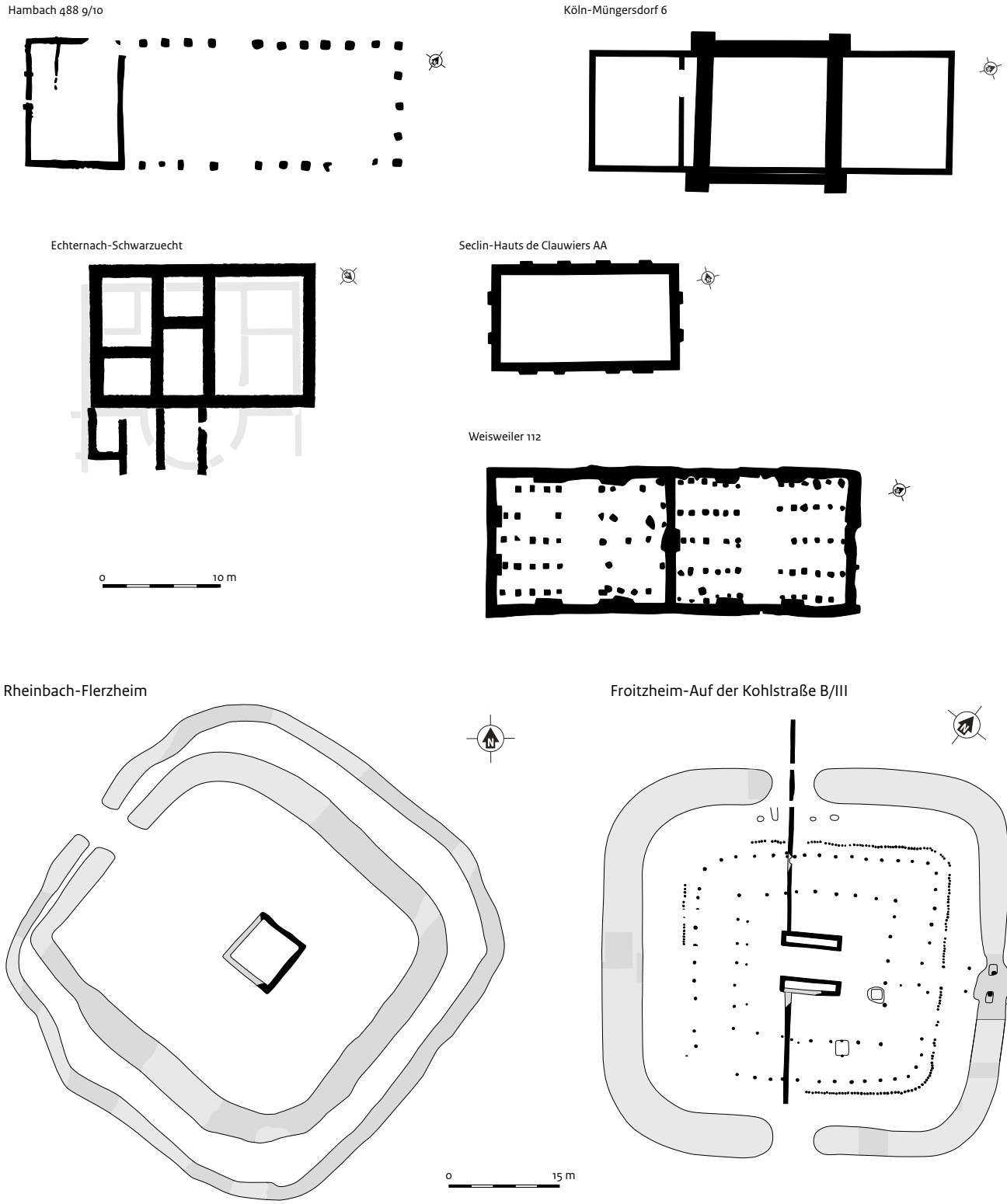


Fig. 8.12 Plans of possible Turmspeicher and other tower-like structures, cont., as well as the towers of Rheinbach and Froitzheim with the associated features. Scale 1:500, burgi 1:800. (source: modified after Schubert 2016, Befundkatalog; Fremersdorf 1933, pl. 9; Metzler et al. 1981, map 2; Révillion et al. 1994, fig. 12; Heimberg 2002/2003, 121, fig. 46; Gechter 1986, 18; Barfield 1968)

Finally, another type of 'tower' should be discussed: granaries proper turned into or built as multi-storey buildings. The excavators of Hauts de Clawiers in Northern France, for instance, reconstructed AA as a high building, a kind of super-*horreum* with small windows and a gabled roof. Although the area where the granary stood was enclosed by ditches and a palisade, these were neither deep nor high. The granary of Weisweiler 112, which will be discussed again in the next chapter,[507] seems to have been converted into a *burgus* proper at a later stage (Fig. 9.6). Another instance is a granary next to the villa of Obermendig-Im Winkel (D/RP).[508] This building was constructed on a hillock, making it suitable for defence; bolt heads found suggest that it actually was used as such. The quantity of pottery indicates that it was inhabited and finds of charred grain prove that the building was indeed used as granary at one stage.[509] A final example was found at the large axial villa of Barmingen-Burmicht (L), where a granary was converted into a small *burgus* by adding a palisade and a ditch. A larger *burgus* was later constructed at the same spot, with a higher wall with towers and a larger ditch.[510]

8.3.2 Function of tower 407

The overview of (possible) tower-like structures illustrates the large variation in this class of buildings, partly the result of too eager an inclusion of a number of small buildings. Their solid construction certainly made larger granaries suitable for transformation into *burgi*. An ongoing function as grain storage is only likely if they were still part of a production villa. However, one wonders whether the towers at Froitzheim and Rheinbach, for example, were able to accommodate a combination of troops, the inhabitants of the nearby villa and a substantial quantity of grain (over and above provisions for a short period). How the tower of Voerendaal functioned remains an even bigger question. Although it was likely a multi-storeyed structure on the basis of its broad foundations and size (comparable to Rheinbach, Flerzheim, Habay and Goeblingen), it was not part of a *burgus* because there was no ditch. If there had been one, substantial stretches of villa 400 and building 405 would have been intersected and removed. This would even have been noticed in the older excavations but there are no indications of this. The absence of a ditch could imply that at least some rooms around the tower were still in use. However, this would have further lessened the tower's usefulness as a defensive building. Setting alight the surrounding structures would have forced the people inside the tower to surrender quickly. As stated earlier regarding the Medieval *Turmspeicher*, the function of this kind of structure was probably primarily to delay small raiding parties, making negotiations possible. If the tower of Voerendaal really was used as a granary, its capacity would have been sufficient to feed the inhabitants for a certain period – some months or a year – in combination with the seed corn for the next season. Obviously, this was far less than the amount stored in the *horrea*, which was intended for sale at the market.[511]

8.3.3 Dating the tower

It is impossible to give an accurate date for building 407. Nothing was found between the stones of its foundations. The material from the intersected kilns 646 and 647 provides a rather early terminus post quem around AD 100. The interval between this time and the actual construction of the tower must have been considerable, also because a location prone to subsidence was chosen. The builders appear to have been unaware of the large features below. The dating evidence for other tower-like structures is also limited. Finds in the foundations of Köln-Müngersdorf 6 only provide a terminus post quem of c. AD 150. The tower at Habay-la-Vieille Mageroy was supposedly built shortly after AD 263,[512] after the buildings of a previous phase were destroyed.

Although Voerendaal 407 was perhaps not a fortlet proper, it makes sense to look at the rural *burgi* in the wider region to gain an impression of the period in which the countryside became less safe. The current view is that the defensive structures along the major roads in Germania inferior/secunda and the north of Gallia Belgica were built in two main phases.[513] The first phase fell during the Imperium Galliarum (AD 260-274),

507 Section 9.3.1.
508 Wenzel 2012.
509 Zerl 2012.
510 Krier 2011.
511 In the order of magnitude of some 25,000 l/7 tonnes for a single storey. If two storeys were available, the capacity was 13% of the large *horreum* 408.
512 It is unclear whether this date is based on coin finds alone.
513 Brulet 1995, 109ff. See also Bogaers & Rüger 1974; Brulet 1990, 122ff. and for the Rhineland Schulzki 2001, 74-78 and Spiegel 2002, 720-724. Germania inferior was called Germania secunda since Diocletian.

while the second started during the reign of Constantine the Great (from 305 onwards). Along the 'Via Belgica', the forts and *burgi* of Morlanwelz I, Liberchies I (both B/HT), Taviers (B/NA), Braives (B/LG) and Hüchelhoven (D/NRW) are considered to belong to the first generation.[514] Brühl on the Köln-Trier road and Heumensoord on the Nijmegen-Tongeren road are also dated to this phase. Other *burgi* of this period include Froitzheim phases B-D, Rheinbach-Flerzheim and Zülpich-Rövenich. The second generation of structures is dated from the Constantinian period onwards, including sites along the Bavay-Köln road such as Givry (F/SeL), Morlanwelz II, Liberchies II, Penteville (B/WB), Valkenburg-Goudsberg and Maastricht. In addition to newly-built sites, others were repaired or rebuilt.[515] Away from the main road, *burgi* at Alsdorf-Bachfeld, Jülich-Kirchberg (WW112) were constructed in the fourth century AD. On the basis of this general chronology, it is possible that the tower at Voerendaal was built shortly after AD 260. However, it may have been built in the (early) fourth century. Many sites are dated by coins, providing only a terminus post quem. If based on just a few coins, this could appear too late as emissions for the periods both before and shortly after the Imperium Galliarum are relatively scarce.

8.4 The baths

The baths of Voerendaal were excavated and published by Braat;[516] only some parts of the drains were reinvestigated in the 1980s. Doth discussed the building in his thesis on the Roman baths in Germania inferior. His analysis differs only in details from that of Braat.[517]
The description of the remains can be found in the catalogue, Chapter 43. Here we will focus on the use of the different rooms, a comparison with other examples, the dating evidence and technical aspects of heating and, in particular, the water supply.

8.4.1 The rooms and their function

General
The bath building of Ten Hove must have been called a *balneum* (*balnea*) or *balineum* by the villa owners. These names were used in the Roman period for both private and public baths, and also applied to the baths at nearby Heerlen, as an inscription shows.[518] The word *thermae* seems to have been used for the largest public baths.[519] Although not in an excellent state of preservation, the baths were well preserved compared with the other stone buildings in Voerendaal.[520] Although parts of some *pilae* in the hypocausts were still in situ (all gone in the main building), only the *suspensura* or upper floor in room 2 was present. No single piece of wall was found above floor level and it is therefore uncertain how and where *tubuli* were applied. Thanks to classical texts and numerous other excavated examples of Roman baths, it is not difficult to interpret some of the rooms in Voerendaal.

Stokeholes or *praefurnia* were present in our bath at both the north and south end of the building in the first phase (Fig. 8.13).[521] Only the latter – although relocated – remained in the second phase and therefore the southern part of room 8 must have been the *caldarium* or hot room. The *alveus* or hot tub must have been situated above the flue. Its position close to the fire helped to keep the water warm, although this was primarily heated in a boiler situated directly over the fire. A metal half-cylinder or *testudo* was sometimes inserted into the back wall of the *alveus* to facilitate the transfer of heat. Both the air and floor of a *caldarium* were quite hot, about 40-50° C, and the visitors often wore wooden sandals (*sculponia*) to avoid being burnt.[522] It is likely that a pedestalled basin or *labrum* provided cool water in the hot room, located in the semi-circular space near the *alveus*.[523] Small bronze bowls with a handle were used to scoop up the water. Like the *caldarium*, the *tepidarium* or warm room was provided with floor and wall heating but was located further away from the fire. In Voerendaal this applies to the northern part of room 8 and to room 9. Braat opted for the latter, Dodt for the former. In our opinion, the narrow part of room 8 is the more

514 The last site poses a problem because it appears to already have been used in the second century and first half of the third century.
515 The idea of a second 'generation' is in some respects not very useful because if the whole fourth century is included, we are dealing with quite a long period. During this time, there would have been several distinct 'phases' or events of repair and rebuilding.
516 Braat 1953, 59-62. Habets also dug here but produced only a partial plan.
517 Dodt 2003, 238-244, no. 17, figs 107-108.
518 Cf. section 4.3.3.
519 Dodt 2003, 16; Yegül 2010, 48-49.
520 For a more detailed description of the remains, see chapter 43.
521 For convenience, the room where the fire was maintained is often called the *praefurnium*, but strictly speaking this term designated only the fireplace and stokehole (Degbomont 1984, 31-33).
522 Cf. the comments on the experiences in a reconstructed Roman bath and modern Turkish baths by Yegül & Couch 2003, 168.
523 Extensions to the *caldarium* could also be extra basins or the location of statues, however.

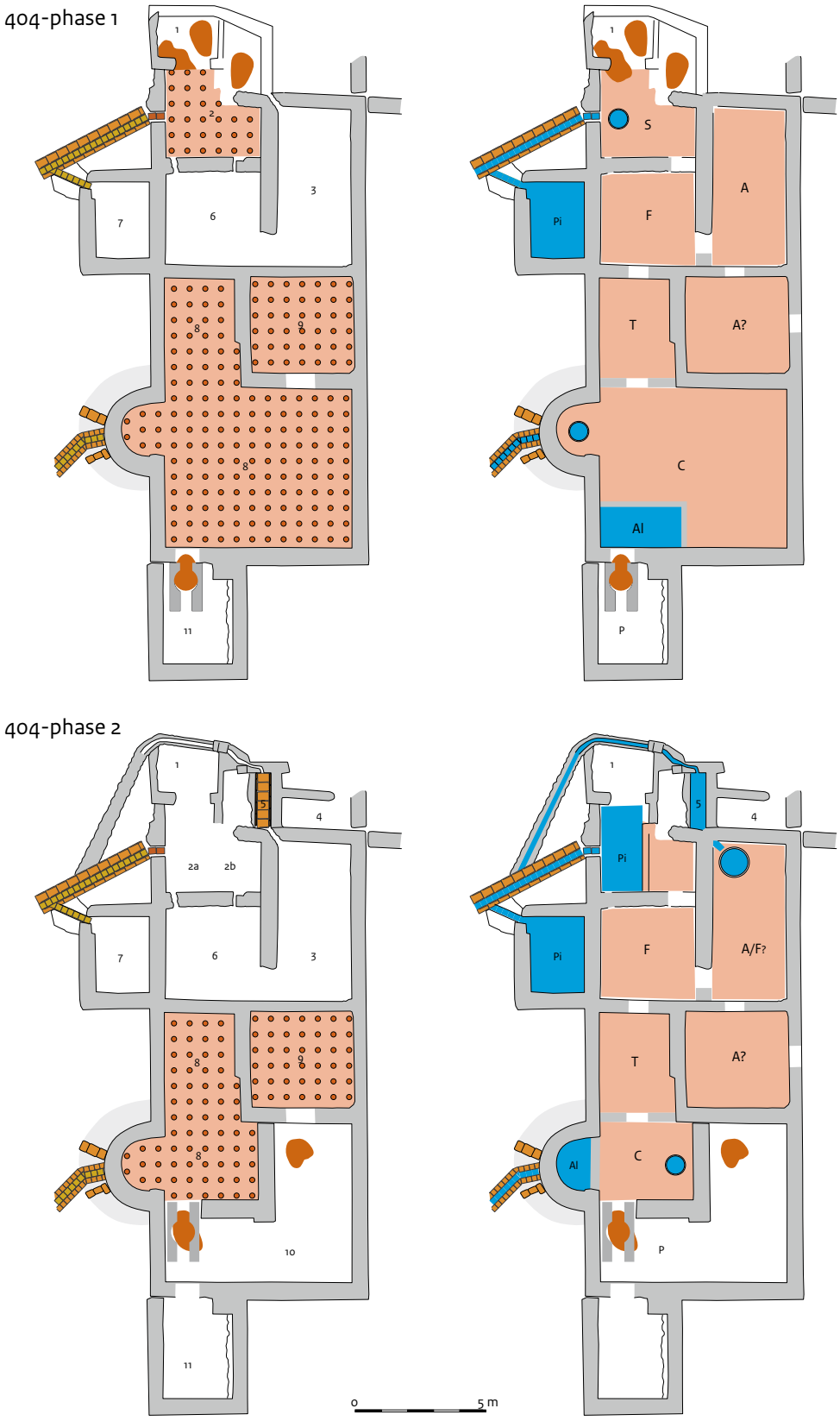


Fig. 8.13 Voerendaal-Ten Hove. The baths, structure 404. Partially reconstructed plans of the foundations and ground-floor level in phase 1 and 2.

likely candidate. It is on the same axis as the *caldarium* and *frigidarium*, and the fact that it was quite small does not present an obstacle, as is shown by other baths. The *tepidarium* with its temperature of 20-30° was designed to acclimatize people before they entered the hot and cold baths and was ideal for rubbing in oil and massaging. Room 6 was the *frigidarium* or cold room. There was no hypocaust and 'room' 7 with a lowered floor was the *piscina* or cold plunging bath. Another heated room was present north of the *frigidarium*, in phase 1. This must have been a *sudatorium* or sweating room,[524] with *praefurnia* at the north side.

As stated above, Braat viewed heated room 9 as the *tepidarium* and, as a consequence, room 3 must have been the *apodyterium* or 'changing room'. This is a likely option because 3 was situated next to the *frigidarium*, where the bath cycle began (but see below). It is possible that 9 was a second, heated *apodyterium*. Most *apodyteria* did not have a hypocaust and they were sometimes even wood-built with a floor of loam, bricks or planks. There are examples of heated *apodyteria*, however. One possible example is Hoogeloon-Kerkakkers, where a large square room (542) of 6 x 6 m seems to have been heated, albeit with a low hypocaust. It was situated between the baths and the rest of the main building and probably gave access to both the *tepidarium* and *frigidarium*.[525] Because of its size, it may have been an *apodyterium* and *triclinium* combined. The same is possible for room 12 at Kerkrade-Holzkuil (approx. 5.8 x 4.4 m).[526] Like both these sites, one of the walls of room 9 at Voerendaal was an outer wall and in theory the doors of a *triclinium* could have been situated there, offering a view to the garden. However, because room 9 measured 3.7 x 3.9 m, it seems rather small for a *triclinium*. Obviously, this does not rule out a function as *apodyterium*, fitted with resting benches and a massage table.

Phase 2

Four alterations or additions to the bath were made in phase 2, obviously not necessarily at the same time: 1) downsizing the *caldarium*, 2) changing the *sudatorium* into a cold bath and 3) adding a toilet. The *caldarium* was made smaller by dividing room 8 by means of an L-shaped wall, thus creating rooms 8 and 10 (Fig. 8.13). The latter became the new *praefurnium*, including a separate stokehole for room 9. It is perhaps needless to say that this change was substantial because a large part of the *suspensura* and tabulation had to be broken away.[527] The new back wall of the *caldarium* had to be inserted precisely, with the connection to the existing (vaulted?) roof possibly the most complex aspect. Moreover, the boiler and all the plumbing had to be disconnected and reinstalled 3 m to the north. Finally, the *alveus* could not be rebuilt directly above the flue because it would have blocked the apse. The latter was probably changed into an *alveus*, while the *labrum* was placed elsewhere in the *caldarium*. At the north side of the baths, half of the floor was removed to create a 40 cm deep basin. The remaining part of the hypocaust was filled up. Changes were possibly needed because of the potentially unstable foundations of room 2. It is also conceivable that the *sudatorium* did not function satisfactorily or was no longer wanted. A third feature of phase 2 is the toilet, consisting of room 4 and a rectangular drain/settling tank 5 under the toilet seat. The room was only 1 m wide, allowing only one person at a time to use the toilet. Because the water running through 'room' 5 came from room 3, Braat thought that a *labrum* or basin was located there; Dodt opted for another *piscina*.[528] The water from the toilet ran through drains 327 and 328. The discharge in the latter was eventually blocked, the only change representing 'phase 3' of the baths.

The fact that drain 5 abutted the walls of room 3 shows that the toilet belonged to phase 2. The eastern short wall of room 4 was in fact the back wall of the portico. Both this wall (61) and wall 62 abutted the northeast corner of room 3 and therefore, according to Braat, the portico should also be considered a feature of phase 2. This is possible, although the baths and portico may simply have been two separate building commissions, executed by two groups of workers. In any event, it is hard to imagine that the baths were not originally connected to the main building or the portico in front of the main building, forcing the bathers to walk more than 100 m without shelter. It is therefore likely that a portico, either of stone or only wood,

[524] The question is ignored here as to whether it was a *sudatorium* proper, with wet steamy heat, or a dry *laconium* (Yegül 2010, 17).

[525] The former possibility is not indicated on plans in Hiddink 2014a.

[526] Tichelman 2005, 81-87. For a further discussion, see Hiddink 2014a, 210; 213-216.

[527] Room 10 received a new rendering with imitation joints (cf. catalogue).

[528] Dodt 2003, 243, fig. 108.

already existed in phase 1 of the baths. If wooden 'columns' were situated at the line of the later stone foundations, they were missed in the excavations.

8.4.2 Type and date of the baths

Types of baths

The bath of Voerendaal can be classified as a bath of the row type or *Reihentyp* because the *caldarium*, *tepidarium* and *frigidarium* are located in a single file. Ideally, the *apodyterium* was located in front of the *frigidarium*, as in the baths at Heerlen (Fig 8.14). However, in most smaller baths this room is situated next to the cold bath. All the baths in Figure 8.14 belong to the 'axial row type', with the three main rooms on the same axis. Voerendaal belongs to a variant in which with the centre of these rooms is not on exactly the same line, '*auf der Mittelachse verschoben*' in German terminology (Fig. 8.15, upper row). Another main type of baths is the block type or *Blocktyp*, where the main rooms form a compact unit, often placed in two rows (Fig. 8.15, middle and bottom row).[529]

Although the difference between row and block type baths seems clear, there is some confusion about the classification of baths. It was caused by Krencker's classification in his famous study of the Kaiserthermen at Trier and other baths in the Roman world.[530] Krencker saw the row type as having a specific circulation pattern (*Benutzungsweg*) and less of a specific elongated shape. Bathers could only enter and leave through the *frigidarium*; after reaching the *caldarium* they had to pass through the other two rooms again. Krencker's other main form was not the block type but the *Ringtyp* (ring type), where visitors arrived back at the *apodyterium* after passing through a series of rooms once (albeit sometimes with shortcuts). If alternative routes through a bath building seem possible, this could result in confusion. The bath of Lemiers, for example, is classified by most authors as a block type but if the *tepidarium* could only be entered via the *frigidarum* and not directly from the *apodyterium*, some would argue that it is an example of a row type (*sensu* Krencker). Likewise, if room 9 in phase 2 at Voerendaal gave access to both rooms 3 and 9 (the *tepidarium*), alternative circuits were possible and the building could not be considered an example of the row type proper. Because we have no clues about the locations of doors, this question remains unsolved.

Dating the types and specific features

It is difficult to date specific bath buildings – especially small, less monumental private ones – on the basis of whether they belonged to either the row or the block type. Both types were built throughout the Early and Middle Roman period.[531] Based on the dating of 'smaller baths' in Germania inferior, as discussed by Dodt, it seems that the row type became less popular around the middle of the second century AD, while the block type and baths without a *tepidarium* became more prominent in the course of time (Table 8.2).[532] However, the 'statistical' basis for this conclusion is quite small. Dodt includes in the group of 'smaller baths' not only examples from villas and urban private houses, but also smaller baths from cities (Forum Hadriani-Voorburg; Xanten-Herbergsthermen), *vici* (Zülpich) and army camps (Xanten/*Vetera* I-Lazarettbad, Krefeld-Gellep/*Gelduba*, Neuss-*castellum*). The baths of the three last site types have a more 'public' character and are therefore better grouped together with large baths like those of Heerlen, Xanten-Große Thermen and Neuss-*castra*. The fact that all these baths belong to the row type[533] could have related to a more 'internationally' inspired architecture than that of villa baths.

At first sight, Table 8.2 appears to confirm that the row type was relatively early and that the chronological 'centre of gravity' of the other types occurred later. We are not denying that there is some truth in this, or pretend that we are able to give more precise dates. However, some comments must be made. The date of some baths of the row type is not independent of, but rather derived from, the – assumed – construction of the villa as such. It is important to bear in mind that many baths were added later (Bocholtz-Vlengendaal, Houthem-Ravensbosch, Stolberg-Propsteier Wald).[534] Doth based the date of Stolberg on that of Bocholtz, while both baths are quite similar. Some of the baths may in reality have been of a later date

[529] The block type is defined in this way by, for example, Heinz (1979, 28-29). '*Unter dem Blocktyp ist die Zusammenfassung der Räume zu einem möglichst in sich geschlossenen Baukörper zu verstehen. Das geschieht durch die Anlage von Raumreihen, in deren einem meist Heizraum und Caldarium, in der anderen Tepidarium und Frigidarium untergebracht sind.*'

[530] Krencker 1929, 177ff.

[531] In Baden-Württemberg, the block type is even considered the oldest type, although the first examples of the row type are barely younger (Heinz 1979, 28-31).

[532] Dodt 2003, 158-159.

[533] White 1999.

[534] Nothing was excavated of the main building of Köln-Vogelsang and therefore the relationship between bath and villa is unknown.

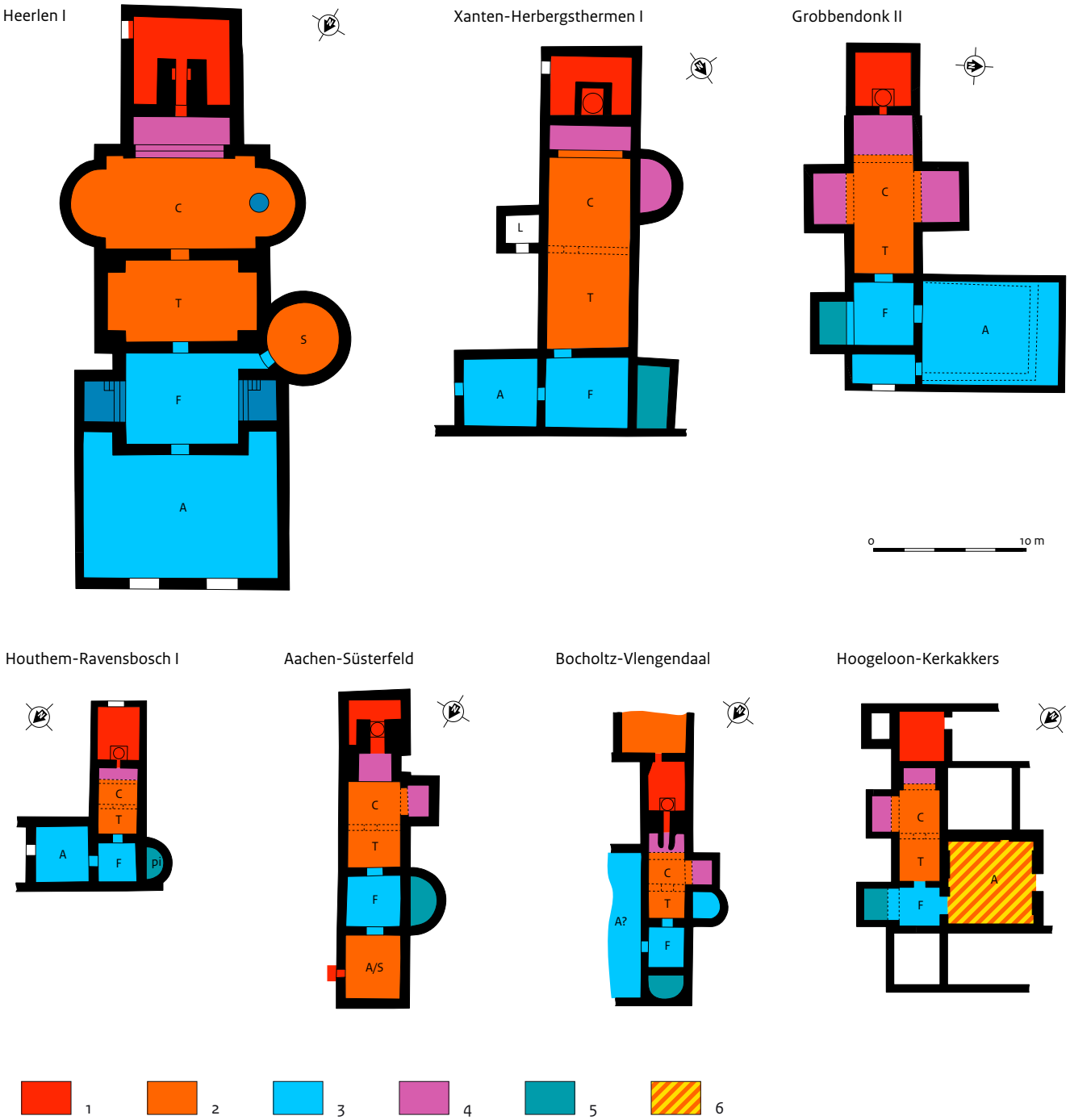
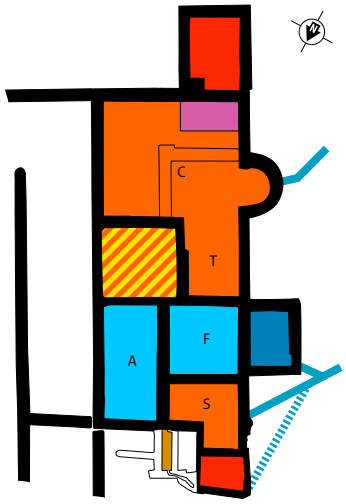


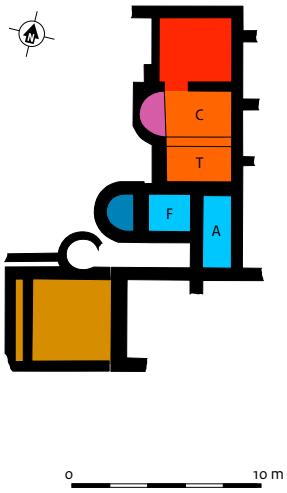
Fig. 8.14 Simplified plans of a number of baths from the row type from cities/vici (upper row) and villas (lower row).(source: modified after Van Giffen 1948, pl. 3, 5; Vos & Jeneson 2020; De Boe 1977, fig. 20; 22; Dodt 2003, fig. 89; 103, 105, 109; Hiddink 2014a, pl. 36)

1 praefurnia; 2 heated rooms; 3 unheated rooms; 4 warm alvei/basins; 5 cold piscinae/labra/basins; 6 heated rooms used as apodyteria, dining rooms etc.

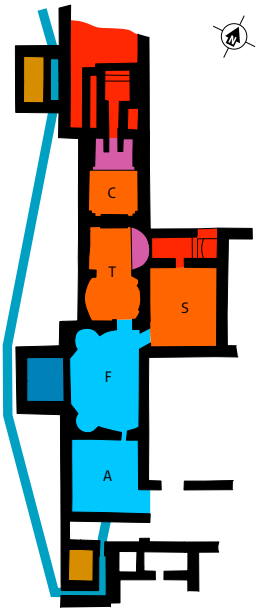
Voerendaal-Ten Hove I



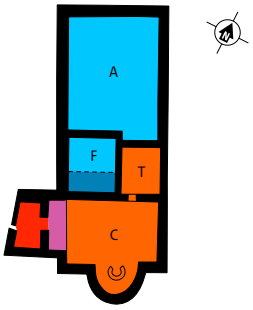
Stolberg-Propsteier Wald



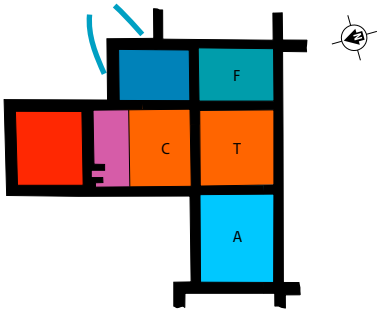
Lürken I



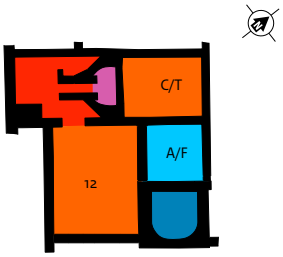
Lemiers



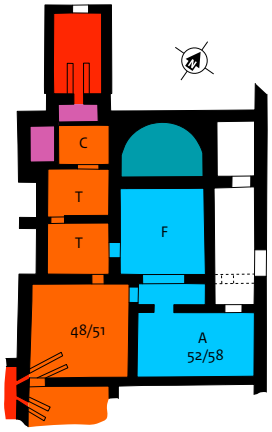
Köln-Müngersdorf 5



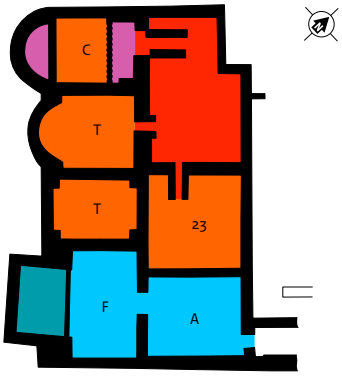
Kerkrade-Holzkuil C



Blankenheim II



Bad Neuenahr-Ahrweiler II



Newel I

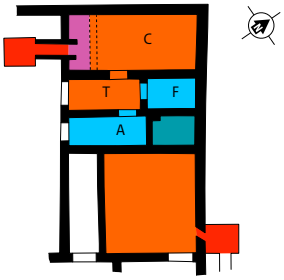


Fig. 8.15 Baths of the row type with rooms not on a single axis (upper row) and examples of block type baths; for legend, see fig. 8.14. (source: modified after Dodt 2003, fig. 104; Kretzschmer 1981, fig. 26; Braat 1934, fig. 12; Fremersdorf 1933, pl. 4; 6; Tichelman 2005, fig. 5.2.21; Oelmann 1916, pl. 13; Fehr 2003, map 2; Cüppers & Neyses 1971, fig. 2)

Table 8.2. Dates of baths of villas and town houses according to Doth; Hoogeloon (Hiddink 2014), Kerkrade (Tichelman 2005) and Inden-Altdorf (Dodt & Päffgen 2004) added.

Period	N rowtype	Sites	N blockt.	Sites	N no tepid.	Sites
IB	3	11 Bad Neuenahr	1	20 Lemiers	2	38 Köln-Cäcilienstr.
		12 Köln-Vogelsang				00 Inden-Altdorf
		37 Köln-Benesisstr.				
II	1	18 Aachen-Süsterfeld			2	29 Übach-Palenberg
						30 Hambach 206
IIA	6	13 Lürken-Alte Burg	2	21 Friesdorf	1	28 Hambach 132
		14 Bocholtz-V'daal		22 Hambach 59		
		15 Stolberg-Prop'wald				
		16 Valkenb-Ravensb				
		17 Voerendaal				
		40 Xanten-insul. 19				
IIB	1	00 Hoogeloon	4	23 Blankenheim	1	00 Kerkrade-Holzkl
				24 Leudersdorf		
				25 Euskirchen-Krzw		
				27 Gerolstein		
III	1	19 Ahrweiler-Bahnhof	1	26 Köln-Müngersdf	1	32 Üxheim-Ahhütte
Total	**12**		**8**		**7**	

than indicated in the table. Concerning the block-type baths of the second half of the second century, it is striking that all four are in the same region (the Nordeifel). Perhaps the researchers there tended to date the buildings somewhat too late or the type is more specific to that region.

More useful perhaps for dating purposes is the shape of the '*exedra*' in the *caldarium*. A second niche or annex is often found next to or opposite the niche in which the *alveus* was located. In early baths, it had a semi-circular shape and was intended as a *labrum*. A nice example is found at Lemiers, where the base of the *labrum* was found. Larger baths, like that of Heerlen, had two *exedrae* opposite each other, one of which had a *labrum* inside (Fig. 8.14). It seems that large(r) public and military baths were no longer equipped with *labra* after the early Flavian period.[535] In later buildings of this class, the opposing semi-circular *exedra* were often rectangular. Although developments in the design of large public baths were probably not directly reflected in smaller villa baths, it appears that only rectangular *exedrae* or niches were constructed later in time. These did not accommodate a *labrum*, but a second warm basin. At Voerendaal, the semi-circular *exedra* was not altered in the second phase, but functioned as the *alveus*. A number of dated baths – some of the block type – suggest that semi-circular niches had fallen 'out of fashion' in around AD 125 (Table 8.3; Fig. 8.14). One of the youngest examples in our table are the Herbergsthermen at Xanten, constructed c. AD 135.

8.4.3 Water supply and drainage. Reconstruction of the baths

Water lines, basins and drains

During both phases, the baths had a *praefurnium* at the south side, no doubt with a boiler over the flue feeding hot water to the *alveus*.[536] The boiler would have contained around 200-300 l of water. To have cold water at hand to mix with the hot water, as well to prevent serious damage to the lead or copper boiler if the supply from outside

[535] White 1999, 229-231.

[536] As well as on the remains found at Ten Hove (chapter 43), this section is based on the discussion about the baths of Hoogeloon-Kerkakkers (Hiddink 2014a, 216-222), with more references regarding *alvei, boilers*, etc.

Table 8.3. Examples of 'dated' baths with semi-circular (SC) or rectangular (RT) niches; some of the block-type, some from cities, vici and army camps.

Niche-shape	N niches	Site	Date	Remarks	References
SC	1	Bad Neuenahr-Ahrweiler II (D/RP)	IB		Fehr 2003, 20-26, plan 2
SC	1	Vetera I-Lazarettbad (D/NRW)	60-70		Dodt 2003, no. 8
SC	1	Borg I (D/SL)	Ic	2nd phase SC niche removed	Brück 1997, 60-64
SC	1	Gelduba/Krefeld-Gellep (D/NRW)	Flavian		Dodt 2003, no. 9
SC	1	Lemiers (N/L)	(Flavian)	bath not specifically dated	Braat 1934, 26-28
SC	2	Haccourt II-III (B/LG)	c. 100 AD		De Boe 1974, 45-50
SC	1	Voerendaal-Ten Hove	(IIa)		Braat 1953
SC	1	Stolberg-Propsteier Wald (D/NRW)	(IIA)	appears to be later addition	Dodt 2003, no. 15
SC	1	Xanten-Herbergsthermen (D/NRW)	ca. 135		Dodt 2003, no. 3
RT	1	Aachen-Süsterfeld(D/NRW)	(II)		Dodt 2003, no. 18
RT	1	Bocholtz-Vlengendaal (N/L)	(begin II)	appears to be later addition	Dodt 2002, no. 14
RT	1	Zülpich (D/NRW)	IIb		Dodt 2003
RT	2	Forum Hadriani (N/ZH)	ca. 125 AD		Buijtendorp 2010, 534-546
RT	2	Grobbendonk (B/LI)	ca. 125 AD		De Boe 1977, 36-40
RT	2	Haccourt IV-V (B/LG)	middle II		De Boe 1976
RT	1	Blankenheim II (D/NRW)	middle II		Dodt 2003, no. 23; Oelmann 1916, 223-225
RT	1	Hoogeloon-Kerkakkers (N/NB)	ca. 180 AD		Hiddink 2014

the building stagnated, there would have been a water tank with a capacity of some 300-400 l.

The *alveus* or hot bath of phase 1 was situated at the exit of the flue, perhaps with a *testudo* for extra heating. The *alveus* would have contained some 800-1200 l of water, constantly or regularly supplied with fresh hot water to maintain the temperature and compensate for water spilt over the edge. When the *caldarium* was made smaller in phase 2, the apsidal room was probably transformed into an *alveus* with some 600 l of water. The bottom of the basin was no longer directly above the (exit of) the flue, perhaps less of a problem because of the reduction in size. The *labrum* was originally close to the water inlet and storage tank of the baths and may have been supplied from there.

Because the *piscina* (room 7) was situated along the supply line from the aqueduct and/or well, it seems logical that it was filled directly by a branch of the main supply. Without a valve, however, too little water may have reached the storage tank and boiler. It is therefore more likely that all the water used came from the south end of the building. The *piscina*, a feature of both phases 1 and 2, contained some 3,650 l. Another 1,450 l of cold water was needed in phase 2, after half of room 2 was transformed into a second basin. A toilet was added at the same (?) time, also requiring a constant water supply. Whether the water overflowing from a *labrum* or basin in room 3 was sufficient is the question; perhaps the toilet had a separate water line.

In total, some 5,000-6,000 l of water was needed to fill the features of the baths in phase 1, to which some 1,000 l were added in phase 2. If this amount of water had to come from well 314, 500-700 buckets would be needed, not counting extra water during the operation of the baths. Therefore, the well was likely fitted with a pump

Fig. 8.16 Voerendaal-Ten Hove. Reconstruction of the exterior of the baths with outlines of the roof trusses and in the south façade an indication of the level of the upper hypocaust floor and the top of barrel vaults.

or other water-lifting device.[537] Later, when the baths were supplied with water from the aqueduct, they would theoretically have been filled after 7 to 25 min.[538] Although matters may have been more complicated in practice, the aqueduct would have supplied ample water, also to supplement the spillage. It is clear where dirty water left the building: through drains 327-330. The first was connected to the toilet, the others close to the basin in room 2, the *piscina* and the *alveus*. These basins would have been fitted with a plug in the floor to discharge dirty water. The floors of the rooms must also have had drains covered with gratings or square stone slabs with holes for the discharge of spillage.

Reconstruction of the building

Concerning the exterior of the building, several reconstruction options exist. It may have had different roofs – like a lower one above the unheated rooms in the north – each of a different height, or it could also have been treated as a single block to make it resemble building 402 at the opposite side of the yard (Fig. 8.16). At least the main *praefurnium* in the south (with the boiler) was situated in a separate room and the apsis in the *caldarium* and the *piscina* in room 7 would have protruded from the west wall. We do not know exactly what the portico looked like, although the interval between the columns was probably not too similar to that in front of the main building. At least the relief had to be taken into account because the baths were situated about one metre below the *horreum*. The *caldarium* of phase 1 was a relatively large room, with a width of some 7 m. If covered by a barrel vault, its top would have been 6 m above floor level (with the base of the roof trusses slightly higher). The resulting large room volume was probably the reason why the *caldarium* could not be sufficiently heated. Perhaps this problem was solved, even in the first phase, by dividing the ceiling into two parts. However, the preserved remains provide no clues, nor are there any on the wall between the southern and northern part of room 8 (*caldarium-tepidarium*). Finds of *tubuli* shaped to form curves and a *tegula* with a central hole suggest that the flue gasses were vented through the roof, although it is unclear how exactly this was done.[539]

[537] Section 10.2.4.
[538] Section 10.3.3.
[539] Cf. sections 32.4.1 and 32.4.5.

9 Buildings and features of the villa related to agriculture and industry

Henk Hiddink

This chapter discusses the structures related to agricultural production, starting with the farm buildings (Section 9.1-5). Features related to other kinds of production, such as kilns or hearths and lime pits, will also be dealt with (Section 9.6-7).

9.1 The plans, dimensions and construction of the stone buildings

9.1.1 Dimensions

Before addressing the question of function, we will comment on the dimensions and construction of both the stone and earlier timber outbuildings at Voerendaal (Fig. 9.1-9.3).[540]

All outbuildings were rectangular. A striking feature of the stone buildings are the projections of the walls at certain points. For now, we will call them buttresses, as is generally done in the literature. Later, we will discuss their exact function. It is important to stress that some of them were not actually excavated, but were reconstructed to Figure 9.2. Inspired by Habets' observations, many were reconstructed, especially in building 405.[541]

For the stone buildings, it is easy to translate their metrical dimensions into Roman feet or *pedes monetales* (approx. 29.6 cm). The regular plan of 403, for instance, is 40 *p.m.* wide and probably 96 *p.m.* long (Fig. 9.2). This last reservation stems from the fact that the position of the 2005 trenches, and therefore the length of

[540] The stone buildings are described in chapter 43; the post-built structures in chapter 82, as well as in chapter 6.

[541] See the descriptions in the catalogue for more details.

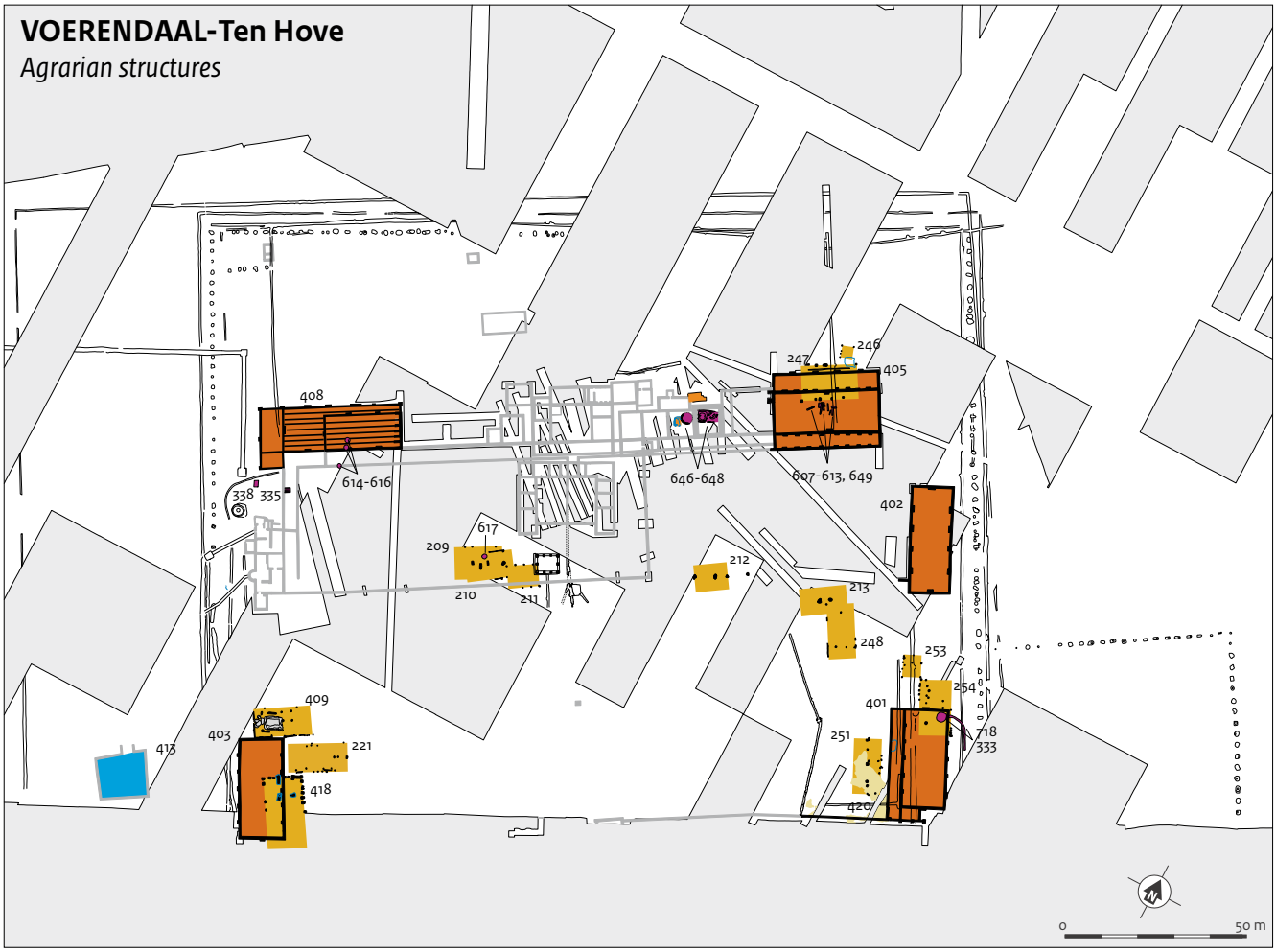


Fig. 9.1 Voerendaal-Ten Hove. Features discussed in this chapter; post-built in orange; stone-built in red.

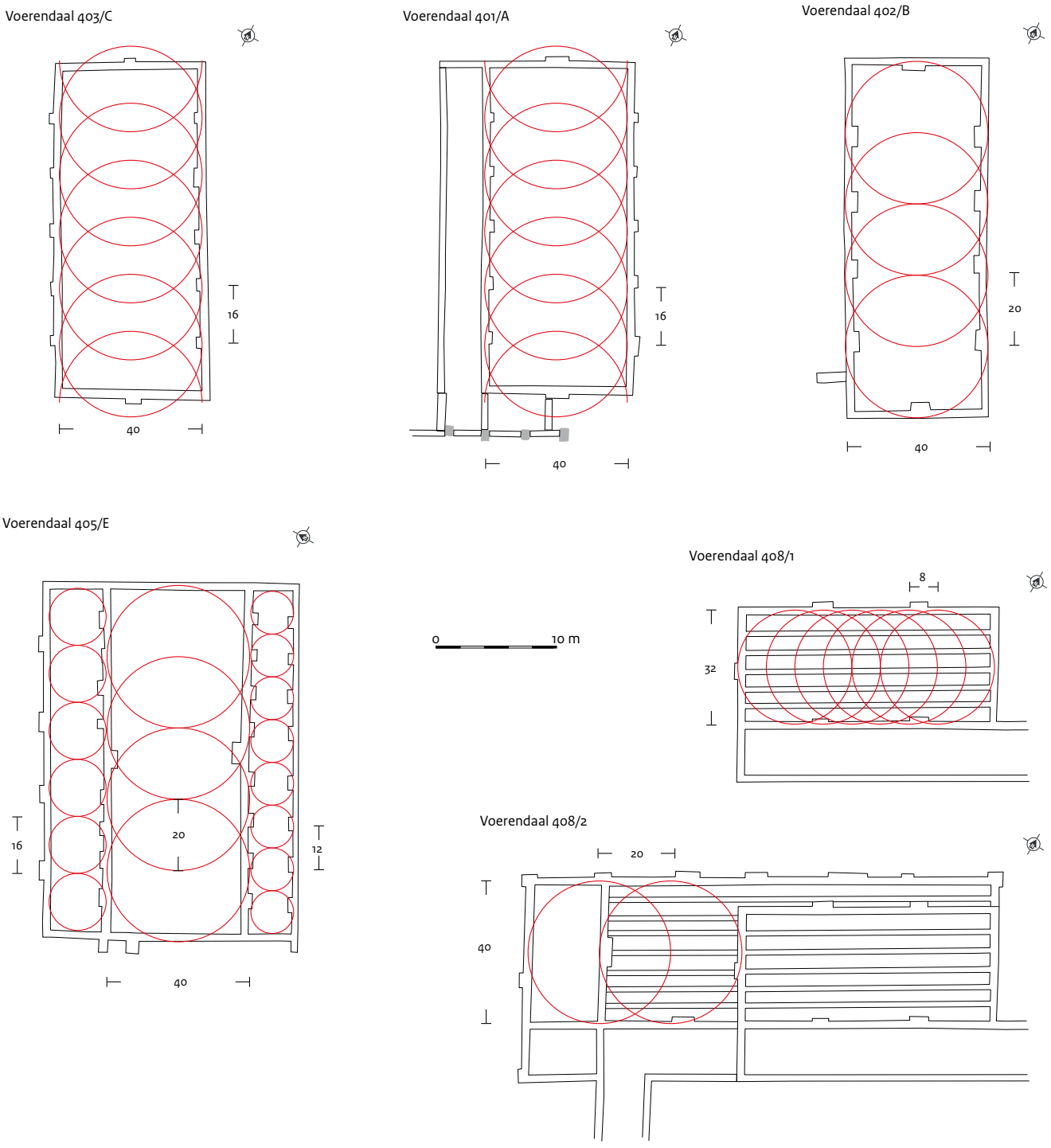


Fig. 9.2 Voerendaal-Ten Hove. The stone outbuildings with the units (sizes in pedes monetalis) possibly used in surveying indicated by circles.

the building, is not exactly known.[542]
The buttresses and the short walls are some 16 *p.m.* apart – 2/5 of the width of the building – and with six 'bays' of 16 *p.m.* the total length would be 96 *p.m.*. The core of building 401, opposite 403 in the southern part of the yard, has almost the exact same width and intervals between the buttresses. The overall length is somewhat less, around 92 *p.m.*. Building 402 also appears to be based on a 40 *p.m.* module, although it is slightly narrower than 403, and the width refers to the outside rather than to the centre of the walls. The buttresses and short walls are – on average – 20 *p.m.* apart in this case, resulting in a length of 100 *p.m.*. Building 405 has a core of the same size as that of 402. The centre of the buttresses in the core and in the passage at the south side is approx. 10 *p.m.* (if our highly hypothetical reconstruction is correct).
The passage could have been based on modules of 12 *p.m.*, with eight of these totalling 96 *p.m.*, the length of the building in the interior.
The northern passage has a width of about 16 *p.m.*, which multiplied by six also totals 96 *p.m.*.
In its first phase, the dimensions of the *horreum* seem to be based on a module of 32 *p.m.*, 4 times 8 *p.m.*. This was the width of the building; its length was 72 *p.m.*, which is 9 times 8 *p.m.*.
The pads in the long walls are not all located in line with the centre of the 32 *p.m.* circles.
When rebuilt, the structure was given a width of 40 *p.m.* and was made about 60 *p.m.* longer. Measured between the interior faces of the short walls, the length was now about 128 *p.m.* or 16 times 8 *p.m.*. Again, the pads were not placed in line with the circles; the portico was 12 *p.m.* wide, like the south aisle of 405. The final stone building is 410. It differs from the rest because it has no buttresses and is located behind the villa. It may not have had an 'economic' function.[543]
Its dimensions are approx. 20 x 40 *p.m.*.
The possible dimensioning of the timber-built outbuildings in *pedes monetales* has already been dealt with in Chapter 6, and we will simply repeat here that for most outbuildings there is no definite proof that Roman feet were used.

9.1.2 Constructional aspects

A closer look at the position and dimensions of the 'buttresses' in the stone buildings suggests that these were not buttresses proper (Fig. 9.3).[544] Firstly, many project into the interior of the buildings (cf. below), a position quite useless for buttresses designed to counteract the outward-directed load of the roof and walls known as 'thrust' (Dutch *spatkracht*).[545] Secondly, the projections at Voerendaal are quite slender for wall supports. Buttresses are ideally quite wide at ground level, becoming smaller higher up. An example of buildings with proper buttresses are the *horrea* at High Rochester, shown in Figure 9.6. An alternative function of wall projections, although only if all were pointing inwards like those in our building 402 or Champion building C', could be that of floor supports (Fig. 9.3).[546] In theory, the pads could even support a kind of independent framework inside the building, used as a first floor.

Concerning the location of the pads/projections in buildings 401, 402 and 403 at Ten Hove, there is a remarkable similarity to a series of villa outbuildings with dug-in wooden posts. The largest barn of Hamois-Le Hody (B/NA), for example, has a plan exactly identical to building 402, with posts at the positions of the projections in our building (Fig. 9.3).[547] A barn at the villa of Dilbeek-Wolsemveld (B/VB) is also identical in this respect.[548] Other examples of this building type are smaller, with three or two pairs of posts in the long walls (cf. Champion C' in Fig. 9.3 and some of the post-built structures in Fig. 15.10). These smaller buildings were used both as barns and houses, and were very common throughout Belgium.[549] The noted similarities suggest that our buildings had a framework of wood, with the posts placed on stone pads rather than dug in. The stonework would have been raised to about a metre above ground level, to prevent damage to the walls by drip water. A number of questions still remain. Firstly, it would make more sense if the pads/projections all pointed inwards, shielding the posts from the elements. Secondly, there was no need at all for slender 'pseudo-buttresses' as even wooden walls (the main posts fixed in sill beams with diagonal braces between them)

[542] The plans of some other buildings, especially 403, 405 and the *horrea*, are somewhat distorted, caused by the deviations between the real and documented locations of trenches and foundations. It therefore seems wise not to attempt a highly detailed analysis of the dimensions of the buildings. We also ignore questions about the exact method of surveying in the Roman period.
[543] See further section 11.3.1.
[544] For a – rather lengthy and sometimes superfluous – discussion on the function of these projections, see Schubert 2016, 366ff.
[545] While the inward movement of the walls is prevented by the roof construction.
[546] Schubert 2016, 373-375. Also buildings with projections pointing both inwards and outwards in the same wall (to a greater extent than in Ten Hove 405), e.g. at Seclin-Hauts de Clauwiers P/Y, Cysoing-Clos de l'Abbaye A and Mérignies-golf de la Pévèle 2 (Ferdière 2017, 29, fig. 2).
[547] Léfert 2006, 69; Léfert & Bausier 2011, 95, fig. 6.
[548] Weterings 2017, 10.
[549] Examples in Lefert & Bausier 2011, fig. 6 (Condroz); De Clercq 2009, chapter 10 (Flanders); Hiddink 2018a, esp. 45 (Haacht with references). On the sandy soils of the Campine, there are examples in Bree and Reusel (Hiddink 2017, 52-54).

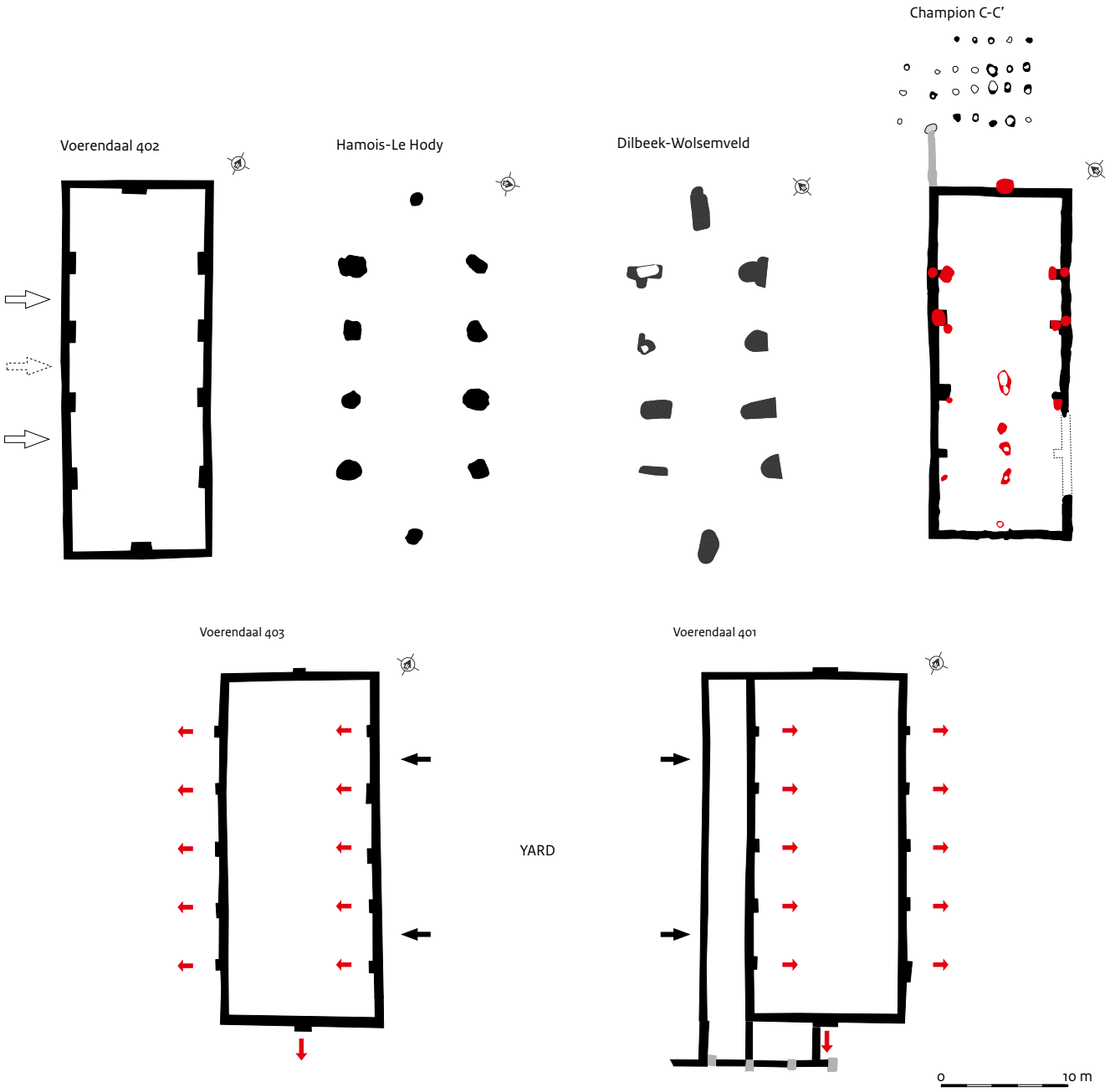


Fig. 9.3 Voerendaal-Ten Hove. The plans of building 401-403 with the possible position of entrances (black arrows) and for 401 and 403 an indication of the position of the 'buttresses' in relation to the yard (red arrows). Three outbuildings of Belgian villas show the relation between timber- and stone-built structures. (source: partly modified after Léfert & Bausier 2011, 95, fig. 6; Weterings 2017, 10; Van Ossel & Defgnée 2001, 105, fig. 91, 98)

would have been perfectly capable of supporting both themselves and the weight of the roof. The pads were possibly a kind of rudimentary element left from post-built models, although it would have been easier to leave them out.

A closer look reveals more puzzling issues. Fairly wide Roman buildings like our outbuildings are mostly reconstructed with 'triangulated trusses', positioned on top of the walls (examples left visible in Fig. 8.8 and 8.16 although originally covered in plaster). These tightly integrated elements transmitted a vertical pressure to the walls.[550] If we assume that the position of the trusses is indicated by that of the pads, five (buildings 401, 403) or four trusses (402) between the short/outer walls were probably sufficient. However, two (first phase) or four trusses (second phase) for the *horreum* seems rather too few. Moreover, what then was the function of the single pads in the short walls of most buildings? These do not make sense in combination with triangulated trusses; such a truss would be unstable if only supported in the centre. We would expect heavy corner posts, as in the *horreum* of Lürken (Fig. 9.6). In the second phase of the Voerendaal *horreum*, there are corner pads, but only in the northern wall (Fig. 9.6). The function of both single (as at Voerendaal) and double pads (e.g. Lürken, WW112) in the short walls, and the construction of the latter in general, must remain an open question for now.[551]

A final, striking element of the buildings is the already mentioned combination of inward- and outward-pointing pads in most buildings (Fig. 9.3, bottom row). The logic of the inward-projecting examples seems to be that they are all located in walls that face the yard.[552] The villa owner and builders appear to have aimed for a smooth appearance of the outbuildings (except for the short walls of 401 and 403 facing the Steinweg!). Even if largely made of wattle-and-daub, their walls would be smoothly rendered and possibly provided with imitation joints to suggest a stone construction. Whatever the case, the positions of the pads can be taken as an indication of the position and number of entrances (Fig. 9.3). Both buildings 401 and 403 had six bays, ruling out the possibility of only one set of barn doors in the centre of the long walls. Probably both had two entrances, in bays 2 and 5. Building 402 may have had one central entrance, although it is still possible that it had two doors, in bays 2 and 4. For building 405 there are no obvious locations for the doors. It may have had a single large gate at the back in bay 3 and several smaller openings to the core.

While the stone buildings shared essentially the same construction, that of the post-built structures is different in each case (Fig. 6.8). Buildings 221 and 251 were two-aisled and 254 and 247 three-aisled, although the latter may have been one-aisled. In the three-aisled buildings, the inner and/or wall posts were not placed opposite each other, something that we would not expect in 'Roman' buildings. From a constructional point of view, this irregular arrangement of the posts is not impossible, however. The roof could have rested on longitudinal beams placed on top of the walls, as was probably also the case in building 418. It is perhaps remarkable that buildings such as 247 and 254 – possible predecessors of 405 and 401 – do not have ground plans of the 'Hody/Dilbeek-type', more 'logical' predecessors for the later stone buildings.

9.2 Comments regarding the functions of outbuildings

9.2.1 Introduction

Determining the function of outbuildings is difficult and mostly impossible. A major obstacle is that they are represented only by their foundations, with no data on features above ground (hearths, inner walls, etc.). Only granaries are often recognizable by the type of plan, floor-supporting walls or pillars and/or their position next to or directly opposite the main building. This holds true for all the examples discussed later in this chapter, with Voerendaal as a perfect illustration, where the *horreum* is situated even closer to the main building than the baths. However, there appear to be no clear patterns in the position of other buildings. Especially on smaller sites, a single building may have had several functions and in general functions might change over time. Regarding

[550] Adam 2010, 209-213, figs 491-492.

[551] Double pads in short walls could, on the basis of their position, have had something to do with trusses with two/three upright (king) posts, as in the famous drawing of St. Paul's-outside-the-Walls at Rome (Adam 2010, 212, fig. 496). See also Süß & Gräf 2017, 69-74, fig. 33. A completely different kind of reconstruction is offered by Schubert for a large building at Hambach 133 (2016, 389), resulting in a steep sloped roof.

[552] Cf. Brüggler 2009, 36, no. 152; Schubert 2016, 374ff., 386.

large villas with an axial layout, we sometimes have the impression that the number of outbuildings was more a matter of status display than functionality. Finds associated with buildings are often scarce or even misleading, deposited after the 'normal' period of use.

When investigating the main function of specific building types, we find that some are less relevant for our purpose because they are unexpected in our region. Instances are those associated with the production and storage of wine or olive oil.[553] The most obvious functions to look for are those that are frequently mentioned in the literature, such as living quarters for personnel, stables, workshops/ smithies, storage buildings and sheds for agricultural equipment. The latter function is not discussed here because it leaves few traces. The storage function is best addressed in relation to the *horreum* building 408 (Section 9.3.1). For now, we will simply comment on residential buildings, stalls and workshops.

9.2.2 Residential buildings

The villa workforce could include an estate manager (*villicus*), servants, farmhands, craftsmen and finally slaves, some of these groups with their family. At a number of villas, secondary residential buildings are present in the form of a second smaller villa, a building with a portico, corner pavilions, cellars and especially heated rooms or hearths.[554] At the large villa of Anthée several buildings even display these characteristics (Appendix XX, Fig. 1).[555] Building 1 in the well-known excavation of Köln-Müngersdorf was seen by Fremersdorf as a house for the *Gesinde* or staff (Fig. 9.4).[556] Its inconspicuous plan is a small version of Voerendaal 401 (16.2 by 13.4 m) and the interpretation is based in particular on the presence of a hearth, a toilet (?) at the corner and wall painting fragments found nearby. However, the threshing floor nearby suggests that the hearth could have been used for parching grain. Another example of a possible additional residential building is Kerkrade-Holzkuil (Fig. 9.4).[557] Post-built building 18 had a hearth and a small cellar-like pit, while its successor 19 had gravel foundations and a portico. Its interior was divided into two large rooms, and a pit in the vicinity contained sherds of kitchen and tableware. The excavator thought that both were residential and that the neighbouring building was a granary (Fig. 6.7).[558] However, it is more likely that both 18 and 19 were *horrea* or storage spaces, especially the latter in the light of its heavy foundations and characteristic plan.

For Voerendaal Braat proposed a function of 'slave quarters' for 'building' 406/F, divided into a larger accommodation for the day and a smaller one for the night.[559] Besides the fact that there is no single piece of evidence for this interpretation, this room was probably a late addition to the main building. We should consider the likelihood that even at large sites with separate residential buildings, most staff, servants and slaves were tucked away in hallways, attics and even outbuildings.[560]

9.2.3 Stalls

An interesting example of supposed stalls is again found at Köln-Müngersdorf. Rectangular building 10 was interpreted as a cattle byre with a cellar for storing milk, and elongated buildings 7, 8 and 9 – each with a decreasing width – as byres for horses, sheep and pigs respectively (Fig. 9.4).[561] These functions were proposed by the architect Mylius, who referred to dimensions that were 'still common nowadays'. Buildings 8 and 9 in particular were supposedly too small for cattle. That building 9 contained a hearth was logical in Mylius' view, as this was where the pig food was prepared in a big cauldron![562] Leaving this specific common-sense interpretation aside for just a moment, elongated buildings – both in stone and post-built – are also interpreted as stables at other sites.[563] Some of these are identified not only on the basis of their plan, but also by ditches and dung heaps. Interestingly, some stalls for cattle were only some 3 m wide and in general not necessarily wider than those for sheep. The fact that stalls for cattle or oxen could be quite narrow is attested in a short passage in Vitruvius: 'The width of the stalls should not be less than ten feet [2.96 m-HAH], nor more than fifteen [4.44 m]; lengthwise, each yoke is to be at least seven feet [2.07 m].'[564] Fremersdorf and Mylius were apparently

553 Basins and foundations of presses are present in these buildings, as in examples from the Mosel area (2000 Jahre Weinkultur 1987, 107-110). In South Gaul these features are often combined with buildings or rooms for the storage of many dolia (Bost & Bohny 2017; Carrato 2017).

554 Examples, for instance, at the villa of Rochefort-Jemelle (Mignot 1997, 10); Neerharen-Rekem (De Boe *et al.* 1992, fig. 286); Nivelles-La Tournette (Brulet 2008, 134, fig. 172; Hambach 127 (Heimberg 2002/2003, fig. 16); Reinheim building 8 (Stinsky 2016, 65-96) and Stein (references in section 8.1.3).

555 Smith 1997, 299, fig. 76.

556 Fremersdorf 1933, 30-31.

557 Tichelman 2005, 140-144.

558 Tichelman 2005, 102-103.

559 Braat 1953, 59.

560 On the (many) functions of rooms, see section 8.2.5.

561 Fremersdorf 1933, 37-39; 40-42; Mylius 1933, 119-120.

562 He uses the term 'Futterküche' (fodder kitchen). In Dutch dialect the cauldron is called the 'sopketel' ('soup' cauldron), which in historical farms was suspended from a beam over the hearth that could be turned into the stall.

563 Ferdière 2017, 32-34, figs 9-10 (dep. Somme); Cayn *et al.* 2017, 223, fig. 6 (Languedoc); Rouppert 2017 (Val-d'Oise, Moselle); Lukas & Adrian 2017, 648-650, fig. 11 (Val-de-Reuil, Haute-Normandie).

564 Vitr., *arch.* 6.6.2.

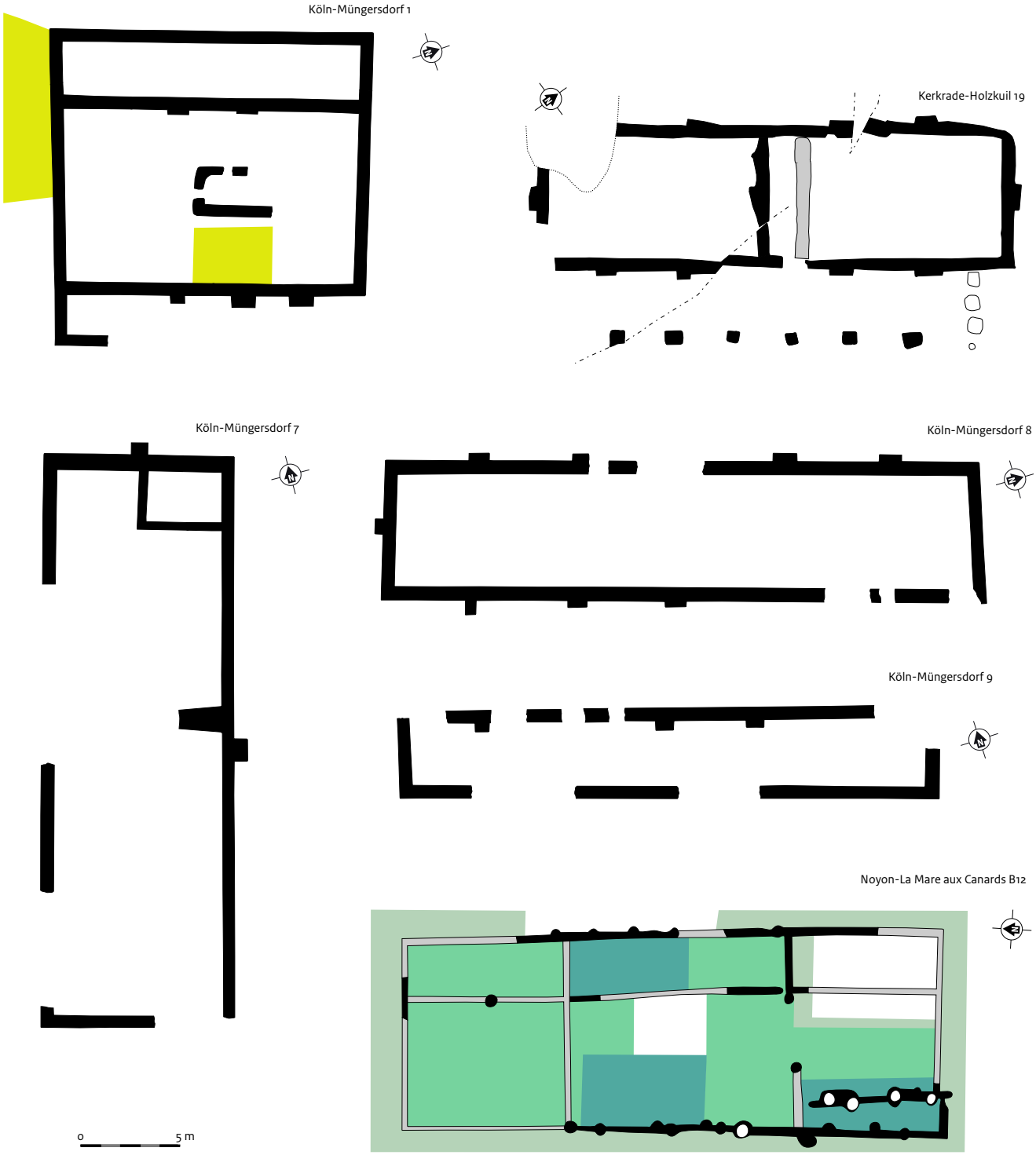


Fig. 9.4 Examples of buildings interpreted by their excavators as residential buildings (top row) or as stalls. (source: modified after Fremersdorf 1933, pl. 7-10; Tichelman 2005, 5.3.27; De Muylder et al. 2017, 276ff., fig. 10, 12)

unfamiliar with this text, for they do not refer to it. The width (interior) of buildings 8 and 9 at Müngersdorf was about 5.9 and 4.6 m. Fremersdorf translated these dimensions into *pedes monetales*: 20 and 15 *p.m.*.[565] Thus even building 9, supposedly only suitable for pigs, satisfies Vitruvius' requirements for a stall for oxen.

A year after Müngersdorf was published, Braat based his interpretation of rooms 12 and 6 in the villa of Vaesrade on Vitruvius: the former room at the west side was a stable for horses and the latter at the rear for cattle. 'From the dimensions given by Vitruvius VI,9 (width 10 to 15 feet and length depending on the number of cattle) it appears that the Romans generally built oblong cattle stalls.'[566] The rear hallways of other villas were probably also stalls, according to Braat. This is unlikely, however, with the possible exception of very small villas with no outbuildings. It is obviously still possible that oblong rooms in outbuildings were used as stalls, although I currently know of only one example: building 12 at Noyon-La Mare aux Canards (F/Oise; Fig. 9.4).[567] The levels of phosphate suggest that part of the hallway was used as a stable, together with a narrow room at the opposite side and a space in the centre of the building. Besides this example of possible stalls as part of a building, there are others in the form of autonomous oblong structures, although real proof only comes from high phosphate levels, manure ditches, cattle boxes or feeding troughs.[568] All the same, there will have been numerous instances where animals were kept in buildings with inconspicuous plans. This was suggested, for example, by the excavators of Champion-Sur Rosdia (B/NA), although with some hesitation. Buildings L, M and O (two of them with two phases) were the most likely candidates for byres. They belong to the type of wooden outbuilding discussed above.[569] Whether the interpretation holds true or not, the excavators make the justified remark that in the past a large proportion of cattle and other animals probably stayed in the open throughout the year (outwintering).[570] Besides, the stalls at many sites would have housed only part of the herd, such as young animals, the most important work animals (e.g. plough oxen) or horses.

9.2.4 Workshops

In principle, the presence of all kinds of workshops – at large villas like Voerendaal – should be no more exceptional than storage buildings or stalls. Agricultural products had to be processed, buildings and equipment made and maintained, while some villas may have produced non-agricultural goods. Concerning the processing of agricultural products, it is in fact astounding how few related buildings and features can be positively identified at villa sites.[571] We would expect many more instances of threshing floors (see Section 9.5) and, for instance, corn dryers, based on the fact that parching spelt made the (second) threshing much easier.[572] Most examples of the latter seem to date to late or later in the Roman period.[573] Perhaps parching was often carried out in less substantial structures. The preparation of food for large numbers of people on a regular basis involved features such as corn mills, bread ovens and kitchens, although the latter two would not have left many traces. Larger mills are more likely to be archaeologically identifiable, in the form of a dug-in *meta* or foundation; in principle, even millraces of water mills could be found.[574] Specific objects indicating larger mills driven by animals or water are iron dosage cones.[575] Milling on a smaller scale is of course attested by finds of querns at nearly every site.[576]

As mentioned earlier, the significance of 'industrial' activities on or near villa sites is much discussed. Many examples of cloth making, pottery and glass production, bronze and iron working, quarrying, brick and tile production and lime-burning can be found in the literature.[577] Especially concerning hearths for metalworking and glass production, it is striking that the majority are dated to the Late Roman period.[578] Irrespective of the date, hearths and fire-related activities can be situated at some distance from the other villa (out)buildings as they caused nuisance and fire hazards. Therefore, they could have been associated with semi-open sheds or shelters, rather than proper workshops (e.g. the structures in Fig. 12.6). If proper workshops did exist, they are as difficult to identify as, for example, stalls. Their plans will seldom show particular traits. If hearths or raw materials,

565 Fremersdorf 1933, 38.
566 Braat 1934, 30.
567 De Muylder *et al.* 2017, 276ff., figs 10, 12.
568 A rare example of a stable, with four stone troughs probably for horses, at Wittlich (D/RP; Roller 1990, 276, fig. 158; Cüppers 1990, 671-672, fig. 615).
569 Cf. above, section 9.1.2. For their location, see appendix XX, fig. 2.
570 Van Ossel & Defgnée 2001, 223-226.
571 Again, excluding features related to the production of wine or olive oil (see above, section 9.2.1), as well as installations for quite specific produce, such as fish farming (see section 9.4.2. below).
572 Kooistra 1996, 18.
573 See Dreisbusch 1994; Czysz 2016; Van Ossel & Huitorel, 2017; for Britain: Morris 1979, 146-148, table 2; Van der Veen 1989. There are still questions about their precise function; the preparation of malt for beer is a possible alternative function.
574 Conical/hourglass-shaped stones of 'Pompeian mills' are found, for example, in France (Jaccottey & Longepierre 2011; Brun *et al.* 2017) and near the quarries at Mayen (Hörter 1994, 32-39).
575 Reniere *et al.* 2014. Most examples come from *castella* and *vici*, although one was found at the villa of Jüchen-Krirchberg (Baatz 1994, 32, no. 11).
576 On the millstones at Ten Hove, see section 33.5.
577 Numerous examples in the contributions to Polfer 1999; for the Late Roman period Van Ossel & Ouzoulias 2000.
578 On the hearths at Ten Hove, see below sections 9.6 and 12.4.

tools and (finished/waste) products are found, formation processes should be taken into account, establishing whether or not they were originally associated with the building.
A cautionary tale is offered by building 4 at Hambach 132. Today it is recognized as a particular type of *horreum* (Fig. 9.6), but at the time of its discovery it was interpreted as a smithy. The evidence consisted of large quantities of iron objects (some 7 kg), including strips, nails and wagon parts (but no slag); a large fork suitable for handling crucibles and a possible half-finished bronze object were also found. Brüggler rightly explains most finds as settlement refuse and the iron objects as a stock of used metal, collected and deposited in the Late Roman period.[579] Finally, even if production is established at a site, there is the question of scale and purpose. An interesting case in this respect is the original interpretation of large quantities of iron slag and fragments of furnace and hearth walls at Hoogeloon-Kerkakkers. The fieldwork suggested that iron production was a major source of wealth for the villa owner.[580] However, most slag material was found in just one well, filled up at the time that the baths were added to the main building. Clearly, iron was produced for the bath fittings and installations, not for export.[581] The same explanation probably holds true for the iron production at Ten Hove.[582]

9.3 Functions of buildings at Ten Hove

Only a selection of buildings are discussed below. Nothing can in fact be said about the function of 402, or post-built structures such as 247, 251, 253 and 254.

9.3.1 The horreum

Features and functions of granaries
Since Braat's excavations, building 408 has been interpreted as a granary or *horreum* (Fig. 9.5-9.6). The identification rests on the presence of longitudinal walls in the interior, designed to support a floor of wood or stone slabs.
This raised floor helped to cool the room above it and also prevented moisture and perhaps mice and rats from reaching the floor. Stored grain takes in oxygen and emits heat, carbon dioxide and water.[583] A large mass of grain can heat up to such a degree that it catches fire. Warmth in combination with the moisture present in the grain can cause the grain to germinate and attract moulds, fungi and insects.[584]
The temperature must therefore be kept below about 15° C and the moisture content below 14%. A first measure to achieve this can be the use of sacks, creating air pockets between the sacks or sack stacks. A second is ventilation,[585] created for example by large windows (with slatted blinds against the ingress of rain and birds).[586] A raised floor is not an essential prerequisite for a granary; a layer of concrete or beaten clay is usually sufficient to protect grain from moisture.[587] However, it constitutes an extra means of cooling.

Floor supports in the shape of longitudinal walls, as in Voerendaal, were in fact quite rare in the *horrea* of villas in Gaul, Germania inferior and superior.[588] Transverse walls and especially pillars are far more common (Fig. 9.6). While the walls at Voerendaal are shown as continuous on our plans, in reality they were not well preserved and were not excavated completely. It is possible that each wall was interrupted several times to improve air circulation. The function of the rooms at the west side of the *horreum* is unknown. They may have been used to store foodstuff other than grain; the larger room could also be the substructure of a platform used for loading and unloading the sacks of grain transported on wagons.

Types of horrea and a comparison of storage capacities
In her model of the agricultural system of the loess area in general and Voerendaal in particular, Kooistra used the floor area of granaries to work out the stored amount of grain in cubic metres.[589] She assumed that the grain was not stored in bulk, but in sacks stacked up more than 1 m high, creating space for transport inside the buildings. The first *horreum* may have had a capacity of some 190 m^3 and the second of about 380 m^3 of spelt still in its hull.[590] The net weight was about 52.3 and 104.5 tonnes respectively. In practice, we could imagine something like ten separate piles of sacks, with enough space between them for access and

579 Brüggler 2009, 35.
580 Slofstra 1983, 98; 1987, 74-75.
581 Well 207 had at least 225 kg of slag in the infill, more than twice the quantity of all the slag from Voerendaal (Boreel 2014, 580-584; Hiddink & De Boer 2014c, 850-857).
582 Cf. furnaces 614-617, discussed in section 9.6.3 below.
583 Gentry 1976, 2-4.
584 Cf. the insect-infested grain cargo of the Woerden vessel (Pals & Hakbijl 1992).
585 E.g. Gentry 1976, plate 2A; Salido Domínguez 2015, 8, fig. 7.
586 Windows placed high in smoothly rendered walls probably did keep out mice and rats. Openings at a lower level should have been equipped with gratings, however. There seems to be little data on the use of cats or other animals – such as weasels – for pest control (some references in Clason 1977, 65-67).
587 Gentry 1976, 8-9.
588 Ferdière 2015; Fouillet & Morillon 2017.
589 Kooistra 1996, 97-98, 109.
590 Kooistra 1996, 109.

A

B

Fig. 9.5 Voerendaal-Ten Hove. The horrea during the excavation campaign of 1987.
A seen from the south, with the corner of the first phase to the right; B remaining parts of two supporting walls of the second horreum.

ventilation. If each pile had a maximum height of about 3 m and consisted of 374 sacks containing 12 *modii* (or 8.7 l), the total volume stored would be 394 m³, almost equalling the amount just mentioned.

Before addressing the question of how large the *horrea* of Ten Hove were compared to other examples, it seems instructive to discuss some different types of *horrea* (Fig. 9.6). This is also relevant regarding the function of building 405 at Voerendaal. Very specific examples are sometimes present in military camps, like those at High Rochester in Great Britain.[591]
Each building is very sturdy, but relatively small; a series of four made up the storage capacity needed. Assuming one floor only, the four *horrea* in High Rochester were almost equal in size (359 m²) to the second, large granary of

[591] A Scottish outpost some 30 km north of Hadrian's wall (cf. Gentry 1976, 81); Richardson 2004.

Voerendaal. The stored grain was presumably enough to feed one cohort of infantry (some 500 men) for a year, although a fort may obviously have needed a buffer but no seed corn. The example of building C at Champion-sur Rosdia (B/NA) shows that some *horrea* do not have a typical plan (Fig. 9.3).[592] Post-built granary I north of it has a considerable floor area of some 36 m²,[593] but it is unlikely that it held all the grain produced at this sizeable villa. It probably held a specific portion of the harvest, the post-built structure C' another. The latter and its stone successor C would not have been recognizable as (possible) *horrea* but for their association with I (and perhaps the location respective to the main building). Building 4 at Hambach 132 belongs to a widespread type of *horreum*, with many examples in Central Gaul (Fig. 9.6).[594] It has a central entrance, two smaller rooms at the front with a central corridor in between, and two rooms for storage with *pilae* as floor supports.
The combined floor space of both storage spaces is 108 m², just over half of the first *horreum* at Voerendaal. Although the *horreum* at Köln-Müngersdorf had a different plan, the arrangement of *pilae* suggests that there was also a central corridor (Fig. 9.6). The surface area with *suspensurae* measures twice 7.5 x 10 m, or 150 m² in total. The granaries of Weisweiler (WW) 112 and Lürken-Alten Burg represent a kind of double variant, with two halves divided by a wall. In each half, zones without *pilae* and the position of the buttresses indicate a corridor (Fig. 9.6). The former building had a total area of two times 14 x 10.5 m or 294 m², the latter two times 15.5 x 14 m or 434 m². This latter size exceeds that of Voerendaal phase 2, in accordance with the substantially larger main building.

When the sizes of the *horrea* discussed above and other examples are shown in a bar chart, that of Voerendaal 408 (second phase) appears to be one of the larger ones (Fig. 9.7A). Within the region, only the *horreum* of Lürken has a slightly larger capacity. It will be no surprise that larger buildings are found elsewhere, for example nearly double the size of building P' and Y at Seclin (F/Nd).[595] The fact that the *horreum* at Lürken is larger than that at Ten Hove is to be expected considering the size of the main buildings. However, there is not always a direct relationship. A comparison of the size of a small sample of villas and that of their *horreum* shows only a moderate correlation coefficient (0.53) (Fig. 9.7B). It is not hard to come up with explanations. Firstly, the size of the main building is not related to the size of the arable, the yields, etc. Secondly, the storage capacity of the typical *horrea* is sometimes increased by that of other buildings (next section). Thirdly, it is likely that the size and number of *horrea*, especially at larger villas, was determined by status display.
At Echternach (L) for instance, there are four apparent *horrea*, two with buttresses (buildings 2-3) and two (large ones) of the 'Hambach 132-type', buildings 6-7 (Appendix XX, Fig. 7).[596] One wonders whether all four were fully packed with stored crops. Clearly, they were also used to impress and to achieve symmetry in the range of outbuildings as a whole.

9.3.2 Building 405. A second horreum or warehouse?

Hearths 607-613 and 649 were found 'inside' building 405 and could theoretically inform us about the function of the building.[597] Unfortunately, finds and a radiocarbon date are not accurate enough to establish the chronological relationship and at the same time the function of the hearths is unknown. Leaving this question aside, it is less likely that the sole purpose of substantial building 405 was to house these hearths. It must have had other, primary functions.

An intriguing aspect is the position of building 405, as a counterpart east of the main building to the *horreum* in the west and probably also connected to the main building by a portico. Its plan differs from 401 and especially 402 and 403. Building 405 does not have a simple rectangular plan like the latter two, but two extra aisles. The function of oblong spaces as stalls was discussed in Section 4.2.3. Köln-Müngersdorf building 9, the 'pigsty', was as wide as the front aisle of 405 and nearly as long. Building 8 had the same length as our building, although it was some 1.5 m wider than the north aisle of 405. The building at Noyon (Fig. 9.4) was much smaller than 405, although its east aisle had a similar width to the southern one at Ten

[592] Van Ossel & Defgnée 2001, 103, 117-120, fig. 91.
[593] Van Ossel & Defgnée 2001, 109-111, fig. 98.
[594] Ferdière *et al.* 2017.
[595] Révillion *et al.* 1994, 122, fig. 9.
[596] Metzler *et al.* 1981, fig. 201.
[597] For these features, see also section 9.6 below.

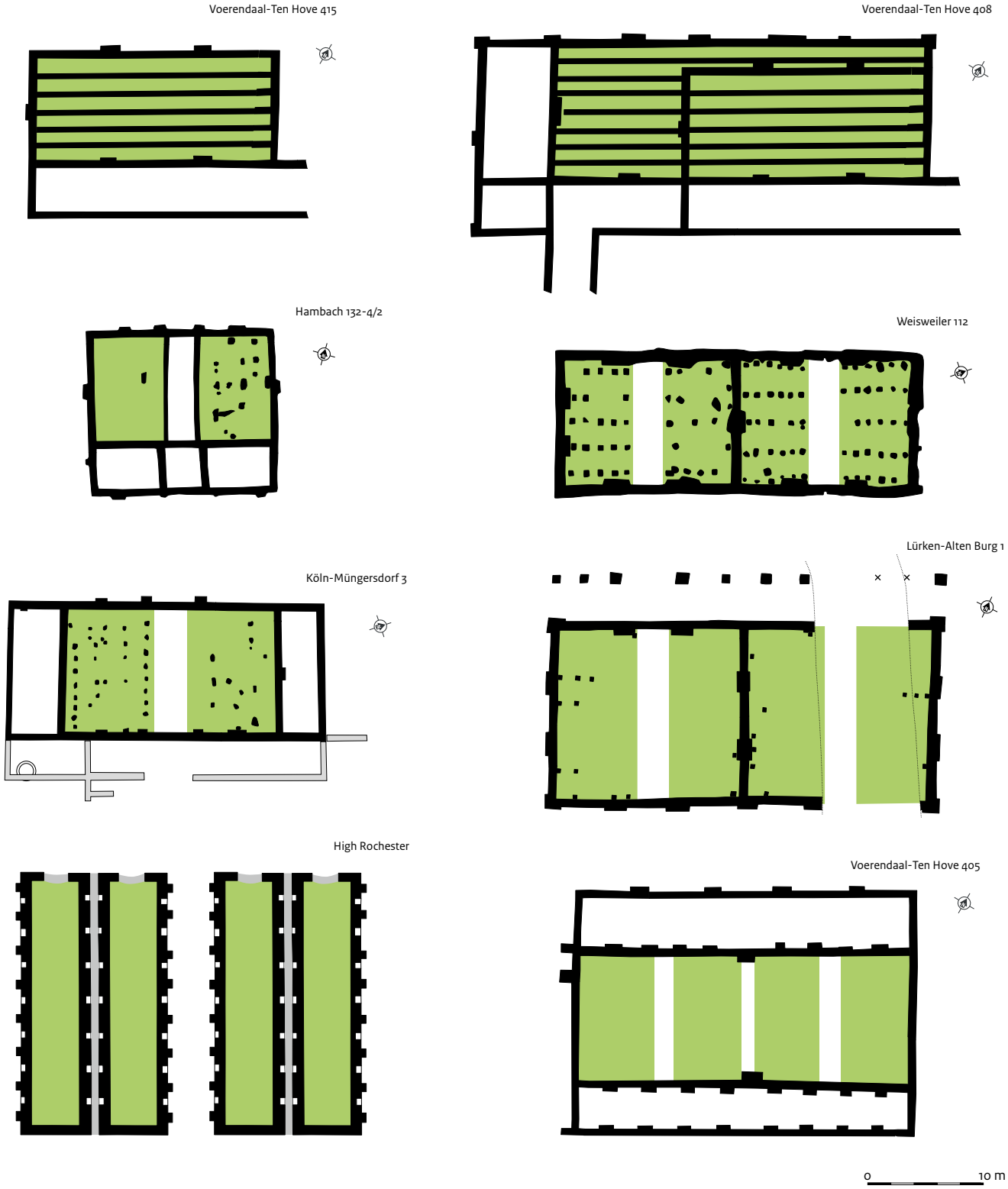


Fig. 9.6 Voerendaal-Ten Hove. Plans of the two phases of the horreum 408, building 405 and five horrea from other sites for comparison; in green supported floors, in white passageways. (source: in part modified after Brüggler 2009, fig. 11; Gentry 1976, fig. 11; Fremersdorf 1933, pl. 13; Piepers 1981, fig. 20; Heimberg 2002/2003, 121, fig. 46)

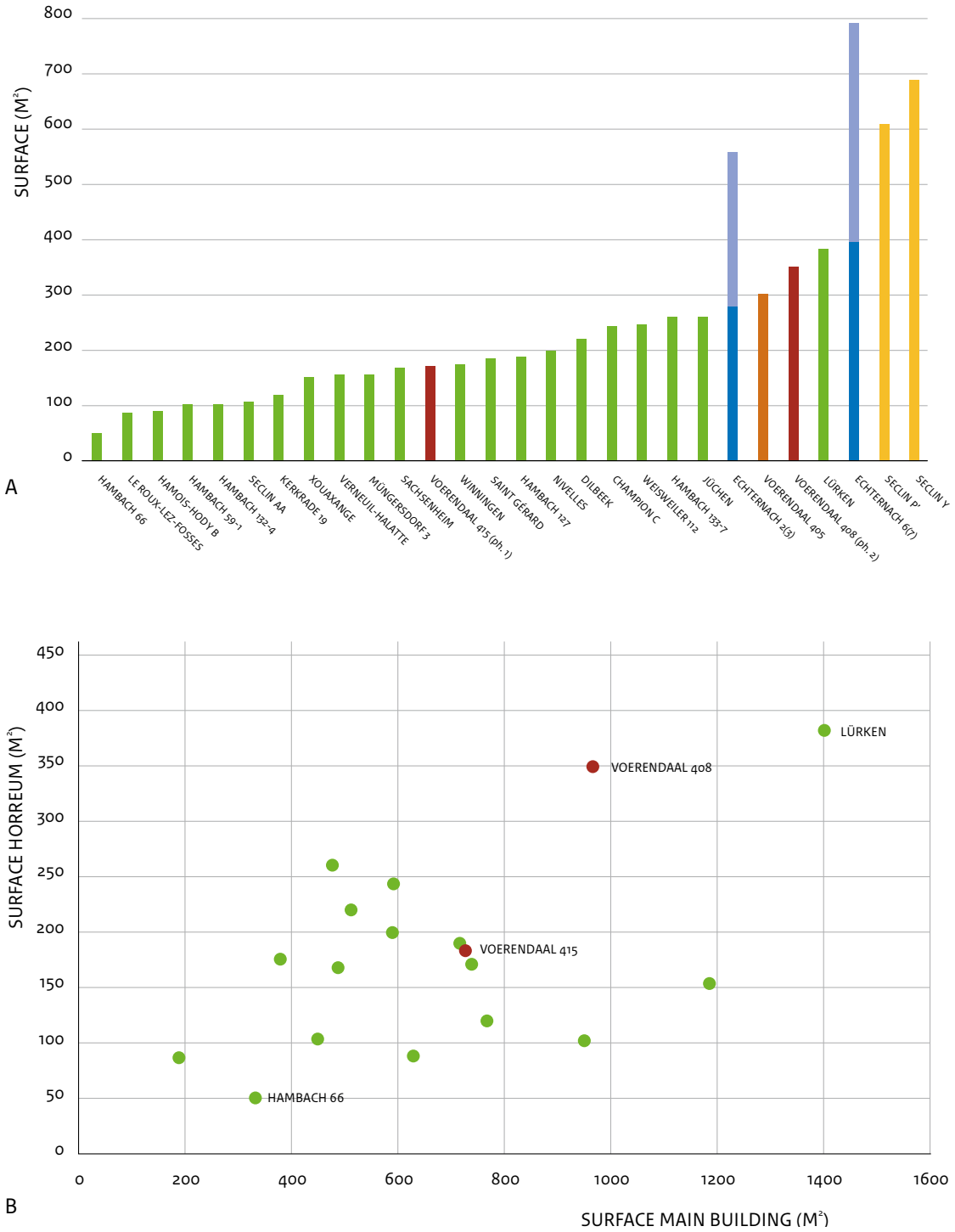


Fig. 9.7 The size of 28 (possible) horrea compared and their size respective to the main buildings (cf. fig. 15.11C). A rank according to floor surface (m²), sites with several buildings from a single phase in specific colours; B size of (one of) the horreum compared to that of the main building at the same site (m²).

Hove. Although the presence of one or two stalls in structure 405 cannot be ruled out, indications in the form of phosphate concentrations or subdivisions (boxes) are missing. In addition, this leaves unanswered the question as to the function of the large core (to store hay, fodder?).

A remarkable feature of 405 are the number and positions of the 'buttresses' or pads. About eight in the inner wall of the north aisle were recorded by Braat/Willems and about the same number in both walls of the southern aisle by Habets.[598] The numbers suggest a sturdier construction than that of 401-403. Furthermore, two larger pads – albeit not well documented – seem to divide the core of the building into two halves, as was done by a wall in the *horrea* of Lürken and WW112 (Fig. 9.6). Obviously, there is no definitive proof of a similar function in the form of floor supports and the plan of 405 differs from that of 408.[599] Nevertheless, the sturdy construction of 405 and its position respective to the main building point to a storage function,

[598] Cf. the catalogue, chapter 43.

[599] No good parallels for 405 were found. Building 9 at Damblain (F/Vosges; Boulanger & Cocquerelle 2017, 251-257, fig. 10) also had a rectangular core with two side aisles, albeit with different proportions and a more elaborate plan.

perhaps for specific types of grain or grain for specific purposes (sowing, local consumption, etc.) or for other products (such as fodder). If both 408 and 405 at Ten Hove were *horrea* in a more general sense, their combined floor size of 650 m² would still have been modest compared, for instance, to the examples of Echternach and Seclin mentioned in the previous section. If used for grain, however, the storage *capacity* would have been excessive in the light of the area of arable thought to be available to Ten Hove. In this case, an explanation could be that the produce of other villas was also stored here or, as mentioned above, that it was not used (entirely) for grain.

9.3.3 Building 401. Processing and temporary storage of crops, living quarters

In the 1980s, the excavators thought that building 401 was originally used as a stall (for oxen or cattle; Fig. 9.3; 9.8).[600] Although this cannot be ruled out, nor for its hypothetical predecessor 254, the phosphate stains mentioned in a preliminary report are neither documented on drawings nor tested by sampling.[601] The hallway or narrow aisle along the west front of 401 was possibly a later addition and in any case there is no supporting evidence for a stall. It is more likely that building 401 had a role in the processing of crops. Indications are the threshing floor (420) in front of it, as well as the contents of the archaeobotanical samples in this area. The unprocessed grain transported from the fields was probably unloaded here and stored until threshing. It is feasible that part of the threshing was done inside during unfavourable weather. Pit 718 probably had a function in the grain-cleaning process or the removal of waste, suggested by connected ditch 333.[602] After the grain was processed, it was transported to *horreum* 408 – and building 405? – for final or long-term storage.

A small cluster of graffiti near building 401 suggests that people actually lived – or at least ate – in this structure.[603] As some of the inscribed pottery is dated quite early respective to the building, perhaps it was simply old but still in use, or related to the wooden structure 254 preceding 401. The impression that people lived in this building is also supported by the find of at least one terracotta figurine, with fragments found in trenches 13 and 27.[604] The large amount of pottery found in this area could also be significant in this light. Perhaps it is not merely the result of 'activities' in general and formation processes, but of a residential function of 401. A similar cluster of finds at the other side of the yard around trench 68/69 seems partly the result of people living there in phase 2b/c (building 409, 418).

9.3.4 Buildings 409, 418 and 403. Supposed forge and stall

Timber-built structures 409 and 418 are predecessors of stone building 403 (Fig. 9.9). Building 418 was interpreted as a stall by the excavators because of the soil's high phosphate content,[605] while 403 was supposedly a smithy at some time.[606] Indications referred to for the latter interpretation were the large quantity of iron slag, metal objects and charcoal in this part of the excavation as well as the upper fill of the cellar in building 409 (Table 9.1). We believe, however, that 418 was not a stall but rather a smithy, partly because the results of the phosphate analysis are not conclusive.[607] This alternative interpretation is also based on the chronological order of the features and the distribution of the iron slag. Building 409 was probably a house, while the specific function of 403 is unknown. It could be a stall because it was situated not far from horse pond 413, although there is no firm evidence.

Regarding the chronology, building 409 must have been the oldest of the three, probably in use around the middle of the first century AD. It is significant that no waste from iron production and/or processing was found in the lower infill of its cellar pit (as already observed by the excavators). The presence of a pit/hollow not entirely filled in was probably no obstacle to the users of succeeding building 418 because this was located 13 m to the south. The presence of some slag in the features of 418 suggests that iron was processed in this area at least some time during its use. Therefore, if one building was a smithy, it was probably 418. However,

600 Cf. section 5.1.4.
601 Chapter 39.
602 Kooistra 1996, 163-164. In the building from Damblain just mentioned, a similar pit with a drain was found (Boulanger & Cocquerelle 2017, fig. 11).
603 Chapter 29. In a large barn, probably a *horreum*, at the villa of Bad Rappenau (D/BW) some small rooms were partitioned off, while graffiti suggested that these had a domestic function (Scholz 2015, 74-76, fig. 5).
604 Chapter 30.
605 Willems & Kooistra 1988, 140; Kooistra 1996, 131.
606 Willems & Kooistra 1987, 35. Cf. section 5.1.4.
607 See chapter 39.

A

B

C

Fig. 9.8 Voerendaal-Ten Hove. Building 401 during the 1985 excavations.
A seen from the southwest; B south wall from outside; C idem, from inside at a deeper level with the lower irregular blocks exposed.

A

B

Fig. 9.9 Voerendaal-Ten Hove. The area of building 403, 409 and 418 during the 1986 and 1987 campaigns.
A building 403 seen from the north, with in the foreground the dark upper infill of 409's cellar pit and a light colour wall ditch of this building;
B features of building 418 just east of building 403.

Table 9.1. Voerendaal-Ten Hove. The number of fragments and weight of slag, iron and pottery in trench 68, 69, 95 and 96 (2.7% of the excavated surface) against the rest of the excavation.

Trenches	N slag	Wt slag		N iron	Wt iron		N pottery	Wt pottery
Wp 68-69	1283	76790		1648	2249		3302	113820
Wp 95-96	51	5486		898	225		2101	83137
Subtotal	**1334**	**82276**		**2546**			**5403**	**196957**
Other trenches	**458**	**23258**		**6117**			**17566**	**562655**

it cannot be ruled out that the iron working was not carried out in the building itself but somewhere in the vicinity. The timber-built structure 418 obviously had to be removed to make way for stone building 403. At the same time, the cellar pit of 409 had to be completely filled in because the (projected) north wall of 403 ran through the edge of the existing hollow. The pottery that was present in the infill, with the slag and other waste, dates to around AD 125 or some time later.[608] Although it is not certain, the iron processing in this area probably had ended by then. In any case, the slag in the cellar pit must have been related to the construction – the making of structural fittings – of the second villa and its outbuildings and the baths.[609]

9.4 The horse pond or cattle dip

9.4.1 Introduction

During the 1987 campaign, structure 413 (M) was investigated in trench 94, outside the villa yard (Fig. 9.10; 9.12; 43.30). The structure measured 12.6-13.3 x 10.5-11.9 m and probably had an original depth of about 1 m. Because it was dug in and had a lining of clay, it was obvious that it once contained water. It could be entered by the channel at the north side. Regarding the interpretation, Willems wrote: '...it is significant that it was constructed outside the yard, implying that it was used for something unpleasant (dirty, dangerous, smelly). It was certainly not a dung heap; although the layer above the stone floor consisted of dirty black silt, this was not particularly rich in phosphate and finds. Several explanations are possible, but the most probable is that it was used for washing animals. In the past, farms in areas with heavy soils often had a 'horse pond' (*paardewed*), where the draught animals could be washed and rested after work. The oxen and mules used as draught animals at a Roman villa may have been treated in the same way.'[610]

9.4.2 Possible functions of ponds at villa sites

Although the excavator's interpretation seems plausible, there are in theory other options. Structure 413 of Voerendaal can be compared to similar stone or wood-lined structures found elsewhere, but also to natural ponds and depressions found at a large number of Roman villas (*Geländemülde* or *Teich* in German; *mare* or *lavogne* in French). The suggested interpretations for these features are partly based on Roman sources, such as the writings of Columella: 'It will be necessary, next, that the villa have the following near it: an oven and a gristmill [...] at least two ponds, one to serve for geese and cattle, the other in which we may soak lupines, elm-withes, twigs, and other things which are adapted to our needs. There should also be two manure-pits, one to receive the fresh dung and keep it for a year, and a second from which the old is hauled; but both of them should be built shelving with a gentle slope, in the manner of fish-ponds, and built up and packed hard with earth so as not to let the moisture drain away.'[611] Other explanations suggested in the literature are often derived from historical features in the European countryside, such as the horse pond or *paardewed* mentioned above. Dutch villages often featured a pond, called a *dobbe*, *koel* or *vate*, depending on the regional vernacular. The suggested functions for these reservoirs, which often appear to be modern common-

608 Chapter 43.
609 Cf. section 9.2.4 above and chapter 34.
610 Willems & Kooistra 1988, 144-145.
611 Colum., *rust.* 1.6.21.

A

B

Fig. 9.10 Voerendaal-Ten Hove. Feature 413 during its investigation in 1987.
A seen from the west, after removal of the upper infill; B the interior seen from the ramp in the north side, after removal of the entire infill and pavement.

sense or nostalgic explanations, were as a source of water for extinguishing fires, drinking (for people and/or cattle), flax retting, watering timber, fish farming and washing sheep before shearing. We will briefly discuss a number of these and other functions.[612]

Ponds as a source of drinking water for humans seem implausible because of the high probability of contamination by animal dung, soil, organic matter such as leaves, etc. The complete opposite, a settling basin for sewage, is another interpretation found in the literature. At Köln-Müngersdorf the water from the bath drained into a depression, resulting in a greenish-yellow layer in the infill (Appendix XX, Fig. 6).[613] Fremersdorf called it a duck pond (*Ententeich*), but it is debatable whether animals would survive in water full of oil and other sewage. A depression at Kerkrade-Holzkuil was situated downslope of the baths, probably connected to it by a water pipe supported by posts (Appendix XX, Fig. 5). This water was probably still clean, merely consisting of the surplus not used in the baths.[614] Another potential function involving dirty, smelly material is that of a dung heap. Our structure 413 bears some resemblance to the dung heaps in the yards of historical farms in Zuid-Limburg.[615] Although these possessed a sloped entrance, a feature mentioned by Columella, this was wider than that of 413. Moreover, our basin was quite elaborate and deep; the historical examples in Limburg appear to have been shallower.

In theory, water mills could be present at or near villas.[616] Oblong stone structures below ground level were identified as mill races at some sites;[617] and large wood-lined rectangular pits are also interpreted as belonging to mills.[618] However, one would expect a mill at Ten Hove in the Hoensbeek valley, where the historical water mills of Voerendaal were also situated.[619] Water for basin 413 could only have been the excess water of the baths upslope (see next section). A location in the valley of the Hoensbeek would have been preferable for fish farming too. An example of a smaller installation was excavated at the Shakenoak villa in Oxfordshire.[620] It consisted of a brook-fed basin of 65.5 x 27 m, connected to a smaller one of 12.1 x 11.6 m and a separate third one of 14.6 x 11.3 m (the latter sizes comparable to 413). Slopes at one side allowed easy access, probably to catch the fish with nets. Pisciculture also seems to have been practised at the villa of Habay-la-Vieille-Mageroy (B/LX).[621] Here, a *mare* was converted into a large basin (diameter 30 m), apparently fed by a small stream.

A location in lower-lying terrain would also be more obvious for two agriculture-related activities that would have been common in the Roman north. The first is flax retting. Although there are no indications that flax was grown or processed at Voerendaal,[622] flax was an important crop. To obtain the fibres for making linen, flax must be retted. In historical agriculture, this was done in various ways: either on grass (dew or field retting), in the running water of streams or in pools, ditches and deep pits (pool or blue retting).[623] The latter method resulted in stagnant, very dirty and smelly water. One would therefore expect retting in the Hoensbeek rather than in 413. Sheep washing is another activity that could equally have been done in ponds or streams as in a specially constructed basin.[624] Classical sources and abundant iconographical material bear witness to the importance of wool and cloth production in Northern Gaul.[625] Finally, water needed for non-agricultural production, such as watering timber, could also be supplied by various sources and did not require special basins.

As mentioned above, the use of ponds in caring for animals is attested by historical examples, called horse pond in English, *paardewed* or *vate* in Dutch, *Pferdeschwemme* in German and *pediluve* or *lavogne* in French (Fig. 9.11). Horses' legs are cooled after exertion to avoid tissue damage and inflammation. Cattle, including oxen, do not sweat and therefore have to be cooled with water after pulling a cart or plough in warmer weather. Obviously, this could also be done in natural ponds or streams, but Willems' interpretation of 413 as a horse or cattle pond is plausible. Although the dirt washed from the animals, and probably some dung, would contaminate the water to some degree, this does not imply that it was not suitable for drenching animals (Fig. 9.11). The stone floor of 413 would prevent soil from being stirred up and dirtying the water. Nevertheless, questions about the

612 For a more extensive account and more references, see Hiddink 2014a, 234-245.
613 Fremersdorf 1933, 71-73.
614 Tichelman 2005, 149-150. At least partly revetted with posts and wickerwork or planks.
615 Some examples in Van Cruyningen *et al.* 2003, 223 (Valkenburg), 230-231 (Reijmerstok, Hoensbroek).
616 Cf. above, section 9.2.4.
617 E.g. in the *département* of Var at La Garde-La Grande Chaberte (Lemaire & Romona 2017); La Crau-Mesclans and Arcs-Saint Pierre (Brun *et al.* 1998; with distribution map).
618 Like that from Etting (D/BAY; 14 x 3 m), discussed in connection with a structure from Buchs (11 x 4 x 1.5 m) in Switzerland (Horisberger 2004, 104-105). A basin of approx. 23.7 x 6 m at Metz-Grigy (F/Mos.) was possibly used in cloth production; see Brkojewitsch *et al.* 2017, 739-749, fig. 8.
619 Cf. section 10.3.2.
620 Brodribb *et al.* 2005, 294-295; 420-423.
621 Zeippen & Halbardier 2006; Zeippen in Brulet 2008, 469-474.
622 Kooistra 1996, 115, table 19.
623 Lindemans 1952; Dewilde 1991.
624 See for example the discussion on the *Fehthing* of Early Medieval Hessens near Wilhelmshaven (Siegmüller 2010, 76-82, 215-217).
625 Also for references, see Hiddink 2014a, 240-242.

Fig. 9.11 Cattle drinking at the historical vate (village pond) of Zierikzee. (source: beeldbank RCE, OF-02809)

supply of water remain. We will discuss this further in the next section, also in relation to other examples of more elaborate Roman basins.

9.4.3 Ponds with walls or revetments

Different types of Roman and historical ponds were discussed in the previous section, but it is important to stress that Roman examples with stone walls or wooden revetments are quite rare our region. A small, statistically insignificant but illustrative sample of 26 villas shows that a pond is present at some 60%.[626] Only three of these sites have a pond with reinforced sides: Voerendaal, Neerharen-Rekem and Hoogeloon-Kerkakkers (Fig. 9.12). Thanks to the proximity of limestone outcrops, Voerendaal 413 would have had a wooden revetment, like the other two.

Structure 210 at Hoogeloon-Kerkakkers was interpreted as a pond for drenching cattle because the villa was thought to be a location where animals from surrounding settlements were collected seasonally, to be sold off at the market in the city of Tongeren.[627] Even if this scenario is incorrect and the pond was only meant for cooling and drenching the local stock of horses, cattle and sheep, 210 would still be remarkable for the MDS area. Excavations of well over 80 post-built sites have not produced any similar structures. In other words, a pond with stone or wooden walls probably had not only practical functions, but was also meant for display. Leaving the specific function aside, the Hoogeloon pond was quite large, 15.8 by at least 16 m. One side had no revetment, but a gentle slope. The bottom of the pond was a natural layer of loam, preventing about one foot of water from seeping out. At a higher groundwater table after rain, it could enter through the seams of the wooden revetment walls. With the water level at a height of about 30 cm, the pond would have contained 60 m^3, and at 65 cm, about 235 m^3. This amount is roughly the minimum for drenching 100 head of cattle for about 10 days.[628]

Although structure 413 at Voerendaal was somewhat smaller than that at Hoogeloon, a water level of 40 cm high, for example, meant that it would have contained some 60 m^3. As stated earlier, it is not entirely clear where the

626 Based on Heimberg 2002/2003, figs 15-21 and Brulet 2008, figs 172-179, with Kerkrade-Holzkuil, Neerharen-Rekem and Dilbeek-Wolsemveld added.

627 Hiddink 2014a, 231-246, map 3; 2015, 110-112, fig. 15; Hiddink & De Boer 2014d, 869-876, fig. 37.1.

628 Hiddink 2014a, 241, table 12.2.

water came from. Because the pond was situated well above the groundwater table, it was probably filled with rainwater, including runoff from the terrain to the north. However, would the pond have been dry during parts of the year if this was the only source? Although there were no connecting ditches, it is possible that excess water from the baths was used. Three water-pipe collars in trenches 106 and 94, together with a large 'flange' from the latter (Fig. 10.10; 20.32),[629] could have been parts of a water line leading to the pond. Needless to say, this remains hypothetical.

At the villa of Neerharen-Rekem, there is evidence for the water supply. A row of double posts over 50 m long ended at the northwest corner of outbuilding B (cf. the single row at Kerkrade-Holzkuil). It was interpreted by the excavator as a palisade but identified as part of a water line by Vanderhoeven, inspired by examples from Germany and Britain.[630] The posts either carried an open wooden flume or wooden pipes. Remarkably, there seems to be no connection with the villa baths, 60 m further south. The most likely source of water is one of the small streams originating on the Kempen Plateau. Trapezoidal 'outbuilding' B measured 13 x 11.5 m and had walls of wooden posts, sometimes repaired two to four times.
The excavator interpreted the structure as a '*potstal*', a byre with a sunken floor;[631] others even thought that it was a sanctuary.[632] However, the description of the feature points to similarities with the basins of Voerendaal and Hoogeloon: 'The floor of the building is dug into the soil. The depth near the entrance [in the southwest corner-HAH] is small, but increases to the east and north to at least 50 cm below the Roman ground level. The infill on top of the bottom and in a number of round pits was brown-black and very humous …'[633]

It appears to be significant that the ponds of Hoogeloon, Voerendaal and Neerharen were quite large, suggesting that they could accommodate a larger number of animals, whether for drenching or just cooling and washing. Outside the region we know of some examples of a similar size from southern France, such as Nîmes-Mas de Boudan (Gard) and Romagnat-Maréchal (Puy-de-Dôme). They measure 10.2 x 9.2 and 11.3 x 11.3 m; only the former has an access ramp.[634] Another class of ponds in Germany and France consists of smaller examples, more likely to have been used for only one or two animals at a time. One at Borg (D/SL) is rectangular and measures approx. 7 x 3.5 m (Fig. 9.12).[635] It was part of a *mansio* on the Trier-Metz road and was probably supplied with water from a well 6 m away. In the south of France, some oblong ponds were found, with a long sloping entrance channel of 2-2.5 m wide and a basin of 3-4 up to 6 m in diameter (Fig. 9.12). Ponds at Conthil-Le Gueren and Peltre-Rocade sud de Metz (both F/Mos.) are very similar, with a circular basin.[636] Another at Villeveyrac-Mas de Siau (F/Hér.) has a basin that is only slightly widened.[637] The structures had stone drainage channels, situated at a low level and likely to have been used to flush out soil and dirt washed off the animals. However, it is not clear how the water was replenished. Water lines were probably once present but without leaving any trace.

9.5 Threshing floor 420

A pavement of irregular blocks of limestone in front of building 401 was interpreted by the excavators as a threshing floor (Fig. 43.34; 43.37). This interpretation was based for a large part on archaeobotanical material, with samples consisting of 96% chaff.[638] Obviously, this charred material provides no direct evidence but points towards crop processing in the vicinity, as is true of other sites.[639] In any case, the number of archaeological examples of possible threshing floors is quite limited.[640] Some are described briefly below.

At Köln-Müngersdorf a pavement of roughly 10 x 8 m was present south of building 1, a possible threshing floor according to Fremersdorf (Fig. 9.4; Appendix XX, Fig. 6).[641] Some years before, he had interpreted an area of some 3 x 4 m paved with gravel and stone inside the 'hall' of Köln-Braunsfeld in a similar fashion.[642] The floor in the central part (about 9 x 4-5 m) of Blankenheim F was paved and could have been used for threshing.[643] At Köln-Widdersdorf, an area of 15 x at least 15 m had a pavement of 8 cm

629 Cf. section 10.5.1; 20.3.16.
630 Vanderhoeven 2005; Hiddink 2014a, 233 (at the time unfamiliar with Vanderhoeven's interpretation).
631 De Boe 1983, 56-57; 1985, 60.
632 Slofstra & Van der Sanden 1987, 143-145; based on the deposition of iron plough shoes.
633 De Boe 1983, 57.
634 Cayn *et al.* 2017, 227, fig. 8, 1-2 (Nîmes); Liegard & Fourvel 2017, 718-721, figs 7-8 (Romagnat).
635 Birkenhagen 2011, 129, fig. 4. Another example near the villa seems slightly larger (Birkenhagen 2010, 129, fig. 5).
636 Mondy *et al.* 2018, 317-323, figs 11-17.
637 Cayn *et al.* 2017, 227, fig. 9.
638 Kooistra 1991, 169; 1996, 158-164, fig. 30. On the radiocarbon dates of the grain found, see table 5.6.
639 Knörzer 1984, 500 (Hambach 69; chaff in a nearby well); Derreumaux & Deflorenne 2017, 312-315 (Villeneuve d'Asque-La Haute Borne (F/Nd)).
640 Cf. seventeen (possible) examples from Great Britain in Morris 1979, 23-28, 108-111.
641 Fremersdorf 1933, 53.
642 Fremersdorf 1930, 115.
643 Oelmann 1932, 313; cf. Kunow in Horn 1987, 363, fig. 306.

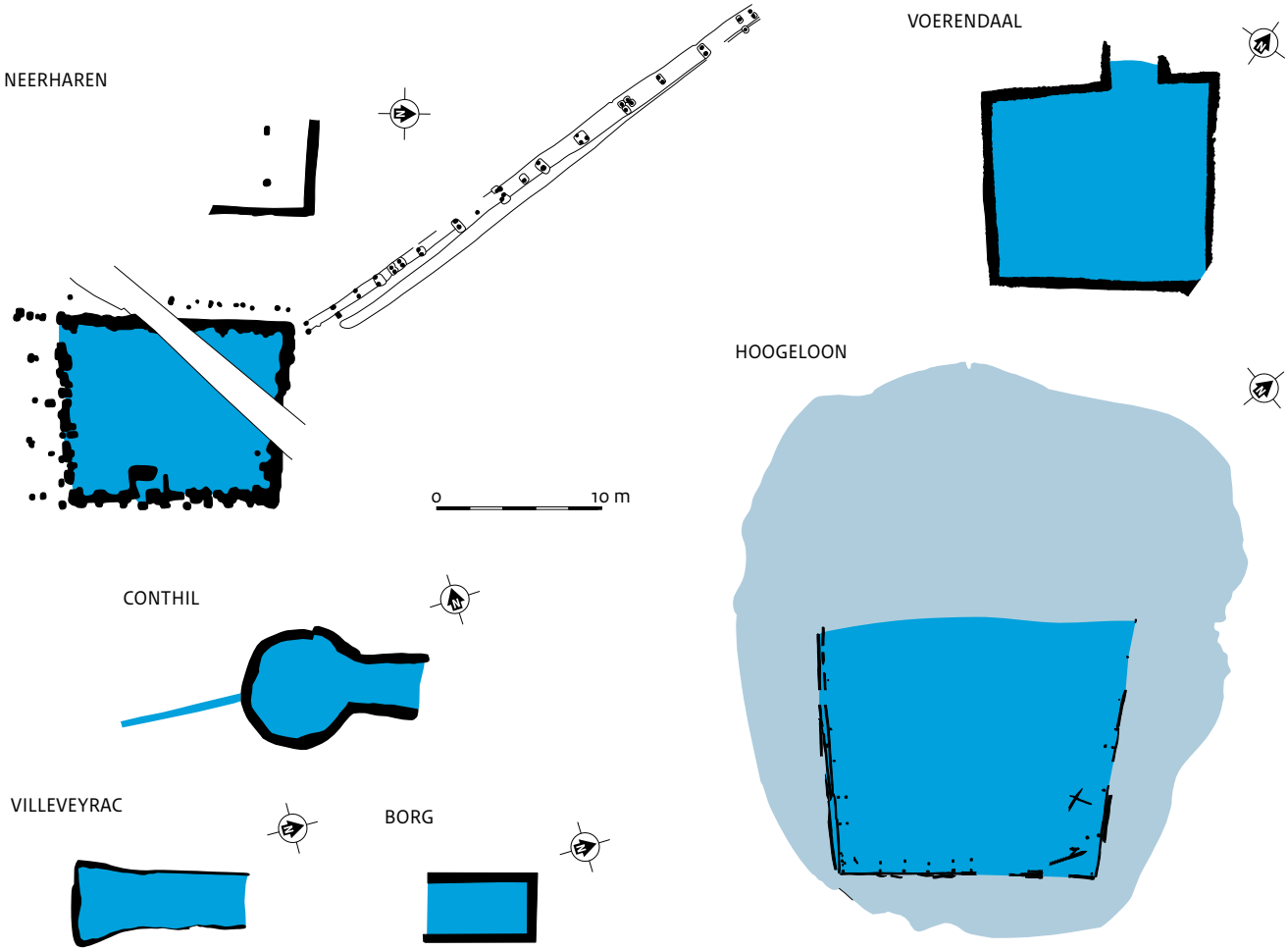


Fig. 9.12 Archaeological examples of ponds. (source: modified after De Boe 1985, fig. 10; Hiddink 2014a, fig. 12.2; 2015b, fig. 15; Mondy et al. 2018, fig. 12, 17; Cayn et al. 2017, fig. 9; Birkenhagen 2011, fig. 4)

thick, with pebbles, stone and tile fragments. In a second phase part of it was shielded by fences.[644] A final example is Ingenheim (F/Bas-Rhin). Here, patches of pavement remained of a larger area; in one a pit marked the location of an animal-driven mill.[645] Prompted by the scarcity of archaeological examples of threshing floors, researchers often refer to descriptions by classical authors.[646] Although to some degree rather theoretical in character and written from the perspective of Mediterranean agriculture, the texts offer an impression of the requirements. Threshing could be done on barren soil, but more often an area was prepared with a pavement of rammed earth and/or stones. These classical texts emphasized that rainwater should not be able to stagnate on the floor and cracks should be avoided, as these would lead to loss of grain and would attract vermin. The presence of a shelter or building nearby was deemed important to avoid losses through rain or strong winds. The texts mention the use of animals, either threshing with their hoofs or with sledges and rotating devices.[647] Finally, the importance of locations being open to the wind was stressed. This was necessary for winnowing, either with forks or winnowing fans.

It is probably needless to say that the threshing floor at Voerendaal is only partly preserved, as already shown by its irregular shape. The largest paved area points to a minimum size of about 11 x 18 m. This is still rather small, especially if teams of oxen were used for threshing. The whole area with patches of stone was likely to have been involved, all between building 401 and drain 317 (25 m). The irregular blocks of limestone resulted in an endless number of cavities, making the collecting

644 Spiegel 2002, 708, fig. 6, feature 329.
645 Brun *et al.* 2017, 117-118, fig. 2.
646 Cato, *agr.* 91-92; Varro, *rust.* 1.51-53; Colum., *rust.* 1.6.23; 2.19-20. Plin., *nat.hist.* 18, 298-300; Halstead (2014, chapter 4) gives a very good account of traditional ways of threshing and cleaning in the Mediterranean.
647 Cf. Heimberg 2011, 110-112. The two-piece threshing flail with a long handle and short swipple was probably not used in the Roman period, but instead a flail (*baculum/pertica*) with a fixed block and curved handle (Heimberg 2011, fig. 87).

of the grain a nightmare. Therefore, there must have been a layer of rammed loess on top of the stones. At the southern edge of the floor, wall 416 shielded it from the wind, but somewhat more to the north, conditions for winnowing must have good. During bad weather and the winter, some of the threshing and winnowing would have been done in building 401.[648]

9.6 Kilns, furnaces and hearths

9.6.1 General

Fifty-three features at the site were classified as 'hearths' (601-653).[649] This category includes all kinds of features related to the use of fire, as suggested by the presence of orange-red burnt loam and/or large quantities of charcoal.
The word 'hearth' is used here as a generic term because the specific function of most features is unknown; they were surely not fireplaces inside the living quarters of buildings, however. Six or seven groups are recognizable, but half of these, including the majority of features (some 70%) belong to the Late Roman period or later. Here we discuss only the Early and Middle Roman hearths.[650] It concerns three groups: the large features 646-648 under and adjacent to tower 407, four smaller circular structures (614-617) and eight oblong hearths inside building 405 (607-613, 617, 649).

9.6.2 Kilns 646-648

The large features 646-648 are in some respects the most enigmatic of all the hearths at Ten Hove. On the basis of their size they can be classified as kilns, but their exact purpose is unknown. Habets thought that 646 was a post-Roman lime kiln, Braat accepted this interpretation and the ROB envisaged it as the chamber of a pottery kiln, with 647 and 648 as its flue and stokehole/working pit.[651] The fact that 646 seems to intersect the foundations of tower 407 is misleading; instead, it is the result of damage caused by Habets' activities. Feature 646 seems rather large for the chamber of a pottery kiln, with a diameter of 3-2.5 m (exterior-interior). In Heerlen, the external width of some kiln chambers is around 2 m (Fig. 9.13).[652] It is not even entirely certain that 647/648 were the stoking hole/working pit of 646 because they are on a slightly different axis and are rather large. They could be autonomous units. Finally, basin/pit 764 near the kiln, supposedly for preparing clay, seems to be older than 646. In any event, a definitive interpretation is prevented by the meagre documentation and incomplete investigation.

If 646-648 really do represent one or more pottery kilns, we should ask why Ten Hove produced all or part of its own pottery in the first or early second century AD.[653] Although pottery was made at villas, this appears to be quite rare and often late in date.[654] Moreover, it would have been much easier to buy pots in Coriovallum. If ceramics were produced at Ten Hove, building ceramics would make more sense, perhaps some rather than all the roof tiles, or batches of special forms such as *tubuli*. Feature 647/648 is the size of a fairly small tile kiln (Fig. 9.13).[655] Finally, it is possible that lime was burned, for mortar and plaster for building 399 or 400. At least the size of the round part 646 is similar to that of smaller examples found elsewhere (Fig. 9.13).

9.6.3 Furnace 614-617

Like the features discussed above, 614-617 can be dated to period 2c of the first villa or 3a during construction of the second. Two of them are intersected by the foundations of the *horreum* and portico (Fig. 9.14; 45.4). All four are circular ditches with an external diameter of 1.2-1.4 m. The ditches are about 30 cm wide and encircle some 70-80 cm of 'clean' loess soil (only inside 617 was the soil relatively brown). The infill of the ditches was described by the excavator as '... consisting of charcoal, partly with numerous pieces of iron slag.'[656] The adjective 'numerous' is somewhat exaggerated: in fact only four pieces (366 g) were recovered from 615 and three (1540 g) from 616. However, the presence of two blooms and a piece of slag from a smithy hearth show that the features related to iron production.[657] It is not clear what type of furnace leaves a 'ring-ditch' shape. The ring is probably the impression of the base of a shaft furnace, filled with charcoal and other material after

[648] Winnowing can be done with the help of gravity alone (removing the straw by hand) and grain was also sieved (Heimberg 2011, 112; Plin., *nat.hist.* 18.108).
[649] For the locations of all hearths, kilns and furnaces, see figure 45.1.
[650] For the younger examples, see section 12.4.
[651] Chapter 45 and 46.
[652] On pottery kilns at Heerlen, see among others Gielen 1971a; b; 1978; Hoevenberg 1996; Veldman 2007; Tichelman 2020, 46ff. The kiln of Sirault (B/HT) in fig. 9.13 measures 2.2 m internally.
[653] It is unlikely that the kilns still existed at this location after villa 400 was built.
[654] Bausier *et al.* (1999) refer to four kilns of the late third/early fourth century AD at the villa of Bruyelle-Haute Eloge (B/HT). A kiln at Flostoy-Lizée (B/NA) is also rather late (Ech-Chakrouni 2019, 53; Lefert 2019). Luik (1999, 210-211) refers to only three Rhineland examples: Habscheid-Hollnich (early second century); Euskirchen-Euenheim; Bedburg-Garsdorf (two kilns, fourth century AD).
[655] Tile kilns are mostly, but not always, rectangular: see e.g. Venlo (Ernst *et al.* 2016, fig. 2); Temse (Van Roeyen 1997, fig. 2); Berg en Dal-De Holdeurn (Holwerda & Braat 1944, map).
[656] Willems & Kooistra 1988, 140-141.
[657] Cf. chapter 34.

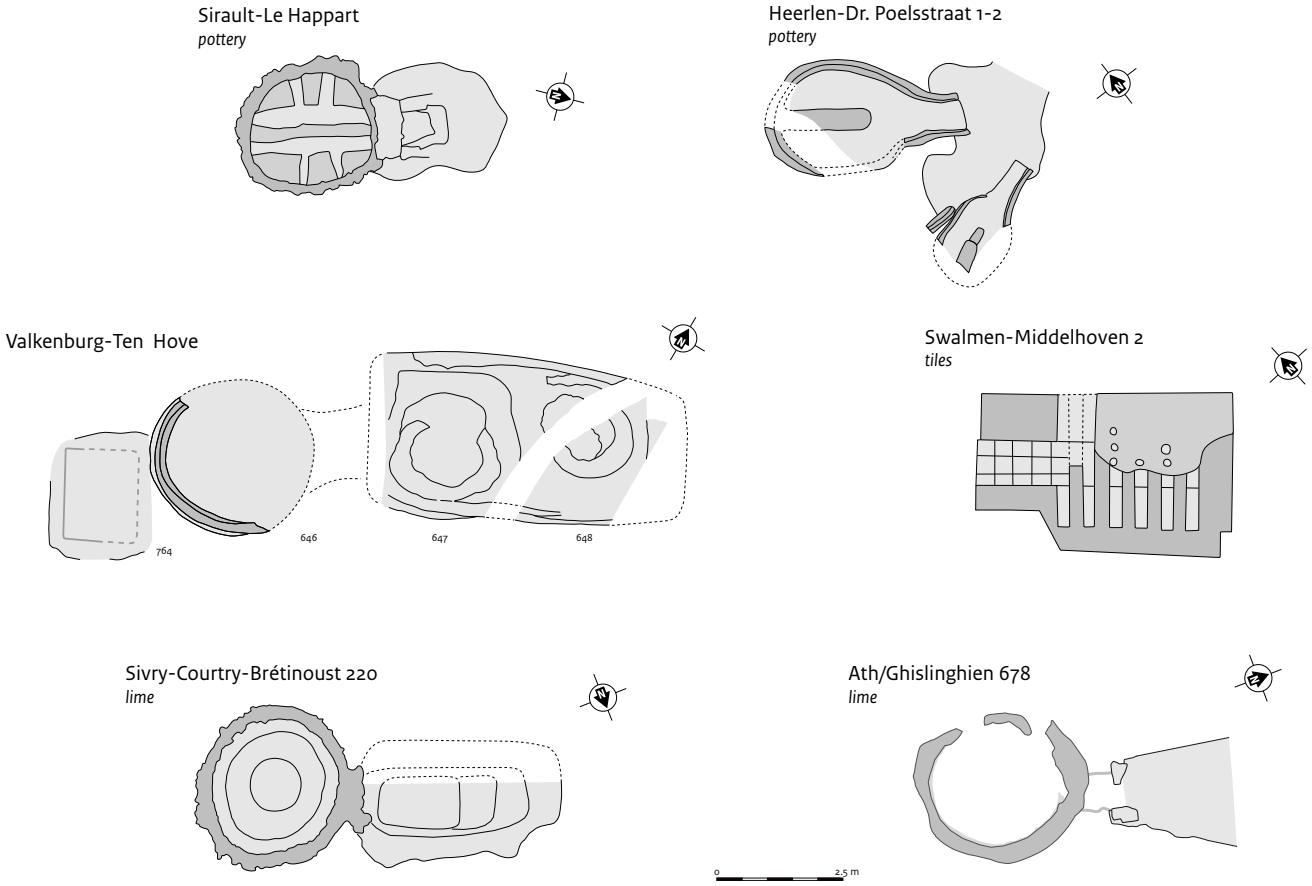


Fig. 9.13 Some examples of kilns for producing pottery, tiles and lime. (source: in part modified after Danese & Authom 2015, fig. 1; Veldman 2007, fig. 12; Wibaut & Mathieu 1999; Ansieau et al. 2012, fig. 1; Suméra & Veyrat 1998, fig. 11; Ernst et al. 2016, fig. 7)

removal of the superstructure (Fig. 9.14; 45.4). The excavator pointed to similar features found 'under' insula 25 of the Colonia Ulpia Traiana, but the precise function of these three circular features (*Kreisanlagen*) was also not clear.[658] Later, two intersecting round hearths were found in neighbouring insula 26, again with no indications of their purpose.[659]

9.6.4 Hearths 607-613, 649

The third group of hearths to be discussed in this chapter are mostly oblong features.[660] Features 608 and 649 are more rectangular or irregular and 610 is oval at one end, but all form part of the same cluster 'inside' building 405. The true relationship to the building is unknown, however. The hearths are not intersected by foundations and could predate the building, be contemporaneous with or post-date it.[661] Some pottery from 608 dates after AD 100, sherds from 609 and 610 after c. AD 150, while there are no recognizable fourth-century finds. This suggests that the hearths belong to period 2, or else 3. However, the radiocarbon date of 610 allows for all finds to be residual and the hearths to be Late Roman or Early Medieval. Feature 619 elsewhere on the site, partly longitudinal, certainly did belong to period 4. Kooistra investigated the charred plant material from some of these hearths and suggested a role in cooking/preparing food because of the presence of wheat grains (bread?).[662] However, if the macrobotanical remains were indeed residual or secondary, the hearths could have been used for a totally different, albeit unknown purpose.

658 Anon. 1989b, 488.
659 Precht 2008, 178-179, fig.114.
660 For the descriptions and dating evidence, see chapter 45.
661 Hearth 649 is also part of this group, but is keyhole-shaped, like the Late Roman/ Early Medieval hearths (section 12.4).
662 Kooistra 1996, 155-156.

A

B

Fig. 9.14 Voerendaal-Ten Hove. Furnace 614 and 615.
A both furnaces with 615 cut by the south wall of the horreum, the first phase wall of the latter in front; B close up of hearth 614.

9.7 Pits

9.7.1 Lime pits

Two pits are certainly not related to normal, daily agricultural or industrial activities at the site, but to occasional ones. It concerns two pits in which lime or mortar was prepared for the rendering of walls or bonding of stone (Fig. 9.15). Tailings of Kunrade limestone from the quarry or stoneworking at the site would have been used as raw material.[663] To make lime, stone or shells are calcinated or 'burned' in a kiln, resulting in carbon dioxide and calcium oxide or quicklime: $CaCO_3$ + heat > CO_2 + CaO.[664] Slaked lime is produced by adding water and mixing: CaO + H_2O > $Ca(OH)_2$. The slaking could be done either at the production site (ensuring a certain quality of the product) or at the building site (less weight and lower transport costs). Finally, water is again added to obtain lime putty. This must be devoid of the last pieces of quicklime because these can pop and thus produce holes in the rendering. The addition of sand as an aggregate and mixing with some more water results in mortar.

[663] On regional production in historical times, see Nillesen 1977; 1989; Thissen 2012; 2014.

[664] For the production process, see e.g. Sölter 1970 (Iversheim); Adam 2010, 65-80.

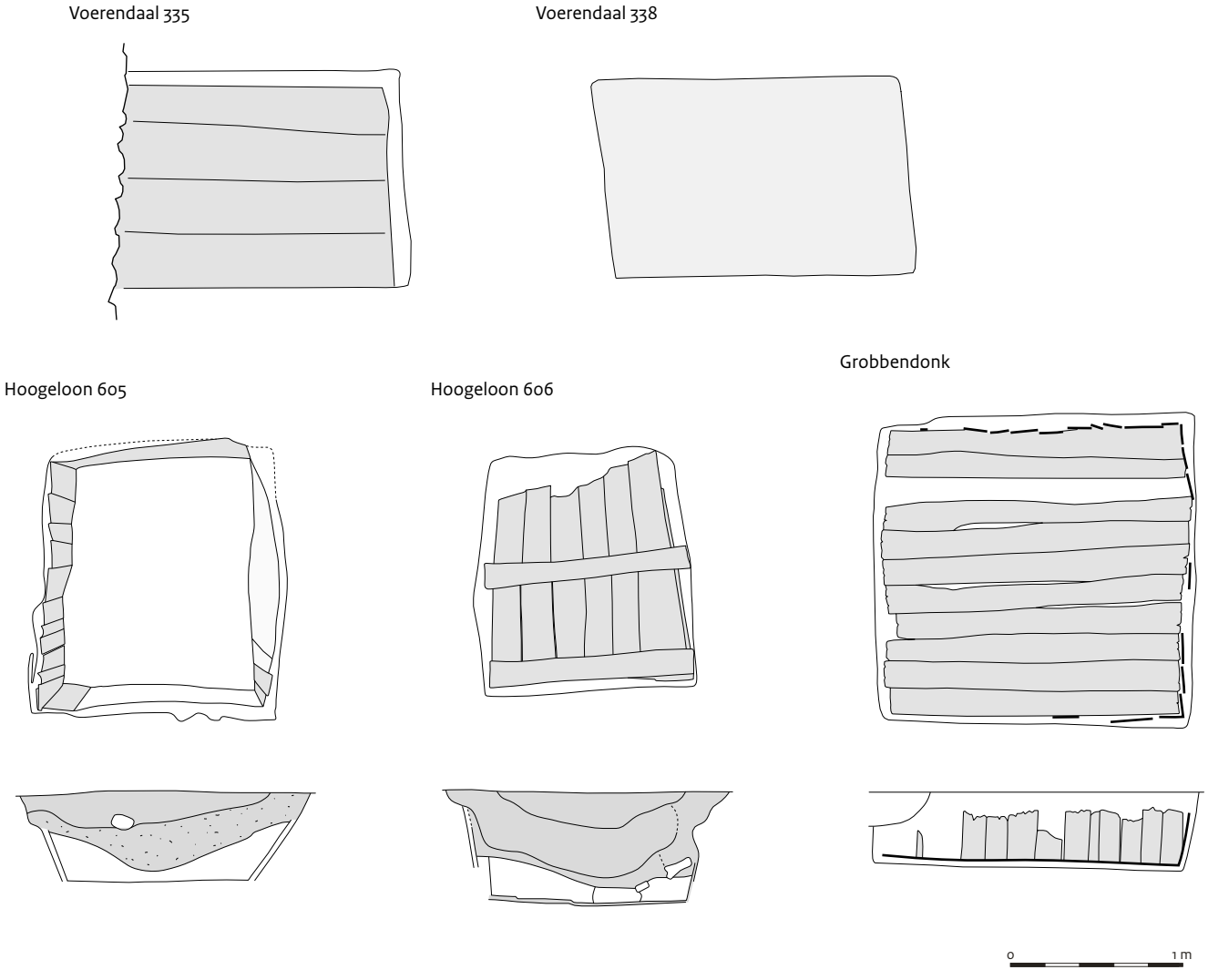


Fig. 9.15 The lime pits of Ten Hove, with examples from Hoogeloon-Kerkakkers and Grobbendonk-Steenberg. (source: modified after Hiddink 2014a, 934, fig. 42.9; De Boe 1977, 19, fig. 6)

Lime pits are regularly found at Roman sites with stone-built structures, although these represent only a fraction of the original number. These pits can be rectangular or round, either unlined or lined with wood – shown by the impressions of planks in lime – or *tegulae* (Fig. 9.15).[665] Voerendaal pit 335 had a lining of rather broad planks, 338 possibly also, although only a featureless bottom was observed. A fragment of brittle, flaky lime with large 'blisters' or bubbles from the latter pit represents freshly slaked lime. This kind of lined lime pit was probably mainly used for preparing lime putty because the lining prevented the intrusion of sand and other material. To make mortar, unlined pits usually sufficed because sand would be added anyway. Because of their location, it is likely that both 335 and 338 were used to prepare lime putty to render the walls of the baths or the portico leading to it.

9.7.2 Other pits

During the excavations, a large number of both larger and smaller pits were investigated (Fig. 46.1).[666] The differences in size and shape hint at a multitude of functions. Some may have been dug for the extraction of loess loam (used in floors, walls, bricks and tiles), as temporary unlined wells or for underground storage. A (secondary) function for many would have been the disposal of waste. There is no certainty about the dating of most pits.[667] Because the finds, if present, only provide termini post quem, it could well be that many of the possible Early and Middle Roman pits were not dug (or filled in) until much later (Table 9.2). This impression is based on the presence of building rubble in many pits and the relatively large amounts of Middle Roman material in examples that certainly post-date the villa.[668] It is important in this respect to note that pits are quite rare at the many excavated Middle Roman settlement sites on the sandy soils of the MDS area in the southern Netherlands.

Table 9.2. Voerendaal-Ten Hove. Pits possibly dating in the Early and Middle Roman period, according to their terminus post quem (>); an * indicates the presence of relatively - intuitively assessed - much building rubble (brick and tile, painted wall plaster), suggesting a post-villa date.

> AD 50/70	> AD 50/70	> AD 125	> AD 150	> AD 175	> AD 200
703*	765	718	726*	701*	702*
705*	767*	739*	729	720	704*
707*	777	754	730	744*	740*
710*	778*	758	775	752*	741
721	782*	763*	784	803*	742
724*	783*	764	805*		743
725	785*	806			762*
727	786				781*
731*	787				
746	788				
748*	804*				
761*	809*				

665 Examples of lime pits: De Maeyer 1937, 139-140, fig. 16; 1940, 32 (Basse-Wavre); De Boe 1977, 18-19, fig. 6 (Grobbendonk-Steenberg); Piepers 1981, 36, fig. 7, nos 134-136 (Lürken-Alten Burg; one pit and two dolia with lime putty); Ebnöther 1995, 32-33, fig. 20 (Dietikon (CH)); Van Ossel & Defgnée 2001, 138-141 (Champion-sur Rosdia); Lenz-Bernhard 2002, 259-262, figs 129-130, pit 255 (Ladenburg-Ziegelscheuer (D/BW)); Pauwels & Creemers 2006, 71, figs 3, 24 (Lanaken-Smeermaas); Hiddink 2014a, 226-230; 932-938 (Hoogeloon-Kerkakkers).

666 On the selection criteria and for the descriptions of 112 pits, see chapter 46.

667 Cf. section 5.2.3.

668 Section 12.5; chapter 46.

10 Water supply, distribution and drainage at Voerendaal

Peter Schut

10.1 Introduction

This chapter discusses 'water management' at the villa of Voerendaal: the supply and distribution of fresh water and the drainage of used water (including rainwater). The primary features related to this theme are as follows (Fig. 10.1):

- water was collected from well 314 and brought to the site by means of aqueduct 316, both situated at the north side of the baths;
- water was used in bath 404 and garden basins 319 and 336; main building 400 may also have been supplied with fresh water from the aqueduct;
- used water from the bath was discharged via drains 327-330 and ditches 302 and 311; dirty water and rainwater from the main building and the basins in front was discharged by drains 317, 318 and possibly 334.

Basin 413 was not related to the other features and because it had an agricultural function, it has already been discussed in the previous chapter. Besides these features, information about the presence and location of water mains or drains is also provided by finds of iron collars, which were used to connect wooden water pipes.

Section 2 of this chapter discusses the first source of water: well 314.[669] The third section is devoted to the most remarkable feature of our villa, aqueduct 316. An attempt is made to reconstruct its course to the water source. In Section 4 calculations are made about the necessary water head (*opvoerhoogte*) to distribute the water away from the aqueduct. Section 5 is devoted to the actual distribution lines, by analysing the distribution of iron water-pipe collars. This is followed by a discussion of the basins in front of the villa(s) and the drains leading away from it/them. Section 6 contains some concluding remarks on the features in comparison to those of other villas. Appendix III presents some estimates of the amount of material and labour input needed for the construction of aqueduct 316.

10.2 Well 314

10.2.1 Function and dating

Well 314 was situated less than 2 m from the northwest corner of the baths, more or less in line with the aqueduct that ended 8 m further to the north.[670] Willems thought that the well supplied the baths with water during its first phase, before the aqueduct was built. Because the distance between well 314 and the main building is 70 m, more wells were probably present closer to the latter. Possible locations for more wells are the non-excavated areas at both sides of the first villa.[671] It was assumed that well 314 was put out of use early in the second century AD, when the aqueduct took over the water supply.[672] However, this chronology is not substantiated by finds or other dating evidence. An alternative scenario is that the well still functioned later as a back-up, for times when the aqueduct malfunctioned or had to be maintained. Whatever the case, the well was open or visible until a late phase of the occupation, at least until the late second century and probably well into the third century AD.[673]

10.2.2 Construction

The fact that no parts of a stone lining were found during the excavation suggests that the well was made entirely of wood (Fig. 41.11). This does not exclude the possibility that the upper part, just above and below the ground surface, was constructed in stone (and later removed). It is most likely that the wooden lining of the well formed a square.[674] As such, the depth of at least 13 m of well 314 must have posed no problem for the builders (but see below). In the loess of the Hambach lignite mining area, wells had to reach a depth of 20-30 m in order to function.[675] There, a round shaft was dug and provided with a temporary wooden lining to prevent it from collapsing.[676] Then, a sturdy square frame was put in position at groundwater level, functioning as a base for the rest of the wooden lining.[677] The lining of Roman-period wells was most frequently made with horizontal planks, often with notches at the corners to connect them.[678] The use of iron nails was apparently not

669 More extensive descriptions of all the features can be found in the catalogue, section 41.2.

670 The way in which it was investigated, only partly by excavation, as well as a detailed description, can be found in chapter 41.

671 Large parts of the yard in front of and behind the main building(s) were also not excavated.

672 Willems & Kooistra 1988, 143.

673 Cf. chapter 41.

674 The round shape of the feature at level 2 does not necessarily reflect the situation at a greater depth; often the square shape of a well is not initially visible.

675 See e.g. Kaszab-Olschewski 2006, 46ff.; on the construction of Roman wells, also Albrecht 2014, 18ff.

676 Cf. Palladius (*agr.* 9.9.3).

677 See e.g. Hallmann-Preuß 2002/2003, 343ff., figs 23-24 (Hambach 59). A nice example in a well at Empel (Hiddink 1994, 66, fig. 12). Similar frames were also found in 4-5 m deep wells near Weert-Nederweert (e.g. De Boer & Hiddink 2014, fig. 16.43ff.)

678 Examples in Albrecht 2014, 35-39. In wells in the Southern Netherlands square corner posts play a part in stabilizing the structure, in combination with notches and protruding parts of planks (De Boer & Hiddink 2014, fig. 16.46ff.).

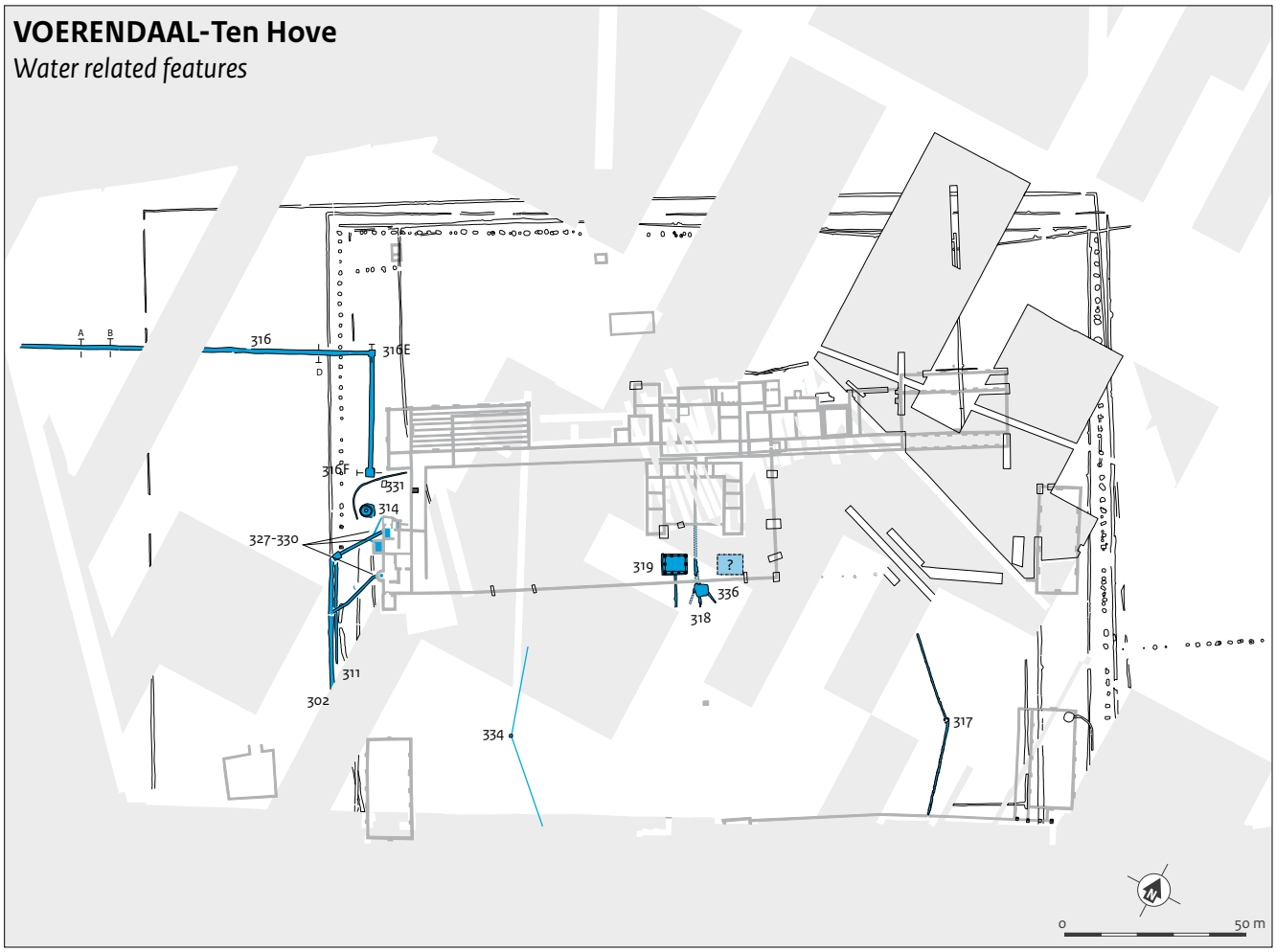


Fig. 10.1 Voerendaal-Ten Hove. Features related to the supply and drainage of water, as well as basins.

necessary and is seldom observed.[679] It was essential, however, to ram the backfilled soil around the lining to prevent later movement of the soil and planks, causing the well to collapse.[680] Signs of such a collapse or – to be more precise, caving-in – of the loess halfway down the shaft are clearly visible in the section of our well at Ten Hove. The question is whether this happened during construction – caused by an unusually high groundwater table or water from a thunderstorm? – or much later when the lining was rotting and disintegrating. It is remarkable that the shaft had a diameter of 2.8 m above the disturbance and just 1.8 m below it. Moreover, the centre line of the shaft shifts in the upper part. This suggests that some calamity happened during construction, although it was in some way overcome.

10.2.3 Water level

Between 80.20 and 80.40 m NAP a layer of gravel was recorded in the boring. It is not entirely certain, although possible, that the gravel marked the bottom of the well. In that case, it was either deposited by the builders to function as a filter,[681] or it was part of a natural layer in the subsoil, forming an aquifer. However, it is not clear how a natural layer of gravel should be interpreted in geological terms. It is reminiscent of the gravel of the slope deposits north of the Kunrade fault,[682] but is not known if

679 Rare examples e.g. Hoogeloon-Kerkakkers well 208 (Hiddink & De Boer 2014c, 857ff.) and Empel-De Werf 335 (Hiddink 1994, 68, fig. 15).

680 Doppelfeld 1962/1963; Albrecht 2014, 23.

681 See e.g. Albrecht 2014, 26-27; Hiddink 1994, 60, fig. 2. Gravel or a wooden floor with holes (as at Sindelfingen (D/BW); Heiligmann in Planck 2005, 319) could prevent sand or dirt being scooped up with the water.

682 Kuyl 1980, 102, fig. 56.

these were present at Ten Hove and if so, at what depth (Fig. 4.1).[683]

A possible second water table above the layer of gravel, at the level where the shaft was caved in, is suggested by a note on the drawing at 83.20 m NAP: 'old groundwater table?'. The question mark already indicates that the excavators did not know how to explain a colour shift in the core of the feature (from light brown-yellow to blue-grey). It could be a change from oxidation to reduction but this does not necessarily indicate a groundwater table, perhaps just the presence of capillary water. The caving-in at about 86.50 m NAP must relate to water, but it is unlikely that there was a kind of water-bearing stratum at this level (loess is quite homogeneous), or that the groundwater reached this level once in a while. In the Hoensbeek valley – ground level at approx. 88.50 m NAP – the water level sometimes rises to a height at which cellars in existing buildings are flooded.

10.2.4 Raising the water

There is no obvious evidence for the way in which water was raised from deep wells. Although a bucket on a rope or chain could have been used in combination with a windlass or a counterweight, this was very labour intensive. It would have taken some 1,000 buckets to fill only the baths of our villa.[684] The use of a well sweep or pole (Egyptian-Arabic *shaduf*; Dutch *haalbalk*, *putmik*) is impossible at depths of over about 4-6 m.[685] Two feasible options exist for raising water from a deeper well, namely a bucket chain or a pump.[686] The former calls for a well with a large diameter (an example from London measured 2.6-3.6 m).[687] Also important is the capacity of such a device. The London bucket chain probably yielded 2-3.7 l/s (172-320 m³/24 hours max.). Experiments with reconstructed Roman pumps indicate a capacity of 95-112 l/min (about 144 m³/day max.).[688] An interesting find was made in Bad Bellingen (D/BW), where wooden water pipes were connected to a well, probably supplying a workshop with water.[689] Water lines connected to wells must have been in existence at many villas without aqueducts because there are no indications of the latter at the large majority of sites.

10.3 The aqueduct

10.3.1 The aqueduct in the excavated area

The aqueduct, feature 316, was recorded over a length of 130 m. The first 97 m have a southwest-northeast orientation.[690] After a settling basin (316E) it makes a 90° turn to end close to the baths. Large parts of the structure are merely present – or recorded – as a ditch (Fig. 10.2). For now, we assume that both the stone and the clay lining were robbed.

Where the aqueduct was well preserved, a lining of 'Cerithium clay' was present at the sides and bottom (Fig. 10.2; 10.3B; 10.9B).[691] This lining prevented the loss of clean water and/or the entry of dirty water into the aqueduct. The stones of the wall were placed in the bed of clay and covered with larger stone slabs and a layer of loose stones. For the sake of convenience, we will assume that the clay bottom and stone walls/roof formed the aqueduct. However, it is theoretically possible that a wooden flume was built in, or that lead or wooden water pipes were added.[692] Although lead pipes are likely to have been removed in later times for use as raw material,[693] no indications of robbing were found, even in the parts where the covering slabs were still present. Moreover, in Roman times lead pipes were mainly used in siphons and at end distribution points, not as a rule in simple aqueducts. Wooden water pipes would also have fitted – albeit only just – in our aqueduct, but if these were actually used, one would expect they were left in place and indicated by finds of iron collars.[694]

Two structures were added to the aqueduct: a settling tank where it changed direction and a 'basin' at the end (316E-F).[695] The settling tank measured approx. 1.7-1.45 m square (interior-exterior) and had clay walls and a stone floor. It probably also originally had stone walls. The receiving basin measured approx. 2.4 x 2.4. m. Regrettably, it was nearly completely destroyed by Braat, preventing an interpretation of the thin line along the edges. The drawing suggests a wooden lining but it is more likely that the basin was fitted with walls of clay and stone.

683 Core B62B3051 (www.dinoloket.nl > ondergrondgegevens) is of no use because it refers in fact to the infill of our well! The sections published with the geological map 62W/E (C-C' and G-G') and core B62B0535, just north of the Retersbeek, indicate a thin layer with gravel in the subsoil near Ten Hove at a depth of about 7-12 m.

684 Cf. e.g. Heirbaut & Van Enckevort 2011, 36 (Wijchen-Tienakker); Hiddink 2014a, 220 (Hoogeloon-Kerkakkers).

685 Hodge 2002, 54. Heege (2012, 51, fig. 19) assumes that a sweep was used in a 6.5 m deep well at Hambach 500.

686 Oleson 1984; Blair *et al.* 2006; Albrecht 2014, 70-76.

687 Blair *et al.* 2006, 49.

688 Neyses 1972.

689 Albrecht 2014, 83-84.

690 Cf. the catalogue, chapter 41.

691 Cf. section 33.4.

692 For the use of planks, e.g. Putnam 1997; 2002; Jacobi 1934, Abb. 14-7; Huther 1994, 106ff.; Hübner 2008, 395-409. Other types of wooden channels are described by Huther 1994, 106ff.; Samesreuther 1936, 95.

693 Schut 2005, 68; Brunsting 1959, *241-2.

694 Only one collar (100-1-10) was found near the endpoint; cf. the discussion on the collars near drain 317 (section 10.5.1). See also Koblenz and Kornwestheim (D, Baden-Württemberg): Samesreuther 1936, 70; 80.

695 Cf. section 10.4.2 below.

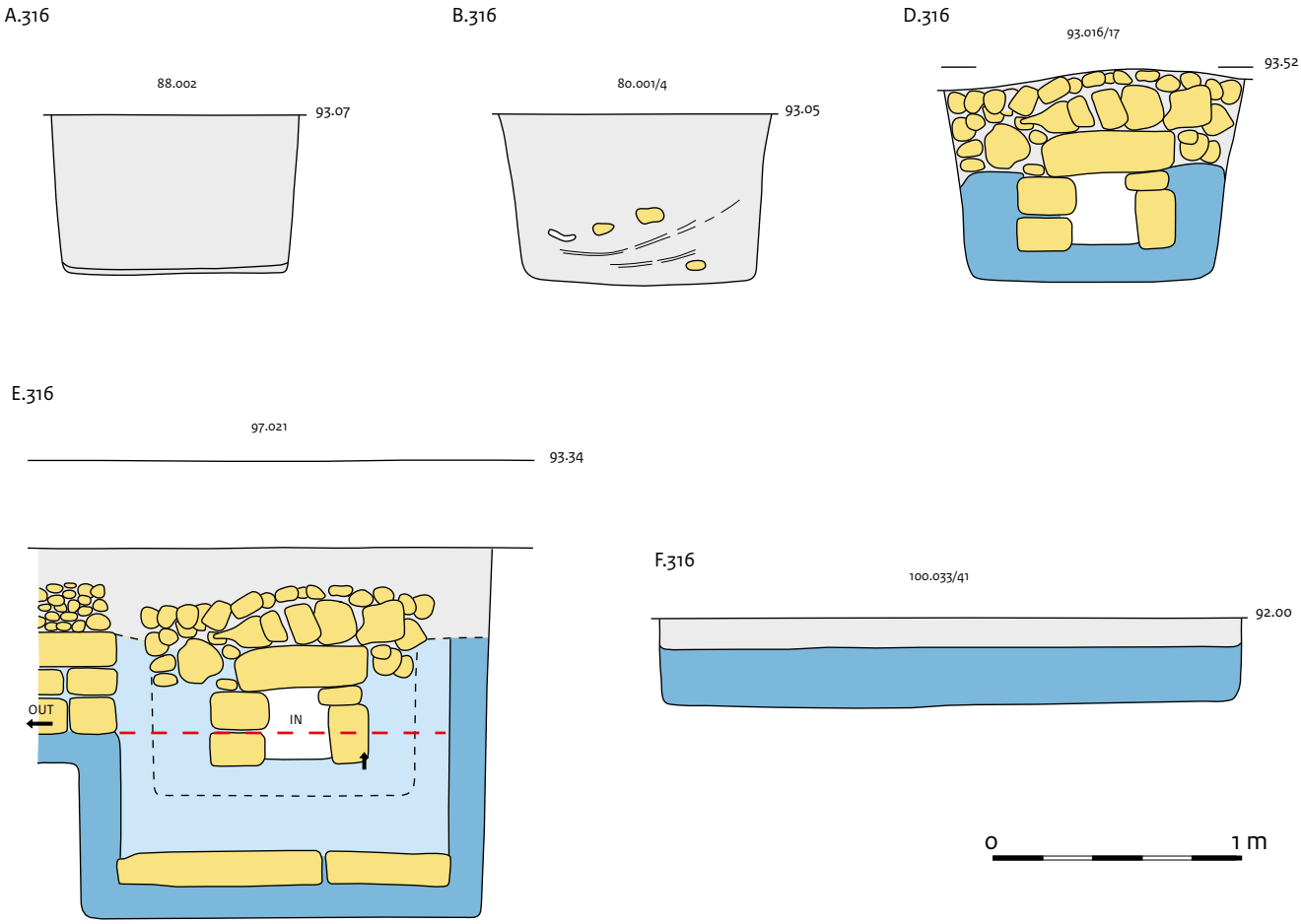


Fig. 10.2 Voerendaal-Ten Hove. Sections of aqueduct 316 (E is reconstructed).

A

B

C

Fig. 10.3 Voerendaal-Ten Hove. The aqueduct during the excavations.
A intact part of the construction in trench 93, viewed towards the east;
B photo of section D, trench 93;
C settling basin 316E towards the west (inlet).

10.3.2 Reconstruction of the aqueduct to the source

Sources in the vicinity

In the preliminary reports on Voerendaal-Ten Hove, it was assumed that the aqueduct began at the sources of the Hoensbeek.[696] Although this is still the most likely option, it is only one of three potential water sources in the vicinity:

1) the valleys of the present-day Kraubeker- and Grubbenvloedgraaf near Craubeek (some 1,400 m west of the villa; Fig. 10.4-10.5).[697] In theory water could be captured from these valleys, but the type of streams here, called '*vloedgraven*' of '*grubben*', are for the main part man-made, only carrying water temporarily during and after longer and intense rainfall.[698] The valleys themselves have become more pronounced in the course of time as the roads running through them eroded. It is highly unlikely that they yielded a constant supply of water in the Roman period.

2) the Retersbeek is fed by two sources, some 1,700 m west of the villa (Fig. 10.4). The water is collected on the Central Plateau/ Schimmert Plateau,[699] a large area but supplying relatively little water to the sources of the Retersbeek.[700] This makes it less plausible that they supplied an aqueduct. Moreover, a loess ridge blocks the route to our villa (Fig. 4.1), a problem that could have been only solved by the construction of a deep gully or a (qanat) tunnel and/or a long detour.[701]

3) to the southwest, at a distance of some 800 m as the crow flies, there is the aforementioned source of the Hoensbeek, an area known as the 'de Zevensprong' (De Sevensprongh, Sjprungs).[702] The oldest topographic and land registry maps already note a source, 'Fontein' or 'Fontaine', at this location (Fig. 10.4).[703] The cause of water springing at several spots is the Kunrade Fault just to the south (Fig. 4.1). The amount of water is indicated by the fact that the Hoensbeek dried up, leaving two mills without water, when a pump house was built in 1920.[704] This involved the considerable amount of some 3,600 m³ for a full day with a constant temperature of 9-10° C.[705] The Zevensprong satisfied the Roman preference for sources in limestone because of the constant supply.[706] The only potential disadvantage is the deposition of a hard layer of limescale inside a water line in certain circumstances.[707] However, this was not observed (or recognized) during the excavation of the aqueduct. Because of the amount of water and the small chance of it freezing during winter, the Zevensprong sources are the most likely water source for the villa at Ten Hove.

Gradient of the excavated part

A first step in reconstructing the course of the aqueduct to the source is to determine the gradient. Ideally, observations along the entire route should be available, but at present the only data are those on the excavated stretches. Levels were taken of ten sections, six of which are illustrated in Figure 10.2. A similar number are noted on the field drawings, but it is not always clear whether they refer to the bottom of the ditch or the channel proper (top clay). However, sections in the vicinity often solve this problem. For the first 80 metres of the aqueduct the only levels are those of the bottom of the ditch, while further down the line the height of the clay is also known (Table 10.1).

Beginning at the west side of trench 88, the gradient of the ditch is 18 cm over 66.2 m (0.27%). In the last 30 m it seems to be 36 cm (1.2%), but the data are not reliable enough for a precise calculation. Perhaps the latter gradient had something to do with the approach to the end basin. Obviously, it was the gradient of the (clay) bottom of the channel proper and not of the construction ditch that determined the actual gradient. There is only a limited number of levels for the last 46.3 m of the aqueduct. They also show a steeper gradient. A complication is the presence of settling tank 316E in this part of the channel. Beyond this tank there are only two levels of the clay bottom. They are situated higher than the clay west of the tank and the same holds true for the outlet (Fig. 10.2E). The raising of the outlet slowed the water down, leaving sand behind in the tank (and resulting in some water flowing back through the inlet). Although based on the level of the bottom of the construction ditch and not the top of the clay, the gradient of about 0.25% in the western-most part seems to be realistic in the light of data on

696 Willems & Kooistra 1987, 36-37.
697 Files of waterways, Water Maatschappij Limburg.
698 *Vloed* means flood, unusual quantities of water; both *graven* and *grubben* refer to man-made features (cf. *graf*/ grave, *groeve*/quarry).
699 The eastern edge is just visible in figure 4.1.
700 Written communication from W.P.A.M. Hendrix (Rijkswaterstaat).
701 Like the gully at Nijmegen-Mariënbos (Schut 2005); on tunnels cf. section 10.6.2 below.
702 Voerendaal E3, plot E26; Hendrix 1990; Gerards 2017. The number seven has biblical and folkloristic connotations. Haberey (1972, 63) mentions the '*Sieben Sprünge*' near the village of Urft and explains the name as 'Seifen', a small valley.
703 TMK sheet 208; Voerendaal E3, plot E26
704 http://www.schumulder.nl/theo/waterpompstation_craubeek.htm (consulted 21-5-2020); Gerards 2017, 10-18.
705 A quantity of 41.7 l/s or 3603 m³ (Hendrix 1990, 17; referring to Jongmans *et al.* 1941) equals 150 m³/hr or 3,600 m³ in another source (Gerards 2017, 16; referring to Buiter *et al.* 1999, 30-31).
706 Grewe 1992, 87.
707 Brinker 1986, 243-248.

Fig. 10.4 Klimmen-Craubeek area. The landscape according to the oldest land registry maps (1821-22) with the sources of Hoensbeek and Retersbeek. (source: modified after land registry maps Klimmen A2; B1; C2; Voerendaal A4; E1)

Table 10.1. Voerendaal-Ten Hove. Levels of the bottom of the ditch and the top of the clay. Values with a * taken from section drawings, others from notes on the field drawings; value between ( ) is the floor level inside the settling tank.

Section Fig. 10.2	Trench	Distance from o/W wall trench 88	Ditch	Top of clay
	88	0.30	*92.55	
	88	7.67	92.49	
A	88	16.50	*92.43	
B	80	25.00	*92.35	
	80	27.00	92.46	
	82	50.80	*92.43	
	82	58.86	92.40	
C	82	66.50	*92.37	
	93	68.95	*92.29	
	93	75.15	92.19	
D	93	82.83	*92.17	*92.31
	97	84.35		92.32
	97	96.10		92.13
E	97	96.40	*92.01	*92.11
	97	96.02		(*91.77)
E	97	96.72	*92.14	*92.24
	97	97.08		92.24
	97	101.50	92.26	
F	100	129.12	*91.64	*91.88

Roman aqueducts (see below). It must be stressed, however, that the gradient does not have to be constant in all parts of the channel.

Course of the aqueduct

On the basis of the gradient of the excavated part, it is possible to reconstruct the course of the aqueduct to the source (Fig. 10.5). One of the basic assumptions is that the Romans preferred to use natural gradients, following the relief contours.[708] Only in extraordinary circumstances were bridges or tunnels used. Although a single water conduit could have different gradients, the average lies between 0.05 and 0.5%, with 0.2-0.3% occurring frequently.[709] The 0.25% of the western excavated part of our aqueduct falls in the latter range, although at most it is merely indicative of the original gradient of the feature as a whole. In our calculations of the hypothetical gradient and flow rate, 0.15% is taken as the minimum value for the former and 0.25% as the maximum. At a gradient of 0.25%, the ground level towards the source raises 2.5 m per kilometre; at 0.15% it would be 1.5 m.

Including the excavated part of 130 m, the reconstructed course has a length of about 1,820 (0.25%) or 1,500 m (0.15%). Starting from the inlet of the settling tank 316E, where more reliable levels were taken (relative to those of the final stretch of 34 m), the distance to the source would be about 1,786 or 1,466 m. The theoretical heights at the source can be calculated from the level of the bottom of the channel (top clay) and the ground surface at 316E (Table 10.2; Fig. 10.2, E). While the reconstruction of the aqueduct route is based on the present-day ground level (see below), the bottom of the channel is more relevant for the altitude at the source. The source itself may have been situated further upslope than the beginning of the aqueduct. In any event, the present-day ground level at the Zevensprong is about 97 m NAP,

[708] Grewe 1992.

[709] Grewe 1993; 2001; 2002; 2004; Hodge 2002, 173ff.; 346-348; Wegner & Heimberg 1978; Schut 2004, 15. Pliny mentions a minimum of 0.002% (Plin., *nat.hist.* 31.57) and Vitrivius one of 0.5% (*arch.* 8.6.1).

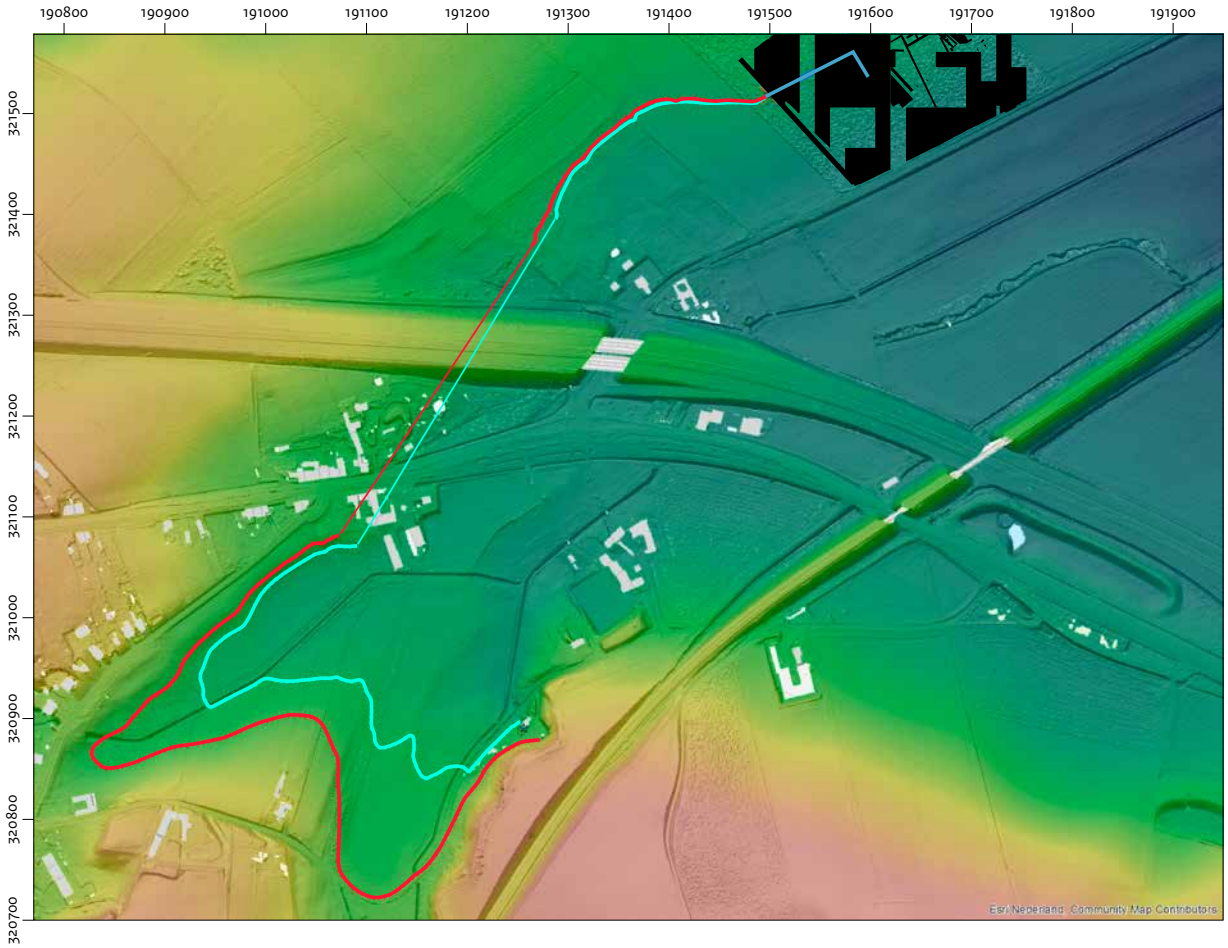


Fig. 10.5 Voerendaal-Ten Hove. Reconstruction of the course of the aqueduct with either a 0.25% (red) or an 0.15% gradient (blue); the sections with a thin straight line are in an area where the relief is changed too much to allow for a reconstruction; for absolute heights, see figure 4.1. (source: P. Schut & ESRI Nederland)

suggesting that a gradient of 0.25% is the most probable option.

Some additional comments about our reconstruction are in order here. Firstly, the present-day altitude of the ground level was taken into account; it could have been lower or higher at specific locations in Roman times, before erosion or sedimentation. Secondly, the relief has certainly been seriously altered in some areas by the construction of several roads – especially the highway – and buildings in hamlets and villages. It is striking that the excavated part of the aqueduct runs in a straight line, while the reconstructed part turns just west of the excavation border. This is likely the result of erosion, with the channel in reality running further to the south. Geophysical research in combination with additional trial trenches could perhaps clarify this.[710]

At the source

It is not known, nor ever will be, just how the water was collected at the source. The remains of the aqueduct have probably been completely destroyed, at the latest when the pump house was built in the beginning of the twentieth century. Perhaps a collecting basin was built over one specific spring well-head, as at Anthée-Grand Bon Dieu (B/NA). The aqueduct of this large villa started at the source of Al Tavienne, some 2 km from the villa. A masonry basin was constructed there, 1.75 m square, 45 cm deep and covered with large slabs of 160 by 64 cm.[711] Another possible method to capture a source or

[710] See section 10.6.5 below.
[711] De Maeyer 1937, 200.

Table 10.2. Voerendaal-Ten Hove. Altitude of the aqueduct at basin 316E and hypothetical altitude at the Zevensprong for two gradients.

Gradient	Difference in height	Bottom 316E	Ground-level 316 E	Bottom channel at source	Ground-level at source
0.15%	(1.466 x 1.5 m=) 2.199 m	92.11	93.34	94.31	95.54
0.25%	(1.786 x 2.5 m=) 4.465 m	92.11	93.34	96.58	97.81

series of springs was a long channel at the foot of a slope or cliff face. An example can be found at the Grüner Pütz near Nettersheim (D/NRW) in the German Eifel, one of the sources feeding the aqueducts for Roman Köln.[712] The structure found here is an 80 m long 'seeping line' (*Sickerleitung*), at the side facing the slope made of coarse stonework without mortar. The other side was made watertight with a clay lining. Behind the capture line, the water was collected in a settling basin like 316E at Voerendaal, although somewhat larger with an interior of roughly 1.9 x 1.9 m and a depth of 2 m. The inlet of the aqueduct at the opposite side of the basin was at a slightly higher level to remove sand (Fig. 10.6; cf. 10.2E).

10.3.3 Flow through the aqueduct

It is interesting to obtain an impression of the amount of water the aqueduct carried, even if it is just a rough estimate. Calculating the flow rate (*debiet*) or discharge of the aqueduct is quite easy: it is determined by the cross-section of the channel and the flow velocity. However, calculating the velocity of the water is quite complex. Several formulae exist but the one used here is that of Chézy. This is appropriate for open conduits and therefore only for the first part of the Voerendaal aqueduct, since this section was probably not completely filled, unlike the last part in the excavated area.[713] It falls outside the scope of this contribution to discuss the details of the formula and the calculations based on it (see Appendix II). However, it will be obvious that major factors here are the size of the canal, the water level and the gradient. Also important, but the most complex part of the formula, is the 'roughness' of the bottom and walls of the channel. In layperson's terms, the water is slowed down by friction and turbulence; this is expressed by the Chézy coefficient. This is usually calculated by introducing one of Manning's coefficients for the roughness of different materials, such as 0.015 for rough concrete or brick and mortar sewers, or 0.013 for unplaned wood (Appendix II).

The graph in Figure 10.7 was constructed with the help of an Excel application.[714] It shows the water supply for slopes of both 0.25 and 0.15% and for two possible aqueduct designs. One has been given the clay bottom and stone walls as found, with a width of approx. 24 cm (Fig. 10.2). A second, hypothetical design has a wooden flume, narrowing the channel with two times the thickness of 5 cm planks (24 - (2 x 5) = 14 cm). Finally, the model takes into account different water levels in the channel. For instance, a water level of 10 cm and a gradient of 0.25% in a channel with stone walls and a clay bottom resulted in a supply of about 11.5 l/s or 994 m³/day. A wood-lined channel with the same water level but a gradient of only 0.15% supplied 5 l/sec or 430 m³/day. With a yield of about 42 l/s, the Zevensprong source(s) could easily supply these amounts of water. Only a small portion of the spring water had to be captured, the remainder feeding the Hoensbeek. Hopefully, future investigations of the aqueduct – both just outside the excavations and nearer to the source – could shed more light on its construction and gradient, enabling more precise calculations of the flow rate.

10.4 Distribution of water over buildings and basins

The water supplied by the aqueduct was obviously intended for use, most likely at the baths where large volumes were needed. Although the endpoint of the aqueduct was not situated at a great distance from building 404, tens of metres still had to be bridged to reach the

712 Haberey 1972, 64-68.

713 In this case it is likely that some sort of air escape was built in (Kottman 1984, 82-85). See below, section 10.4.1.

714 Made by C. van der Ree, the principles discussed with J. Louwe Kooijmans. We are grateful for their help.

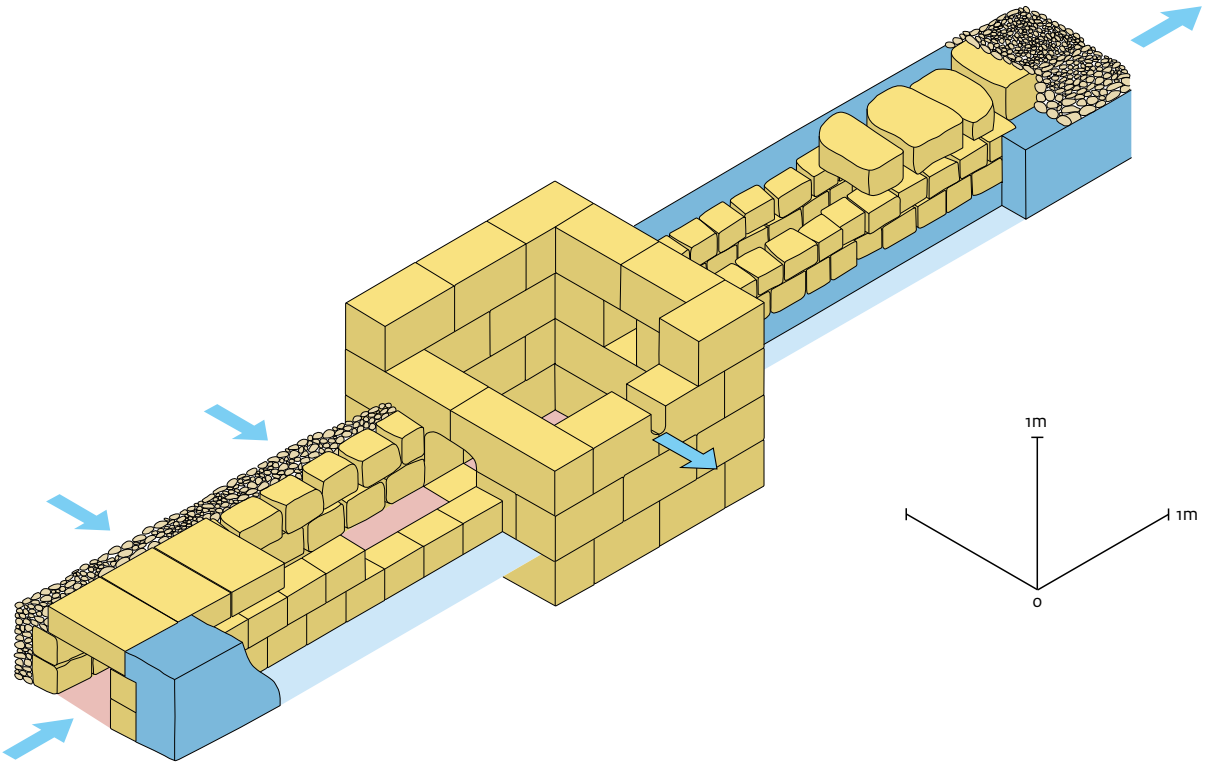


Fig. 10.6 Craubeek-Zevensprong. Hypothetical reconstruction with part of a infiltration line (left), collecting basin with overflow (middle) and the aqueduct as found in the excavation (right).

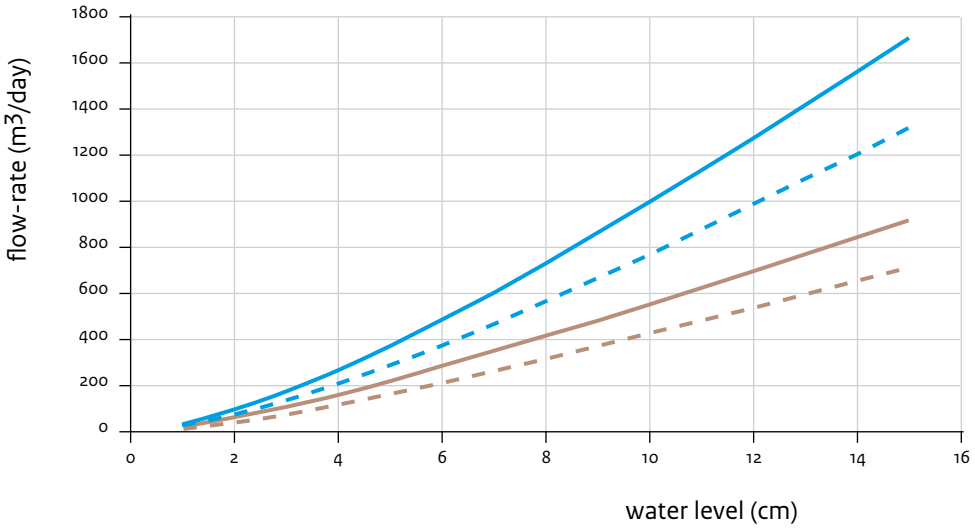


Fig. 10.7 Voerendaal-Ten Hove. Graph showing the estimated flow-rate (m³/day) for a water-level of 1-15 cm in the aqueduct and a gradient of 0.25 (solid lines) and 0.15% (dashed lines). Blue: a stone/clay-channel; brown: wood-clad channel.

boiler and storage tank. Furthermore, we should investigate how the height of the aqueduct's end basin related to the height at which water had to be delivered in the baths. Besides the baths, water was possibly used in the main building. In any case, even if there were no taps in the villa itself, water flowed towards basin 319, 80 m from the endpoint of the aqueduct. The first section below discusses the level of the water lines entering the baths and main building, while the second is devoted to the functions of the aqueduct basins in relation to the distribution.

10.4.1 Locations where water was used

The baths

The distance from the end of the aqueduct to the baths was only a dozen metres but the water was needed at the south side of the latter.
The *praefurnium* was situated there, with a boiler to heat the water.[715] It is likely that the water first filled a storage tank; one of its functions was to buffer an amount of water to prevent the boiler from overheating when the water supply from the aqueduct was interrupted. The water level in the tank/at the entrance point must have been above that in the boiler, the basins and *labra* of the baths. In the schematic reconstruction in Figure 10.8, the water level in the storage tank is about 93.00 m NAP. This is 112 cm above the (clay) bottom of basin 316F at the end of the aqueduct (91.88 m NAP).

The main building

Although it seems obvious that not only the baths but also the main building were supplied with fresh water, this is far from certain.
The majority of Roman villas in the north had no water lines and water was taken from wells.
The latter holds true for the first main building (399) at Voerendaal-Ten Hove, which did have an aqueduct. At villas where water lines were found, these generally entered the building at the baths, not at the living quarters. Even at a villa like Hoogeloon-Kerkakkers, which only had a well, the latter was first situated near the living quarters in the south and then moved to the other side when the baths were constructed there.

The only possible indications of the supply of water to the main building are ditch 331 – for a wooden water line? – and drain 318 (if this was intended not only for the discharge of rainwater). A water line for the (second) main building required a height at its entrance of some decimetres above floor level (Fig. 10.8). The latter level – possibly not the same in every room – can only be estimated by means of the levels of the lower floors of the *hypocausta*. A rule of thumb is that the ground level of a Roman building was situated at least some 80 cm above the bottom floor: 60 cm for the pillars and 20 cm for the thickness of the concrete floor on top of them (*suspensura*). Rooms 14 and 13 had a lower floor at a level of 91.79 and 91.74 m NAP, suggesting a ground level of about 92.59 and 92.54 m NAP. The taps – small fountains, gargoyles – must have been situated about 1 m higher. It is virtually impossible for water for the main building to have been supplied from settling tank 316E (see below) and it must therefore have come from end basin 316F (Fig. 10.8, A). Both were located at a distance of 70 m from the main building. Even if the main building had no direct water supply, basin 319 must have been connected to a water line. The bottom of this basin was at a level of 90.65 m NAP (Fig. 10.8). At a depth of 1 m, the water level in the basin was about 91.65 m NAP, somewhat below the bottom of basin 316F (80 m away).

10.4.2 Function and design of the aqueduct basins

The settling basin

Settling basin 316E marks a 90° turn in the aqueduct (Fig. 10.2B; 10.3C). Although its position, a little upslope of the main building, seems logical for a point to divert water to the villa, it is not. Gravity would draw all water towards basin 316F unless this was prevented by a valve. In that case, however, it would deprive the baths of water. As described earlier, the slightly higher level of the outlet relative to the inlet made the basin function as a settling basin for sand, at the same time slowing the water velocity down to prevent damage to the rest of the channel.

[715] Cf. section 8.4.

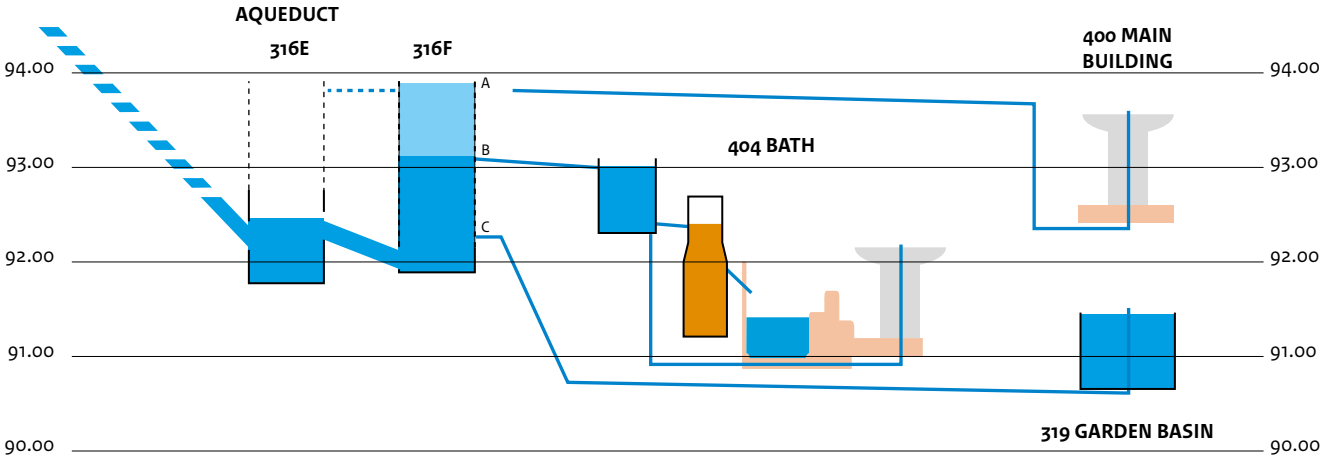


Fig. 10.8 Voerendaal-Ten Hove. Diagram of the reconstructed water supply system. For clarity's sake, the lines A-C leaving tank 416f are at different levels, but in reality, all left at the same level.

The end basin

Because settling tank 316E could not have played a role in the distribution of water, end basin 316F must have done so (Fig. 10.8-10.9). The basin measured 2.25 m square and was more than 57 cm deep (level 1 at 92.21 m NAP – bottom at 91.64). Above the 22 cm thick layer of clay at the bottom, the fill was disturbed during Braat's excavation and evidence about its construction was lost. Lumps of clay found in the disturbed fill suggest that this material was used for lining or sealing the walls. The floor and walls proper were probably made of stone that was later robbed.

The structure could theoretically have been used as a well, a distribution basin or a kind of water tower. The first option is unlikely because the amount of water was too great and the basin would have overflowed continuously. A well sweep (*shaduf*), bucket chain or pump was not suitable for a shallow basin.[716] A second option for basin 316F was that it was a kind of *castellum divisorium*. These could have various designs, but they were generally not very deep, with the outlets only slightly higher than the inlet (primarily for the settling of soil particles).[717] At Voerendaal, the water lines leading away from such an installation must have run at least above excavation level 1 (about 92.15 m NAP) because no traces of them were found. However, this was far too low to bring the water to the baths and/or the main building. Only garden basin 319 could have been supplied with water without problems (Fig. 10.8, line C).

Therefore, a third option is the most plausible: a kind of water tower. It must have included a closed tank to a height of at least some decimetres above about 93.00 m NAP to feed the baths (Fig. 10.8, line B) and some 80 cm above that level to enable a flow of water to the main building (Fig. 10.8, line A). Although outlets A-C are placed at different levels in Figure 10.8 to simplify the diagram, for a water tower to function, all lines had to leave the tank from the same level, in casu A (or B if the main building was not supplied). Otherwise, all the water would have quickly drained away to basin 319 through C. Outside the tank the water lines would have been brought to ground level or rather beneath it to prevent freezing during the winter. Perhaps ditch 313 held part of the lines with wooden or lead pipes to the baths and the main building/basin 319.

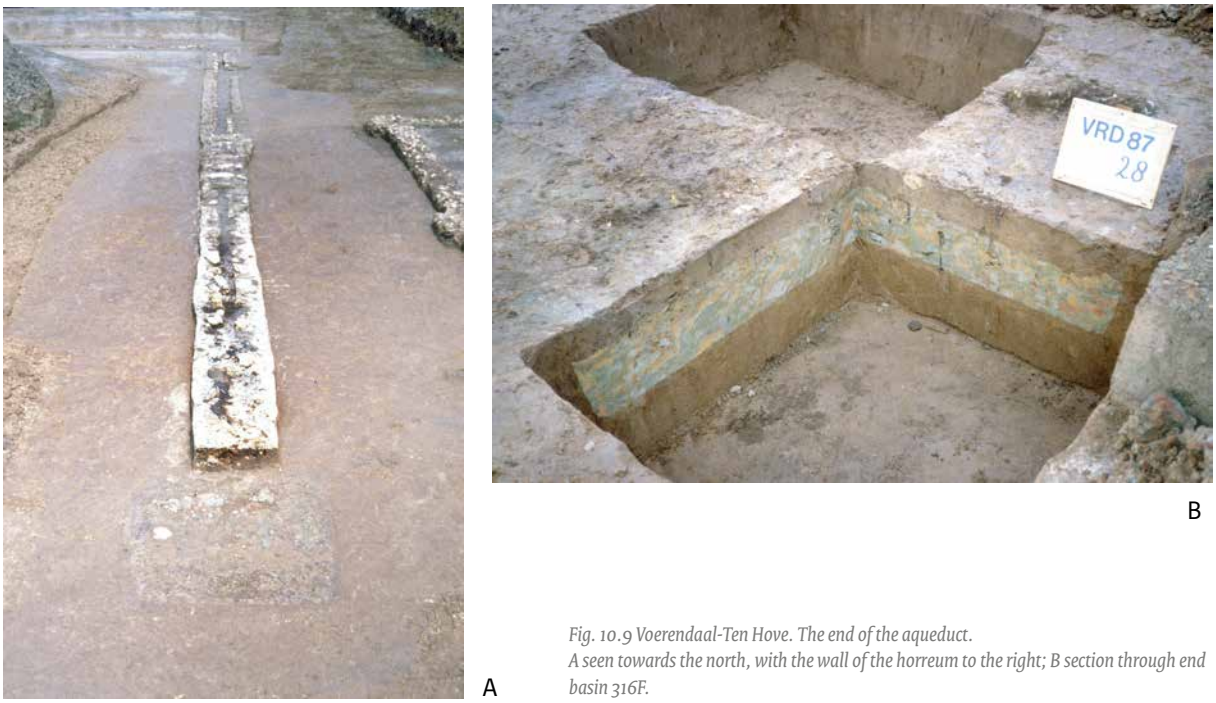
Water towers were known in the Roman period. A 7 m high example from Pompeii was designed both for regulating water pressure and distribution.[718] Although a water tower was probably used at Voerendaal, many questions remain about its design and operation. The water level in the tower/tank would have been higher than the level in the final stretch of the aqueduct, over a length of hundreds of metres. It is not clear how water loss through the top of the aqueduct in this part could have been prevented.[719] Perhaps the pressure was low because of the continuous flow of water, resulting in little seepage through the top of the

716 Oleson 1984.

717 Well known examples in Pompeii and Nîmes (see e.g. Kretzschmer *s.a.*, 49-51; Adam 2010, 250-253); for Nijmegen, see Schut 2005, 66-72

718 Kretzschmer *s.a.*, 51, fig. 87; Grewe 1992,77ff.; Jansen 2002, 36ff.

719 On top of the limestone split in section 316D, no traces of a sealing layer of clay were found. Did the loess above it suffice to prevent seepage?



A B

Fig. 10.9 Voerendaal-Ten Hove. The end of the aqueduct.
A seen towards the north, with the wall of the horreum to the right; B section through end basin 316F.

aqueduct. Other questions are whether the clay bed in basin 316F could have carried a stone tower, how a tower was made watertight (clay, plaster, lead inner tank) and whether there was excess water at the top that had to be diverted.

10.5 Water mains, basins and drains

10.5.1 Iron collars as indicators of water lines

The characteristic iron bands or collars, with ridges on their circumference,[720] were used to connect the wooden segments of water lines. They are found at many Roman (villa) sites, albeit typically in small numbers; only one or two are depicted in most publications. Therefore, the 30 found at Ten Hove form a substantial find category. In principle, they could provide information about the locations where water lines were once present. Descriptions and drawings of the collars of Ten Hove are given in the chapter on metal finds (Section 20.3.16). The examples referred to in that chapter show that their diameters fall within the normal range of 9-16 cm, mostly around 12 cm. The wooden pipes were made out of logs with a round or square exterior. Sometimes logs were split, resulting in triangular pipes.[721] A large 1.27 m long spoon-bit auger for drilling the channel in the pipe was found at the Saalburg.[722] The length of the pipes could vary considerably as some examples show: 1.5-1.8 m at Wroxeter,[723] 1.8-2 m at Heybridge,[724] 2-2.5 m at Nijmegen,[725] 3.5 m at Trier,[726] 3.7 m at Koblenz[727] and 4.5 m on average at Aachen.[728] For Voerendaal there are no indications of double collars with an extra ring around the circumference of the pipe. These could be used in water mains with a higher pressure.[729]

If we look at the distribution of the collars at Ten Hove, we find only one example north of the villa in trench 7 (Fig. 10.10). Willems thought that the main building was supplied directly from settling tank 316E in the aqueduct via a water main running towards the north side of the villa.[730] A single collar offers no compelling evidence for such a line, however, and the settling tank was not a distribution point, as we have seen above. The collar found in pit 744 next to the endpoint of the aqueduct could have been part of a main leading from there (either to the bath or the main building). A ring found in pit 785, one from trench 106 and another from 94

720 *Deichelringe* in German (a *Deichel* being a length/log of wood used as a water pipe).
721 Neyses 1994.
722 Jacobi 1934, 42, fig. 2.20.
723 Burgers 2011, 26; see also Hodge 2002, 112. According to Manning, a length of approx. 2.1 m (7 *pm*) is 'often' found in Great Britain (1985, 128).
724 https://intarch.ac.uk/journal/issue40/1/3-7-6.html (consulted 7-5-2020).
725 Schut 2005, 69.
726 Haberey 1972, fig. 101.
727 Samesreuther 1936, fig. 44.
728 Grewe 1988, 62.
729 Examples at e.g. Kerkrade-Holzkuil (Tichelman 2005, 223, fig. 7.2b) and Saalburg (Jacobi 1934, fig. 14.5b).
730 Willems & Kooistra 1988, 143; as stated above, this is impossible.

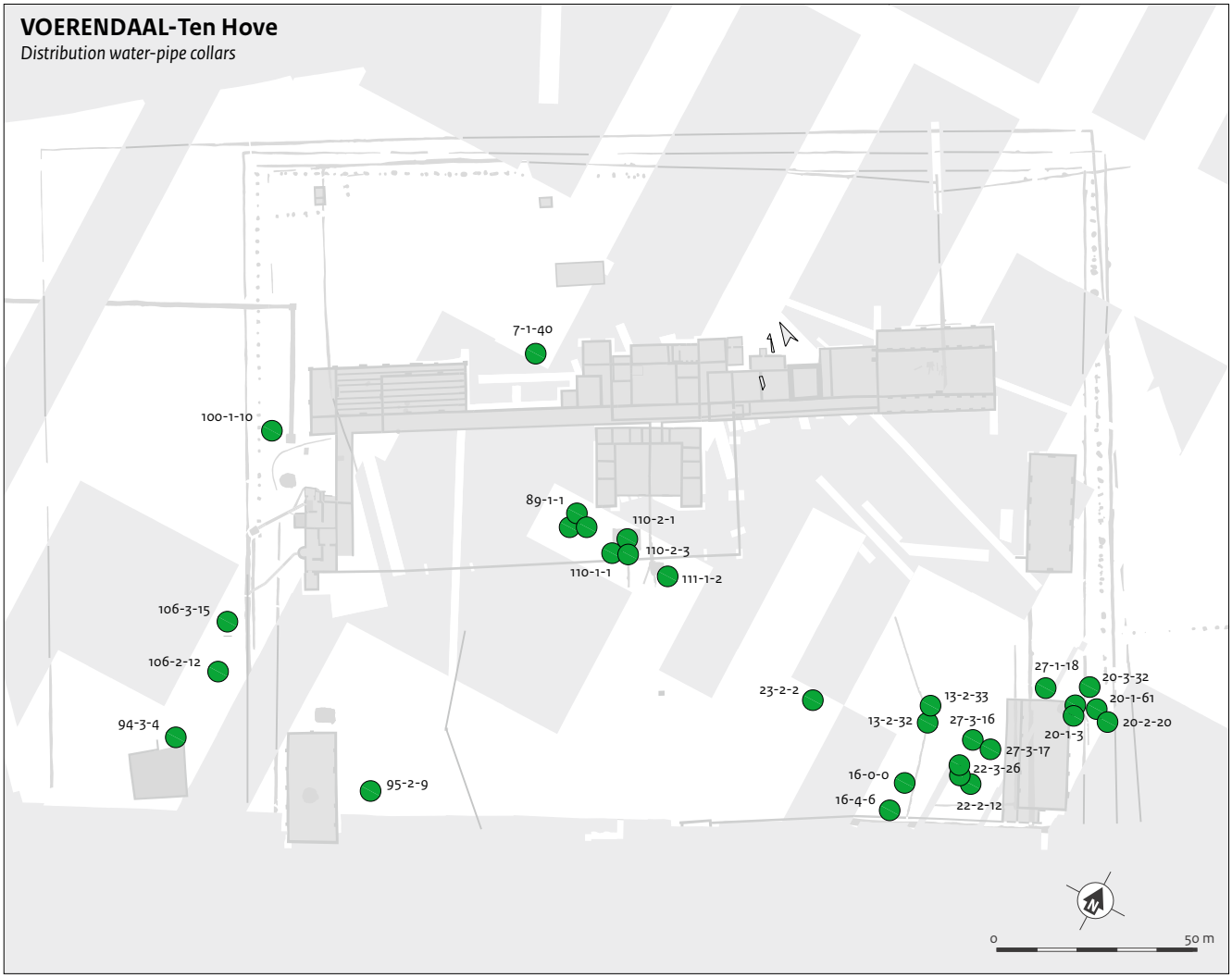


Fig. 10.10 Voerendaal-Ten Hove. Distribution of the iron collars used in wooden water lines and drains.

could in theory have been part of a line feeding horse pond 413, although they could also be stray finds.[731]

A considerable number of collars were found in two 'concentrations'. Seven were collected in front of the main building(s). It is likely that most were originally part of the water pipe supplying basin 319 (Fig. 10.11); one was actually found in its fill.[732] Because some of these collars came from locations south of the basin and its 'predecessor' 336 (Fig. 10.12B), the drains of the basins may have consisted of wooden pipes in the ditches. The presence of wooden drains is further suggested by the second concentration of collars in trenches 20, 22 and 27. One ring was found in drain 317 and some others were found in its vicinity. A complication, however, is that the drain still had most of its covering stones. It was not dismantled and the collars around it cannot be explained, apart from the possibility that they belonged to its first phase (see below), or a hypothetical later phase on top of the stone drain. Another option is that the rings, especially those found in front of building 401, were brought here at a later time, for instance the Late Roman period (as raw materials for a smith?). Four collars northeast of building 401 deserve special consideration because they might have been part of a wooden drain in ditch 333.

[731] Section 9.4.3.

[732] A 4 m long feature entirely consisting of charcoal (110.012) in the basin could have been a burned water pipe. For the basins, see further sections 11.2.3 and 82.2.

A

B

Fig. 10.11 Voerendaal-Ten Hove. Basin 319.
A seen towards the northeast, with the 'garden wall' in the foreground and drain 318 at the back; B section, southwest quadrant.

A

B

C

Fig. 10.12 Voerendaal-Ten Hove. Details of drains and basins.
A detail of drain 317 in trench 13, seen from the south; B drain 318 and basin 336 seen from the southeast; C basin 334, seen from the north.

10.5.2 The drains of the villa and baths

The drains of the bath

The drainage system of the baths consisted of several drains. Four were made of stone or tile (327-330). Two of those were quite long and terminated near a series of ditches (including 302). The drains of stone/tile are described in detail in the catalogue,[733] as are the ditches of the site.[734] Here, we will only comment on their water drainage function. Both drains 328 and 330 had a kind of end basin – severely damaged during Braat's excavations – situated at the edge of ditch 302. The primary function of 302 was that of a boundary of the villa yard but part of it (also) became a drain. The gradient of ditch 302 was more than enough because it dropped 1.2 m in height (3.6%) over about 33 m. On the basis of the finds, we can conclude that the drain was used until the baths went out of operation. It is possible that ditch 311 also functioned as a drain alongside 302 because it begins where drain 328 ends. However, it disappears after some 30 m. One wonders if main drainage ditch 302 was provided with some kind of revetment, preventing erosion upslope and silting-up downslope. No traces of it were present (or observed), however. The end basins of drains 328 and 330 were probably intended to reduce the velocity and erosive power of the water coming from the baths.

Drain 318

This stone drain was not well recorded in 1987 and was destroyed by Braat at the point where it crossed the garden wall (Fig. 10.11A; 10.13B).[735] It was 13 m long and described as having two phases, the first running south-southeast, the second due south (to connect with the drain of basin 319?). In reality, the 'wall' dividing the central room of the first villa (399) probably represents parts of drain 318, with a point of origin at the front of the second villa (400). In any case, 318's role as a drain rather than a water main is shown by the direction downslope. Its gradient was some 59 cm over 13.3 m (44.36/1,000 m) or 4.4%, which would be unusual for a supply line.

Drain 334

Small basin 334 in the western half of the villa yard (trench 107) had something to do with water, as is shown by the presence of blue-grey clay (Fig. 10.13C). The basin was probably a settling basin like that of drain 317 in the east (see below). The drain proper, of which 334 was a part, appears to be completely eroded. To the north it may have been connected to the west corner of the main building or the east corner of the *horreum*. Apart from the probability of erosion, nothing more is known about its northern part because it ran through an unexcavated zone.

Drain 317

Some 50 m of drain 317 were excavated. It had at least two phases: the first was a ditch (with wooden pipes?),[736] the second a stone construction with large covering slabs of limestone and flint (Fig. 10.13A). This second phase did not have a stone bottom and clay was only applied over the last 11 m. A rectangular settling basin of 80 x 90 cm was present halfway along the excavated part. One of its purposes could have been to reduce the water velocity. The change of direction south of the basin was perhaps made to avoid the threshing floor next to building 401. The level of the drain dropped from 89.58 to 87.10 m NAP or 2.48 m over about 51.50 m, which amounts to a gradient of 4.82%.

10.5.3 Drainage of rainwater

Even if the main building was supplied with fresh water by a water line, probably not all three drains 334, 318 and 317 were needed to discharge the used water. Rainwater was another kind of water that had to be discharged, albeit incidentally. The vast majority of Roman buildings had neither rain gutters nor downpipes, but some examples of gutters at ground level below the eavesdrop do exist.[737]

Based on the position of the drains just mentioned, it is likely that only water from the roofs of the (second) main building (perhaps including later additions in the east), the *horreum* and baths was drained, not water coming off the other outbuildings. Most runoff must have come via the portico that connected the buildings of

733 Chapter 43, structure 404.
734 Chapter 41.
735 Section 41.2.
736 Cf. section 10.5.1 above.
737 E.g. at Köln-Müngersdorf (Fremersdorf 1933, 73, pl. 4; Troll 1988, 94-96); Newel (Cüppers & Neyses 1971, 147, fig. 4); Oberweis (Cüppers 1990, 513-514; around the west pavilion); Anderlecht (De Maeyer 1937, 194); Wavre (De Mayer 1940, 30). See also Burgers 2001, 45.

the '*pars urbana*'. The question is which roof planes were drained: only those facing the yard or also those opposite at the back? Rainwater from the western half of the baths was without doubt drained via drains 328, 330 and ditch 302. It is not known how the water on the roofs of the north side/back of the other buildings was dealt with. There were problems with water at this side anyway because the villa was not situated on the crest of the loess ridge and therefore blocking runoff downslope.[738]

If only the rainwater from the roofs of the '*pars urbana*' was diverted, it concerned an area of roughly 1,000-1,250 m² (Table 10.3). If we also have to take account of the roofs of the later eastern wing of the villa and building 405, the area is about 1,750-2,050 m². The amount of rainwater would have varied substantially of course. The largest amounts fell during cloud bursts (25 mm/hr or at least 10 mm/5 mins) and heavy rain (at least 50 mm/24 hrs), events that only happened once every decade on average.[739] In a cloud burst, 1,000-2,000 m² of roof would receive 25-50 m³ of rainwater per hour. A single drain 15-20 cm wide with water 5-10 cm high could easily discharge average amounts of 94-187 l/h, but the maximums would have posed a problem and required more drains.

Table 10.3. Voerendaal-Ten Hove. Rough estimates of the roof-surfaces (not corrected for slope: roof surface= building/room surface).

Building	Min. roof surface (m²)	Max. roof surface (m²) incl. northern half
Bath	84	84
Horreum	224	224
Portico west	555	555
Main building ('symmetrical' phase)	221	375
Subtotal	**1084**	**1238**
Portico east	198	198
Main building, 'east wing'	135	271
Building 405	327	327
Subtotal	**660**	**796**

10.6 Conclusion. The water system of Voerendaal in perspective

10.6.1 Wells

With a depth of 13 m, the well found at Ten Hove belongs to the group of deepest Roman wells in the Netherlands. On the sandy soils in the south, a depth of 2-2.5 m was generally sufficient, with 4-5 m required in places.[740] Such depths were also sufficient in and near the Meuse valley. A well at Grevenbicht, just north of the loess and probably at a villa site, was 3.65 m deep;[741] one of two wells at a villa near Borgharen, 5 km north of Maastricht, was at least 3.2 m deep (but not much more).[742]

Deeper wells were only necessary on the ice-pushed ridge around Nijmegen and in the loess area. The number of known and investigated wells from these areas is small, however, primarily because there have been few large-scale excavations of villa sites. The focus on the main building in older excavations is another explanatory factor because wells can be situated at a greater distance from the main building (Table 10.4).[743] Even in Voerendaal, we can expect several more wells outside the excavated areas. The known wells at villa sites in the Netherlands were seldom excavated in their entirety; nowhere is the depth established with certainty. It is clear, however, that most examples were more than 9-10 m deep.

Not much is known about the construction of the wells. Only at Heer-Backerbosch does the lining seem to have been made completely of marl, a very soft stone which can be cut with a saw. Most wells at villa sites probably had a stone superstructure, above and just below the surface. Some would have been made entirely of stone, but for the majority wooden linings deeper down can be expected. Again, this is not proven because of the incomplete investigations that did not reach the groundwater table. However, in comparison with the situation in the Hambach lignite mining area, they are likely to have fulfilled their function quite well as they were strong enough to prevent the shaft from caving in for a period of some decades. Because of the considerable depth of the wells in loess areas and the fact that some were used to supply baths with water, water-raising devices must have been used. For the Dutch part of the

738 The clay lining of the cellar wall suggests that this was indeed a problem (chapter 43, main building 400).
739 https://www.knmi.nl/kennis-en-datacentrum/uitleg/zware-neerslag (consulted 18-5-2020)
740 Cf. section 10.2.
741 This well had an inner diameter of 2.3 m and was constructed with large sandstone blocks (Goossens 1924).
742 Hulst & Dijkman 2008, fig. 7.
743 Although only 1.5 m from the baths, Braat missed well 314 because it was just outside his trench.

Table 10.4. Data on deep Roman wells in the Dutch loess area and at Nijmegen.

Site/well	Depth (m)	Distance to main building (m)	References
Voerendaal-Ten Hove 314	13	70	this report
Heer-Backerbosch V	> 10	2	Habets 1895
Heer-Backerbosch 2	?	40	Driesen 2004
Heer-Backerbosch TT	6	5-24	Habets 1895; wells?
Heer-Backerbosch 5	?	45	Driesen 2004, 12; fig. 11
Kerkrade-Holzkuil 1	> 9	35	Tichelman 2005, 153-154
Kerkrade-Holzkuil 2	>4?	2.5	Tichelman 2005, 153-154
Nuth/Arensgenhout-Steenl.	>9	60	Hensen 2010, 56-59
Nijmegen-castra	>7	n/a	Brunsting 1959; Schut 2005

loess area, however, nothing can be said about them.[744]

10.6.2 Aqueducts

Like the wells, relatively little is known about the water lines and drains of villas in the southern part of the Netherlands and surrounding regions.[745] Again, this is explainable in part by the limited scope of many investigations. Only as far away as Wallonia do we find examples of better known features for villa water supply. Anthée-Grand Bon Dieu has already been mentioned. Water channels of 2.1 and 3.3 km in length were found there, capturing water at the Al Tavienne and Fontaine des Noisettes sources.[746] The construction of the aqueducts and end basins is relatively well known and three mains – two made of *tegulae* and one of wood – were even traced over some distance on the villa yard. More stretches of channels and drains were recorded at the site. A thorough analysis of the system was never made, probably because the research was carried out in the nineteenth century. The same holds true for the – also very large – villa complex at Mettet-Bauselenne (B/NA).[747] Here, a 50 m long bridge was part of the 2 km long aqueduct. The villa at Élouges-Des Monts (B/HT) was supplied by three channels, two of which crossed a stream. Again, there is no detailed analysis and even a good plan of the villa itself appears to be lacking.[748]

For the rest of Germania inferior, including the *civitas Tungrorum*, the total number of water lines supplying villas is very small indeed.[749] A 150 m long line at Fourons le Comte/'s-Gravenvoeren (B/LI) was interpreted by De Maeyer as part of an aqueduct, although the plan suggests that it was a drain.[750] At the villa of Bad Neuenahr-Ahrweiler (D/RP) a 40 cm wide channel at least 33 m long runs between the main building and the baths.[751] It is interpreted as a drain for water from the slope behind the villa, at the same time supplying the baths with water. Because the excavation plan shows covering slabs over the whole channel, one wonders how the water was captured and diverted towards the building. At Lürken-Alten Burg a small part of a channel was found between the villa and the valley of the Merzbach.[752] However, the villa was situated upslope and the water therefore had to be lifted (see below). For other villas in Germany, such as Aachen-Stolberg, the position downslope (*Hanglage*) is mentioned[753] but apparently not investigated further. The same holds true for Haccourt (B/LG), where the plotting of a number of sources on a map indicates that the excavator was aware of their significance.[754] Some of these sources are situated 5-10 m above the villa site, suggesting that a roughly 2 km long aqueduct may have been present.

Obviously, there are more possible solutions for the water supply than a 'simple' aqueduct. The use of bridges and qanat tunnels has already been mentioned above. Although not the preferred option, they were used in the Roman period when ridges or valleys blocked the route between a source and villa. Besides the bridge at

744 Cf. 10.2.4. A deep posthole was found near the well at Nuth/Arensgenhout-Steenland, but it was probably not part of a well sweep considering the depth of the well.

745 Regarding the towns, see Ponzetta *et al.* 2002; Meylemans 2009, 81-98 (Tongeren); Schut 2005 (Nijmegen); Haberey 1972 (Köln); Wegner & Heimberg 1978 (Xanten).

746 De Maeyer 1937, 78-83, fig. 18a-b; 200-202; 1940, 229-237.

747 De Maeyer 1937, 99-103, fig. 24-b; 195-200, figs 65-67 (sections of mains and basins); 1940, 273-280; Brulet 2008, 547, fig. 480, no. 2.

748 De Maeyer 1940, 52-59; Herinckx in Brulet 2008, 327-328, fig. 80.

749 A sample of 80 villas was investigated on the basis of Deru 1994 and Dodt 2003, supplemented by sites with published plans (esp. De Maeyer 1937; Brulet 2008; Heimberg 2002/2003). In the Netherlands water lines were found in Vaals, made of sandstone slabs beneath (!) a Roman grave (Glazema 1949, 36), and Brunssum, consisting of two undated wooden lines (Daemen 1963, *202-203).

750 De Maeyer 1937, 119, fig. 42.

751 Fehr 2003, plans 1-5.

752 Kretschmer 1981, 69-70.

753 Dodt 2003, 233-234 (for the villa, see Biermanns *s.a.*).

754 De Boe 1974, fig. 6.

Mettet-Bauselenne, qanat tunnels are known, for example, at Walferdange-Raschpëtzer in Luxembourg (600 m),[755] and Pölich (430 m),[756] Inden (at least 280 m)[757] and Düren-Droverberg (1,660 m) in Germany.[758] It is an intriguing question whether the aqueduct of Fauvillers (B/LX), hewn through the rock at 4 m deep, was also part of a qanat tunnel.[759] But there are other possible ways to obtain water.

Concerning these alternatives, the example of Lürken mentioned above is interesting because the villa is situated higher than the stream.[760] Deru notes that the 'majority' of the sites in his study have sources in the vicinity, albeit mostly at a lower level.[761] His suggestion that the sources have shifted in 2000 years seems unlikely, but the observation about the relative position of sources is relevant. It may have been more common than we think that water was raised in some way before being diverted into an aqueduct. This could have been done with installations such as scoop wheels, driven by animals or people. Obviously, these raised the water level only slightly. Villas such as Lemiers, Houthem-Ravensbosch and Kerkrade-Holzkuil are situated downstream of small brooks with a low gradient, the Weijerhofbeek, Strabeek and a nameless (?) stream south of the Tichelstraat respectively. Perhaps these were dammed upstream to capture water.

Finally, it is not only sources or streams that can provide water. Rain is another option, albeit probably as an additional source, as shown by finds in Frechen-Königsdorf (D/NRW), Anderlecht (B/BRU) and Basse-Wavre (B/WB).[762] In Frechen-Königsdorf water from a well was replaced in the third century AD by water from a roof, led via a settling tank to a cistern (13 x 3.7 m, containing some 136,000 l). At Anderlecht a sidewalk was bordered by a drain of *tegulae*, discharging into a well connected to a cistern (5 x 3.5 x 1.5 m; some 26,000 l). A rainwater basin with an overflow was found at Basse-Wavre (4.5 x 2.5 x 2 m, some 22,000 l).

10.6.3 Drains

The number of sites with drain finds exceeds that of sites with water mains or aqueducts: about 60% of our sample of 80 villas have one or more drains. This is unsurprising given that drains are by definition at a lower/deeper level than aqueducts and are therefore more likely to survive. The vast majority of drains found at villas lead from the baths, frequently from the parts of the building where the *alveus/labrum* and/or *piscina* were situated.[763] There are few examples that indirectly prove that water was supplied to the main building; they are in fact as rare as aqueducts. Besides Anthée, there are instances at Basse-Wavre (B/WB) and Modave (B/LG). At Champion-sur le Rosdia, one short and one very long drain lead from the residential part of the main building (Appendix XX, Fig. 2).

If we take the number of drains and their total length, Voerendaal probably ranks in the 'top 3' and definitely in the 'top 5' of the sites in our sample. The number of drains – seven in total, with three from the baths and four in front of the main building, including the ditch from 319 and hypothetical drain 334 – is exceptionally high. The investigated length of over 100 m is also exceptional. The fact that we know something about the drains at 60% of the sites implies that this is not the case for the remainder. For the most part this can be explained by the poor preservation at many sites and by the period in which many sites were excavated. In the nineteenth and early twentieth century, the focus was on the buildings proper and simple drainage ditches were probably often not recognized. The Dutch villas with baths score fairly low: drains are reported for just four of eleven sites. The poor quality of Habets' work probably explains the absence of drains for sites such as Heer-Bakkerbosch or Hoensbroek-Schuureik,[764] while the limited scale of the excavation could explain their absence at Mook-Plasmolen and the poor conservation of the subsoil around the buildings at sites such as Houthem-Ravensbosch and Lemiers.

[755] This tunnel had 25 shafts of 36 m deep (Kayser & Waringo 2004).
[756] Kremer 2004, 127-141.
[757] With 27 shafts up to 30 m deep (Päffgen 2006).
[758] Grewe 2004; Päffgen 2006.
[759] De Mayer 1940, 185-186.
[760] Kretzschmer (1981, 69-70) thought that water from the Merzbach was raised by some kind of water-lifting device.
[761] Deru 1994, 15-16.
[762] Troll 1988, 94-96 (Frechen); De Maeyer 1940, 4-5 (Anderlecht); 1937, 73-75; 1940, 30 (Basse-Wavre).
[763] At some sites, there are no drains proper but passages through walls, indicating that they were once present.
[764] The function of the feature in front of the villa at Meerssen-Onderste Herkenberg is not clear (basin, bath?). The same holds true for the 'ponds' with 'streams' at Nuth-Arensgenhout-Steenland (Habets 1882, 131, pl. 1, k/l (dung pits?); Hensen 2010, fig. 2.4).

10.6.4 Conclusion

Even at Voerendaal, only parts of the aqueduct and drains – albeit totalling over 200 m – were excavated. Many questions remain about the precise function and operation of some features. Nevertheless, the site stands out for the number and known length of the features, not only in the Netherlands but also in surrounding regions. The aqueduct in particular is quite unique because there are very few examples in the wider region that are relatively well known and are reconstructed to the source. Furthermore, there are no sites in the northern provinces where the water supply and drainage has been analysed in the same detail as has been done for Voerendaal.

Some remaining questions about the Voerendaal aqueduct could perhaps be solved by new research, without the need for large excavation trenches. For example, a trial trench at the western border of the excavation could answer the question as to why the clay lining is missing there. Was it perhaps robbed or not recognized; do lumps of clay in the fill indicate that it was once present? Another trench some dozens of metres further to the west could be useful to document the position and elevation of the aqueduct and provide additional data on its gradient (although this may be impossible due to erosion, suggested by the curve just west of the excavated area, as shown in Fig. 10.5). It is probably difficult to dig more trial trenches because roads and modern buildings are present along the hypothetical route of the aqueduct, but some possible locations remain.
The aqueduct can perhaps be tracked by measuring resistivity, magnetism or other properties of the subsoil. Obviously, a thicker topsoil and/or colluvium could prevent detection of the aqueduct and it is also possible that the stone and clay were robbed. The last question is whether traces of the land surveyor's work, such as impressions of marker posts in the subsoil, can be identified.

11 Other structures and features of the villa

Henk Hiddink

This chapter discusses the structures and features of the villa at Ten Hove that do not relate to the production of agrarian and other goods or to water supply and drainage.
It concerns the ditches and other demarcating features (Section 1), the elements of a garden and a possible Jupiter column in the front yard (Section 2) and three buildings behind the main building, including at least one small temple (Section 3).

11.1 Features at the boundaries of the complex

11.1.1 Ditches

The Roman villa of Ten Hove was clearly delineated from the fields and meadows surrounding it (Fig. 11.1). There were three main phases of ditched enclosure: 301, 303 and 302.[765] Although this sequence seems to be generally correct, some details are not clear. Ditch 301 is without doubt the oldest. It is intersected by 302 and its orientation differs slightly from the other two. The excavators believed that 301 belonged to the same phase as prehistoric enclosure 308.[766] This cannot be true, however. Firstly, 308 is much older than previously thought and 301 seems to have been (partly) open in the Roman period (as the excavators themselves noted).[767] Secondly, the enclosure created by 301 has 'Roman' dimensions. The width (west-east) of the delineated area was 262 m in the north, but about 266-267 m halfway downslope. This latter length corresponds to about 900 *peded monetales*, that is 7.5 *actus* of 120 *p.m.* each. Assuming that the southern stretch of 301 was situated under or just south of the Steinweg, the yard measured some 5 *actus* (177.6 m) from north to south and had an area of 37.5 *actus quadrati* or 18.75 *iugera* (4.7 ha). If the north-south length was 5.33 *actus*, the area would have been the round number of 40 *actus quadrati* or 20 *iugera* (5 ha).

That ditch 303 represented a second phase is not shown by intersections with the other two, but by other clues. The excavators' argument that 303 had an opening giving access to annex 326, while 302 did not, is not decisive. Ditch 326 does not appear to have gone out of use at an early stage and a simple wooden bridge across 302 could still have provided access. More telling is that 303 ran quite close to buildings 401 and 402 and was intersected by ditch 333, associated with the former building. Ditch 303 was connected to ditch 307, which is older than structure 411.
As stated above, some details do not fit in with the general order. The youngest ditch (302) was accompanied at the inside by a row of trees at the west and east side (see below). The row at the north side runs along ditch 303. Further, the rows of planting holes/trees around building 411 are apparently also connected to 303 and not to 302. In the end, these are all minor problems because in essence both 303 and 302 delineate a yard of more or less the same size. Based on ditch 302, this yard measured exactly 6 *actus* (west-east) by perhaps 5 *actus* (north-south), resulting in an area of 15 *iugera* (3.8 ha).[768] After stone wall 416 was constructed, this area was probably slightly reduced in size and no longer a neat rectangle. The area enclosed by 302 and 416 probably measured around 14.5 *iugera* (3.7 ha).

Although ditch 301 seems to be the oldest, parts of it may still have functioned in some way as a boundary later on. As it happens, horse pond 413 is located exactly in the centre of the space between 301 and 302. It is conceivable that this strip of land functioned as an annex to the yard, where farm animals could be kept in the open. If we do need to add this strip to the area of the phase 3 yard, its total area would be some 18.5 *iugera* (4.7 ha). The precise function of the other ditches inside the yard is not clear. At the northwest side of the yard, ditch 307 is connected to 303, and turns slightly before disappearing in the vicinity of the *horreum*. Broad ditch 312, situated downslope, does the same. These changes in direction reflect the relief and suggest that the ditches also had a drainage function. Because 312 seems to be intersected by 303, it was probably (much) older and could have related to the early Alphen-Ekeren-type building 208 of phase 2a.[769] Ditches 304 and 305 in the eastern half of the yard must have constituted its boundaries at early stages. Both are situated at a roughly equal distance to the central axis of the first villa 399 as ditch 312. Ditches 306 and 307 appear to have been their counterparts, somewhat closer to the axis of the first main building.

[765] Descriptions of all ditches can be found in chapter 40.
[766] Cf. section 5.1.2 and chapter 7.
[767] Willems 1986, 146; Willems & Kooistra 1987, 31.
[768] Cf. Willems 1992, 530.
[769] There is some Roman material present, although only in the upper infill (section 41.1). On this ditch and 304-307, see also sections 14.5.3 and 15.3.1.

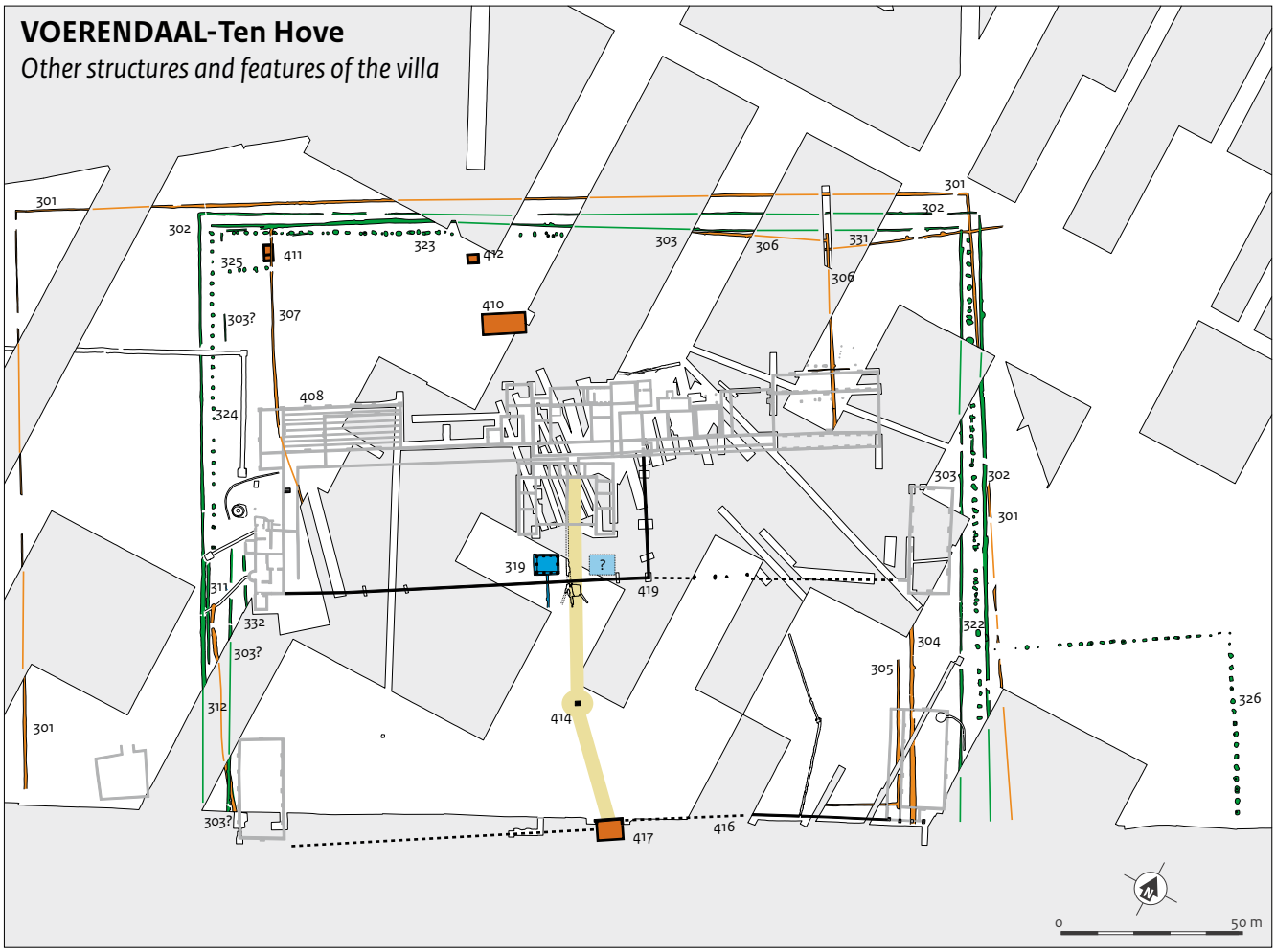


Fig. 11.1 Voerendaal-Ten Hove. Structures and features discussed in this chapter with their numbers; red ditches relatively old, green ones younger.

11.1.2 Tree rows

A considerable number of pits were found parallel to boundary ditch 302 (and 303). Their irregular shape and large size were mentioned by the excavators as arguments for an interpretation as planting holes for trees rather than postholes.[770] Their small, varying depths are also relevant in this respect. Trees were conspicuously absent in the northeast (area of ditches 306 and 331) and south of the baths. However, hedges - leaving no archaeological traces - may have been planted there. Few parallels are found in the region for trees along the boundaries of villas. Boundary ditches could be combined with pits in the Hambacher Forst, but these are fence postholes.[771] Planting holes are present, however, at Jüchen-Neuholz, in the form of pits some 3 m apart, with a specific infill (Fig. 14.11).[772] It is impossible to give an accurate date for the pits at Voerendaal. Most finds ended up in the features after the trees died and/or were removed, shown by tile fragments and even fragments of metal gloss beakers of the third century AD.

11.1.3 Annex 326

The features around this area of some 55 x 52 m in the east were more regular in shape than the planting holes discussed above; they were about 3 m apart. Their regular shape, together with the presence of some post pipes, is the most important argument for an interpretation as

[770] Willems 1986, 146.

[771] On these boundaries, see Gaitzsch (1986, 402-403), who mentions Cato, *agr.* 6.3, where the planting of elms and poplars around the farm and along its roads is advised.

[772] Andrikopolou-Strack *et al.* 1999, 158 (also on hedges).

postholes. Their depth was not necessarily greater than that of the planting holes, however. The function of the annex is unknown but it was probably a field where cattle and/or horses could graze.

11.1.4 Wall 416 and gate house 417

The wall at the southern border of yard 416 was constructed at the same time as (or slightly later than) threshing floor 420, which in turn was laid when the longitudinal room was added to building 401.[773] Unfortunately, we do not know how the wall ended at either end at the boundary ditches. The fact that our villa had a wall only at the front suggests that its main function was to impress visitors and passers-by. And the fact that examples of walls at villa sites in Zuid Limburg and adjacent regions are quite rare is probably largely due to the traditional focus on the main buildings. A wall of 256 x 95 m was recorded around the villa of Nuth-Arensgenhout-Steenland, 5.5 km northwest of Ten Hove, largely robbed and the remainder still 30 cm deep.[774] Recent observations suggest, however, that the villa enclosure was not as regular as Habets suggested and partly consisted of ditches.[775] Another example not far from Ten Hove is Haccourt, where parts of a wall were found.[776] The villa complex of Köln-Müngersdorf also had a wall; some 130 m of the original length of about 800 m was excavated (Appendix XX, Fig. 6).[777] The villa of Blankenheim featured a walled yard of 140 x 115 m with further internal divisions and a separate enclosed area behind the main building.[778] The few examples in Belgium known to De Maeyer more than 80 years ago are located more than 100 km away and enclosed quite large villas: Mettet-Bauselenne and Anthée (B/NA).[779] At present, the number of known instances has only slightly increased.[780]

The only feasible interpretation of partly excavated structure 417 is that of a gatehouse (Fig. 11.2). Buildings of this kind are even rarer than walls in our part of the Roman world. Sadly, they are often not described and illustrated in much detail. Therefore, we only refer here to a small arbitrary selection (Fig. 11.3).[781] Compared with these examples, the gatehouse at Voerendaal was not elaborate – there are no indications of a stairwell or 'gatekeeper's house' as at Viques I and III – but it was still quite large and may have had a second storey.[782] Its width was some 26 *p.m.*, while Vicques I and Laquenexy were about 20 *p.m.* wide and Rheinheim and the gate proper of Vicques III about 18 *p.m.*. Although it is known that Roman carts and wagons were not very wide, it is still remarkable how narrow the passage through some gates was. In Vicques I (CH), Rheinheim (D/SL) and Laquenexy (F/Mos.) it was about 2 m or even slightly less. In the light of this, the width of the gatehouse at Voerendaal is even more remarkable. Another notable aspect is the position in relation to other elements of the villa: slightly off the axis to the main building and Jupiter column 414. Moreover, if the gate was oriented north-south, carts would have been forced to make a quarter turn on the road outside the yard, which is believed to have run not too far to the south in the low-lying terrain there (Fig. 43.35A). The gateway may have been oriented west-east, with carts turned inside the yard, ending up on the central axis (Fig. 43.35B). Perhaps this hypothetical configuration is too far-fetched, however, while the path could have been intentionally situated slightly off-centre, passing the Jupiter column at the right-hand side.

11.2 Structures in the front yard of the villa

11.2.1 A possible Jupiter column

On the southward extension of the central axis through the second villa, some 30 m past the gatehouse, a rectangular foundation of limestone was found, measuring 1.45 x 1.2 m (structure 414). It was already suggested during the excavations that it was the base for a Jupiter column.[783] Columns of this type consist, in its basic form, of a rectangular base with deities in niches (or a dedicatory inscription), a column with a characteristic scaling (stylized leaves, sometimes with depictions of deities), a capital and a sculpture of Jupiter, seated either on a throne or on horseback, slaying a giant.[784] Item 20-1-90/3253 of Nivelstein sandstone could be

[773] The descriptions of wall and gatehouse can be found in chapter 43.
[774] Habets 1882, 127, pl. 1; Hensen 2010, fig. 4.2.
[775] Hensen 2010, 49-53.
[776] De Boe 1974, fig. 2; 1976, fig. 18.
[777] Fremersdorf 1933, 51-52.
[778] Oelmann 1916, fig. 2.
[779] De Maeyer 1937, 136. See also Brulet 2008, fig. 481 (Mettet); fig. 511 (Anthée).
[780] Short stretches at Habay-la-Vieille-Mageroy (B/LX; Brulet 2008, 470, fig. 348) and a wall surrounding the '*pars urbana*' of Jemelle-Le Mageroy (B/NA; Idem, 571, fig. 529; Mignot 1997, 10).
[781] Examples of gatehouses: Vicques (CH) south gate ('back' of the complex) 5 x 5-5.4 m (Gerster-Giambonini 1978, 180-181); north gate (front, entrance to the *pars rustica*) about 6 m wide (1978, 234-237); Reinheim (D/SL) 5.5 x 5.6 (Stinsky 2016, 61-65, fig. 60); Laquenexy (F/Mos.) 6.3 x 5.55 m (gate of the *pars urbana* (?); Brkojewitsch *et al.* 2015, 231-233, fig. 5)
[782] The width of the foundation was 70-80 cm; at Reinheim, reconstructed with a second storey, only 60-70 cm.
[783] Willems & Kooistra 1988, 144.
[784] The enthroned Iuno or Minerva from Bunde in table *11.1 is included because some Jupiter columns depict the god together with Iuno on a throne.

Fig. 11.2 Voerendaal-Ten Hove. The gatehouse from the east.

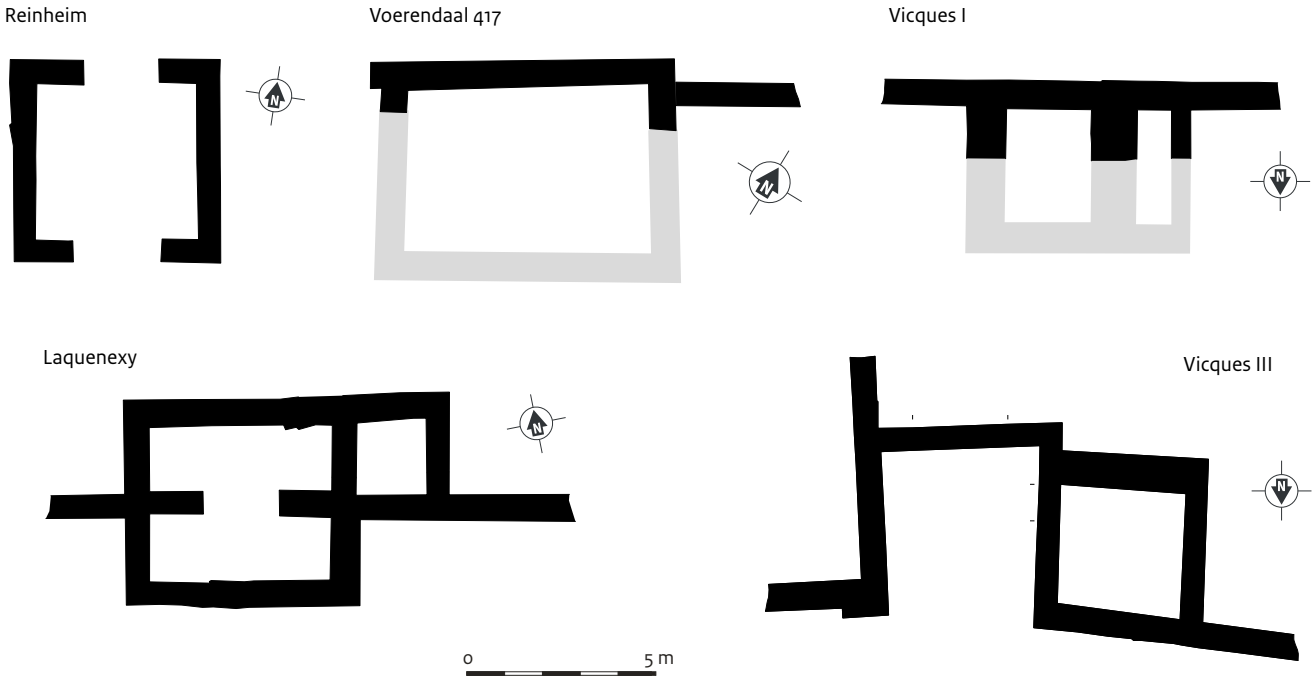


Fig. 11.3 Voerendaal-Ten Hove. Plan of the gatehouse with four others for comparison. (source: in part modified after Stinsky 2016, fig. 60; Brkojewitsch et al., 2015, fig. 5; Gerster-Giambonini 1978, 180-181; 234-237)

part of a Corinthian or composite capital of such a column, if it did not form part of the portico of the main building.[785]

The idea that a Jupiter column was present at Voerendaal is not far-fetched because many fragments of such columns are found at villa sites.[786] In the Dutch province of Limburg, some finds stem from *vici*, mainly from Maastricht but also from Heerlen and Rimburg (Table *11.1).[787] The fragments from Heel and Melick/St. Odiliënberg are probably also from *vici*. Half of the (original) locations are villas or possible villas, however. Only for Kerkrade-Holzkuil are there more data on the find context. Several fragments of scaled columns, some apparently unfinished, were found there in a well. This is reminiscent of several finds of large fragments of columns found in wells in the German loess area, such as Jülich-Steinacker, Inden-Altdorf and Kleinbouslar Evinghoven.[788] It is feasible that the columns were deliberately destroyed and discarded in wells during raids by Germanic 'non-believers'.

Concerning the suggestion that a Jupiter column was present at Voerendaal, we should ask whether foundation 414 was the right size. This question is hard to answer, firstly because these columns came in different sizes and designs. The large square Jupiter column (pillar) of Maastricht-Derlon, for instance, was nearly 10 m high. The base of the pillar rested on a monolithic block of 184 x 195 x 40 cm on top of the foundation.[789] Most columns were of a more modest size, as is shown by examples from the German loess area. A column from a villa at Köln-Weidenpesch/Longerich was still some 3.5 m high (only Jupiter's head is missing),[790] one from Inden-Altdorf measured 2.75 m, excluding the base,[791] while columns from Kleinbouslar and Rheyd-Mülfort were 2 and 1.5 m high.[792] Unfortunately, only a few possible foundations for Jupiter columns are known at villas and their measurements are often not specified in publications. A possible column foundation at Hambach 488 consists of one or two features in an area of 2-4 m,[793] while that at Inden-Altdorf had sides of about 1 m.[794] A foundation at

785 Cf. section 33.2.2.
786 Noelke 1981; 2010/2011 (Germania inferior); Bauchenß 1981 (Germania superior).
787 Tables marked with an asterisk (*) can be found in appendix IX.
788 Noelke & Päffgen 1998 (Jülich); Noelke & Geilenbrügge 2010; Noelke 2010/2011, 229-230 (Evinghoven).
789 Panhuysen 1996, 204; 1997, 183; 340.
790 Noelke 1981, no. 10; 2010/2011, fig. 15; no. 10.
791 Noelke 2010/2011, fig. 1; 18-19, no. 232; Noelke & Geilenbrügge 2010.
792 Noelke 1981, no. 6, pl. 55; no. 11, pl. 65.
793 Krüger 2007, fig. 5; Noelke 2010/2011, fig. 4.
794 Noelke & Geilenbrügge 2010, fig. 4 (measured from plan of about 1:1388!).

Arensgenhout-Steenland of about 1.75 m square was situated 65 m in front of the main building, slightly off the central axis.[795] At Meersen-Onderste Herkenberg, a rectangular pit was found at the intersection of two trial trenches; it is not certain whether this was a (robbed) foundation.[796] Foundations at Tongeren-Kielenstraat measured some 2 x 1.2 m, but this column – in an urban setting – may have been quite large.[797] Although the data are meagre, we can conclude that our structure 414 was probably large enough to be a column. In Figure 11.4, a column of about 3.6 m high is reconstructed on the foundations as found, covered with a monolith of 120 cm wide and 20 cm thick. The result looks very convincing but, needless to say, remains entirely hypothetical.

11.2.2 Wall surrounding a garden

A good 30 m past the Jupiter column, visitors to the villa would have reached wall 419 (Fig. 10.11; 8.4-5). Like all the walls at Voerendaal, only its foundations were preserved and the width of the passage – located without doubt in front of the main building – is therefore unknown. It must have been situated east of basin 319. Wall 419 enclosed a rectangular area of about 96 x 34 m (interior) in front of the second villa, the *horreum* and the baths.[798] Therefore, the wall delineated the *pars urbana*, separating it from the rest of the yard.[799] It is likely that the enclosed area was used as a garden, although no traces were found. This can be explained in part by erosion, in part by the fact that only about one third of this area was excavated and that deep planting ditches were unnecessary in the loess soil. Obviously, we have no clues as to what the hypothetical garden at Voerendaal actually looked like. The wall was possibly accompanied by hedges along the inside, to offer an additional, more attractive boundary. There must have been several lawns with paths in between, combined with trees and statues.

Traces of gardens are entirely absent at most villas and the rare examples are quite fragmentary. The most famous examples of gardens north of the Alps are those at the Swiss villa of Dietikon and at the 'palace' of Fishbourne in England. In Dietikon, narrow ditches were found in front of the U-shaped main building.[800] Box hedges were probably planted in the ditches, surrounding two rectangular lawns of 14.5 x 10-13.5 m. Two opposing semi-circular recesses, probably for statues, were present along the path in between. A basin of 10 x 6.5 m was constructed in the centre of a third lawn. At Fishbourne planting ditches bordered two large lawns.[801] Along the central pathway, the hedges were doubled and tripled along a series

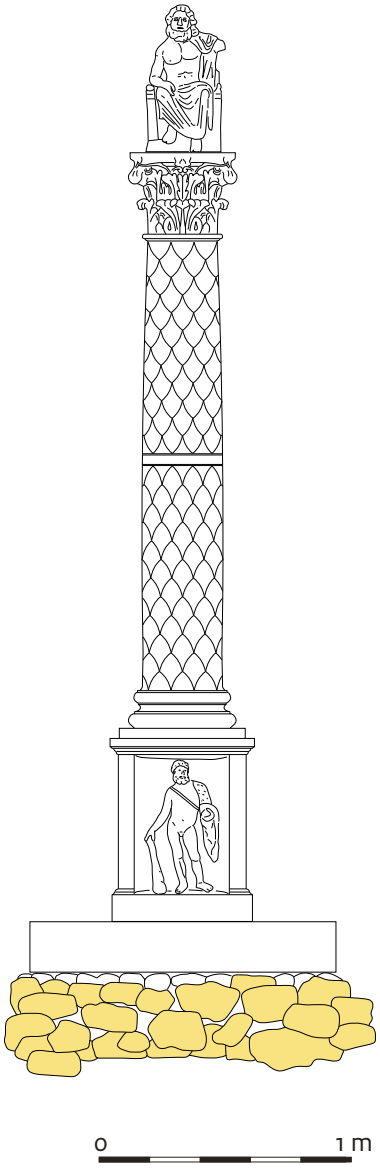


Fig. 11.4 Voerendaal-Ten Hove. Hypothetical reconstruction of a luppiter-column on foundation 414 (cf. fig. 43.32).

795 Hensen 2010, 53, fig. 5.21, map 1, feature 131. A large block of quartzite from a well column (Hensen 2010, 104, fig. 5.62) seems too rough to even have been part of a foundation. Nevertheless, part of a life-size statue was found at this site in around 1850 (De Groot 2007, 104, no. 41).

796 De Groot 2005, 51, figs 31-32. The pit measured 3.75 x 4 x 0.4 m and had fragments of tile and brick in its infill.

797 Noelke 2010/2011, fig. 3a-b, no. 334.

798 For a possible wall or fence further east, see the catalogue, chapter 81 (structure 212) and 43 (building 402).

799 See section 8.2.4.

800 Ebnöter 1991; 1995, 35ff.

801 Cunliffe 1971, 128-148. For some other examples in England, see Perring 2002, 179-182.

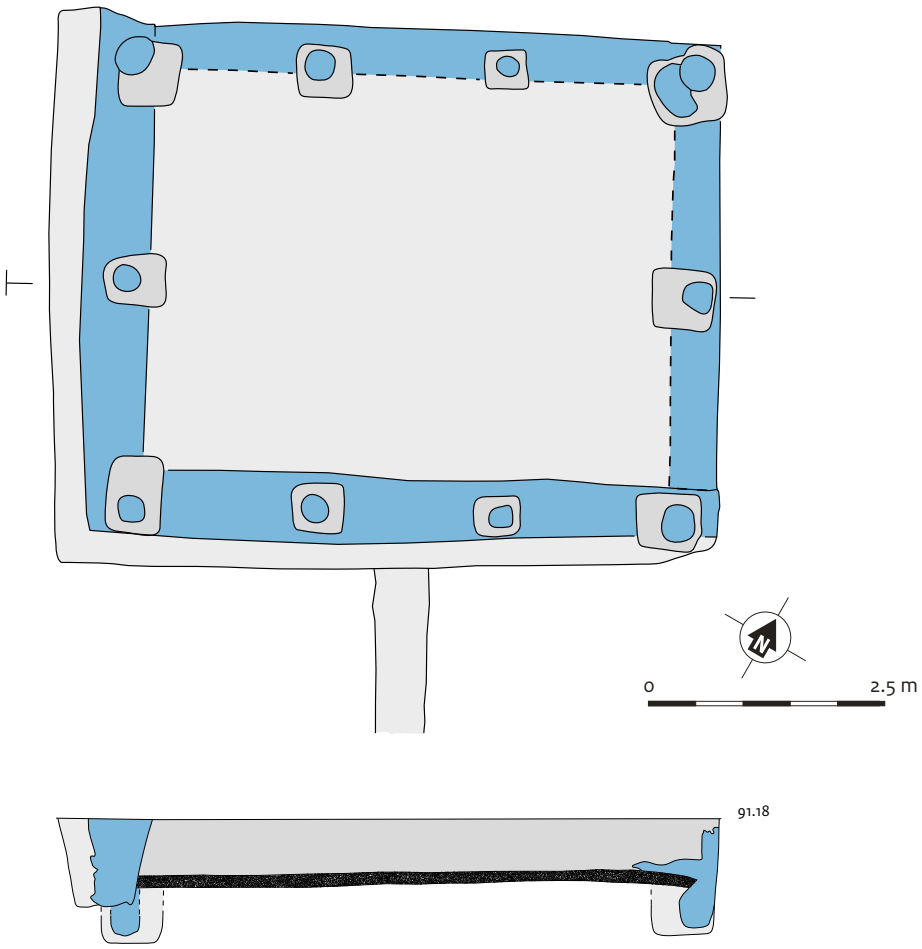


Fig. 11.5 Voerendaal-Ten Hove. Plan and section of basin 319 (cf. fig. 41.16).

of alternating rectangular and semi-circular recesses. A system of ceramic water pipes suggests that basins and fountains were present. Closer to Voerendaal, some traces of a garden were found in front of the villa of Neerharen-Rekem (B/LI). They consisted of two diagonal rows of five planting holes each, converging on the entrance to the main building, with a basin in the centre.[802]

11.2.3 Basin 319

A rectangular basin was found inside the walled area discussed above, measuring 7 x 5.7 m, with a depth of 70 cm (Fig. 10.11; 11.5). Among other indications, the clay lining of the pit proves that it once held water. The basin was possibly constructed – or rebuilt; it had two phases – in the late second or third century AD but this date rests on only one pottery fragment.[803] The infill dates from the third century, shown by fragments of black-slipped Niederbieber 33 beakers. Because the basin at Voerendaal was situated west of the path to the main building, the existence of a counterpart east of the path is a distinct possibility. If basin 319 is reflected through the central axis of the main building (period 3), the corner of a second basin should have been observed in trench 111. However, if the axis had been along the Jupiter column towards the gate, a second basin could be expected just outside the excavated area. Both options therefore remain open.

Although many villas had irregular-shaped, unlined ponds in front,[804] rectangular, lined basins are less frequently found and then mostly at larger villas. These basins come in many sizes. Very large ones, for example, are those at Echternach-Schwarzuecht (L; 59 x 14.5 m) and Haccourt (B/LG) phase 4 and 5 (52 x 7 m).[805] A slightly smaller basin of 30 x 10 m was found in front of the building at Borg (D/SL).[806] Some impressive villas had only a fairly modest basin, however. The one in the garden at Dietikon measured only 10 x 6.5 m and at Anthée 7.5 x 7.5 m.[807] The dimensions of the basin in front of the villa of Neerharen-Rekem, sealed with loam, are similar to the area delineated by the posts in our basin 319: respectively 5.9 x 4 and 5.5 x 4.5 m.808 [808] Also much larger was an example at Bocholtz-Vlengendaal (20 x 8 m), in front of a main building comparable in size to

[802] De Boe 1982, 73, fig. 37; *et al.* 1992, 493, fig. 286.
[803] Section 41.3.
[804] See section 9.4.
[805] Metzler *et al.* 1981 (Echternach); De Boe 1975, figs 16-17 (Haccourt). At the latter site, a second basin of 24 x 5 m was situated along the side of the main building.
[806] Miron 1997, 17-18, fig. 6; fragments of sculpture in the fill.
[807] De Mayer 1937, 79 (Anthée).
[808] De Boe 1982, 73, fig. 37, no. 13; De Boe *et al.* 1992, fig. 286.

Ten Hove.[809] An interesting feature of the last basin were two parallel foundations that cross it at (almost) a right angle, 10 m long and 2.3 m apart. Undoubtedly, these were part of a kind of bridge ending at the main entrance. As the basins at Haccourt and Borg occupied almost the entire front of the main building, it is likely that one or more bridges were also present there.
At Echternach there was ample room to go around the basin, making bridges unnecessary. The intention was probably to block a straight route to the main entrance, forcing visitors to make a detour.

An iron collar from our basin (319-16) itself and three more found elsewhere in trenches 110 and 111 suggest that the basin was constantly supplied with fresh water by a wooden line. The small ditch connected to the basin must have been for water that spilt over. Not all the construction details of the basin itself are clear. In a first phase ten posts probably held the planks of a revetment along the walls of the pit, but for the second phase only a thick wall of clay is identified, raising the question of whether it would stay in position without posts or planks. Also remarkable is the layer of gravel, instead of clay, forming the bottom. Perhaps its function was to make cleaning easier, to allow water plants to grow and/or to reflect sunlight. Fish may have been kept in the basin. Whatever the case, the loess subsoil beneath the gravel would have prevented large volumes of water from draining away.

It is also possible that the basin was fitted with a fountain. The Romans' love of fountains and basins with flowing water is known from literary sources,[810] wall paintings[811] and archaeological finds in gardens.[812] The basins as depicted on wall paintings are also archaeologically attested north of the Alps – often placed inside the building – at, for example, the villas of Buchs (CH), Echternach (large marble vases), Nennig and Borg (both D/SL, marble basins).[813] The substructure of a small fountain was found in a *peristylium* at Conthil (F/Mos.). It consisted of two large stone blocks with a lead pipe/nozzle in between; an iron collar in situ shows that a wooden water line was used.[814] There is no evidence at Voerendaal of a water pipe entering the basin from below but it could have been placed higher or even above ground level, in the shape of the head of a god or animal.[815]

11.3 Structures at the back of the main building

Three structures – 410, 411 and 412 – were found in the northwestern part of the area enclosed by ditches 302 and 303. It was noted above that this area differed from that in the northeast because it was surrounded by trees, whereas the latter was not. Another difference is the presence versus the absence of buildings. Therefore, the counterpart of the garden at the front of the main building seems to have had a different character, probably even more private. Regrettably, only a part of the area at the back of the villa was excavated.

11.3.1 Building 410 with an unknown function

This structure has a rectangular ground plan of 20 x 40 *p.m.* and is situated 13 m north of the second main building 400 (Fig. 43.27). There are no clues as to how it should be reconstructed and what its function was. Concerning the latter, it may have had a more 'down-to-earth' purpose, as a shed for tools and other implements used in vegetable gardens behind the villa, a chicken coop, stalls, etc. On the other hand, the structure is situated not far from small shrines 411 and 412 and a walk from the villa towards the latter building would have meant passing 410. Therefore, the structure could have been used as something like a 'summer *triclinium*', a room to linger in the shade, looking out onto the garden.

11.3.2 Structure 411. Grave monument or shrine?

This structure measures 4.85 x 3.1 m (exterior, approx. 16 x 10 *p.m.*) and consisted of a larger part in the north and a smaller one in the south (Fig. 11.6). When it was first mentioned in a preliminary report, the suggested interpretations were as a grave monument, a small temple or a watchtower.[816] Arguments in favour of the latter

[809] Goossens 1916, pl. 5.
[810] E.g. the basins in a garden and a room inside one of Pliny's villas (Plin., *ep.* 5.6).
[811] Round basins on pedestals in murals in the House of the Marine Venus (Pompeii) and the Villa of Popaea (Oplontis).
[812] Some examples in Grant 1971, 122-127; Adam 2010, 256, fig. 593.
[813] Hoek *et al.* 2004, 48 (Buchs); Metzler & Zimmer 1981, 51-53, fig. 37; 114-145 (Echternach); Schindler *s.a.*, fig. 8 (Nennig); Birkenhagen 2011, 327, fig. 8 (Borg).
[814] Mondy & Lefebure 2018, 313-317, figs 6-10.
[815] Like the examples in Adam 2010, 257, figs 595-596.
[816] Willems & Kooistra 1987, 36-37. In the latter case, the smaller room could have been a kind of staircase (cf. the gatehouse of Vicques I, fig. 11.3, top right).

Fig. 11.6 Voerendaal-Ten Hove. Structure 411 seen from the northeast, with the hearths 601-606 (grey patches) in the background.

interpretation are the width of the foundations – suggesting a second storey – and the location at the highest point of the site.[817] However, although structure 411 is indeed built at more or less the highest point, the view from this spot was not optimal and unrestricted. The ground level was at most 1.5 m higher than that of the area where the *horreum* and main building stood, so that these buildings would have blocked the view from a tower. The presence of an enclosure formed by the rows of trees suggests a more 'non-profane' function. When reviewing the suggested function of 411 as a grave monument, the location near a boundary is significant (Section 13.1). However, there are no indications of the presence of graves in or around this building and the same holds true for structure 412. If graves had once been present, we could expect some burned bone in the features and subsoil in the vicinity. None was observed in the field or present in archaeobotanical samples, however. Therefore, only the plan of the building can perhaps give some clues. The problem is that a grave monument with a plan like that of 411 would simply resemble a small temple, with a square *cella* and a rectangular hall or *pronaos* in front. Monumental tombs can be reminiscent of temples in some way but have a different construction (Fig. 11.7). The famous Poblicius monument from Köln, for instance, has a front with four columns, as often found at *prostylus* temples.[818] However, the part with the statues of those commemorated is rectangular and not very deep, giving the monument as a whole a rectangular ground plan (orientated perpendicular to Voerendaal 411). While our structure probably had only two columns rather than four, the ground plan would still be different, as the monument of Obulaccus from Sarsina in Italy shows.[819] This even has a door suggesting a *cella* but the back half of the monument remains shallow. Moreover, representatives of this type of grave monument only have a bipartite plan on their 'first floor', which is not reflected in the rather monolithic structure and foundations of the high base/ ground floor. Another group of temple-like grave monuments is that of the 'burial chambers' in the Moselle region, such as Trier-Reichertsberg, Igel-Grutenhäuschen, Nehren-Heidenkeller and Bech-Kleinmacher.[820] The plan at ground level is more or less comparable to that of Voerendaal 411, except that the two rooms differ more markedly in size. Moreover, these buildings are far larger because they housed one or more *sarcophagi* (dating to the late third/fourth century

817 The width did not exceed that of the foundations in the main building, however, and was less than that of tower 407.

818 Precht 1975; for similar monuments from Italy, see plate 30 (monument of Asfionius Rufus, Sarsina; see also Toynbee 1971, pl. 37); 33 (M. Octavius and wife, Pompeii).

819 Precht 1975, fig. 28.

820 Faust 2001, 147-158 (Trier); 43-147 (Igel); Krencker 1922; Eiden 1976, 65-67; Wegner in Cüppers 1990, 489-491 (Nehren); Krier 1994 (Bech).

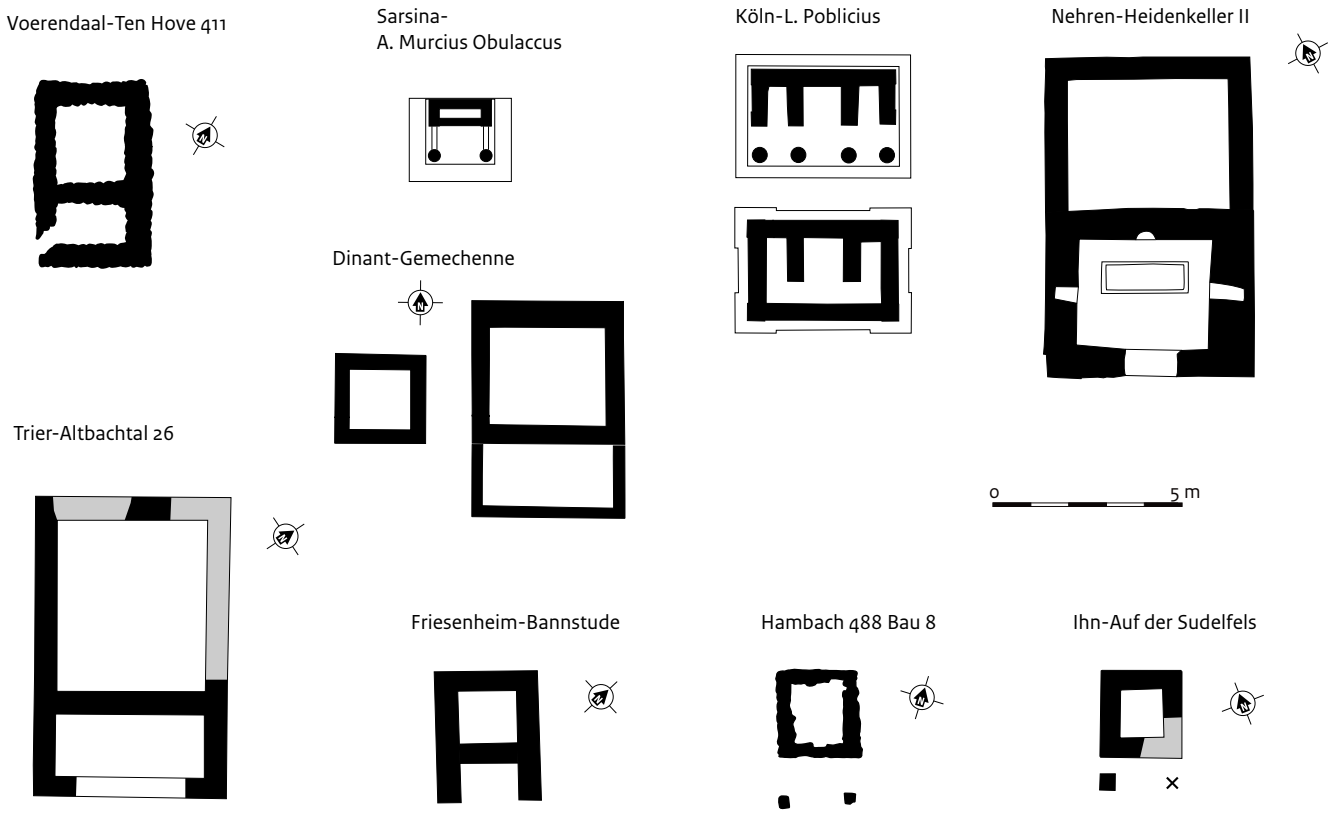


Fig. 11.7 Voerendaal-Ten Hove. Plan of structure 411 with a number of grave monuments (three in upper row right) and temples for comparison. (source: modified after arachne.uni-koeln.de, no. 2108307; Precht 1975, fig. 36-37; Wegner in Cüppers 1990, fig. 405; Paridaens 2016, fig. 3; Gose 1972; Fingerlin 1976, fig. 2; Schubert 2016, Befundkatalog; Miron 1994, fig. 2-3, 15)

AD). In the Mediterranean area, there are more grave monuments in the shape of a temple, with steps in front leading to the *pronaos*. These buildings are rare, however, and were even larger than those of the Moselle area.[821] As far as we know, very small temple-like structures like that at Voerendaal used as graves are not found in the Roman provinces north of the Alps. The conclusion must be that structure 411 was probably a temple or shrine proper.

This interpretation was also preferred by the excavator in the last intermediary report, after structure 412 was found (see below). He referred to plans similar to 411 'Both in England and on the continent [...] also at larger cult places...', but none of these sites was named.[822] In his study on religious practices in Northern Gaul, Derks cites Voerendaal 411 without hesitation as a small temple and mentions some parallels at Trier, Friesenheim and Ihn (Fig. 11.7).[823] Building 26 at Trier-Albachtal measures some 8 x 5 m and dates to the second half of the first century AD.[824] Obviously, the context of a large cult place leaves no doubt about the interpretation. A much smaller structure of 3.4 x 2.5 m at Friesenheim-Bannstude (D/BW) was situated near a supposed station of *beneficiarii* and associated with sculptures of Diana (Abnoba) and possibly Epona.[825] In the small sanctuary for Apollo, Rosmerta and Sirona belonging to the villa of Ihn/Niedaltdorf-Auf der Sudelfels (D/SL), one of the three temples was a small square of 2.3 x 2.2 m (Fig. 11.7). A square stone block found in 1903 probably had a counterpart originally and both blocks would have supported columns (if the block found was no part of the building, it would belong to the group of small square buildings, discussed in the next section).[826]

A small temple of this type was also found closer to Voerendaal, at the villa of Merzenich-Hambach 488. It measured 3.5 x 2.1 m and consisted of a square stone *cella*, with two stone

821 Toynbee 1971, 131-132 (also for ancient depictions). Examples are the 'Oratory of Phalaris' at Agrigento (Sicily; many photos on the internet) and a grave monument or temple, later transformed into the church of Sant'Urbano alla Caffarella along Via Appia (Noreen 2002).

822 Willems & Kooistra 1988, 145.

823 Derks 1998, 151-152.

824 Gose 1972, 88; figs V, W, X. This and the small square examples (see below) date from the first to well into the third century AD.

825 Plan after Fingerlin 1976, fig. 2; see also Kotterba 1996 for the Diana sculpture and a reconstruction of the complex.

826 Miron 1994, 9-14, 29-30, figs 2-3, 15; coins between AD 259 and 330 (Miron 1994, 134).

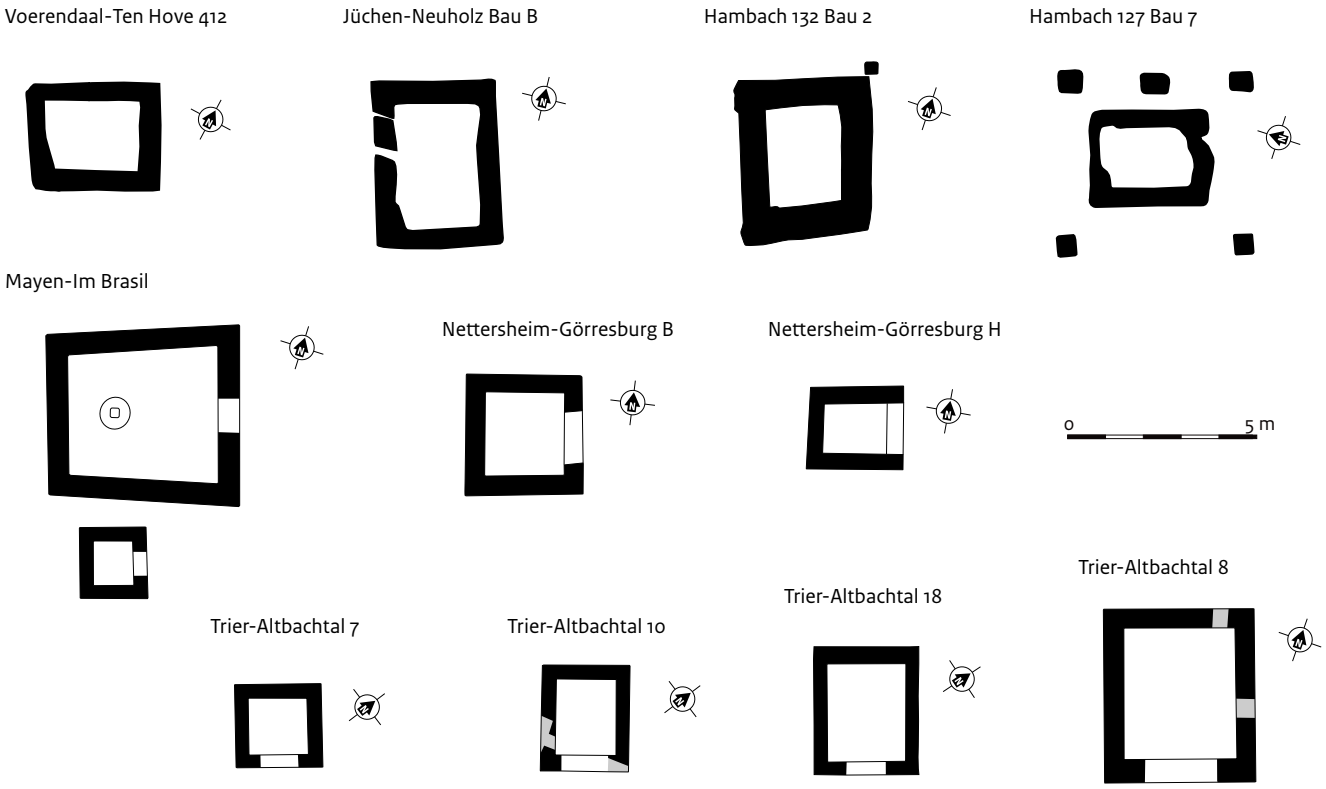


Fig. 11.8 Voerendaal-Ten Hove. Plan of structure 412 with a number of (possible) small temples and a grave monument (Hambach 132 Bau 2) for comparison. (source: modified after Frank & Keller 2007, fig. 264; Brüggler 2009, fig. 40; Schubert 2016, Befundkatalog; Oelmann 1928, pl. 2; Lehner 1910, pl. 23; Gose 1972)

bases for columns and a pavement of large tiles in front.[827] No significant finds seem to have been made near the building, but besides the typical plan, the location is relevant. The structure was situated some 30 m from the entrance to the yard, on the same axis as the foundations of the Jupiter column mentioned earlier.[828] A last interesting example, at a greater distance from Ten Hove, was found at Dinant-Gemechenne (B/NA).[829] Two small buildings were excavated some 125 m southeast of the main building.
The smaller building was a simple square of 2 x 2 m, the larger measured 3.1 x 3.5 m and a portico of 1.6 m was later added. Sculpture fragments were found in front of the smaller building, including a hand and the head of a cock (symbol of Mercury). Pottery in the debris of the larger building dates from the second to fourth centuries AD.

11.3.3 Structure 412. A small shrine

This small building was found 53 m east of 411 (Fig. 11.8). Its gravel foundations, measuring 3.5 x 2.9 m, may have been intended for a building of 11 x 9 *p.m.*. Because remarkable finds – terra nigra with graffiti – were collected in this area, the building was interpreted as a shrine from the start.[830] The terra nigra is represented by over 500 fragments, all of a variant of the Holwerda 25 bottle, most likely dating to the second half of the first or first half of the second century AD (Fig. 11.9). More fragments of this type were found at the site but in far smaller numbers. The four names written on fragments found around 412 are the most remarkable feature and a main piece of evidence for a small cult place.[831] The other finds collected consist of regular pottery types, dating from before AD 120 (two sherds only) to the late second century (terra sigillata Dragendorff 32 dish, colour coated Stuart 10 dish) and probably the third century (Urmitz and Soller ware).[832]

827 Gaitzsch 2005, 81; plan after Schubert 2016, feature catalogue.
828 Krüger 2007, fig. 5.
829 Paridaens 2016.
830 Willems & Kooistra 1988, 145-146.
831 For the graffiti, see chapter 29.
832 Chapter 43.

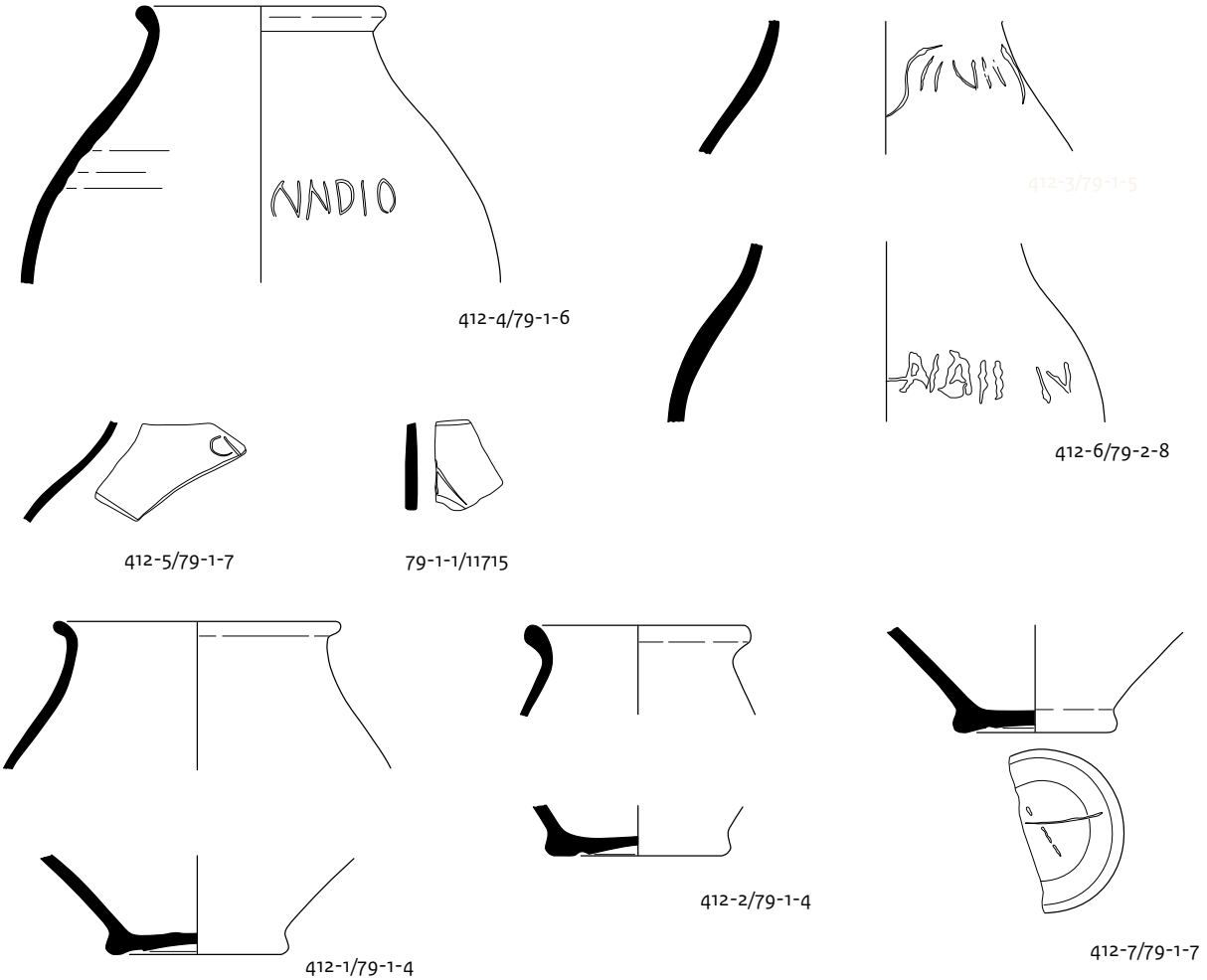


Fig. 11.9 Voerendaal-Ten Hove. Terra nigra bottles with graffiti from the area of structure 412. Scale 1:3. (source: H.A. Hiddink & F. Horbach)

Regarding the building type of small square shrines, an example at Gemechenne has already been mentioned in the last section. Although this building was found near a villa, it is not insignificant that the building type of simple square structures is often found at larger sanctuaries. At the sanctuary of Trier-Altbachtal, for instance, a dozen small square and rectangular shrines were found.[833] Examples further to the north include those at the small sanctuary of Nettersheim-Görresburg in the Nordeifel/Ahrgebirge region. Two smaller buildings were found inside the *temenos* of a small Gallo-Roman temple (9 x 9 m) (Fig. 11.8).[834] The larger one (B) had sides of about 3 m and probably columns in front,[835] the smaller (H) was a simple square of some 2.5 x 2.2 m. Both had an entrance facing east. In theory, many of the square buildings could have had wooden columns in front, making them variants of the Voerendaal 411 or Hambach 488 building type. We should even consider the possibility that columns were placed all around the buildings, thus resulting in a small Gallo-Roman temple. An example of such a building is Hambach 127, situated near a cemetery (Fig. 11.8).[836] Like that structure, a rectangular building at Jüchen-Neuholz was also found near the boundary of the complex, some 15 m behind the main building and at the same distance from a cemetery (Fig. 14.11).[837] The rather small distance between the 'temple' and burials at these sites stands in sharp contrast to the separate locations of larger Roman sanctuaries – public cult places of cities

833 Not counting those with two columns flanking the doorway. A selection of examples with different sizes are shown in figure 11.9 (after Gose 1972, fig. 54; 62; map section II).

834 Lehner 1910, pl. 23.

835 Lehner 1910, 304.

836 Gaitzsch 2005; plan after Schubert 2016, feature catalogue.

837 Andrikopoulou-Strack *et al.* 1999, 156, fig. 14; for a more complete plan of the settlement, see Frank & Keller 2007, fig. 264.

and *vici* – and cemeteries. It is likely that the small buildings discussed here were not temples for a larger cult community but functioned at a local or rather household level. They must have been private shrines for the *genius loci*, *lares* and/or ancestors. A position near graves could point to a kind of ancestor cult.

Many more examples of temples at villas could be named but this would not be very useful. However, some are interesting because they illustrate the fact that different positions respective to the main building could be chosen and that more than one shrine was often present (not all of the square type). We have already mentioned Gemechenne, with two temples far away from the main building and the single shrines at Hambach 127 and Jüchen-Neuholz close to the villa and near cemeteries. At Mayen-Im Brasil (D/RP) two temples were built at 40 m from the main building.[838] A single rectangular building had its own *temenos* close to the main building at Blankenheim (D/NRW).[839] No fewer than four temples accompanied the large axial villa of Dietikon (CH). Here, a possible podium temple stood in front of the main house, a Gallo-Roman temple flanked by a small square building (6.7 x 6.7 m) in the '*pars rustica*', and a second Gallo-Roman temple in the centre of the yard.[840] At Newel (D/RP), a Gallo-Roman temple was situated 100 m outside the yard, again associated with burials: four *tumuli* and a large grave monument in the same enclosure.[841] Finally, at Hechingen-Stein (D/BW), a walled plot of 32 m square outside the villa yard contained no fewer than ten small square structures. Each measured some 2.5 m square and were associated with sculpture fragments of Venus and Diana and pieces of a Jupiter column.[842]

838 Oelmann 1928, 67ff., pl. 2 and for the finds 76, pl. 13 (terracotta statuettes); 78-79, fig. 14 ('incense burners').
839 Oelmann 1932.
840 Ebnöther 1995, 177-200 (building, K, G/J, 1953).
841 Cüppers & Neyses 1971, 195-215, fig. 1; 36.
842 Schmidt-Lawrenz in Planck 2005, 106-109.

12 The Late Roman and Early Medieval settlement

Henk Hiddink

12.1 Introduction

Dating problems are the main reason for discussing the Late Roman and Early Medieval settlement remains in a single chapter (Fig. 12.1). Only a few structures and features can be assigned to a specific phase of 'period 4'. The chronological position of most structures in a time span of some 350 years remains unknown. The fact that the site has not been excavated in its entirety, a substantial part of it being located in the fields south of the Steinweg, also prevents us from obtaining a clear picture of the layout and development of the settlement. The next section briefly recapitulates some aspects of the larger post-built structures. The third, fourth and fifth sections are successively devoted to the sunken-floored huts (*Grubenhäuser*), all kinds of hearths and pits. The final section discusses Late Roman and Early Medieval settlements from the Meuse valley and adjoining regions to put our site into context.

12.2 Post-built structures

As the larger post-built structures have already been discussed in Section 6.7, we confine ourselves here to comments on chronology and interpretation. Some twenty post-built structures are assigned to period 4, including 14 larger examples that probably functioned as (byre) houses (Fig. 12.2). Only four of these 14 buildings are dated by finds and/or radiocarbon dates.

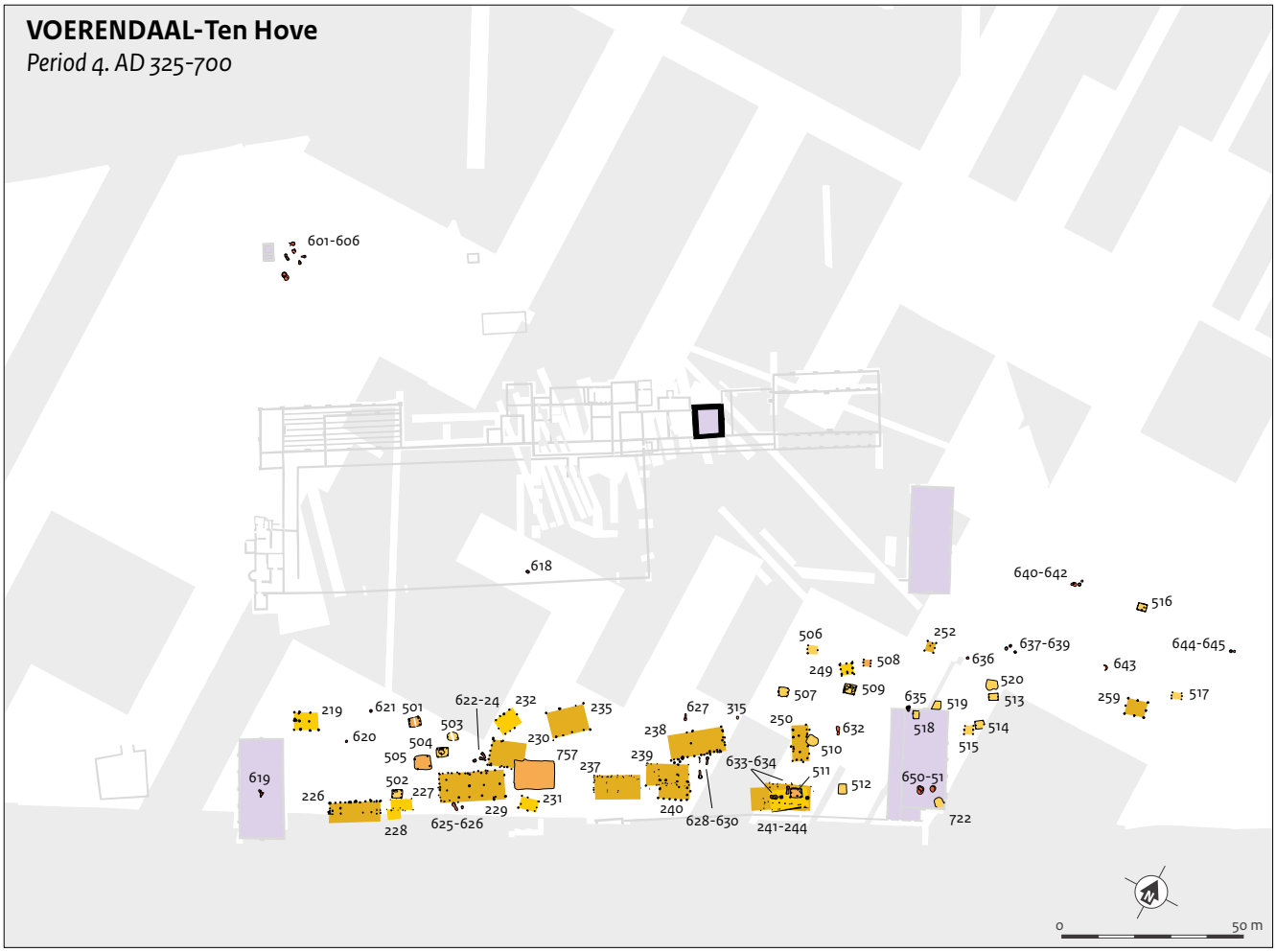


Fig. 12.1 Voerendaal-Ten Hove. Features of period 4, Late Roman and Early Medieval phases; for legend, see figure 5.4.

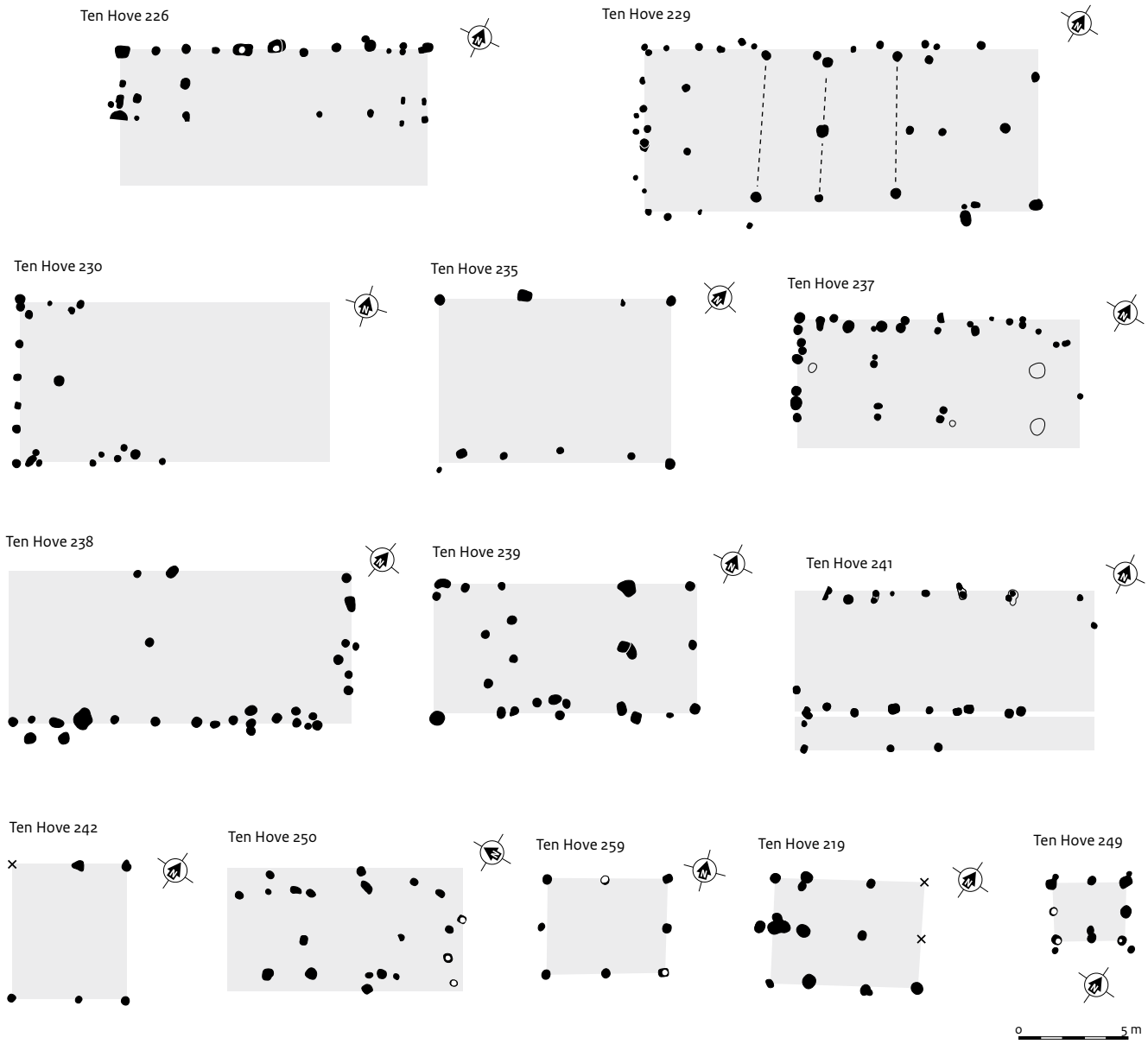


Fig. 12.2 Voerendaal-Ten Hove. Late Roman and Early Medieval buildings.

Building 226 yielded one base fragment of Mayen ware and radiocarbon dated bone dates between c. AD 255 and 535.[843] Building 230 appears to be Late Roman because of two sherds found from this period, one being terra nigra with an orange core.[844] A sherd of Argonne terra sigillata was found in a posthole belonging to 238, while distinctive Early Medieval sherds were found in the features of house (?) 259. Possible Late Roman (handmade, 237) or Early Medieval (coarse-walled, 250) sherds were found in two other buildings.

The other buildings likely post-date the villa on the basis of their position in the former villa yard and the building type. There is no single, characteristic type, however, as the buildings have different constructions, besides the fact that half of them are incomplete. The common denominator is that the buildings are rectangular and not particularly long (the two largest measuring about 18 and 15 m). Nevertheless, most could have contained a byre, albeit for only a limited number of cattle. Buildings such as 242, 250 and 259 are quite small. The latter building,

[843] See chapter 81 and table 5.6.
[844] Section 26.3.2; 26.5.3.

for instance, has a length of only 6 m but is likely to have been a house because there are no other (larger) structures in the proximity.
The remaining buildings are interpreted as outbuildings on the basis of their plan, size and/or position relative to larger buildings (227, 228, 231, 232, 252). Because they belong to different types and few finds are associated with them, none can be assigned to period 4 with certainty. Two buildings, 219 and 249, can be interpreted as granaries because of their plan and larger postholes. Both could be Late Roman in date, although the former could also belong to the Late Iron Age (Fig. 12.2).[845]

12.3 Sunken-floored huts

12.3.1 Characteristics of the Voerendaal huts

Sunken-floored huts are small rectangular buildings with a floor that is not at ground level but in a pit some decimetres deep.[846]
The wooden/wattle-work walls partly function as a revetment of the pit. At least two central posts support the gable-ended roof and four corner posts are often also present.

Twenty sunken huts were found in Voerendaal (501-520). Six have nothing of the pit left and are only recognizable by the typical configuration of six postholes. These form a narrower rectangle than most six-post granaries and the corner posts are often not exactly in line with the central ones. A handful of huts consist of nothing more than a rectangular pit of approximately the 'right' size (and located near positively identified examples; Fig. 12.3-12.4). Structure 503 is the only one with two (central) posts; twelve examples have six posts. Of this largest group, 501 has eight postholes, although two at the northwest side seem to have been added (or they replaced earlier ones). The four postholes at this side were shallower than the others. In many of the sunken huts at Voerendaal, there is no marked difference in depth between the central and corner posts. Buildings 504 and 505 had only four posts, at the corners. The central posts may originally have rested on padstones,[847] or the corner posts may have supported a kind of truss. Only a few of our huts have stretches of wall (505, 511, 516). Structure 518 – if it really was a sunken hut and not just a pit – is the smallest: 2.2 x 1.8 m (4 m²). The largest is 505, measuring 4.5 x 4 m (18 m²). All in all, the sizes of most huts are quite similar, with an average of 3 x 2.4 m (7 m²). Feature 757 is exceptionally large, measuring approx. 11 x 8 m, with a depth of about 1 m. This feature could well be another sunken-floored hut, albeit a very large one, rather than the cellar of a house. It is a pity that nothing is known about the construction of its walls, the roof and the roof supports.[848]

In practice, dating the sunken-floored huts is as difficult as dating house plans. Whereas (much) more find material and some radiocarbon dates are generally available, most dates are nothing more than termini post quem, with a high chance of being too old because of residual material.[849] Two huts contain no datable material at all and three only Middle Roman material. However, even these features must date to the Late Roman period or later. Of the more or less datable examples, eleven have a terminus post quem in phase 4b (beginning in c. AD 350/375) and the remainder in phase 4c (after c. AD 450).

12.3.2 Functions

Sunken-floored huts were certainly used for different purposes. However, the use of specific examples is seldom clear because they are artefact traps par excellence, yielding many finds unrelated to the original function. Three kinds of use are most often referred to. The first is textile production, based on finds of loom weights, spindle whorls and features interpreted as related to looms (longitudinal pits). The relatively high air moisture content in structures that were partly underground was apparently favourable for linen weaving.[850] A second possible function is storage, which required a somewhat lower, stable temperature.[851] Thirdly, sunken huts are often connected with metallurgical activities, especially the working of bronze and precious metals. Indications of this are concentrations of charcoal, hearths and sometimes ingots, pieces of scrap metal, moulds and waste. The risk of fire would have been the main reason for using huts at some distance from the houses.[852] In some

845 On the date of 219, see chapter 81.
846 In English, also known as sunken-feature buildings, pit houses or grub(en) huts; even the German term *Grubenhaus* is frequently used. The Dutch designation is *hutkom* or *kuilhut*.
847 A possibility mentioned by Zimmermann (1992, 186).
848 Cf. the catalogue, chapter 44. We interpret some details differently from Proos (2019). Two parallels from Wijster that he mentions were considerably smaller: structures 99 and 108 measured 9.4 x 3.8 m and 6.8 x 3.2 m respectively (Van Es 1967, 85-87, fig. 39).
849 See further chapters 5 and 85 for a discussion of the dating evidence.
850 Zimmermann (1992, 212) with a comprehensive overview of construction variants and possible functions (1992, 156-217). The interpretation as huts for weaving was also proposed by Von Uslar (1949, 107, no.11; 139-140). See further Zimmermann 1982; Tipper 2004, 164-177; Windler 2008; Tidow 2010.
851 Zimmermann 1992, 215-216.
852 Huts with this function are found e.g. at Flögeln in Lower Saxony (Zimmermann 1992, 212-214) and Warburg-Daseburg (D/NRW; Günther 1990). At the latter site, only the huts associated with metalworking are located at some distance from the houses. The Late Roman huts 9001 and 9004 at Cuijk-De Nielt yielded hammerscale (Boreel 2017, 523).

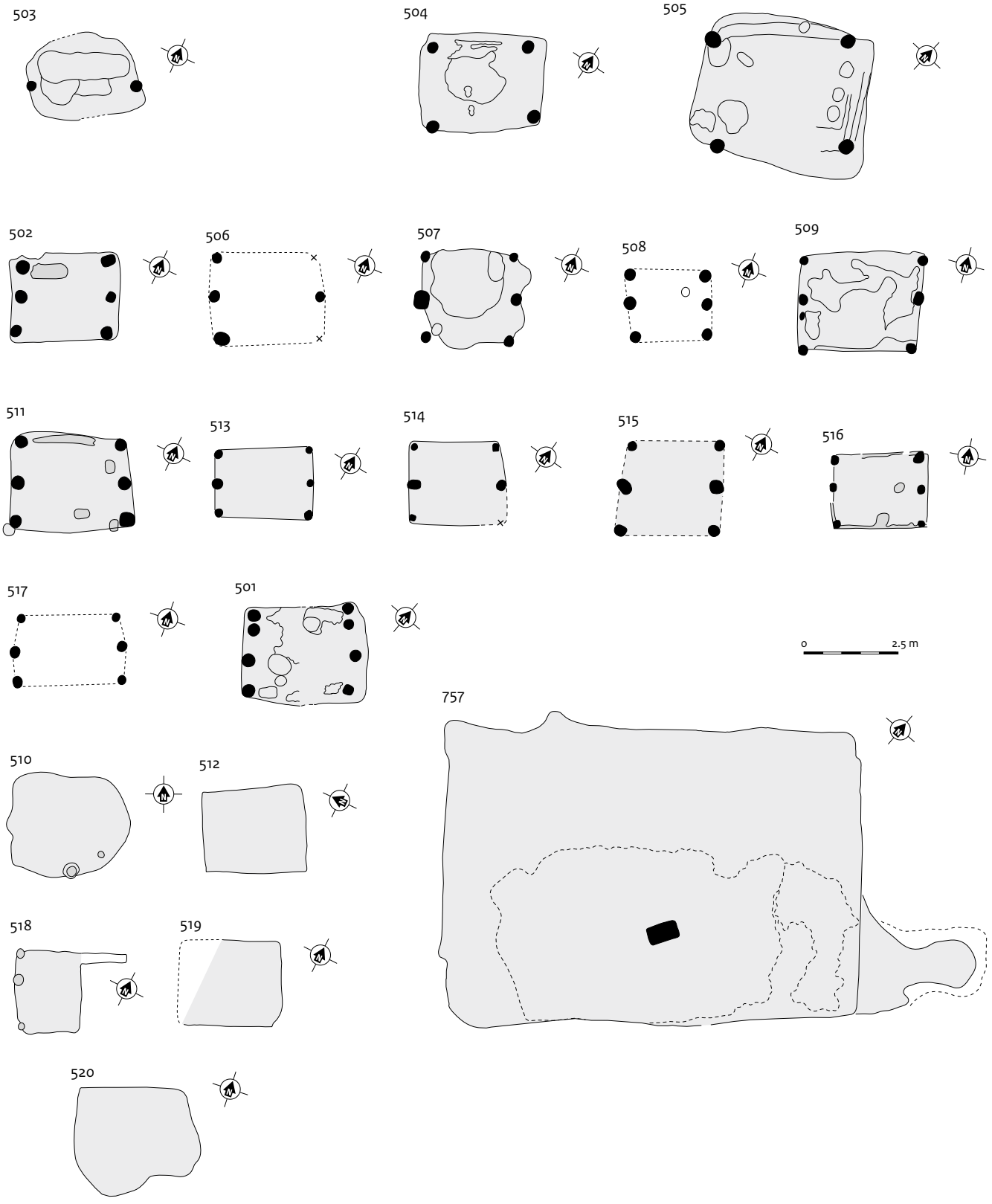


Fig. 12.3 Voerendaal-Ten Hove. Plans of the sunken huts.

A

B

Fig. 12.4 Voerendaal-Ten Hove. Two sunken huts in the field.
A feature 501 seen from the north, with features of building 222 and 223 in the background; B 504 seen from the northeast, note the many mole burrows.

settlements discussed in Section 12.6 below, the majority were found some dozens of metres from the houses (e.g. Geldrop, Breda-Steenakker, Helden-Schrames). It goes without saying that other structures could have been used for all the possible functions of sunken-floored huts: houses for weaving and storage; granaries, cellars or pits for storage; and light sheds for metalworking.

There are no features or finds associated with the sunken huts at Ten Hove that offer conclusive evidence about their function. Loom weights or spindle whorls are absent and although posthole and pit-like features were present in several huts (e.g. 501, 503, 505), most are shallow and represent deeper parts of the huts themselves rather than separate features. Some 'real' features were present in 502, 511 and 516, but they do not seem to have been associated with looms (such as a pit with two posts at Neerharen-Rekem).[853] The presence of four red-deer bone fragments in 513 is remarkable, but these were not antler fragments, the raw material for combs, needles, etc. Some finds may perhaps be regarded as circumstantial evidence of metalworking. This does not hold true for pieces of slag in features 510, 511 and 520, with a low weight. However, a remarkably large number of bronze coins were found in and near sunken huts 514, 515 and 519. Perhaps these were used as raw material for new objects, not necessarily melted inside the buildings, but at least in the vicinity. Parts of whetstones were found in features 503 (2) and 516, possibly for sharpening tools or objects used or made inside these features. Finally, we should mention the quern fragments found in 510, 511 and 516, suggesting that the huts could have been used for food preparation alongside storage.

12.3.3 A period- and culture-specific phenomenon?

Traditionally, sunken huts found west of the Rhine have been particularly associated with 'Germanic' groups of the Late Roman period. The reason for this opinion is obvious: they are well known from Germania magna and rare inside the Imperium Romanum before the Late Roman period. First, we will look into the chronology of this type of feature, before addressing sunken huts as indicators of Germanic people.

Although sunken huts were already constructed in the Neolithic, they are not known from Iron Age settlements in the wider region around Voerendaal. In the northern half of the Netherlands and northwest Germany, the first sunken huts appeared around the beginning of the Christian era.[854] Some early examples are known from the German Rhineland, where indications of Germanic immigration are found around the middle of the first century AD.[855] Two huts at Morken-Kirchberg belong to a settlement of this period, preceding a large Roman villa.[856] At Voerde-Mehrum, two huts are dated to the first and one to the second half of the first century AD.[857] A single hut at Vorselaer V was found next to a two-aisled house and contained handmade pottery and two fragments of Italic terra sigillata.[858] At Jüchen-Neuholz two sunken huts date to the Augustan period.[859] One of two huts at Rheinberg contained first-century pottery, including a Gallo-Belgic Hofheim 121 beaker and a Flavian colour-coated beaker.[860] A large structure at Neerharen-Rekem was interpreted by the excavator as a *Grubenhaus* pre-dating the villa, but it is quite large (8 x 5 m) and unusual in that it had postholes all along its edges.[861]

During the Roman period, the number of *Grubenhäuser* steadily increased in settlements east of the Rhine, while examples remain rather rare west of the river, on Roman soil. One atypical, Middle Roman hut is known at Hambach 132, while four dated to the second century and first half of the third century AD – apparently not inhabited in the Late Roman period – are known at Pulheim-Brauweiler.[862] Two examples were investigated at Hambach 412: *Grundriß* 27 is believed to date to the first half and 28 around the middle of the second century AD.[863] This site was inhabited in the Late Roman period, albeit on a modest scale and not for a long period of time. In the Netherlands, a sunken hut with two posts was found near Blerick just west of the Meuse, at a curious site with both two-aisled Alphen-Ekeren houses and a three-aisled house. The find material comprises Roman wheel-turned pottery as well as handmade Frisian pottery from the (late?)

853 De Boe 1986, 62, fig. 13.
854 E.g. Noordbarge (Harsema 1980, 41-42; Hiddink 1999, 132, fig. 5.30), Engter (Schlüter 1988; 1989), Vreden (Reichmann 1982, fig. 7) and Warburg-Daseburg (Günther 1990, appendix 5).
855 E.g. metal finds in graves at Tönisvorst (Bridger 1996, 301ff.) and pottery at Jüchen-Neuholz (Frank & Keller 2007, 319, fig. 268) and the cemetery of Uedem-Keppeln (Bridger 2008, 616-617, fig. 430).
856 Hinz 1969, 21-27 (*Grubenhütte* A and E).
857 Brand & Schönfelder 2008.
858 Brüggler 2011, 97, fig. 2.
859 Andrikopolou-Strack *et al.* 1999, 149ff., fig. 11; 172-173, fig. 21; 178-180, fig. 24. Two postholes in feature 94 (not visible on the plan) are thought to be part of a loom.
860 Binding 1968, 122-124, fig. 3; 132-133, fig. 9.
861 De Boe 1982, 72, figs 37-38, no. 9. In some respects it resembles our basin 319, although without (?) a clay lining.
862 Brüggler 2009, 52-53, fig. 31 (HA 132); Andrikopoulou-Strack *et al.* 2000, 430-431 (Pulheim). A layer of charcoal at the bottom of Grubenhaus C of Pulheim is taken as an indication of artisan activities.
863 Kießling 2008, 131-135, 470-472, pl. 76.

first and second century AD.[864] Other sunken-floored huts are dated to the third century AD by their excavators but the finds provide only termini post quem and indications of a later date were missed or not emphasized.[865] Examples are Lierop-Steemertseweg,[866] Horst-Hoogveld Oost,[867] Son-Pastorie[868] and Cuijk-Havenlaan.[869] Perhaps the most conclusive argument against the existence of Middle Roman sunken huts in the MDS area is the fact that some 80-90 excavations with over 500 house plans from the period c. AD 1-270 did not yield a single sunken-floored hut.[870]

It is only in the Late Roman period that sunken-floored huts are frequently encountered in the known settlements south and west of the Rhine.[871] Because these features are relatively abundant in settlements from this period north and east of the river,[872] and also appear in England in the Anglo-Saxon period,[873] it is understandable that they are seen as indicative of Germanic settlers. Although these settlers must indeed have been responsible to a certain degree for the (re)introduction and spread of the building type in (former) Roman territory, huts in settlements do not constitute unequivocal evidence of their presence. The building type may have been 'borrowed' by other groups for specific purposes; they were not emic ethnic markers. Moreover, the number in relation to that of the houses differs in each settlement and sometimes huts are missing entirely. In the light of the problems of dating and especially functional interpretation, a real understanding of the phenomenon in cultural or economic terms remains elusive.

12.4 Hearths

12.4.1 Types and dating

Fifteen 'hearths' of the villa periods 2 and 3 were discussed in a previous chapter.[874] Most features associated with the use of fire are certainly or probably younger and belong to period 4 or 5. It concerns 19 keyhole-shaped features, 17 more or less round,[875] and two rectangular features (Fig. 12.5-12.6; 16.14). The latter two, 652 and 653, are square/slightly rectangular and have rounded corners; the infill contains charcoal and 652 has a layer of burnt loam at the bottom. Similar pits are often found, albeit in relatively low numbers, in many excavations and are called

Fig. 12.5 Voerendaal-Ten Hove. Hearth 630, constructed with roof-tile fragments.

[864] Schotten 1993; 1994.
[865] For these examples, see also Van Enckevort *et al.* 2017, 194-197, table 7.4.
[866] Verwers 1991, 141, fig. 42, nos 1-2. Two sherds of 'terra nigra(-like) bowls' may be Late Roman although the rest of the pottery dates from the third century AD.
[867] Verhoeven (2000, 14-17) dates two huts to the third century on the basis of some sherds and house plans in the vicinity. However, he does not mention handmade pottery (2000, 22-23), some of which has a 'chalk' tempering.
[868] Van der Weerden 2012, 27-29.
[869] Ball *et al.* 2001, 38-44. A possible sunken hut yielded tile fragments, part of a limestone column and third-century sigillata. Some pottery is handmade and terra nigra-like; the excavators only hint at its possible Germanic character.
[870] For a list of settlements, see Hiddink & Roymans 2015, appendix.
[871] Cf. section 12.6 below.
[872] See e.g. Hiddink 1999, fig. 5.30ff. (Northern Netherlands/Germany); Van der Velde 2011, 82-144 (Eastern Netherlands); Van Enckevort *et al.* 2017, 79-94 (Central and Eastern Netherlands).
[873] An exhaustive contextual analysis of examples from this period can be found in Tipper 2004.
[874] Section 9.6.
[875] Features 650 and 651 were not investigated but possibly belong to this group.

'*meilers*' in Dutch (pit kilns for charcoal). They are generally considered Medieval or (much) later, although this is seldom proven. The examples from Ten Hove also seem to be quite late, features of period 5 rather than 4 (Fig. 16.14). Within the group of 'keyhole-shaped' pits there is considerable variation, although all have a circular part and a funnel. It does not seem useful to make a more precise classification because 1) the difference in shape is probably often the result of formation processes rather than a different function, and 2) the plans drawn at 1:50 are not detailed enough. All hearths are simple dug-in pits, only 630 has walls made of tile fragments (yet situated close to two 'normal' examples). Some of the 17 round hearths may have been keyhole-shaped originally, having lost their shallower funnel part. However, it could be significant that most are found in the southeastern part of the excavation, suggesting another function or date.

In terms of chronology, only one of the round hearths is in fact dated, and none of the others by either finds or stratigraphy. This is partly explained by the location: in areas with relatively few features or finds (636-644). Only 624 is found close to two keyhole-shaped examples. Of the keyhole-shaped features, 635 intersects the wall/foundation of building 401, which points to a rather late date. A kind of stratigraphy, albeit only a 'horizontal' one, also applies to the cluster with 601-606 and 633-634. The former group is situated near building 411 and must therefore be younger because it is highly unlikely that it existed simultaneously with a shrine or grave monument. Features 633-634 are located in or near houses 241-243 and next to sunken hut 511. Because all belong to period 4, there must have been a relationship between the structures, although the chronological order is unknown. The scanty dating evidence (Table 12.1) shows that pit 652, and therefore probably 653 as well, are indeed quite young, as already expected on the basis of the form. Hearth 631 is also late on the basis of radiocarbon dating, but obviously this does not necessarily apply to other round examples. The radiocarbon date of 635 suggests that an Early Medieval date is more likely for this feature, again without implications for similar shaped features. It is likely that hearths were constructed during several phases of period 4.

Table 12.1. Voerendaal-Ten Hove. Dating evidence for hearths.

Feature	Type	Dating evidence (termini post quem)
604	Keyhole-shaped	Argonne sigillata (also as stray find trench 74)
629	Keyhole-shaped	Argonne sigillata
630	Keyhole-shaped	Argonne sigillata
633	Keyhole-shaped	Argonne sigillata
634	Keyhole-shaped	Argonne sigillata
623	Keyhole-shaped	Argonne sigillata (>AD 375)
619	Keyhole-shaped	>pit 738 (>AD 395)
632	Keyhole-shaped	coin Theod. dynasty (>AD 383), glass bead 5th century
627	Keyhole-shaped	>AD 409(-688; radiocarbon)
635	Keyhole-shaped (-oval)	>AD 437(-600; radiocarbon)
631	Round	>AD 666(-774; radiocarbon)
652	Rectangular	pottery probably Karolingian

12.4.2 Possible functions of the hearths

Activities associated with hearths

Considering the fact that most hearths at Ten Hove date to post-villa period 4, at least some of them could have been used for recycling materials.[876] It must be noted, however, that recycling and reuse may have occurred during the villa's existence, when buildings were altered or rebuilt. Besides recycling, production of entirely new material is an obvious alternative explanation for the presence of hearths, especially at Late Roman and Early Medieval sites. As already mentioned in Chapter 9, the range of activities in which hearths, kilns and furnaces – fire and heat – were used is quite large. Pottery or tile production is less likely for the small hearths of period 4 and typical features of pottery or tile kilns are absent (cf. Fig. 9.13). In theory, of course, some may have been used in the small-scale production of handmade wares. Lime kilns are more likely to be expected – one is referred to in the discussion of 647-649 in Chapter 9 – both in relation to construction and recycling. In the Late Roman period limestone blocks and marble – even statues – were transformed into (quick)lime as one of the raw materials for mortar. But again, lime kilns also tend to be quite large, with even smaller examples having diameters of about 2 m (Fig. 9.13).[877]

Another process in which heat plays a part is the production of charcoal, a type of fuel devoid of the contaminants and volatile components of wood. Because no air is allowed in during much of the production process, we would not expect flues, like those in keyhole- or pear-shaped hearths. Some of the round hearths at Voerendaal may have been used for making small amounts of charcoal, although a positive identification is virtually impossible. It is difficult to distinguish between charcoal in the infill as a residue from production and a fuel for other processes. Although little is known about the size and shape of Late Roman charcoal pits in the region,[878] those from the Early Middle Ages at least are mostly circular.[879]

Small hearths like those at Ten Hove could have been used in a range of other processes. The problem is that hearths for glass making, iron production or other unspecified activities can be very similar, at least concerning their parts below ground level (Fig. 12.6). The several types of kilns used in glass making – for melting raw material, heating during blowing or forming and cooling – show some resemblance to examples from Voerendaal (Fig. 12.6).[880] However, glass making can only be proven through the presence of production waste such as glass threads or droplets, as well as glass that was connected to the blowing iron, etc. Other characteristic finds are melting pots, such as coarse-walled Alzey 28 bowls with adhering loam and glass at Hambach 132. Perhaps needless to say, such indications are missing at Ten Hove. The same holds true for those related to the recycling of bronze (statues, vessels, brooches etc.) and lead (water pipes, basins, plugs for fixating iron clamps). We would expect to find crucibles or moulds, or at least metal droplets and dross.[881] Such keyhole-shaped hearths seem suitable for use in melting[882] because the flue may have been used for adding fuel and poking/raking the fire.

Iron was the most commonly used type of metal. Four furnaces used for smelting/reducing at Ten Hove were discussed earlier.[883] These were of a particular type, dissimilar in shape to the examples discussed here. It is possible, however, that simple round hearths represent the slag pit of furnaces, the higher part where the bloom formed and the bellow was attached, and which are not preserved because they were situated above ground level. Although our keyhole-shaped hearths are somewhat reminiscent of slag-tapping furnaces, the flue should be pointing down to discharge the slag and there should be working pits to operate them. A role in reheating or smithing is perhaps still possible for both types, but we would expect to find thin, flaky bits of hammerscale. Perhaps small, simple hearths were also used in a cruder fashion during recycling: to burn away the wood of beams and planks to recover nails and fittings (leaving only charcoal and ash).

Finally, hearths and fireplaces were involved in all kinds of crop and food processing, such as drying or smoking meat and fish, perching grain, baking bread, etc.[884] However, most of these activities could and would be done with the help of larger, more permanent installations above

876 On the topic of recycling in general, see e.g. Munro 2011; 2020; Fleming 2012.

877 Besides the publications referred to in connection with figure 9.13, examples of small lime kilns were found at Touffréville (F/Cal.; Coulthard 1999, figs 12-15). These are both keyhole-shaped and round, but the length/diameter is still 2 m.

878 Early and Middle Roman charcoal pits in the southern Netherlands are mostly rectangular but quite rare and often not well dated. In Flanders, pits from these periods are often rectangular (Bruggeman & Reyns 2015; Beke & Van den Dorpel 2017; Deforce *et al.* 2017).

879 Deforce *et al.* 2021, fig. 2.

880 Gaitzsch *et al.* 2000, 101-106; Brüggler 2009, 68-70. On glass production in northern France, see Van Geesbergen 1999.

881 The only crucible from Ten Hove (409-54; fig. 43.25) belongs to period 2 or the very beginning of 3, not to period 4. Moreover, it is not known what was melted in it.

882 That this type of kiln was suitable for metal smelting is suggested by Werner 1991.

883 Section 9.6.3; see also chapter 34.

884 According to Werner (1991), small keyhole-shaped hearths were not suitable for making bread.

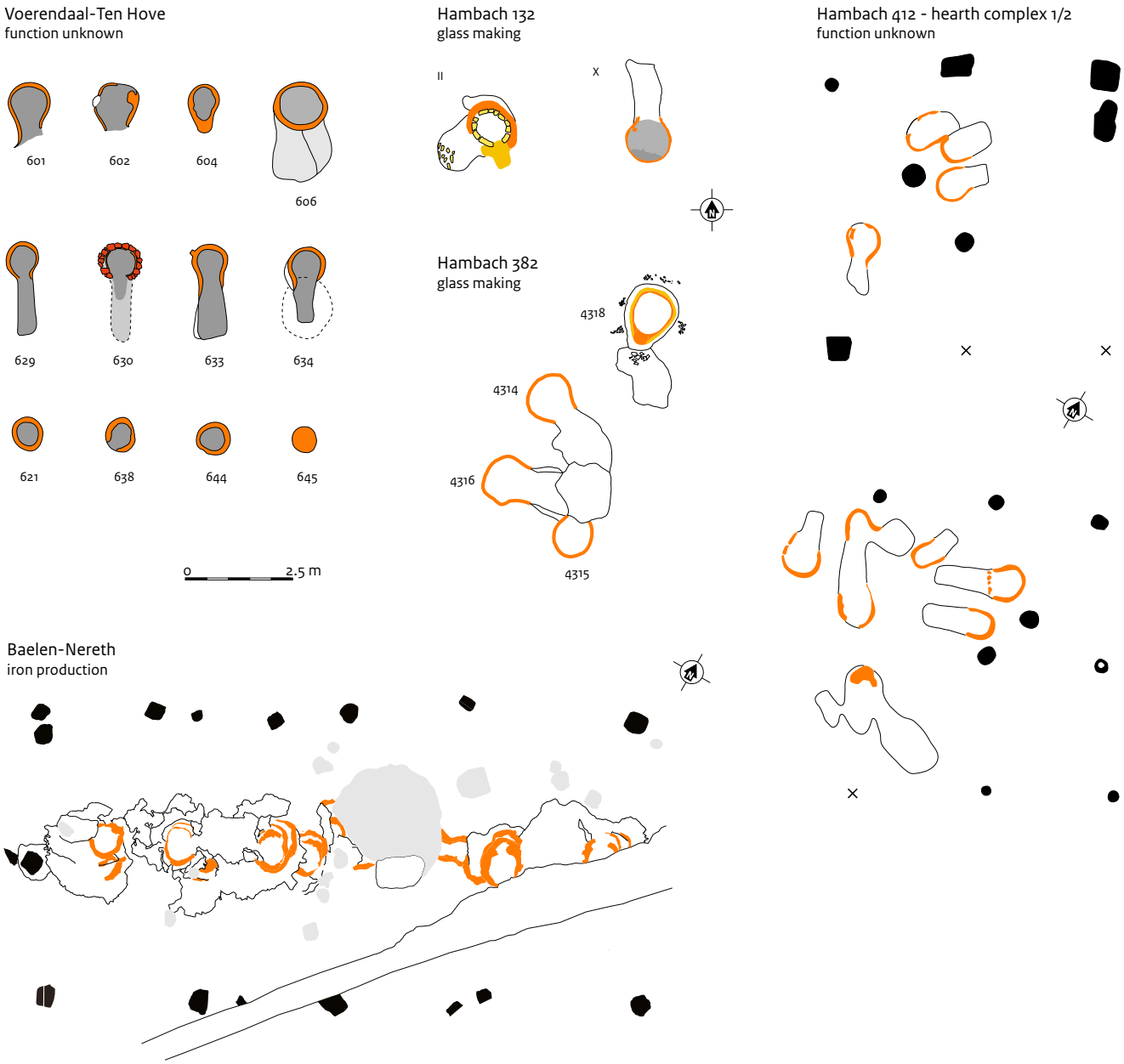


Fig. 12.6 Hearths from Voerendaal and examples from other sites with different functions. (source: in part modified after Gaitzsch et al. 2000, fig. 11, 47, 50, 51; Kießling 2008, pl. 72; Fock 2018, 113, fig. 2)

ground.[885] Moreover, the only material left would be charcoal and ash; even if something went wrong, the processed material would be charred at best.

And at Ten Hove?

The examples of hearths elsewhere show an extensive range of possible functions but offer few clues for determining the functions of the hearths at Ten Hove. In the end, the lack of material such as glass or metal droplets, hammerscale and the like prevents definitive interpretations. It must be stressed that the absence of this material is not the result of the excavation methods. Although the infill of features was not sieved to collect finds, many archaeobotanical samples were, and they were also analysed under a microscope.[886]

The location of most hearths seems random and therefore also of little help. Only that of 601-606 next to building 411 is perhaps significant. A role of these hearths in recycling material from structure 411 is plausible. Several activities could have been carried out there: lime burning, lead melting and iron working (the latter materials used for the (fixing of) clamps between the stone blocks). Trench 74 yielded one piece of cinder (35 g), but without an exact find location. Obviously, different types of material could be recycled at a single location. However, it is even possible that building 411 was not dismantled to obtain raw material but was itself used as a small workshop. Two hearths with significant finds are located in trench 23. Although the tiny piece (1 g) of slag from 629 could theoretically be intrusive, this is unlikely for two pieces of cinder (7 g) and one smithy hearth bottom (59 g) from 630. Even in the latter case it is not certain that the slag relates to the hearth; the pottery sherds found in its infill certainly do not.[887] The area containing hearths 627, 628, 629 and 630 does not particularly stand out in the general distribution of iron slag. Like all find categories, slag is fairly abundant throughout the area along the Steinweg (Fig. 34.4-34.5). The concentration in trenches 13, 16, 20-22, 27 is also only in part a reflection of the scale of activity here, again because these trenches yielded a large quantity of finds anyway (Fig. 5.6). Still, the type of slag in the general area indicates that iron was worked during period 4.[888] On these grounds at least some hearths could have been used in iron working.

12.5 Pits

Pits are a final type of feature of the Late Roman/ Early Medieval settlement (Fig. 46.1). As already mentioned in Chapter 9, the pits were undoubtedly dug for different purposes. Considering the find material, mostly pottery, some glass or coins, 22 pits could be Late Roman and four Early Medieval; another four pits could belong to the latter period (Table 12.2). The total number – 30 pits – is quite high, considering the relatively small percentage of Late Roman and Early Medieval finds at the site. However, as noted in Section 9.7.2, of the 50 Middle Roman pits, 28 contain building rubble, suggesting that they could belong to later periods. Obviously, the dates of the pits in the table are also termini post quem only. It is therefore conceivable that a substantial proportion of all the examples at Ten Hove were dug in the later part of the Early (Carolingian-Ottonian period) or during the High Middle Ages to dispose of rubble. Because the site was used as arable in those periods, no Medieval material ended up in pits, suggesting older dates. If it is true that the majority of pits post-date period 4, the absence of coal, for example, in their infill points to them being dug well before the modern age.[889]

Table 12.2. Voerendaal-Ten Hove. Pits ordered according to period/terminus post quem.

LROM			EMA?	EMA
713	745	789	709	711
716	747	790	712	733
717	755	792	715	735
719	759	801	760	807
722	768	802		
723	770	808		
728	771			
737	788			

[885] This certainly holds true for corn dryers; see section 9.2.4.

[886] Seventeen hearths were sampled, sieved and investigated.

[887] As both hearths 629 and 630 are close to buildings 238-240, these structures are not contemporaneous.

[888] Section 34.4.4.

[889] On the date of coal, see section 16.4.2.

12.6 Late Roman and Early Medieval settlements

12.6.1 Introduction

In the synthesis, we will elaborate on the development of the Late Roman and Early Medieval settlement at Ten Hove.[890] Below, we will make only a few general comments. The following sections address excavations in the wider region to obtain a picture of the size, layout, buildings and activities at settlement sites of this period. Although all sites obviously have specific characteristics, some general trends can perhaps be observed. The emphasis lies on Late Roman sites, the period in which post-built houses, sunken huts and some other features non-existent at Roman villa sites were (re) introduced in the region.

The most relevant aspect of Voerendaal during period 4 is its size. On the basis of the 10-12 buildings that were probably (farm)houses, as well as the assumption that these belong to the period c. AD 350/375-650/675, some 300 years, we can estimate the number of houses existing at any one time.[891] The result of the calculation – number of houses x use-life/duration of settlement – is rather sobering: only one. However, there must have been more house plans in the non-excavated zone beneath and south of the Steinweg. Moreover, particularly in the later Early Medieval phases, the habitation may have been more dispersed, with houses and yards in the large areas that were not investigated. There may have been episodes of discontinuity, as well as periods with two to three houses. Be that as it may, the site was never more than a hamlet.

12.6.2 State of research. When did the Late Roman habitation begin?

Since the 1980s, the period in which large-scale open-area excavations began, a fair number of settlements were excavated in the southern part of the Netherlands and northern Belgium (Table *12.3; Fig. 12.7-9; Appendix XXI).[892] A few excavations were extensive, with areas of 10 ha or more, some covered areas of around 3 ha, but many were small in scale; we often get to see only a small part of the settlement involved. A further limitation is that almost a third of the sites are not published in full – including key sites like Neerharen-Rekem and Gennep-Stamelberg – and some publications lack details or even basic data on the finds that would be helpful for interpretation.

Full publication is of course important for all investigations but especially for the sites discussed here because the number of finds is often very small and each find counts. This takes us immediately to a key topic: the question of when these sites were founded. In theory, post-built structures could be expected in the region directly after the 'catastrophic' events of AD 260-275,[893] although the likelihood increased in the course of the fourth century AD because of the increasing Germanic presence. However, especially after the first dendrochronological dates became available 25 years ago, with dates (after) AD 390-c. 408,[894] it became clear that the settlements were quite late. Regrettably, only three other dendro-dates have been published since then, from Alphen-Kerkakkers and Meldert, but these confirm the others (cf. Fig. 16.2). Besides these dates, some coin assemblages offer clues. The analysis of their contexts at Neerharen-Rekem and Holtum shows that (almost) all coins, including those of Constantine and his sons or Valentianus/Valens, are likely to have been deposited at the very end of the fourth or during the fifth century AD.[895] At the first site the coins were interpreted as part of two 'extended' hoards and, at the latter, the oldest coins were found in the same layers as the youngest. A hoard found in a sunken-floored hut at Helden-Schrames is also late.[896] No details were published on the coins from Gennep-Stamelberg, but the general trend seems to be that about 10% were struck before c. AD 350, 20% after this date and 70% between AD 388 and 402.[897] The majority of the pottery and glass provides no better dating evidence, although Argonne sigillata and some fabrics of coarse-walled Mayen ware, for example, are relevant in specific cases.[898] It goes without saying that not every site was founded in around AD 400. Baelen-Nereth and Breda A, for example, appear to have been inhabited from the middle of the fourth century AD onwards.

890 See further section 16.2.3; 16.3.3.

891 There are data which suggest that an average lifespan of 30 years for post-built houses is realistic, but another reason to assume this value is to simplify comparisons of the size of settlements (cf. Hiddink 2014a, 133-135).

892 Mainly sites from the MDS area and the northern Meuse valley are discussed in this section. Sites with stray finds or a few features are not considered (some with sunken huts in section 12.3.3). For a recent overview of all Dutch sites, see Van Enckevort *et al.* 2017; Roymans *et al.* 2020, table 1. See further e.g. Theuws 2008b; Heeren 2017; Lenz 2005; and contributions to Lodewijckx 2004. Tables marked with an asterisk (*) can be found in appendix IX.

893 Section 16.1.

894 Theuws & Hiddink 1996, 78.

895 Stroobants 2013; Kemmers 2010a; 2012; 2014a. Cf. Chapter 19.

896 Kemmers 2010b.

897 Heidinga & Offenberg 1992, 63.

898 Cf. chapters 26 and 27.

12.6.3 Houses and other structures

Looking at the number and kind of structures, as well as the layout of sites, we see many differences. Longhouses, a phenomenon already discussed in Chapter 6, are found at a minority of sites (Breda A, Goirle-Huzarenwei, Gennep-Stamelberg, Neerharen-Rekem, Neer-Wijnaerden, and perhaps Holtum-Noord (Fig. 12.7-8; 16.9; Appendix XXI, Fig. 7).[899] Most houses are not particularly long, however, like those at Alphen and Meldert, but there are also buildings – including shorthouses – for which the interpretation is unclear: are they outbuildings only or small houses without a byre or just a tiny byre (Fig. 12.9)? The buildings are not clustered at most sites, except for Holtum, with all the larger ones in the northern part of the excavated area.

Sites also differ in respect to the frequency of sunken huts. More than a hundred were found at Gennep and about 30 were recorded at Neerharen. However, the number of sunken huts is quite small at, for instance, Goirle, Baelen, Helden, Holtum and Meldert, and they are absent at Breda B and Tilburg. The fact that the latter two sites are relatively late could play a part, although the feature type as such could also be Early Medieval (Voerendaal, Wange, Geldrop-site C).[900] It appears that the sunken huts are not particularly associated with the larger buildings at some sites. At Breda A and Geldrop they are mostly situated in a separate zone, perhaps determined by the kind of activities performed there (because of fire hazard?). As holds true for Voerendaal, the function of the huts at other sites is seldom known. Rare possible exceptions are that of Neerharen (loom) and two huts at Cuijk-De Nielt (hammerscale), already mentioned in a previous section.

At Gennep and Alphen, some hearths and charcoal rich pits were situated close to sunken huts, others in clusters at a distance (supposing the features were contemporaneous). It is perhaps needless to say that the function of most hearths is unknown, like those at Ten Hove. That metalworking was practised at sites is shown instead by finds, such as the hammerscale at Cuijk, small bronze bars/ingots at Holtum and the waste and products with coin production flaws at Wijchen-Tienakker. Fragments of crucibles (with gold traces), a mould for belt fittings, three bronze ingots and scrap metal was collected in Gennep. At Baelen-Nereth the furnaces and working pits were without doubt related to iron production/working.

12.6.4 Size and development of settlements

An important question about the settlements is their size in terms of the number of houses existing at any one time. To answer this, we should at least know the duration of settlement. However, this is even more difficult to establish than the start of the occupation. Given the limited size of many, or in a certain sense all, excavations, it is possible that younger – as well as older! – houses are located outside the investigated area.[901] Assuming that the 10-12 houses excavated at Gennep constitute the complete settlement of the fifth century AD, this consisted of three to four houses. Dendrochronology shows that a later well was constructed at Alphen between AD 552 and 568.[902] Based on a date between c. AD 380/400 and 580/600, the eight excavated houses represent a settlement of just a single house in a period of about two centuries. The case of Breda is interesting because there must have been a hiatus between what is here called 'site A', with one or at most two farms in the fourth/early fifth century, and 'site B', with dendrochronological dates from c. AD 465-477 onwards. (Fig. 16.2) [903] There is also a shift in orientation and location of the buildings, although the latter is small (about 50-100 m). Site B existed until after c. AD 600, the four to eight houses implying a settlement of one or two buildings at most. Assuming that the Late Roman structures at Geldrop date to around AD 400, there could be a hiatus of nearly two centuries because the oldest wells in the Early Medieval settlement 250 m to the west date to shortly after AD 600.[904] At Helden, the two orientations of the buildings also indicate that there were several distinct phases, with probably only one or two houses at any one time. The small size of many settlements – and of cemeteries for that matter – suggests that hiatuses in habitation were quite common.

[899] The plans at Holtum are too wide to represent the cores of three-aisled buildings, too narrow for single-aisled ones.

[900] Geldrop C (Theuws 1999, 341, fig. 4) is situated some 250 m west of the Late Roman site discussed here and shown in appendix XXI, fig. 4.

[901] See further section 16.3.2.

[902] In fact, the same well in which wood from AD 401-403 was used (see above).

[903] The second farm of site A is not present on map 2 of the excavation report (Koot & Berkvens 2004), but in fig. 2 in Berkvens & Taayke 2004b.

[904] One well has a dendrochronological date of 'shortly after 606 ± 6', another of '613 ± 6' (Theuws 1999, 141, fig. 4).

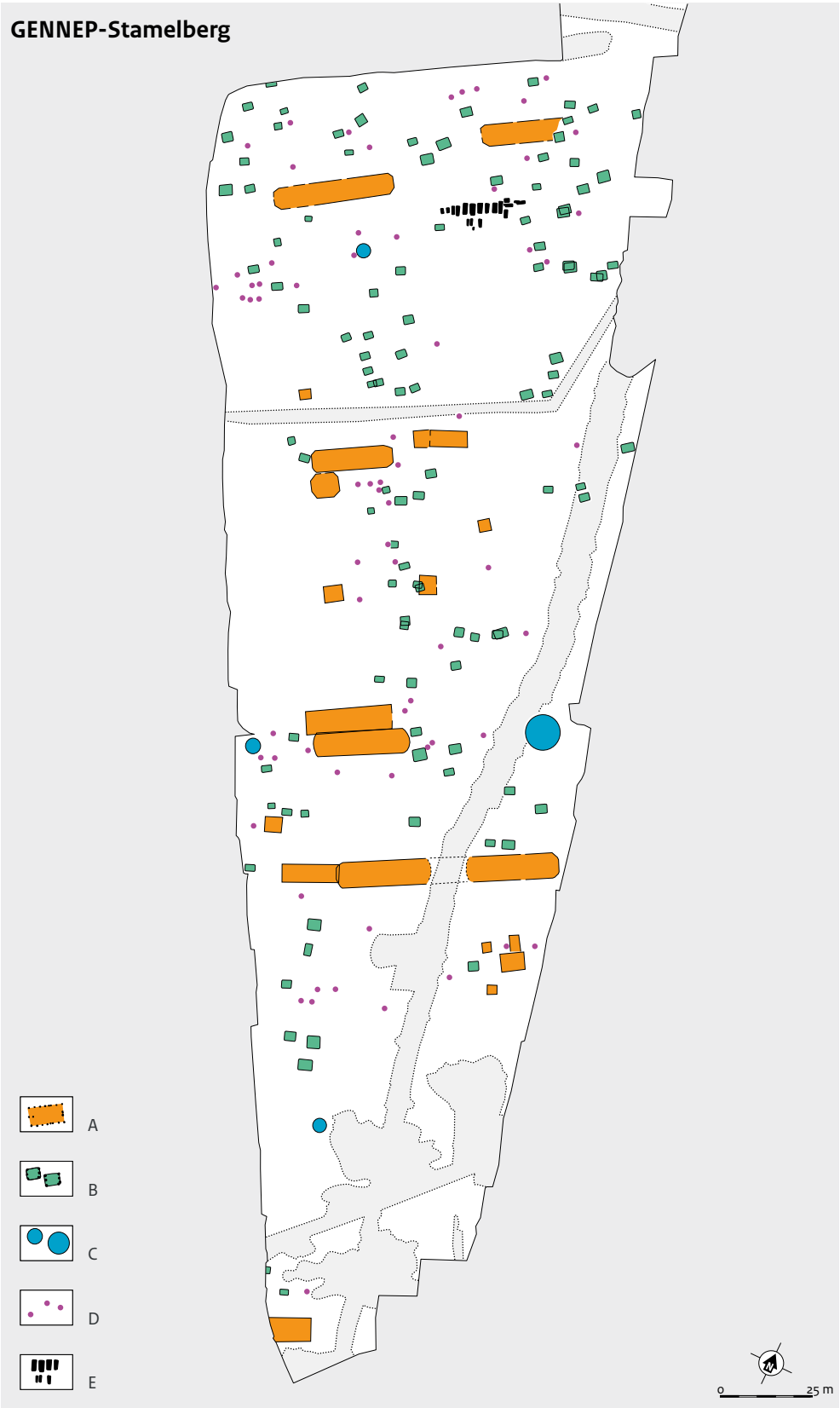
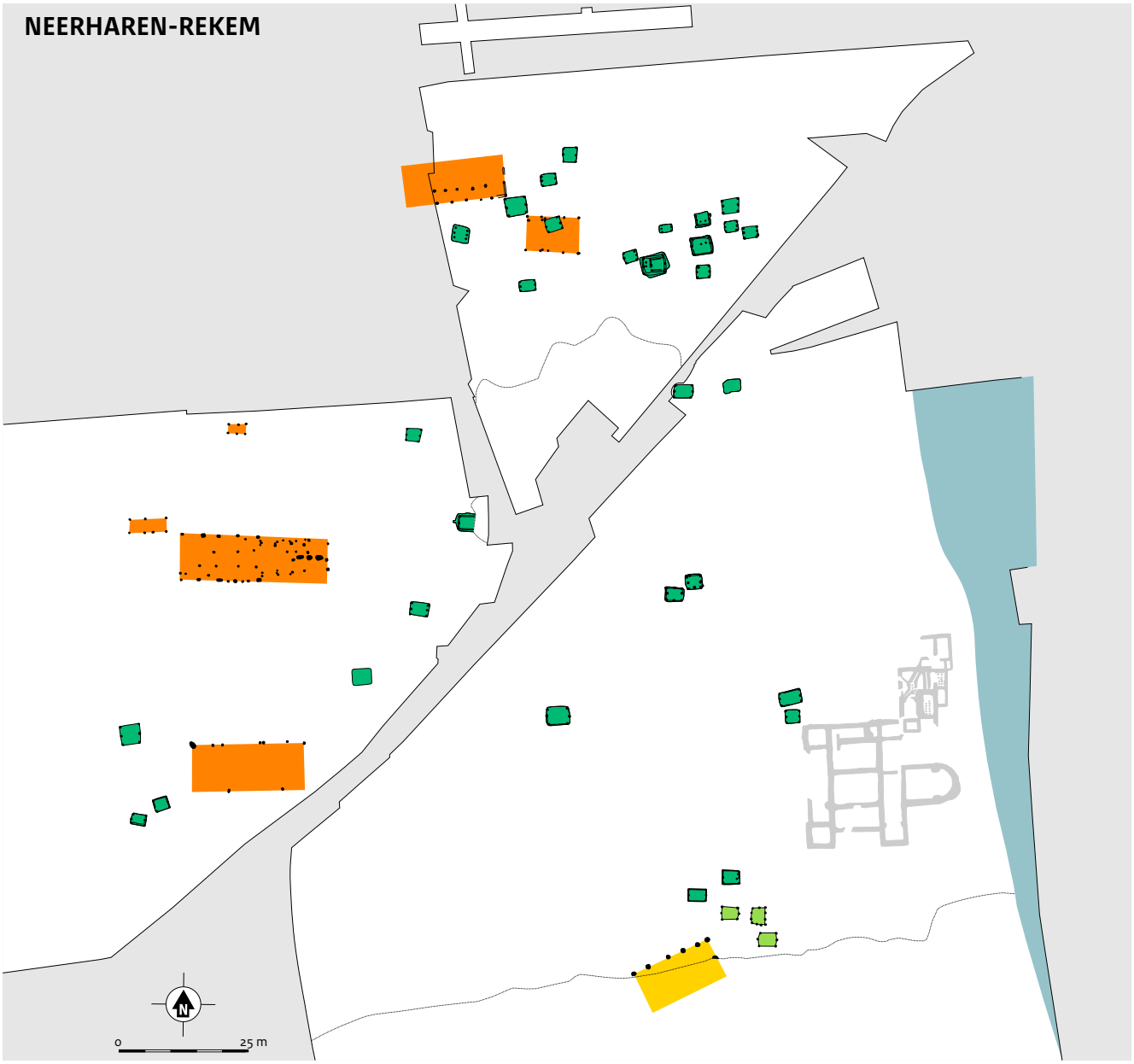


Fig. 12.7 Gennep-Maaskemp. Provisional plan of the Late Roman settlement, with buildings in outlines only. (source: modified after Heidinga & Offenberg 1992, 64)
A buildings; B sunken-floored huts; C wells; D hearths; E graves.



12.6.5 Origin and livelihood of the inhabitants

It is generally taken for granted that the inhabitants of the post-built settlements originated from Germania north and east of the Lower Rhine, either as enemies or soldiers of Rome.[905] Besides features and finds from settlements, the burial evidence is an important element – and virtually the only one until the 1990s – in the discussion on origins.[906]
The settlement evidence as such certainly does not give the impression of an unambiguous, homogenous 'Germanic' material culture (if there even was one in Germania). As stated above, typical three-aisled 'longhouses' are found in a minority of the sites in our sample. In Goirle and Neerharen, for example, there are (also) two- or combined two-/three-aisled examples with no direct, more or less identical, parallels east and north of the Rhine (for which there is a detailed typology based on hundreds of plans). In some publications all smaller buildings are classified as 'shorthouses', but this 'Wijster' type proper – with rounded corners and the sides of entrances slightly curved inwards – is only attested at Helden, Geldrop and possibly

[905] See e.g. Lenz 2005 with many references and further chapter 16 below.
[906] Section 16.2.2.

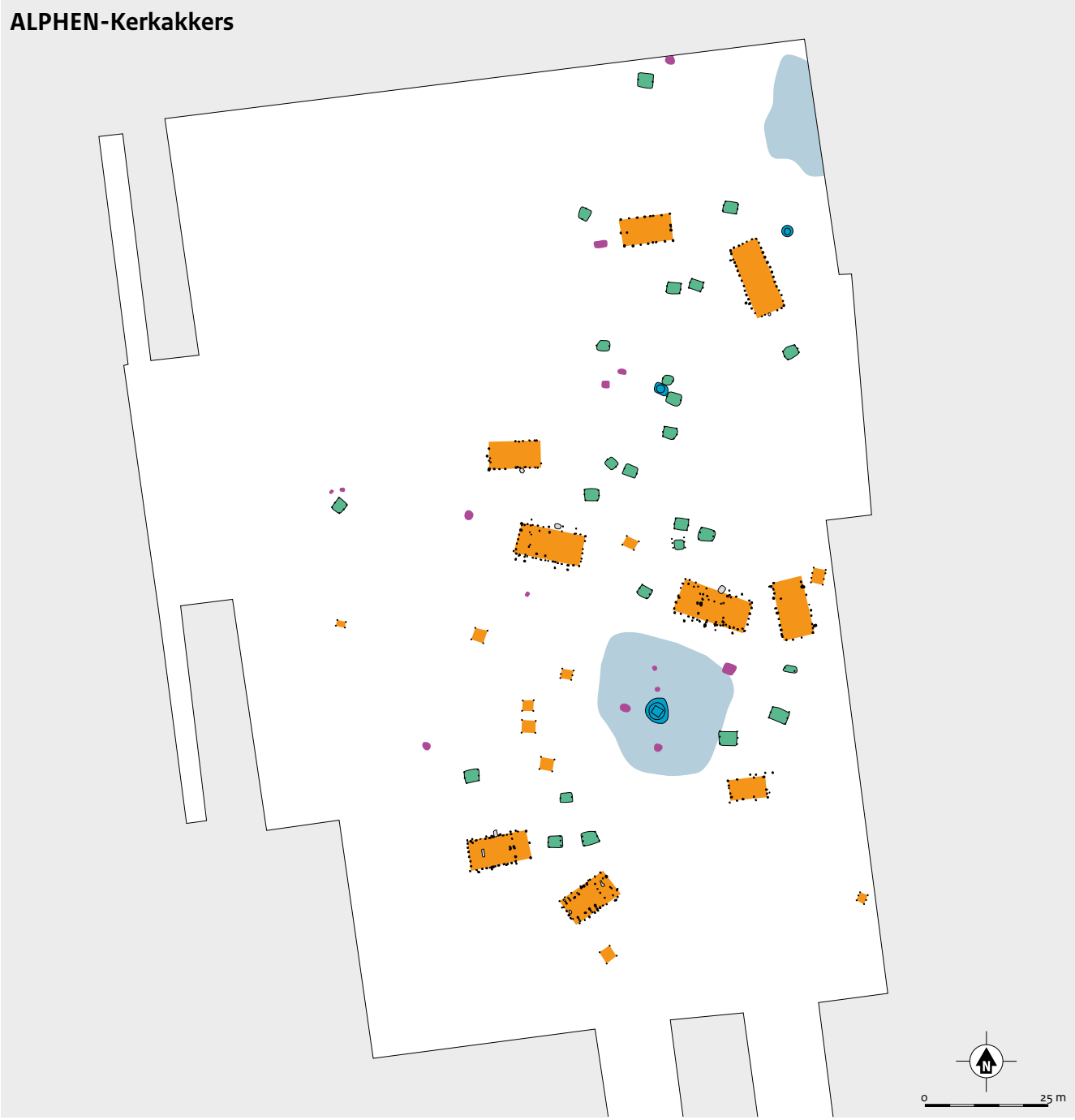


Fig. 12.9 Alphen-Kerkakkers. Plan of the Late Roman and Early Medieval settlement; legend see fig. 12.7. (source: modified after De Koning 2005, fig. 10)

Wijchen. The different proportion of sunken-floored huts has already been mentioned earlier.

Handmade pottery, at least in the MDS area, was generally not made and used at all for two or three centuries (c. AD 50/70-250/350).[907] From the later fourth century AD onwards, it is again found in all settlements. Petrological/chemical analysis shows that some vessels were actually produced in the north of the Netherlands or Germany.[908] Others have at least 'Germanic' forms, decorations – such as fingertip impressions on the transition to the shoulder – or traits such as bone-tempering.[909] However, the portion of handmade ware in the total pottery assemblage differs per site. At Breda A it is the only pottery found, in Voerendaal it constitutes no more than 7-9%,[910] while it is slightly over 15% at Goirle (rims), nearly 25% at Meldert, 60% at Gennep and 40-60% at Alphen.[911] Also based on data from other sites, the conclusion seems justified that 'Roman' pottery – as well as glass and metalwork – dominates the finds assemblage in most settlements (and graves).

Although the lack of publications on important sites and the inadequate grasp of chronology prevent definitive conclusions, it seems that the population of the rural settlements here had different origins. At Baelen-Nereth, only (some of the) handmade pottery is a 'foreign' element and it is possible that all or the majority of inhabitants were descendants of indigenous Gallo-Roman people. At the same time, the small group – probably a single household only – living at Breda A could have been made up exclusively of newly arrived Germanic people. Most relevant is the observation that the majority of settlements started in around AD 400, almost a century after the first Germani supposedly settled according to historical texts and perhaps after two or three generations of quite massive recruitment of Germanic warriors for the Roman army.[912] Therefore, it is more than likely that many rural settlements were by that time inhabited by a mix of people from different regions and cultural backgrounds. The probability of discontinuity and an interrupted habitation in many local settlement territories, among other matters, implies that the label 'Germanic' is inadequate in any case for the Early Middle Ages. The term Franci refers to people who were partly of Germanic origin but was mainly of relevance for groups living west of the Rhine.

Finally, it must be stressed that some rural settlements may have been connected to the Roman military; we are certainly not dealing with only soldiers and their families. Agriculture must have been the main occupation of the population in general. The presence of soldiers seems likely for a place like Gennep, situated near roads and the confluence of rivers, perhaps even with a *burgus* nearby. Non-agricultural activities such as those of a goldsmith and other (metalworking) artisans make this settlement stand out. However, the longhouses probably had stables and food was grown here and in other settlements,[913] rye being a new crop for this period.[914] Finally, what was the role and military strength of tiny groups, living literally in the middle of nowhere at Helden, Alphen or Breda? Most rural settlements were probably not part of an official 'military infrastructure', their inhabitants being at most veterans or relatives of soldiers able to defend themselves to a limited degree.

907 See e.g. Hiddink 2005a, 185 with references; some rare examples e.g. from Deurne (Hiddink 2008b, 139, fig. 10.1 from a third-century well).

908 De Paepe & Van Impe 1991 (esp. Donk); Van Thienen *et al.* 2020.

909 Bone-tempering e.g. in Baelen-Nereth (Van Thienen *et al.* 2020), Breda A, Geldrop (here granite is also used as tempering).

910 Section 26.5.1; table 26.3.

911 Depending on the method of quantification (De Koning 2005, 71). On the material from Gennep, see Verhoeven 2003, 116ff.; on Meldert: Clerbaut & Bakx 2012.

912 Section 16.2.2. Initially, most Germanic soldiers would be settled along the frontier and in or near the major cities.

913 The supposed indications of the import of both animals and crops at Gennep (Heidinga & Offenberg 1992, 87ff.) were never published in detail.

914 At Gennep less than 10% (Heidinga & Offenberg 1992, 88), at Geldrop 50% (Luijten 1990); cf. section 16.2.3.

13 The Roman and Early Medieval burials

Henk Hiddink

The first section of this chapter is devoted to the graves of the Middle and Late Roman period. By comparisons with some other villa sites, explanations are sought for the scarcity of graves from these periods at Ten Hove. Two interesting graves from the early part of the Late Roman period were interpreted decades ago by Willems, and his view is presented and discussed.
The second section is devoted to the Early Medieval graves in and around building 403 of the villa, their date and interpretation. We will also address the topic of the frequent occurrence of Merovingian burials around the ruins of Roman (villa) buildings.

13.1 A handful of Roman burials

Despite the large area investigated, only a handful of (possible) Roman burials were found during the excavations at Voerendaal-Ten Hove (Fig. 13.1; 42.1). Late Roman feature 315 does not appear to be a grave; at most it is a 'special deposit' containing human skull fragments.[915] The function of building 411 in the northwest corner of the villa yard is not entirely certain, although it is more likely to be a small temple than a grave monument.[916] Features 309 and 310, located 75 m east of the boundary ditch of the villa yard, also yielded no cremations but they are identifiable as burials because of the presence of a complete glass bottle and the base of a jar. While both these burials are Middle Roman in date, graves 320 and 321 – 80 m to the north – belong to the first part of the Late Roman period (Fig. 13.1; 13.4-5). The question is, of course, whether the four known burials were part of a larger, badly eroded cemetery or small isolated pairs in their own right. This leads directly to a second question: what should we expect and what do we know about burials near other villas? This matter will be dealt with in the next section. The burials themselves will be discussed in a following section.

13.1.1 Cemeteries of Roman villas

A first glance at the plans of some extensively excavated sites in the Hambach lignite mining area shows that a single villa can have several 'cemeteries', ranging from one or two graves to larger clusters (Fig. 13.1).[917] Although the number of graves at the illustrated sites is much higher than at Ten Hove, they are only a fraction of the original number, the rest being erased by erosion and agriculture. Between 20 and 24 graves were found at the Hambach sites, representing less than a single nuclear family.[918] Gaitzsch estimated that, on average, over half of the burials are missing,[919] which still seems rather optimistic. Most relevant here is the location of the graves/cemeteries, in the majority of cases close to the boundary ditch of the yard. At Hambach 132 the large earlier cluster is situated along the road to the complex. This situation is similar to that at Simpelveld-Stampstraat, where three stone ash chests with cremated bone were found 100 m from the main building, downslope and probably along a road (Fig. 13.2, E; Appendix XX, Fig. 14).[920] It is possible that the graves had markers, in the form of an enclosure wall and/or grave monument, to signal their presence to visitors and people passing by. A famous example of such a situation is Newel (D/RP), with a grave enclosure and a temple constructed 80 m from the yard, along a road.[921] Graves near the entrance or access road at Voerendaal would have been missed anyway because the southern border of the complex was not excavated.

An alternative to locations for all to see are burials in more private areas, closer to the main building.[922] At Hambach 132, at least six dead were buried 70 m behind the main building in the second half of the second or first half of the third century AD.[923] About a century later, a third cemetery was founded next to the main building. This remained in use in the Late Roman period and ultimately comprised some 50 graves.[924] An undated foundation points to a grave monument or small temple.[925] The largest cluster of burials at Hambach 516 is also located behind/next to the main building, at a distance of only 15 m. As shown by these examples, it is understandable why a function as a grave monument had to be considered for structure 411 at Ten Hove.

There is yet another type of location where graves can be found – not near the boundaries of the yard proper but in the arable along field boundaries. An interesting case in this respect is Hambach 59, where most graves were dug along

915 See chapter 42 for feature descriptions. An undated fragment of human bone was found in trench 9 (9-1-1/12169; 39 g). It was identified as a right humerus by F. Laarman (RCE, Amersfoort). Dr E. Smits, who recently analysed all the human bone material, added that it was probably of an adult because of the thickness of the cortex and the general size.

916 Section 11.3.2.

917 An overview in Gaitzsch (1993); see also Heimberg 2002/2003, fig. 15ff.

918 For HA 132 only based on the 24 southern graves, second half of the first/end of the second century AD (Brüggler 2009, 94-101). HA 59: 22 graves middle of the second/beginning of the third century AD (Hallmann-Preuß 2002/2003, 359-365); HA 69: 24 graves second/third century AD (Gaitzsch 1986, 414-418; fig. 12; 16); HA 516: 19-20 graves Claudian/Neronian-late second century (Kaszab-Olschewski 2001; 2006, 116, fig. 57; figs 73-75).

919 Gaitzsch 1993, 17, 36.

920 Holwerda 1931; Beckers & Beckers 1940, 267-270; De Grooth & Mater 1997a; Zinn 1997; Waters-Rist *et al.* 2017.

921 Cüppers & Neyses 1971.

922 There are even possible examples of monumental tumuli close to main buildings. Those at Vechmaal-Walenveld (Vanvinckenroye 1990, 21, fig. 6) and Mook-Plasmolen (De Groot *et al.* 2009, 8) are probably prehistoric, however, without known evidence for Roman (re)use. Part of a 47 m wide post circle around a lost tumulus was excavated at Wijchen-Tienakker,, only a dozen metres from an entirely destroyed villa (Heirbaut & Van Enckevort 2011, 25-30).

923 Brüggler 2009, 101.

924 Brüggler 2009, 102-126.

925 Section 11.3.3.

Fig. 13.1 Plans of five villa complexes with the location of (possible) cemeteries and graves in green. (source: in part modified after Hallmann-Preuß 2002/2003, fig. 6; Gaitzsch 1986, fig. 5; 8; Brüggler 2009; Kaszab-Olschewski, 2006)

a field boundary, nearly 100 m behind the main building (Fig. 13.1). Two separate graves lie at the opposite side, also a good 100 m from the villa. Another example of graves at a field boundary are seven examples at Hambach 34/419, some 100 m behind the villa.[926] At Hambach 69, two graves were also situated 100 m from the main building, apparently in the middle of nowhere (Fig. 13.1). Like the examples mentioned, graves 309-310 and 320-321 at Voerendaal must have been situated in the fields. Although no traces of boundaries were found there, they may have existed (either as shallow ditches or hedges). The latter two graves lie along the extension of ditch 302 and annex 326, the former in that of the annex (Fig. 13.1). There is no obvious proof because the hypothetical boundaries are entirely lost due to erosion. The impact of erosion is shown by the depth of grave 309 in particular, of which only 6 cm was left. Even though erosion must have been quite severe, it is possible that the number of 'peripheral' burials at Ten Hove was never much larger than four or that some graves are located in non-excavated areas.[927]

Finally, there are instances in which the absence of graves need not be 'explained' by erosion or the extent of the excavated area.[928] At Hoogeloon-Kaboutersberg, for example, two graves and seven enclosure ditches of what once must have been a much larger cemetery – including a tumulus and a large stone grave monument – were situated 300 m north of the villa settlement (Fig. 13.2, D).[929] One of the factors determining the location must have been the proximity to the border of the local territory, conveying a message about the ownership of the area to people entering it. The construction of monumental graves of villa-owning families at prominent locations is a well-attested model. For Nieuwenhagen-Valderveste, east of Heerlen, it was suggested that the monumental burial of a woman belonged to a villa (Koelweg) 300 m to the west.[930] The grave was situated near the edge of a plateau, possibly along the Via Belgica or at least visible from afar (Fig. 13.2, C). A rather extreme example is Echternach, where a tumulus of 70 m in diameter and 12 m high was raised at a distance of 1 km from the façade and on the central axis of the main building at Schwarzuecht (Fig. 13.2, B).[931] It is likely that a huge grave monument was erected on top of the tumulus, adding at least 12 m to its height. The site of the tumulus, along with an adjoining cemetery, must have been chosen because it is close to the spot where the road crossed the river Sauer.[932] One wonders whether the site where the head of a statue, 'the Voerendaal lady', was found, a kilometre south of Ten Hove, belonged to our villa (Fig. 13.3).[933] This is possible, although the distance seems too great for a monument of some 5-7 m tall to have been visible from the main building (Fig. 13.2, A).[934] However, if the monument was placed on the small 'cape', it may have been visible to passers-by on the 'Via Belgica' at the foot of the slope.

13.1.2 Interpretation of the graves

Regarding the four graves 309-310 and 320-321, the obvious question is what can we say about the people buried in them. Little is known about the dead in the former two, for none of their cremated remains were found. The presence of a single vessel in each grave might suggest that the deceased and their family were not particularly well-to-do. However, graves 320 and 321 also contained only one or two items of pottery. Moreover, the glass vessel in 309 is quite rare and suggests a degree of affluence on the part of its owners. Although the distance between the two pairs of graves is considerable, it is still possible that they both belonged to the same leading family. Graves 309 and 310 can in theory date to as early as c. AD 250, but they might have been closer in time to 320 and 321 than appears at first sight.

As the excavator has already presented a well-considered interpretation of graves 320 and 321 (Fig. 13.4-5), it would be both superfluous and vain to try to alter or improve it, even though it was written over 30 years ago. Therefore, Willems' interpretation is printed here in its entirety.[935] The only new insight is that he later reinterpreted the 'bolt-heads' as rake prongs (Fig. 13.5). Some comments on these peculiar objects and some additions are presented after the citation of the original text.

926 Here, other groups of six and seven burials are situated at the front of the yard, along the Köln-Bavay road (Gaitzsch 1993, 32-34, fig. 5a).

927 However, while there is 80 m between the two pairs of graves, there is a gap of only 35 m between trenches 42 and 60/63.

928 Another reason for the absence of monumental graves of villa owners could be that they were located near *civitas capitals*. However, in the *civitas Tungrorum* at least, the countryside is full of tumuli, while no elite burials are attested at Tongeren (Vanderhoeven 1996, 223). In any event, we would still expect the graves of servants and workers at villa sites.

929 Hiddink 2011e; Roymans 2015.

930 Hiddink 2004, 34ff., figs 2 and 28.

931 Metzler *et al.* 1981, 362, fig. 13; 1983, 38, fig. 1 (topography); 1981, 305-312, fig. 229 (monument). A Late Roman *burgus* was constructed on top of the tumulus (1981, fig. 204).

932 On the relationship of villa sites and monumental graves in the territory of the Treveri, see Krier & Henrich 2011.

933 Section 4.3.5, fig. 4.7, no. 631.

934 Perhaps only under perfect circumstances.

935 Willems 1989, 151-152. Only the numbering of the notes is different here; the contents of some are edited slightly.

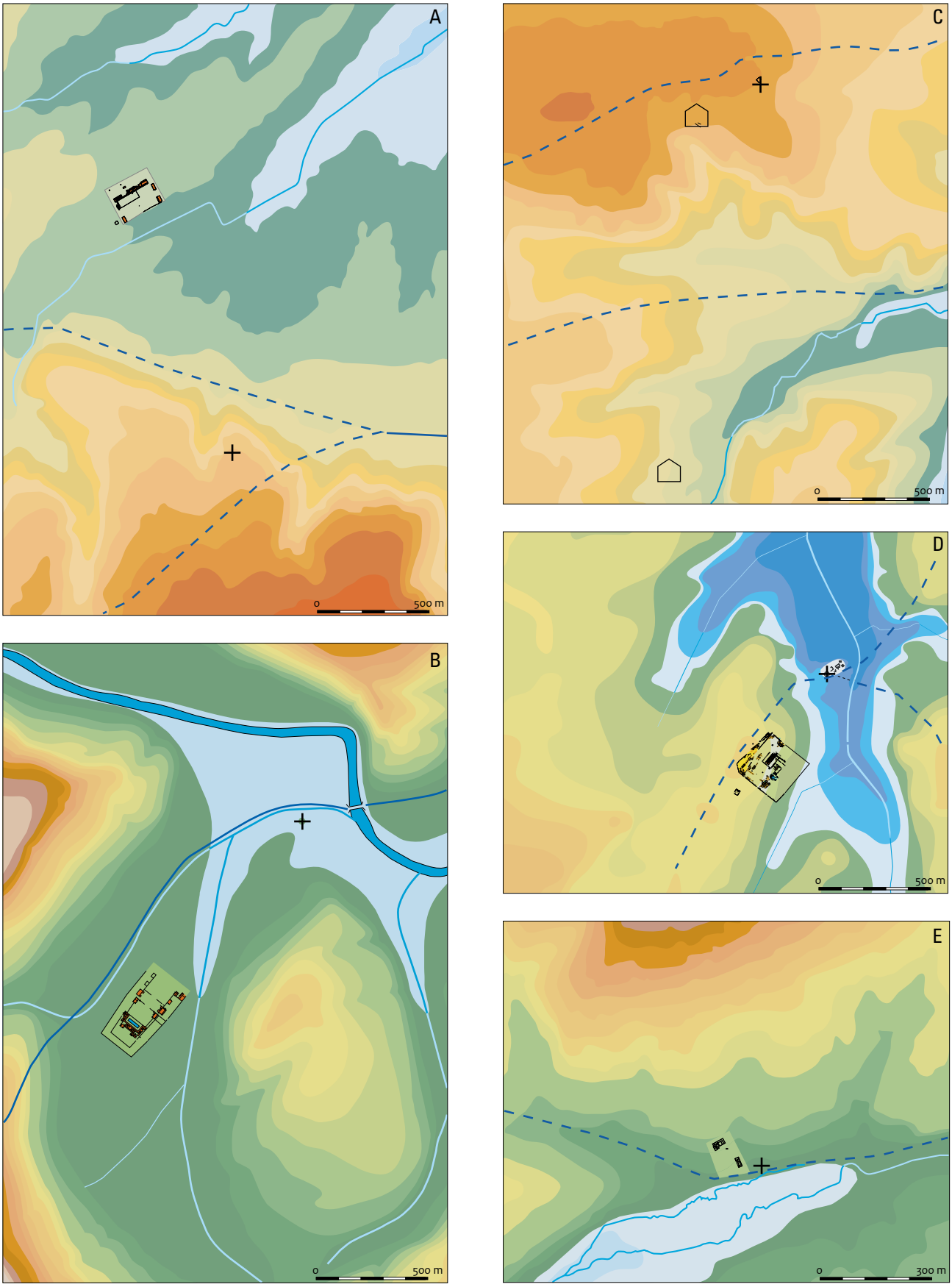


Fig. 13.2 Five villas and (possibly) associated grave monuments in relation to the landscape. Height interval 5 m, except for B (10 m) and D 0.5 m). A Voerendaal; B Echternach (source: Metzler et al. 1981, fig. 13); C Nieuwenhagen (source: Hiddink 2005, fig. 28); D Hoogeloon (source: Hiddink 2014, pl. 8; 2015, fig. 2); E Simpelveld (source: Braat 1941, fig. 32; 1948,

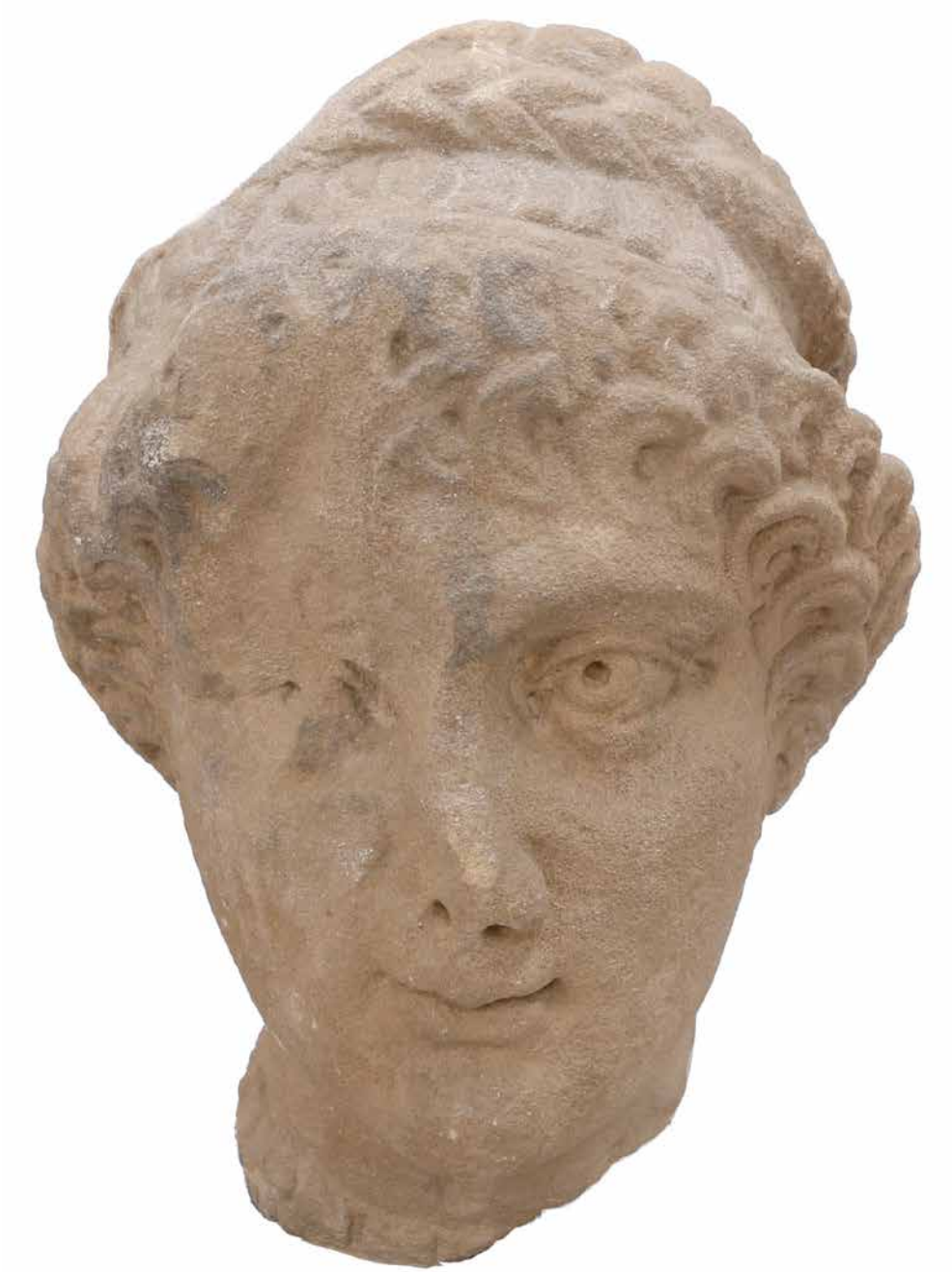


Fig. 13.3 Voerendaal-Haaren Gewande. The 'lady of Voerendaal', head of a statue in sandstone.
(source: Centre Céramique, Maastricht)

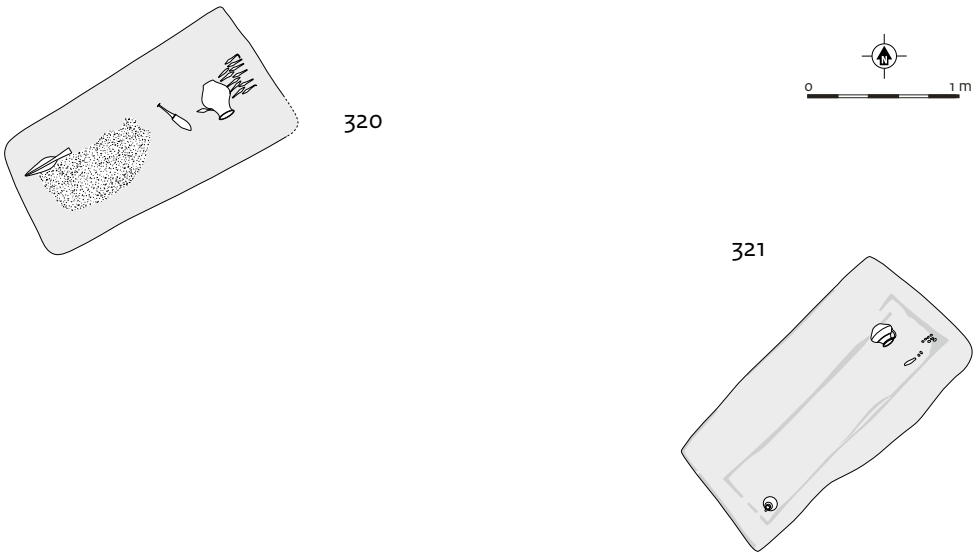


Fig. 13.4 Voerendaal-Ten Hove. Grave 320 and 321 (see fig. 42.4-5 for more detailed illustrations).

Interpretation
Willem J.H. Willems

'The reason for discussing two graves from the site of the Roman villa at Voerendaal in this volume [*Proceedings Roman military equipment conference* – HAH] is, obviously, the presence of possibly military equipment of a unique kind in one of them.[936] A problem even more difficult than the true nature of this equipment, is the interpretation of the burials. Who were the deceased and in which settlement did they live? The date of the two graves is very important in this respect. Unfortunately, the weapons are of little help with this problem. They indicate without any doubt a fourth-century dating, but the fact that the spearhead and the knife have parallels in late fourth-century graves elsewhere is not decisive. After all, datable weapons are normally those regularly found in Germanic weapon graves and these are the result of a tradition that started in the mid-fourth century and became popular only from the end of that century onwards.[937] By contrast, the pottery from both graves presents no chronological problems and indicates a date in the first half of the fourth century, or even around AD 300.

The fact that the weapon-burial is a cremation cannot be used for direct chronological inferences. Nevertheless, it would be quite exceptional for a late fourth-century 'Germanic' weapon-burial and fits more readily in ordinary third-century and earlier practices of the disposal of the dead. The structure of the grave and its association with an inhumation nevertheless point to a rather late date. There is some difference in the orientation of both burials so that the most likely interpretation would be that they are the remains of a couple buried together but not at the same time.

The chronological evidence indicates that these people can hardly have been inhabitants of the Germanic village [phase 4 – HAH], who were presumably Frankish *laeti* or *foederati*. In addition, the contents of the graves are unusual for Frankish burials. We may disregard the inclusion of bolts, but the absence of an axe in the male grave is surprising if it were Frankish, and so to some extent is the absence of brooches in the

presumed female burial. The conclusion is, therefore, that we are probably dealing with graves of the inhabitants of the latest phase of the villa [phase 3c – HAH].

This conclusion has some interesting implications. It means, firstly, that it is not very likely that the weapon-grave is that of a Germanic officer heading a small group occupying the estate.[938] This does not preclude the possibility that the burial is in some way military. It is conceivable that a villa owner in the early fourth century AD was at the same time a soldier, e.g. an artillery officer. It is even quite

936 Another grave with one (socketed) bolt-head that is definitely a grave gift is known from Krefeld-Gellep (Pirling 1974, 176; grave 1911). Several socketed points were found in Westendorf, grave 4 (Czysz 1986), which has some remarkable parallels in a general context and dating to the Voerendaal grave.

937 Cf. Pirling 1966, 230-237 or Böhme 1974, 158-165, both with further references.

938 Such as e.g. Abbeville-Homblières (Böhme 1974, 178), Vert-la-Gravelle, Contrat, and others (Böhme op. cit., 180-181); compare also the conclusions of Czysz 1986 for Westendorf. The interpretation of grave 4 as a Germanic burial is supported by positive evidence from the grave goods as well as the context, which indicates that the deceased in this case was not a wealthy villa owner.

Fig. 13.5 Voerendaal-Ten Hove. Iron objects from grave 320 and pottery from 321.

likely that he was in some way connected with military affairs, if only for the defence of his estate.[939] Moreover, we may expect a considerable degree of Germanization in this period, a process which may indeed be illustrated by the two Voerendaal burials.

Nevertheless, the most likely interpretation remains that the graves are of the owners of the villa, and that should lead us to a less speculative conclusion. After all, it is a well-known fact that Roman soldiers or veterans were not buried with their weapons. But it is also known that civilians sometimes were. In his study on the Roman cemeteries in northern Gaul, Van Doorselaer devoted considerable attention to the weapon graves of the first three centuries AD.[940] The second- and third-century examples concentrate in the fertile loess zone and coincide with the densest distribution of villas, to which in most cases (e.g. the tumulus-graves) there is a direct relation. Voerendaal is situated in this region.

The weapon-graves are, without any doubt, a native tradition of elite burial. As Van Doorselaer was able to show,[941] this is, in a provincial-Roman context, primarily related to the fact that the grave gifts were hunting weapons. The overall scarcity of weapons in graves and their strong association with very luxuriously furnished graves is conclusive proof of their function as high status grave goods. They were used primarily in burials of wealthy Gallo-Roman villa owners of native descent. Hunting may well have been a favourite pastime of these gentlemen.

The burial from Voerendaal is most likely an example of this type of burial and thereby the latest one known to date. The weapons can all be interpreted as hunting equipment and an axe, sword or shield are lacking. Even the bolt-heads can be placed in a non-military context, as is shown by the crossbows on the hunting scenes from Salignac and Saint-Harcel.[942] The troubled times in which the deceased lived could suggest a military function for his grave goods and thus that he was an officer and a gentleman. The evidence, however, proves only that he was a gentleman.'[943]

Additional comments

Willems' interpretation for graves 320 and 321 as the burials of 'villa owners' – whatever form the Voerendaal villa may have had in around AD 300 – rather than Germanic or other 'newcomers' is still the most plausible. The analysis of the cremated bone shows that the man in 320 was quite young, about 20-25 years of age.[944] Therefore, the deceased could have been a son rather than the actual owner. There is no real evidence that the person in 321 was a woman; this idea is based only on the absence of 'male' grave goods (weapons). As such it is well possible and it might been the wife, daughter or sister of the man in grave 321. All this is less important of course, because the discussion is focussed on the metal objects from the latter grave.

Concerning the explanation of the weapons, Willems mainly referred to research by Van Doorselaer,[945] 20 years old at the time and now over 50. More finds and more literature about weapon finds in graves (and non-military settlements) have become available since then, although this does not essentially affect the interpretation.[946] Weapon graves from the Middle Roman period onwards and well into the fourth century AD remain quite rare, however, in the range of 1:100 graves in some cemeteries and perhaps 1:5,000 on the whole.[947] The vast majority of the 'weapons' are not meant for battle; there are very few graves with swords.[948] Spearheads and large knives are the most common weapons and although sometimes found in non-elite graves – as at Tönisvorst – most examples are related to higher social strata and most likely used in hunting.
An interesting example not known at the time of Van Doorselaer's inventory is the tumulus of Berlingen (B/LI), dating to around AD 80 and containing – among many other objects – a spearhead and an axe.[949] A find spatially and chronologically closer to Voerendaal is the rich grave with sarcophagus from Bocholtz, 10 km to the southeast. This burial dates to the last quarter of the second or the third century AD and contained a dagger, spurs, a spearhead and axe.[950] It may have belonged to the villa of Bocholtz-Vlengendaal,[951] or one of two others 300-400 m away. One of the rich graves at Maastricht-Belfort contained arrowheads and

939 The central buildings of the villa include a massive square tower which presumably belongs to a late phase. Similar towers, sometimes interpreted as *burgi* and sometimes as granaries and perhaps being both, are known from various villa sites in the Rhineland (Bechert 1978). [cf. section 8.3-HAH]

940 Van Doorselaer 1967, 185-199 and Map 1.

941 Van Doorselaer 1967, 194-195. The types of weapons in the graves and the absence of shield bosses lead to this conclusion.

942 Espérandieu 1908, 442-444, nos 1679 and 1683. Cf. Campbell 1986, 128: the reliefs prove the existence of these weapons and their use for hunting, but there are also reasons (op. cit., 131-132) to assume the military use of similar arms.

943 I am grateful to F. Horbach (drawings) and to the ROB technicians H.J.M. Meijers (restoration) and A.W.P.M. Penders (photography), whose work allowed the quick publication of the find and to Dr C. van Driel-Murray for correcting the English text.

944 Section 42.3.

945 Willems only refers to Van Doorselaer 1967. Van Doorselaar 1965 contains a useful table summarizing the data on weapon graves. A critical review of the former publication is Nierhaus 1969.

946 A large number of references in Bridger 1996, 165-168, discussing finds from Tönisvorst (D/NRW). On finds from Belgian tumuli, see Massart 2015, 142-143. In the Heerlen Basin, a grave with a spearhead is known from Vrank (section 4.3.5).

947 Nierhaus 1969, 258, no. 30 (Middle Roman period). In

fragments of a bow and quiver, without doubt used in hunting.[952] As a final example, grave A at Linne-Ossenberg should be mentioned. At the time Van Doorselaer wrote that it was considered a sword grave because a bronze object had been identified as part of a scabbard. It is in fact a razor blade! Some of the eight pieces of pottery provide a date of c. AD 225-300 (or slightly later).[953] The cemetery for this burial is situated 900 m from the villa of Maasbracht-Steenakker and therefore most likely belonged to yet another (villa) settlement in this area.

Although grave 321 at Voerendaal represents a Roman elite culture rather than a 'barbaric warrior culture' of the Völkerwanderungszeit, the difference between the two is probably smaller than often thought. In an analysis of fourth/fifth-century weapon graves, Theuws questions traditional interpretations.[954] It would be going too far to mention all his arguments here, but there are good reasons to doubt the 'Germanic' character of later weapon graves. According to Theuws, we should ask whether 'expressing ethnicity' was in fact a motive of the participants in the grave ritual. Moreover, the dead were probably more 'landlords' than 'warlords' because the weapons are very similar to those in our grave 320. Spearheads, axes, arrows and knives can be found among the grave goods, while weapons such as swords, daggers and shields were avoided.[955] Theuws argues that the weapons in the graves are symbols for activities such as reclamation and hunting, through which new elites claimed the land.

Even if the essence of Willems' interpretation still stands, there is still the problem of the presence of prongs from one or two rakes in grave 320, rather than of 11(-12?) individual bolt heads.[956] The excavator suggested a simple explanation, associating rakes with gardening or agriculture, activities in which the 'villa owner' of Voerendaal was involved. This might be true, also bearing Theuw's ideas in mind, rakes being a kind of equivalent of axes in other graves. In such an interpretation, they represent the aspect of the 'farmer-cultivator', the spearhead, arrowhead and knife that of the 'hunter-warrior'. One objection, already noted by Willems, is that agricultural implements are seldom found in graves. However, alternative explanations for the rakes are not easy to imagine. Even if seemingly far-fetched at first sight, they may perhaps still relate to the rather 'masculine' implements in grave 320. If the large spearhead and knife were indeed used in hunting, a rake might have been used (if 'only' as a symbol) to prepare the spot where the animals were butchered and skinned. Along this line of thought, a relationship with animal games (*venationes*) is also feasible, the rake being an implement for the preparation of the *(h)arena*.[957] Again, although perhaps far-fetched, we believe that these interpretations should be considered.

13.2 The Early Medieval cemetery

13.2.1 The graves and the people buried in them

Even a first glance at the plan of the cemetery clearly shows that the seven burials that were found represent only a part of the cemetery (Fig. 13.6).[958] It is impossible to give an estimate of its real size. The unexcavated area could contain slightly over a dozen more graves east of graves 384 and 387, which would result in some 20 in total. Theoretically, there could be even more if the interior of building 402 were crammed with burials and some people were interred west of the building. In any case, the excavated area around the southeast corner of the Roman barn yielded no burials, pointing to a limited size. Moreover, if the cemetery were larger, some graves would have been observed in Holwerda's trenches.[959] All in all, the cemetery was probably modest in size, certainly not exceeding 25 or 30 burials. Of the seven graves in ROB trench 11/17, only four were investigated (Fig. 13.7). The criterion seems to have been that burials partly situated outside the trench and thus outside the archaeological monument were not touched (384-386), although a small extension was made for 387. It is obvious that the information value of only four graves, combined with some objects from a fifth (388), is quite limited.

Concerning the dates of the graves, 382 and 388 could be as early as c. AD 565, although the metal objects allow for a much later date

161 fourth-century graves at Tongeren-ZW grafveld, only three axes (Vanvinckenroye 1984, 200; 228)

948 Cf. Van Doorselaer 1965. Umbos present in some graves were probably used in hunting, e.g. Nijmegen-West grave 8 with three spears and an umbo (Koster 2010, 256-257).

949 Roosens & Lux 1973, 31, fig. 20, nos 40-41.

950 De Groot 2006, nos 215-216, 304-305.

951 Goossens 1916.

952 Koster 1997, 47; 2021, 49-52, pl. 9-10.

953 Hiddink 2005c, 36-37.

954 Theuws 2009.

955 Sword graves are rare finds, occurring from the middle of the fifth century AD onwards (with swords of the Krefeld type).

956 Willems (1990, 22) assumes that two rakes are represented but in any case, the position of the prongs – in the small space between the jug and edge of the grave – suggests that the rakes were disassembled, with the handles removed. In the above-mentioned cemetery of Tönisvorst, a bolt head was found in grave 44, where a child of 2-3 years was buried! See Bridger 1996, 166-168, fig. 53; 344-345, pl. 20.

957 (*H*)*arena* is the Latin word for sand.

958 We have numbered a sax found by Habets as 388. See further chapter 42.5 for a detailed description of graves and finds.

959 Holwerda was familiar with Early Medieval cemeteries. Two years before his campaign in Voerendaal, he investigated the one at Wageningen (Van Es 1964, 189). However, his trenches were narrow and the work was not properly finished.

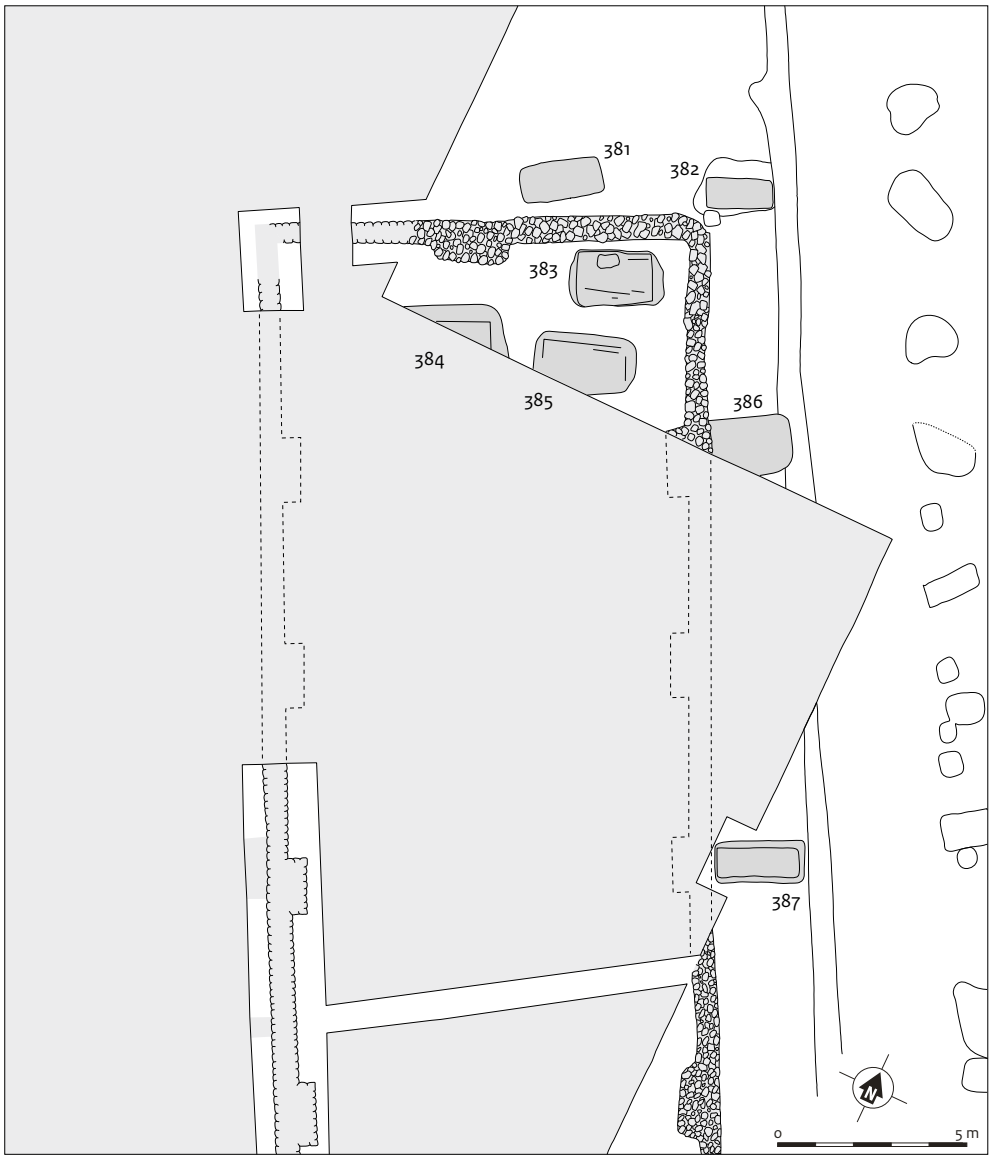


Fig. 13.6 Voerendaal-Ten Hove. Plan of the Merovingian cemetery around building 402.

(Fig. 13.8). The only indication of a beginning in the second half of the sixth century AD (or earlier) is a fragment of a *Knickwandtöpf* FAG 2b/LPV 390 (before AD 580/590).[960] Grave 383 could also date to the latter period, but was more likely dug in the first half of the seventh century AD. Grave 383 belongs to the beginning of the seventh century (assuming 383-27 was not very old at the time of deposition). Finally, grave 381 dates to the later seventh century AD. Taking the available evidence together, the cemetery was in use for at least a century, during the period c. AD 575-675.

The skeletons were not well preserved and the fact that a fair number of bones in graves 381-383 were still present or recognizable is due to the chalk of the Roman building stones. Normally, they would have completely dissolved in the decalcified loess. The bones from 382 are kept in the depot, but as they are still lodged in loess, now completely dried out, it was decided not to investigate them. Some molars from the person in grave 383 suggest that the deceased was around 17-23 years of age. On the basis of the lost beads, we know that a woman was

[960] Find 11-0-0/1200, like 17-1-1, is a stray find from the area; cf. section 27.4.2 also for the FAG and LPV typologies.

A

B

C

D

Fig. 13.7 Voerendaal-Ten Hove. Early Medieval burials, all seen from the south. A grave 381; B idem, detail of the skull with beads; C grave 382 with axe on the foreground; D grave 383 with traces of the chest and spear in the foreground.

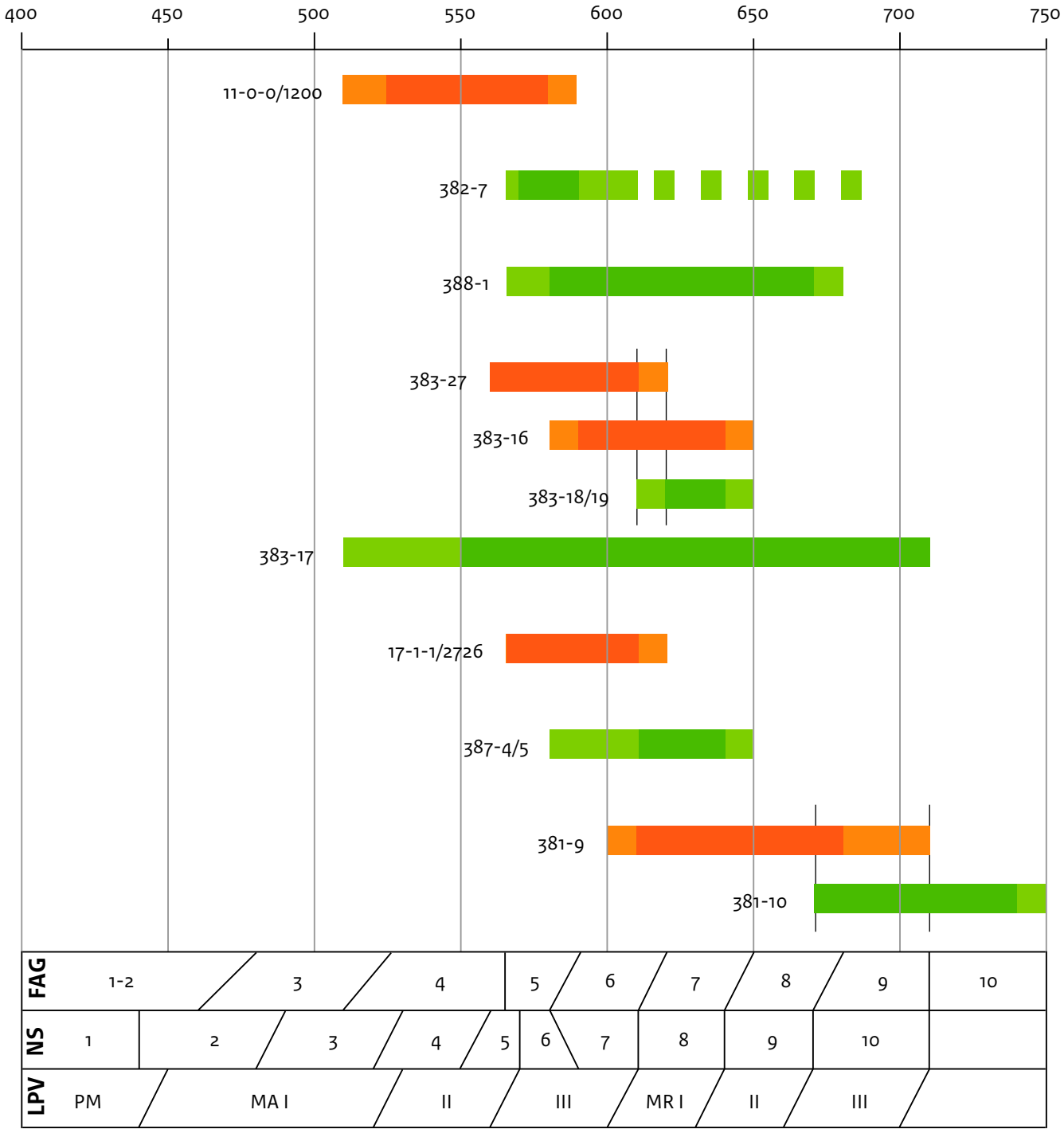


Fig. 13.8 Voerendaal-Ten Hove. The date ranges of objects from the Merovingian cemetery; pottery in red; metal in green.

buried in grave 381. Grave 387 containing only elements of a belt could also belong to a woman. The presence of weapons in graves 382, 383 and 388 suggests that men were interred there (Table 13.1).

Based on their inventory, the burials are neither particularly rich nor poor. Of course, this kind of qualification has a limited value. At present, it is generally accepted that the grave inventory is not a direct 'reflection' of the wealth or social standing of the deceased.[961] Rather, it is the result of the intentions of the next of kin, in combination with general traditions and practices in specific regions and periods. With these reservations in mind, we can conclude that object categories such as horse gear, helmets, 'high status' weapons such as swords or angos, as well as glass or bronze vessels and precious metals, are not present. At the same time, the graves are not 'poor' either; all contain at least one object and three of them yielded three objects.

For the record, there is no unmistakable evidence that some of the graves were robbed, resulting in missing objects.[962] Some objects or parts thereof were found slightly dispersed, but this could be the result of post-depositional processes. The beads in grave 381, for instance, are found in an area of 65 cm in length. In any event, they were not taken away (they perhaps represent two strings). The belt fittings in grave 387 were found in a somewhat peculiar position, but the dark lines of the coffin are more or less uninterrupted, counter-indicative of the presence of a robber pit (also nothing resembling it was observed during excavation). The most 'chaotic' situation can be observed in grave 383. The skull (molars) was 30 cm off the central axis of the skeleton, fragments of pot 383-16 were collected 60 cm away from its base and perhaps some belt fittings (and a sword?) are missing. However, the displacement of the skull and sherds may have been caused by animals burrowing before the lid of the burial chamber gave way.

13.2.2 Merovingian cemeteries in and near villas

The location of the small Early Medieval cemetery at Ten Hove inside an old building is far from unique. In neighbouring countries like France, Belgium and Germany, as well as many others, there are numerous examples of Merovingian burials associated with Roman buildings, both in cities and *vici* and at cult places and villas. We will confine ourselves to the latter category. Obviously, the classification of Roman sites would have been less clear or even irrelevant for the Merovingian population. For instance, the Roman ruins of a small Roman cult place at Born-Buchten, 18 km north of Voerendaal, could well have passed for any 'ordinary' old building to the people burying their dead there.[963] As such, the reuse of buildings had started in the Late Roman period.[964] A nice example is Furfooz-Hauterecenne (B/NA), where the occupants of a hillfort buried their dead in and against an older bath building during the late fourth/first half of the fifth century AD.[965]

In the literature, the interpretation of Merovingian graves near Roman buildings ranges between two extremes. One is that

Table 13.1. Voerendaal-Ten Hove. Summary of the grave gifts in the Merovingian graves.

Grave	Sax (sword)	Spear	Axe	Belt	Beads	Knife	Other tools	Pot
381				X	X			X
382			X			X	X	
383	X	X		X				X
387				X				
388	X							

961 Theuws 2009, esp. 293ff.

962 On this practice, see e.g. Van Haperen 2010; 2017; Belling 2017 (Köln-Müngersdorf).

963 For this site, see Derks & De Fraiture 2015. An example of a cemetery in a villa close to Voerendaal is Borgharen (Dijkman 2003; Lauwerier *et al.* 2011; Lauwerier & De Kort 2014); the plan of the villa is unknown, however.

964 Cf. Effros 2001, 103ff.

965 Brulet 1978; Böhme 1974, 182-183; 288-290 (site 120), pl. 88-90.

Roman ruins and the associated rubble resulted in land totally unsuitable for agriculture, only usable as a source of building material and for burying the dead. However, authors proposing this interpretation often note that the rubble would have made grave-digging hard. The excavators wrote the following about Rosmeer-Diepestraat (B/LI; Fig. 13.9): 'Three centuries later the site was still unsuitable for agriculture and therefore the Merovingians chose it for their cemetery. The rubble must have posed a hindrance initially because the graves – with two exceptions – were dug around the building. Only later were the walls, apart from the cellar, completely removed and the site levelled.'[966] Because of the vast layers of rubble, the common-sense explanation is not logical. Hinz realized this, commenting on the location of the graves at Morken (D/NRW) and adding: 'This down-to-earth, realistic interpretation is opposed by irrational reasons: the ruins belonged to the sphere of the afterlife ['*der Ort jenseitiger Umtriebe*' in the original wording-HAH] and perhaps the place for rituals [...] These could also have been factors in choosing these locations for cemeteries.'[967]

A purely 'ritual interpretation' is the other extreme, the view that villa ruins were chosen deliberately for cemeteries (leaving the question of the '(ir)rationality' of beliefs aside). Many authors refer to examples where the dead were laid to rest in former Roman baths because these had apsidal rooms, reminiscent of the apse of chapels and churches. Percival stated that burials at villa sites were '...extremely common in France and Belgium, where there are literally hundreds of examples and frequent also in the Rhine and Danube provinces...'. Also 'extremely common' were the cases where '...villas survived, no longer *as* villas, but as religious centres, as cemeteries, chapels or monasteries.'[968] Percival notes that the continuous use of Roman sites was sometimes purely coincidental.[969] However, the later religious use of some Roman sites is still a reality. Early Medieval texts show that ruins were reused in this way and that ancient remains – if used by the appropriate Christian individuals – were not per se impure, contaminated or dangerous.[970] In a famous passage, Gregory of Tours writes about the nobleman and later saint Senoch, who in the sixth century erected an altar in ancient ruins, where he supposedly discovered an oratory used by St Martin.[971]

Besides religious motives, claims on agricultural land could have been a reason to locate cemeteries at villa sites. By burying their dead at an 'old' site, a community probably aimed to establish a connection to past ownership, giving their claim 'historical depth' and thereby more weight. This would be an additional element in the Medieval repertoire of constructing ancestry, which was also done by constructing genealogies or legends of origin, as well as by burying the dead in older cemeteries.[972] The practice of burying the dead near old, prehistoric cemeteries was already quite common in the Roman period in the sandy regions north of the loess.[973] The number of Early Medieval examples of re-using cemeteries is smaller there, but they do exist.[974] Merovingian burials at or next to Roman cemeteries are known, for instance, in the MDS area from Posterholt,[975] Ophoven and possibly Berghem, in or next to prehistoric barrows and/or urnfields at Beerse-Krommenhof,[976] Casteren-De Kattenberg, Hoogeloon-Broekeneind,[977] Rekem-Tombosch,[978] as well as at sites in other regions such as Wageningen and Tüddern.[979] Many Anglo-Saxon burials in or near prehistoric barrows (and villas) are known in Britain.[980]

Returning to villa sites, for the vast majority it is obviously impossible to say which specific reasons lay behind the decision to bury the dead there. Even a thorough analysis often fails to provide clear answers. At Erps-Kwerps (B/VB), 39 inhumation graves were still present (Fig. 13.9). Some of the graves, dating from the end of the sixth/end of the seventh century AD, were constructed with stone, roof-tile fragments and stone slabs from the villa.[981] A structure with four wooden posts is a possible chapel. The location and orientation of the graves show that the walls at the west side of the villa were still visible, but in the interior some graves intersect the foundations.[982] Nevertheless, the Merovingian settlers were aware of the presence of an old building and must have chosen the location deliberately. At Rosmeer (B/LI), mentioned earlier, around 120 burials dating from the third

966 De Boe & Van Impe 1979, 43.
967 Hinz 1969, 75.
968 Percival 1976, 183. For more examples, see e.g. Samson 1991, 109; Lewit 2003, 262-263.
969 Percival 1976, 184.
970 Effros 2001. Also significant is the practice of using Roman objects as grave goods (Pion 2011; Kars 2011, 174ff.; 206ff., figs 1-3; 9-10).
971 Greg., vit 15.1; Percival 1976, 197; Effros 2001, 93.
972 On claims on land and 'creating' ancestors in general, see e.g. Theuws 1999; Effros 2001, 100.
973 Roymans 1995; Hiddink 2003a, 47-49.
974 For references concerning the sites mentioned below, see Hiddink 2003a, 49.
975 De Haas & Theuws 2013.
976 Delaruelle *et al.* 2012.
977 Glasbergen 1955 (Hoogeloon); Beex 1954 (Casteren-tumulus 2).
978 Coenegracht 1912; Vanderhoeven & Janssen 1974.
979 Van Es 1964, 188-189 (Wageningen); Siegmund 1998, 431 (Tüddern).
980 Williams 1998; Van de Noort 1993 (also continental examples). Sippel (1980) shows that Carolingian people were aware that barrows were ancient burial sites.
981 Verbeeck 1994, 77-85. The site was also occupied in the Late Roman period.
982 A problem is that these walls were robbed early in the twentieth century!

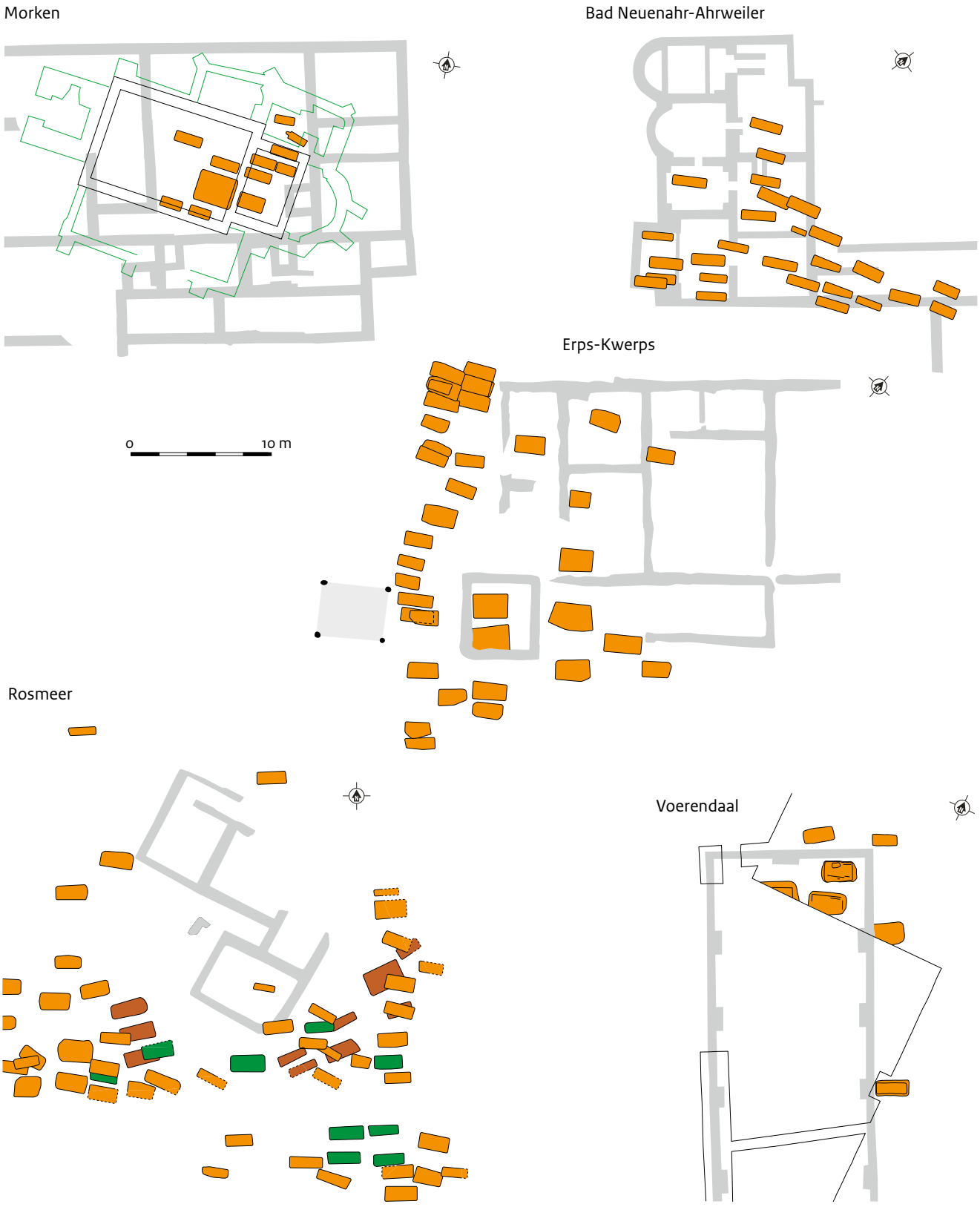


Fig. 13.9 Examples of Merovingian graves in or near villa buildings; earliest graves at Rosmeer in red and green. (source: in part modified after Verbeeck 1994, fig. 2; 9; De Boe & Van Impe 1979, pl. 1; Roosens 1978, pl. 1; Fehr 2003, pl. 5; Hinz 1969, fig. 42; map 1-2)

quarter of the sixth until the end of the seventh century were investigated (Fig. 13.9).[983] Although the oldest graves (red and green) are clustered near one of the corner pavilions of the Roman villa, an early seventh-century grave intersects the foundations. This suggests that little was indeed left of the building when the first graves were dug. This does not exclude the possibility that the Merovingian group chose the site for more positive reasons than it being a heap of rubble not good for anything else. The fact that the situation at a ruined villa can be more complicated is suggested for the villa of Bad Neuenahr-Ahrweiler (D/RP). Here, 32 graves were found over the foundations of the baths.[984] The excavator believes that the dead were Christians, on the basis of the later date (seventh/eighth century AD), absent grave goods and heads facing east. Although the bath lay in ruins, the apsidal caldarium and northern *tepidarium* were left free of graves, suggesting that they were still recognizable as rooms reminiscent of a chapel, of even used as one. While a real church was present at Morken-Harff-Kirchberg (D/NRW), the religious connotation of the site is only secondary.[985] It is not known whether walls of the large Roman villa were still visible in around AD 600, when the famous 'lord of Morken' (grave 2) was buried there (Fig. 13.9).[986] The burials were laid out in a different orientation from that of the villa, although confined to a single large room. Because the Medieval church had the same orientation as the Merovingian burials, it was possibly preceded by a smaller, simple rectangular church erected over the graves. An important observation is that the Morken area was already inhabited before AD 600. At 400 m to the west of the Kirchberg, a cemetery of some 450 graves was already founded in 'phase 3', AD 460/80–510/25.[987] The 'lord of Morken' and his family apparently founded a new cemetery to set themselves apart from the rest of the population.

Returning to the burials at Voerendaal, we can say that their location and orientation prove that at least part of the walls of building 402 were still present. Furthermore, as a rectangular outbuilding like 401 and 403, it certainly had no apse-like feature attracting the attention of the Medieval occupants of the site. Further conclusions cannot be drawn because we know nothing about the height of the remaining walls and the extent of the cemetery to the west and south. It is possible that the remains of the former outbuilding were reused and re-roofed to create a new structure, a kind of *cella memoriae* over an important grave or graves. However, it is also feasible that the Roman walls were quite low, used simply as an enclosure wall around a number of graves.

983 Roosens *et al.* 1976; Roosens 1978; Theuws 1988, 71-75; for the villa, see De Boe & Van Impe 1979. Rosmeer seems to have been land in the possession by the Merovingian kings (Theuws 2001, 213).

984 Fehr 2003, 31.

985 Hinz 1969, 63-75. The same holds true e.g. for Lürken (Piepers 1981). Here, Merovingian graves dating from around AD 600-800 were dug in the ruins of the large Roman villa. The cemetery was apparently in continuous use into the High Middle Ages and only then was a wooden church constructed.

986 See also Nieveler 2003, 35-40; 314-316.

987 Nieveler 2003, 40; Herzog & Nieveler 2018.

This report presents the results of the excavations at Voerendaal-Ten Hove, especially those conducted three decades ago by the State Service for Archaeological Investigations (ROB). A full publication of the Roman villa was long overdue because it represents only one of three Dutch examples investigated in its entirety. Moreover, the site is relevant for its Late Iron Age enclosure, post-built structures preceding the large villa and settlement remains and burials of the Late Roman and Merovingian period.

In this first part of the publication, the research history, environment, formation processes and periodization of the site are presented, followed by a discussion of the main features of each phase.

This scientific report is intended for archaeologists, as well as for other professionals and amateur enthusiasts involved in archaeology.

The Cultural Heritage Agency of the Netherlands provides knowledge and advice to give the future a past.