Frontiers of the Roman Empire – The Lower German Limes

Nomination File for Inscription on the UNESCO World Heritage List

Part I – Nomination file

Frontiers of the Roman Empire – The Lower German Limes

Nomination File for Inscription on the UNESCO World Heritage List

Netherlands | Germany

Acknowledgements

Programme manager
Tamar Leene

Main authors
Marinus Polak, Steve Bödecker, Lisa Berger, Marenne Zandstra, Tamar Leene

Text contributions
Astrid Gerrits, Martijn Goedvolk, Tessa de Groot, Sebastian Held, Peter Henrich, Thomas Otten, Sebastian Ristow, Alfred Schäfer, Jennifer Schamper, Dirk Schmitz, Martin Wieland, Lisa Wouters

Additonal support
Matthias Angenendt, Sandra Rung, Johanna Steffesthun

Final editing
Jens Wegmann

English correction
Nigel Mills

Cartography
Eugen Rung

Design
Christoph Duntze

Printing
LVR-Druckerei, Inklusionsabteilung

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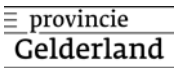

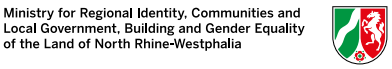

Preface

Rome and the huge Empire it built during the first centuries AD extended over vast swathes of Europe, the Near East and North Africa. This Empire has fascinated people since the days of the Enlightenment. In the wake of Rome's military conquests, Roman culture also spread and began to influence the cultural expressions of the societies it vanquished. These developments, combined with intensive mobility and trade – especially within the Empire – ensured a flourishing exchange between cultures and peoples.
When Rome's expansion came to an end, linear frontiers known as *limites* were created from the 1st century AD onwards to secure the borders. These borders continued to exist for a long time, especially along rivers. The military installations along the *limes*, along with waterborne means of communication, form an important part of the frontier. Dotted along the border like pearls on a chain, the remains of these installations still exist today as archaeological sites.
In 2005, the Upper German-Raetian Limes (DE) was inscribed onto the World Heritage List, joining Hadrian's Wall (UK) to form the transnational serial World Heritage site *Frontiers of the Roman Empire*. Ever since, representatives of bodies from the relevant European Member States have been working together to bring about the inclusion of all relevant European sections of the Roman Frontier in this World Heritage site. In 2015, Tunisia also inscribed its Frontiers of the Roman Empire onto the Tentative List, the first step towards nominating the Roman Frontier as a World Heritage site.

Following a recommendation by ICOMOS and the UNESCO World Heritage Centre in early 2016, a Thematic Study – complete with a Nomination Strategy – was prepared in 2016/2017, with the aim of including all of the Frontiers of the Roman Empire. During its 41st meeting, the World Heritage Committee acknowledged this study. The Nomination Strategy recommended that the World Heritage sites that make up the European stretch of the Frontier should be put forward as separate nominations to become part of the Frontiers of the Roman Empire, alongside their already existing status as a World Heritage site. It also recommended that all of the proposed World Heritage sites should be subject to common management principles. The present Nomination File includes a description of one of the separate sites put forward, including the management principles.

In the name of the Netherlands and on behalf of Germany, I am delighted to present our nomination for *Frontiers of the Roman Empire – The Lower German Limes*. This nomination is in full accordance with the proposals made in the Thematic Study and the Nomination Strategy. I would like to take this opportunity to commend the years of international collaboration which have culminated in this nomination and to express my gratitude to all those who supported us in this process, in particular ICOMOS and the UNESCO World Heritage Centre.

Ingrid van Engelshoven,

Minister of Education, Culture and Science
Government of the Netherlands

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Executive Summary

Executive Summary

States parties

Germany (DE) | Netherlands (NL)

State, province or region

Germany
Federal state of North Rhine-Westphalia (*Nordrhein-Westfalen*): municipalities (kreisfreie *Städte und Gemeinden*) of Kleve, Bedburg-Hau, Kalkar, Uedem, Xanten, Wesel, Alpen, Moers, Duisburg, Krefeld, Neuss, Monheim am Rhein, Dormagen, Köln, Bonn, Bornheim, Alfter, Swisttal and Bad-Münstereifel.
Federal state of Rhineland-Palatinate (*Rheinland-Pfalz*): municipality (*Stadt*) of Remagen.

Netherlands
Province (*provincie*) of Gelderland: municipalities (*gemeenten*) of Arnhem, Berg en Dal, Nijmegen, Overbetuwe, Zevenaar.
Province (*provincie*) of Utrecht: municipalities (*gemeenten*) of Bunnik, Utrecht, Woerden.
Province (*provincie*) of South Holland (*Zuid-Holland*): municipalities (*gemeenten*) of Katwijk, Leiden, Leidschendam-Voorburg, Voorschoten.

Name of property

Frontiers of the Roman Empire – The Lower German Limes
Grenzen des Römischen Reiches – Der Niedergermanische Limes
Grenzen van het Romeinse rijk – De Neder-Germaanse Limes

Geographical coordinates to the nearest second

Frontiers of the Roman Empire – The Lower German Limes is a serial transnational nomination. The western end is constituted by the fort of Valkenburg (NL), with its approximate centre at E 4°25‘59“ N 52°10‘48“ (DMS). The fortress of Xanten-Fürstenberg (DE) constitutes the approximate centre of the nominated property, at E 6°28‘12“ N 51°38‘35“ (DMS). The southern end is constituted by the fort of Remagen (DE), with its approximate centre at E 7°13‘41“ N 50°34‘48“ (DMS).
The 106 component parts of the nominated property are listed in table 1, with the coordinates of their centre points. They are listed from north(west) to south(east).

id	name	country	municipality	E	N
1a	Valkenburg-Centrum | Kerkweg	NL	Katwijk	4°25'59"	52°10'48"
1b	Valkenburg-Centrum | Centrum	NL	Katwijk	4°25'59"	52°10'48"
1c	Valkenburg-Centrum | Raadhuis	NL	Katwijk	4°25'59"	52°10'52"
1d	Valkenburg-Centrum | Kerkhof	NL	Katwijk	4°25'59"	52°10'52"
2a	Valkenburg-De Woerd | North	NL	Katwijk	4°26'17"	52°10'19"
2b	Valkenburg-De Woerd | South	NL	Katwijk	4°26'24"	52°10'12"
3	Voorburg-Arentsburg	NL	Leidschendam-Voorburg	4°21'0"	52°3'36"
4a	Corbulo's canal | Vlietwijk	NL	Voorschoten	4°27'36"	52°7'30"
4b	Corbulo's canal | Starrenburg	NL	Voorschoten	4°26'13"	52°6'32"
4c	Corbulo's canal | Knippolder	NL	Voorschoten	4°25'44"	52°6'18"
4d	Corbulo's canal | Vlietvoorde	NL	Leidschendam-Voorburg	4°25'23"	52°6'4"
4e	Corbulo's canal | Rozenrust	NL	Leidschendam-Voorburg	4°24'32"	52°5'28"
4f	Corbulo's canal | Romeinsepad	NL	Leidschendam-Voorburg	4°23'56"	52°5'2"
5a	Leiden-Roomburg | Park Matilo	NL	Leiden	4°31'1"	52°9'0"
5b	Leiden-Roomburg | Besjeslaan	NL	Leiden	4°31'8"	52°8'53"
6	Woerden-Centrum	NL	Woerden	4°53'2"	52°5'10"
7a	Utrecht-Limes road | Zandweg	NL	Utrecht	4°59'46"	52°5'28"
7b	Utrecht-Limes road | Veldhuizen	NL	Utrecht	5°0'29"	52°5'10"
7c	Utrecht-Limes road | De Balije	NL	Utrecht	5°1'19"	52°4'48"
8a	Utrecht-Hoge Woerd | Castellum	NL	Utrecht	5°2'31"	52°5'10"
8b	Utrecht-Hoge Woerd | Langerakbaan	NL	Utrecht	5°2'38"	52°5'17"
9	Utrecht-Groot Zandveld	NL	Utrecht	5°3'4"	52°5'42"
10	Utrecht-Domplein	NL	Utrecht	5°7'19"	52°5'28"
11a	Bunnik-Vechten | Marsdijk	NL	Bunnik	5°9'58"	52°3'29"
11b	Bunnik-Vechten | Provincialeweg	NL	Bunnik	5°10'26"	52°3'47"
12	Arnhem-Meinerswijk	NL	Arnhem	5°52'26"	51°58'16"
13	Elst-Grote Kerk	NL	Overbetuwe	5°50'56"	51°55'12"
14a	Nijmegen-Valkhof area | Valkhofpark	NL	Nijmegen	5°52'12"	51°50'53"
14b	Nijmegen-Valkhof area | Hunnerpark	NL	Nijmegen	5°52'19"	51°50'49"
15	Nijmegen-Hunerberg	NL	Nijmegen	5°53'2"	51°50'24"
16a	Nijmegen-Kops Plateau | West	NL	Nijmegen	5°53'31"	51°50'17"
16b	Nijmegen-Kops Plateau | North	NL	Berg en Dal	5°53'42"	51°50'20"
16c	Nijmegen-Kops Plateau | East	NL	Nijmegen	5°53'42"	51°50'10"
16d	Nijmegen-Kops Plateau | Kopse Hof North	NL	Nijmegen	5°53'46"	51°50'10"
16e	Nijmegen-Kops Plateau | Kopse Hof South	NL	Nijmegen	5°53'46"	51°50'6"
17a	Berg en Dal-aqueduct | Mariënboom	NL	Nijmegen	5°53'17"	51°49'34"
17b	Berg en Dal-aqueduct | Swartendijk	NL	Berg en Dal/Nijmegen	5°53'28"	51°49'23"
17c	Berg en Dal-aqueduct | Cortendijk	NL	Berg en Dal	5°53'24"	51°49'12"
17d	Berg en Dal-aqueduct | Louisedal	NL	Berg en Dal	5°54'0"	51°49'5"
17e	Berg en Dal-aqueduct | Kerstendal	NL	Berg en Dal	5°54'50"	51°49'1"
18a	Berg en Dal-De Holdeurn | North	NL	Berg en Dal	5°55'59"	51°49'1"
18b	Berg en Dal-De Holdeurn | South	NL	Berg en Dal	5°55'55"	51°48'58"
19	Herwen-De Bijland	NL	Zevenaar	6°5'56"	51°52'52"
20	Kleve-Keeken	DE	Kleve	6°4'41"	51°50'28"
21a	Kleve-Reichswald | West	DE	Kleve	6°5'35"	51°47'28"
21b	Kleve-Reichswald | East	DE	Kleve	6°6'22"	51°47'28"
22	Till	DE	Bedburg-Hau	6°14'20"	51°46'37"
23	Kalkar-Kalkarberg	DE	Kalkar	6°17'6"	51°43'44"
24	Kalkar-Bornsches Feld	DE	Kalkar	6°19'8"	51°42'50"
25a	Uedem-Hochwald | Hochwald 1	DE	Uedem	6°21'7"	51°41'31"
25b	Uedem-Hochwald | Hochwald 2	DE	Uedem	6°21'14"	51°41'38"
25c	Uedem-Hochwald | Hochwald 3	DE	Uedem	6°21'25"	51°41'31"
25d	Uedem-Hochwald | Hochwald 4	DE	Uedem	6°21'36"	51°41'31"
25e	Uedem-Hochwald | Hochwald 5	DE	Uedem	6°21'47"	51°41'35"
25f	Uedem-Hochwald | Hochwald 6	DE	Uedem	6°22'1"	51°41'28"
25g	Uedem-Hochwald | Hochwald 7.1	DE	Uedem	6°22'1"	51°41'20"
25h	Uedem-Hochwald | Hochwald 7.2	DE	Uedem	6°22'5"	51°41'20"
25i	Uedem-Hochwald | Hochwald 8.1	DE	Uedem	6°21'54"	51°41'17"

Table 1 List of component parts of the Lower German Limes, with the coordinates of their central points. The coordinates are in Degree-Minute-Second.

id	name	country	municipality	E	N
25j	Uedem-Hochwald | Hochwald 8.2	DE	Uedem	6°21'54"	51°41'17"
25k	Uedem-Hochwald | Hochwald 9	DE	Uedem	6°21'54"	51°41'24"
25l	Uedem-Hochwald | Hochwald 10	DE	Uedem	6°21'43"	51°41'20"
25m	Uedem-Hochwald | Hochwald 11	DE	Uedem	6°21'32"	51°41'17"
25n	Uedem-Hochwald | Hochwald 12	DE	Uedem	6°21'18"	51°41'20"
25o	Uedem-Hochwald | Hochwald 13	DE	Uedem	6°21'4"	51°41'20"
26a	Wesel-Flüren | Flürener Feld 1	DE	Wesel	6°33'32	51°40'55"
26b	Wesel-Flüren | Flürener Feld 2	DE	Wesel	6°33'40"	51°40'59"
26c	Wesel-Flüren | Flürener Feld 3	DE	Wesel	6°33'43"	51°41'6"
26d	Wesel-Flüren | Flürener Feld 4	DE	Wesel	6°33'50"	51°41'6"
27	Xanten-CUT	DE	Xanten	6°26'38"	51°40'1"
28	Xanten-Fürstenberg	DE	Xanten	6°28'12"	51°38'35"
29	Alpen-Drüpt	DE	Alpen	6°32'46"	51°35'13"
30	Moers-Asberg	DE	Moers	6°40'12"	51°25'55"
31	Duisburg-Werthausen	DE	Duisburg	6°42'40"	51°25'19"
32	Krefeld-Gellep	DE	Krefeld	6°40'55"	51°19'59"
33	Neuss-Koenenlager	DE	Neuss	6°43'26"	51°10'55"
34a	Neuss-Reckberg | Wachtturm	DE	Neuss	6°45'58"	51°10'34"
34b	Neuss-Reckberg | Kleinkastell	DE	Neuss	6°46'8"	51°10'26"
35	Monheim-Haus Bürgel	DE	Monheim am Rhein	6°52'23"	51°7'44"
36	Dormagen	DE	Dormagen	6°50'24"	51°5'35"
37	Köln-Praetorium	DE	Köln	6°57'32"	50°56'17"
38	Köln-Deutz	DE	Köln	6°58'12"	50°56'17"
39	Köln-Alteburg	DE	Köln	6°58'37"	50°54'18"
40a	Kottenforst Nord | Am Weißen Stein 1	DE	Bornheim	6°58'37"	50°44'6"
40b	Kottenforst Nord | Am Weißen Stein 2	DE	Alfter	6°58'59"	50°43'52"
40c	Kottenforst Nord | Domhecken 5	DE	Alfter/Swisttal	6°57'40"	50°42'50"
40d	Kottenforst Nord | Domhecken 1	DE	Alfter	6°58'23"	50°42'50"
40e	Kottenforst Nord | Domhecken 2	DE	Alfter	6°58'41"	50°43'1"
40f	Kottenforst Nord | Domhecken 3	DE	Alfter	6°58'55"	50°42'54"
40g	Kottenforst Nord | Domhecken 4	DE	Alfter	6°59'10"	50°42'58"
40h	Kottenforst Nord | Dürrenbruch 3	DE	Alfter	6°59'10"	50°42'32"
40i	Kottenforst Nord | Dürrenbruch 2	DE	Alfter	6°59'17"	50°42'29"
40j	Kottenforst Nord | Dürrenbruch 1	DE	Alfter	6°59'28"	50°42'25"
40k	Kottenforst Nord | Pfaffenmaar 1 und 2	DE	Alfter	6°58'34"	50°42'22"
41	Bonn	DE	Bonn	7°6'0"	50°44'42"
42a	Kottenforst Süd | Oben der Krayermaar	DE	Bonn	7°2'38"	50°41'35"
42b	Kottenforst Süd | Villiper Bach	DE	Bonn	7°4'52"	50°39'40"
42c	Kottenforst Süd | Professorenweg 1	DE	Bonn	7°5'20"	50°39'32"
42d	Kottenforst Süd | Professorenweg 2	DE	Bonn	7°5'38"	50°39'32"
42e	Kottenforst Süd | Riesenweg	DE	Bonn	7°5'42"	50°39'25"
42f	Kottenforst Süd | Wattendorfer Allee 2	DE	Bonn	7°6'0"	50°39'54"
42g	Kottenforst Süd | Wattendorfer Allee 1	DE	Bonn	7°6'29"	50°39'50"
42h	Kottenforst Süd | Bellerbuschallee	DE	Bonn	7°7'5"	50°39'58"
42i	Kottenforst Süd | Villiprot	DE	Bonn	7°4'12"	50°38'42"
42j	Kottenforst Süd | Heiderhof	DE	Bonn	7°8'35"	50°39'25"
43	Iversheim	DE	Bad Münstereifel	6°46'26"	50°35'17"
44	Remagen	DE	Remagen	7°13'41"	50°34'48"

Textual description of the boundaries of the nominated property

Frontiers of the Roman Empire – The Lower German Limes is a serial transnational nomination. Its component parts represent the boundary of the Roman province of *Germania inferior* or Lower Germany, and are spread out over c. 400 km along the Lower Rhine river.

The nominated property consists of 106 component parts. When an archaeological complex (such as a fort with its associated civil settlement and cemeteries) is

divided into two or more component parts, these parts have been combined in a cluster. In all, 79 of the 106 component parts have been grouped in 17 clusters, leaving 27 component parts which are not part of a cluster. The 27 individual component parts and 17 clusters add up to 44 component parts/clusters.
The boundary of the nominated property as a whole is defined in such a way as to encompass a good representation of the elements and values of the Lower German frontier. Boundaries of individual component parts are preferably based on administrative boundaries and visible features (e.g. walls, ditches), as far as these are located close to the known boundaries of the archaeological remains.
All component parts are additionally protected by buffer zones. These buffer zones have several purposes, and their application varies along with the local situation. A buffer zone may serve one or more of the following purposes:

A. It includes parts of the overall archaeological assemblage or element where values or features are expected, but have not yet been attested.

B. It clarifies the overall archaeological assemblage or element, by including parts that have been (partly) destroyed or cannot be sustainably protected.

C. It protects important views and elements of the setting.

The boundaries of each buffer zone have been delineated to encompass all the elements necessary to serve its purposes. The boundaries are preferably based on administrative boundaries and visible features.

Map of the nominated property

The entire extent of the nominated property is illustrated in fig. 1. Due to the dimensions of the nominated property it is not possible to indicate the numbers of the component parts in a map of the entire property, or the boundaries of individual component parts and buffer zones.
Numbers of component parts/clusters have been indicated in separate overview maps of relevant parts of the two countries (cf. chapter 1; figs 1.4–1.7). For clusters of component parts, the location and numbers of individual component parts may be found in the maps of the catalogue of component parts (Annex 1).
The boundaries of the component parts and buffer zones can only be mapped at the level of the individual component part/cluster. Detailed maps illustrating the boundaries of component parts and buffer zones may be found in the catalogue of component parts (Annex 1).

Criteria under which property is nominated

Frontiers of the Roman Empire – The Lower German Limes is nominated under criteria ii, iii and iv (cf. below).

Draft statement of Outstanding Universal Value

Brief synthesis

Frontiers of the Roman Empire – The Lower German Limes ran for 400 km along the Lower Rhine, along the north-eastern boundary of the Roman frontier province of *Germania inferior* (Lower Germany), from the Rhenish Massif south of Bonn (Germany) to the North Sea coast (the Netherlands). For more than 450 years from the late 1st century BC, it protected the Roman Empire against Germanic tribes which it considered as 'barbaric'.
The first military bases were built in the last decades BC, for the conquest of Germanic territories across the river Rhine. Once this ambition had failed the left river bank was converted into a fortified frontier separating Roman Gaul from the 'barbaric' foreland. Military installations of widely varying types and sizes and associated civil structures were built on the edge of the left river bank and linked by an infrastructural and logistical network. Having survived a crisis in the late 3rd century AD, the frontier shared the phased disintegration of the Western Roman Empire until the mid-5th century.
Frontiers of the Roman Empire – The Lower German Limes eminently illustrates the innovative responses of the Roman military engineers to the challenges posed by the dynamic landscape of a lowland river, as witnessed by the positioning and design of the military installations and by exceptional water management works. The entire range of large early bases to small late strongholds is represented, reflecting strategic adaptation and development of military engineering. The first military bases on the Lower Rhine represent the very beginning of the linear perimeter defence of the Roman Empire, which would develop into a coherent frontier system extending over three continents in the 2nd century AD. The military and civil structures associated with the military fortifications illustrate the formidable impact of the Roman military presence on the landscape and society of the periphery of the Empire.
The wetland conditions have led to an outstanding preservation of timber and other organic remains, providing unparalleled insights into military construction, shipbuilding, logistics and supply.
Criterion (ii): The extant remains of *Frontiers of the Roman Empire – The Lower German Limes* constitute significant elements of the Roman Frontiers present

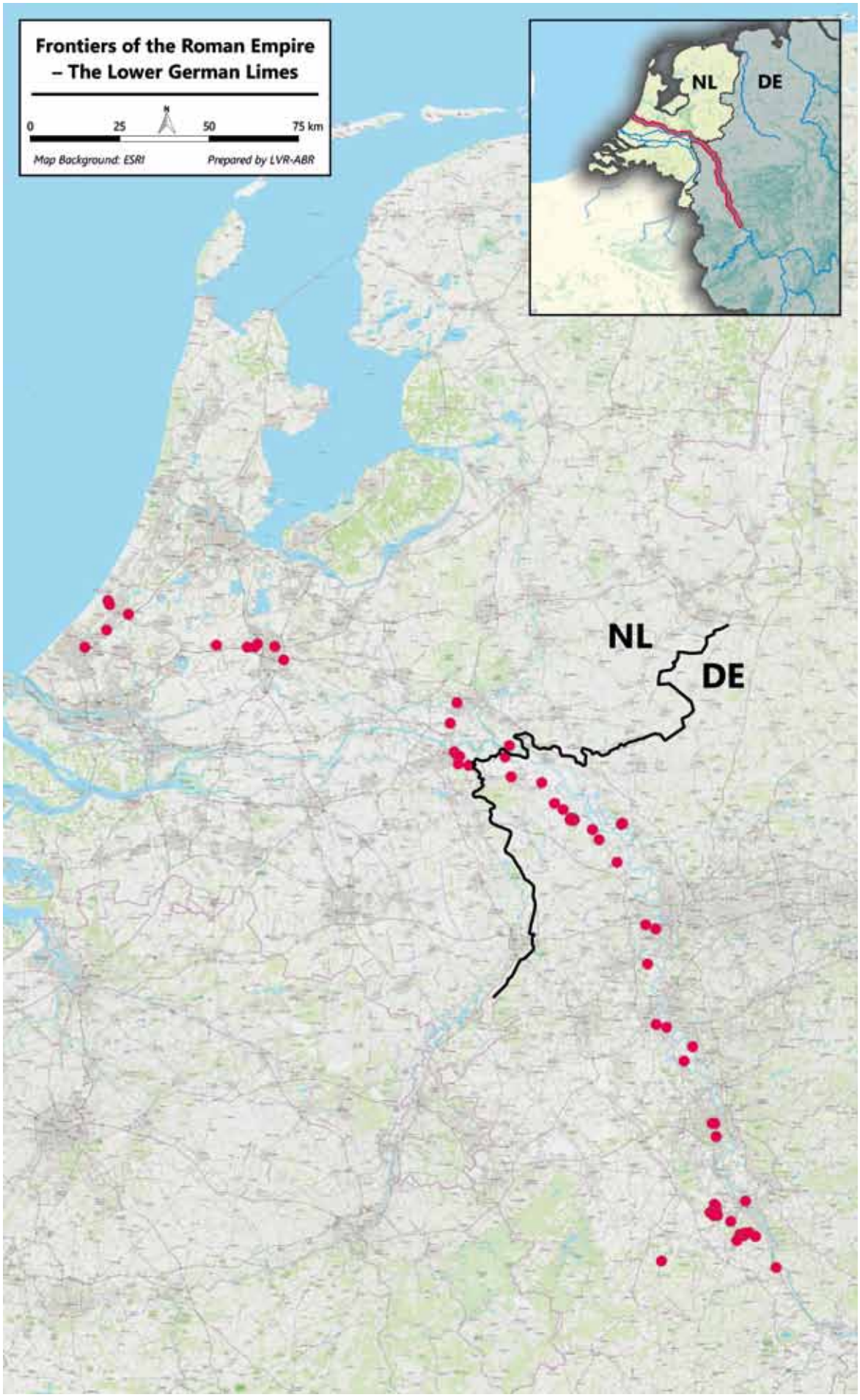

Fig. 1 Location of the nominated serial property *Frontiers of the Roman Empire – The Lower German Limes*.

in Europe. With its legionary fortresses, forts, fortlets, watchtowers, linked infrastructure and civilian architecture it exhibits an important interchange of human and cultural values at the height of the Roman Empire, through the development of Roman military architecture, extending the technical knowledge of construction and management to the very edges of the Empire. It reflects the imposition of a complex frontier system on the existing societies of the north-western part of the Roman Empire, introducing for the first time military installations and related civilian settlements, linked through an extensive supporting network. The frontier did not constitute an impregnable barrier, but controlled and allowed the movement of peoples: not only the military units, but also civilians and merchants. Hence, it triggered the exchange of cultural values through movement of soldiers and civilians from different nations. This entailed profound changes and developments in terms of settlement patterns, architecture and landscape design and spatial organisation.

Criterion (iii): As part of the Roman Empire's general system of defence, *Frontiers of the Roman Empire – The Lower German Limes* has an extraordinarily high cultural value. It bears an exceptional testimony to the maximum extension of the power of the Roman Empire through the consolidation of its north-western frontiers and thus constitutes a physical manifestation of Roman imperial policy. It illustrates the Roman Empire's ambition to dominate the world in order to establish its law and way of life there in a long-term perspective. It witnesses Roman colonisation in the respective territories, the spread of Roman culture and its different traditions – military, engineering, architecture, religion management and politics – and the large number of human settlements associated with the defences which contribute to an understanding of how soldiers and their families lived in this part of the Roman Empire.

Criterion (iv): *Frontiers of the Roman Empire – The Lower German Limes* was the earliest linear frontier of the Roman Empire, created as an answer to Rome's inability to control its northern neighbours by means of diplomacy. Its military installations outstandingly illustrate the development of the large operational bases of a field army to the varied range of smaller installations required by an extended frontier line. Situated in an area which has always been a wetland, with outstanding preservation conditions, *Frontiers of the Roman Empire – The Lower German Limes* exhibits unique testimonies of water management strategies and constructions employed by the military command of the Roman Empire. Buried riverine rubbish deposits constitute veritable treasure-chests of organic materials and artefacts bearing unique information on frontier life and on vanished traditions such as notably that of river boat building.

Integrity

The component parts of *Frontiers of the Roman Empire – The Lower German Limes* have been carefully selected to provide a good representation of the attributes and values of the proposed Outstanding Universal Value. They clearly bring out the early development of perimeter defence. They cover the entire range of military installations and relevant associated structures of a frontier system, explaining its functioning and development. Distinctive aspects which are clearly brought out by the component parts are the responses of the Roman army to the dynamic river landscape and the large impact of the frontier on the landscape and its inhabitants.

The general state of conservation is good to very good. More than three quarters of the component parts/clusters encompass nearly or largely complete elements of the frontier. All were exposed to the normal degradation of archaeological sites, but in most cases their intactness is good or very good, as witnessed by the presence of remains of the latest building phase. The rarity of aboveground remains is amply compensated by the outstanding preservation of the buried features. The sites are not exposed to significant threats, and current legislation warrants a proper protection of the property, enhanced by adequate buffer zones.

Authenticity

As an archaeological property, *Frontiers of the Roman Empire – The Lower German Limes* has a high level of authenticity. Virtually all the remains were buried during or soon after the Roman period and thus protected against later alterations. The authenticity of form and design of nearly all elements is unaffected, because they have not undergone any changes after the Roman period. At half of the sites stone walls or timber and organic remains have been preserved to a level which permits the qualification of their authenticity as unaffected. Elsewhere only, the foundations of stone walls remain, or timber and organics have decayed, leading to a rating of the authenticity of materials and substance as fair. The location and setting of the elements of the frontier have in most cases considerably changed, by the embankment or canalisation of the Rhine, changes in land use and urbanisation. There are only four sites where the present setting still reminds of the Roman landscape, although it can still be explained at half of the sites; at the other half the authenticity of location and setting is clearly compromised. Reconstructions occur at five sites, whereas other types of visualisations – evidently not pretending to be authentic – significantly contribute to the sustained protection of the sites.

Protection and management requirements

The nominated property is legally protected by the national and state laws on heritage protection of Germany (federal states of North Rhine-Westphalia and Rhineland-Palatinate) and the Netherlands. Much of the responsibility rests with the owners and with local and regional authorities. The component parts will be primarily managed at the national (NL) and state (DE) levels, but the management of the nominated property is coordinated by a joint Dutch-German Management Group (MG-LGL), which is overseen by an Intergovernmental Committee (IGC-LGL). The joint Management Group sets out the main lines of the management and supervises the implementation of the national management plans and the periodic reporting to UNESCO. The role of the Management Group and its procedures will be laid down in a Joint Declaration.
The management organisation of *Frontiers of the Roman Empire – The Lower German Limes* will co-operate intensively with their counterparts of the existing World Heritage site *Frontiers of the Roman Empire* (Ref: 430ter) and the nominated property *Frontiers of the Roman Empire – the Danube Limes (Western Segment)* (Ref: 1608, nominated 2018), and with States Parties preparing the nomination of other sections of the Roman frontiers. A framework for this international cooperation is provided by the 'Frontiers of the Roman Empire World Heritage Clus-ter' set up in 2018 to support international collaboration in those fields relevant to the overall management and development of the Frontiers of the Roman Empire in Europe as World Heritage.

Name and contact information of official local institutions/agencies

Lead contact agency
Rijksdienst voor het Cultureel Erfgoed
(Cultural Heritage Agency)
Smallepad 5
3811 MG Amersfoort
T +31 33 4217421
M info@cultureelerfgoed.nl
W www.cultureelerfgoed.nl

Germany | North Rhine-Westphalia
LVR-Amt für Bodendenkmalpflege
(LVR-State Service for Archaeological Heritage)
Endenicher Str. 133
53115 Bonn
T +49 228 98340
F +49 228 9834119
M bodendenkmalpflege@lvr.de
W https://bodendenkmalpflege.lvr.de/

Germany | Rhineland-Palatinate
Generaldirektion Kulturelles Erbe Rheinland-Pfalz
Direktion Landesarchäologie
Außenstelle Koblenz
Niederberger Höhe 1
56077 Koblenz
T +49 261 66753000
F +49 261 66753010
M landesarchaeologie-koblenz@gdke.rlp.de
W www.gdke.rlp.de

Netherlands
Rijksdienst voor het Cultureel Erfgoed
(Cultural Heritage Agency)
Smallepad 5
3811 MG Amersfoort
T +31 33 4217421
M info@cultureelerfgoed.nl
W www.cultureelerfgoed.nl

1 Identification of the Property

1 Identification of the Property

1.a States parties

Germany (DE) | Netherlands (NL) (fig. 1.1)

1.b State, province or region

Germany
Federal state of North Rhine-Westphalia (*Nordrhein-Westfalen*): municipalities (kreisfreie *Städte und Gemeinden*) of Kleve, Bedburg-Hau, Kalkar, Uedem, Xanten, Wesel, Alpen, Moers, Duisburg, Krefeld, Neuss, Monheim am Rhein, Dormagen, Köln, Bonn, Bornheim, Alfter, Swisttal and Bad-Münstereifel.
Federal state of Rhineland-Palatinate (*Rheinland-Pfalz*): municipality (*Stadt*) of Remagen.

Netherlands
Province (*provincie*) of Gelderland: municipalities (*gemeenten*) of Arnhem, Berg en Dal, Nijmegen, Overbetuwe, Zevenaar.
Province (*provincie*) of Utrecht: municipalities (*gemeenten*) of Bunnik, Utrecht, Woerden.
Province (*provincie*) of South Holland (*Zuid-Holland*): municipalities (*gemeenten*) of Katwijk, Leiden, Leidschendam-Voorburg, Voorschoten (fig. 1.2).

1.c Name of property

Frontiers of the Roman Empire – The Lower German Limes
Grenzen des Römischen Reiches – Der Niedergermanische Limes
Grenzen van het Romeinse rijk – De Neder-Germaanse Limes

1.d Geographical coordinates to the nearest second

Frontiers of the Roman Empire – The Lower German Limes is a serial transnational nomination. The western end is constituted by the fort of Valkenburg (NL), with its approximate centre at E 4°25‘59“ N 52°10‘48“ (DMS). The fortress of Xanten-Fürstenberg (DE) constitutes the approximate centre of the nominated property, at E 6°28‘12“ N 51°38‘35“ (DMS). The southern end is constituted by the fort of Remagen (DE), with its approximate centre at E 7°13‘41“ N 50°34‘48“ (DMS).

The nominated property consists of 106 component parts. When an archaeological complex (such as a fort with its associated civil settlement and cemeteries) is divided into two or more component parts, these parts have been combined in a cluster (e.g. cluster 1, with four individual component parts 1a, 1b, 1c, 1d). In all, 79 of the 106 component parts have been grouped in 17 clusters, leaving 27 component parts which are not part of a cluster. The 27 individual component parts and 17 clusters add up to 44 component parts/clusters.
The component parts are listed in table 1.1, with the coordinates of their centre points. They are listed from north(west) to south(east).

1.e Maps and plans. showing the boundaries of the nominated property and buffer zones

The entire extent of the nominated property is illustrated in fig. 1.3. It extends from Valkenburg (NL) in the west to Remagen (DE) in the south. running for

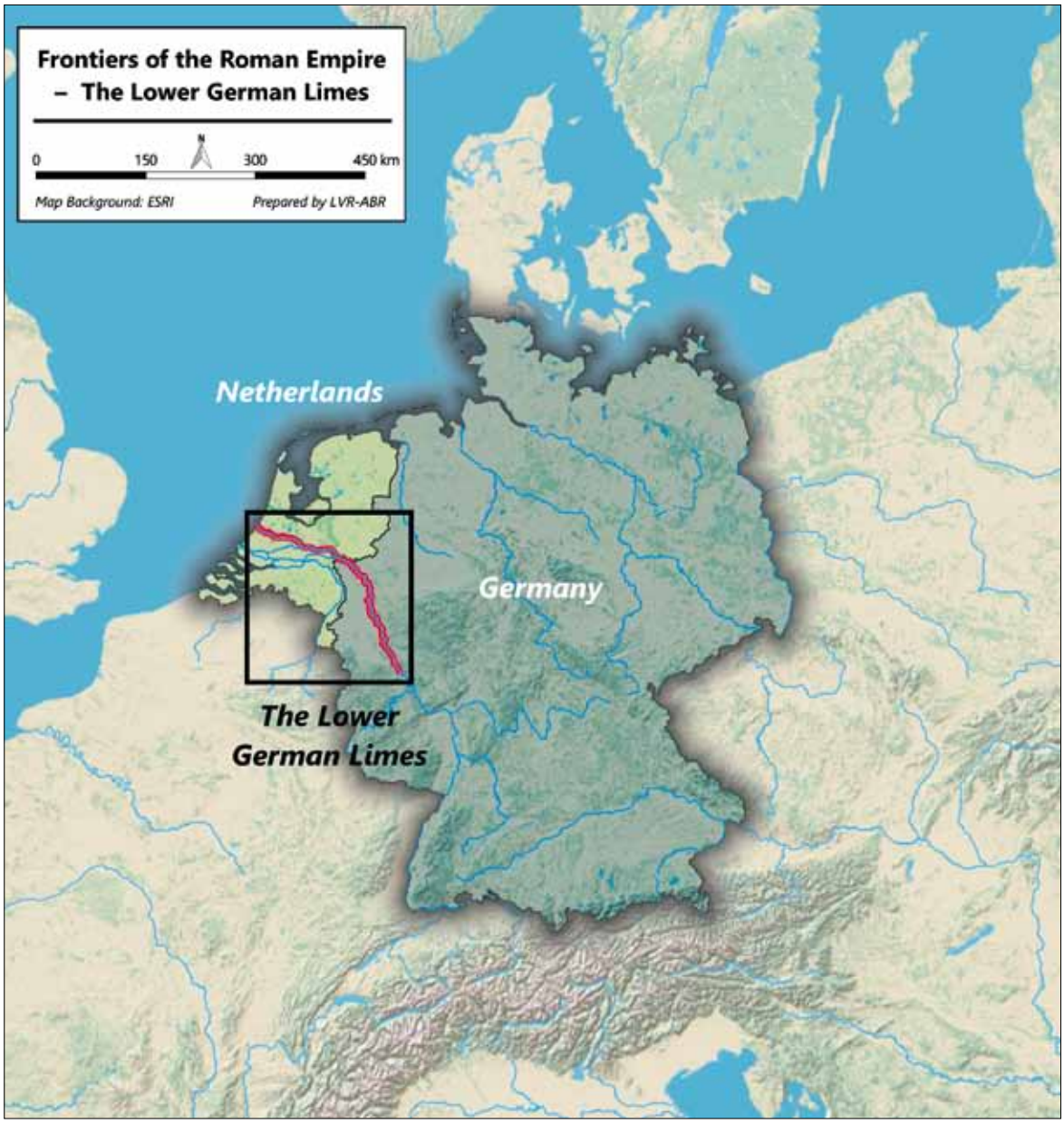

Fig. 1.1 Location of Germany and the Netherlands, with the extent of the Lower German Limes.

Fig. 1.2 Location of the federal states of North Rhine-Westphalia and Rhineland-Palatinate (Germany) and of the provinces of Gelderland, Utrecht and South Holland (Netherlands), with the extent of the Lower German Limes.

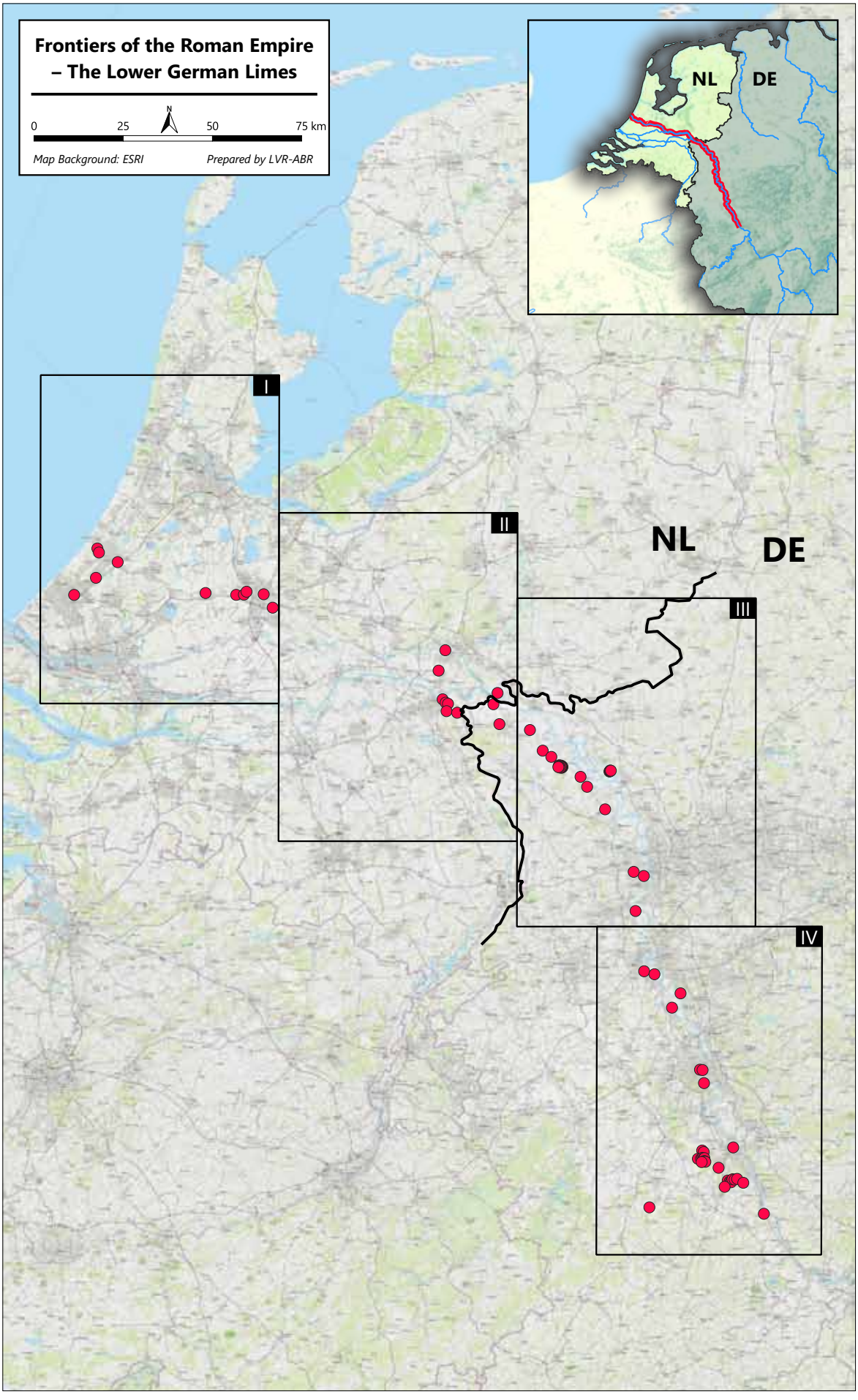

Fig. 1.3 Location of the nominated serial property *Frontiers of the Roman Empire – The Lower German Limes*, with indication of four sections illustrated in figs. 1.4–1.7.

Fig. 1.4 Overview of section I of *Frontiers of the Roman Empire – The Lower German Limes* (Valkenburg-Centrum to Bunnik-Vechten) with numbers of the component parts/ clusters.

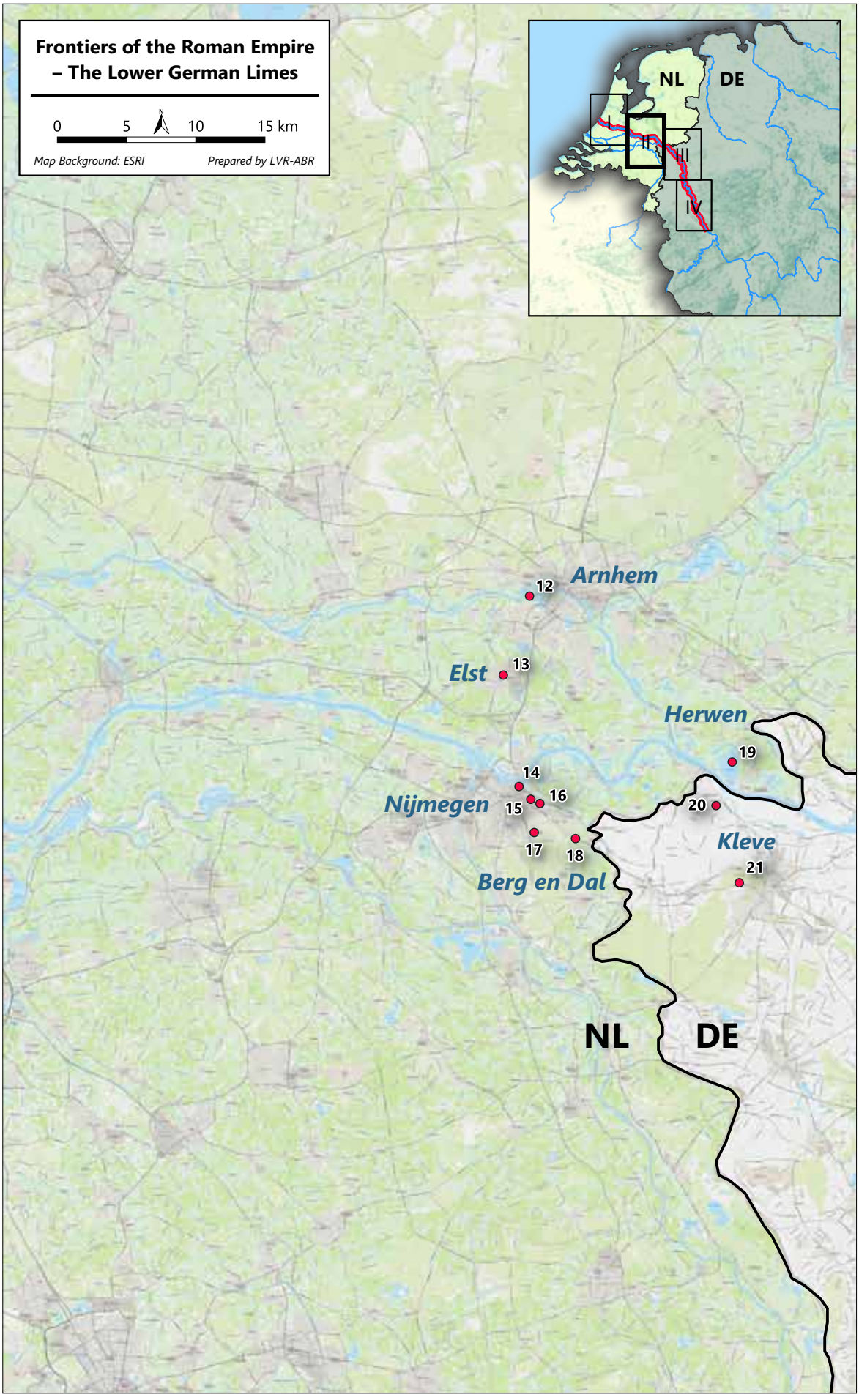

Fig. 1.5 Overview of section II of *Frontiers of the Roman Empire – The Lower German Limes* (Arnhem-Meinerswijk to Kleve-Reichswald) with numbers of the component parts/ clusters.

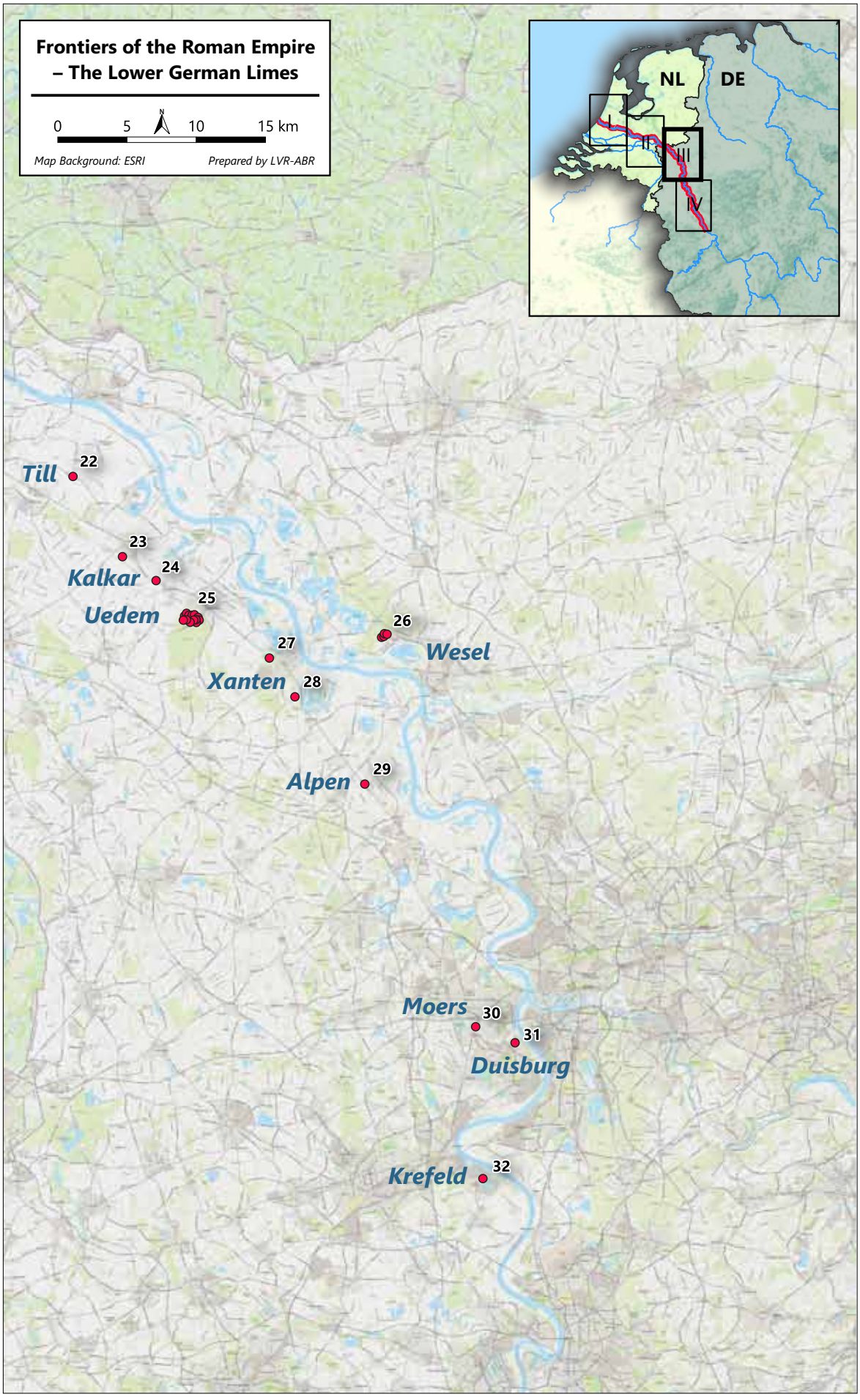

Fig. 1.6 Overview of section III of *Frontiers of the Roman Empire – The Lower German Limes* (Till to Krefeld-Gellep) with numbers of the component parts/ clusters.

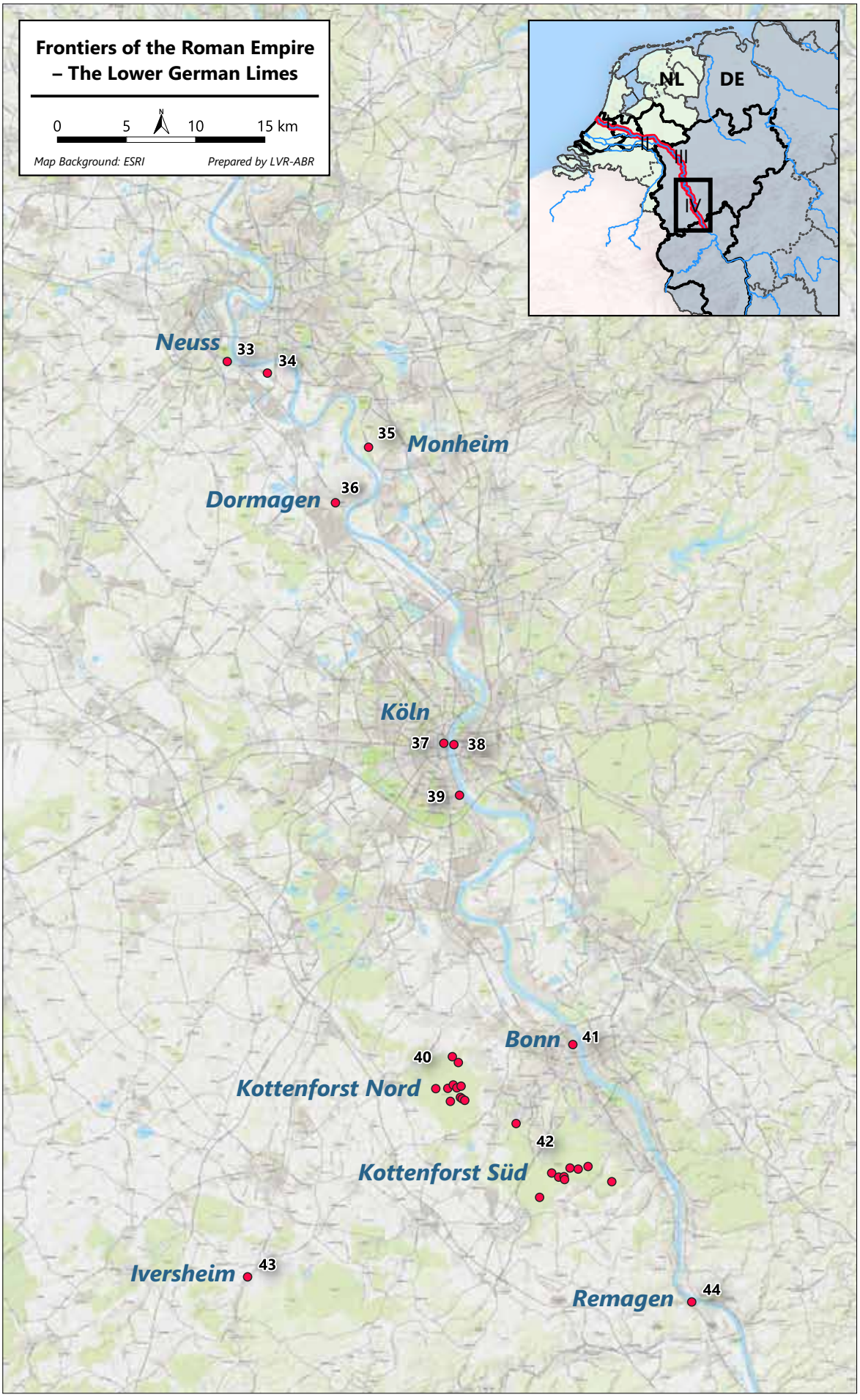

Fig. 1.7 Overview of section IV of Frontiers of the *Roman Empire – The Lower German Limes* (Neuss-Koenenlager to Remagen) with numbers of the component parts/ clusters.

approx. 400 km along the river Rhine. Due to the dimensions of the nominated property it is not possible to indicate the numbers of the individual component parts in a map of the entire property. Numbers of component parts/clusters have been indicated in separate overview maps of relevant parts of the two countries (figs 1.4–1.7). In case of clusters of component parts. the location and numbers of individual component parts may be found in the maps of the catalogue of component parts (Annex 1).
The boundaries of the component parts and buffer zones can only be properly mapped at the level of the individual component part/cluster. Detailed maps illustrating the boundaries of component parts and buffer zones may be found in the catalogue of component parts (Annex 1).

1.f Area of nominated property (ha) and buffer zone (ha)

Total area of nominated property:	756.10 ha
Total area of buffer:	3760.96 ha
Total:	4517.06 ha

The areas of the individual component parts and their buffer zones are listed in table 1.2.

Table 1.1 List of component parts of the Lower German Limes, with the coordinates of their central points. The coordinates are in Degree-Minute-Second.

id	name	country	municipality	E	N
1a	Valkenburg-Centrum | Kerkweg	NL	Katwijk	4°25'59"	52°10'48"
1b	Valkenburg-Centrum | Centrum	NL	Katwijk	4°25'59"	52°10'48"
1c	Valkenburg-Centrum | Raadhuis	NL	Katwijk	4°25'59"	52°10'52"
1d	Valkenburg-Centrum | Kerkhof	NL	Katwijk	4°25'59"	52°10'52"
2a	Valkenburg-De Woerd | North	NL	Katwijk	4°26'17"	52°10'19"
2b	Valkenburg-De Woerd | South	NL	Katwijk	4°26'24"	52°10'12"
3	Voorburg-Arentsburg	NL	Leidschendam-Voorburg	4°21'0"	52°3'36"
4a	Corbulo's canal | Vlietwijk	NL	Voorschoten	4°27'36"	52°7'30"
4b	Corbulo's canal | Starrenburg	NL	Voorschoten	4°26'13"	52°6'32"
4c	Corbulo's canal | Knippolder	NL	Voorschoten	4°25'44"	52°6'18"
4d	Corbulo's canal | Vlietvoorde	NL	Leidschendam-Voorburg	4°25'23"	52°6'4"
4e	Corbulo's canal | Rozenrust	NL	Leidschendam-Voorburg	4°24'32"	52°5'28"
4f	Corbulo's canal | Romeinsepad	NL	Leidschendam-Voorburg	4°23'56"	52°5'2"
5a	Leiden-Roomburg | Park Matilo	NL	Leiden	4°31'1"	52°9'0"
5b	Leiden-Roomburg | Besjeslaan	NL	Leiden	4°31'8"	52°8'53"
6	Woerden-Centrum	NL	Woerden	4°53'2"	52°5'10"
7a	Utrecht-Limes road | Zandweg	NL	Utrecht	4°59'46"	52°5'28"
7b	Utrecht-Limes road | Veldhuizen	NL	Utrecht	5°0'29"	52°5'10"
7c	Utrecht-Limes road | De Balije	NL	Utrecht	5°1'19"	52°4'48"
8a	Utrecht-Hoge Woerd | Castellum	NL	Utrecht	5°2'31"	52°5'10"
8b	Utrecht-Hoge Woerd | Langerakbaan	NL	Utrecht	5°2'38"	52°5'17"
9	Utrecht-Groot Zandveld	NL	Utrecht	5°3'4"	52°5'42"
10	Utrecht-Domplein	NL	Utrecht	5°7'19"	52°5'28"
11a	Bunnik-Vechten | Marsdijk	NL	Bunnik	5°9'58"	52°3'29"
11b	Bunnik-Vechten | Provincialeweg	NL	Bunnik	5°10'26"	52°3'47"
12	Arnhem-Meinerswijk	NL	Arnhem	5°52'26"	51°58'16"
13	Elst-Grote Kerk	NL	Overbetuwe	5°50'56"	51°55'12"
14a	Nijmegen-Valkhof area | Valkhofpark	NL	Nijmegen	5°52'12"	51°50'53"
14b	Nijmegen-Valkhof area | Hunnerpark	NL	Nijmegen	5°52'19"	51°50'49"
15	Nijmegen-Hunerberg	NL	Nijmegen	5°53'2"	51°50'24"
16a	Nijmegen-Kops Plateau | West	NL	Nijmegen	5°53'31"	51°50'17"
16b	Nijmegen-Kops Plateau | North	NL	Berg en Dal	5°53'42"	51°50'20"
16c	Nijmegen-Kops Plateau | East	NL	Nijmegen	5°53'42"	51°50'10"
16d	Nijmegen-Kops Plateau | Kopse Hof North	NL	Nijmegen	5°53'46"	51°50'10"
16e	Nijmegen-Kops Plateau | Kopse Hof South	NL	Nijmegen	5°53'46"	51°50'6"
17a	Berg en Dal-aqueduct | Mariënboom	NL	Nijmegen	5°53'17"	51°49'34"
17b	Berg en Dal-aqueduct | Swartendijk	NL	Berg en Dal/Nijmegen	5°53'28"	51°49'23"
17c	Berg en Dal-aqueduct | Cortendijk	NL	Berg en Dal	5°53'24"	51°49'12"
17d	Berg en Dal-aqueduct | Louisedal	NL	Berg en Dal	5°54'0"	51°49'5"
17e	Berg en Dal-aqueduct | Kerstendal	NL	Berg en Dal	5°54'50"	51°49'1"
18a	Berg en Dal-De Holdeurn | North	NL	Berg en Dal	5°55'59"	51°49'1"

id	name	country	municipality	E	N
18b	Berg en Dal-De Holdeurn | South	NL	Berg en Dal	5°55'55"	51°48'58"
19	Herwen-De Bijland	NL	Zevenaar	6°5'56"	51°52'52"
20	Kleve-Keeken	DE	Kleve	6°4'41"	51°50'28"
21a	Kleve-Reichswald | West	DE	Kleve	6°5'35"	51°47'28"
21b	Kleve-Reichswald | East	DE	Kleve	6°6'22"	51°47'28"
22	Till	DE	Bedburg-Hau	6°14'20"	51°46'37"
23	Kalkar-Kalkarberg	DE	Kalkar	6°17'6"	51°43'44"
24	Kalkar-Bornsches Feld	DE	Kalkar	6°19'8"	51°42'50"
25a	Uedem-Hochwald | Hochwald 1	DE	Uedem	6°21'7"	51°41'31"
25b	Uedem-Hochwald | Hochwald 2	DE	Uedem	6°21'14"	51°41'38"
25c	Uedem-Hochwald | Hochwald 3	DE	Uedem	6°21'25"	51°41'31"
25d	Uedem-Hochwald | Hochwald 4	DE	Uedem	6°21'36"	51°41'31"
25e	Uedem-Hochwald | Hochwald 5	DE	Uedem	6°21'47"	51°41'35"
25f	Uedem-Hochwald | Hochwald 6	DE	Uedem	6°22'1"	51°41'28"
25g	Uedem-Hochwald | Hochwald 7.1	DE	Uedem	6°22'1"	51°41'20"
25h	Uedem-Hochwald | Hochwald 7.2	DE	Uedem	6°22'5"	51°41'20"
25i	Uedem-Hochwald | Hochwald 8.1	DE	Uedem	6°21'54"	51°41'17"
25j	Uedem-Hochwald | Hochwald 8.2	DE	Uedem	6°21'54"	51°41'17"
25k	Uedem-Hochwald | Hochwald 9	DE	Uedem	6°21'54"	51°41'24"
25l	Uedem-Hochwald | Hochwald 10	DE	Uedem	6°21'43"	51°41'20"
25m	Uedem-Hochwald | Hochwald 11	DE	Uedem	6°21'32"	51°41'17"
25n	Uedem-Hochwald | Hochwald 12	DE	Uedem	6°21'18"	51°41'20"
25o	Uedem-Hochwald | Hochwald 13	DE	Uedem	6°21'4"	51°41'20"
26a	Wesel-Flüren | Flürener Feld 1	DE	Wesel	6°33'32	51°40'55"
26b	Wesel-Flüren | Flürener Feld 2	DE	Wesel	6°33'40"	51°40'59"
26c	Wesel-Flüren | Flürener Feld 3	DE	Wesel	6°33'43"	51°41'6"
26d	Wesel-Flüren | Flürener Feld 4	DE	Wesel	6°33'50"	51°41'6"
27	Xanten-CUT	DE	Xanten	6°26'38"	51°40'1"
28	Xanten-Fürstenberg	DE	Xanten	6°28'12"	51°38'35"
29	Alpen-Drüpt	DE	Alpen	6°32'46"	51°35'13"
30	Moers-Asberg	DE	Moers	6°40'12"	51°25'55"
31	Duisburg-Werthausen	DE	Duisburg	6°42'40"	51°25'19"
32	Krefeld-Gellep	DE	Krefeld	6°40'55"	51°19'59"
33	Neuss-Koenenlager	DE	Neuss	6°43'26"	51°10'55"
34a	Neuss-Reckberg | Wachtturm	DE	Neuss	6°45'58"	51°10'34"
34b	Neuss-Reckberg | Kleinkastell	DE	Neuss	6°46'8"	51°10'26"
35	Monheim-Haus Bürgel	DE	Monheim am Rhein	6°52'23"	51°7'44"
36	Dormagen	DE	Dormagen	6°50'24"	51°5'35"
37	Köln-Praetorium	DE	Köln	6°57'32"	50°56'17"
38	Köln-Deutz	DE	Köln	6°58'12"	50°56'17"
39	Köln-Alteburg	DE	Köln	6°58'37"	50°54'18"
40a	Kottenforst Nord | Am Weißen Stein 1	DE	Bornheim	6°58'37"	50°44'6"
40b	Kottenforst Nord | Am Weißen Stein 2	DE	Alfter	6°58'59"	50°43'52"
40c	Kottenforst Nord | Domhecken 5	DE	Alfter; Swisttal	6°57'40"	50°42'50"
40d	Kottenforst Nord | Domhecken 1	DE	Alfter	6°58'23"	50°42'50"
40e	Kottenforst Nord | Domhecken 2	DE	Alfter	6°58'41"	50°43'1"
40f	Kottenforst Nord | Domhecken 3	DE	Alfter	6°58'55"	50°42'54"
40g	Kottenforst Nord | Domhecken 4	DE	Alfter	6°59'10"	50°42'58"
40h	Kottenforst Nord | Dürrenbruch 3	DE	Alfter	6°59'10"	50°42'32"
40i	Kottenforst Nord | Dürrenbruch 2	DE	Alfter	6°59'17"	50°42'29"
40j	Kottenforst Nord | Dürrenbruch 1	DE	Alfter	6°59'28"	50°42'25"
40k	Kottenforst Nord | Pfaffenmaar 1 and 2	DE	Alfter	6°58'34"	50°42'22"
41	Bonn	DE	Bonn	7°6'0"	50°44'42"
42a	Kottenforst Süd | Oben der Krayermaar	DE	Bonn	7°2'38"	50°41'35"
42b	Kottenforst Süd | Villiper Bach	DE	Bonn	7°4'52"	50°39'40"
42c	Kottenforst Süd | Professorenweg 1	DE	Bonn	7°5'20"	50°39'32"
42d	Kottenforst Süd | Professorenweg 2	DE	Bonn	7°5'38"	50°39'32"
42e	Kottenforst Süd | Riesenweg	DE	Bonn	7°5'42"	50°39'25"

id	name	country	municipality	E	N
42f	Kottenforst Süd | Wattendorfer Allee 2	DE	Bonn	7°6'0"	50°39'54"
42g	Kottenforst Süd | Wattendorfer Allee 1	DE	Bonn	7°6'29"	50°39'50"
42h	Kottenforst Süd | Bellerbuschallee	DE	Bonn	7°7'5"	50°39'58"
42i	Kottenforst Süd | Villiprot	DE	Bonn	7°4'12"	50°38'42"
42j	Kottenforst Süd | Heiderhof	DE	Bonn	7°8'35"	50°39'25"
43	Iversheim	DE	Bad Münstereifel	6°46'26"	50°35'17"
44	Remagen	DE	Remagen	7°13'41"	50°34'48"

Table 1.2 List of component parts with indication of the surface areas of the component parts and buffer zones. Arrows in the column for the buffer zone indicate that the buffer zone of a component part is shared with the previous or next component part.

id	name	country	municipality	nominated property (ha)	buffer zone (ha)
1a	Valkenburg-Centrum | Kerkweg	NL	Katwijk	0.01	20.09
1b	Valkenburg-Centrum | Centrum	NL	Katwijk	0.63	↑
1c	Valkenburg-Centrum | Raadhuis	NL	Katwijk	0.03	↑
1d	Valkenburg-Centrum | Kerkhof	NL	Katwijk	0.03	↑
2a	Valkenburg-De Woerd | North	NL	Katwijk	0.97	12.18
2b	Valkenburg-De Woerd | South	NL	Katwijk	3.26	↑
3	Voorburg-Arentsburg	NL	Leidschendam-Voorburg	11.89	6.48
4a	Corbulo's canal | Vlietwijk	NL	Voorschoten	3.31	167.09
4b	Corbulo's canal | Starrenburg	NL	Voorschoten	1.31	↑
4c	Corbulo's canal | Knippolder	NL	Voorschoten	2.76	↑
4d	Corbulo's canal | Vlietvoorde	NL	Leidschendam-Voorburg	2.30	↑
4e	Corbulo's canal | Rozenrust	NL	Leidschendam-Voorburg	0.75	↑
4f	Corbulo's canal | Romeinsepad	NL	Leidschendam-Voorburg	0.44	↑
5a	Leiden-Roomburg | Park Matilo	NL	Leiden	8.16	6.17
5b	Leiden-Roomburg | Besjeslaan	NL	Leiden	2.61	- - -
6	Woerden-Centrum	NL	Woerden	1.44	5.94
7a	Utrecht-Limes road | Zandweg	NL	Utrecht	0.39	↓
7b	Utrecht-Limes road | Veldhuizen	NL	Utrecht	0.46	12.45
7c	Utrecht-Limes road | De Balije	NL	Utrecht	3.32	↑
8a	Utrecht-Hoge Woerd | Castellum	NL	Utrecht	8.84	14.10
8b	Utrecht-Hoge Woerd | Langerakbaan	NL	Utrecht	1.68	↑
9	Utrecht-Groot Zandveld	NL	Utrecht	0.83	2.84
10	Utrecht-Domplein	NL	Utrecht	2.64	8.96
11a	Bunnik-Vechten | Marsdijk	NL	Bunnik	80.83	51.88
11b	Bunnik-Vechten | Provincialeweg	NL	Bunnik	0.94	↑
12	Arnhem-Meinerswijk	NL	Arnhem	2.75	4.12
13	Elst-Grote Kerk	NL	Overbetuwe	0.39	0.50
14a	Nijmegen-Valkhof area | Valkhofpark	NL	Nijmegen	2.43	20.64
14b	Nijmegen-Valkhof area | Hunnerpark	NL	Nijmegen	2.37	↑
15	Nijmegen-Hunerberg	NL	Nijmegen	33.95	21.11
16a	Nijmegen-Kops Plateau | West	NL	Nijmegen	4.03	19.89
16b	Nijmegen-Kops Plateau | North	NL	Berg en Dal	0.86	↑
16c	Nijmegen-Kops Plateau | East	NL	Nijmegen	0.77	↑
16d	Nijmegen-Kops Plateau | Kopse Hof North	NL	Nijmegen	0.16	↑
16e	Nijmegen-Kops Plateau | Kopse Hof South	NL	Nijmegen	0.93	↑
17a	Berg en Dal-aqueduct | Mariënboom	NL	Nijmegen	1.53	254.68
17b	Berg en Dal-aqueduct | Swartendijk	NL	Berg en Dal/Nijmegen	0.66	↑
17c	Berg en Dal-aqueduct | Cortendijk	NL	Berg en Dal	0.26	↑
17d	Berg en Dal-aqueduct | Louisedal	NL	Berg en Dal	5.86	↑
17e	Berg en Dal-aqueduct | Kerstendal	NL	Berg en Dal	9.71	↑
18a	Berg en Dal-De Holdeurn | North	NL	Berg en Dal	0.56	8.02
18b	Berg en Dal-De Holdeurn | South	NL	Berg en Dal	7.03	↑

id	name	country	municipality	nominated property (ha)	buffer zone (ha)
19	Herwen-De Bijland	NL	Zevenaar	2.07	1013.14
20	Kleve-Keeken	DE	Kleve	4.52	374.71
21a	Kleve-Reichswald | West	DE	Kleve	0.42	7.31
21b	Kleve-Reichswald | East	DE	Kleve	0.17	↑
22	Till	DE	Bedburg-Hau	75.84	150.98
23	Kalkar-Kalkarberg	DE	Kalkar	1.83	5.05
24	Kalkar-Bornsches Feld	DE	Kalkar	47.18	58.27
25a	Uedem-Hochwald | Hochwald 1	DE	Uedem	2.93	106.16
25b	Uedem-Hochwald | Hochwald 2	DE	Uedem	1.34	↓
25c	Uedem-Hochwald | Hochwald 3	DE	Uedem	2.45	↓
25d	Uedem-Hochwald | Hochwald 4	DE	Uedem	1.47	↓
25e	Uedem-Hochwald | Hochwald 5	DE	Uedem	1.63	↓
25f	Uedem-Hochwald | Hochwald 6	DE	Uedem	0.66	↓
25g	Uedem-Hochwald | Hochwald 7.1	DE	Uedem	0.57	↓
25h	Uedem-Hochwald | Hochwald 7.2	DE	Uedem	0.56	↓
25i	Uedem-Hochwald | Hochwald 8.1	DE	Uedem	0.16	↓
25j	Uedem-Hochwald | Hochwald 8.2	DE	Uedem	0.69	↓
25k	Uedem-Hochwald | Hochwald 9	DE	Uedem	1.27	↓
25l	Uedem-Hochwald | Hochwald 10	DE	Uedem	1.31	↓
25m	Uedem-Hochwald | Hochwald 11	DE	Uedem	1.55	↓
25n	Uedem-Hochwald | Hochwald 12	DE	Uedem	0.86	↓
25o	Uedem-Hochwald | Hochwald 13	DE	Uedem	1.65	↓
26a	Wesel-Flüren | Flürener Feld 1	DE	Wesel	1.50	84.86
26b	Wesel-Flüren | Flürener Feld 2	DE	Wesel	1.17	↓
26c	Wesel-Flüren | Flürener Feld 3	DE	Wesel	2.51	↓
26d	Wesel-Flüren | Flürener Feld 4	DE	Wesel	2.67	↓
27	Xanten-CUT	DE	Xanten	90.19	39.86
28	Xanten-Fürstenberg	DE	Xanten	126.17	137.08
29	Alpen-Drüpt	DE	Alpen	36.20	53.70
30	Moers-Asberg	DE	Moers	7.56	40.61
31	Duisburg-Werthausen	DE	Duisburg	0.31	1.13
32	Krefeld-Gellep	DE	Krefeld	3.36	12.14
33	Neuss-Koenenlager	DE	Neuss	28.51	141.13
34a	Neuss-Reckberg | Wachtturm	DE	Neuss	0.01	37.83
34b	Neuss-Reckberg | Kleinkastell	DE	Neuss	0.27	↓
35	Monheim-Haus Bürgel	DE	Monheim am Rhein	2.48	8.61
36	Dormagen	DE	Dormagen	5.81	35.42
37	Köln-Praetorium	DE	Köln	1.32	97.66
38	Köln-Deutz	DE	Köln	2.39	32.61
39	Köln-Alteburg	DE	Köln	6.03	55.43
40a	Kottenforst Nord | Am Weißen Stein 1	DE	Bornheim	2.68	122.69
40b	Kottenforst Nord | Am Weißen Stein 2	DE	Alfter	0.72	↓
40c	Kottenforst Nord | Domhecken 5	DE	Alfter/Swisttal	1.65	↓
40d	Kottenforst Nord | Domhecken 1	DE	Alfter	3.79	↓
40e	Kottenforst Nord | Domhecken 2	DE	Alfter	2.11	↓
40f	Kottenforst Nord | Domhecken 3	DE	Alfter	1.90	↓
40g	Kottenforst Nord | Domhecken 4	DE	Alfter	1.90	↓
40h	Kottenforst Nord | Dürrenbruch 3	DE	Alfter	0.45	↓
40i	Kottenforst Nord | Dürrenbruch 2	DE	Alfter	1.68	↓
40j	Kottenforst Nord | Dürrenbruch 1	DE	Alfter	3.05	↓
40k	Kottenforst Nord | Pfaffenmaar 1 and 2	DE	Alfter	6.04	↓
41	Bonn	DE	Bonn	31.01	210.98
42a	Kottenforst Süd | Oben der Krayermaar	DE	Bonn	1.90	190.94
42b	Kottenforst Süd | Villiper Bach	DE	Bonn	1.09	↓
42c	Kottenforst Süd | Professorenweg 1	DE	Bonn	0.94	↓
42d	Kottenforst Süd | Professorenweg 2	DE	Bonn	0.77	↓

id	name	country	municipality	nominated property (ha)	buffer zone (ha)
42e	Kottenforst Süd | Riesenweg	DE	Bonn	1.09	↓
42f	Kottenforst Süd | Wattendorfer Allee 2	DE	Bonn	1.56	↓
42g	Kottenforst Süd | Wattendorfer Allee 1	DE	Bonn	1.79	↓
42h	Kottenforst Süd | Bellerbuschallee	DE	Bonn	1.52	↓
42i	Kottenforst Süd | Villiprot	DE	Bonn	1.78	↓
42j	Kottenforst Süd | Heiderhof	DE	Bonn	1.46	↓
43	Iversheim	DE	Bad Münstereifel	0.08	10.72
44	Remagen	DE	Remagen	1.47	94.80

2 Description

2 Description

The nominated property *Frontiers of the Roman Empire – The Lower German Limes* represents the boundary of one of the north-western provinces of the Roman Empire (c. 27 BC – AD 480 in the West). It is located in a dynamic riverine landscape, which is responsible for several distinctive characteristics of the military infrastructure, and for the outstanding and rare preservation of organic remains, especially timber constructions.

This chapter offers a description of the nominated property, outlining its distinctive attributes and values (section 2.a) and its history and development, both during and after the Roman period (section 2.b). Since the Lower German Limes is only a part of the frontiers of the Roman Empire, both its description and its history are set out against the background of the whole of the Roman frontiers, and of their potential as World Heritage.

When linked but spatially separated parts of a larger entity could not be included within a single boundary, the separate parts have been nominated as individual component parts. In such cases these associated component parts have been grouped in clusters and presented under a joint heading. This explains the use of the term 'component parts/clusters' throughout this nomination dossier. Notations such as 'Neuss-Koenenlager ▶33' refer to the catalogue of component parts (Annex 1), where the component part/cluster in question can be found under the number indicated in blue.

2.a Description of property

The description of the nominated property has been divided into five sections. The first is a very succinct sketch of the frontiers of the Roman Empire as World Heritage (section 2.a.1), referring to the existing World Heritage site *Frontiers of the Roman Empire* (Ref: 430ter), to the nominated property *Frontiers of the Roman Empire – The Danube Limes (Western Segment)* (Ref: 1608) and to the Thematic Study and Nomination Strategy presented to the World Heritage Committee in 2017. This is followed by a general sketch of the Lower German Limes (section 2.a.2). The main distinctive characteristics are outlined in more detail in section 2.a.3, while the main physical elements are presented in section 2.a.4. An explanation of the selection process and an overview of the component parts and of the elements represented in them can be found in section 2.a.5.

2.a.1 Introduction

***Frontiers of the Roman Empire – The Lower German Limes* represents the external boundary of the Roman province of *Germania inferior* or Lower Germany, which was part of the north-western frontier of the Roman Empire. It is the earliest example of a linear frontier, set in a dynamic riverine landscape which forced the Roman military engineers to develop innovative solutions to the challenge of creating a frontier in a constantly changing landscape context. It is a distinctive section of the Roman frontiers, which justifies its nomination as a separate World Heritage site, alongside other frontier sections in Europe, and alongside potential sections in North Africa and the Near East at some stage in the future.**

The Roman Empire is one of the largest known from history, encircling the Mediterranean Sea across the three continents of Africa, Asia and Europe. Gradually expanding from c. 500 BC onwards it existed for a millennium in the West and two millennia in the East, reaching its largest extent in the 2nd century AD.

The external frontiers of the Empire – often referred to by the Latin term of *limes*, plural *limites* – constitute a tangible manifestation of its ambition to dominate the known world and of the spread of its culture and traditions. At the height of the Empire in the 2nd century the frontiers stretched over 7,500 km in a wide ring around the Mediterranean, with thousands of fortresses, forts and watchtowers lined up along rivers, deserts, mountain ranges and artificial barriers (fig. 2.1).

The establishment of this military infrastructure thoroughly changed the landscape and spatial organisation at the periphery of the Empire. At the same time the frontier garrisons and their following of families, merchants and other civilians triggered the interchange of cultural values, introducing traditions from

Fig. 2.1 Map of the Roman Empire under the Emperor Antoninus Pius (AD 138–161).

the Mediterranean and from other, more distant parts of the Empire, and absorbing local influences in return.

The empire-wide deployment of army units and of their commanding officers required a large degree of uniformity in military installations, but the setting of these installations in very different landscapes and the varied tasks required of them and their garrisons demanded adaptations to local conditions. As a whole, therefore, the frontiers of the Roman Empire constitute a single but complex and varied monument.

As an exceptional testimony to a long-lived world empire with an immense cultural impact the frontiers of the Roman Empire qualify for World Heritage as a transboundary monument extending over three continents. Their eligibility is demonstrated by the successive inscription on the World Heritage List of three frontier sections in Europe, under the joint heading of Frontiers of the Roman Empire: Hadrian's Wall in northern England (1987, Ref: 430), the Upper German-Raetian Limes in Germany (2005, Ref: 430bis) and the Antonine Wall in Scotland (2008, Ref: 430ter). Since the early 2000s it has been the ambition of the States Parties involved in the preparation of proposed nominations of Roman frontier sections 'to create a World Heritage site encompassing all the frontiers of the Roman Empire […] as evidence of the remains of one of the world's greatest civilisations and as a symbol of common heritage'.[1] At the inscription of the Upper German-Raetian Limes in 2005 the World Heritage Committee recommended the idea of a 'wider, phased, serial transboundary nomination to encompass remains of the Roman frontiers around the Mediterranean Region'.[2] After an expert meeting on serial properties and nominations in 2010,[3] however, a phased approach was no longer advised.

1 Quoted from the Summary Nomination Statement included in the nomination dossier for the Upper German-Raetian Limes p. 410 (< http://whc.unesco.org/uploads/nominations/430ter.pdf > [accessed 14.11.2019]).

2 Decision 29 COM 8B.46.

3 UNESCO World Heritage: Serial Properties and Nominations. International expert meeting on World Heritage and serial properties and nominations. Ittingen, Switzerland, 25–27 February 2010 (Ittingen 2010). Cf. decision 34 COM 9B.

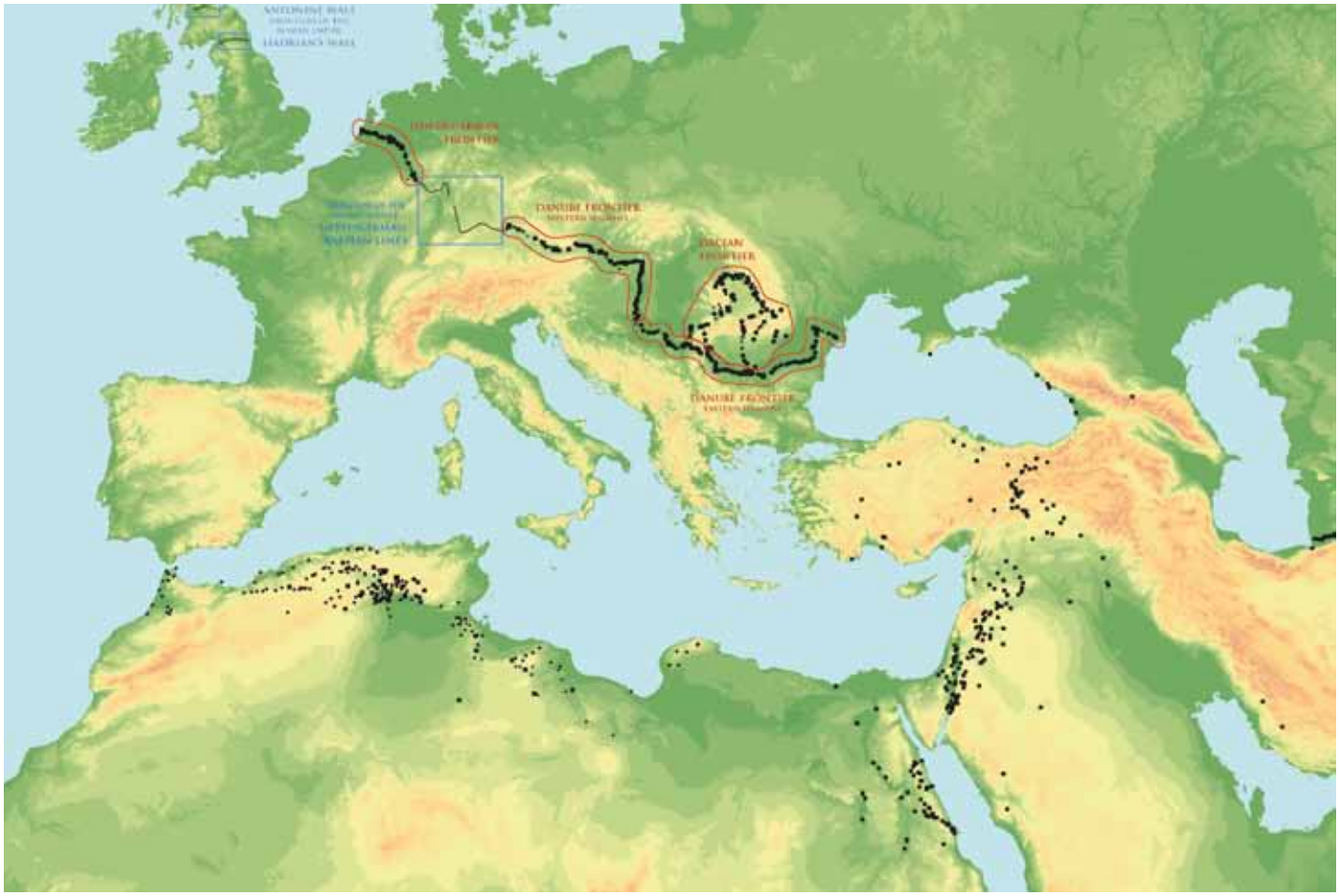

Fig. 2.2 The existing property F*rontiers of the Roman Empire* (blue) and the three envisaged additional properties for the European frontiers (red).

In 2017 a new nomination strategy was advanced in a thematic study written at the advice of ICOMOS International.[4] The study provides an overview of all frontiers of the Roman Empire as they existed during the 2nd century AD. It also offers a comparison of frontier sections differentiated on the basis of differences in landscape setting, typology of frontier installations and character of external threats.
For Europe, three future nominations were proposed as distinct properties (fig. 2.2):

- the frontier along the river Danube, nominated in January 2018 as *Frontiers of the Roman Empire – The Danube Limes (Western Segment)* (Ref: 1608);[5]
- the frontier along the lower course of the river Rhine, presented in this dossier as *Frontiers of the Roman Empire – The Lower German Limes*;
- the frontier of the Roman province of *Dacia* (modern Romania).

If accepted, these three sections would constitute three separate World Heritage properties, alongside the existing serial World Heritage property (Ref: 430ter).
In view of the current political situation in several of the countries concerned it was not feasible to outline a detailed nomination strategy for the frontiers in the Near East and North Africa, but the thematic study offered a broad division for these areas as well:

- the desert frontier in Africa, Egypt, the Roman province of Arabia and the southern part of the province of Syria, with the former provinces of Numidia and Mauretania set apart on account of their mountainous frontier sections;
- the frontier of northern Syria and the province of Cappadocia which was facing Rome's most powerful rival, the Parthian Empire.

In 2019 the feasibility of nominating sections of the Roman frontier in the Near East and North Africa

4 R. Ployer/M. Polak/R. Schmidt, The Frontiers of the Roman Empire – A Thematic Study and Proposed World Heritage Nomination Strategy. Advised by ICOMOS-International and commissioned by the Intergovernmental Committee of the 'Frontiers of the Roman Empire' World Heritage Site (UK, DE) and the Bratislava Group (Vienna, Nijmegen, Munich 2017). Cf. decision 41 COM 8B.50.

5 The 2018 nomination concerns the western segment of this river frontier, in Germany, Austria, Slovakia and Hungary. It is intended to nominate the eastern segment, in Croatia, Serbia, Bulgaria and Romania, in a second step, as a major extension. The nomination of the western segment has been referred to the States Parties by the World Heritage Committee in 2019 (decision 43 COM 8B.23).

Fig. 2.3 Riverine landscape near Xanten. The site of the double-legionary fortress of Xanten-Fürstenberg ▶28 (centre right) situated today on the left bank of a now abandoned river course of medieval date (right), todays course of the Rhine (top right corner), the modern-day town of Xanten (top left corner) and Xanten-CUT ▶27 (far top left corner).

has been explored in a meeting during the 43rd session of the World Heritage Committee at Baku (Azerbaijan). It is intended to find a way forward at a joint meeting of representatives from States Parties on all three continents in 2020, in advance of the 44th session of the World Heritage Committee at Fuzhou (China).

2.a.2 General description

***Frontiers of the Roman Empire – The Lower German Limes* is a river frontier, which developed around the beginning of the Common Era on the left bank of the lower course of the river Rhine. This serial, transnational nomination encompasses a selection of 91 military installations and 49 associated structures located in the modern countries of Germany and the Netherlands. They are spread out over c. 400 km along the Lower Rhine. The military installations belong to a wide range of types and sizes. The associated structures include infrastructural works, supporting facilities and civil settlements. Excavated canals, ships, quays and other riverine infrastructure illustrate the impact of the river dynamics.**

The Lower German Limes is a river frontier, which developed around the beginning of the Common Era on the left bank of the lower course of the river Rhine, known as the Lower Rhine. By AD 85 at the latest, the Lower Rhine frontier zone and its direct hinterland were converted into a separate province named *Germania inferior* or Lower Germany, renamed *Germania secunda* or Second (part of) Germany in the late 3rd century AD (fig. 2.3).

Well over a hundred military installations of varying sizes are known or assumed to have existed within the province and in its foreland across the Rhine. Half of them stood on the left bank of the river, while the others were divided over three areas: to the east of the Rhine, along the North Sea coast and in the hinterland. This nomination is limited to a selection of 91 military installations and 49 associated structures along the Lower Rhine. These 140 elements of the frontier system are divided over 106 separate component parts located in the modern countries of Germany and the Netherlands. The nomination therefore concerns a serial, transnational World Heritage property.

Most of the military installations included in this nomination are located along the left bank of the Lower Rhine, from Valkenburg ▶1 near the North Sea coast in the west to Remagen ▶44 on the fringes of the Rhenish Massif in the south, covering a distance of c. 400 km. The bridgehead fort of Köln-Deutz ▶38, the temporary camps of Wesel-Flüren ▶26 and the fortlet of Duisburg-Werthausen ▶31 are located on the opposite river bank. The structures associated with the military installations, such as roads and industrial sites, are distributed across the frontier zone.

The military installations comprise a wide range of sizes, from as large as c. 900 × 600 m for the double-legionary fortress of Xanten-Fürstenberg ▶28 to barely 5 × 5 m for the watchtower of Neuss-Reckberg ▶34a. These installations were all surrounded by one

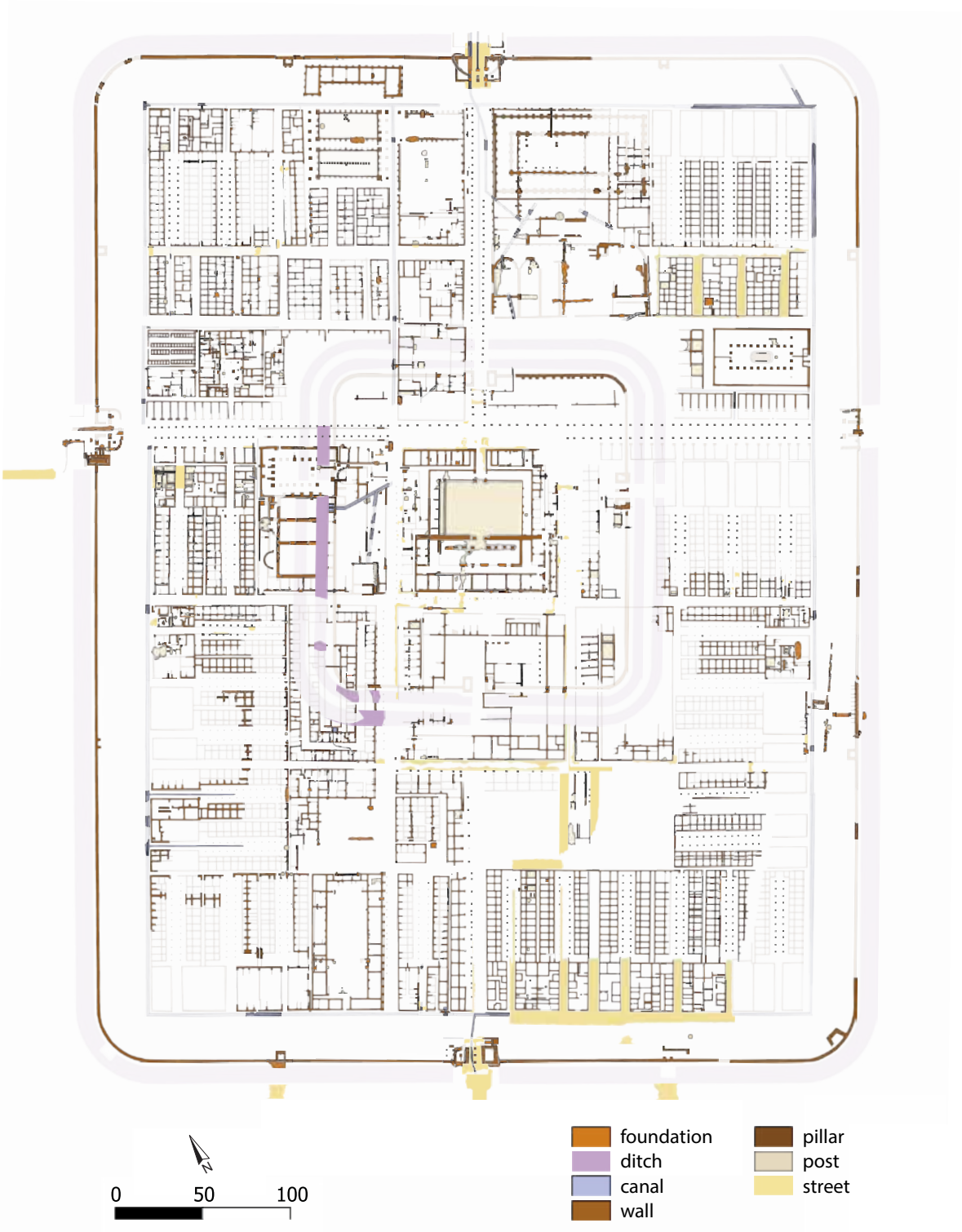

Fig. 2.4 Neuss-Koenenlager ▶33 features one of the most complete ground plans of a legionary fortress known today. After its abandonment in c. AD 100, the site of the fortress was occupied by a cavalry fort.

to five ditches and, with the exception of the watchtowers, by ramparts made of timber, timber-and-earth or stone, usually provided with three or four gates, corner towers and intermediate towers. The internal buildings normally included a headquarters building, a commander's house and several barrack blocks, alongside additional structures such as workshops and storage buildings. The fortifications were manned by infantry, cavalry or a mixture of both, but Köln-Alteburg ▶39 was a fleet base with specialised personnel. Most of the fortifications were in use for decades or longer, but in the vicinity of the legionary fortresses of Bonn and Xanten close to two hundred temporary camps have been identified, constructed mainly for training purposes (fig. 2.4).

The maintenance of the military installations and their garrisons relied on a large number of supporting facilities. These included first of all infrastructural elements like the military road or 'Limes road' connecting the forts and – characteristic of this frontier in a dynamic river landscape – ships, quays and revetments along the river bank and an extremely rare example of an excavated canal. Other facilities illustrate the immense logistics required for the maintenance of

the army: an aqueduct and kilns for the production of lime, bricks, tiles and pottery.

Permanent forts and fortresses were surrounded by civil settlements which offered accommodation to the families of the soldiers and a wide range of economic activities. These agglomerations developed along the roads entering the forts, with shops and workshops facing the road, living quarters in the rear of the buildings and kilns, wells, latrines and kitchen gardens in the backyards. The cemeteries where the remains of deceased soldiers and civilians were buried were generally located on the outskirts of the settlement.

The extramural civil settlements constituted the interface between the military system and the society in which it was implanted. They served as an inlet for regional products and services to the army, but equally as an outlet for Roman products and values to the region. The interchange of cultural traditions can be clearly discerned in the religious domain, with monumental temples succeeding indigenous open-air sanctuaries and soldiers worshipping regional deities.

On the Lower Rhine, towns were inextricably bound up with the military infrastructure. The administration of a Roman province relied heavily on district capitals, but the Lower Rhine was an area without an urban tradition. Consequently, all four towns along the Lower Rhine – *Forum Hadrian* (Voorburg), *Ulpia Noviomagus* (Nijmegen), *Colonia Ulpia Traiana* (Xanten), *Colonia Claudia Ara Agrippinensium* (Köln) – were founded or actively promoted by emperors and built with the assistance of the army. They vividly illustrate the formidable impact of the Roman military presence on the landscape and society of the periphery of the Empire.

Fig. 2.5 Relief of a burial monument in the LVR-LandesMuseum Bonn depicting the horned and bearded personification of the river Rhine (Rhenus bicornis).

The river Rhine performed the same tasks as artificial barriers in areas where no convenient rivers were available, such as Hadrian's Wall: controlling movement into and out of the Empire, suppressing brigandage and raiding, and supporting a coherent military infrastructure. Navigable rivers were the preferred transport arteries for heavy and bulky loads, although the sailing season was largely confined to the period from April to September. From the point of view of logistics, it was advantageous for a fort to be located on a river bank, and each fort in the Lower Rhineland is likely to have had mooring facilities.

The Roman Rhine – personified as a male deity known as *Rhenus* (fig. 2.5) – differed in many aspects from the Rhine of today. For most of the year the river bed was much wider and shallower. In the Roman period the river developed large meanders, which gradually migrated downstream through the continuous erosion of outer bends and accretion of inner bends, until they were cut off as the river created a new channel.

As long as the river cut its bed into older sediments forts could be built on the edge of the river terrace and remain free of flooding. However, closer to its outlet into the sea the river started to deposit sediments on its banks, marking the beginning of the river delta. For the Roman Rhine this point was located near the modern border between Germany and the Netherlands.

In the delta, forts built on the edge of the river bank were constantly exposed to flooding. The archaeological evidence shows that the whole of the military infrastructure in the Rhine delta suffered from periodic flooding, destroying some parts and covering others with layers of sediment. This was the price of locating military installations close to the river for the purposes of observation and accessibility for ships. Upstream from the delta the forts were not immune to erosion by the river either, as the bank of the river terrace could be undermined in outer bends.

Since river bends gradually migrate downstream, erosion of the river bank in front of a fort could make way for accretion, and active meanders could be cut off by new channels (fig. 2.6). In such cases accessibility for ships deteriorated. This could be countered by building new quays further out, backfilling the intermediate space with soil, brushwood and debris. The process of silting up was quite often accelerated by use of the river as a convenient dump for settlement waste. In several places these riverside dumps have been preserved as they were eventually sealed by sediment. These sealed rubbish deposits provide a wealth of information about everyday life on the Roman frontier.

Rivers were navigated by ships, and over the centuries the Lower Rhine has relinquished wrecks of some twenty cargo ships, two patrol crafts and several dug-

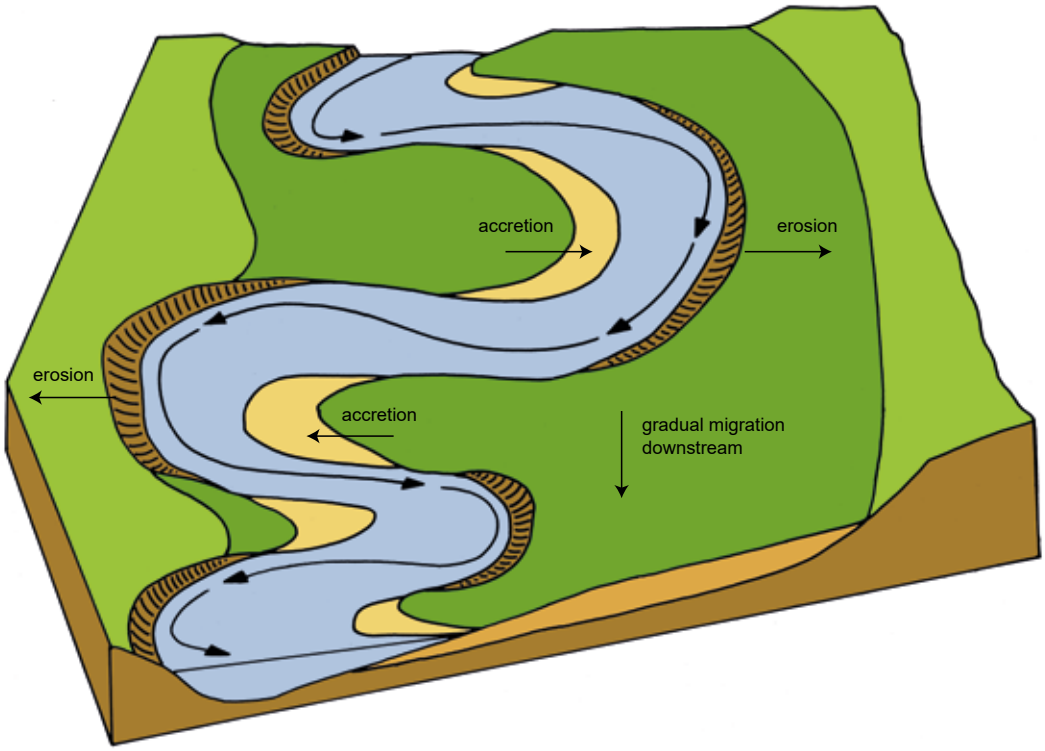

Fig. 2.6 Simplified model of a meandering river, showing the process of accretion and erosion in the inner and outer river bends.

out canoes. While several of these ships will have been wrecked by accident, others were deliberately sunk to protect river bends against erosion or to serve as a foundation for a new quay. The number of excavated ships is so high that it can be predicted with confidence that some are hidden in sections of the Rhine included in component parts of the nominated property. This is known to be the case for two component parts which contain remains of incompletely excavated ships.

2.a.3 The first linear frontier, embedded in a dynamic river landscape

***Frontiers of the Roman Empire – The Lower German Limes* may be considered as the cradle of Roman perimeter defence. Another distinctive aspect is its setting in the dynamic landscape of a lowland river and its delta.**

When Roman troops first arrived on the Rhine in the mid-1st century BC, perimeter defence was still an unknown concept. Thus far, Rome had constantly been expanding its territory, and internal unrest and external attacks had been countered on an ad hoc basis. In retrospect, the first linear frontier on the periphery of the Empire developed in the early 1st century AD, although it may not have been conceived as such at the time.

The Lower German Limes, as this first linear frontier is commonly known, may therefore be considered as the cradle of Roman perimeter defence. Thanks to the wide range of military installations and their excellent preservation *Frontiers of the Roman Empire – The Lower German Limes* is of extraordinary importance for the understanding of this strategic development.

Another distinctive aspect of *Frontiers of the Roman Empire – The Lower German Limes* is its setting in the dynamic landscape of a lowland river and its delta. Serving both as a demarcation line and as a major transport route, the river needed close military observation. Both functions required tailor-made strategies and installations, which are either unique to this frontier section or much better preserved than elsewhere. These and other characteristics, which clearly distinguish *Frontiers of the Roman Empire – The Lower German Limes* from other sections of the Roman frontiers, are outlined in the sections below.

The first linear frontier

The Lower German Limes developed as a result of Rome's inability to control Germanic groups across the Rhine by diplomatic means or by territorial expansion. In the early decades of the 1st century AD the military infrastructure on the left bank of the river was converted into a linear frontier, the first instance of perimeter defence.

It was Julius Caesar who first took the Roman army as far north as the river Rhine, during his conquest of Gaul (58–52 BC). In the course of his military campaigns he was confronted with various Germanic groups from across the Rhine: mercenaries participating in internal Gaulish conflicts, migrants searching for new areas to settle and raiders profiting from the chaos of war.

The gradual conversion of Gaul into a Roman province in the decades following the conquest did not put an end to the Germanic incursions. Initially, Rome replied with punitive expeditions across the

Rhine, and one of these led to the establishment of the first archaeologically attested military base in the Lower Rhineland, at Nijmegen-Hunerberg ▶15 in 19 BC (fig. 2.7). When neither these brief campaigns nor the displacement of Germanic groups to the left river bank had a lasting effect, Rome tried to subdue large parts of *Germania* to the east of the Rhine in large-scale wars, but peace treaties with conquered peoples were violated time and again, even when sealed with hostages. Once again, the large-scale deportation of Germanic groups failed to produce a lasting peace.

While in the Near East and North Africa Rome had been quite successful in securing its interests through negotiations with regional rulers, this diplomatic approach evidently failed in *Germania*. This was probably due to unremitting migration pressure from the north and east, and to the absence of any central authority or of a tradition of written agreements. After nearly thirty years of gain and loss, the Emperor Tiberius concluded Roman offensives across the Rhine in AD 17, contenting himself with the successes achieved so far. While a triumph over *Germania* was being celebrated at Rome, the army was withdrawn to the left bank of the Rhine.

It is uncertain whether Tiberius considered the withdrawal as an abandonment or as a postponement of further actions in *Germania*, but in retrospect we can establish that the offensive was never resumed. The military installations on the left bank of the Lower Rhine were no longer a springboard for operations in *Germania*, but developed into the first linear frontier in the history of the Roman Empire, a clear and well-defended demarcation line.

In the late 90s AD the historian Tacitus complained that 'it was taking so long before Germania was conquered', but there is little reason to believe that further conquest was still a serious ambition at that time. By the mid-1st century the legionary fortresses of Xanten-Fürstenberg ▶28 and Neuss-Koenenlager ▶33, previously constructed in timber, were rebuilt in stone. This is generally considered to reflect acceptance by the Romans that the military deployment along the Rhine would remain unchanged.

An early awareness of the permanence of the status quo is also indicated by the appearance of many smaller military installations soon after AD 17. The preceding period of continuous expansion had been characterised by the deployment of field armies operating from large bases. The early base of Nijmegen-Hunerberg ▶15 with a capacity of 10–15,000 troops is a fine example of this category. During this offensive stage, fortifications for less than five thousand men were rare and possibly confined to nodes in the supply system needing protection. Consolidating territorial gains demanded a different deployment, however, with a fine-meshed network of smaller posts to tighten control; spreading the units may also have eased the pressure of supply. The second quarter of the 1st century AD saw a sudden increase in the number of forts for 500 men or less. A whole series of these was built in the western delta, which had been without military occupation thus far. In the same period the first watchtowers were built here, along a particularly winding stretch of the river which was difficult to oversee. The main task of this tight screen of forts and towers in the delta must have been the protection of a supply line to the Roman troops in Britain, the

Fig. 2.7 Section through the two ditches on the eastern side of the early operational base of Nijmegen-Hunerberg ▶15. View from the south.

conquest of which was the main military focus from AD 43 onwards. That the restoration of the Roman claim on Germanic territory across the Rhine had lost its priority is clearly illustrated by the termination of a military campaign with precisely this aim in AD 47, on explicit imperial order.
Upstream from the delta the increase in smaller forts is less conspicuous, but by the middle of the 1st century most of the gaps between the legionary fortresses had been plugged.

Adapting (to) a dynamic riverine landscape

In the Roman period the Rhine continuously changed its course. The river dynamics hampered shipping and threatened the military posts which were built on the edge of its bank. Various infrastructural works were undertaken to improve the navigability. The need to secure river traffic led to the adaptation of fort designs, the construction of watchtowers and various measures to cope with flooding and erosion of the river bank.
On leaving the Rhenish Massif, with its average elevation of 500 m above sea level, the river Rhine gradually descends from a height of c. 60 m down to sea level on the North Sea coast. Before it was restricted by dikes and other manmade constructions in the Middle Ages, the Rhine had a very winding course, with large meanders gradually migrating downstream. In the delta it split into several branches. The river dynamics hampered shipping and threatened the military installations which were built on the edge of the river bank in order to exercise control over the river itself and the opposite bank.
Navigability was improved by the construction of a groyne – a partial dam extending across the river bed – and at least two canals. The groyne was designed to feed more water into the most northerly Rhine branch in the delta. It must have been located between the forts of Herwen-De Bijland ▶19 and Kleve-Keeken ▶20 and is mentioned in an inscription from the latter site. One of the canals was probably dug to connect a creek system discharging into the Rhine near the fort at Arnhem-Meinerswijk ▶12 to the peat lakes which provided access to Germanic territories further north and east. Its precise location is unknown. The second canal has been firmly attested by archaeological excavation. It was built to connect the Rhine to the river Meuse further south, just behind the coastal barriers, to avoid the risks of a passage by sea (Corbulo's canal ▶4). Its course has been recorded over a distance of at least 11 km (fig. 2.8). The sides of the canal were consolidated by timber posts, which have survived thanks to the high groundwater table in the delta. Roman canals are extremely rare, and this excellently preserved example is a vivid illustration of the pains taken by the Roman army to improve the infrastructure of the river delta.
With the exception of Bunnik-Vechten ▶11, all the forts in the delta with a known ground plan display a design which deviates from the standard plan attested on all other frontiers. Normally a fortress or fort is divided into three strips of buildings, with the headquarters in the centre of the middle strip. The forts in the delta, however, have only two strips of buildings, with the headquarters in the rear part. Measuring no more than 0.9–1.6 ha these 'delta type' forts are considerably smaller than other forts.

Fig. 2.8 Section through Corbulo's canal near the Romeinsepad component part ▶4f. The clay filling of the c. 14 m wide and 1.2 m deep canal stands out clearly from the peat layers in which it was excavated.

Although the width of the natural levees to the left of the Rhine does not exceed 400 m in some places, the locations of all fort sites in the delta could have provided enough space for a standard size fort, so the divergent design cannot be a consequence of space constraints. Instead, the size of the garrison seems to have been the key determinant, with less than a regular unit of 500 men being considered sufficient to perform the assigned task.

The forts in the delta share an extremely vulnerable position on the edge of the river bank, where they repeatedly suffered from flooding. Nevertheless they were invariably rebuilt on the same spot, even if a more elevated position was available at some distance from the river channel. This reveals that the very specific bank edge siting of these forts was an absolute requirement for the fulfilment of their primary task: the observation and protection of river traffic. Most were built in AD 40 or soon after, a period for which we have indications of Germanic piracy.

The effects of flooding and erosion by the river can be seen at various fort sites. At Kalkar-Bornsches Feld ▶24 the northeast corner of the fort was destroyed by the erosion of the terrace on which it was built. The gap was simply closed by a new rampart, at an angle to the front and side of the fort. At several forts in the delta successive building phases are separated by layers of river sediment and artificial raised levels, revealing that despite considerable efforts flooding could not be avoided. Occasionally, the layers of sediment are so thick that a fort or part of it may not have been usable for some time. This has been taken as an indication that the forts in the delta were not continuously occupied; only when the strategic situation required. However, it is equally possible that a flooded fort was replaced by a temporary camp nearby, for the time needed to rebuild it.

The river bank sections in front of the forts were consolidated by rows of posts and revetments, most of which collapsed after a period of time. Mooring facilities for ships were secured by more elaborate constructions, which often shared the same fate. If erosion was replaced by accretion, the river bank was regularly built out to maintain access to the receding channel.

The vulnerability of the military infrastructure within the dynamic riverine landscape is also demonstrated by the Limes road connecting the forts. Upstream from the delta it was established on the flood-free river terrace, on a low embankment or artificial levee paved with gravel and flanked by drainage ditches. In the delta the preferred location for the road was the edge of the natural levee of the Rhine, only just above the wet floodplain. Where required, to keep the course of the road straight, the line crossed the floodplain or approached the erosive river channel. In such wet or vulnerable conditions the road embankment was lined with rows of posts and occasionally even heavier constructions, to survive periodic flooding. Although most of these adaptations to the instability of the natural conditions were local measures, there were two coherent supra-regional campaigns of renovation, in AD 99/100 and AD 123/125, following visits of the Emperors Trajan and Hadrian.

A particularly winding stretch of the Rhine between the forts of Utrecht-Hoge Woerd ▶8 and Woerden-Centrum ▶6 is one of the few areas where watchtowers have been attested, overlooking large meanders. They were probably built in the 40s AD, contemporaneous with the delta type forts. Upstream from the delta, the considerably later tower of Neuss-Reckberg ▶34 was also located in a winding section of the river, suggesting that towers may have been a common element of the military infrastructure, required for proper surveillance of the dynamic river landscape.

Roman military construction in timber

Thanks to the outstanding preservation of organic remains and to the repeated rebuilding of vulnerable forts, *Frontiers of the Roman Empire – The Lower German Limes* constitutes a showcase of Roman construction in timber. The rich preserved remains also offer a clear insight into the exploitation of natural woodlands. Dates derived from tree-ring patterns provide an almost inconceivably fine chronological resolution for the exploitation of forests, the history of the military infrastructure and developments in Roman timber construction.

When Roman armies were on campaign they built temporary camps with earthen ramparts. Timber, natural stone and brick were only used when bases were expected to be permanent, or at least long-lasting. In the Lower Rhineland timber and clay were abundant, but natural stone was only available in the very south. The legionary fortresses were the first to be rebuilt in stone, from the mid-1st century onwards, but it would take another century before all the smaller installations had followed this trend.

Thanks to the outstanding preservation of organic remains and to the repeated rebuilding of vulner-able forts, *Frontiers of the Roman Empire – The Lower German Limes* constitutes a showcase of Roman construction in timber and earth-and-timber. The fort of Valkenburg-Centrum ▶1 is internationally renowned for its standing timber remains, but the nomination includes several sites with similar preservation conditions (fig. 2.9).

Prior to their rebuilding in stone, the defensive walls consisted essentially of the soil dug out from the surrounding ditch or ditches. The exterior of the wall was clad with timber frames or piled-up sods. Timber frames consisted of horizontal planks locked up be-

Fig. 2.9 Southwest corner of successive defensive walls of the fort at Valkenburg-Centrum ▶1. Left: track of horizontal beams constituting the base of an earthen rampart. Centre: sleeper beams of the fronts of two successive earth-and timber ramparts. Right: collapsed remains of a stone wall.

hind uprights which were driven into the ground or placed on sleeper beams set in trenches; the front and rear faces of the ramparts were connected by horizontal tie beams. Ramparts with facings of sods had foundations of horizontal trunks and were further stabilised by adding horizontal timber frames at regular intervals of height, anchored by vertical posts.

Timber gate towers, corner towers and intermediate towers usually rested on four to ten heavy uprights; in the delta these constructions had foundations of massive horizontal planks. This construction method was also used for free-standing timber watchtowers. Aboveground remains of towers have not been attested in excavations so far.

The streets within the fortifications were metalled with gravel or, near the coast, with shells. Along the delta road substructures of beams and planks have been found, occasionally overlying wooden drainage channels; such timber substructures are likely to have occurred elsewhere, too. Wells were provided with timber linings, consisting of wickerwork, reused wine barrels, or horizontal planks kept in place by uprights.

Internal buildings made of timber had the same basic construction as the defensive walls, with uprights either driven into the ground or resting on sleeper beams. The walls of the buildings were made of wattle-and-daub or clad with planks. Well preserved remains of the former construction type are known from the delta. They consist of horizontal laths slid into asymmetrical notches in the uprights, providing a frame for vertical wattle covered with loam. The existence of walls of horizontal planking has been deduced from the occurrence of closely spaced uprights without notches for wattle frames. Floors consisted of tamped loam or woodchips, occasionally applied over planks or branches.

Frontiers of the Roman Empire – The Lower German Limes provides many well-preserved examples of these and other timber constructions, in rare cases even including aboveground elements. Construction details like half-lap and mortise-and-tenon joints are almost without parallels on the Roman frontiers.

Stretches of the Limes road that have been lined with posts or otherwise consolidated with timber provide insight into the logistics of major building campaigns, including the provenance of the trees used, and reveal many details of woodworking. This is the case also for the rows of posts lining Corbulo's canal.

The more than thirty shipwrecks preserved in the Rhine channel constitute another valuable source of timber construction technology. Most wrecks are of heavy, flat-bottomed cargo ships up to 35 m long (fig. 2.10), built with flush-laid planking in a bottom based construction with oak planks up to 20 m long and 77 × 10 cm in section. Two patrol craft from Köln and Bunnik-Vechten ▶11, however, were built largely from considerably lighter pinewood, in a Mediterranean mortise-and-tenon technique. Small-scale trans-

Fig. 2.10 Large cargo ship (a) excavated at Utrecht-Limes road | De Balije ▶7c now exhibited in the site museum Utrecht-Hoge Woerd. The flat-bottom ship from Xanten (b) may have also been used as a reaction ferry for crossing the Rhine.

port was provided by dugout canoes: simple vessels made from hollowed trees up to 10 m long. Some of these were reused as creels.

The well-preserved timber remains also offer a clear insight into the exploitation of natural woodlands. The identification of wood species and their natural habitats has revealed that initially the riverine forests of the region were exploited; these mainly consisted of ash, alder, elm and willow. Regional oak was generally of poor quality and oak was therefore mainly procured from outside the delta. Pine was supplied from the Upper Rhine area. Once the regional forests were cleared of the best timber, the area depended largely on imported oak.

Analysis of tree-ring patterns adds further detail to this field of research, as it permits the identification of growing conditions and of regional groups of timber. By comparing tree-ring sequences to known dated

ring patterns it is possible to establish very precise felling dates for oak, and in the western delta for ash and elm also. This provides an almost inconceivably fine chronological resolution for the exploitation of natural resources, the history of the military infrastructure and developments in Roman timber construction.

The footprint of a frontier

The impact on the regional landscape and society of an army of tens of thousands of men must have been immense, as the area was only sparsely populated. Accommodating the troops required much more than fortifications alone: the entire infrastructure for their maintenance and supply had to be built from the ground up. The involvement of the army in the development of an urban infrastructure demonstrates that despite obvious cultural interchanges between the military and the regional population, the transformation of the Rhineland into a Roman province was a slow process and required substantial imperial encouragement.

At the beginning of the Common Era the left bank of the Rhine was probably still partly forested. Arable farming and stockbreeding were practised locally on too modest a scale to generate large surpluses, and there were no valuable minerals to extract. Consequently, there was no economic basis for centralised power. This is reflected in the settlement pattern, which was characterised by scattered clusters of usually less than a handful of farmhouses and by a lack of central places, although the latter may have been partly compensated for by regional sanctuaries.

In the early phase of the Roman occupation the army of Lower Germany is likely to have consisted of 40–50,000 men, not counting non-combatant personnel and camp followers. From a numerical point of view alone it is evident that the impact of the army was immense, both on the landscape of the Lower Rhine and on the regional population. Accommodating the troops required much more than fortifications alone: the entire infrastructure for their maintenance and supply had to be created. At a later stage the army was also involved in the development of an urban infrastructure required for the administration of the province. Contacts between the military and the indigenous population led to an interchange of merchandise and values, but the transformation of the Lower Rhineland into a Roman province appears to have been a slow and reluctant process, despite imperial encouragement.

The Lower German frontier contains a wide range of military infrastructural works. The Limes road connecting the military installations over land is the most obvious manifestation of the infrastructure that was rolled out on the left bank of the Rhine. As early as 17 BC, immediately following the foundation of the earliest known military base in the region, a road was built from Trier on the river Moselle to Köln on the Rhine. This road constituted a more secure connection to the hinterland than rivers like the Meuse and Rhine with their rapidly changing water levels. The road was soon extended downstream from Köln, but for as yet unknown reasons it took nearly a century before the North Sea coast was reached. Although the Rhine was a less reliable route than the road, the river was of major importance for the transport of heavy and bulk cargoes. The particular infrastructure characteristic of this frontier in a dynamic riverine landscape has already been discussed above (fig. 2.11).

Fig. 2.11 Excavation of a ship and the Limes road at Utrecht-Limes road | De Balije ▶7c in 1997. Front: rear part of a cargo vessel. Centre: parallel rows of posts lining the embankment of the Limes road, with horizontal planks on the inner sides. View from the north.

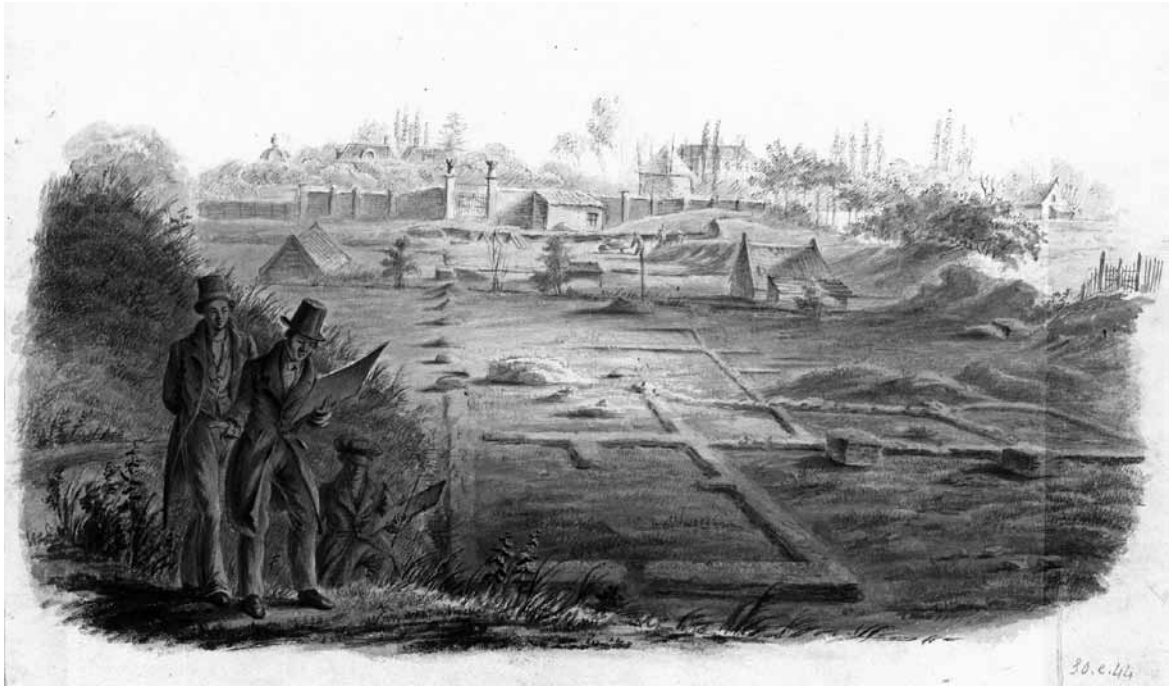

Fig. 2.12 Lithography showing the first scientific excavation (1827–1834) at Voorburg-Arentsburg ▶3 (*Forum Hadriani*), with foundations of stone buildings in the centre of the Roman town. The remains in the centre of the image are probably still preserved.

The construction and maintenance of the military installations and transport system demanded huge quantities of building materials. Initially, timber was the main source. The felling and processing of trees has left no tangible traces, apart from the many preserved remains of defensive works, buildings and other constructions. While buildings were initially roofed with wooden shingles or reed, roof tiles made their appearance by the middle of the 1st century AD. The rebuilding in stone of many military posts required large quantities of lime and natural stone, which only occurred in the south.

Maintaining the troops with food, drink, tools and equipment was also a major concern, especially since considerable quantities had to be kept in stock to survive sieges and hitches in the supply system. Warehouses and workshops in the forts and the adjacent civil settlements give an idea of the required facilities, but some were located at a distance. Drinking water was usually obtained from wells and from cisterns in which rain water was collected, but several legionary fortresses are known to have been serviced by aqueducts.

All these buildings, constructions and facilities give a clear picture of the massive footprint of the army on the landscape, but there are also less direct indicators. The native population does not appear to have been very keen on moving away from a subsistence economy that generated insufficient wealth to maintain a powerful elite or to enable public munificence, both of which were prerequisites for urban development. By AD 5 at the latest, the Emperor Augustus gave an early impetus to the development of a provincial capital by establishing a settlement with urban pretensions at what is now known as Köln. The promotion of this settlement to a *colonia* – *Colonia Claudia Ara Agrippinensium* – by the Emperor Claudius in AD 50 constituted a further strong encouragement to its development into a city. A *colonia* was the highest rank in the Roman municipal system and its foundation involved the settlement of army veterans.

The development of regional capitals, which formed the basis of the provincial administrative system, proceeded even more slowly. Development was eventually forced by the promotion or creation in the early 2nd century of the towns of *Colonia Ulpia Traiana* at Xanten and *Ulpia Noviomagus* or *Municipium Batavorum* at Nijmegen by the Emperor Trajan, and of *Municipium Aelium Cananefatium* or *Forum Hadriani* at Voorburg by his successor Hadrian. There are several indications of military involvement in the construction of public buildings. Furthermore, VVoorburg-Arentsburg ▶3 appears to have played a role in supplying the forts in the region, and Xanten-CUT ▶27 took on defensive tasks in the 3rd and 4th centuries. On the Lower Rhine the urban and military domains were therefore closely knit (fig. 2.12).

The provincial capital at Köln was the seat of the governor or *legatus Augusti* ('envoy of the Emperor'), who was also commander-in-chief of the provincial army. The palace of the governor, or *praetorium* ▶37, served as headquarters to the army and as the ultimate display of Roman culture to the regional population. A similarly hybrid position is illustrated by the sanctuaries on the Kalkarberg ▶23 and at Elst ▶13. Inscriptions on votive altars and other objects found on the Kalkarberg demonstrate that the temple was mainly visited by soldiers, whilst being dedicated to a Germanic goddess with the name of Vagdavercustis. The monumental temple at Elst, constructed

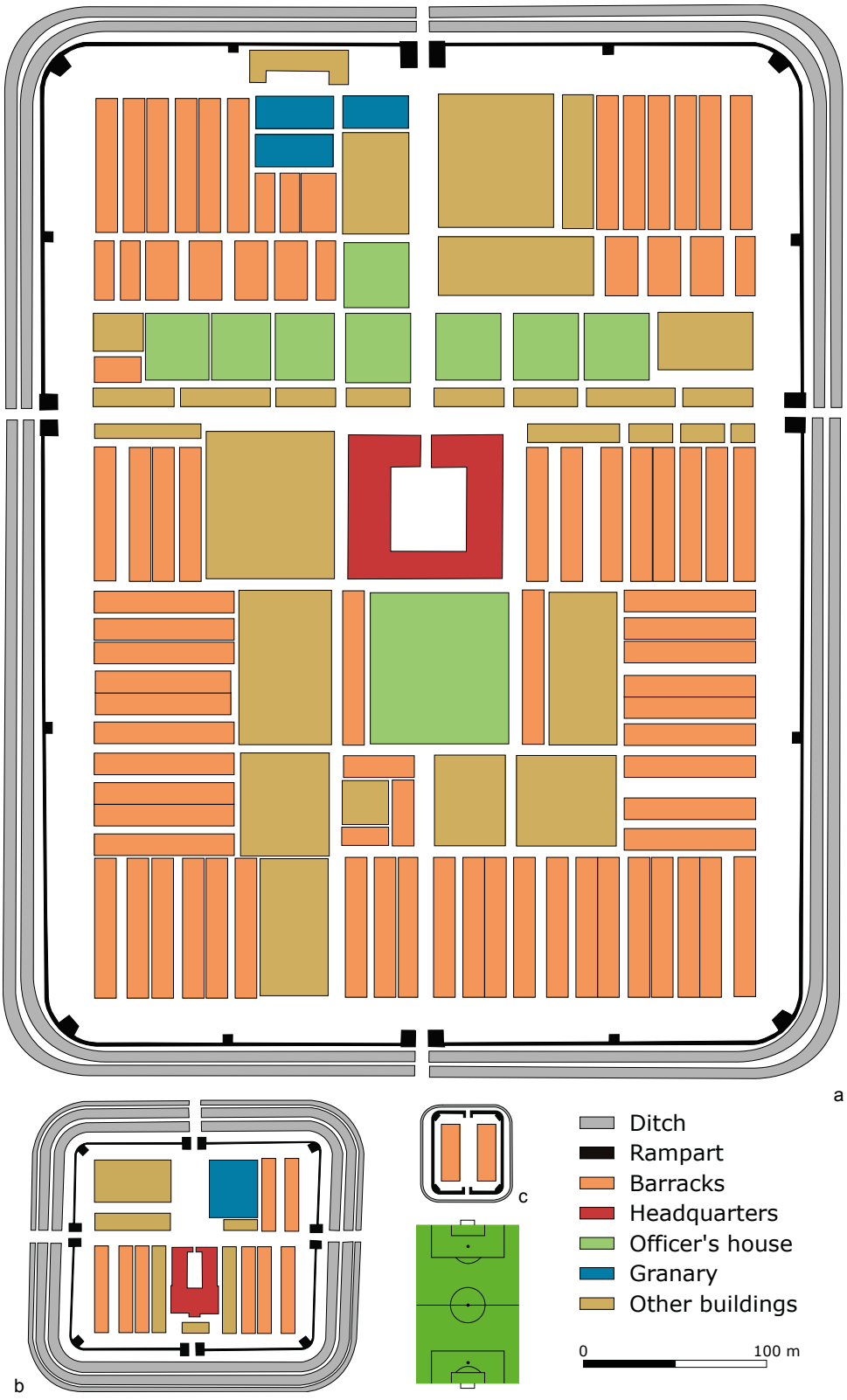

Fig. 2.13 Layout plans of military installations at common scale. Legionary fortress Neuss-Koenenlager ▶33 (a), auxilliary fort Valkenburg-Centrum | Kerkweg ▶1a (period 6) (b) and fortlet Duisburg-Werthausen ▶31 (c). Football pitch as benchmark

by or with the assistance of the army, succeeded a pre-Roman open-air sanctuary. Its architecture is a mixture of Roman and Gaulish elements, and it is the largest example of its kind known so far. These temples and other similar ones vividly illustrate the interchange of cultural values between the army as representative of the Roman Empire and the regional population.

Military history of the Western Empire

***Frontiers of the Roman Empire – The Lower German Limes* is the only frontier section that spans the entire history of the Western Roman Empire in the imperial age.**

As mentioned previously the Lower German Limes is the earliest linear frontier, and as such it encompasses

military installations from a period which is missing from other frontier sections. The earliest bases stand out through their large dimensions and irregular plans. They represent an offensive period in which large field armies were deployed and bases were too short-lived to make the effort to adapt the landscape to the requirements of standardised fort designs. The stage of consolidation of the military infrastructure on the left bank of the Lower Rhine from AD 17 onwards is illustrated by an increase in the number of forts for 500 men or less. Later in the 1st century such forts appear to have been occupied by individual auxiliary regiments, but there is increasing evidence that their garrisons may have consisted of mixed detachments of legionary and auxiliary soldiers in this early experimental stage (fig. 2.13).

In AD 286 the ruling emperor Diocletian (AD 284–305) decided to share the imperial power with Maximian (AD 286–305) and to divide the Roman Empire into a western part and an eastern part. With two interruptions this divide existed until the disintegration of the Western Empire in AD 430–490.

The Lower German frontier offers the full range of Roman military installations from the beginning of the imperial age to the end of the Western Empire, from vast operational bases for 10–15,000 men to watchtowers for a dozen or less. Besides the standard range of legionary fortress – auxiliary fort – fortlet – watchtower, the frontier section includes special-purpose fortifications such as a fleet base, a bridgehead fort and temporary camps of different sizes and functions.

Treasure-chest of frontier life

Thanks to the water-logged conditions in many parts of the riverine landscape, organic remains and metal objects are often very well preserved. Rubbish deposits in river channels in front of military settlements constitute veritable treasure-chests of everyday life on the frontier. They are an essential key to our understanding of the functioning of military settlements.

The wet conditions of the riverine landscape, which posed many problems to the Roman military engineers, greatly favoured the preservation of perishable materials. In water-logged conditions materials like wood, leather and seeds may survive millennia. Further, metal objects are preserved in mint condition, in contrast to when they are exposed to oxygen and the effects of manuring of arable fields and meadows.

Military bases were kept relatively tidy, which resulted in the miscellaneous objects that illustrate everyday life being discarded in large quantities outside the defences. On a river frontier a water channel was the most convenient place to deposit waste. As long as the water current was strong, most of the rubbish was washed away, but if the channel migrated away from the fort layered rubbish deposits accumulated. The accumulation of waste increased when the river bank was built out by constructing quays and revetments closer to the channel, backfilling the intermediate space with soil and debris.

These layered rubbish deposits constitute veritable treasure-chests of everyday life on the frontier. Well-preserved animal bones, seeds and pollen permit the reconstruction of the surrounding landscape, the diets of men and animals, and the sources of supply with animal and plant food. Leather waste includes remains of military equipment such as tents and shield covers. The most frequent leather finds are shoes, not just of soldiers, but also of women and children (fig. 2.14). They give an idea of the composition and age structure of the military settlement at large, and of changing fashions. Wooden objects may be as varied as parts of weapons, tools, furniture, combs and writing tablets, shedding light on military as well as civilian life. Metal objects cover a similarly wide field (fig. 2.15).

Fig. 2.14 Remains of leather shoes from Voorburg-Arentsburg ▶3 (*Forum Hadriani*): single-piece shoe (*carbatina*) for a child (a), soles of nailed sandals (b).

Fig. 2.15 Visor of a cavalry helmet found in the northern outlet of the *fossa Corbulonis* just outside the northwest gate of the auxiliary fort of Leiden-Roomburg | Park Matilo ▶5a.

These riverine rubbish deposits are an essential key to our understanding of the functioning of military settlements. They occur most frequently in the delta, but have been attested at various sites upstream as well. Nijmegen-Kops Plateau ▶16 provides a very rare example of a 'dry' rubbish deposit. The slope of the ice-pushed moraine in front of the fort was used for dumping settlement waste. The preservation of organic material in the sandy subsoil of the moraine is obviously inferior to that of silted-up river channels, but the deposits nevertheless constitute a layered archive of the occupation history of the fort.

2.a.4 Elements of Frontiers of the Roman Empire – The Lower German Limes

This section provides an overview of all the elements of *Frontiers of the Roman Empire – The Lower German Limes*, in twelve categories. Each category is briefly elucidated, with references to the component parts in which it is represented. If a component part (or cluster) encompasses remains of two or more categories of elements it is listed in all relevant categories.

Legionary fortresses and other large bases

Until the army reforms at the end of the 3rd century, a Roman legion consisted of approximately 5,000 soldiers. The standard accommodation for such a unit covers c. 20 ha within the defensive walls. Neuss-Koenenlager ▶33 is one of the best-known examples of this type of installation on the Roman frontiers, with a so-called playing card shape – a rectangle with rounded corners. During the 1st century AD fortresses for two legions are known, of which that of Xanten-Fürstenberg ▶28 covering c. 56 ha is a classic example. These legionary bases were initially built in timber and earth, but in the course of the 1st century the defensive walls and main internal buildings were rebuilt in stone. The fortress of Bonn ▶41 is one of the most long-lived on the Roman frontiers, still functioning in the early 5th century.

During the early offensive period large bases of irregular shape were constructed. The earliest example on the Rhine is that of Nijmegen-Hunerberg ▶15 measuring 42 ha, but the above-mentioned double-legionary fortress of Xanten-Fürstenberg ▶28 was preceded by an irregular shaped base, covering c. 57 ha. The irregular shaped bases were all built in timber and earth (fig. 2.16).

A singular construction is the Late Roman fortification within the city walls of the *colonia* of Xanten-CUT ▶27 (*Tricensima*). Two ditches and a stone wall with rounded towers surround the nine central *insulae* of the city, an area of c. 400 × 400 m, where the main public buildings were situated. The massive defensive works indicate that it served as a military stronghold, but internal buildings with a clear military character have not been recognised as yet.

Fig. 2.16 Results of the geophysical surveys carried out at Xanten-Fürstenberg ▶28. Indicated are the fortresses of the Augustan and Claudio-Neronian periods.

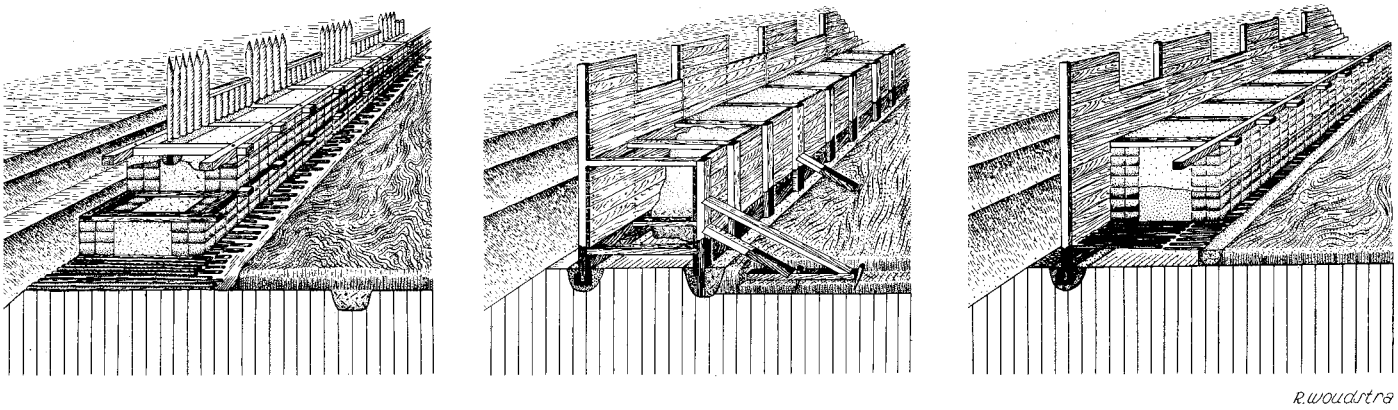

Fig. 2.17 Reconstructions of successive earth-and-timber walls of the Roman fort at Valkenburg-Centrum ▶1, phases 1–3 (left to right).

Forts

From the later 1st century onwards reduced versions of standardised legionary fortresses became common, for the accommodation of regular auxiliary units of nominally 500 and 1,000 men. Sizes of such so-called auxiliary forts typically range from 2–5 ha, depending on the size of the garrison and on whether it included cavalry or not – cavalry needing more space than infantry. Clear examples of such forts can be found at Till ▶22, Krefeld-Gellep ▶32 and Dormagen ▶36.

The final building phase of the fort at Bunnik-Vechten ▶11 belongs to the same size range, but its orientation is in keeping with that of the 'delta type' forts with only two strips of buildings, instead of the usual three. Of this reduced fort type of 0.9–1.6 ha, Valkenburg-Centrum ▶1 is the classic example. Although in the case of infantry a regular unit of 500 men might be squeezed in, the garrisons may well have been smaller, especially if they consisted partly or entirely of cavalry.

The regular and delta type forts were initially built in timber, or occasionally provided with ramparts clad with sods (fig. 2.17). The headquarters buildings were the first to be rebuilt in stone; the defences and other buildings generally followed later. Only the fort at Dormagen ▶36 and the cavalry fort which succeeded the legionary fortress of Neuss-Koenenlager ▶33 were built in stone from the outset, at the end of the 1st century.

In size the fort at Remagen ▶44 belongs to the range of delta type forts, but its form was irregular. Forts of irregular shape are typical of the earlier stages of the frontier. Most of the building phases of Moers-Asberg ▶30 belong to this category, of which the fort of Nijmegen-Kops Plateau ▶16 is a further clear example. The fleet station of Köln-Alteburg ▶39 (cf. below) is of irregular shape as well. Whereas irregular fortresses and forts were as a rule replaced by regular ones at some point in their history, Köln-Alteburg and Remagen kept their irregular form until the very end of their existence, for Remagen as late as the 5th century.

A singular installation is the walled area of c. 250 × 150 m that was marked out in the southern corner of *Colonia Ulpia Traiana* at Xanten ▶27 (Südquartier), provisionally dated to the 3rd century AD. Although the situation is reminiscent of the reduced forts of the Late Roman period, the size and shape are similar to those of earlier regular auxiliary forts.

Forts of the Late Roman period are characterised by heavy stone walls and large numbers of round towers. The bridgehead fort of Köln-Deutz ▶38 (cf. below) is the best preserved example. The fort of Nijmegen-Valkhof ▶14 may have had a similar outward appearance. Most Late Roman installations were not new creations, but reductions of previously existing forts, as at Kalkar-Bornsches Feld ▶24 and Dormagen ▶36. Remagen ▶44 stands out in retaining the same size in the Late Roman period as before.

Fortlets and towers

Fortlets are military installations in the size range of 0.1–0.5 ha, providing accommodation for detachments from larger military units. This explains why headquarters buildings are missing and most of the internal buildings consist of barracks.

Three military posts can be classified as fortlets, on account of their sizes. The two smallest examples, of Duisburg-Werthausen ▶31 (0.17 ha) and Neuss-Reckberg ▶34b (0.11 ha) are unlikely to have accommodated more than c. 160 soldiers. The fortlet of Neuss-Reckberg was located on the Limes road, overlooking the winding stretch of the Rhine between Neuss ▶33 and Dormagen ▶36. The fortlet of Duisburg-Werthausen was positioned in the 'bottleneck' of a narrow meander, on the right bank of the river. The massive construction of the fortlet of Haus Bürgel ▶35 with its projecting round towers is typical of the Late Roman period (fig. 2.18). Today it is situated on the right bank of the Rhine, but in the Roman period it was located on the left bank of a large meander, perhaps in a position similar to that of Neuss-Reckberg. It is the only military installation on the Lower German frontier with partly standing walls, incorporated into a castle of medieval and later

Fig. 2.18 Aerial view of Monheim-Haus Bürgel ▶35. Parts of Late Roman masonry are still visible in the buildings' facade today.

date. The reduced Late Roman fort at Dormagen ▶36 had similar dimensions.

Watchtowers were the smallest military structures, with their walls rarely exceeding 20 m in length. They could be surrounded by earthen embankments or additional stone walls and by one or two ditches. Given their small size they are extremely difficult to trace. In all, over a dozen towers are known or suspected along the Rhine, but many more may have existed.

Intensive field survey and large-scale excavation have produced a series of five timber watchtowers along a particularly winding stretch of the river between the forts of Utrecht-Hoge Woerd ▶8 and Woerden-Centrum ▶6. It was possible to preserve one of these, at Utrecht-Groot Zandveld ▶9. These are the earliest known watchtowers on the frontiers along the Rhine and the Danube. There are some indications that one or more timber towers in the Utrecht area were succeeded by stone towers. At Neuss-Reckberg ▶34a a stone tower of c. 5 × 5 m has been attested, only 200 m northwest of the fortlet mentioned earlier. Two successive stone towers existed in the dynamic stretch of the Rhine at Xanten-Lüttingen, but these could not be preserved; along with that of the Reckberg they demonstrate that more towers may have occurred at very specific positions in the riverine landscape.

A much more massive stone tower has been attested at Moers-Asberg ▶30, built in the late 4th century AD on the site of the auxiliary fort evacuated at the end of the 1st century. The tower of 18 × 18 m was surrounded by an extra defensive wall of c. 38 × 38 m and by a wide ditch. Installations of this type are often labelled *burgus*, and are common on some other frontier sections. On the left bank of the Rhine it is the only preserved example.

Temporary camps

Temporary camps were standard elements of the Roman military repertoire, constructed for protection for short periods of time. They were built for different purposes, for instance as a shelter during field operations or sieges, in advance of the completion of a permanent base, or just for training. When they were occupied for less than a campaign season the troops will have camped in tents, leaving comparatively few traces. Usually little more than an earthen wall and the surrounding ditch would have remained after the troops left. Today several can still be discerned on the surface.

Accommodation of the troops in tents required much less space than in a permanent base with its solid barracks and additional buildings such as warehouses and workshops. Temporary camps were therefore considerably smaller than permanent ones. On the Lower Rhine nearly 200 temporary camps have been attested so far, most of them in clusters of up to several dozen. Large clusters have been found at distances of a few kilometres from the legionary fortresses of Xanten-Fürstenberg ▶28 and Bonn ▶41. The majority of the camps involved have sizes in the range of c. 0.5–2.5 ha; larger camps of c. 3–5 ha are much rarer (fig. 2.19).

Those temporary (or marching) camps occurring in dense clusters have been further interpreted in their function as manoeuvring camps built for training purposes, similar to clusters outside the legionary bases of Chester and York (UK) or at Strasbourg (FR) and Komárom (HU).

The sizes and arrangement of the camps near Bonn suggest that they are the remains of incidental move-

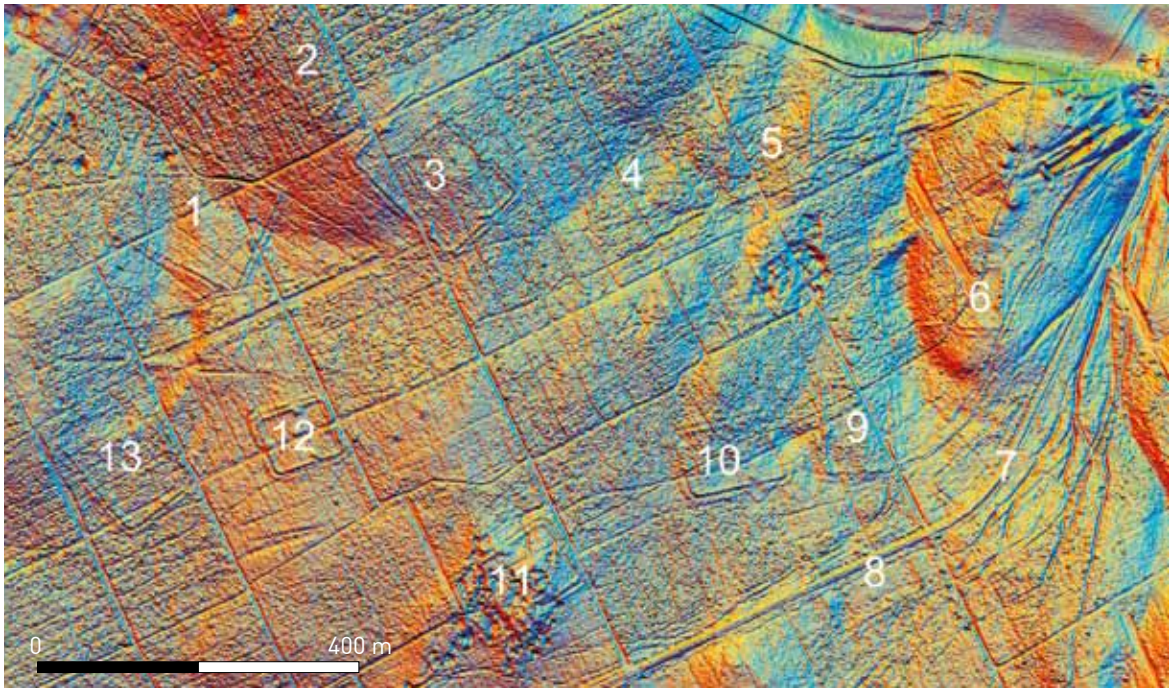

Fig. 2.19 Digital elevation model of the temporary camps at Uedem-Hochwald ▶25 (north at top).

ments of a single legion and its associated auxiliary forces, as mentioned in the context of imperial visits in the historical sources. In view of the similar sizes, most of the temporary camps in the vicinity of Xanten are probably manoeuvring camps as well, but the arrangements suggest that these reflect a joint operation of several legions and their auxiliary units. Those of Wesel-Flüren ▶26 were located on the right bank of the Rhine, demonstrating that the opposite river bank was claimed for military purposes, confirming literary and epigraphical sources.

A few temporary camps are considerably larger, ranging from c. 10–30 ha, providing space for possibly as many as 10–30,000 troops. These camps were clearly built for large armies involved in or preparing for a war. In the case of camp B at Till-Kapitelshof ▶22 it is clear that it was used for a somewhat longer period than the others, as it was provided with a timber-framed wall. The presence of four to five defensive ditches indicates that it was located in a very hostile environment; it might well be the camp of *Arenacum* mentioned in a description of the Batavian revolt of AD 69/70 in a historical source.

Fig. 2.20 Gravestone of one Horus from Alexandria in Egypt who served in the Rhine fleet ('EX CLASSE') garrisoned in Köln-Alteburg ▶39.

Fleet base and bridgehead fort

The Rhine was used for naval operations from the very start of the Roman occupation of the area. Initially, the fleets were presumably ad hoc flotillas used for exploration and for transport of troops and supplies. A standing fleet may not have existed before the 40s AD. The irregularly shaped fort of Köln-Alteburg ▶39 has been identified as the main base of the Roman fleet on the Rhine, on account of the presence of numerous tile stamps mentioning the *classis Germanica* ('German fleet'), and of gravestones and votive altars mentioning fleet personnel (fig. 2.20). As the fort is located on the river terrace, c. 8 m above the water level of the Rhine, the harbour installations must have been located along the river channel, but so far no remains of it have been attested.

The Roman army was very reluctant to build bridges over rivers on external boundaries. All known permanent bridges across frontier rivers date to the Late Roman period, and were secured by heavily fortified bridgehead forts on the opposite river bank.

The Late Roman bridgehead fort of Köln-Deutz ▶38 is the only known permanent military post on the

Fig. 2.21 Results of the geophysical surveys of the civil settlement (*vicus*) west of the fort of Kalkar-Bornsches Feld ▶24.

right bank of the Lower Rhine, serving to protect a permanent bridge. Both fort and bridge were built c. AD 310–315, to permit swift military actions across the Rhine. The fort was a strong square construction of c. 1.8 ha, with an estimated garrison of c. 500–1,000 troops. The 3.3 m thick stone wall was provided with two gates, flanked by rounded towers, and with fourteen additional towers.

Civil settlements and cemeteries

Permanent forts and fortresses constituted the cores of much larger agglomerations which included additional military facilities as well as civil buildings. In the case of legionary fortresses these agglomerations are known as *canabae legionis*; those around auxiliary forts are generally called (military) *vici*. These settlements developed as ribbons along the roads leading to and from the fortifications, before expanding laterally.

The largest military facilities known from extramural settlements are exercise halls or *campi* – open training courts which could measure more than 100 × 100 m, surrounded by covered halls and porticoes. At Xanten-Fürstenberg ▶28 two to four *campi* have been located recently. An amphitheatre has been known for much longer here, and amphitheatres are known from extramural settlements elsewhere. Bath houses occur in both *canabae legionis* and military *vici*, quite often immediately outside one of the fort gates, as at Utrecht-Hoge Woerd ▶8 and probably Bunnik-Vechten ▶11.

The extramural settlements provided accommodation for a wide variety of non-combatants, including soldiers' families, artisans and merchants. Such remains are known from Valkenburg-Woerd ▶2 and are doubtless hidden in the extramural areas of sites like Leiden-Roomburg ▶5, Utrecht-Hoge Woerd ▶8, Bunnik-Vechten ▶11 and Kalkar-Bornsches Feld ▶24 (fig. 2.21).

The deceased were buried outside the settlements, along the main roads or elsewhere in the periphery. For most of the Roman period the dead were cremated; the burnt remains were buried in pits, often ac-

Fig. 2.22 Glass vessels from a cremation burial uncovered in Moers-Asberg (*Asciburgium*).

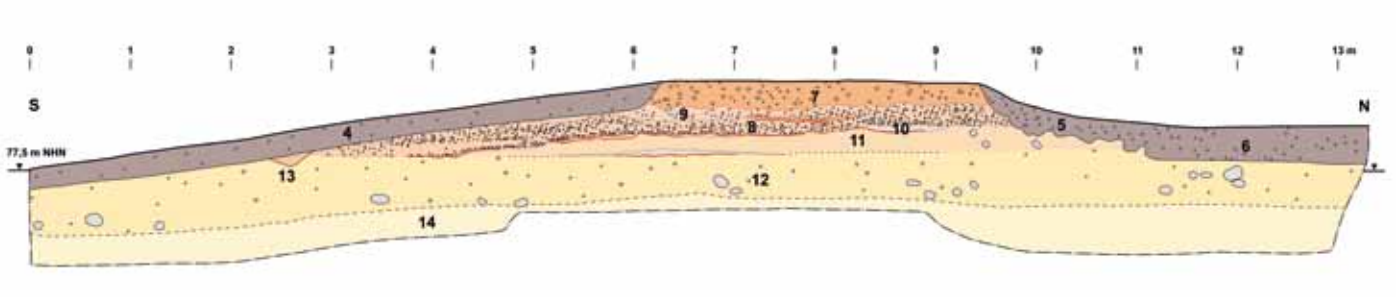

Fig. 2.23 Cross-section of a Roman road near Kleve-Reichswald ▶21 with the different layers of its substructure visible (nos 7–10).

companied by pottery, brooches and other personal objects. On the surface the graves might be marked by gravestones or larger stone monuments; on the Lower Rhine circular and rectangular ditches occur as grave markers, with or without low mounds inside them. Burials are among the most difficult features to trace by means other than (destructive) excavation (fig. 2.22), which explains why the presence of unexcavated parts of cemeteries is only attested for some of the larger clusters of component, as with Kalkar-Bornsches Feld ▶24.

Limes road

'Limes road' is the convenient name for the road which connected the military installations along the external frontiers of the Roman Empire. On the Lower Rhine the road typically consisted of an embankment 6–15 m wide, metalled with thick layers of gravel and flanked by drainage ditches, as at Kleve-Reichswald ▶21 (fig. 2.23). Where the road was exposed to flooding, however, the embankment was consolidated by rows of posts, in some cases clad with planks and connected by tie beams, as at Utrecht-Balije ▶7c.
The earliest section of the Limes road on the Lower Rhine was between Köln and Trier on the river Mosel-le, constructed in or soon after 17 BC. Its northward extension as far as Xanten appears to date from the very beginning of the 1st century AD. Downstream from Bunnik-Vechten, however, the Limes road seems not to have been built before the 80s of the 1st century. This explains why the forts of Utrecht-Hoge Woerd ▶8 and Utrecht-Domplein ▶10 were not on the line of the Limes road, but connected to it by branch roads, since the main road by-passed the large meanders on which these forts were located.

Kiln sites

One of the largest known facilities for lime production in the Roman Empire is situated at Iversheim ▶43. Six kilns with a workshop and other buildings illustrate the process of converting local limestone into quicklime for building purposes, up to 200 tons per month. Inscriptions demonstrate that this facility was operated by the legion stationed at Xanten.
The army also produced huge quantities of ceramic roof and floor tiles, conduits and elements for heating systems. Initially the kiln sites were spread out over the frontier zone, but from the early 2nd century onwards the manufacture was concentrated at Berg en Dal-Holdeurn ▶18, a production unit set up in the

Fig. 2.24 Tableware and coarse pottery made by and for the *legio X* stationed at Nijmegen.

Fig. 2.25 The remains of the Roman earthworks at Berg en Dal-aqueduct ▶17 are still clearly visible in the landscape today.

late 1st century by the legion stationed at Nijmegen. Several kilns and buildings illustrate the enormous scale of production. In the early stage of its existence the kiln site was used for the manufacture of pottery as well (fig. 2.24).

Aqueduct

Aqueducts are well known in the context of water supplies to cities, but they have also been attested near legionary fortresses. The water demand of such bases may well have amounted to five million litres a day, not accounting for demand within extramural settlements and for industrial activities. It may not have been easy to supply such volumes from wells and from cisterns collecting rain water.
The legionary fortress of Nijmegen-Hunerberg was served by the aqueduct of Berg en Dal-aqueduct ▶17. Collecting water from natural sources and aquiferous strata it ran over a distance of 5.5 km, cutting through a low hill and bridging three valleys (fig. 2.25).

Towns and governor's palace

In the Lower German frontier zone towns developed very slowly. In the 1st century AD ribbon development seems to have prevailed over the classic chequerboard layout known from towns in the interior of the Empire. It took strong imperial encouragement and military assistance in the early 2nd century to provide the district capitals of the Lower German frontier with the types of monumental public buildings normally financed by the urban elite. It was only then that these towns developed an internal structure with square *insulae* (blocks of houses) (fig. 2.26); sooner or later the towns were provided with a wall and ditch. At Xanten-CUT ▶27 a fort was built inside the city wall in the 3rd century. In the late 3rd or early 4th century the entire city was reduced to a military stronghold covering the nine central *insulae*.
The provincial capital of Köln underwent a more prosperous development, due to its promotion to a *colonia* by AD 50 and to the presence of the headquarters of the commander of the Lower German army, which served as the seat of the provincial governor after the creation of the province of Lower Germany c. AD 85. The *praetorium* or governor's palace was situated on the river front at Köln, clearly visible from the opposite bank. The building was repeatedly enlarged and rebuilt until it occupied as much as four *insulae* of c. 100 × 100 m each. The palace served several times as the residence of emperors and usurpers.

Sanctuaries

In the Lower Rhineland, monumental temples were first introduced in the Roman period, succeeding the open air sanctuaries of the Iron Age. Most temples belong to the so-called Gallo-Roman type, characterised by a high *cella* (cult room) surrounded on all four sides by a *porticus*. Although it is likely that most temples were dedicated to a single deity, they attracted dedications to other gods and goddesses as well. Classical deities from the Greek-Roman pantheon were regularly identified with regional deities, resulting in mixed creations such as Hercules Magusanus, which was particularly popular amongst soldiers.
It has been claimed that this god was venerated in the Gallo-Roman temple of Elst-Grote Kerk ▶13, but

Fig. 2.26 Artist's impression of the *Colonia Ulpia Traiana* in the 2nd century AD. The city's internal structure is defined by streets laid out in a grid pattern forming square blocks of buildings, so called *insulae*.

conclusive evidence is lacking. It is, however, clear that the army was involved in the erection of this monumental temple on the site of an earlier open air sanctuary. The military connection of the Gallo-Roman temple of Kalkarberg ▶23 is even stronger, with inscriptions testifying to the veneration of the Germanic goddess Vagdavercustis by military personnel (fig. 2.27).

Riverine infrastructure and deposits

The most telling example of how the Roman army tried to adjust the riverine landscape to its needs is the artificial channel connecting the rivers Rhine and the Meuse, just behind the coastal barriers. The purpose of this canal was recorded by the historian Tacitus as 'to avoid the dangers of the sea', and its construction attributed to the army commander Cn. Domitius Corbulo – hence its modern name Corbulo's canal – and dated to AD 47. In fact, the connection between the two rivers is not artificial over its entire length of c. 30 km as it includes two natural channels. In several excavated sections the artificial section of the canal has been shown to be c. 12–14 m wide and 1.5–2.0 m deep. For most, if not all, of its length the sides of the canal were consolidated by rows of posts. From their tree-ring patterns, felling dates in AD 50 have been calculated, indicating that either the construction took several years or the rows of posts were added somewhat later than excavation of the canal itself.

Fig. 2.27 Selection of finds from the sanctuary Kalkar-Kalkarberg ▶23.

Fig. 2. 28 Timber structures of the harbour of Xanten-CUT ▶27 during excavation.

Fig. 2. 29 Frame saw (a) and block plane (b) recovered from a Roman cargo vessel excavated at Utrecht-Limes road | Balije ▶7c.

Since the Rhine was the easiest way to supply the military infrastructure with heavy and bulk goods, it is likely that all fortifications along the river channel were provided with mooring facilities of some kind. In their most elementary form they could consist of simple rows of posts along the river channel, as at Leiden-Roomburg, or of revetments locked behind heavy uprights, as at Bunnik-Vechten. More elaborate constructions away from the main river course, as attested at Xanten-CUT and Voorburg-Arentsburg, may be described as harbours (fig. 2.28).

The importance of waterborne supply explains why great pains were taken to maintain access to the river channel if it migrated away from the military installation. In such cases new rows of posts or revetments were constructed out into the receding river channel, backfilling the intermediate space with soil, brushwood and settlement waste. Excavations at Bunnik-Vechten have demonstrated that the river bank was built out as far as 60 m.

When the river migrated away from the military settlement, waste dumped into the river channel was no longer washed away but instead covered with sediment. In this way layered waste deposits were gradually built up which provide a detailed image of everyday life on the frontier over time. Such deposits have been attested at several sites, from Kalkar-Bornsches Feld ▶24 to Leiden-Roomburg ▶5.

Ship wrecks first of all reflect the key importance of rivers for the transport of troops and supplies. Excavations at Alphen aan den Rijn-Zwammerdam (table 2.1), Woerden-Centrum ▶6 and Utrecht-Balije ▶7c have further demonstrated that occasionally ships were deliberately sunk to serve as a foundation for a quay or as protection against erosion of the river bank. Ships may therefore be part of the built riverine infrastructure as well as providing evidence of transport and supply. The component parts of *Frontiers of the Roman Empire – The Lower German Limes* include remains of at least two ships: a patrol craft at Bunnik-Vechten ▶11 and a cargo ship at Utrecht-Balije ▶7c. A geophysical survey suggests that there may be another ship still intact at the latter site, and given the large numbers of ships found so far, it is very likely that more ships are hidden in other component parts (fig. 2.29).

Table 2.1 Brief description of elements of F*rontiers of the Roman Empire – The Lower German Limes*. The elements included in the nomination are preceded by the number of the component part used throughout this study. Elements without a number (shaded) have been rejected.

id	name	brief description
- - -	Katwijk-Brittenburg	Auxiliary fort. At various times in the 16th and 17th centuries the remains of a stone fort have been observed on the beach of the North Sea during extremely low tide. A drawing made c. 1560 and several illustrated and collected finds seem to confirm that the remains belong to a Late Roman fort, presumably with an earlier predecessor. Despite repeated efforts it has not been possible to establish the location of the fort. For this reason the site was not included in the nomination.
- - -	Katwijk-Uitwateringssluis	Civil settlement. During the construction in the 1980s of a new lock regulating the outflow of the Rhine into the North Sea, several Roman finds and features were excavated which were thought to be remains of the military *vicus* belonging to the presumed fort of the Brittenburg (cf. above). The excavation was very limited and although, in view of its location, the interpretation of the features as part of a military complex is plausible, the extent of the settlement is unclear and the modern setting makes sustainable protection of any remaining features impossible.
1a	Valkenburg-Centrum | Kerkweg	Auxiliary fort. The fort at Valkenburg-Centrum was built on the western bank of the Roman Rhine, close to its estuary, immediately bordering the river channel. The fort is the best known example of the 'delta type' with two ranges of internal buildings instead of three. It is thought that six successive forts were occupied from c. AD 40 until 270, with initially timber and later stone building phases. Some finds from the Late Roman period suggest activity in the period AD 270–450. The preservation of the timber remains is especially good, but parts of the stone walls were also found standing to a height of 50 cm, which is rare in the delta. The site has been investigated through large-scale excavations, but parts of the fort remain in the ground, and the preservation of organic material continues to be excellent. Although the northeast corner of the fort was eroded by the Rhine in the Middle Ages, the state of preservation of both timber and stone remains and the attested longevity of the fort justify the site's inclusion in the nomination. Component part 1a includes the unexcavated north-western corner of the headquarters building. This main building of the fort was situated at the same location within the fort throughout all the building phases.
1b	Valkenburg-Centrum | Centrum	For a general description cf. component part 1a. Component part 1b includes various parts of the fort: most of the two main roads within the fort, the northwest part of the headquarters building, sections of the defensive structures throughout all the building phases, parts of the commander's quarters from the earliest phase and parts of infantry and cavalry barracks from successive phases.
1c	Valkenburg-Centrum | Raadhuis	For a general description cf. component part 1a. Component part 1c, located in the northeast corner of the fort, includes the remains of cavalry barracks from the earliest building phase and of large buildings from subsequent phases.
1d	Valkenburg-Centrum | Kerkhof	For a general description cf. component part 1a. Component part 1d, located in the southwest corner of the fort, encompasses part of the defensive structures of the fort throughout the different building phases.
2a	Valkenburg-De Woerd | North	Civil settlement, Limes road, quays. The civil settlement of Valkenburg-De Woerd is the best known example of a military *vicus* in the Rhine delta, which is one of the main reasons for its inclusion in the nomination. Habitation started around AD 50 and lasted until the middle of the 3rd century AD. The layout and finds assemblage indicate that the site was an extra-mural civil settlement connected to a fort, but its association with the fort of Valkenburg-Centrum ▶1, situated c. 1 km north of De Woerd, is not clear. The settlement consisted of strip houses stretching out along the Limes road. The houses were built on an artificially raised platform, necessitated by the wet conditions near the estuary of the Rhine. The rows of posts lining the Limes road, the heavy posts of quays and rows of posts along the river bank, all well-preserved, were also a response to these conditions. Component part 2a holds evidence for a bend in the Limes road, probably because the earlier straight course had been washed away by the river. Just south of this bend, traces of a channel connected to the Roman Rhine have been discovered. It is likely that that a bridge or similar structure had to be constructed here to carry the main course of the Limes road.
2b	Valkenburg-De Woerd | South	For a general description cf. component part 2a. Component part 2b contains the remains of rows of posts lining the river bank and of parallel series of heavy posts indicating the presence of quays. The Limes road continues in a straight line through this southern component part, with strip houses aligned to it. About halfway through, the course of the Limes road crosses a watercourse connected to the Roman Rhine. It has been shown that the road in this area had at least two phases, with the latest phase dated to AD 123/125.
3	Voorburg-Arentsburg	Town, harbour. The civil town of *Forum Hadriani* owed its existence largely to the 2nd-century emperor Hadrian. It was a very late creation in the frontier zone, meant to serve as the administrative centre of the tribal area of the Cananefates. The built-up area of the town was divided into rectangular blocks of irregular size and shape. The town houses and other buildings were mostly built in timber, but stone buildings stood in the centre of the town, including a large bathhouse. The surface area of the town lay between 9 and 14 ha, varying between building phases. At some point the town was enclosed by a stone wall and a double ditch. The finds assemblage from the town has some particular military characteristics, suggesting that the town played a part in the supply of the army. In AD 160 a natural channel within the town area was transformed into a harbour through the construction of timber revetments and quays. The harbour was connected to Corbulo's canal ▶4, allowing transport to the Rhine frontier in the north as well as to the estuary of the Meuse and Waal to the south, and to that of the Scheldt still further south. In the early 3rd century AD repairs were made to the harbour quays. Habitation ended in the early 4th century at the very latest. The site is relatively well preserved. The excavations in the early 19th and 20th centuries in parts of the town were only partly destructive. Because of the level of preservation and the assumed military connection of this civil town with its harbour, the site of Voorburg-Arentsburg has been included in the nomination.

id	name	brief description
4a	Corbulo's canal | Vlietwijk	Canal. The existence of a man-made canal between the Oude Rijn near Leiden-Roomburg ▶5 and the river Meuse southwest of Naaldwijk has been established in several locations. So far the canal, which connected two natural channels, has been attested over a distance of 11 km, being on average c. 12–14 m wide and c. 1.5–2.0 m deep. Nearly everywhere the sides of the canal were consolidated with rows of timber posts, which are well preserved. There is also evidence for further reinforcement of the sides through the use of wattle between the timber revetments and the application of clay sods. This man-made canal can be equated with the historically attested canal dug over a distance of 23 Roman miles by soldiers under supervision of the army commander Corbulo in AD 47. The favourable conditions for the preservation of timber have allowed the establishment of felling dates as precise as the spring of AD 50. Man-made canals are a rare category on their own account, but Corbulo's canal stands out because of its preservation and historical context. Component part 4a is the most northerly of six component parts covering the 11 km stretch along which the canal has been attested. At Vlietwijk, the canal seems to have been dug into a largely silted-up natural tidal channel.
4b	Corbulo's canal | Starrenburg	For a general description cf. component part 4a. Component part 4b is the northerly of three component parts (4b–d) where excavations have established the course of the canal. Here it has been dug through peat.
4c	Corbulo's canal | Knippolder	For a general description cf. component part 4a. Component part 4c is the middle of three component parts (4b–d) where excavations have established the course of the canal. The canal has been dug through peat at Knippolder. In addition, natural creeks have been discovered next to the canal. The canal seems to have taken a turn inland at this location.
4d	Corbulo's canal | Vlietvoorde	For a general description cf. component part 4a. Component part 4d is the southerly of three component parts (4b–d) where excavations have established the course of the canal. The canal has been dug through peat at Vlietvoorde. At this location the course of the canal seems to have shifted in its second phase. On the eastern side there are traces of an earlier natural creek.
4e	Corbulo's canal | Rozenrust	For a general description cf. component part 4a. Component part 4e holds traces of a second, possibly natural creek next to the canal.
4f	Corbulo's canal | Romeinsepad	For a general description cf. component part 4a. Component part 4f is the most southerly of six component parts covering the 11 km stretch along which the canal has been attested. Here the width of the canal has been established as 14 m. Following the course of the canal in the direction of the Meuse, it appears that not far outside the component part the canal bent away to the west, crossing a coastal barrier.
5a	Leiden-Roomburg | Park Matilo	Auxiliary fort, civil settlement, harbour installations, riverine waste deposits. The site of Leiden-Roomburg holds the remains of a military complex centred on an auxiliary fort of the 'delta type', built at the junction of the river Rhine and a tributary river c. AD 40/50. This natural channel was connected to the town of Voorburg-Arentsburg ▶3 and to the river Meuse further south by Corbulo's canal ▶4. The fort was evacuated in the 3rd century AD, but finds indicate some activity in the later 3rd and 4th centuries. The well-preserved timber revetments and quays along the natural channel are part of the nominated complex, as are the riverine waste deposits containing a wealth of organic remains. The site also includes many remnants of the extra-mural civil settlement, the periphery of which has been found in excavations. The fort itself has been excavated only to a very limited extent; consequently, practically nothing is known about the fort's interior. The limited scale of excavation, the favourable conditions for preservation of organic remains and the presence of several key values of the Lower German Limes justify the inclusion of this site in the nomination. Component part 5a includes the unexcavated parts of the civil settlement surrounding the fort and extending along the southern bank of the natural channel. To the east, part of the bank of the Rhine is included. The extent of the civil settlement has been attested by coring and trial trenches. Its precise lay-out, however, remains unknown. The component part is likely to include roads leading to the west and south.
5b	Leiden-Roomburg | Besjeslaan	For a general description cf. component part 5a. Component part 5b includes unexcavated parts of the extra-mural civil settlement south of the fort. The boundaries of this settlement have been established by coring and trial trenches, but the lay-out is otherwise not known. The component part is likely to include a road leading to the south, possibly lined with burials.
- - -	Limes road Alphen aan den Rijn | West	Limes road. On account of coring surveys the presence of the Limes road was expected at various locations between Alphen aan den Rijn and Zoeterwoude-Rijndijk. Its existence has been confirmed in two trial trenches, but the preservation was not sufficient to include the section in the nomination.
- - -	Alphen aan den Rijn-Hoorn	Limes road (?), fortlet (?), watchtower (?). Markers for Roman roads have been identified at several locations within the Hoorn area, but the course of the Limes road could not be securely established. A concentration of pottery fragments and the presence of wooden posts might relate to the presence of a fortlet or watchtower, but this identification remains uncertain. The site is therefore not included in the nomination.
- - -	Alphen aan den Rijn-Centrum	Auxiliary fort, civil settlement, riverine waste deposits. The auxiliary fort of Alphen aan den Rijn, belonging to the 'delta type', was almost completely excavated in c. 2000 (with nothing preserved). At the same time a considerable proportion of the waste deposits in the former riverbed was investigated. It is likely that significant parts of the extra-mural civil settlement still remain, but their extent and layout remain unclear. This site has therefore not been included in the nomination. All aspects of the site are better represented elsewhere.

id	name	brief description
- - -	Alphen aan den Rijn-Goudse Rijpad	Watchtower (?). The number and character of surface finds collected here and the location along the Limes road have often been taken as indications of the presence of a small military post, possibly a watchtower. Despite several surveys and a limited excavation, this hypothesis has not so far been confirmed, but watchtowers are very difficult to locate. On the basis of the evidence currently available, it is not possible to include the site in the nomination.
- - -	Limes road Alphen aan den Rijn | East	Limes road. On account of coring surveys the presence of the Limes road was expected at various locations between Zwammerdam and Alphen aan den Rijn. Its existence was confirmed in one of two trial trenches , but the preservation was not sufficient to include the section in the nomination.
- - -	Alphen aan den Rijn-Zwammerdam	Auxiliary fort, civil settlement, riverine waste deposits, ships. At Zwammerdam an auxiliary fort was completely excavated in c. 1970 (with nothing preserved). It can be classified as a 'delta type' fort. A large segment of the adjacent riverine waste deposits has been excavated as well, together with the remains of six ships from the Roman period. Parts of the extra-mural civil settlement are probably still preserved, but its extent and layout are unclear. Because of the near complete destruction of the fort and the fragmentary knowledge of the remaining elements of the civil settlement, the site is not included in the nomination. All aspects of the site are better represented elsewhere.
- - -	Bodegraven-Centrum	Auxiliary fort (?). In the town centre of Bodegraven some remains of a small timber military installation have been attested, built in the mid-1st century AD. The size and shape of the fort have yet to be determined – it may have been a small fort of the 'delta type' or an even smaller installation. In two locations well-preserved timber has been uncovered. The finds assemblage indicates military activity starting around the middle of the 1st century AD and probably extending into the 2nd or 3rd century. In 2018 efforts were made to establish the extent of the fort by geophysical research and a trial trench, but neither method proved successful. Currently there are no other locations available through which to assess the size and form of the fort. In the absence of any further evidence it is impossible to include the site in the nomination. Should future research be more successful and provide further evidence of good preservation of timber and other organics, consideration may be given to include the fort through a proposal for a minor boundary modification.
- - -	Limes road Woerden-Bodegraven	Limes road. On account of coring surveys the presence of the Limes road was expected at various locations between Woerden and Bodegraven. Its existence seemed to be confirmed in three of six trial trenches, but the preservation was not sufficient to include the section in the nomination.
6	Woerden-Centrum	Auxiliary fort. The town centre of Woerden is built on the remains of an auxiliary fort of the 'delta type'. It was situated on the southern bank in a bend of the Roman Rhine. The fort was founded in the early 40s AD and initially built of earth and timber. The first phase of the fort has an orientation differing from that of the later ones and knowledge of it is very incomplete. Part of it appears to be buried beneath the rear section of the later forts, and is therefore included in the nominated property. In the late 2nd century the rampart and some inner buildings were rebuilt in stone. The interiors of the successive forts remain largely unexcavated; only some sections of timber buildings and a small section of stone wall have been attested. The fort seems to have been evacuated or abandoned in the 3rd century, but the levels from this period are not well preserved.
- - -	Limes road Harmelen-Woerden	Limes road. On account of coring surveys the presence of the Limes road was expected at several locations between Harmelen and Woerden. Its existence was confirmed in only one of three trial trenches and the preservation was not sufficient to include the section in the nomination.
7a	Utrecht-Limes road | Zandweg	Limes road, watchtowers, ship. West of the fort of Utrecht-Hoge Woerd ▶8 a c. 2.5 km long section of the Limes road was traced along the southern edge of three large meanders of the Rhine. Initially, from the mid-1st century AD onwards, the river bends were protected by timber watchtowers. The Limes road was built later, probably in the 80s AD. Like all other known sections of the Limes road in the western delta, it was rebuilt in AD 99/110 and 123/125, presumably following personal inspection by the emperors Trajan (AD 98–117) and Hadrian (AD 117–138). The foundation of the road consisted of an earthen embankment 10 m wide on average, but the road itself appears not to have been wider than c. 5 m. The embankment was consolidated either immediately or very soon after construction with rows of timber posts; on the river side of the road in some places and on both sides in others. In some sections these rows of posts were clad with planks on the inner side, to reduce the lateral pressure of the soil. The revetments on either side were occasionally linked with tie beams. The watchtowers and roads were constantly threatened by erosion from the shifting river bends. Particularly vulnerable sections of the river bank were consolidated by revetments, and in one case by the deliberate sinking of a large cargo ship. The road section represented by component parts 12a–c is likely to be characteristic of much of the section between the military complex of Bunnik-Vechten ▶11 and Harmelen (further west), as various small excavations in the built-up area of the municipality of Utrecht have demonstrated. Between Harmelen and the North Sea coast the course of the Limes road is often less certain and the integrity of the attested remains frequently does not meet the standards required for nomination (cf. several records below). Because the well-preserved road section in Utrecht is located in an area with high development pressure (urban, infrastructure), the potential for sustainable protection is limited. The three component parts 12a–c constitute a small but high-quality example of the Limes road in the Rhine delta.

id	name	brief description
		Component part 7a is the most westerly of the three component parts. Here, three phases have been identified in the construction of the Limes road. The surrounding ditch of an excavated timber watchtower is still partly preserved under the edge of the Limes road. Buried remains of a Roman ship may still lie in the former riverbed.
7b	Utrecht-Limes road | Veldhuizen	For a general description cf. component part 7a. Component part 7b is the middle of the three component parts. Excavations have shown that here the initial road revetment was replaced between AD 91 and 100 because of erosion caused by river activity. The length of the revetment, at least 70 m, indicates that this must have been a large-scale water management project.
7c	Utrecht-Limes road | De Balije	For a general description cf. component part 7a. Component part 7c is the most easterly of the three component parts. The earliest phase of the Limes road was found here to post-date the ditch of a watchtower. The road was twice damaged by the Rhine, in spite of its consolidation by timber revetments and basalt blocks. Further evidence for erosion comes from a c. 35 m long cargo ship which was deliberately sunk around AD 100 to consolidate the revetments. This ship is still largely preserved underground. Some 50 m further east the earlier of two 1st-century watchtowers is partly preserved.
- - -	Utrecht-Meerndijk	Dug canal (?). A water channel attested below a dike named the Meerndijk has been taken as a partly artificial connection between the Rhine near Utrecht-Hoge Woerd ▶8 and the Hollandse IJssel further south. It is, however, a matter of discussion whether it was a natural connection or partly artificial. Since the supposed artificial water channel is situated below the dike, further investigation is not possible. In the absence of conclusive evidence this site was not included in the nomination. Corbulo's canal ▶4 further to the west is a well-attested example of a dug canal.
- - -	Utrecht-Touwslagerslaan	Watchtower (?). On account of finds of pottery and a sling shot, this site has been in the past considered as a possible watchtower. In view of recent new insights into the relationship between the locations of watchtowers and the course of the Rhine in this area, this is no longer considered likely.
8a	Utrecht-Hoge Woerd | Castellum	Auxiliary fort, civil settlement, cemetery, riverine waste deposits. The Hoge Woerd area encompasses a succession of 'delta type' forts, most of the extra-mural civil settlement, parts of the cemeteries, a 400 m long stretch of the Roman Rhine channel in front of the forts, and roads departing in three directions. The fort was occupied c. AD 40–275. Coins from the 4th century reveal some later activity. This site is one of the few fairly complete examples of the whole of a military complex, including its riverine rubbish deposits. The fort area is relatively untouched by later building and by excavation. The remains of the extra-mural settlement include the lower walls of a stone bathhouse. The silted-up river channel has yielded rich and layered deposits of settlement waste. In addition, it may well hide the remains of one or more ships. Component part 8a includes the larger part of the complex. All the key elements listed above are represented in this component part.
8b	Utrecht-Hoge Woerd | Langerakbaan	For a general description cf. component part 8a. Component part 8b includes traces of the extra-mural settlement to the north and east of the fort and part of a Roman cemetery.
9	Utrecht-Groot Zandveld	Watchtower. The site holds the remains of a timber watchtower, which stood on a sandy ridge c. 1 m high on the south bank of the Roman Rhine. Its ground plan comprises four timber uprights delineating a square of 3 m × at least 2.8 m. The watchtower was surrounded by at least two ditches. The installation appears to have been built in the mid-1st century AD, but was probably in use for only 10–20 years. In the 3rd century AD the river migrated rapidly to the northwest. There are indications that the watchtower may have been succeeded at that time by a somewhat larger military installation, perhaps a fortlet, situated nearer to the new river channel. The remains of the timber watchtower are still largely intact. This is a rare situation since watchtowers are usually only detected during excavation, causing destruction of most or all of the remains. The tower is representative of a series of (excavated) towers which were located along a particularly winding stretch of the Rhine, revealing the critical importance to the Roman military of ensuring close observation of the river channel.
- - -	Utrecht-Duitse Huis	Cemetery. In view of its proximity to the fort of Utrecht-Domplein ▶10 it is likely that this cemetery, attested by excavation, was part of the military complex. It is largely built over and it is uncertain whether much more of it remains.
10	Utrecht-Domplein	Auxiliary fort. The Domplein fort, measuring c. 125 × 150 m at its greatest extent, was built on the southern bank of the Roman Rhine, directly on the river channel. It belongs to the 'delta type', of which it is the largest known representative. Although parts of the successive headquarters buildings and of some of the surrounding buildings have been uncovered, most of the fort's interior is untouched. Founded in the 40s AD, the fort was probably evacuated in the 3rd century. Some Late Roman finds seem to indicate military activity in the period AD 270–450, but there are no known defensive structures from that phase. The very limited extent of excavation and the good preservation of timber and stone remains justify its inclusion in the nomination.

id	name	brief description
11a	Bunnik-Vechten | Marsdijk	Auxiliary fort, civil settlement, cemetery, Limes road, quays, riverine waste deposits, remains of a ship. Vechten is the earliest and largest military site in the western Netherlands, located on the south bank of a now silted-up channel of the Rhine. It was occupied from c. 5 BC to AD 275; finds indicate some later activity, in the 4th century AD. In its final building phase, the fort had the standard three ranges of internal buildings, but it shared the orientation of the 'delta type' forts, with the long front facing the river. The final, stone-built fort was preceded by a series of earth-and-timber forts. With the attested remains of a series of forts of various sizes, a large extra-mural civil settlement and parts of cemeteries it constitutes a fairly complete example of all aspects of a military complex. This includes rubbish deposits in the Roman Rhine channel running in front of the fort. Initially, timber revetments protected the river bank against erosion. However, when the river channel in front of the fort was cut off by a new meander, the river bank was gradually built out by constructing quays and revetments closer to the channel. Part of a military patrol vessel is still buried in the silted-up river bed, and it is possible that other ships are buried here. An excavation 1 km southeast of the nominated property attests the course of the Limes road in its building phase of AD 123–125. It may reasonably be assumed therefore that parts of the Limes road are present in the nominated property as well. Component part 11a includes most of the military complex. It includes all the key elements listed above.
11b	Bunnik-Vechten | Provincialeweg	For a general description cf. component part 11a. Component part 11b is a small part of the civil settlement, situated c. 1 km to the northeast of the Roman fort, showing that the extra-mural settlement stretched over a distance of about 1.5 km along the channel of the river Rhine.
- - -	Bunnik-Schoudermantel	Watchtower (?). Allegedly, the presence of a watchtower was attested here during construction works on the A12 motorway, but there is no proper documentation for this. Since any remains were destroyed during the works, it has not been included in the nomination.
- - -	Limes road Wijk bij Duurstede-Bunnik	Limes road. The region between Wijk bij Duurstede and Bunnik-Vechten ▶11 is the most easterly area of the Netherlands where remains of the Limes road have been attested. Further east, between Wijk bij Duurstede and Herwen-De Bijland ▶19, there is only a general idea of its former course, on account of the geological context of the road further west. The landscape between Wijk bij Duurstede and Bunnik-Vechten is defined by three more or less parallel stream ridges of the Rhine, which successively developed from the Bronze Age until the Late Iron Age. The Limes road must have followed one of these ridges. Archaeological surveys in the past few decades have indicated several possible remains of roads, but the presence of the Limes road was not confirmed in a targeted campaign in the early 2000s. In 2013 the Limes road was clearly identified in an excavation close to the military complex of Bunnik-Vechten ▶11, but its further course to the southeast is still difficult to determine. For this reason this section of the Limes road was not included in the nomination. Several rural settlements in the area may have been situated on the Limes road, but there are no firm indications of any association with the military infrastructure.
- - -	Rijswijk-Roodvoet	Auxiliary fort (?). The finds from quarry pools near the former Roodvoet brick works at Rijswijk had been taken to represent the remains of an eroded fort. The discovery of fragments of three helmets contributed considerably to this assumption. However, the overall assemblage of finds collected during the dredging works is not conclusive. About one third of the collected pottery fragments are medieval or later in date, clearly indicating that the dredged finds do not constitute a homogeneous assemblage. Moreover, the Roman pottery fragments comprise consi derably more handmade pottery than is normal for a military site, which casts severe doubts on the presumed military character of the settlement from which they originate. Although a location near the bifurcation of two Rhine branches would make perfect sense for a fort, the finds assemblage cannot be safely interpreted as such. The site is therefore not included in the nomination. The category of eroded forts is adequately represented Arnhem-Meinerswijk ▶12 and Herwen-De Bijland ▶19.
- - -	Maurik-Eiland van Maurik	Auxiliary fort. Dredging activities in the early 1970s have yielded a large number of Roman finds. Most are dated to c. AD 70–275, but they also include a finds assemblage from the 4th century. The dredging activities were hindered by the presence of concentrations of massive stones at considerable depth. The occurrence among the finds of over 130 tiles stamped by military units supports the assumption that the assemblage represents an eroded fort. So far, however, it has not been possible to attest the presence of any intact remains. As the category of eroded forts is adequately represented Arnhem-Meinerswijk ▶12 and Herwen-De Bijland ▶19, the site has not been nominated.
- - -	Amerongen-'t Spijk	Military post (?). Large-scale quarrying of sand and gravel has produced large numbers of finds from a period ranging from the Late Iron Age to the Late Middle Ages. They include Roman pottery and building debris and several finds with a military association, including a fragment of a Roman helmet. On account of the helmet it had been thought that the Roman finds represented the eroded remains of a small military post (watchtower?) once positioned on the right bank of the Rhine. However, recent geological research indicates that the findspot was located on the left bank in the Roman period. If the finds actually originate from a military post, its position cannot be established. Due to the uncertain character and location of the site, it was not be included in the nomination.

id	name	brief description
- - -	Kesteren-Prinsenhof	Auxiliary fort (?), cemetery. Excavations in the Prinsenhof area have attested the presence of a cemetery, with several horse burials preceding human cremation burials. There are various indications that this cemetery belongs to a (mainly or entirely) eroded fort which was located to the north or northwest of the cemetery. As the known remains of the cemetery have been excavated (with nothing preserved), it has not been included in the nomination.
- - -	Randwijk	Auxiliary fort (?). Situated about halfway between Driel-Baarskamp (previous) and Kesteren-Prinsenhof (next) the area of Randwijk is generally considered as a possible location for a military post. It is situated on a wide pre-Roman stream ridge which provided a north-south land connection between the rivers Rhine and Waal, opposite two access routes into Germanic territories to the north of the Rhine. There are three findspots in the region which have produced some Roman finds with a military character, but always alongside pre- and post-Roman material. The presence of some Roman military finds is a general phenomenon on rural sites in the Dutch river area. Without additional evidence therefore, none of the three findspots at Randwijk can be interpreted as a military settlement.
- - -	Driel-Baarskamp	Military post (?). The hypothesis of an early military installation at Driel-Baarskamp is based on a dozen Early Roman finds and on its location at the presumed junction of a regional road with the Limes road, of which only the former has been attested as yet. Non-destructive research has failed to produce further positive evidence, and the finds assemblage is rural rather than military. On account of its uncertain character the site has not been included in the nomination.
12	Arnhem-Meinerswijk	Auxiliary fort, civil settlement. The fort at Meinerswijk was located at a strategic position near the bifurcation of the Rhine and the Gelderse IJssel. It is assumed that the latter can be partially equated with a canal dug by the Roman army to create a shorter route to the north, but this has not yet been archaeologically confirmed. The canal was used in the German campaigns of 12 BC and AD 15. At Arnhem-Meinerswijk the remains of a succession of forts and the associated extra-mural civil settlement have been discovered, but a considerable part of the site has been eroded by the river. The best known remains are those of the stone headquarters and defences at the rear of the fort. In the eastern part of the Dutch river area it is the only representative of the 'delta type' fort, and the only one so far with surviving remains. The finds assemblage points to activity at this site from c. AD 10/20 until 250, with some Late Roman activity here as well. Structural remains from the early period have not yet been attested since the limited excavations barely reached the earlier layers, but given the high groundwater table the quality of preservation is probably very good. It is also possible that the former river channels which have eroded the fort and the civil settlement still contain Roman remains at great depth. The attested and projected remains, and the fort's association with key historical events, are the reasons for inclusion the site in the nomination.
- - -	Duiven-Loowaard	Auxiliary fort. Large-scale quarrying of sand and gravel has produced considerable numbers of unequivocally military finds, including massive wall fragments at great depths. These are most likely the remains of a fort which has been largely or entirely eroded by the Rhine. It is so far unknown whether any parts of the military complex have remained intact, so it is impossible to establish its boundaries. As the category of eroded forts is adequately represented by Arnhem-Meinerswijk ▶12 and Herwen-De Bijland ▶19 the site has not been selected.
- - -	Elst-Westeraam	Sanctuary. A few kilometres to the east of the temple of Elst-Grote Kerk a smaller Gallo-Roman temple has been excavated. This temple belonged to a nearby rural settlement. There are no indications of any association with the army. Because the temple is nearly completely excavated (with nothing preserved) the temple site has not been selected.
13	Elst-Grote Kerk	Sanctuary. The remains of the temple at Elst are buried below the present Grote Kerk, built in the 15th century, and its Early Medieval predecessors. In its final shape the temple belongs to the so-called Gallo-Roman type, combining Roman elements with some only known to the north of the Alps, and was one of the largest temples of this type in the Gaulish and German provinces. The monumentality of the temple at Elst-Grote Kerk suggests that the Roman army was involved in its construction. The main deity assumed to have been venerated here, Hercules Magusanus, appears to have been especially popular among soldiers and veterans. This military connection and the good preservation of timber and stone remains were reasons for inclusion of this site in the nomination.
- - -	Nijmegen-*Ulpia Noviomagus*	Civil town. After the destruction during the Batavian revolt of AD 69/70 of the Early Roman urban settlement in the Valkhof area ▶14, a new civil administrative centre developed c. 2 km further west. The first part of the name of *Ulpia Noviomagus* refers to the emperor M. Ulpius Traianus (AD 98–117), who granted market rights and possibly also the formal status of *municipium* (town with legal status) which is attested for a later period. Several public buildings were erected under Trajan, and the use of military building materials hints at the involvement of the army in their construction. In the late 2nd century the town was provided with a stone wall. It was abandoned in the course of the 3rd century. The character and development of the town are similar to those of *Colonia Ulpia Traiana* at Xanten ▶27 and of *Forum Hadriani* at Voorburg-Arentsburg ▶3, where the conditions for sustainable protection are much better. For this reason the civil town of Nijmegen-*Ulpia Noviomagus* has not been selected.

id	name	brief description
14a	Nijmegen-Valkhof area | Valkhofpark	Early Roman town, Late Roman fort. The Valkhof area encompasses two elements of the frontier: an Early Roman town and a Late Roman fort. The town may have been founded as early as 10 BC. It had a ribbon-like layout, and the nucleus of the settlement must have been at least 10 ha in size. The finds assemblage indicates that the first inhabitants may have been or included army veterans. It is assumed that the settlement served as the urban centre for the tribal area of the Batavians. Its military start-up and slow urban development is probably representative of the military zone on the left bank of the Rhine. During the Batavian revolt of AD 69/70 the civil settlement was destroyed. In the late 3rd century AD a fortification was built on the Valkhof plateau, defended by a stone wall and a double ditch system. The enclosed area measured c. 2.8–4 ha. Two additional ditches surrounded the fort at c. 40–90 m to the southwest and west, probably encompassing a vacant zone which may have functioned as an additional defensive slope (glacis). The occupation of the fort seems to have continued at least into the 5th century. It is the only site in the Dutch frontier zone with incontestable physical remains of a Late Roman military fortification. Parts of the northern defensive stone wall may have been included in later, still standing walls. A considerable part of the fort was built over by a Carolingian palace, which probably had an Early Medieval predecessor. The remains of the inner area of the fort are hidden beneath those of the palace. The almost complete lack of excavation explains why we have no information on the state of preservation of the fort's interior or of the remains of the early town underneath it. Component part 14a is an unexcavated zone situated within the inner ditches of the Late Roman fort. It is also located within the core area of the Early Roman town.
14b	Nijmegen-Valkhof area | Hunnerpark	For a general description cf. component part 14a. Component part 14b is an unexcavated zone situated partly inside, partly outside the inner ditches of the Late Roman fort on the eastern side of the Valkhof area. It may cover part of the additional defensive slope (glacis) delineated in the west and southwest by two outer ditches. It is also located within the core area of the Early Roman town.
15	Nijmegen-Hunerberg	Operational base, legionary fortress, civil settlement. The Hunerberg holds the remains of a large Augustan military base, and of a legionary fortress of the late 1st and early 2nd centuries with its extra-mural civil settlement and associated cemeteries. The earliest fortification, covering more than 40 ha, served as an operational base c. 19–16/12 BC. It can be viewed as the cradle of the Lower German Limes. After the suppression of the Batavian revolt in AD 70 the area of the Augustan operational base was built over by construction of a regular legionary fortress and its extra-mural civil settlement. The latter extended eastwards as far as the by then abandoned fort on the Kops Plateau ▶16. The legionary fortress is closely associated with the aqueduct ▶17 and the industrial site of De Holdeurn ▶18 at Berg en Dal. Extensive parts of the early operational base remain unexcavated and therefore unknown, but they most likely conceal the remains of the large storage facilities essential to the survival of such a forward base. The later complex of legionary fortress and extra-mural settlement is fairly well preserved as a whole, although there is little information about the burial zones belonging to the settlements. About two-thirds of the area occupied by this complex remain unexcavated and some of the earlier excavations (before 1970) did not involve complete destruction. This allows the Hunerberg site, with its succession of different military installations and associated features, to be included in the nomination.
- - -	Ubbergen-Rijksstraatweg	Military harbour (?). In the Roman period the river Waal had a meander at the foot of the ice-pushed moraine. It might be expected that a harbour serving the legionary fortress of Nijmegen-Hunerberg ▶15 would have been located here, but efforts to locate it have so far failed.
16a	Nijmegen-Kops Plateau | West	Fort, cemetery, waste deposit, civil settlement. The Kops Plateau, a small elevated plateau along the edge of the ice-pushed moraine of Nijmegen-Kleve, contains the remains of an irregularly shaped Early Roman fortification with several annexes (extra-mural military compounds) and cemeteries. The military settlement was established c. 12 BC and evacuated during the Batavian revolt of AD 69/70. An oversized residential building (not preserved) indicates that the fort was atypical; functions that have been proposed include a command post during the German wars of the emperor Augustus and a training facility for the highly valued Batavian cavalry. Although three quarters of the military installation has been excavated (with nothing preserved of uncovered features), the fort and associated features have been included in the nomination. They constitute an unparalleled complex with elements including the irregular shape of the fort, an overrepresentation of residential buildings, extra-mural military structures, a remarkably luxurious finds assemblage and the presence on the northern slope of the plateau of a rubbish deposit which provides a layered history of the material culture of the garrison. The surviving remains are remarkably intact, although timber and other organic remains have usually decayed. After the abandonment of the fort during the Batavian revolt of AD 69/70, the plateau continued in use. The road leaving the eastern gate of the legionary fortress on the Hunerberg ▶15 crossed the plateau from west to east, just south of the fort. Graves have been attested at several points along this road and the cemeteries belonging to the earlier fort remained in use. The civil settlement of the legionary fortress (canabae legionis) extended over the western periphery of the earlier fort and its western annex. Component part 16a includes a significant unexcavated part of the Early Roman fort, including a substantial part of the defences, most of the headquarters building and traces of a military annexe outside the defensive structures of the main fort. Additionally it preserves features of the civil settlement belonging to the legionary fortress of Nijmegen-Hunerberg ▶15 and burial areas.

id	name	brief description
16b	Nijmegen-Kops Plateau | North	For a general description cf. component part 16a. Component part 16b is situated on the slope of the ice-pushed moraine. It holds an exceptional rubbish deposit and part of the defensive structures on the northern side of the Early Roman fortification.
16c	Nijmegen-Kops Plateau | East	For a general description cf. component part 16a. Component part 16c includes a smaller unexcavated area on the south-eastern side of the Early Roman fortification. It includes a section of the fort defences and several burials belonging to the later legionary fortress of Nijmegen-Hunerberg ▶15 and its civil settlement.
16d	Nijmegen-Kops Plateau | Kopse Hof North	For a general description cf. component part 16a. Component part 16d encompasses the northern part of an unexcavated area of a cemetery primarily associated with the Early Roman military settlement on the Kops Plateau. The earliest graves date from the early 1st century AD. The cemetery continued to be used in the 2nd century AD, probably by occupants of the military settlement on the Hunerberg ▶15 and its civil settlement.
16e	Nijmegen-Kops Plateau | Kopse Hof South	For a general description cf. component part 16a. Component part 16e encompasses the southern part of an unexcavated area of a cemetery primarily associated with the Early Roman military settlement on the Kops Plateau. The earliest graves date from the early 1st century AD. The cemetery continued to be used in the 2nd century AD, probably by occupants of the military settlement on the Hunerberg ▶15 and its civil settlement.
17a	Berg en Dal-aqueduct | Mariënboom	Aqueduct. Component parts 17a–e include the dams and artificial valleys which were part of an aqueduct system supplying the legionary fortress of Nijmegen-Hunerberg ▶15 with fresh water. The aqueduct ran over c. 5.5 km, but only the earthworks have been preserved. Although they have suffered from some erosion over the centuries they are still largely intact. The water channel would most likely have been made of wood, which has not survived in the sandy subsoil of the ice-pushed moraine. The water supply must have been established in the late 1st century AD and is likely to have functioned until the abandonment of the legionary fortress around the mid-2nd century. Most known aqueducts supplied water to towns, but several legionary fortresses are also known or are projected to have been serviced by aqueducts. Preserved remains of military aqueducts are rare, however. Projected aqueducts servicing the legionary fortresses of Bonn ▶41 and the eroded successor of Xanten-Fürstenberg ▶28 have not been properly attested. The remains of the Berg en Dal aqueduct consist of three artificial valleys and two dams. Component part 17a is a shallow artificial valley over 300 m long and 1–2 m deep, excavated to allow water to cross a low hill. The channel and narrow mounds of spoil on either side are still visible today.
17b	Berg en Dal-aqueduct | Swartendijk	For a general description cf. component part 17a. Component part 17b is an embankment up to 3.7 m high in its current state, originally probably somewhat higher. The dam was constructed over a distance of c. 250 m to carry the water channel of the aqueduct across a shallow dry valley, similar to component part 17c.
17c	Berg en Dal-aqueduct | Cortendijk	For a general description cf. component part 17a. Component part 17c is an embankment up to 4.5 m high in its current state, originally probably somewhat higher. The dam was constructed over a distance of c. 50 m to carry the water channel of the aqueduct across a shallow dry valley, similar to component part 17b.
17d	Berg en Dal-aqueduct | Louisedal	For a general description cf. component part 17a. Component part 17d is an artificial valley up to 50–60 m wide and 14 m deep, extending over c. 470 m. Today, the mounds of spoil are up to 4 m high. The valley is assumed to have cut through aquiferous strata.
17e	Berg en Dal-aqueduct | Kerstendal	For a general description cf. component part 17a. Component part 17e has two branches. The northern branch is a valley c. 1 km long and up to 35 m wide and 11 m deep. The valley is partly natural and partly artificial, and is assumed to have provided access to springs and aquiferous strata. The southern branch is a small, apparently artificial, lake c. 350 m long and up to 25 m wide, but it is likely to have been larger in the past. It is thought to have been a reservoir for water from the northern branch, with a dam at its western end.
18a	Berg en Dal-De Holdeurn | North	Military tile and pottery kilns. Component parts 18a–b encompass the known and projected remains of an industrial site which produced bricks, tiles and pottery from the late 1st century onwards. Initially the kiln site exclusively supplied the legionary fortress of Nijmegen-Hunerberg ▶15, at 4 km to the northwest. In the later 2nd and 3rd centuries, however, the site served as the central brickworks for the whole of the army in Lower Germany. Limited excavations c. 1940 demonstrated the presence of kilns, buildings, loam pits and production debris. Most kilns appear to have been dismantled during the excavations, but two kilns were left partly intact, alongside parts of buildings. Geophysical research points to the presence of more kilns and buildings outside the excavated areas, and a coring survey has demonstrated the occurrence of production debris. De Holdeurn has been selected to illustrate this important aspect of military production and supply. The two other known military production sites for tiles and pottery (Dormagen, Xanten) are mostly excavated or otherwise destroyed, and De Holdeurn is the only one which serviced the whole of the army in Lower Germany. Component part 18a encompasses loam pits and areas with production debris.

id	name	brief description
18b	Berg en Dal-De Holdeurn | South	For a general description cf. component part 18a. Component part 18b includes most of the remains of the kiln site, with unexcavated parts of buildings and two kilns, loam pits and dumps of production debris. There is every reason to expect further kilns and buildings here.
19	Herwen-De Bijland	Auxiliary fort, temporary camp. From the 1920s onwards, eroded remains of a stone fort have been found at great depths during sand extraction, and there are still some remains in the resulting quarry pool known as De Bijland. Most of the dredged finds are dated c. AD 70–260, but there is an earlier inscription making explicit reference to a groyne or dam. This groyne is one of the most famous examples of Roman water management, a barrier built in the river c. 12–9 BC to increase the water volume of the northern branch of the Rhine in the delta. Such a vital regulating element of water management must have been guarded by a fort. It has long been thought that the entire military settlement had been eroded by post-Roman migration of the river bends, but recently the ditches of at least two military installations have been found c. 250 m northeast of the location of the dredged finds. One of the ditches has a very clean fill, which is typical of short-lived, temporary camps. The pottery assemblage and metal objects from the excavated area confirm the military character of the features. Although the remains at De Bijland are very incomplete examples of military installations, the extraordinary narrative connected to them justify their inclusion in the nomination.
20	Kleve-Keeken	Fort or semi-permanent camp. The camp is situated on a slight elevation on a floodplain terrace, directly west of an old course of the river Rhine and next to the bifurcation of the Rhine and the Waal. It was positioned opposite the fort of Herwen-De Bijland ▶19 and its function may have been to control and protect river transport at this strategic point. The camp was first discovered in 2016 by aerial photography. It has two parallel ditches some 1.5 m in width indicating a longer occupation period than overnight marching camps which usually have only one ditch. The western side is some 240 m in length. The eastern side has not yet been detected. It measures at least 150 m so the camp encompasses an area of at least 3.6 ha. It is thought that the camp could have occupied an area up to 8.5 ha in size. No internal structures are known as yet. No information on the chronology of the camp is currently available.
21a	Kleve-Reichswald | West	Limes road. Two component parts represent a well-preserved section of the Limes road between Till ▶22 and Nijmegen ▶14–16. The road runs in an east-west direction along the ice-pushed moraine at Kleve. Traces of a 7 m-wide road embankment have been recorded by LiDAR. The embankment still has a height of c. 0.5 m. Two stretches are recorded, measuring 410 m (western part) and 175 m (eastern part). A stretch of 570 m in between has not been preserved above ground. Recent excavations revealed that the road had a width of approx. 12–15 m including the road ditches. The embankment is formed of several layers of compacted gravel. The date of the Limes road in this section is not yet known. It may have served as the major military road from the beginning of the Roman occupation in the second decade BC until the end of the Lower German Limes in the 5th century.
21b	Kleve-Reichswald | East	Limes road. For a general description cf. component part 21a. This component part contains the stretch of 175 m of the Limes road.
- - -	Kleve-Rindern	Auxiliary fort (?). Roman finds and the discovery of a heated room with hypocausts in the area of the church and cemetery in 1870/72 indicated Roman activity in the area of the modern village of Rindern. Its medieval name 'Renharen' has been suggested as being the medieval form of a Roman place called *Harenatium* or *Arenatium*, mentioned in Roman written sources of the 1st and 3rd centuries as a military site between Xanten and Nimwegen. As yet, no archaeological evidence for a military installation has been recorded.
- - -	Bedburg-Hau-Qualburg	Late Roman fort (?). Two profiles of one or two Late Roman ditches located north and east of the church of Qualburg and its cemetery were recorded in small scale excavations in the 1930s. Taken together with a further record of a Late Roman ditch south of the church in 1990, a Late Roman fortification in that area is very likely. It has been suggested this might be the Late Roman site of *Quadriburgium* (Latin for 'Four-tower-fortification') mentioned in written sources for the 4th century. However, there is no evidence for Late Roman walls, towers or gates, leaving the actual size and form of the presumed fortification unclear. The modern cemetery that covers much of the site makes further investigation difficult.
22	Till	Legionary fortress, auxiliary fort, five temporary camps, civil settlement. The nominated property of Till includes a range of eight military installations of different size and function. The installations range from temporary camps to a permanently occupied auxiliary fort. The whole area is fairly level and slightly raised above the flood plain. The area is defined by a small, early Holocene course of the Rhine to the west and by a larger pre-Roman course of the Rhine to the east, silted up in the Bronze age (Tiller Graben). The Roman course of the river Rhine, which probably ran several hundred metres further east, has been eroded by later courses of the river in the Middle Ages. The earliest dated military installation is a camp at the Steincheshof measuring 184 × 180 m. A V-shaped ditch dating to the 1st century is the only known feature. Interior structures are not recorded. Its function as a temporary (marching?) camp or early permanent fort is unclear. It was succeeded by an auxiliary fort with an area of 2 ha (162 × 140 m), constructed in the centre of its

id	name	brief description
		predecessor. The fort was probably built early in the 70s AD. Excavations have revealed several building phases. It continued in use at least into the 180s AD. About 300 m NW, around the neighbouring Kapitelshof, five military installations of different size and function are recorded. The exact sequence has not so far been determined. Through a combination of aerial photographic and geophysical data, it has been possible to determine that fortress B measured about 515 × 382 m (19.2 ha). It was fortified with up to five ditches and an earth-and-timber rampart which has been recorded in part. It is unclear whether the troops lived under canvas or whether interior buildings were constructed. Fortress B was followed by camp A, which is defined by two or three ditches. It measures about 314 m from SE to NW and at least 414 m transversely. It encloses a minimum of 13.1 ha and overlaps the northern part of fortress B. Both installations were probably abandoned after several weeks or months of use in the second half of the 1st century AD. Aerial photographs show parts of defensive ditches of at least three further temporary camps of unknown size and dating. They may all have served as marching camps. Further to the NW lies a very large marching camp next to the Sandkampshof. The southwest side of the camp measures 552 m, and over 380 m of the southeast side has been recorded. The camp, therefore, occupies an area of at least 25 ha but may have been larger. A series of pits is visible inside the camp in two locations; close to the perimeter and in the centre.
23	Kalkar-Kalkarberg	Sanctuary. The sanctuary lies on the edge of an ice-pushed moraine with a wide field of visibility into the valley of the meandering Rhine to the east. The main road between *Burginatium* via Kleve-Reichswald to Nijmegen ran on this moraine and passed the sanctuary on its western side. The sanctuary was enclosed by a *temenos* wall enclosing an area of 1.6 ha (150 × 110 m). In the centre of the sanctuary is a Gallo-Roman temple measuring 15 × 15 m. It is clearly smaller, but similar in construction to the temple at Elst ▶13, with a cella and a surrounding colonnade. Next to it there is another rectangular cult building of 14 × 8 m. At the back of the complex there is a residential building, which probably accommodated priests or pilgrims. Dedicatory inscriptions have been found, left by soldiers from Kalkar-Bornsches Feld ▶24 and legionaries from Xanten-Fürstenberg ▶28. The Roman sanctuary existed from the 1st to the 4th centuries. Below the temple a pre-Roman cult site was detected. It consisted of at least two ditches forming an irregular oval of around 65 × 70 m.
- - -	Kalkar-Monreberg	Pre-Roman enclosure. A 15 ha polygonal enclosure formed by three parallel ditches located in the immediate vicinity of the auxiliary fort of Kalkar-Burginatium has previously been interpreted as a Roman vexillation fortress. Recent geophysical surveys have led to a re-interpretation of the site as a pre-Roman fortified settlement.
24	Kalkar-Bornsches Feld	Auxiliary Fort, civil settlement, cemetery, limes road, fort (fleet base?), temporary camp or fort, waste deposit. The nominated property of *Burginatium* includes several military and civil installations which extend over an area of at least 1,000 × 600 m. Most of them are known from geophysical surveys. The elements are situated on a flood-free area directly on the Roman course of the Rhine at the bottom of the ice-pushed moraine. A smaller fort detected by geophysical survey, with a defensive ditch and a central building (*principia*?), was probably its predecessor. It was at least 100 m × min. 30 m in size. The front side facing the Rhine is unknown and it may be that the fort was open to the river bank as is the case for early fleet bases elsewhere. The cavalry fort of *Burginatium* is situated in the centre of this intensively used site. The fort measured 205 × 190 m (3 ha) in the main building phase, including the defensive ditches. In the Late Roman period, the fort was reduced in size to about 2 ha and the main wall strengthened by an outer second wall. At 2 ha this was still a large base compared to other Late Roman forts along the Lower German Limes. Erosion seems to have caused the loss of the north-eastern corner over an area of approx. 800 m² whilst the fort was in use. A new massive wall closed the gap, following the newly formed bank of the river Rhine. Remains of another camp can be found further east, largely washed away by the Roman Rhine. The vicus with several buildings (strip houses) and cellars extends about 500 m along a road running southwest of the fort. A *mansio* (Roman hostel) measuring 65 × 37 m is located in the centre of the vicus at a main crossroads. The road turning off to the southeast runs in an arc around the fort. The road embankment can still be seen on the surface. Several graves have been found to the west and south of the vicus, indicating larger cemeteries.
25a	Uedem-Hochwald | Hochwald 1	Temporary camp. The camps are located in what is now a wooded area, on the northern edge of the ice-pushed moraine and on meltwater sands. The complete cluster comprises 13 camps ranging in size from 0.5 to 2.5 ha. Oriented partly in rows or in the same orientation, they relate to each other. There is no overlap. The defences of the camps consist of an earthen rampart, which is typical for Roman marching camps. These ramparts were constructed with turves (lat. *caespites*), laid to form a wall. The gates are without exception in the form of *claviculae* (literally keys) his special method of fortification can be identified clearly in the field today.
25b	Uedem-Hochwald | Hochwald 2	Temporary camp. For a general description cf. component part 25a.
25c	Uedem-Hochwald | Hochwald 3	Temporary camp. For a general description cf. component part 25a.

id	name	brief description
25d	Uedem-Hochwald | Hochwald 4	Temporary camp. For a general description cf. component part 25a.
25e	Uedem-Hochwald | Hochwald 5	Temporary camp. For a general description cf. component part 25a.
25f	Uedem-Hochwald | Hochwald 6	Temporary camp. For a general description cf. component part 25a.
25g	Uedem-Hochwald | Hochwald 7.1	Temporary camp. For a general description cf. component part 25a.
25h	Uedem-Hochwald | Hochwald 7.2	Temporary camp. For a general description cf. component part 25a.
25i	Uedem-Hochwald | Hochwald 8.1	Temporary camp. For a general description cf. component part 25a.
25j	Uedem-Hochwald | Hochwald 8.2	Temporary camp. For a general description cf. component part 25a.
25k	Uedem-Hochwald | Hochwald 9	Temporary camp. For a general description cf. component part 25a.
25l	Uedem-Hochwald | Hochwald 10	Temporary camp. For a general description cf. component part 25a.
25m	Uedem-Hochwald | Hochwald 11	Temporary camp. For a general description cf. component part 25a.
25n	Uedem-Hochwald | Hochwald 12	Temporary camp. For a general description cf. component part 25a.
25o	Uedem-Hochwald | Hochwald 13	Temporary camp. For a general description cf. component part 25a.
- - -	Xanten-Vynen	Auxiliary fort (?). Finds from gravel extraction in the 1980s indicate Roman activity in this area. One brick stamp of an auxiliary unit (*cohors II Britonum*) may indicate military building activity. The area has been dug out by gravel extraction. No indication of any in-situ preservation.
26a	Wesel-Flüren | Flürener Feld 1	Temporary camp. The camps are located on the right banks of the river Rhine and north of the mouth of the Lippe valley, in a raised position on the lower terrace. Four camps with a size of 1.2 to 2.4 ha preserved above-ground form part of a cluster along with further camps known from aerial reconnaissance. The defences of the camps consist of an earthen rampart, which is typical for Roman marching camps. These ramparts were constructed with turves (lat. *caespites*) laid to form a wall. The gates are without exception in the form of *claviculae* (literally keys).
26b	Wesel-Flüren | Flürener Feld 2	Temporary camp. For a general description cf. component part 26a.
26c	Wesel-Flüren | Flürener Feld 3	Temporary camp. For a general description cf. component part 26a.
26d	Wesel-Flüren | Flürener Feld 4	Temporary camp. For a general description cf. component part 26a.
- - -	Xanten-Lüttingen	Watchtower A Roman timber watchtower with a succeeding stone construction phase has been recorded by rescue excavation. The site has been entirely destroyed by gravel extraction. The stone built phase of the watchtower has been marked on a new location ex situ.
- - -	Xanten-Vynen/Lüttingen	Battlefield (?). Finds of military equipment and of a stone inscription made in the 1980s during gravel extraction in the channel of a Roman branch of the Rhine. A possible link with a battlefield of the Batavian Revolt in AD 69–70 has been suggested. So far there is no evidence for in-situ preservation in this area.
- - -	Xanten-CUT	Auxiliary fort(s) (?). A 2003 study of finds of military equipment from the area of the later CUT has led to the suggestion that Roman military installations existed at this site in the 1st century before the *colonia* was founded in AD 100. Recent re-consideration has thrown doubt on these suggestions and no clear evidence for 1st century Roman fortifications in the area of the later *colonia* can be attested so far.
27	Xanten-CUT	Limes road, city, fort, Late Roman fort, harbour. The component part lies in a slightly elevated position on the lower terrace, directly above the Roman Rhine. Several military installations were located on the 70 ha area of the *Colonia Ulpia Traiana* (CUT). The Limes road runs from northwest to southeast through CUT. Its course is slightly different to the orientation of the later division of the Roman city into *insulae* and therefore older. The road had a width of 18.5 m and consisted of a gravel base with a hard, concrete-like surface. There are accompanying ditches on both sides. In the surface of the road there are clear grooves approx. 1.4 m apart, created by carts and wagons. It is clear therefore that the ancient road surface is preserved.

id	name	brief description
		In the south of CUT is an area of 3.9 ha fortified with a wall in the second half of the 3rd century. At its south-western and south-eastern end points, this wall connects directly to the CUT city wall, using it as the southern boundary. There were simple gates with gate towers in the north-west and northeast sides of the enclosure. The military use of the fortified area is obvious. One possible interpretation is that it was erected as a temporary military camp in the context of the Franconian raids of the last third of the 3rd century and the planning and construction of the *Tricensima* within the former city area of CUT. The *Tricensima* was created by transformation of the central nine insulae of CUT into a fortification in Late Antiquity. The defence of the *Tricensima* consisted of a 3.5 m wide wall with 11 intermediate towers, four corner towers and gates. Around 8.5 m in front of the wall, the fortress was protected by two surrounding ditches, each 12 m wide. It probably played a fundamental role in the organisation of Late Roman border security. In addition to stationing military units, it probably also offered shelter to civilians from the former Colonia. In front of the city walls, the harbour quay extended over a maximum length of 230 m along the banks of the Rhine, mainly in front of the later Insula 36. The harbour was probably built around the middle of the 1st century AD and so served as a supply station for the legionary fortresses for at least half a century before the foundation of CUT. The bank was reinforced to protect it from erosion. There is evidence of a boathouse southeast of the dock.
- - -	Xanten-Halenboom	Military tile and pottery kilns. The tile and pottery kilns, operated by several different military units according to associated brick stamps, have been entirely excavated and built over in the 1930s and 1960s. No significant remains have been left in situ.
28	Xanten-Fürstenberg	(Double-)Legionary fortresses, civil settlement, Limes road. The component part, which includes the double-legionary fortresses, civil settlement, an amphitheatre and several very large military building units, is located on an ice-pushed moraine clearly elevated above an old arm of the Rhine. The total area of the complex measures about 1,600 × 900 m. The highest point today is 71.6 m above sea level. The amphitheatre is located in a depression 30 m above sea level. The double-legionary fortresses each covered a similar area of about 57 ha. However, their form and orientation differ. The early fortress is polygonal in shape with internal rectangular divisions. It dates to the Augusto-Tiberian period and was of earth-and-timber construction. The dimensions measure about 750 × 800 m. The succeeding Claudio-Neronian fortress measures approx. 600 × 900 m and has the typical rectangular playing card shape. The interior buildings are of stone while the rampart comprises earth-and-timber. Its location half on a slope and half on level ground as described by Tacitus can still be seen today. The almost complete ground plans of both legionary fortresses are known from large-scale geophysical survey. In addition to the two double-legionary fortresses, there are at least two large parade grounds within the property, (so-called *campi*, which offered the legionaries space for training and marching) as well as the amphitheatre. In the north, there are also structures that may represent civilian settlement structures in the immediate vicinity of the legionary fortresses (lat. *canabae legionis*). Roads have been found leading in every direction, demonstrating the importance of Lower Germany's largest legionary fortress as a key junction for traffic in this region.
- - -	Xanten-Vetera II	Legionary fortress (eroded). Roman finds made in the 1950s during gravel extraction at the 'Bislicher Insel', an area of multiple medieval branches of the Rhine, have been interpreted as the site of the legionary fortress of Vetera II, the late 1st century successor of Vetera I at the Fürstenberg. A recent study of epigraphic records found in the 17th and 18th centuries in that area has suggested that the fortress may have been located several hundred metres to the north. The whole area has been eroded by shifting courses of the Rhine from the 16th to the 18th centuries and nothing has been preserved in situ.
- - -	Wesel-Büderich	Auxiliary fort (?). Finds of military equipment made in the 1930s near Wesel-Büderich have been interpreted as a military site. Geophysical surveys and an extensive aerial survey programme have not revealed any significant structures.
29	Alpen-Drüpt	Auxiliary fort, large temporary camps. The cluster is located on the younger lower terrace, above an oxbow of the Rhine that silted up in Late Roman or medieval times. The site is surrounded by pre-Roman river courses still marshy today, making the location a very narrow strip between the riverine landscape and dry land. In the southern part of the property lies an auxiliary fort, the eastern part of which has been eroded by the Rhine. An area of 1.5 ha of the fort has been preserved. The central part of the interior layout of the fort is very well documented through non-invasive methods. The headquarters (lat. *principia*), the commander's house (lat. *praetorium*) and a storage building (lat. *horreum*) are recorded by aerial photographs and magnetometer survey. Outside the fort there is another large building which probably served as a storage depot. North of the fort lie two large marching camps whose ditches can be traced over several hundred metres. Rounded corners evidence the typical Roman army design. The eastern side of camp 2 has been eroded by the Late Roman or early medieval Rhine. It is preserved to a size of at least 517 × 400 m (c. 20 ha) making it the second largest marching camp along the Lower German Limes besides fortress B at Till ►22. Camp 3 partly overlaps camp 2, and is rotated about 45 degrees. This slightly smaller camp of at least 15 ha has dimensions of 369 × at least 380 m.

id	name	brief description
- - -	Area of Alpen, Xanten, Wesel, Kalkar	Temporary camps. In the area of Alpen, Xanten, Wesel and Kalkar, almost 200 temporary camps have been recorded by aerial photography since the 1960s indicating that only parts of the ditches are preserved and that earthen ramparts have been destroyed by ploughing in medieval and modern times. Only temporary camps with significant preservation of earthen ramparts (as detected by LiDAR in forest areas), have been selected for the nomination as the most complete and representative examples of Roman marching camps ▶25–26.
- - -	*Calo*	Cavalry fort (?). Roman finds from gravel extraction in the 1950s from Duisburg-Beeckerwerth have been interpreted as the site of a cavalry fort called *Calo* mentioned in Roman written sources of the 4th century. The name of a medieval settlement called Halo, eroded by the Rhine in late medieval times, may indicate that the fort or its memory still existed at that time. The site seems to have been totally eroded by later changes in the course of the river Rhine.
- - -	Rheinberg	Military road station (?). Excavations in the 1960s revealed a Roman timber building in the centre of an almost rectangular enclosure with a V-shaped ditch next to the presumed course of the Limes road between Moers-Asberg and Xanten. Because the structure differs in many ways from typical Roman watchtowers and there are no small finds that might indicate the presence of Roman military, the former interpretation as a military site is not proven.
30	Moers-Asberg	Auxiliary fort, Late Roman *burgus*. The fort is situated on the flood-free left bank of the Rhine, at the later Essenberger Altarm, which silted up in Late Antiquity, on a site that still dominates the modern topography of this area. The first fort was built around 16/15 BC in polygonal form and was surrounded by an earth-and-timber rampart and two ditches. There is no evidence for interior buildings; the soldiers seem to have lived under canvas. After AD 17 a new fort was built in a similar manner, with several subsequent re-building phases. The fourth phase is marked by the foundation, around AD 45, of a regular auxiliary fort for a cavalry unit of about 500 men (lat. *ala*). This had interior buildings, of which the headquarters and barracks are attested. After the Batavian revolt, the fort was totally rebuilt in an almost rectangular form of c. 170 × 190 m (3.2 ha), still serving a cavalry unit. In Late Antiquity, a small fortification with a central tower and a wide ditch (burgus) was erected in the south-eastern area of the long abandoned auxiliary fort.
- - -	Moers-Asberg	Marching camp (?). Profiles of one or more V-shaped ditches south of the auxiliary fort of *Asciburgium* have been interpreted as being part of a marching camp of the Roman governor C. Didius Vocula during the Batavian revolt in AD 69. The suggested oval form of the camp is without any parallel amongst Roman marching camps. No dateable finds support this interpretation. The original function of the ditches is therefore unclear.
31	Duisburg-Werthausen	Fortlet. The fortlet was located on the former right bank of the Rhine, near the auxiliary fort of *Asciburgium*. It measured about 46 × 41 m. The wall had two gates, in the east and in the west, and four corner towers. The walls, made of tuff set in mortar, lie almost directly under the topsoil. In the west-east running road a cistern has been preserved which was mistakenly interpreted as a burial place during excavations at the end of the 19th century. The fortlet was probably built after AD 85, when the auxiliary fort *Asciburgium* was abandoned. It existed until the middle of the 3rd century.
32	Krefeld-Gellep	Auxiliary fort, battlefield, civil settlement and cemetery. The fort lay on the flood-free terrace next to the Rhine. The Roman course of the Rhine is similar to the modern harbour basin, but the modern Rhine is about 600 m away. *Gelduba* is also a battlefield site associated with the Batavian revolt. Parts of the battlefield with unique archaeological features are located under the fort or in the immediate vicinity. They tell the story of the attack by the Batavians on the camp of the Governor Caius Dillius Vocula. The auxiliary fort was founded as a base for a cavalry unit (lat. *ala*) after the Batavian revolt in AD 70 and redesigned over various phases. At first it was of timber construction. Further timber construction phases were replaced by a stone construction of about 140 × 170 m (2.38 ha) in the middle of the 2nd century. In the second half of the 3rd century the fort was rebuilt following Germanic invasions. In the 4th and early 5th centuries, the fort comprised a new, smaller construction (2.25 ha) with strong defensive elements. Traces of the battlefield are both attested and projected south of the fort.
- - -	Neuss-Innenstadt	Late Roman fortress (?). Late Roman written sources dated AD 388 mention a Roman fort named *Nivisium*. Its location has been supposed to lie in the modern inner city of Neuss where some indications of Late Roman activity have been recorded. To date no Late Roman fortification structures have been attested in this area.
- - -	Neuss-Hummelbachaue	Late Roman fortification (?). Results of a rescue excavation in the area of a golf course led to the doubtful identification of a small Late Roman timber fortification.

id	name	brief description
33	Neuss-Koenenlager	Legionary fortress, auxiliary fort. The legionary fortress is located on a flood-free terrace. East of the fortress the river Erft flowed into the Rhine which, in antiquity, ran directly north of the legionary fortress. In Roman times, the Rhine ran quite straight from southeast to northwest for a distance of 6 km between Neuss and the Reckberg, creating a strategically suitable location. The fortress was built in AD 43 by the *legio XVI Gallica*. It measures 570 × 420 m, so with an area of 24 ha it is a relatively large fortress, with space for auxiliary troops as well as legionaries. The Kölner Straße (*via principalis*) provides a cross-section through the layout of the legionary fortress, including the southern facades of the central staff building (*principia*), the bath (*balineum*) as well as the barracks of the 1st cohort and additional troops. North of it are the barracks for a cavalry unit (lat. *ala*), which was integrated into the legionary fortress. The fortress was destroyed during the Batavian revolt the fortress was destroyed and then rebuilt by the *legio VI*. It was abandoned around AD 100. From the middle of the 2nd century to the 4th century there was an auxiliary fort in the central area of the former legionary fortress with a size of about 3 ha. It encloses the area of the former *principia* and maintains the same orientation. The equestrian unit *ala Afrorum* was stationed here. A gravestone from its *signifer* has been preserved.
34a	Neuss-Reckberg | Wachtturm	Watchtower. 200 m northwest of the fort, Constantin Koenen uncovered the foundations, made of Liedberger sandstone, of a watchtower. They measure 5 × 5 m. It is not known whether the tower was surrounded by a palisade and a ditch like those along the Upper German-Raetian Limes or with two ditches like the watchtower at Utrecht-Groot Zandveld ▶9.
34b	Neuss-Reckberg | Kleinkastell	Fortlet. The fortlet measures 34.5 × 33 m. It was first built as an earth-and-timber construction and later expanded in stone with a 3 m wide gate integrated into the 2.2 m wide stone wall. The small fort is protected by a double V-shaped ditch.
35	Monheim-Haus Bürgel	Late Roman fort. The Late Roman fort was relocated to the right bank of the Rhine as a result of a shift in the course of the river in the 14th century. In Roman times the course of the river formed a loop that extended far into the area now on the right bank of the Rhine. Large parts of the Late Roman fort are still preserved up to 4 m high in the medieval castle complex and the early modern country estate. The 64 × 64 m fort was built in the Constantinian period. It was constructed using massive cast brickwork, divided by horizontal brick lines. The brickwork visible today is the inner part of what was originally a 2.4 m thick wall, with four projecting corner towers and eight interval towers. Torsion weapons could be operated from platforms on the corner towers. Gates, with a passage width of 3.6 m, were located in the east and west walls. The interior buildings of the fort were built directly onto the fortified wall. They were built partly in stone and partly in timber. A bathhouse was located in the south-eastern corner, extending at least 8 m into the inner courtyard. The remaining area was probably open.
36	Dormagen	Auxiliary fort. The fort is situated on a flood-free terrace. In Roman times it was located directly by the Rhine; today the river runs about 1 km east from the fort. The fort was built of wood in the 80s of the 1st century AD and re-built in stone around AD 150. It covers an area of 3.3 ha. Numerous excavations make it easy to reconstruct the interior structure of the fort. Around the centrally located headquarters building (lat. *principia*) in the rear area, there are long barracks in which soldiers and horses were accommodated together in adjacent rooms. It has been calculated that there were 500 soldiers and horses inside the fort. In the front part of the fort there is a workshop, a storage building and the commander's quarters as well as more barracks. Following the burning of the fort in AD 161, the north corner continued in sporadic use until the end of the 3rd/beginning of the 4th century, when a reduced fort was built in this area, using the former fort wall. It was in use until AD 430. Several roads still follow the orientation of the Roman fort today.
- - -	Dormagen-Bayerwerk	Tile kiln. Four Roman tile kilns associated with brick stamps of the 1st legion were excavated in the 1960s during construction of a public bath. No significant remains have been preserved.
37	Köln-Praetorium	Governor's palace. The palace was situated in a prominent, elevated position on the eastern edge of the city plateau, overlooking the city wall and the river. The whole complex occupied two blocks (lat. *insulae*); an area of about 150 (N–S) × 60 m has been extensively excavated. The remains of four main building phases were found, one overlying the other, resulting in a warren of walls not easy to distinguish; many of the main phases showed secondary alterations whilst in use. A key observation was that the main (eastern) front of the complex was moved progressively closer to the city wall. The first phase dates to the very beginning of the 1st century. In the late 1st century, massive north-south walls and a first version of an *aula* were constructed in the southern part of the complex. In this phase the main building was characterised by an eastern façade with two big apses. Around the mid-180s, the whole complex of 90 × 25 m was rebuilt under the governor Didius Iulianus, later Emperor of the imperium for a short period. A new, bigger *aula* with an apse at the eastern end was included in the complex. The last palace (constructed after the middle of the 4th century) was characterised by a 90 m long façade with porches or pavilions at both ends and a central, octagonal, tower over 20 m high and more than 15 m in diameter. The interior was characterised by large, hall-like rooms, whereas the adjoining part to the west comprised smaller rooms arranged around an open courtyard.

id	name	brief description
		The abandonment of the palace continues to be discussed by scholars; some think it was never completely finished, others think there is evidence that it was still in use, at least partly, during the Frankish period and that it was finally destroyed in the second half of the 8th century.
38	Köln-Deutz	Late Roman fort. The bridgehead fort of Deutz played an important part in Emperor Constantine the Great`s building programme to reinforce the defensive line along the river frontier. It was located east of the Rhine, directly on the bank of the river. It was connected with the *Colonia Claudia Ara Agrippinensium* by a bridge over 400 m long. The fort was surrounded by a ditch on three sides (12 m wide, 3 m deep) and formed a square with sides of 148 × 148 m (more than 2 ha). The curtain wall was 3.3 m thick, a minimum of 8 m high and had 14 round towers that protruded much more on the exterior than the interior faces. There were two double-towered gates to the west and east, the fort being divided in two halves by the *via praetoria* connecting them. The interior was completely taken up by 16 rectangular, north-south oriented barracks (58 × 11.5 m), constructed with stone foundations carrying timber-framed walls. The four middle barracks had porticoes on their narrow sides opening onto the centre of the fort; in one of them, close to the southern defences, a bathhouse was located. Around the barracks were gravelled roads with wooden sewers beneath. In the current state of research, *Divitia* is one of the few examples of a Late Roman fort where the interior layout is fully understood. According to epigraphic evidence and written sources, the fort was built between 309/10 and; the garrison consisted of about 800–1,000 soldiers. Based on the finds, the fort continued to be used by Frankish *foederati* under Roman command until the middle of the 5th century.
39	Köln-Alteburg	Fleet base (fort). The fort was located about 3 km south of the CCAA on a flood-free natural plateau directly on the bank of the river Rhine. The river has the same course today. The fleet base was an irregular pentagon in shape, surrounded by a single ditch. Gates are attested for the northern, western and southern sides; a fourth gate is very likely on the eastern side (probable harbour) but has not so far been confirmed. In its first phase (c. AD 10), the fort had a earth-and-timber rampart that was replaced by a stone wall about 0.8 m wide in the late 1st century AD. A very unusual feature is the complete absence of interval towers on both earth-and-timber and stone defences. The stone fort was a little larger than its predecessor on its western side, but the overall shape was retained; the maximum dimensions were 362 m (NW to SE) resp. 258 m (W to E), covering an area of c. 7.3 ha. Most of the interior buildings known so far are east-west orientated barracks with an inner layout that is different from other fortifications, be it legionary or auxiliary. This presumably indicates a different and particular organisation of the auxiliary forces of the Roman fleet. In the first phase the barracks were constructed in wood, replaced later by timber-framed outer walls on stone foundations. Between the barracks were gravelled roads. In the centre of the fort, at the crossing of the two main roads, a headquarters building (lat. *principia*) has been detected just recently by geophysical survey. It seems to have been rebuilt in stone as early as the reign of Nero (AD 54–68) – a feature that normally is to be found only in legionary fortresses. Around 85, the whole fort was rebuilt in stone. Representing a paradigm change in the military defence strategy along the Rhine border, the Alteburg fort was built to accommodate over 1,000 soldiers, both fleet and combat forces. The main gate (lat. *porta praetoria*) opened to the river, underlining the monumental aspect of the fleet base. The fort was in use for more than 200 years with nine building phases, reflecting the long-term development of the Roman army. Its abandonment in the 3rd century reflects the major reorganisation of the Roman army in crisis.
40a	Kottenforst Nord | Am Weißen Stein 1	Temporary camp. A manoeuvring area of the Bonn Legion is located In the hinterland of Bonn, on the high plains of the Ville in the northern Kottenforst. 12 temporary camps with a size of 0.5 to 1.9 ha form a cluster. Orientated partly in rows or with the same orientation, they relate to each other. There is no overlap between them. The defences of the camps consist of an earthen rampart, typical for Roman marching camps. These earthen ramparts were constructed using turves (lat. *caespites*) stacked to form a wall. The gates are without exception in the form of *claviculae* (literally keys). This special method of fortification is easily legible in the field today.
40b	Kottenforst Nord | Am Weißen Stein 2	Temporary camp. For a general description cf. component part 40a.
40c	Kottenforst Nord | Domhecken 5	Temporary camp. For a general description cf. component part 40a. This camp probably also belongs to the cluster of 40d–g.
40d	Kottenforst Nord | Domhecken 1	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40e, 40f and 40g. They are arranged fan-shaped in always 10° difference to each other.
40e	Kottenforst Nord | Domhecken 2	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40d, 40f and 40g. They are arranged fan-shaped in always 10° difference to each other.
40f	Kottenforst Nord | Domhecken 3	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40d, 40e and 40g. They are arranged fan-shaped in always 10° difference to each other.

id	name	brief description
40g	Kottenforst Nord | Domhecken 4	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40d, 40e and 40f. They are arranged fan-shaped in always 10° difference to each other.
40h	Kottenforst Nord | Dürrenbruch 3	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40i and 40j. They are orientated to each other.
40i	Kottenforst Nord | Dürrenbruch 2	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40h and 40j. They are orientated to each other.
40j	Kottenforst Nord | Dürrenbruch 1	Temporary camp. For a general description cf. component part 40a. This camp is strongly connected to 40h and 40i. They are orientated to each other.
40k	Kottenforst Nord | Pfaffenmaar 1 and 2	Temporary camps. For a general description cf. component part 40a. These camps are strongly connected to each other. They are parallel to each other and share the direction of the *via principalis*.
41	Bonn	Legionary fortress. The Bonn legionary fortress, which existed for about 400 years, is located directly beside the Rhine in a flood-free area. To the west, the plateau was bounded by a small river, the Gumme. The almost square legionary fortress was built by *legio I* (*Germanica*) around AD 35 under the Emperor Tiberius. At 27.8 ha it is one of the largest within the Roman Empire. Following *legio XXI rapax*, *legio I Minervia* was based here as the main legion from AD 83 for more than 200 years. In the eastern part of the fortress were large storage buildings (lat. *horrea*). They were conveniently located close to a gate which provided access to the waterfront, where most goods were delivered via the Rhine. In Late Antiquity, the wall of the legionary fortress was reinforced and widened to 2.5 m and an 11–13 m wide ditch was built. The garrison was reduced at this time. Nonetheless, the size of the Bonn legionary fortress remained unchanged throughout its life.
42a	Kottenforst Süd | Oben der Krayermaar	Temporary camp. A manoeuvring area of the Bonn Legion lies in the hinterland of Bonn, on the high plains of the Ville in the northern Kottenforst. 10 temporary camps 0.5 to 1.9 ha in size form a cluster. Oriented partly in rows or with the same orientation, they relate to each other. They do not overlap. The defences of the camps consist of an earthen rampart, typical for Roman marching camps. These earthen ramparts were constructed using turves (lat. *caespites*) stacked to form a wall. The gates are without exception in the form of *claviculae* (literally keys). This special method of fortification is easily legible in the field today.
42b	Kottenforst Süd | Villiper Bach	Temporary camp. For a general description cf. component part 42a.
42c	Kottenforst Süd | Professorenweg 1	Temporary camp. For a general description cf. component part 42a.
42d	Kottenforst Süd | Professorenweg 2	Temporary camp. For a general description cf. component part 42a.
42e	Kottenforst Süd | Riesenweg	Temporary camp. For a general description cf. component part 42a.
42f	Kottenforst Süd | Wattendorfer Allee 2	Temporary camp. For a general description cf. component part 42a.
42g	Kottenforst Süd | Wattendorfer Allee 1	Temporary camp. For a general description cf. component part 42a.
42h	Kottenforst Süd | Bellerbuschallee	Temporary camp. For a general description cf. component part 42a.
42i	Kottenforst Süd | Villiprot	Temporary camp. For a general description cf. component part 42a.
42j	Kottenforst Süd | Heiderhof	Temporary camp. For a general description cf. component part 42a.
- - -	Königswinter-Drachenfels	(Roman?) Stone quarry. The mountain of 'Drachenfels' on the right bank of the Rhine is formed from trachyte, a rock formation with a very distinctive pattern making it easy to identify stone building materials from this source. The use of this specific rock formation for building materials in Roman times is attested at many buildings along the river Rhine. Traces of past manual stone extraction in the form of wedge-holes are preserved at several locations, but their Roman dating has not so far been proven.
43	Iversheim	Lime kilns. The nominated property is located on the northern edge of the Sötenicher Kalkmulde. These limestone deposits are the most northerly in the Rhineland that were known in Roman times, on the left bank of the Rhine.

id	name	brief description
		Six lime kilns are located in a large hall with dimensions of approx. 30 × 6 m. Four to five of the kilns were in use during different periods and produced up to 200 tons of quicklime per month, used for the construction of large buildings and other structures in the Province of *Germania inferior*. The industrial installation was probably used from at least the 1st century to the end of the 3rd century AD and underwent several modifications and reconstructions. The complex is also unusual in that it comprises not only the kilns and the industrial hall, but also associated structures for the accommodation of soldiers and the storage of material. The decisive factors for the location were not only the occurrence of limestone, but also the availability of fire wood and access to water. Transport of the finished products was probably via the Erft into the Rhineland.
44	Remagen	Auxiliary fort. At the centre of the complex is an auxiliary fort dating back to the time of Augustus (Phase 1). An earth-and timber-fort with an encompassing ditch was built in the time of Tiberius-Claudius (Phase 2). The fort was destroyed in AD 69 during the Batavian revolt, but immediately rebuilt in stone to the same plan as before (Phase 3). A further reconstruction, or rather a strengthening, of the fort took place between AD 270/280 and the Constantinian period (Phase 4). The Late Antique walls were constructed on the existing walls of the stone fort. The fortifications of the early and middle Empire (Phases 2 and 3) were integrated into the later defences and continued to be used into Late Antiquity.

2.a.5 Selection process and overview of component parts

Over a hundred military installations are known or supposed to have existed within the territory of the province of Lower Germany and in its foreland across the river Rhine. Half of them were positioned on the left bank of the river, while the others were distributed over the foreland, the hinterland and the North Sea coast. For the nomination of *Frontiers of the Roman Empire – The Lower German Limes* 106 component parts have been selected.

Fig. 2.30 Section through the silted-up channel of the Roman Rhine at Alphen aan den Rijn. The dark area with the collapsed embankments dates to the Roman period, the lighter fine-layered upper fill is medieval.

The process of selection of sites for the proposed nomination of *Frontiers of the Roman Empire – The Lower German Limes* was first of all guided by the so-called Koblenz Declaration of 2004: 'The Frontiers of the Roman Empire World Heritage site should consist of the line(s) of the frontier of the height of the empire from Trajan to Septimius Severus (about AD 100–200), and military installations of different periods which are on that line. The installations include fortresses, forts, towers, the Limes road, artificial barriers and immediately associated civil structures.'[6] This declaration was adopted by the States Parties involved in the process of nominating sections of the frontiers of the Roman Empire in Europe, and was maintained as a guideline for future nominations in the Thematic Study for the Frontiers of the Roman Empire presented to the World Heritage Committee in 2017.[7] Application of this declaration to the Roman province of Lower Germany and its foreland implied a focus on the river Rhine, which was the line of the frontier in the 2nd century AD in this area.

The three frontier sections which have been inscribed on the World Heritage List under the joint heading of *Frontiers of the Roman Empire* – Hadrian's Wall in England (1987), the Upper German-Raetian Limes in Germany (2005) and the Antonine Wall in Scotland (2008) – are all continuous artificial barriers. For these three component parts the linear barrier – stone wall, timber palisade, earthen rampart, ditch – is an important element of the nominated property. The military

6 Nomination file 430ter, p. 427.

7 R. Ployer/M. Polak/R. Schmidt, The Frontiers of the Roman Empire – A Thematic Study and Proposed World Heritage Nomination Strategy. Advised by ICOMOS-International and commissioned by the Intergovernmental Committee of the 'Frontiers of the Roman Empire' World Heritage Site (UK, DE) and the Bratislava Group (Vienna, Nijmegen, Munich 2017). Cf. decision 41 COM 8B.50.

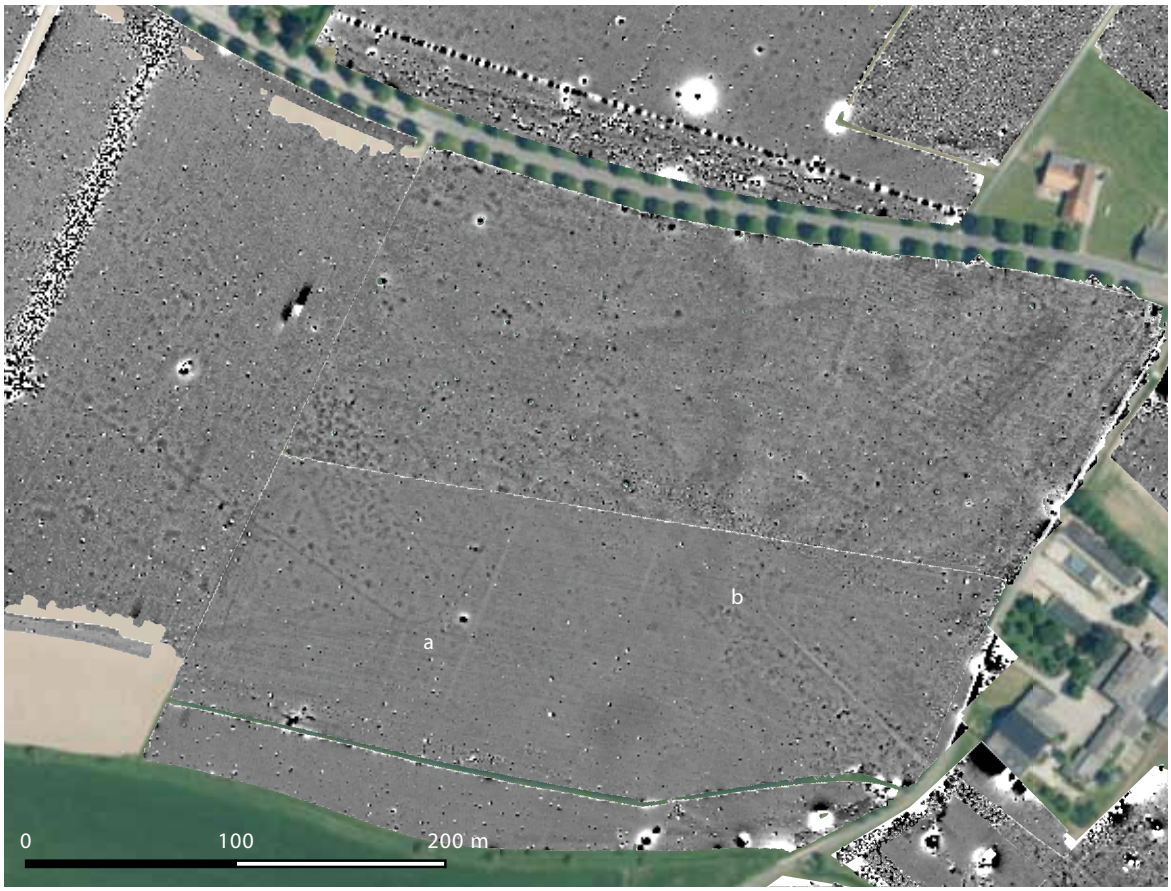

Fig. 2.31 Results of the geophysical surveys carried out at Till ▶22. Corner of a large marching camp with a single ditch (a) and corner of a fortress with several ditches (b).

installations on the left bank of the Rhine, however, were essentially connected by the river, and only at a later stage additionally by a road. Since the Roman period the Rhine has shifted its course in many places, so the river of today is not a useful representation of its Roman predecessor (fig. 2.30). Furthermore, the location of the river channel in the Roman period is not always known, and in some areas it has been eroded by later river bend migrations. The Limes road connecting the forts is not known in its entirety, and the state of preservation of several attested parts does not meet the requirements for nomination. Neither the river nor the Limes road can therefore be parts of a nominated property in their entirety. *Frontiers of the Roman Empire – The Lower German Limes* is therefore nominated as a serial property, with its separate elements constituting the pearls on a necklace.

As the site selection should express the linear character of the frontier, it should be of sufficient size, and the selected sites should be adequately distributed. Furthermore, they should be able to convey the proposed Outstanding Universal Value, be in a good condition and not subject to significant threats. These requirements were the basis of a further two stage selection process. In the first stage, separate, provisional selections were made for sites in Germany and in the Netherlands. In the second stage the two provisional selections were subjected to a joint assessment, evaluating the contribution of all individual sites to the overall proposed Outstanding Universal Value.

In Germany the project 'Zustanderfassung und Inventarisierung des Niedergermanischen Limes' (record and inventory of the Lower German Limes) was started in 2005 to provide a complete as possible, up-to-date GIS-based inventory of more than 200 proven or suspected Roman military sites in North Rhine-Westphalia as the basis for further selection. The joint Dutch-German expert meeting 'The outstanding universal value and the feasibility of a joint nomination as a World Heritage site of the Lower German Limes – Limes Germaniae inferioris' held in Xanten in 2010 led to a better understanding of the criteria for the selection process and highlighted the value of the concept of a 'wetland frontier' with all its different aspects.

This approach was further elaborated in a first draft of a Statement of Outstanding Universal Value and a comparative analysis in 2014.[8] With reference to this draft, a total of 27 sites/site clusters was compiled for the German section of the Lower German Limes between Remagen and Till as part of the re-evaluation of the German Tentative List entry in 2014. To provide a better understanding of the archaeological remains at these sites for the definition of the property and

8 W. J. H. Willems/E. Graafstal/C. van Driel-Murray, Draft Statement OUV & Comparative Analysis World Heritage Nomination Lower German Limes (Leiden 2014).

Fig. 2.32 Trial trench at the Herwen-De Bijland ▶19, excavated in November 2018 to verify the results of a coring survey. View from the southwest.

buffer zones and to evaluate some probable sites, a combined investigation programme of geophysical research, aerial survey and trial trenches was conducted at various sites in 2015. This led to a better understanding of previously known sites and the discovery of a hitherto unknown auxiliary fort at Alpen-Drüpt and of a new camp at Keeken. Within the international research programme 'Harbours from the Roman period to the Middle Ages', many sites and sections along the Roman river were investigated between 2012 and 2018, leading to a better knowledge of the palaeogeographic context of the riverine landscape.

In 2015, a large-scale magnetometer-survey programme was started at four locations to provide a better understanding of the concept of a military landscape, resulting in many new discoveries of military installations and associated elements. One site (Kalkar-Monreberg) was proven to be a pre-Roman fortification rather than an early Roman camp and was deselected (fig. 2.31). Eventually, 29 sites/site clusters where listed in the updated Tentative List entry in 2018.

Since 2014, the total number of sites has increased as a result of three new discoveries which contribute to the Outstanding Universal Value (Kleve-Keeken, Kleve-Reichswald, Alpen-Drüpt), while three sites have been deselected since 2014 following re-evaluation of their dating (Königswinter-Drachenfels, Kalkar-Monreberg) or because of inadequate authenticity and integrity (Alpen-Boenninghardt). The selection included in this nomination reflects a decrease to 24 sites/site clusters based on the merging of former individual elements within combined clusters.

In the Netherlands a first selection was made in 2012.[9] A grouping of 233 sites located within an area which had been demarcated by the Cultural Heritage Agency of the Netherlands as the Dutch section of the Lower German frontier zone was reduced to a provisional selection of 119 sites. In 2014 the selection was further reduced to 72 sites, grouped in 42 clusters. Additional information was provided for each site,[10] making use of the first draft of the Statement of Outstanding Universal Value compiled in the same year.[11]

In 2015 the situation was evaluated by an international committee appointed by the Ministry of Education, Culture and Science of the Netherlands,[12] which concluded that the selection of sites and the definition of their boundaries were at times debatable. To improve the site selection an academic assess-

9 W. A. M. Hessing/B. Brugman/W. J. Weerheijm/L. Ziengs, Voorstel voor een kader voor de verankering van de Romeinse Limes in de provinciale ruimtelijke verordeningen van de provincies Gelderland, Utrecht en Zuid-Holland (Amersfoort 2012).

10 K. M. van Dijk, Terreinencatalogus voor de werelderfgoednominatie Romeinse Limes (s.l. 2014).

11 Cf. note 8.

12 For the latter cf. Bitter en zoet. Advies van de Expertgroep beoordeling werelderfgoednominaties (s.l. 2015).

ment was carried out in 2016, which started with the earlier 'long list' of 233 sites, evaluated these against the background of the draft Statement of Outstanding Universal Value, and subjected the resulting selection of 23 sites/site clusters to an internal comparative analysis.[13] Additional field work was recommended for ten sites, to collect more evidence concerning the presence, character, preservation and extent of the archaeological remains. These recommendations resulted in eight desktop studies, two geophysical surveys, five coring surveys and six excavations in the form of trial trenches, all carried out in 2017–2019. The outcomes of these research projects led to a further reduction in the selection. Four sections of the Limes road, which turned out to be insufficiently preserved, and the fort of Bodegraven, the form and size of which could not be established, were removed from the list (fig. 2.32).

As a result of the selection process outlined above, the nominated property *Frontiers of the Roman Empire – The Lower German Limes* consists of 106 component parts, 79 of which are grouped in 17 clusters. An overview of the component parts and the elements of the frontier represented by them is provided in table 2.1. This table also includes the most relevant of those elements which have been considered for nomination but rejected; these elements are not preceded by a number and are not further discussed in this dossier.

The selected component parts and clusters are presented in detail in the catalogue of component parts (Annex 1), where their main characteristics and their contribution to the proposed Outstanding Universal Value may be found under the headings 'Brief description' and 'Attributes and values'.

2.b History and development

In order to understand the development of the Lower German Limes it is necessary to have some idea of the wider context of the Roman Empire and its frontiers. This is summarised in section 2.b.1. The history of the Lower German frontier is outlined in section 2.b.2. After the abandonment of this frontier in the 5th century AD most of the installations decayed and disappeared from sight, until they were 'rediscovered' in the 16th century. Our knowledge of the military infrastructure and the present state of the remains are influenced by the gradual development of scientific archaeology and of measures taken for their protection and presentation. These aspects are briefly discussed in section 2.b.3.

[13] M. Polak/J. de Bruin, The Lower German Limes. Scientific assessment of the site selection for the 'Frontiers of the Roman Empire' World Heritage Site (Nijmegen 2016).

2.b.1 The Roman Empire and its frontiers

Rome started off as a kingdom, was converted into a republic c. 500 BC, ending with the murder of Julius Caesar in 44 BC after a series of civil wars. The appointment of his adoptive son as a head of state in 27 BC is considered as the start of imperial rule, which would last for five centuries in the West and fifteen in the East. From c. 250 BC onwards Rome gradually expanded its power outside Italy, initially over the relatively developed societies surrounding the Mediterranean Sea, but from c. 50 BC onwards increasingly over more remote areas with less centralised traditions. At the same time military control of the annexed areas moved from the interior to the external boundaries. As the offensive made way for the defensive, large expeditionary armies were redeployed into smaller units spread out over the frontier lines.

According to historical tradition Rome was founded in 753 BC. The city was initially ruled by elected kings, but misgovernment led to the expulsion of the last king c. 509 BC and to the establishment of what we know as the Roman Republic, led by two annually elected consuls. In the following centuries Rome gradually expanded its power in Italy by concluding treaties with other cities and by applying brute military force where diplomacy failed. By the middle of the 3rd century BC all of Italy was under Roman control.

The expansion into southern Italy and to the island of Sicily brought Rome into conflict with the other main powers in the Mediterranean: the city state of Carthage on the African coast and the kingdoms of Greece. After several hard-fought victories Rome had annexed most of the coastal regions of the Mediterranean Sea and converted these into provinces of the Republic. The conquest and exploitation of these areas generated great military prestige and immense wealth for some members of the c. 25 families that constituted the ruling elite. Their internal rivalry and the increasing imbalance within the Roman society uprooted the republican system, culminating in the dictatorship of Julius Caesar, his murder by political rivals in 44 BC and the appointment of his adoptive son Octavian as head of state with the honorary title of Augustus ('venerable') in 27 BC (fig. 2.33). This date is now considered as the start of imperial rule or Principate (derived from *princeps*, 'leading citizen').

When Nero, the last descendant of the Julio-Claudian dynasty of Augustus, died in AD 68, a civil war broke out which might have put an end to the imperial model, but Vespasian managed to restore order in AD 69, founding the Flavian dynasty. After his youngest son Domitian had been assassinated in AD 96, imperial succession was for almost a century arranged by adoption, followed by the rule of the Severan dynasty after a brief civil war. When the last member of the

Fig. 2.33 Miniature glass head of Augustus. Today in the Römisch-Germanisches Museum of Köln.

Severan house was murdered in AD 235 the Roman Empire was faced with a deep crisis. The next fifty years saw more than twenty more or less legitimate emperors and at least as many usurpers, most of them ambitious army commanders. Around AD 270 the Empire even fell apart briefly, into three competing empires: the Gallic Empire in the West, the Palmyrene Empire in the East and the remaining part of the Empire centred around Italy.

The chaos produced by this imperial competition, in which frontier garrisons were used as pawns, paved the way for invasions from outside the Empire, on the Rhine and Danube, in the East and in large parts of northern Africa. From the Black Sea to the North Sea the military infrastructure was destroyed or otherwise affected; in the East the army suffered humiliating losses, and in Egypt and Africa large areas were overrun. It was only in the final years of the 3rd century AD that order was restored, after Diocletian had divided the Empire into a western and an eastern part, sharing the burden of imperial rule with Maximian and two junior emperors. The division of the Empire and of the imperial power was maintained for much of the 4th and 5th centuries, but the system suffered heavily from conflicts over succession. During the 5th century, increasingly, emperors of the West were not recognised by those of the East, until the Roman West finally dissolved c. AD 480. The Eastern Empire continued to exist for nearly a millennium, usually referred to as the Byzantine Empire after its capital *Constantinopolis*, formerly named *Byzantium*.

During the Republic the Roman armies operated mainly around the Mediterranean Sea, in areas with developed hierarchical societies. These regions could be controlled by posting army regiments in the interior, in or near the major cities and other central places. From the late 1st century BC onwards, on moving further inland, the Roman armies were increasingly faced with less centralised and often migratory societies. Subjection, military control and civil administration of their territories was very difficult, as Rome experienced in areas as far apart as the German Rhineland and the deserts and semi-deserts of Arabia and Africa. As the troops advanced more and more into economically marginal areas whose carrying capacity was insufficient for the maintenance of a large army, supply was an increasing challenge. In many regions the expansion therefore came to a standstill.

When the societies outside the annexed areas could not be controlled by treaties, the armies were pushed out from the interior to the external boundaries of the newly acquired territories. The Lower Rhine was the first area where this development took place, but other areas soon followed. The transition to perimeter defence in the course of the 1st century AD is reflected by the gradual disappearance of bases for more than a legion, the swift increase in forts for units of a thousand or less troops, the conversion of earth-and-timber fortifications into stone ones, and the establishment of a network of metalled roads.

In the early 2nd century AD the Roman Empire reached its greatest extent, with linear arrangements of military installations along its boundaries in most areas. This development culminated in the creation of the continuous artificial barriers of Hadrian's Wall and the Antonine Wall in Britain and the Upper German-Raetian Limes in southwest Germany. This defence system provided cost-effective and adequate protection against raiding and other small-scale threats. Larger threats were countered by ad hoc armies, preferably beyond the frontier line.

The reduction of the frontier garrisons during the crisis of the 3rd century and the development of large tribal formations such as the Franks, the Alamanni and the Goths beyond the Rhine and Danube led to sustained attacks on several frontier sections. Where the line was broken, invaders penetrated deeply into the Empire. Although the linear defence was subsequently restored in many places, the frontier installations were reduced in number and size. New and restored forts were much more massive than their predecessors, characterised by projecting towers for the effective use of artillery (fig. 2.34). Additionally, new strongholds were built along the roads leading into the interior of the Empire. These were intended to slow the pace of invaders in anticipation of the ar-

rival of a large mobile army stationed in the rear. The increased risks for the provincial population led to the building of city walls and the fortification of farmhouses and granaries.

The conquests of the Roman Republic had been fought by ad hoc legions recruited from small peasants in Italy, and by so-called auxiliary forces provided by Italian allies, subject tribes and occasionally mercenaries. Augustus greatly reduced the number of legions which had been raised during the civil war at the end of the Republic. He created a professional standing army of c. 30 legions or c. 150,000 men, supplemented with a similar number of auxiliary soldiers. Initially, the troops were divided between the periphery of annexed territories and areas in the interior needing further pacification. The concentration of the armies on the external boundaries into large bases demonstrates that they were not intended as frontier garrisons, but rather as strike forces for further conquests. In the course of the 1st century AD, as linear defence started to develop, the large expeditionary armies were dissolved. Single legions were stationed at strategic locations, but frontier security was primarily left to mobile auxiliary units spread out along the perimeter. Flexibility of deployment was increased by the creation of so-called military units of 1,000 men and *numeri* of possibly 300 men, as supplements to the legions of 5,000 men and the regular auxiliary units of 500 men.

Army units were frequently relocated as long as the Empire was expanding, but when the frontier lines solidified in the 2nd century AD mobility was greatly reduced. Armies for large wars were increasingly assembled by drafting detachments from legions, instead of entire legions.

The rearrangement of the military infrastructure from the late 3rd century onwards went hand in hand with a restructuring of the army. The changes included a reduction in size of the legions and the creation of large mobile armies as a flexible complement to the now reduced frontier garrisons.

2.b.2 History of the Lower German Limes

The earliest known military base in the Rhineland was built in 19 BC. For over three decades, military campaigns across the Rhine and diplomatic measures failed to solve the problem of unremitting Germanic invasions into Gaul. In AD 17, the Roman armies were withdrawn from east of the Rhine and military installations developed along the left bank, forming the first linear frontier of the Empire. For over two centuries the Lower German Limes proved an effective instrument of Roman frontier defence, with the exception of a near collapse during the civil war of AD 68–69. During the 3rd century the frontier shared in the general political and economic crisis, with a prominent role in the temporary breakaway known as the Gallic Empire. Despite several restorations in the 4th century, the frontier was eventually abandoned after the middle of the 5th century.

Fig. 2.34 Projecting towers, as attested at the east gate of the Late Roman bridgehead fort of Köln-Deutz ▶38 for instance, provided enough space to mount artillery. Today, the layout of the gate is marked out with masonry erected on top of the actual features.

Although it is certain that the armies of Julius Caesar operated in the Rhineland during the Gallic War of 58–52 BC, the camps which they must have built in this area have not, so far, been recognised. The transformation of the conquered Gaulish territories into three Roman provinces – (*Gallia*) *Lugdunensis*, *Aquitania* and *Belgic*a – took several decades. The process of provincialisation was retarded by the civil wars which led to the end of the Republic and the creation of the Principate, by tribal revolts in Gaul and by Germanic invasions. The latter were countered by punitive expeditions and it was during one of these campaigns that the earliest known military base in the Rhineland was built, at Nijmegen-Hunerberg ▶15 in 19 BC. On the same occasion some pro-Roman Germanic groups were displaced to the left bank of the Rhine, to repel further attacks from the east.

When repeated invasions demonstrated the inadequacy of this new security arrangement, the Emperor Augustus (fig. 2.35) turned to large-scale war across the Rhine. From 12 BC onwards nearly a quarter of the entire Roman army was on campaign in Germany as far as the river Elbe – 500 km east of the Rhine. Several nodes in the logistical system were secured by military posts, as at Bunnik-Vechten ▶11 and Moers-Asberg ▶30. The scale and range of the operations indicate clearly that Rome intended to incorporate this vast area as a Roman province. Although resounding victories were won, peace rarely lasted more than a few years. Treaties were violated time and again, and even the deportation of tens of thousands of notorious troublemakers to the left of the Rhine failed to create a stable situation. In AD 17 Tiberius ordered the withdrawal of the armies to the left bank of the river. The military infrastructure was extended with

several bases, including a fleet base at Köln-Alteburg ▶39 and smaller posts such as Kalkar-Bornsches Feld ▶24 and Alpen-Drüpt ▶29.

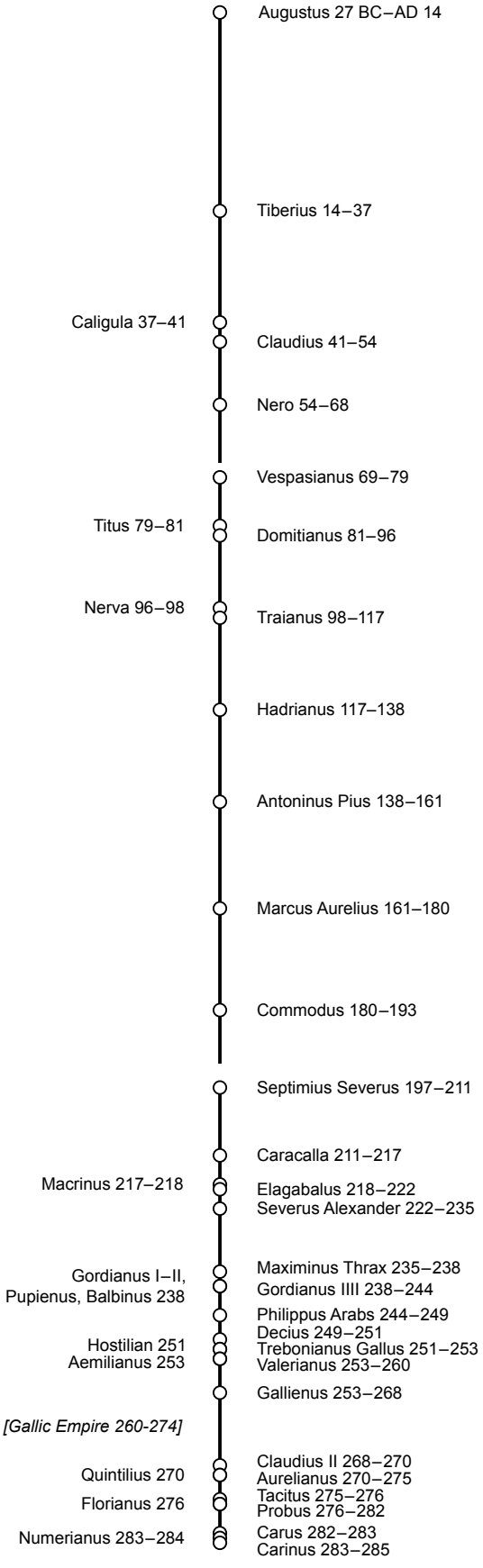

Fig. 2.35 Roman Emperors from Augustus to Carinus with their respective dates of reign.

The Emperor Gaius (AD 37–41), better known as Caligula, resumed the aggressive military policy of Caesar and Augustus. After a brief display of power beyond the Rhine he prepared to cross the English Channel to Britain, but the plan was cancelled at the last minute. Judging by the immediate establishment of a dense series of small forts such as Valkenburg-Centrum ▶1 and Utrecht-Domplein ▶10 in the Rhine delta – clearly intended to protect this vital supply line to Britain against Germanic piracy – the invasion was not abandoned, but only postponed to allow for better preparation. In AD 43 Claudius (AD 41–54) carried through the initiative begun by his predecessor, and it is highly likely that his rapid advance in Britain owed much to Caligula's preparations (fig. 2.36).

In AD 47 the ambitious military commander Corbulo embarked upon recapturing Germanic territories across the Rhine, but he was whistled back by Claudius, who must have recognised the risks of a war on two fronts. After redeploying his troops on the left bank of the river, Corbulo ordered the construction of a canal ▶4 connecting the Rhine and Meuse behind the coastal barriers, 'to keep his troops busy' as the historian Tacitus wrote, and 'to avoid the hazards of the ocean'. At about the same time the ramparts and the main inner buildings of the legionary fortresses of Xanten-Fürstenberg ▶28 and Neuss-Koenenlager ▶33, previously constructed in timber, were rebuilt in stone. This is a further indication that the series of military installations along the left bank of the Rhine was now considered to be a permanent frontier line. Nevertheless, parts of the east river bank were still claimed as Roman military territory. This is demonstrated by the harsh eviction under the rule of Nero (AD 54–68) of Frisian and Ampsivarian settlers from the right bank of the river, recorded by Tacitus. Archaeological evidence of a continued Roman claim on the right bank is provided by the exploitation of a stone quarry at the Drachenfels opposite Bonn and of a *tegularia transrhenana* ('brick works across the Rhine').

The death of Nero and the ensuing civil war of AD 68–69 brought an end to compliance with Roman rule by three generations of the Germanic tribes that had been transferred to the left bank of the Rhine during the reign of Augustus. The acting commander of the Lower German army was the second of four consecutive claimants to the imperial purple. He left for Italy with troops of the Lower and Upper German armies, who had acclaimed him as emperor. The weakened army on the Lower Rhine was thereupon assaulted by a federation of Gaulish and Germanic tribes, with a prominent role for the Batavians, settled in the river delta west of Nijmegen, and for the auxiliary units recruited from amongst them. All the camps on the Rhine were destroyed by fire, either when hastily evacuated by their garrisons or when captured by

Fig. 2.36 Brandmarks with the abbreviated names of the Emperor Caligula on staves of wine barrels found at Valkenburg (a) and Vechten (b).

the rebels (fig. 2.37). The uprising is likely to have been encouraged by Vespasian (AD 69–79), the fourth candidate for the purple. Once Vespasian's position on the imperial throne was secured, one of his generals succeeded in quelling what has become known as the Batavian revolt, in AD 70. The restoration of order was sealed by the establishment a new legionary fortress at Nijmegen-Hunerberg ▶15.

The reign of Vespasian's second son Domitian (AD 83–96) constituted a turning point in the history of the Lower German Limes. A war with the Germanic Chatti was formally concluded with a triumph in Rome *de Germanis*, 'over the Germans', i.e. the Germans at large. The victory was thus presented as the final conclusion of the wars which had started nearly a century before. The Upper and Lower German military districts were now transformed into Roman provinces. This somewhat forced arrangement was probably connected with an incursion by the powerful Daci across the river Danube. To counter this invasion, troops were ordered from other provinces including Lower Germany. Most of the displaced units seem to have returned to their bases, but the building of a new fort at Dormagen ▶36 may point to some rearrangements.

Following his assassination, Domitian was briefly succeeded by the elderly Nerva (AD 96–98), who adopted a man from outside his family as his intended successor, as the first of four consecutive emperors. When Nerva died this adoptive son, the able general M. Ulpius Traianus (AD 98–117), was residing in the *praetorium* at Köln ▶37 as acting governor of Lower Germany. Trajan's first actions as emperor included the foundation of the *Colonia Ulpia Traiana* at Xanten and

Fig. 2.37 Horse burial from Krefeld-Gellep ▶32 on the battlefield of AD 69.

the promotion of the civil settlement at Nijmegen to *Ulpia Noviomagus*, probably as early as AD 98 or 99. A few years later the legionary base at Neuss ▶33 was replaced by an auxiliary fort, and the legion at Nijmegen-Hunerberg ▶15 appears to have been replaced with detachments only. The number of auxiliary units was also decreased, and the evacuation of the fort at Moers-Asberg ▶30 may be related to these measures. In all, the Lower German army was reduced by nearly fifty percent in the first quarter of the 2nd century AD. The Limes road in the Rhine delta was twice repaired on a large scale, in AD 99/100 and 123/125, as firmly attested at Utrecht-Limes road ▶7. It is tempting to consider all these measures as elements of a coherent plan to mitigate the negative effects of the troop reduction, but there is no clear evidence of a causal connection between these successive events. There is, however, little doubt that the reduction of the Lower German army was in some way related to the Dacian Wars of AD 101–102 and 105–106, which resulted in the creation of the new province of *Dacia*. This led to a large-scale and permanent redeployment of army units, to the Danube or to other frontiers, succeeding regiments which had been displaced for the Dacian Wars (fig. 2.38).

From the late 1st century BC to the early 2nd century the army had been very mobile. Legions and auxiliary regiments were constantly relocated to fight wars and to man the gradually developing external frontiers. The incessant transfers are mirrored by the frequent rebuilding of military installations, which was necessary to accommodate new units of different sizes and compositions than the previous ones, or to respond to changing strategies. The reign of Hadrian (AD 117–138) brought a radical change. Trajan's wars in *Dacia* and the East had overstretched the capacities of the Roman army. Hadrian therefore evacuated most of the recent acquisitions in the East and consolidated the remaining frontiers. From then on army units left their bases only periodically for military campaigns elsewhere; large numbers of temporary camps as at Uedem-Hochwald ▶25 and Wesel-Flüren ▶26 demonstrate that training for military campaigns was a constant concern. If expeditionary forces were needed, they were usually composed of detachments of legions and auxiliary units, which returned to their bases after the conclusion of a war.

For most of the 2nd century it appears to have been relatively quiet on the Lower Rhine, with only a record of Germanic raiding into nearby *Gallia Belgica* in the early 170s AD and perhaps a further unspecified Germanic invasion under Commodus (AD 180–193). After the assassination of Commodus the Empire was dragged into a succession war which lasted for five

Fig. 2.38 Inner face of a military diploma found at Elst, issued to a Batavian horsemen on his release from the auxiliary forces of the Roman army. The document lists nearly all auxiliary units present in Lower Germany in February AD 98.

years (AD 193–197). The Lower German army may have been involved in the conflict, but any battles were fought outside the province.

The nearly forty years of the reign of the Severan dynasty (AD 197–235) heralded the crisis of the 3rd century. The rule of the Severi was interrupted when the commander of the imperial guard murdered the Emperor Caracalla (AD 211–217) and appropriated the purple for just over a year – foreshadowing the numerous military usurpations during the remaining history of the Western Empire. Further, the reign of Caracalla saw the start of protracted conflicts on the Rhine with new federations of Germanic tribes – the Alamanni on the Middle Rhine and the Franks on the Lower Rhine. Initially, the involvement of Lower Germany appears to have been limited to the supply of troops for military operations further south, where the Upper German-Raetian Limes was overrun in AD 233. The invaders were defeated a few years later. From then on the garrisons of the Lower German Limes were thinned out to participate in the power struggle between successive emperors and usurpers and in repeated wars on the Danube and in the East.

From AD 256 onwards Lower Germany suffered from attacks by the Franks. Shortly afterwards Köln became the capital of the so-called Gallic Empire, established in AD 260 by the usurper Postumus (AD 260–268), who was an army commander in Lower Germany. The Gallic Empire included both German provinces, most of Gaul, and Britain and Spain. Postumus and his successors seem to have had their share of Germanic troubles, which must have included piracy, as coins with depictions of a warship indicate. After a military victory in AD 274 the Gallic Empire was dissolved by the officially recognised emperor of the Western Roman Empire.

It is unclear whether the Lower German Limes was affected by the German attacks of AD 275/276. It has long been thought that these led to a large-scale destruction of the military infrastructure along the Rhine and Danube, but this assumption is now subject to much debate, not least because of the virtual absence of destruction layers from this period. Political and military instability went hand in hand with a deep economic crisis, in which increasing taxes to finance the military apparatus and buying off invaders were important factors. The crisis is likely to have been aggravated by climate change resulting in hot summers and extremely cold winters and by soil erosion caused by agricultural overexploitation and extensive felling of forests. The scarcity of finds at many military sites in the 3rd century, which led to the assumption of reduced military activity, may therefore rather be an effect of the economic crisis. On the whole, there are no signs of significant destruction or abandonment of military installations along the Lower German Limes in this period, but in Xanten-CUT ▶27 the south-

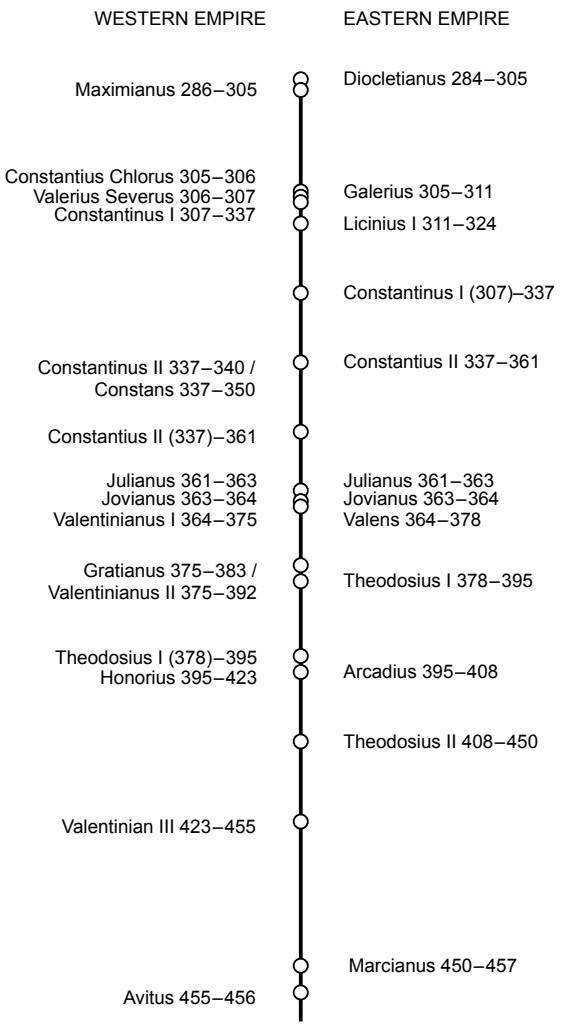

Fig. 2.39 Western and Eastern Roman Emperors' dates of reign.

western part of the town was cleared for the construction of a military post.

It is generally accepted that Diocletian (AD 284–305) and his co-emperor Maximian (AD 286–305) managed to stabilise the Empire (fig. 2.39). This was now divided into a western and an eastern part. Most provinces were subdivided to improve their manageability, and subsequently grouped into larger districts called *dioceses*. Lower Germany, renamed to *Germania secunda*, became part of the *diocesa Galliarum*. The historical sources of the Late Roman period mainly refer to *Gallia* instead of its constituent parts, which is a severe hindrance to our understanding of events on the Lower Rhine.

From the reigns of Diocletian and Maximian onwards the army and the military infrastructure were thoroughly reorganised, building on earlier experiments with a mobile field army in the rear of the frontier and fortified posts along the main roads into the hinterland. The frontier garrisons were thinned out and the remaining troops were accommodated in smaller forts with massive stone walls, numerous projecting towers and wide ditches. Existing forts were often considerably reduced in surface, and some were abandoned while a few new ones were added.

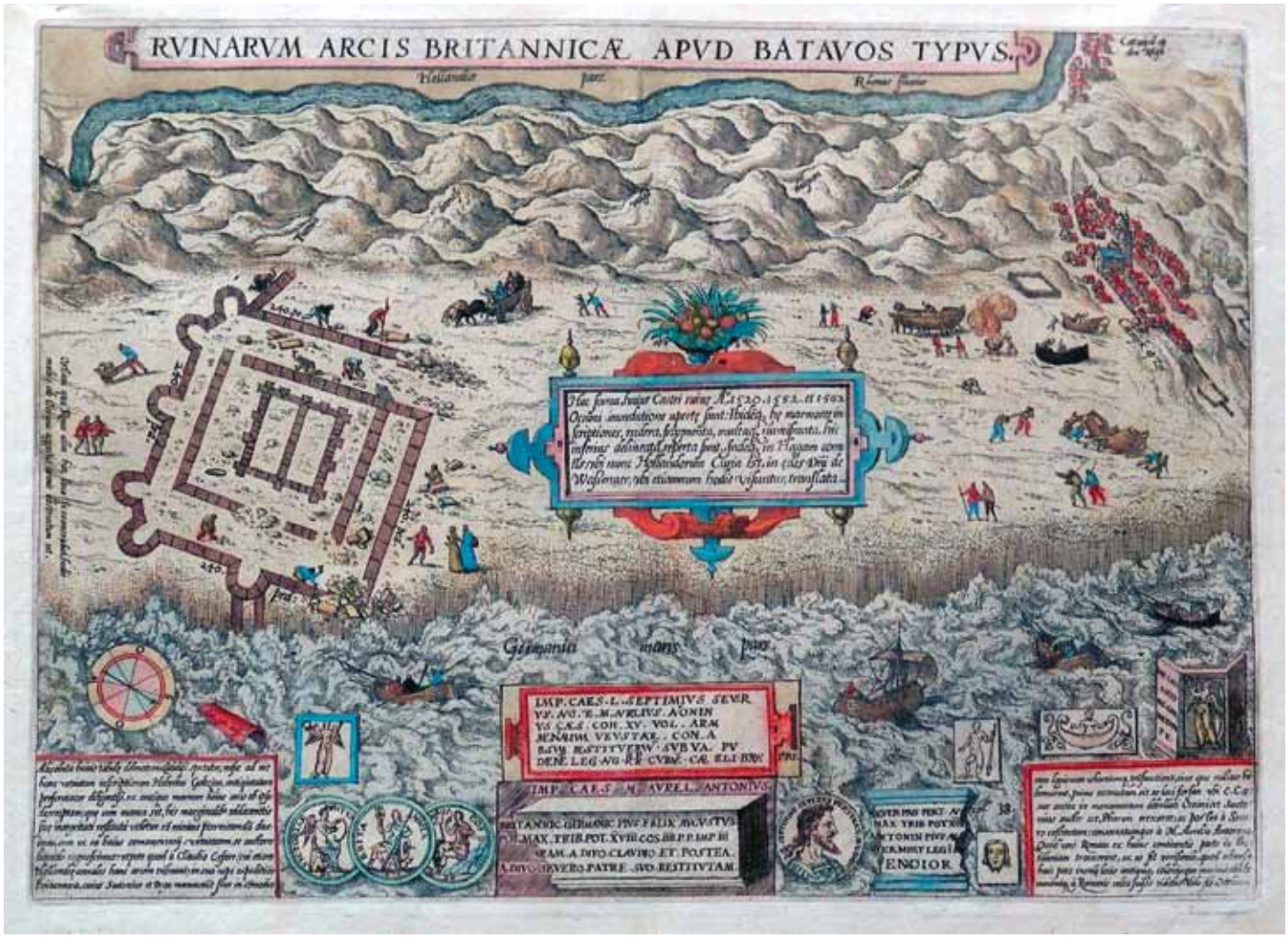

Fig. 2.40 Coloured engraving of the Brittenburg made by Abraham Ortelius in 1581 showing the remains of the westernmost fort of the Lower German Limes, as seen at very low tide in the 16th century.

Whether the frontier section downstream from Nijmegen continued in use is unclear, in the absence of attested remains of Late Roman walls and ditches. Because the late 4th and early 5th centuries seem to have been extremely wet – as reflected by a clear shift of rural settlements in the delta to more elevated positions – it cannot be ruled out that the fort sites were now considered as unsuitable, or that the region was no longer worth protecting. It is not very likely that the massive walls and deep ditches of Late Roman forts have been accidentally missed at all sites in question. The only site in the delta for which a Late Roman fort seems certain is the now submerged Brittenburg at Katwijk (fig. 2.40). However, rather than being the end point of a defence line along the river Rhine, this most likely belonged to a series of fortifications along the southern North Sea coast.

The 4th and 5th centuries were characterised by numerous armed conflicts between emperors and usurpers, and by unremitting Frankish attacks. During the more stable reigns of Constantine the Great (AD 306–337) and Valentinian (AD 364–375), many military installations on the Lower German frontier were built or rebuilt, like the bridgehead fort at Köln-Deutz ▶38 under Constantine and the massive tower of Moers-Asberg ▶30 under Valentinian. The building activities reflect the Frankish invasions, some of which ended in the settlement of Frankish groups to the left of the Rhine in exchange for their employment as frontier garrisons. In the 5th century the military infrastructure along the Lower Rhine gradually collapsed through further troop reductions for the protection of Italy and ongoing Frankish invasions. When Köln was taken over by the Franks in the 450s AD, Roman rule of the Lower Rhine area finally ceased.

2.b.3 Later developments

The development of the landscape and of the remains of *Frontiers of the Roman Empire – The Lower German Limes* in the Middle Ages and Modern Period has not always been identical and simultaneous between Germany and the Netherlands. For this reason some of the later developments are discussed separately for the two countries.

Middle Ages

Most of the military installations on the Lower Rhine were left to their fate in or after the Late Roman

period. Downstream from Nijmegen, the thin spread of Late Roman finds may indicate that evacuated fortifications were already being robbed, since there are no known traces of fort defences from this period. In an area without natural stone reserves abandoned forts were eagerly used as quarries. While this is not certain for the Late Roman period, it is well attested for the Early Middle Ages, when for instance the fort at Bunnik-Vechten ▶11 was dismantled to reuse the stones for church-building in nearby Utrecht. Judging by the rarity of substantial remains of stone walls most fortifications and other stone-built structures in the Dutch frontier zone shared the fate of Vechten.

The forts of Utrecht-Domplein ▶10 and Nijmegen-Valkhof ▶14 became nuclei of Early Medieval development, but it is uncertain whether there was any continuity in occupation from the Late Roman period. At Nijmegen some of the walls of the Roman fort may have been reused in the *Kaiserpfalz* (royal palace) of Charlemagne (AD 742–814) and its presumed predecessors, and fragments of Roman pillars and other construction materials are still visible in the remains of chapels from successors to that palace. At Utrecht the Roman fort made way for a cluster of chapels, churches and palaces, and formed the core of the ecclesiastical territory. The governor's palace ▶37 in the capital of the province of Lower Germany remained a centre of political power after Late Roman times. The city continued to develop from the Middle Ages to the present day and the town hall is still located directly above the palace. At other major sites such as Xanten ▶27 and Bonn ▶41 the city centres moved away from the Roman military installations and developed in the areas of former Roman cemeteries or civil settlements. In the eastern river delta at least four forts fell victim to post-Roman river erosion. Until very recently, Herwen-De Bijland ▶19 was also considered as a completely eroded fort, on account of the occurrence of many stone remains and other finds at depths of 8–10 m in fossil river channels, but now we know that parts of two or more camps have escaped the brute power of shifting meanders. The fort of Arnhem-Meinerswijk ▶12 is another example, damaged by migrating meanders in the Late Roman period or Early Middle Ages and again in the Late Middle Ages. Finds assemblages similar to that of Herwen-De Bijland point to the existence of several other forts which appear to have been even less fortunate. Upstream from Xanten few sites were eroded by the river. It is still unknown exactly when the eastern parts of two military installations in Alpen-Drüpt ▶29 were eroded by a recent course of the Rhine. The fort of Haus Bürgel ▶35 is today located on the right bank of the Rhine. During the great flood of 1374, after which the river changed its bed – and thus Haus Bürgel changed its side of the Rhine – only the southwest corner was destroyed; a large proportion of the remaining parts of the building is now integrated into a castle complex.

In the course of the Middle Ages nearly all the remains of the Roman frontier installations disappeared from sight, but the ruins of the Roman bridge over the river Erft were still visible in the 17th century (fig. 2.41). In

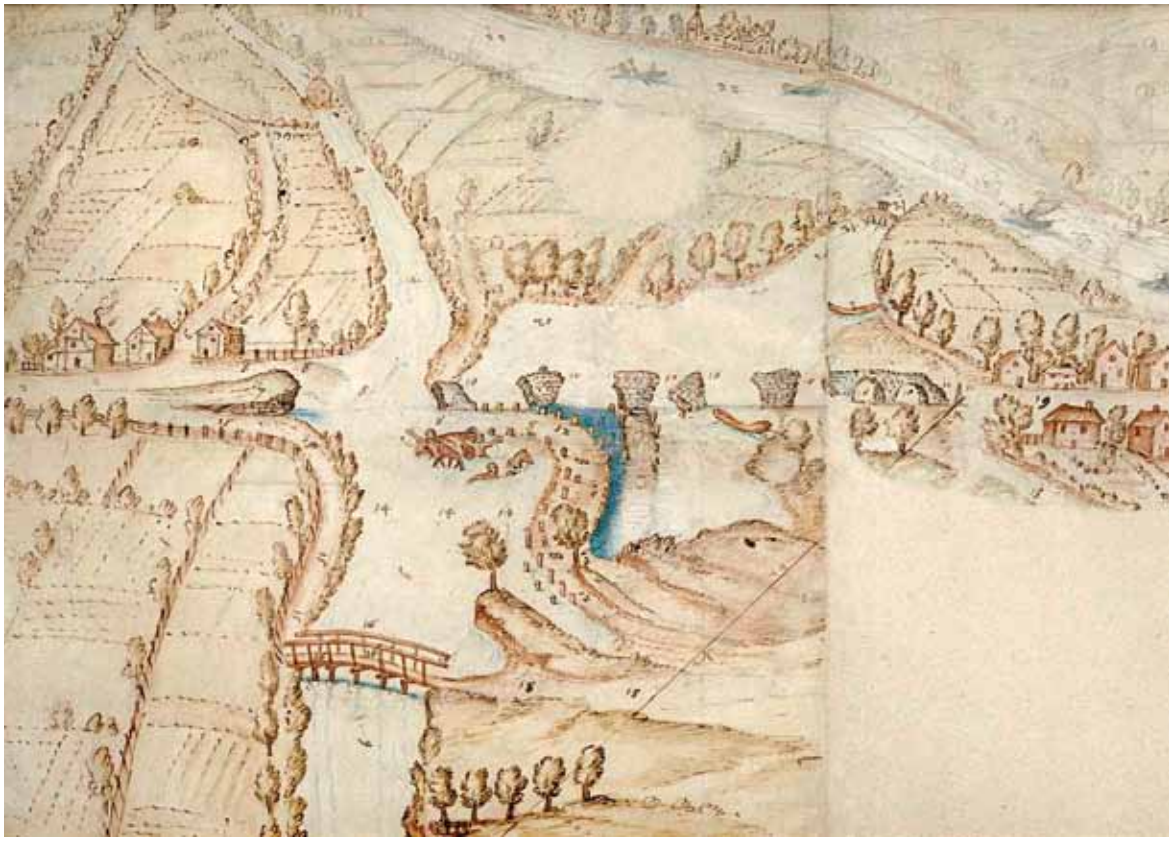

Fig. 2.41 Remains of the Roman bridge at Neuss-Grimmlinghausen were to been seen until Early Modern times (drawing c. 1620/30).

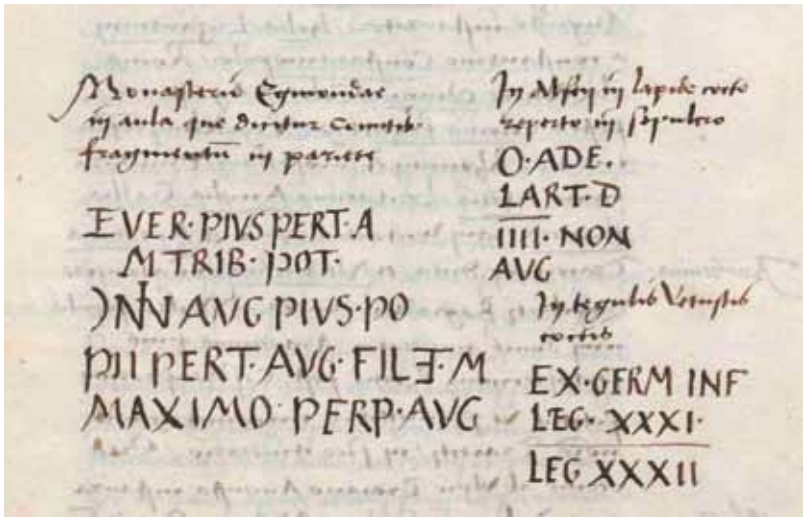

Fig. 2.42 Fragment from a manuscript of the Historia Episcoporum Ultrajectensium by Wilhelmus Heda, published c. 1520–1524. In the left part a now lost building inscription dateable to AD 200–204 is mentioned, which was probably found either at Katwijk-Brittenburg or at Leiden-Roomburg. Utrecht University Library ms. 0 b 6, 12 verso.

urban areas, forts and other structures were covered by increasing amounts of settlement waste and debris from demolished buildings, gradually building up protective levels. In rural areas some overgrown Roman remains were covered by manure and settlement waste, which provided some protection, but others were exposed to ploughing, and in a few cases to the extraction of clay and sand.

Antiquarian interest

The Renaissance, which developed in Italy in the 14th century and spread to the rest of Europe by the 16th century, was characterised by a profound interest in Antiquity. 'Above all, one must hasten to the sources themselves, that is, to the Greeks and ancients', as the famous Dutch humanist Erasmus (1466–1536) stated, leading to a hunt for Roman inscriptions, coins and buildings.

Netherlands

Erasmus' contemporary Cornelius Aurelius (c. 1460–1531) was perhaps the first to record Roman buildings and finds in the Rhine delta. He mentioned in 1502 the discovery of 'foundations of a large palace' and of three inscriptions at Leiden-Roomburg ▶5, for which he cites the texts. The swift increase in antiquarian interest is illustrated by the staggering number of 978 coin collections which the renowned numismatist Hubertus Goltzius (1526–1583) boasted of having visited on his journey through Europe in 1558–1560. The rapidly spreading knowledge of Roman sites seems to have led to considerable activity in collecting Roman objects (fig. 2.42), judging by the lively account of a visit to the site of the Roman fort at Bunnik-Vechten ▶11 in 1711: 'I noticed several people roaming the fields, looking for silver and copper coins of Roman emperors, fragments of red jugs, tiles, old glass, rings and other things. […] I even heard from these people that recently such fragments had been carried off by the cartload, either to clear the fields, or – as I prefer to believe – to sort out the antiquities at leisure at home'.[14]

The early 19th century saw the gradual development of a more scientific approach to archaeological finds and remains. In the Netherlands a key role was played by Caspar Reuvens, who in 1818 was appointed as professor of archaeology at Leiden University and, at the same time, as the first director of the newly established National Museum of Antiquities, also at Leiden. Reuvens is famous for his excavations at the former estate of Arentsburg at Voorburg ▶3, where he lived in 1827–1834. Here, he uncovered parts of the Roman town of *Forum Hadriani*, recording his findings in excellent drawings and plans. The National Museum would remain the leading excavating institution for much of the following century, although regional learned societies and universities gradually started excavating as well.

From the early 20th century onwards excavation methods improved, with increasing attention paid to connecting the unearthed buildings and other features with the associated coins, pottery and other finds. As excavating was manual work until well after the Second World War, the scale of the excavations was generally limited, and any stone walls uncovered were often left in place, reducing the damage to the archaeological remains. Strong population growth – from 5 to 8 million in 1900–1940 in the Netherlands – required an enlargement of towns and villages and an intensification of agriculture. Although this led to many new archaeological discoveries, for a long time excavations continued to be steered by scientific curiosity rather than by any policy of anticipating impacts of spatial developments. Without the personal efforts of local clergymen and dignitaries, most would have been lost.

Germany

In Germany, too, an increased interest in antiquity began in the 15th and 16th centuries. The rediscovery in Rome in 1455 of the historical and ethnographic study *Germania* of Tacitus and its subsequent printing, led to the first studies of the country's ancient history. This return to antiquity, however, was a largely literary study, focusing on which sites of ancient ruins might correspond with places mentioned in the texts; targeted excavations were rare. The humanist Pighius (1520–1604), born in Kampen (NL) and died in Xanten (DE), succeeded for the first time in identifying *vetera castra*, known from literary sources, as Xanten. In *Asciburgium* (Moers-Asberg), too, the first recognition

[14] Paraphrased from L. Smids, Schatkamer der Nederlandsche oudheden (Amsterdam 1774) 429–430.

Fig. 2.43 Roman finds and inscriptions incorporated in the facade ornamented the exedra-shaped open-air tomb of Johan Maurits, Prince of Nassau-Siegen (1604–1679) at Kleve. The finds have been replaced by reproductions in modern times.

and interest in the ruins as being Roman took place after 1521. The remains, seemingly still partly visible, found their way into cartographic works.

In the 17th century, the interest in archaeological artefacts and the number of collections and publications increased. Johan Maurits, Prince of Nassau-Siegen, began collecting inscriptions and placed them in outdoor antiquarian cabinets. In 1678 he had several of them, including the famous Caelius gravestone from *Vetera*, built into his open air tomb in a park (fig. 2.43). The inscriptions were moved to the newly founded museum in Bonn in 1820 and replaced in the park by reproductions. Another collection, created by the humanistically educated Graf Hermann von Manderscheid (1535–1604), consisted of finds from Köln and Bonn as well as monuments from the Jülich region, the Eifel and occasionally from further afield. The stone monuments were once set up in his castle courtyard; today many of them have been included in the collection of the Römisch-Germanisches Museum at Köln.

The 'search for antiquities' continued during the 19th century, but cannot yet be regarded as a developed science. Many historical and archaeological associations and new museums of cultural history were founded. Prior to the First World War, important steps were taken towards the establishment of an ordered approach to the preservation of historical monuments. The historical importance of the Rhineland was recognised, and the Museum für Vaterländische Alterthümer zu Bonn founded, at the comparatively early date of 1820. Already at that time, the goal was 'the preservation and research of interesting fragments from Roman times'. At this time also, the first excavations in the area of the legionary fortress in Bonn took place. The members of the Verein von Altertumsfreunden im Rheinland, which had existed since 1841, were active in exploring the Rhineland. The Bonner Jahrbücher, an important academic publication, is still published by this association today. In 1857, Alfred Rein wrote a book on sites and roads between Köln and *Burginatium* (Kalkar-Bornsches Feld), and can thus be regarded as the founder of systematic research into the Lower German Limes. With the founding of the Reichslimeskommission in 1892, systematic research of the Upper German-Raetian Limes began. The main initiator of the foundation was the ancient historian Theodor Mommsen, one of the most important antiquarian scholars of the 19th century.

At the end of the 19th and the beginning of the 20th centuries, various first scientific excavations of important sites took place, with the aim of researching and preserving the antiquities found there: e.g. Constantin Koenen (fig. 2.44) began excavating the legionary fortress at Neuss in 1887 and Hans Lehner began researching the site on the Fürstenberg near Xanten in 1905. Constantin Koenen was the first to establish the principles of archaeological research based on excavations. The most modern methods were used, including the first photo documentation of the excavation process. This research represents the beginning of modern provincial Roman archaeology. The excavations in the legionary fortresses of Bonn, Neuss and Xanten were crucial for the interpretation of the ground plans of Roman forts. This work on the legionary fortresses of the Lower German Limes, which have been particularly well researched, is of especial importance and continues to form an important basis for research today. The first excavations at the site of the only fleet base on the Lower German Limes began as early as the 1870s, during building construction.

Fig. 2.44 Constantin Koenen was one of the pioneers of Roman archaeology in the Rhineland and the first to conduct scientific excavations on the site of the legionary fortress of Neuss-Koenenlager ▶33.

Modern archaeology

The Second World War was in many ways a caesura in the development of archaeology. In some cases war damage offered an opportunity for excavation, but on the whole the post-war reconstruction and the need to feed the starving population led to development and agricultural exploitation at a scale and speed which exceeded by far capacity for excavation. The 'Lustgrabung' (excavation steered by curiosity) of the past made way for the 'Rettungsgrabung' (emergency excavation).

The excavation of endangered archaeological sites was to some extent facilitated by mechanisation, with the introduction of draglines and other mechanical excavators. Narrow excavation trenches were replaced by area excavation, and stone walls could now be easily removed. At the same time, the quality of archaeological documentation improved significantly using a variety of technological developments. Alongside excavation drawings, photo documentation became a standard procedure and the spatial recording of the locations of excavations and of individual features became much more precise. From the late 1980s onwards, post-excavation analysis was increasingly facilitated through the use of computers, whilst various methods from the natural sciences were applied more widely to archaeological data, enabling, amongst other benefits, the broadening of the interpretational scope by providing precise dates and insights into the physical and natural landscape setting of the archaeological sites. Not less important was the introduction of such non-destructive research methods as aerial photography and geophysical survey, which reveal archaeological features without disturbing them.

Netherlands

The excavations in the 1940s at Valkenburg-Centrum ▶1 and Elst-Grote Kerk ▶13 were both initiated following near complete destruction of local churches by

Fig. 2.45 Grote Kerk at Elst ▶13 in 1948, heavily damaged by bombardments in 1944–1945. View from the northeast.

Fig. 2.46 Remains of the govenor's palace in Köln ▶37 have been preserved underground and made accessible to the public.

bombing, while at Bunnik-Vechten ▶11 an excavation was made necessary by a need for soil improvement. These are telling examples of the direct effects of the Second World War (fig. 2.45).
A less direct effect was that of the large-scale redistribution of land to improve agricultural exploitation; this particularly affected the river area from the 1950s onwards. The redistribution was preceded by a large-scale coring survey, to assess the agricultural quality of the soils. An important side effect of this survey was the discovery of many archaeological sites, as the habitation layers were recognised in the core samples. Increasing awareness of the need for spatial planning can be recognised in the adoption of the first Spatial Planning Bill in 1960. By this bill and its successors, spatial development became much more 'predictable', thus providing time for prior archaeological research. At the same time, knowledge of past landscapes and habitation patterns improved through ongoing archaeological surveys and excavation campaigns, the scale of which increased through the 'landscape archaeology' trend of the 1970s. As a consequence of these developments, the presence of archaeology – that is: past habitation – became more 'predictable'. All in all, assessment of the archaeological impacts of spatial plans improved greatly, enabling destruction of archaeological remains to be avoided – at least theoretically.

Germany

War damage in Köln offered the opportunity to carry out large-scale excavations in the area of the Praetorium. In 1953, O. Doppelfeld uncovered the main building of the governor's palace, which was made accessible underground for the public (fig. 2.46).
The development of new settlements in the 1950s, 60s and 70s also led to Roman sites being built over. The construction of single-family houses at Moers-Asberg ▶30 and Neuss ▶33 resulted in many small interventions that provide a good picture of the military installations without destroying much archaeological substance.
Special attention should be paid to the survey and non-destructive exploration of several monuments since c. 2005. The use of LiDAR (light detection and ranging), where the surface is illuminated with pulsed laser light, brought numerous new sites to light. Through the systematic analysis of LiDAR data, many new temporary camps have been discovered in forest areas near Xanten ▶25–26 and Bonn ▶40 and ▶42. Using the magnetometer geophysical survey technique, the spatial organisation of military complexes at new ▶22 and previously known sites ▶24 and ▶28 were completely surveyed. The surveys produced extensive new results; their scientific interpreta-tion profoundly changed the picture of the quality and quantity of Roman building projects and their effects on the cultural landscape of the time. Even with the well-known archaeological research method of aerial photography, new military installations are continually being discovered. Most recently this was done at Kleve-Keeken ▶20, where a camp with two ditches now forms a counterpart to the newly discovered camps at Herwen-De Bijland ▶19 for securing the Rhine-Waal bifurcation. Through systematic, combinatory evaluation of the various survey methods, it can be predicted that new monuments will be discovered in the future and that their environment and spatial context will be better understood (fig. 2.47).

Introduction of legal protection and anchoring in spatial planning

From the late 1960s onwards the preservation of archaeological sites acquired a legal basis, through the

Fig. 2.47 Structures of the fort at Kalkar-Bornsches Feld ▶24 reveal themselves as crop-marks in this aerial photograph. The combination of different survey methods, such as aerial photography, geophysics or LiDAR, are very likely to lead to the discovery of sites yet unknown.

promulgation of state laws (DE) and a national law (NL) for the protection of archaeological heritage. These laws were introduced in 1961 in the Netherlands, in 1978 in Rhineland-Palatinate, and in 1980 in North Rhine-Westphalia (cf. chapter 5). In the Netherlands, the sites of several Roman forts and associated elements were legally protected between 1969 and 1983. In Germany, the registration of well-known monuments took place in the 1980s; for newly discovered monuments the process is underway, and is strongly supported by all stakeholders.

The 'Valletta convention', short for the 'Convention for the Protection of the Archaeological Heritage of Europe (revised)', adopted in Valletta (Malta) in 1992, constituted an important further step towards the preservation of archaeological heritage. It replaced an earlier convention of 1969, which was targeted mainly at preventing illegal excavation. The Valletta convention is aimed at preventing any form of excavation, by reconciling and combining the requirements of archaeology and development plans. The adoption of the principles of the convention in state and national legislation has undoubtedly contributed to the sustained protection of many remains of the Lower German Limes.

Reconstruction and presentation as protective instruments

The lack of visibility of the buried remains of the Lower German Limes has always made it difficult to promote awareness of their presence and importance. In the 1970s this problem was tackled on an ad hoc basis by re-constructing excavated features on the modern surface, such as the ground plan of the headquarters building of the fort at Zwammerdam (not included in this nomination), which was marked by excavated stone blocks. This approach

Fig. 2.48 The course of the defensive wall of the fort of Utrecht-Domplein ▶10 is indicated by a band of weathering steel, into which the outlines of several sections of the Roman frontier have been engraved. When dark at night, light is projected from below while a fine water spray is projected upwards, creating the impression of a vertical line.

was not pursued systematically, and never extended to reconstructing buildings up to their projected original form and dimensions.

Over the past two decades the urge to visualise the remains of Roman forts and other elements of the frontier has increased, along with development pressure. Particularly in urban areas, space is scarce. Safeguarding areas from building and other types of development requires broad societal support, which can be created and fed by making buried remains more widely known, understood and appreciated. To further a sense of connection and relevance, it is preferable that visualisations have additional functions that benefit local communities. Visualisations can not only offer protection in a horizontal sense, against developments in the surrounding area, but also in a vertical sense, by literally covering the buried remains. Damage to the underlying remains is prevented by applying a protective layer of soil and by avoiding penetrating foundations (fig. 2.48).

3 Justification for Inscription

3 Justification for Inscription

3.1.a Brief synthesis

The nominated property *Frontiers of the Roman Empire – The Lower German Limes* is a very distinctive section of the Roman frontiers, located in Germany and the Netherlands. It was the first frontier section to develop into a linear defence line and presents the whole array of Roman military installations. Its location in the dynamic riverine landscape of the Lower Rhine demanded various water management strategies and adaptive constructions. Thanks to the water-logged conditions in many areas the preservation of timber constructions and of other organic remains is exceptionally good, providing information which is only rarely attested elsewhere.

The Lower German Limes and the frontiers of the Roman Empire

At its height in the 2nd century AD, the Roman Empire extended in a wide ring around the Mediterranean Sea, including parts of the three continents of Africa, Asia and Europe. The Empire's frontiers stretched along thousands of kilometres, facing widely varying natural and political conditions. The frontiers demonstrate the vast extent of the Empire and constitute a single but complex monument to the Roman civilisation.

Since 1987 three sections of the Roman frontier have been inscribed on the World Heritage List: Hadrian's Wall (UK, 1987), the Upper German-Raetian Limes (DE, 2005), the Antonine Wall (UK, 2008). These three sections are component parts of a single World Heritage site, under the joint name *Frontiers of the Roman Empire* (Ref: 430ter). In 2018 *Frontiers of the Roman Empire – The Danube Limes* (*Western Segment*) has been nominated (Ref: 1608).[1] These inscribed and proposed World Heritage sites are linked by an overarching collaborative framework for management and development, which is open to States Parties considering or preparing nominations of further frontier sections.

The inscription of the property *Frontiers of the Roman Empire* on the World Heritage List shows that the frontiers of the Roman Empire both as a whole and as separate, distinctive frontier sections are considered as having Outstanding Universal Value. From the early 2000s onwards it has been the aim of the States Parties in Europe having sections of the Roman frontier within their territories to nominate all the frontiers of the Roman Empire over three continents as World Heritage, 'as evidence of the remains of one of the world's greatest civilisations and as a symbol of a common heritage'.[2] This ambition has been commended by ICOMOS International and the World Heritage Committee (cf. section 2.a.1).

In the present nomination dossier *Frontiers of the Roman Empire – The Lower German Limes* is proposed as an additional, separate World Heritage site, having the potential to demonstrate Outstanding Universal Value on account of its distinctive characteristics. By its specific traits *Frontiers of the Roman Empire – The Lower German Limes* further enhances the Outstanding Universal Value of the Roman frontier as a whole, adding to the understanding of its ingenuity, complexity and impact.

Geographical and historical context

***Frontiers of the Roman Empire – The Lower German Limes* was part of the north-western frontier of the Roman Empire. It was laid out on the left bank of the river Rhine, from the northern fringe of the Rhenish Massif a little to the south of Bonn (DE) to the North Sea coast near Katwijk (NL), a distance of c. 400 km. The Lower German Limes existed for nearly five centuries, from the late 1st century BC to the middle of the 5th century AD.**

The Lower German Limes constituted the external boundary of the Roman province of *Germania inferior* or Lower Germany. The frontier installations were

[1] The nomination concerns the western segment of this river frontier, in Germany, Austria, Slovakia and Hungary. The nomination has been referred to the States Parties by the World Heritage Committee in 2019 (decision 43 COM 8B.23).

[2] Quoted from the Summary Nomination Statement included in the nomination dossier of the Upper German-Raetian Limes (Ref: 430ter, p. 410).

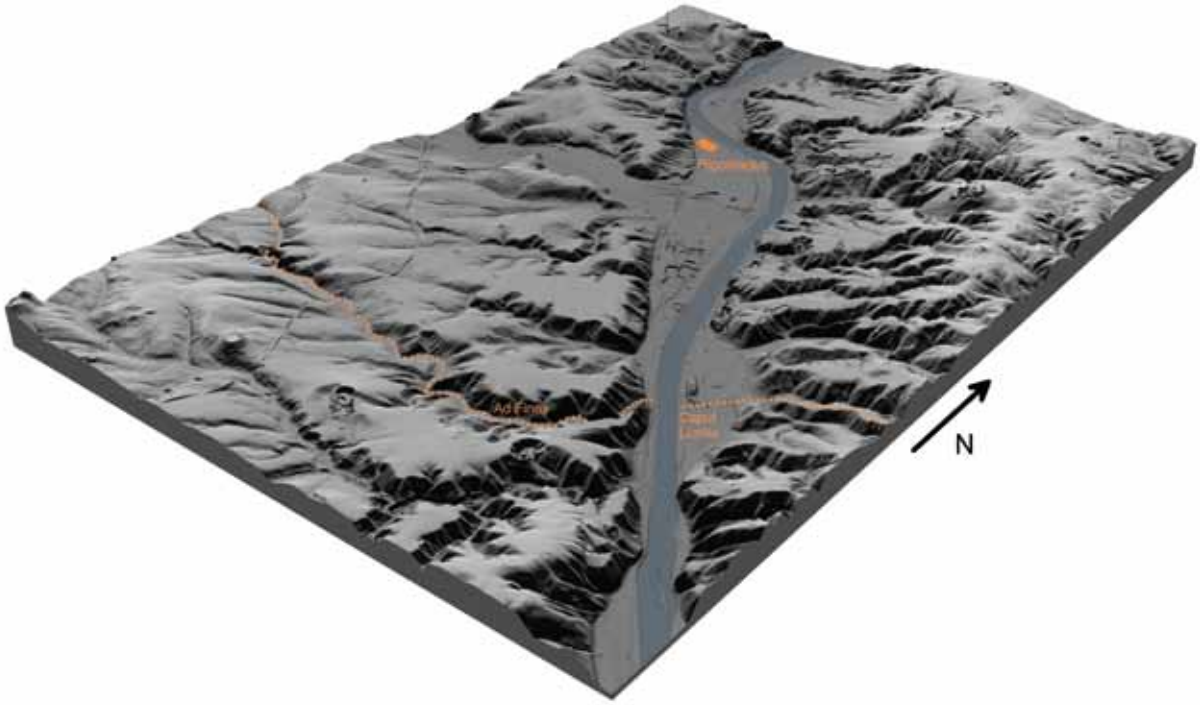

Fig. 3.1 Digital Elevation Model (DEM) of the area around the fort of Remagen ▶44 (*Rigomagus*) situated on the left bank of the Rhine. Somewhat up-stream, the rivulet Vinxtbach (Latin *Ad Fines*, 'At the borders') marked the border between the Roman provinces *Germania inferior* and *Germania superior* (dotted line). On the Rhine's opposite bank lies the endpoint (Caput Limitis) of the Upper German-Raetian Limes (dotted line).

located on the left bank of the river Rhine. The south-eastern border of the province, separating it from the province of *Germania superior* (Upper Germany), was constituted by a small river nowadays called the Vinxtbach. In the late 2nd and 3rd centuries AD the Upper German-Raetian Limes ended here, on the opposite bank of the Rhine, some 550 km to the northwest of its starting point near Regensburg (DE) on the river Danube.

For the first c. 20 km downstream from the provincial border the river Rhine is wedged between the mountain ranges of the Rhenish Massif. The first Roman military post, at Remagen, was situated on the river bank halfway down this first stretch, with a good view of the narrow river valley to the north and south. Beyond this short mountainous stretch, near Bonn, the Lower Rhine plain opens up. Here the Rhine starts meandering within a c. 3 km wide band of Holocene sediments, sometimes eroding the edges of the glacial Lower Terrace on either side (fig. 3.1). This older river terrace was normally flood-free, and several military installations were built on the edge of the terrace, at points where it was touched by the active river channel. Some posts were positioned to oversee stretches of the river, while others were located opposite major access routes into the Germanic foreland.

Nearly halfway along its route to the coast, a short distance downstream from Xanten, the river started depositing sediment on its banks, marking the beginning of its delta, soon followed by the bifurcation of the Rhine and Waal. The southern channel known as the Waal had developed into the main branch of the river Rhine, but the Romans preferred the northern branch, which provided access routes into Germanic territories to the north and east. They therefore built a groyne or dam at the bifurcation to divert more water into the northern channel, which retained the name of the Rhine.

Between Xanten and Bunnik-Vechten, the landscape to the left of the Rhine was dominated by an alternation of slightly elevated, relatively dry river bank deposits and lower-lying, relatively wet flood plains. To the right of the Rhine a large, inaccessible peat area was located, at some points interrupted by elevated ice-pushed moraines. Downstream from Utrecht this peatland extended on both sides of the river, as far as the coastal barriers. The river banks in this delta landscape were constantly exposed to flooding, but nevertheless the military installations were positioned on the edge of the river, demonstrating that their primary task consisted in monitoring the river.

The only flood-free area downstream from Xanten was the ice-pushed moraine near Nijmegen, which was then bordered by a meander of the Waal, just downstream of the bifurcation with the Rhine. Just like the similarly positioned military bases on the Fürstenberg near Xanten, those on the elevated moraine at Nijmegen were overlooking a vast area of the river plain to their north and east.

The Lower German Limes ended on the North Sea coast. The fort of Valkenburg is the last military post included in the nomination, but there is unequivocal evidence for a fort some 6 km further west. This fort, known as the Brittenburg, has been inundated by the North Sea, and all efforts to locate its remains have so far failed.

Today, the Roman landscape is difficult to imagine. Large parts of the modern Rhineland are densely

Fig. 3.2 Metal vessels salvaged during gravel extraction near Xanten. The unstratified finds are assumed to have got lost in the course of the Batavian Revolt AD 69/70.

populated and urbanised, and in several areas the Roman Rhine has silted up or shifted away from the military settlements, obscuring the once immutable bond between the military infrastructure and the river. Aboveground remains of Roman military installations are very rare. Nowadays, the treasures of the Lower German Limes are nearly all hidden below the surface. The Lower Rhineland became part of the Roman Empire during the Gallic War of 58–52 BC, but there is no firm archaeological evidence for a Roman military presence at that time. So far the earliest known military fortification is the large operational base of Nijmegen-Hunerberg. It must have been established in 19 BC for a punitive campaign against Germanic raiders from across the Rhine. A much larger offensive was launched in 12 BC. During the next three decades victories and peace agreements proved to be no more than intervals between waves of armed resistance to Roman

rule. In AD 17, the ambition to incorporate a large part of the Germanic territories east of the Rhine into a Roman province *Germania* was abandoned, and the troops were withdrawn onto the left bank of the river.
In the decades to follow, the military infrastructure along the Lower Rhine was gradually built up, developing into the first linear frontier of the Empire. The abortion in AD 47 of a new effort to resume control of Germanic territories to the east of the Rhine, and the subsequent rebuilding in stone of two legionary fortresses reveal that the defence line on the Lower Rhine was meant to stay. The general stability of Roman rule to the west of the Rhine was severely interrupted by the struggle for imperial power after the death of the Emperor Nero in AD 68. The commander of the Lower Rhine army was one of the pretenders to the throne and deployed a large proportion of his troops for a march to Italy. The reduced garrisons on the Lower Rhine were confronted with a major uprising of tribes on both sides of the river, known as the Batavian Revolt (fig. 3.2). Once the struggle for power in Rome was decided, the rebellion on the Rhine was crushed.
By AD 85 the status quo on the Rhine was sealed with the conversion of the Upper and Lower German military districts into Roman provinces. This was a prelude to a reduction of the size and mobility of the Lower German army in the late 1st and early 2nd centuries AD, followed by more than a century of relative peace and quiet. In the 230s AD the tide turned, making way for nearly two centuries of unremitting usurpation. New waves of migration and new tribal federations across the Rhine and Danube led to increasing pressure on the frontiers, the defence of which was weakened by internal wars and by a severe economic crisis. The Lower German frontier suffered repeatedly from attacks by the new Germanic federation of the Franks. Although there are no signs of massive destruction of frontier installations, it seems that military control of the Rhine was considerably reduced in the course of the 3rd century AD.
Order was restored in the late 3rd century AD when many changes were implemented in the administrative and military domains. The Empire was divided in two parts, to be ruled by two emperors of equal standing. The frontier garrisons were thinned out in favour of the creation of strong mobile armies in the hinterland. Most of the military posts on the frontier line were reduced in size, but provided with heavy stone walls and projecting towers to withstand prolonged attacks. The success of the revised military strategy fluctuated along with the stability of imperial rule. In the 5th century AD the frontier defence finally collapsed, and when Köln was taken over by the Franks in the 450s AD, the Rhineland was no longer under Roman rule.
During the following centuries, many of the abandoned military posts and other structures were used as stone quarries for new buildings. There are only a few cases, as at Köln and Utrecht, where Roman walls were integrated into new constructions. Elsewhere the Roman ruins were gradually overgrown or built over, providing a protective covering for the buried features. The Rhine retained its dynamic character in many areas, occasionally damaging the remains of the Roman military infrastructure, particularly between Nijmegen and Bunnik-Vechten. Most of the sites, however, have survived the centuries remarkably well.
The Roman past of the Rhineland was rediscovered by the Humanists of the late 15th and early 16th centuries. Until the early 20th century archaeological research resulted in little damage to the underground remains. Excavating was manual work, so trenches were narrow and usually limited in depth, while any stone walls revealed were generally left in place. During the 20th century, the scale and the degree of destruction increased, from population growth, from the mechanisation of agriculture and from archaeological field work. A positive effect of the intensification of archaeological research was a vast increase of the knowledge of the Roman past.

Values and attributes

The Lower German Limes stands out amongst the frontier sections of the Roman Empire by its early development, its complete representation of military installations and its setting in a dynamic riverine landscape. The water-logged conditions in many areas have led to excellent preservation of aspects of military construction and frontier life which have not survived elsewhere. These key values are represented by the design, position and other characteristics of a wide range of military installations and of other structures which were part of the military system and the frontier landscape, including roads and logistical facilities, but also civil settlements and sanctuaries. Through these values the Lower German Limes adds considerably to the Outstanding Universal Value of the frontiers of the Roman Empire as a whole.
The elements and distinctive values of *Frontiers of the Roman Empire – The Lower German Limes* have already been addressed in some detail in section 2.a.3. Here they will be summarised and supplemented with an overview of the contribution of the individual component parts/clusters to the proposed Outstanding Universal Value.
The Lower German Limes is the first frontier section that developed from a handful of large campaign bases into a fine-meshed linear defence system extending over hundreds of kilometres, which remained in place for several centuries. Extending along the left bank of the lower course of the Rhine, it is also the first instance of a river frontier. On the Lower Rhine

an example was set which would be followed on other frontiers, resulting in a permanently fortified perimeter across three continents in the late 2nd century AD. After the Empire had gone through a constitutional, economic and military crisis in the 3rd century AD, the military infrastructure was once again adapted, by reduction of the frontier garrisons in favour of large mobile armies in the rear, while adding fixed bridges and bridgeheads across the Rhine for forward control. In the West this system finally collapsed by the middle of the 5th century AD. The Lower German Limes is the only frontier section which tells the story of the military defence of the Western Empire from beginning to end.

The conversion of an offensive into a defensive system is illustrated by the replacement of large irregularly shaped camps for a field army with a mixture of more standardised military posts of varying sizes, which allowed control of a large area by a relatively small army of occupation. Parallel to this, the temporary fleets of the offensive period were transformed into a standing fleet, with major tasks in the fields of security and military transport. Several concentrations of temporary camps testify to a constant vigilance and readiness of the army, which sufficed to counter disturbances at a regional scale. Small but massively built strongholds testify of the changing military strategy in the 4th century AD. The military installations of the Lower German Limes therefore serve as a catalogue of the evolution of military strategy, design and construction over four centuries, with the added value of the excellent preservation of timber building phases in some places, providing fine chronologies and rare details of construction techniques.

The Lower German frontier was established in the very distinctive landscape of a lowland river and its delta. The only frontier zone with similar climatic and geographical conditions was that of the Lower Danube, but the Danube delta was primarily secured by a fleet, with less than a handful of known forts within the delta. The tight network of military installations of the Lower German Limes, however, continued throughout the delta, with a screen of posts in vulnerable positions on the river bank.

The landscape of the dynamic Lower Rhine was not particularly suitable for the establishment of a military infrastructure. The river created large bends which gradually moved downstream, causing erosion in some areas and accretion in others, while occasionally cutting new channels at some distance from the previous ones. In the delta the river banks were constantly subject to flooding. Nevertheless, the vulnerable left bank of the Rhine accommodated a large frontier garrison for nearly five centuries. Evidently, the strategic importance of the Rhine outweighed the challenges caused by its changeable nature (fig. 3.3).

The need to create and maintain a complex military infrastructure in the dynamic conditions of the riv-

Fig. 3.3 Partially collapsed revetments along the channel of the Roman Rhine at Bunnik-Vechten ▶11, excavated in 1932.

main group	category	type	number
military installations	large bases	irregular	2
		standard	4
		Late Roman	2
	forts	irregular	4
		delta type	7
		standard	10
		Late Roman	6
	fortlets & towers	fortlet	2
		tower/*burgus*	5
	temporary camps		47
	fleet base & bridgehead fort	fleet base	1
		bridgehead fort	1
military installations			*91*
associated features	infrastructure	Limes road	8
		canal	1
		harbour/quay	5
		waste deposit	5
		lime kiln	1
		brick/pottery kiln	1
		aqueduct	1
	other	civil settlement	12
		cemetery	6
		town	3
		palace	1
		sanctuary	2
associated features			*46*
total elements			**137**

Table 3.1 Aspects of the assessment of the integrity of *Frontiers of the Roman Empire – The Lower German Limes*.

erine landscape resulted in constructions and designs which do not or only rarely occur elsewhere along the Roman frontiers. A canal between the Rhine and the river Meuse further south is an exceptional demonstration of the pains taken by the Roman military to mould the landscape to their strategic needs. But on the whole it was the military infrastructure which was adapted to the vicissitudes of the river landscape, by adjusting fort designs, erecting watchtowers to ensure close observation of winding stretches of the river, consolidating river banks and vulnerable stretches of road as a protection against erosion and flooding, and building the banks out when the river moved away from military installations. Through all these distinctive characteristics the Lower German Limes is the river frontier par excellence.

The frontier encompassed far more than just military installations and the road and river connecting them. The maintenance of the infrastructure and the supply of the garrisons relied on a variety of supporting facilities, built and operated by the army, such as an aqueduct and lime kilns. The forts and fortresses were surrounded by civil settlements which accommodated military families, traders and craftsmen, and were inseparable parts of the military community. On the Lower Rhine more than anywhere else, the army had a major impact on the regional landscape and society, not just through the scale of its presence, but also through its involvement in civil building projects instigated by successive emperors to accelerate the markedly slow process of urbanisation and further development of the area. The nomination includes sites that represent these wider aspects of the frontier story to allow a proper understanding of the operation and impact of a frontier.

The potential Outstanding Universal Value set out above is conveyed by the military installations and associated structures included within the nominated property, in particular by three sets of attributes: form and design, materials and substance, and location and setting. The structural elements of the Lower German Limes are summarised in table 3.1. Some component parts/clusters include representation of several elements, so the overall number of elements does not match with the number of component parts.

Fig. 3.4 Detail of the rear part of a Roman cargo vessel excavated at Utrecht-Limes road | De Balije ▶7c, with standing walls of a deck cabin.

Table 3.1 provides an overview of the range of military installations and associated features which underpin the understanding of the operation and impact of the frontier. Identification of an element is primarily based on its form and design (i.e. its outline and internal structure), recognition of which is facilitated by the generally very high degree of completeness of the recorded remains.

At the scale of the property as a whole, the variety of forms and sizes illustrates the evolution from large offensive bases to a fine-meshed defensive linear infrastructure which was subsequently thinned out, collectively providing a representative sample of Roman military installations. The occurrence of other types of structure clearly demonstrates that the Roman military depended on a complex infrastructural and logistical network, that it was accompanied by a large number of non-combatants, and that its impact on the regional landscape and society extended far beyond the military domain.

The form and design of the individual elements demonstrate the challenges produced by the establishment of a frontier in a dynamic riverine landscape. The canal exemplifies the great efforts made to mould the landscape to military needs, whilst sundry constructions and designs testify to the varied strategies employed to adapt to the continuous processes of flooding, erosion and accretion of the river bank.

The materials and substance of the elements of the frontier illustrate a particular, regional use of building materials, with the near absence of natural stone in the subsoil explaining the protracted use of timber and the slow extension of building in stone from large to small installations and from southeast – closer to the stone quarries in the neighbouring provinces – to northwest. The scarcity of natural stone is emphasised by the systematic demolition of Roman stone buildings in the Middle Ages to reuse the stones. Timber normally decays over time, but the water-logged conditions have led to a very high degree of preservation in many parts of the riverine landscape. The materials and substance of the varied elements of the Lower German frontier thus provide rare insights into Roman military construction in timber, including shipbuilding (fig. 3.4). This outstanding preservation in wet conditions extends to other organic remains and to metal objects, resulting in a rich and varied image of frontier life which cannot be obtained on other sections of the Roman frontiers.

The spatial distribution of the military installations, which can be understood from their location and original setting, illustrates the linear character of the military infrastructure and its tight connection with the river Rhine. This patterning is in many places now obscured by later migration of the river and the silting up of cut-off river bends, but can be clearly explained at individual sites, including those damaged by river erosion, bringing to life the importance of these river dynamics for the history of the Lower German Limes.

The above is only a brief and general indication of how the attributes of the varied elements of the Lower German Limes contribute to the potential Outstanding Universal value. The contribution of the individual component parts/clusters is summarised in table 3.2.

id	name	contribution to Outstanding Universal Value
1a–d	Valkenburg-Centrum	This is the most westerly preserved military installation of the Lower German Limes. Thanks to the outstanding preservation of timber, the fort is an icon of Roman military construction. The fort is the best known example of the 'delta type', its basic design maintained during several adaptations and comprehensive rebuilding phases. The vulnerability of forts in the delta is not just demonstrated by the destruction of the northeast corner by river erosion, but also by the preservation of timber buildings of the first building phase up to a height of 0.5 m, caused by flooding. Surviving standing remains of timber military buildings are extremely rare and provide us with invaluable insights into Roman military construction in timber.
2a–b	Valkenburg-De Woerd	The characteristic ribbon-like layout of a military vicus is combined here with measures taken to deal with the wet landscape of a river estuary. The settlement was built on a platform of soil and sods, which is so far without parallels. The component parts also include a stretch of the Limes road, known to have been consolidated with rows of posts on either side. Part of the road section was presumably eroded by the Rhine and subsequently rebuilt. The building phases include the two repair phases known from the Utrecht-Limes road ▶7, illustrating the scale and planning of military infrastructural works.
3	Voorburg-Arentsburg	This regional capital is the latest to have been founded on the Rhine. Its names, referring to the Emperor Hadrian, demonstrate the particularly slow development of the Lower German frontier zone and the need for imperial support of the process. Yet the town was ideally placed as an urban centre, safe behind the coastal dunes and about halfway along Corbulo's canal, connecting it with the trade networks using the Rhine and Meuse. It is assumed that it played a role in the supply of the military infrastructure in the region. With the lower courses of stone walls still intact, its later phases are well preserved by the standards of the Rhineland.
4a–f	Corbulo's canal	This rare preserved example of an artificial canal provides outstanding testimony to the Roman military strategy to mould the Rhine delta to the needs of the army. The canal connected natural outlets into the Rhine to the north and into the Meuse into the south, and may have taken over a thousand man-years to dig. The historian Tacitus records that the canal was constructed to provide a connection between the estuaries of the two rivers, as a safe inland alternative to the route along the North Sea coast. The start of its construction in AD 47, mentioned by Tacitus, is corroborated by tree-ring dates of AD 50 for rows of posts lining the sides of the canal over most of its known length. The six component parts include representative sections of the canal with excellently preserved remains and the best prospects for sustainable protection.
5a–b	Leiden-Roomburg	The Roomburg fort is an almost unexcavated example of the 'delta type'. The best known features are the defences from the final, stone built phase, consisting of a single ditch surrounding a (now robbed-out) stone wall resting on still preserved timber foundation piles, one of which has been dated to AD 243, the latest date so far established for a fort downstream of Nijmegen. At least some of its predecessors appear to have had largely the same outline. The condition of the remains of the internal buildings of the successive forts is uncertain, as part of the area was built over by a monastery which existed from c. 1460–1575. The Roomburg fort owes much of its relevance for the nomination to its position at the junction of the Rhine and a natural watercourse which was the northern outlet of Corbulo's canal ▶4. The fort was built where the banks of the watercourse and the Rhine met, and the bank of the watercourse was consolidated with rows of heavy posts which were repeatedly replaced by new rows further out from the bank. The posts illustrate how the watercourse gradually moved away from the fort, leaving accumulated layers of settlement waste with very well preserved organic remains, including amongst others very rare leather shield covers with the name and emblem of an infantry regiment. The fort was surrounded by an extra-mural settlement of which extensive unexcavated parts are included in the component parts, which probably also encompass burials and a part of the Limes road. In all, the complex is a relatively complete example of a military settlement with all its constituent elements, illustrative of many aspects of a frontier post in the Rhine delta.
6	Woerden-Centrum	The fort of Woerden is a well-preserved example of the 'delta type', nearly untouched by excavations. Whereas the latest, stone built phase seems not to have survived very well, the few excavations have demonstrated that the earlier timber phases are very well preserved. They have produced a so far unique construction element; a defensive ditch clad with rectangular beams of alder – a wood species typical of the wet parts of the delta. Since three other forts between Utrecht-Hoge Woerd ▶8 and Leiden-Roomburg ▶5 could not be included in the nomination the Woerden fort is also important for understanding the linear character of the military disposition in the delta.
7a–c	Utrecht-Limes road	The three component parts include representative and very well preserved remains of the Limes road as it traversed the wetter part of the riverine landscape, with its embankment consolidated by rows of posts, occasionally reinforced with revetments connected by tie beams. The stratigraphy and the associated finds indicate that the road was first laid out in the 80s AD, but tree-ring patterns of excavated posts and other timbers have revealed two repair phases, in AD 99/100 and 123/125, which have also been attested at other points in the delta. This road section thus represents three large-scale military building campaigns. The road was traced along the southern side of bends on a winding stretch of the Rhine, small sections of which are included in the component parts as well. The river bank was in some places consolidated with timber revetments and basalt blocks to counter erosion, and at one point by a cargo ship sunk against the bank; this barge, an excellent example of this characteristic vessel type of the Lower Rhine, is still largely preserved in situ (a second ship was entirely excavated and is now exhibited in the site museum at Utrecht-Hoge Woerd ▶8). The component parts also include remains of two watchtowers which were discovered accidentally and partly preserved. The attested river bank consolidations, ships and towers illuatrate the complexity of the military infrastructure and its tight connection with the river.

Table 3.2 Overview of the contribution to the proposed Outstanding Universal Values of *Frontiers of the Roman Empire – The Lower German Limes* of the individual component parts/ clusters (sites/site clusters).

id	name	contribution to Outstanding Universal Value
8a–b	Utrecht-Hoge Woerd	The Hoge Woerd fort is a relatively complete example of the 'delta type', though its final, stone building phase does not seem to have survived in very good condition. On the other hand, a recent excavation of very limited extent has proven that the earlier layers are very well preserved and provide very detailed insights into the history of the fort and its garrison. Moreover, the nominated property encompasses most of the unexcavated parts of the extra-mural civil settlement and of two burial sites, and part of the silted-up river bed in front of the fort, with thick layers of accumulated settlement waste. In its early phase, the extra-mural settlement included some military buildings, and later a military bathhouse (with its stone foundations still preserved underground). The age and sex of the buried individuals can often still be determined, while associated gifts such as pottery vessels give an idea of the material culture and burial traditions. Cemeteries – which are difficult to locate – thus contribute much to our knowledge of the military communities to which they belonged.
9	Utrecht-Groot Zandveld	This is a rare example of a timber watchtower of which all four corner posts and most of the double defensive ditch have survived. With their light construction and surface area of little more than 100 m², including one or more surrounding defensive ditches, timber towers are notoriously difficult to locate. Most known examples have therefore only been found accidentally during large-scale excavations and have not been preserved. When the timber of the uprights is preserved, as here, it can provide a very accurate building date, adding much to our understanding of the chronology of the frontier as a whole and of the employment of this smallest category of military installations in particular.
10	Utrecht-Domplein	The Domplein fort is one of the best preserved examples of the 'delta type', being largely unexcavated and deeply buried beneath medieval layers. Only the deepest foundations of the churches from that period have disturbed the Roman levels. The fort was extended slightly in its final, stone built phase to accommodate a partly mounted infantry unit, a garrison type which in the delta is only otherwise known from Valkenburg-Centrum ▶1. It is one of only a few forts with preserved standing remains of the stone defensive wall, some of which are accessible to the public. Excavations have demonstrated that timber remains from the early building phases are in an excellent condition, with great potential for understanding Roman military construction in timber.
11a–b	Bunnik-Vechten	The fort at Vechten contributes to understanding of various key values, by its location, design and fairly complete and well-preserved representation of many aspects of frontier life. In its final building phase, the fort was the largest one downstream from Nijmegen and the only one which accommodated a full cavalry regiment. Its design is an unparalleled mix of elements from standard forts and adapted 'delta type' forts. At least in some of its earlier phases, it is likely to have been of irregular shape, in line with its foundation in the early offensive period. The establishment of the first fort must be related to use of the river Vecht, which branched off from the Rhine a little further downstream and provided an access route into Germanic territories to the north. The site thus adds significantly to understanding of the early Roman offensive strategy. A succession of protective revetments parallel to the river bank, using timber frameworks built out into the river, illustrates very well the alternation of erosion and accretion which is so characteristic of the Lower German Limes. Thick layers of settlement waste which have accumulated in the river bed in front of the fort constitute a veritable treasure-chest of frontier life, with very well preserved organic remains and metal objects. The channel also includes some remains of a military patrol craft built in a Mediterranean tradition, exemplifying one of the tasks of the fleet as a part of the military system. The complex also includes remains of the extra-mural civil settlement, stretched out along the river bank over a distance of c. 1.5 km, and of several groups of burials. Gravestones mentioning, amongst others, merchants from Tongeren (BE), a veteran from the area of modern Bulgaria and a Germanic freedwoman give an idea of the potential of this complex for understanding the great cultural diversity of military communities.
12	Arnhem-Meinerswijk	The fort of Meinerswijk provides testimony to the dynamics of the river Rhine. It was damaged by successive river bend migrations, the first of which may already have occurred in the Late Roman period. There is enough left of the fort to prove that it belonged to the adapted 'delta type', at least in its latest building phase. It is the most easterly known representative of this type. Early phases of the fort – probably well-preserved as a result of the high groundwater table – may well have been larger and of irregular shape, characteristic of the early offensive stage of the military infrastructure on the Rhine. The location of the fort exemplifies the early military occupation of nodes of strategic importance, in this case at a point of access into Germanic territories north of the river. The site thus clearly contributes to the understanding of the initial military strategy in the Rhineland. Since the other forts downstream from Herwen-De Bijland ▶19 appear to have been entirely destroyed by the dynamic behaviour of the Rhine as far as Bunnik-Vechten ▶11 – over 90 km along the river bank – inclusion of the Meinerswijk fort in the nomination is also needed to illustrate the linear character of the later military disposition.
13	Elst-Grote Kerk	In the monumental state in which it was rebuilt c. AD 100, this Gallo-Roman temple was one of the largest of its kind. In view of its size and building date it is inconceivable that this temple was a private initiative. The contemporaneity with the erection of monumental public buildings in the nearby town of *Ulpia Noviomagus* and the use of building materials only available to the army reveal the involvement of the Emperor Trajan and of the army. Thus, the temple is an illustration of the slow development of the frontier zone. Additionally, it is one of the few monuments from the Lower German Limes with substantial standing remains of stone walls, underneath the foundations of a medieval and later church.

id	name	contribution to Outstanding Universal Value
14a–b	Nijmegen-Valkhof area	The area was at first occupied by a civil settlement. The layout of the buildings and the finds assemblage indicate that its initial inhabitants included army veterans, but it was to become the administrative capital of the Batavian region, which largely consisted of the Rhine delta. Through its ribbon development, the layout of the settlement deviates from the normal Roman urban pattern and illustrates the slow adoption of Roman traditions in the Rhineland. The historian Tacitus records its destruction during the Batavian Revolt, describing it as *Oppidum Batavorum*. Part of the former urban area was built over in the late 3rd or early 4th century AD, when a fort was erected on the edge of the plateau now known as the Valkhof, overseeing the plain of the river Waal. Most of this fort is buried under the remains of successive medieval palaces, in the building of which several of the Roman walls or at least their stones will have been reused. The fort is the only site in the delta with incontestable physical remains of a Late Roman military post, demonstrating the strong reduction in the military infrastructure along the Rhine in the 4th and 5th centuries AD.
15	Nijmegen-Hunerberg	The large irregular base is the earliest military installation in the Rhineland attested so far, and defined the subsequent evolution of the Lower German Limes. Built for a punitive expedition across the Rhine and maintained for some years to oversee a Germanic group which had been displaced to the left bank of the river, the base illustrates two early military strategies which would prove unsuccessful. Its position on the edge of an elevated plateau, with a wide view over enemy territories to the north and east, exemplifies the strategic priorities of the period. Some time after its abandonment the early camp was built over by the construction of a standard legionary fortress and its civil settlement. This later fortress was built in the aftermath of the Batavian Revolt of AD 69/70, doubtless to prevent further troubles. The fortress lost much of its importance when its garrison was transferred to the Danube c. AD 104. The legion appears to have been replaced by small detachments only, reflecting the relative peace and quiet which had been established in the Rhineland by this time, allowing a significant reduction of the frontier army. The Nijmegen fortress thus illustrates two important stages in the history of the Rhineland.
16a–e	Nijmegen-Kops Plateau	By its irregular form, adapted to the relief of the elevated plateau on which it was positioned, the fort exemplifies the first generation of military installations. It stands out by its internal layout, with an atypical overrepresentation of residential (officers'?) buildings as compared to normal barracks, and by the presence of annexes – military compounds loosely attached to the fort. A further distinctive characteristic is the layered waste deposit on the steep slope of the plateau, which reflects the history of everyday life in the fort.
17a–e	Berg en Dal-aqueduct	Military aqueducts, supplying legionary fortresses with fresh water, are a rare phenomenon, and this is one of the few known examples with extant remains. The actual water channel which transported water from the sources to the fortress of Nijmegen-Hunerberg ▶15 has not survived, but the impressive earthworks give an excellent idea of the scale of such a facility and of the efforts required to mould the rugged landscape of the ice-pushed moraine to military needs.
18a–b	Berg en Dal-De Holdeurn	The military kiln site for the production of bricks, tiles and pottery is the only one of its kind which, during the later phase of its existence, was operated by and for the Lower German army as a whole. Initially it exclusively supplied the nearby legion, as is normally the case, and the production of pottery was limited to this early phase. The assemblage of De Holdeurn, along with the lime kilns of Iversheim ▶43, illustrates an important aspect of military production and supply, demonstrating that the frontier army was self-supporting as far as the provision of building materials is concerned.
19	Herwen-De Bijland	De Bijland provides a vivid illustration of the dynamics of the river Rhine. The component part includes ditches of two or three camps, at least one of which was short-lived. The extent of the camps is unknown, but parts of them must have been destroyed by shifting meanders of the Rhine and Waal. The forts of De Bijland and of Kleve-Keeken ▶20 were positioned near the dam which the Romans built at the bifurcation of the rivers Rhine and Waal, to divert more water into the northerly branch (Rhine), and which is mentioned in historical sources and in the text of a gravestone found at De Bijland. The twin forts thus constitute a proxy for this significant water management work, the precise location of which remains to be discovered. Despite its incomplete preservation the military complex of De Bijland is of great significance for the Lower German Limes.
20	Kleve-Keeken	The military site of Keeken, positioned south of the bifurcation of Rhine and Waal, must have played a major role in controlling the river at this strategically vital point. It probably acted as a counterpart to Herwen-De Bijland ▶19, which was positioned downstream of the bifurcation, between the branches of the Rhine and Waal.
21a–b	Kleve-Reichswald	The two component parts include representative and well-preserved remains of the Limes road. This section was part of the main route between the central military sites and the civilian towns of Xanten and Nijmegen and thus represents an important aspect of the infrastructure developed by the Roman military.
22	Till	The wide variety of military installations at Till makes it one of the most important military sites of the Lower German Limes. The military site of Till provides testimony to the wide range of designs of military bases, reflecting very different purposes of the Roman army. The site is situated in a complex riverine landscape at a strategically important point between Xanten and Nijmegen.
23	Kalkar-Kalkarberg	The sanctuary on the Kalkarberg of Vagdavercustis, a war goddess, is of great importance to understanding the religious life of Roman soldiers of the Lower German army. Within the sacred area, a large number of items of military equipment provides a unique insight into the religious activities and ritual practices of Roman soldiers from the beginning of the Roman occupation until the 5th century AD.
24	Kalkar-Bornsches Feld	The component part represents a broad range of elements: a cavalry fort, its extramural settlement, cemeteries, the Limes road. The early dating of the site and the design of the early fort with strong parallels to smaller fleet bases makes *Burginatium* an important element of the first linear frontier. The fort shows a special adaptation to the river bank situation. The site shows a continuous development from the 1st century into the early 5th century AD. The vast organic deposits in the Leybach in front of the fort contain extensive and rich organic strata, preserving an abundant treasure-chest of well-preserved organic materials and metal objects.

id	name	contribution to Outstanding Universal Value
25a–o	Uedem-Hochwald	Thirteen temporary camps with well-preserved ramparts in the hinterland of the legionary fortress of Xanten provide important testimony to the manoeuvring and training activities of Roman legions near their base, illustrating the variety of military installations and activities of a Roman frontier.
26a–d	Wesel-Flüren	The four camps contribute significantly to the Outstanding Universal Value through their preserved earthen ramparts, which provide rare and significant examples of Roman military architecture on campaign. Together with four other camps known from aerial photographs south of the property area, the cluster of camps in the Flürener Feld represents a manoeuvring or gathering area of the Roman army on the east bank of the Rhine. It demonstrates the will and the ability of the Roman army to move large numbers of troops across the river. It can also be seen as an indication of the use of pontoon bridges, often employed by the Rhine fleet according to the historian Cassius Dio.
27	Xanten-CUT	The *Colonia Ulpia Traiana* as a veteran settlement and major recruitment centre connects the primary military installations of forts and fortresses with the civilian domain. It contributes significantly to understanding the complete footprint of a Roman frontier. With its timber built harbour, the largest between the provincial capital at Köln and the town of *Forum Hadriani* (Voorburg-Arentsburg ▶3) near the coast, the site served also as a key point for the supply of the Roman army along the river Rhine. The polygonal layout of the Colonia Ulpia Traiana, caused by the course of the river, makes the close connection to the river landscape even more apparent. The reduction of the town in the early 4th century AD to the Late Roman fortress of *Tricensima* reflects the major changes in the strategic concepts of the Roman army in Late Antiquity.
28	Xanten-Fürstenberg	The component part includes the largest double-legionary fortresses in the Roman Empire and large military buildings such as *campi* (exercise halls) and an amphitheatre as well as buildings north and south of the fortresses, demonstrating the wide range and variety of ancillary elements of a large legionary base. The complex can also be seen as an early example of the footprint of a Roman legionary fortress with its military and civilian infrastructure. The topography remains as it was in Roman times and its description by the Roman historian Tacitus can still be seen through his eyes in an authentic manner. *Vetera* was one of the earliest military bases along the Rhine and acted as the major springboard to invade the Lippe valley and the Germanic territories.
29	Alpen-Drüpt	The component part includes a variety of military installations: a fort, a segment of a major road and two large temporary camps. The location provided a connection point between land traffic, attested by the road segment, and riverine transport. The site is situated on the west bank of the Rhine and south of the mouth of the river Lippe, the main corridor into Germanic territories to the east. The two large temporary camps underline the strategic role this site played for the Roman army.
30	Moers-Asberg	This site provides important testimony to the early stationing of troops on the Lower German Limes. It was first built in 16/15 BC in a polygonal form and developed into a sub-rectangular timber fort in the 70s of the 1st century AD. The site therefore reflects the very beginning of Rome's new strategy to place smaller contingents of troops along its outer border, developing into its first linear frontier. From here, with a commanding view over a wide bend, the Roman army was able to control transport along the river Rhine.
31	Duisburg-Werthausen	The fortlet was located on the right bank of the Roman Rhine in a narrow bend of the river. It played a strategically important role in controlling the river. The small size of the fortlet and its function as a control point along the frontier is important for understanding the variety and functioning of the frontier system.
32	Krefeld-Gellep	The battlefield of *Gelduba*, from the Batavian Revolt of AD 69, is the only battlefield along the Lower German limes that is attested by both written sources and archeological records. A cavalry fort founded in AD 70/71 on the site of the former battlefield was a further milestone in the development of the chain of forts of the Lower German Limes. The site continued into the Late Roman period with several rebuilding phases.
33	Neuss-Koenenlager	The mid-1st century legionary fortress of *Novaesium* is an iconic example of a legionary fortress with the characteristic 'playing card` shape. Its ground plan is almost completely known as a result of small scale excavation trenches and is seen as a blueprint for Roman legionary fortresses. Its position north of the mouth of the river Erft underlines the strategic position of the fortress.
34a–b	Neuss-Reckberg	The combination of fortlet and a watchtower is very rare on the Lower German Limes. Both of these small installations and their function as control points along the frontier are important for understanding the variety and functioning of the frontier system.
35	Monheim-Haus Bürgel	The fort is an important example of the development and appearance of forts in Late Antiquity. The ground plan shows very close similarities with the larger fort of Köln-Deutz ▶38 wich may have acted as a blueprint for the smaller fort at Monheim. The fort lies in a very dynamic part of the river landscape with several shifted Rhine courses over the last 2,000 years.
36	Dormagen	The fort of *Durnomagus* provides important evidence for the understanding of cavalry forts: it was here that for the first time, stable pits for horses were attested inside barracks through archaeological excavations. This key feature is essential for understanding the daily life of Roman cavalry soldiers. It demonstrates the close connection between riders and their horses in the Roman army. The location on the bank of the river Rhine underlines the role of the cavalry unit in patrolling the riverine landscape.
37	Köln-Praetorium	From the early 1st century AD until the end of Roman presence on the Rhine, the Praetorium was the seat of the governor of Lower Germany and therefore also the military headquarters. In the late 3rd century AD it was also the seat of the Emperor of the Gallic Empire. The Praetorium is one of the best-preserved governor's palaces in the Roman Empire. It was built next to the river bank of the Rhine, connecting the civil and military heart of Lower Germany with the river.
38	Köln-Deutz	The Late Roman bridgehead fort of *Divitia* in Köln-Deutz is the only permanent military installation of the Lower German Limes on the right bank of the Rhine. It expresses the will of the Late Roman Empire to advance its defense strategy into Barbaricum. With its massive walls and 18 projecting rounded towers it is the blueprint of the building programme of Constantine The Great (AD 307–337), securing the Lower German Limes in the early 4th century AD.

id	name	contribution to Outstanding Universal Value
39	Köln-Alteburg	The fort of Köln-Alteburg was the fleet base of the *classis Germanica* (German fleet) from the early stages of the Lower German Limes (founded around AD 15) until the crisis in the late 3rd century AD. The site is therefore of great importance for the understanding of a river frontier. The fleet played an important role in supply and in military actions along the river. The barracks of the fleet base show a unique type of internal layout, not known from any other Roman fort in the Empire, presumably indicating that the Roman Rhine fleet had a particular and special organisation.
40a–k	Kottenforst Nord	Twelve temporary camps with well-preserved ramparts in the hinterland of the legionary fortress of Bonn provide important testimony to the manoeuvres and training activities of Roman legions near their base, illustrating the variety of military installations and activities of a Roman frontier.
41	Bonn	The legionary fortress at Bonn illustrates the longevity of the Lower German Limes. It existed from at least the 30s AD to the beginning of the 5th century AD, illustrating all successive stages of Roman military development. It was situated at a bottleneck between the Middle Rhine Valley and the lower plains of the Rhineland, and opposite the mouth of the river Sieg, making the location of high strategic importance in the river landscape.
42a–j	Kottenforst Süd	Ten temporary camps with well-preserved ramparts in the hinterland of the legionary fortress of Bonn provide important testimony to the manoeuvres and training activities of Roman legions near their base, illustrating the variety of military installations and activities of a Roman frontier.
43	Iversheim	The complex of lime kilns and associated structures belong to the most complete military production facilities known from the Roman Empire. Their operation is attested from the 1st to the late 3rd century AD. The presence of specialists in lime production from the 30th legion based at Xanten, more than 100 km away, demonstrates the importance of the facilities for building activities all along the Lower German Limes. Along with the brickworks of Berg en Dal-De Holdeurn ▶18 this complex represents an important aspect of military production and supply and demonstrates that the army was self-supporting as far as the production of building materials is concerned.
44	Remagen	The site marks the starting point of the chain of forts of the Lower German Limes. The continuous development of the fort from the first Roman occupation along the lower Rhine under Augustus until the end of Roman presence in the 5th century AD underlines its strategic importance at all times. The fort is a rare example of a typical early Roman auxiliary fort built in timber, developing in the 2nd century AD to a fort built in stone and, in the Late Roman period, fortified with massive walls and towers.

3.1.b Criteria under which inscription is proposed

Frontiers of the Roman Empire – The Lower German Limes is considered to demonstrate Outstanding Universal Value by meeting criteria (ii), (iii) and (iv) as set out in the Operational Guidelines for the Implementation of the World Heritage Convention (WHC.15/01, 8 July 2015, Paragraph 77).

(ii) to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design.

Fig. 3.5 Rim sherd of a ceramic vessel (Terra sigillata) found outside the fort of Krefeld-Gellep (*Gelduba*) bearing in Aramaic scripture the name of one Baresamias. In view of the linguistic features of the graffiti Baresamias presumably originated from Osrhoene, a region in what is today the north of Syria.

The remains of the Lower German Limes represent a distinctive section of the frontiers of the Roman Empire. Early military installations of irregular form, more standardised legionary fortresses, forts, fortlets and watchtowers, and massive strongholds of a later date demonstrate the development of Roman military architecture in response to the climate, landscape and threats specific for the region. The frontier system not only encompassed military posts, however, but also various elements of the infrastructure required for the maintenance and supply of the military system, as well as towns, civil settlements and sanctuaries which were closely associated with the military presence. The foreign provenance of these structures can be read from their form and design, while their surviving fabric provides characteristic constructional details. By the arrival of the Roman army on the Rhine, the regional population was introduced to these varied elements of a complex frontier system and to the technical knowledge at the basis of its construction and working.

The Roman army was a blend of soldiers from the Mediterranean and from newly annexed territories, and was accompanied by large numbers of non-combatants of equally varied origins. The cultural values which moved with the army and its followers thus had a strong Mediterranean basis, but steadily absorbed impulses from other regions (fig. 3.5). The mixed character of the army and its followers is demonstrated by the material culture associated with the structures included in the nomination, and particularly in the

riverine waste deposits which accumulated in front of several forts. Through the Roman occupation of the Rhineland, this predominantly Mediterranean cultural mix was introduced to a transitional area between the Celtic and Germanic cultures; existing societal structures were thoroughly disturbed by migration, large-scale wars and deportation. Roman cultural values were only gradually adopted, as illustrated by the slow development of urban centres, which eventually required imperial intervention and military support as shown through their chronology and building materials.

The landscape of the Rhine valley and delta was thoroughly altered to meet the requirements of the army. Large areas were deforested to provide building timber for the military installations and the linked military infrastructure, as can be calculated on the basis of the surviving structures and deduced from the treering patterns of preserved timbers. The navigability of the rivers was improved by water management works of an unprecedented scale, as witnessed by a canal. The military installations and associated infrastructure and facilities constituted further visible claims on the landscape. Once the military deployment took the shape of a defence line, the military posts and the associated structures were spread out along the entire left bank of the Rhine, from the Rhenish Massif to the North Sea coast.

(iii) to bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living or which has disappeared.

As a part of the defensive system of the Roman Empire the Lower German Limes provides exceptional testimony to the power of this world empire. The frontiers reflect the ambition of Rome to dominate the known world, indirectly by diplomatic means or directly by annexation. The early stages of the Lower German Limes exemplify the imperial policy to extend the Empire beyond the river Rhine, while its later development into a linear defence system reflects the effective response to the failure of that ambition. Along with the other sections of the Roman frontiers of the 2nd century AD, the Lower German Limes is thus a physical manifestation of the vast extent of the Roman Empire, as well as of the limits of its military capacity. The scale of imperial ambition and of the successive strategies can be read from the form and design of the military installations, and from their distribution and position in the landscape.

The physical attributes of the military installations and related structures illustrate various tangible aspects of Roman culture, representing architecture and construction of military, civil and religious buildings, and reflect intangible aspects such as convictions, rules and beliefs. The army constituted the vanguard of Roman civilisation, but the contribution to the spread of the Roman way of life by military families and by the traders and craftsmen who followed in the wake of the army should not be overlooked.

(iv) to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history.

The Lower German Limes is an outstanding example of a linear Roman frontier system, adapted to a riverine landscape. Its successive stages and distinctive characteristics eminently reflect the capacity of the Roman military to adapt to specific climatic, geographical and political conditions; this was the basis for the vast expansion of the Roman Empire. The wide range of military installations of the Lower German Limes constitutes a catalogue of military strategy, design and construction covering the entire history of the Western Empire.

Established as a springboard for punitive expeditions and large-scale wars across the river Rhine, the military infrastructure was converted into the earliest linear defensive system of the Empire once the ambition to annexe Germanic territories beyond the Rhine was abandoned. The development into a fine-meshed network stretched out along the left bank of the river for 400 km can be read from the sizes, designs, dispositions and chronology of the military posts.

The Lower German Limes was established in a dynamic riverine landscape, moulded by the successive erosion and accretion of the river banks caused by shifting river bends. The importance of the river as a major transport axis and its continuous threat to the military installations on its left bank led to a variety of designs and constructions, adapted to make full use of its potential for control, communication and supply whilst reducing the negative effects of its dynamics. The former aspect is illustrated by a canal, an adapted fort type, and harbours and quays for the mooring of ships; the latter aspect by a range of protective revetments and extensions of the river bank.

In many areas the water-logged conditions of the riverine landscape have led to outstanding preservation of organic remains, including significant remains of timber buildings, constructions and ships. They constitute a rich source of details of Roman military construction and ship building. The waste deposits which have accumulated in the river bed in front of several forts provide unique insights into life on a Roman frontier.

3.1.c Statement of integrity

This nomination encompasses a selection of 91 military installations and associated structures along the Lower Rhine. These are divided over 106 component parts located in the modern countries of Germany and the Netherlands. The assemblage of component parts provides a good representation

Fig. 3.6 Vehicle-towed sixteen channel magnetometer (SENSYS MAGNETO®-MX ARCH) used for surveying several Roman military sites along the Lower German Limes.

of the proposed Outstanding Universal Value of the Lower German Limes, including all its characteristic values and attributes. The nominated property is in a good condition and not exposed to significant threats.

The integrity of the nominated property is a measure of the completeness and intactness of the attributes that convey its significance. The completeness is defined by the degree to which all the relevant attributes are represented within the property (wholeness), and the intactness by the degree to which they have survived, i.e. their physical quality. The wholeness and intactness of the remains of the frontier have been established by archaeological research over more than a century. While modern non-invasive methods such as aerial photography and geophysical surveys (fig. 3.6) generate valuable information on the wholeness of military assemblages, excavations are required to test the outcomes of non-invasive methods, to confirm the date of the structures and to provide insight into their intactness. The catalogue of component parts (Annex 1) includes information on their research history, with references to the published results.

Representation of Outstanding Universal Value

The nominated property *Frontiers of the Roman Empire – The Lower German Limes* consists of 106 component parts. Of these 106 component parts 79 have been grouped into 17 clusters. A cluster may be composed either of a coherent group of related structures (e.g. a series of temporary camps) or of detached parts of a single structure (e.g. parts of a fort separated by a railway line or by past excavations). Consequently, there are 27 individual component parts and 17 clusters of component parts, adding up to 44 component parts/clusters.

Wholeness

The 44 component parts/clusters include all the elements that are necessary to express the proposed Outstanding Universal Value. Of these elements 91 are military installations, while 46 are associated structures which explain the operation and impact of the frontier system. These 137 elements of the Lower German Limes are the result of a selection process which is explained in section 2.a.5.

The representation of the various types of military installation and associated structures across the 44 component parts/clusters is shown in tables 3.3 and 3.4, respectively. On the whole, common structures have fairly numerous representation in the tables whereas rare or unique structures have low representation, as to be expected. For instance, standard auxiliary forts and extra-mural settlements were quite common, while large bases were rare and there was only a single bridgehead fort.

The component parts are distributed along the entire 400 km length of the frontier, from the first surviving fort in the west (the westernmost fort has been lost to the North Sea) to the last fort in the south. The spatial distribution of the component parts illustrates the linear character of the military infrastructure, apart from a gap in the eastern part of the river delta where

id	name	large bases			forts				other				
		irregular	standard	Late Roman	irregular	delta type	standard	Late Roman	fortlet	tower/ burgus	temporary camp	fleet base	bridgehead fort
1a–d	Valkenburg-Centrum					•							
2a–b	Valkenburg-De Woerd												
3	Voorburg-Arentsburg												
4a–f	Corbulo's canal												
5a–b	Leiden-Roomburg					•							
6	Woerden-Centrum					•							
7a–c	Utrecht-Limes road									•			
8a–b	Utrecht-Hoge Woerd					•							
9	Utrecht-Groot Zandveld									•			
10	Utrecht-Domplein					•							
11a–b	Bunnik-Vechten						•						
12	Arnhem-Meinerswijk					•							
13	Elst-Grote Kerk												
14a–b	Nijmegen-Valkhof area							•					
15	Nijmegen-Hunerberg	•	•										
16a–e	Nijmegen-Kops Plateau				•								
17a–e	Berg en Dal-aqueduct												
18a–b	Berg en Dal-De Holdeurn												
19	Herwen-De Bijland					•					•		
20	Kleve-Keeken						•						
21a–b	Kleve-Reichswald												
22	Till						•				•		
23	Kalkar-Kalkarberg												
24	Kalkar-Bornsches Feld				•		•	•					
25a–o	Uedem-Hochwald										•		
26a–d	Wesel-Flüren										•		
27	Xanten-CUT			•			•						
28	Xanten-Fürstenberg	•	•										
29	Alpen-Drüpt						•				•		
30	Moers-Asberg				•		•			•			
31	Duisburg-Werthausen								•				
32	Krefeld-Gellep						•	•					
33	Neuss-Koenenlager		•				•						
34a–b	Neuss-Reckberg								•	•			
35	Monheim-Haus Bürgel							•					
36	Dormagen						•			•			
37	Köln-Praetorium												
38	Köln-Deutz							•					•
39	Köln-Alteburg											•	
40a–k	Kottenforst Nord										•		
41	Bonn		•	•									
42a–j	Kottenforst Süd										•		
43	Iversheim												
44	Remagen				•			•					

Table 3.3 Overview of the representation of military installations in the component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes*.

id	name	infrastructure							other				
		Limes road	canal	harbour/ quay	waste deposit	lime kilns	tile/pottery kilns	aqueduct	civil settlement	cemetery	town	palace	sanctuary
1a–d	Valkenburg-Centrum												
2a–b	Valkenburg-De Woerd	•		•					•				
3	Voorburg-Arentsburg			•							•		
4a–f	Corbulo's canal		•										
5a–b	Leiden-Roomburg			•	•				•				
6	Woerden-Centrum												
7a–c	Utrecht-Limes road	•											
8a–b	Utrecht-Hoge Woerd				•				•	•			
9	Utrecht-Groot Zandveld												
10	Utrecht-Domplein												
11a–b	Bunnik-Vechten	•		•	•				•	•			
12	Arnhem-Meinerswijk								•				
13	Elst-Grote Kerk												•
14a–b	Nijmegen-Valkhof area										•		
15	Nijmegen-Hunerberg								•				
16a–e	Nijmegen-Kops Plateau				•				•	•			
17a–e	Berg en Dal-aqueduct							•					
18a–b	Berg en Dal-De Holdeurn						•						
19	Herwen-De Bijland												
20	Kleve-Keeken												
21a–b	Kleve-Reichswald	•											
22	Till								•				
23	Kalkar-Kalkarberg												•
24	Kalkar-Bornsches Feld	•			•				•	•			
25a–o	Uedem-Hochwald												
26a–d	Wesel-Flüren												
27	Xanten-CUT	•		•							•		
28	Xanten-Fürstenberg	•							•				
29	Alpen-Drüpt	•											
30	Moers-Asberg												
31	Duisburg-Werthausen												
32	Krefeld-Gellep								•	•			
33	Neuss-Koenenlager								•	•			
34a–b	Neuss-Reckberg												
35	Monheim-Haus Bürgel												
36	Dormagen												
37	Köln-Praetorium											•	
38	Köln-Deutz												
39	Köln-Alteburg												
40a–k	Kottenforst Nord												
41	Bonn												
42a–j	Kottenforst Süd												
43	Iversheim					•							
44	Remagen												

Table 3.4 Overview of the representation of associated structures in the component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes.*

id	name	key value					
		first linear frontier	adapting (to) river landscape	military construc-tion in timber	footprint of a frontier	variety/ time depth	treasure-chest of frontier life
1a–d	Valkenburg-Centrum	•	•	•		•	
2a–b	Valkenburg-De Woerd		•	•	•		
3	Voorburg-Arentsburg				•		
4a–f	Corbulo's canal		•	•			
5a–b	Leiden-Roomburg	•	•	•	•	•	•
6	Woerden-Centrum	•	•	•		•	
7a–c	Utrecht-Limes road		•	•	•		
8a–b	Utrecht-Hoge Woerd	•	•	•	•	•	•
9	Utrecht-Groot Zandveld		•	•		•	
10	Utrecht-Domplein	•	•	•		•	
11a–b	Bunnik-Vechten	•	•	•	•	•	•
12	Arnhem-Meinerswijk	•	•	•	•	•	
13	Elst-Grote Kerk				•		
14a–b	Nijmegen-Valkhof area				•	•	
15	Nijmegen-Hunerberg	•			•	•	
16a–e	Nijmegen-Kops Plateau					•	•
17a–e	Berg en Dal-aqueduct				•		
18a–b	Berg en Dal-De Holdeurn				•		
19	Herwen-De Bijland	•	•			•	
20	Kleve-Keeken	•	•				
21a–b	Kleve-Reichswald				•		
22	Till		•		•	•	
23	Kalkar-Kalkarberg				•		
24	Kalkar-Bornsches Feld	•	•		•	•	•
25a–o	Uedem-Hochwald					•	
26a–d	Wesel-Flüren		•			•	
27	Xanten-CUT		•	•	•	•	
28	Xanten-Fürstenberg	•			•	•	
29	Alpen-Drüpt		•		•	•	
30	Moers-Asberg	•	•	•		•	
31	Duisburg-Werthausen		•			•	
32	Krefeld-Gellep				•	•	
33	Neuss-Koenenlager		•			•	
34a–b	Neuss-Reckberg		•			•	
35	Monheim-Haus Bürgel					•	
36	Dormagen		•			•	
37	Köln-Praetorium		•		•	•	
38	Köln-Deutz		•			•	
39	Köln-Alteburg	•	•			•	
40a–k	Kottenforst Nord					•	
41	Bonn	•	•			•	
42a–j	Kottenforst Süd					•	
43	Iversheim				•		
44	Remagen	•	•	•		•	

Table 3.5 Representation of the main values of *Frontiers of the Roman Empire – The Lower German Limes* in the component parts/clusters.

several forts and smaller structures have been washed away by later activity of the Rhine.

The distribution of the various types of structure over the component parts/clusters demonstrates that there is no significant redundancy within the nominated selection. Many sites selected include rare or unique structures, while the relatively few similar sites are included to bring out the linear character of the frontier or to express the common occurrence of the structure; quite frequently also, apparently similar sites nonetheless have distinctive characteristics at a more detailed level.

The various attributes of the military installations and associated structures included in the 44 component parts/clusters clearly convey the significance of *Frontiers of the Roman Empire – The Lower German Limes*. The contribution of the component parts to the main values of the property is shown in table 3.5.

Some aspects of the proposed Outstanding Universal Value are of a more general nature than others and are thus represented in more component parts. This applies in particular to the aspect labelled 'variety/time depth', which refers to the typology of military installations and to the history of the different sections of the frontier; illustration of the whole array of military installations and of the long history of the frontier evidently requires a considerable range and number of examples. Other aspects are less general, such as 'military construction in timber', which can only be illustrated by sites where timber remains have survived due to a high groundwater table.

The various aspects of the significance of the nominated property are not evenly represented along the frontier. Sometimes the representation mirrors the situation in the Roman period, while in other cases the representation reflects the extent to which remains have survived.

The wholeness of the nominated property overall can be assessed as very good to good. This is also true at the level of the component parts/clusters (fig. 3.7), as explained in more detail in section 4.a.1 and summarised in tables 4.2 and 4.3. In 22 of the 44 component parts/clusters the included elements have survived almost completely, and they have survived to a large extent in another 15. In the remaining 7 component parts/clusters the elements have been substantially affected by river erosion or excavation; their inclusion in the nomination is, however, justified by their contribution of unique or rare attributes and values.

Intactness

The remains of the Lower German Limes as represented in the component parts/clusters have survived fifteen or more centuries. As described in section 2.b.3 stone buildings were often dismantled in the Middle Ages to reuse the stones for new structures. Timbers located above the groundwater table have been exposed to natural degradation, resulting in a loss of original substance. Eventually, nearly all the ruins of the military installations and other structures became overgrown or were built over, and they may have suffered additional damage from ploughing and other activities, including excavation in more recent times. For archaeological sites these types of degradation are entirely nor-

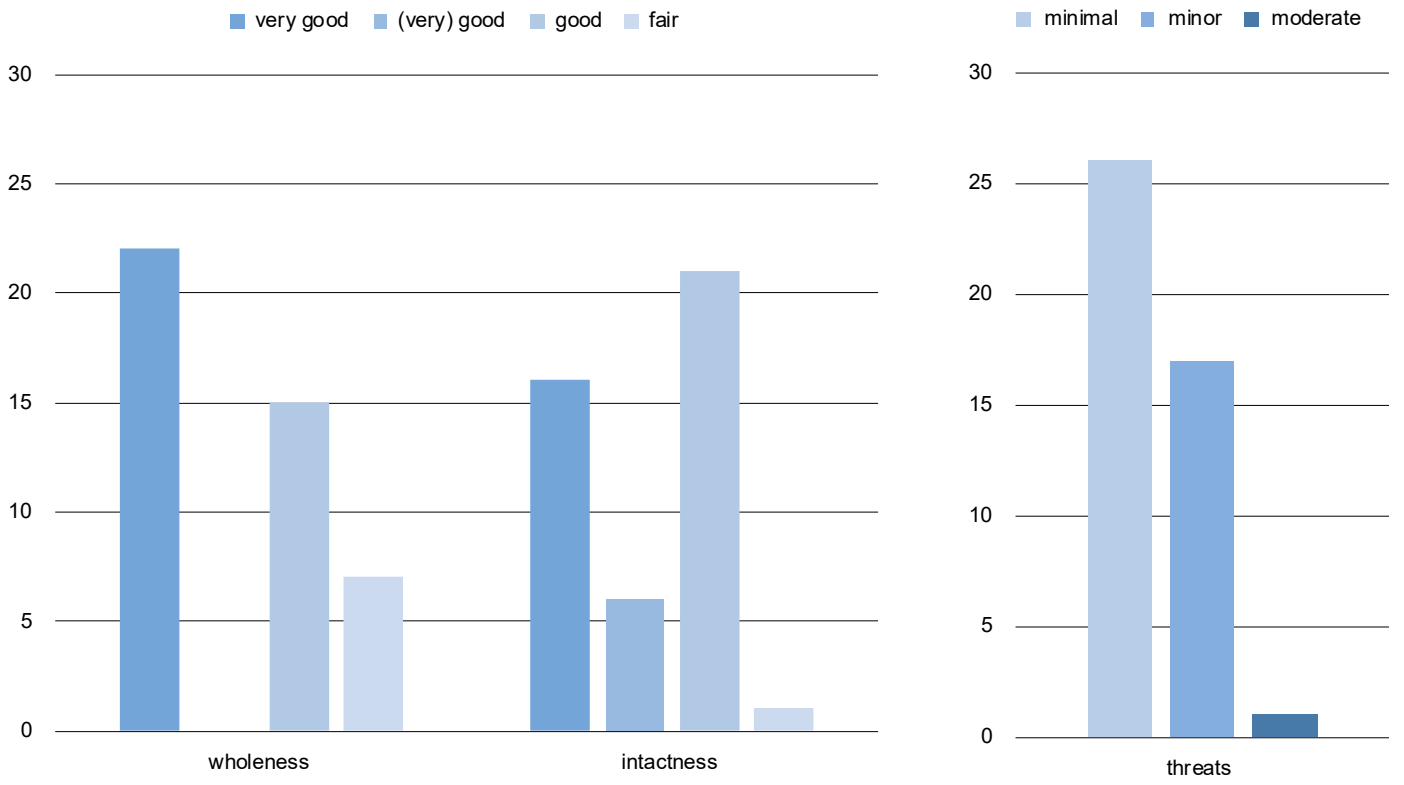

Fig. 3.7 Assessment of the integrity of the 44 component parts/clusters of *Frontiers of the Empire – The Lower German Limes*.

Fig. 3.8 The Cortendijk dam belonging to the Berg en Dal-aqueduct ▶17.

mal, and the intactness of the remains of the nominated property must be judged against this background.
Most of the remains of the Lower German Limes are buried underground, but there are a few sites with visible remains aboveground, including parts of stone defensive walls, earthen ramparts and ditches of temporary camps, and the earthworks of an aqueduct (fig. 3.8). Several other sites have substantial remains of stone walls preserved underground or well-preserved timber remains below or at the groundwater level. In all these cases the intactness can be considered as very good, in the relative sense indicated above. This applies to 16 of the 44 component parts/clusters. The remaining 28 component parts/clusters still include parts of the latest building phase, which is usually most affected by degradation, and at 6 of these some remains of stone walls and timber structures have survived. Sites considerably affected by degradation have been excluded from the nomination, as explained in section 2.a.5.
The intactness of the nominated property as a whole may be assessed as good to very good. The military installations and related structures are preserved to such a degree that their various attributes clearly convey the proposed Outstanding Universal Value. The intactness of the individual component parts is discussed in more detail in section 4.a.1 and summarised in tables 4.2 and 4.3.

Rationale of the property boundary

The nomination of the Lower German Limes is a serial nomination, and it is therefore necessary to explain not only the boundaries of the nominated property as a whole but also those of individual component parts. The protection of the property is regulated by the state laws on heritage protection of the German states of North Rhine-Westphalia and Rhineland-Palatinate and by the national law on heritage protection of the Netherlands (cf. chapter 5).
The boundary of the nominated property as a whole is defined so as to encompass a good representation of the elements and values of the Lower German frontier (cf. above). Unique or rare examples of values and attributes are represented by a single or a few component parts, while less rare values and attributes are represented by the best examples, considered from the perspectives of preservation and manageability.
On the level of individual component parts/clusters some encompass several elements, while others include only a single one. Wherever possible the aim has been to incorporate the whole of an element or complex of elements within the boundaries of a component part, but this has not always been possible. Factors affecting incomplete representation include:

1 The element or complex is incomplete, because part of it has been destroyed or excavated.
2 The extent of the element or complex is not precisely known, and only the properly attested part is included.
3 The size of the element or complex does not allow inclusion in its entirety. Size may refer either to length (canal, Limes road) or to surface area (complexes of fortifications and related structures may extend over several square kilometres).

4 The present setting of the element or assemblage does not allow inclusion in its entirety. This applies mainly to urban areas.

Quite often more than one factor applies. While the extent of fortifications with standardised forms can be established relatively easily, the boundaries of civil settlements and cemeteries are notoriously difficult to attest. When located in rural areas or in public parks in towns today, large complexes of military installations and associated elements can be sustainably protected, but in built-up urban areas the high pressure for development does not favour sustainable protection. In these situations the nominated property is generally restricted to the military installation alone, while associated structures – the precise extent of which is often not properly attested – have been included in a buffer zone. However, such associated structures are adequately represented in the nominated property of the Lower German Limes as a whole, through inclusion in areas not subject to severe development pressure.

When linked but spatially separated parts of a larger complex could not be included within a single boundary, the separate parts have been nominated as individual component parts. In such cases these associated component parts have been grouped in clusters and presented under a joint heading. Besides 27 separate component parts, the nomination encompasses 17 clusters of component parts, grouping 79 individual component parts.

Boundaries of individual component parts are based on – in order of preference – administrative boundaries (property boundaries), physical features (e.g. walls, roads) or natural features (e.g. ditches), where these are located close to the known boundaries of the archaeological remains. When such features are not in close proximity, or when the orientation of the Roman structures deviates from that of the modern topography, the boundaries of a component part may run across modern topographical units. In a few instances, boundaries of protected areas reflect earlier topographical situations which have altered since and do not align well with the current situation.

All the established boundaries have been mapped with great precision and are available digitally. The digital boundaries are available to the relevant administrative authorities and, through administrative mapping applications on the internet, increasingly also to the owners and users of the properties, allowing them to check the precise delineation of the boundaries.

Exposure to threats

The nominated property as a whole is currently not exposed to significant threats. The exposure to threats has been qualified as ‘minimal’ for 84 % of the component parts/clusters, and as ‘minor’ for another 20 %. In the first case there are no significant threats, whereas in the second case there are some threats, but these are currently under control. The latter applies to urban areas, which are generally exposed to development pressure, and to rural areas exposed to agricultural exploitation, with associated impacts such as reduction in groundwater level. The protection provided under state and national laws for heritage protection and the increasing awareness of the negative impacts of agricultural use provide a firm basis for sustained preservation of the nominated property.

The state of conservation of the component parts and the threats to which they are currently exposed are outlined in detail in section 4.a.1. A concise overview is presented in tables 4.2 and 4.3.

3.1.d Statement of authenticity

The authenticity of the nominated property is high, thanks to the abandonment of most of the military installations and related structures during or at the end of the Roman period. Once the buildings had become ruinous or had been purposely dismantled, their remains became overgrown or were built over, thereby protecting the authenticity of their physical attributes. The buried features are the original and fully authentic remains. The setting of the assemblages, however, has often lost some or much of its authenticity.

The authenticity of a nominated property is defined by its ability to provide a truthful and credible expression of its values through tangible and intangible attributes. For the Lower German Limes three pairs of attributes have been considered relevant: form and design, material and substance, and location and setting.

Form and design have been understood as the outline and internal structure of the military installations and associated elements, and also by their spatial relationships in the case of the presence of more than one element. The materials and substance relate primarily to the building materials, but also to the many artefacts associated with the built structures. Some may once have been part of these structures, such as hinges and nails, while others have no constructional link,

Fig. 3.9 Copper-alloy casing of a military pickaxe, from the Rhine bed in front of the fort at Alphen aan den Rijn. The casing was marked by its owner, Aquilius Severus from the unit of Licinius.

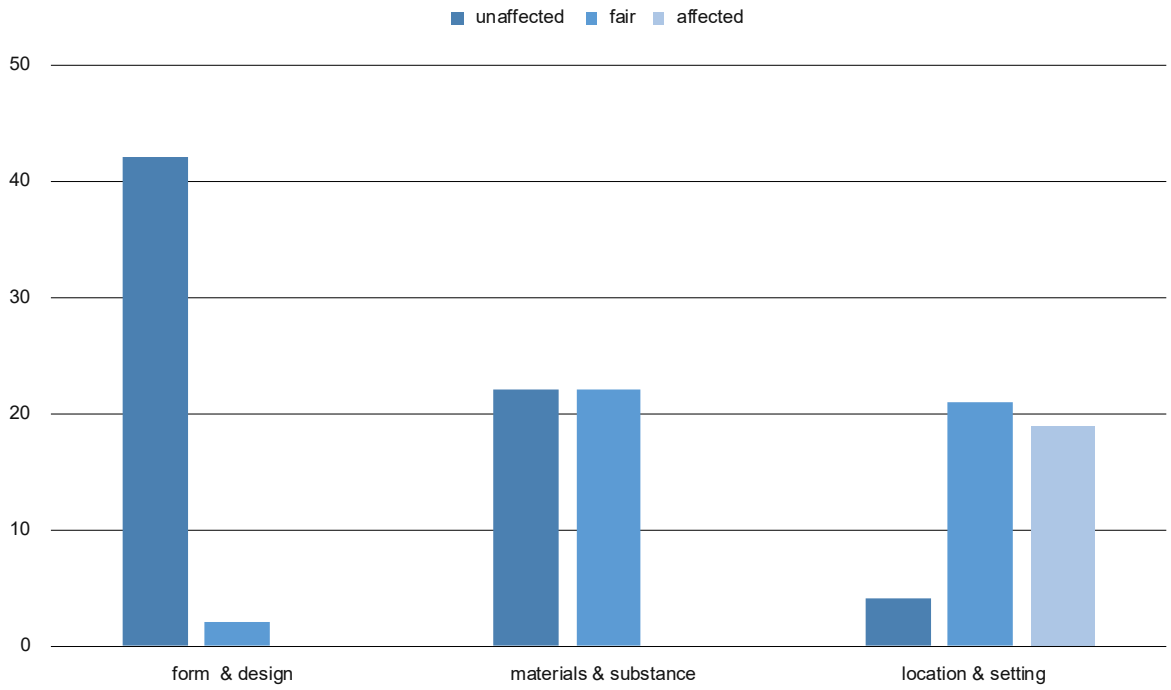

Fig. 3.10 Assessment of the authenticity of the 44 component parts/cluster of *Frontiers of the Empire – The Lower German Limes*.

but are vital to the understanding of their history, use or operation, such as coins and weapons (fig. 3.9). The location and setting have been interpreted in the general sense of landscape and views, but also in the much more specific sense of connection to the river Rhine for those structures which were originally located near the river channel.

The authenticity of the attributes is discussed in detail in section 4.a.2, which includes definitions of the three ratings of condition used to describe the degree of authenticity: unaffected, fair and affected. These ratings have been established by research – often by excavation, but also by non-invasive methods such as field survey, aerial photography, geophysical research and study of digital elevation data. The catalogue of component parts (Annex 1) includes information on their research history, with references to the published results.

The authenticity of form and design of the elements included within the component parts/clusters has been rated as 'unaffected' in all cases but two (fig. 3.10). This indicates that their outline and internal layout, and where applicable the spatial relationships between separate elements, have not undergone any changes since the Roman period. Only Utrecht-Domplein ▶10 and Nijmegen-Valkhof ▶14 may have been exposed to some later alterations, but most of their authenticity has remained intact, leading to a rating of 'fair'.

There are no component parts/clusters where the authenticity of materials and substance has been compromised to a degree which might justify the rating 'affected'. On the contrary, the authenticity of these aspects is overall very high. Half of the component parts/clusters have been given a rating of 'fair' for these aspects. This applies to those sites where stone walls have been completely dismantled, leaving only the foundations and rejected debris, and/or where timber structures have entirely decayed, though their outlines can still be distinguished in the soil. For the remaining sites, where at least the lower courses of stone walls are still standing or where timber remains have retained their original aspect through water-logging, the authenticity of materials and substance has been qualified as 'unaffected'.

The landscape of the Lower German Limes has changed considerably over the centuries since the Roman period. The Rhine has long continued to change its course, leading to the silting up of abandoned Roman river channels at several points. From the Medieval period onwards, however, the Rhine was deprived of much of its dynamics as it was increasingly embanked and occasionally canalised. Wet parts of the river valley became more suitable for agricultural exploitation and other parts altered by the development of small towns and large cities. There are only four component parts/clusters where the present environment remains reminiscent of the Roman setting and may be rated as 'unaffected', evidently in a relative sense. In some instances this rating reflects the preservation of the rugged landscape of an ice-pushed moraine (fig. 3.11), in others it reflects the clarity of the relationship with the river, where the Rhine has retained its Roman course. For nearly half of the sites the authenticity of location and setting has been qualified as 'fair'. This applies where the present setting is to some degree similar to that in the Roman period, and particularly where the vicinity of the Rhine permits an understanding of the association between the river and the military infrastructure, even though the Roman river channel is not visible any more. For

Fig. 3.11 Wide view over the river plain to the northeast of the large army base of Nijmegen-Hunerberg ▶15.

more than a third of the component parts/clusters the setting has changed so thoroughly that their position in the Roman period can no longer be understood. For these sites, the authenticity of location and setting is clearly 'affected'.

A further relevant aspect of authenticity is the presence of reconstructions which are not based on complete knowledge of the original structure. On the Low-er German Limes such reconstructions are limited to five sites: the lime kilns of Iversheim ▶43, a fort gate at Köln-Deutz ▶38, the archaeological park on the site of Xanten-CUT ▶27 and watchtowers at Utrecht-Hoge Woerd ▶8 and Neuss-Reckberg ▶34a. At Iversheim one of the excavated lime kilns has been rebuilt and used to test lime burning. At Köln-Deutz the low-er courses of the walls of the east gate of the Late Roman fort were marked out on the surface, using original stone blocks. The reconstruction of the Utrecht watchtower is based on the excavation of several nearby towers and on the iconography of watchtowers in Roman monuments, while that of the tower of Neuss-Reckberg was inspired by reconstructions from the Upper German-Raetian Limes.

The LVR-Archaeological Park Xanten is a special case. It was created in 1973 to protect the remains of the Roman town, which were threatened by quarrying and industrial development. Sustainable protection of the area was only deemed feasible if it could have an alternative economic function, as an open air archaeological park with elements of the Roman town rebuilt at the original scale. The park visualises the scale and outward appearance of a Roman town in a part of the Empire which has only very few aboveground remains of Roman buildings. It increasingly serves as a laboratory for Roman construction techniques, providing many new insights through a process of experimental archaeology, learning-by-doing.

Besides these reconstructions there are several visualisations of a very different character. Their designs and materials – such as concrete, weathering steel and trees – cannot be mistaken as authentic, although their location and dimensions correspond to those of the buried remains of forts and other structures. By creating an awareness of the presence of underground remains from the Roman period these visualisations support their sustained protection. In some cases the connection of the local population with 'their' Roman monument is increased by the accommodation of community facilities such as children's farms and allotment gardens. The position of these visualisations above the buried structures adds an extra layer of physical protection to the underground remains, and helps justify exclusion from development in their immediate surroundings.

It is proposed that reconstructions and visualisations located within the boundaries of component parts should be considered as belonging to the buffer zone.

3.1.e Protection and management requirements

Protective framework

The Netherlands and the German federal states of North Rhine-Westphalia and Rhineland-Palatinate each have different legal systems and additional regulations for the protection of archaeological heritage. In all cases laws on heritage protection at the national (NL) or federal state (DE) level provide adequate protection of the

nominated property. Although details of the provisions for designation and protection vary, they offer a similar framework for the sustained protection of the nominated component parts. The protective framework of the national and state laws on heritage protection is supplemented by laws and regulations at regional and local levels regarding spatial planning, environmental protection and water management.
In the Netherlands the legislation on spatial planning will change from January 2021. The new Environment and Planning Act will integrate earlier sectoral laws including the Spatial Planning Act and Water Act. The protective framework of the new act and of derived regulations at provincial and municipal levels will be similar to that of their predecessors.

Management organisation

Germany and the Netherlands have discrete national organisations for the management of their respective component parts of the nominated property, but management is also coordinated by a joint Dutch-German management group for the Lower German Limes (MG-LGL), which is overseen by a joint Intergovernmental Committee (IGC-LGL). The principles of the international cooperation will be set out after nomination in a Joint Declaration.
The main lines of the management of the nominated property are set out by the joint management group (MG-LGL), which also supervises implementation of the national management plans and periodic reporting to UNESCO. The management plan for 2021–2026 encompasses joint actions on the level of the property as a whole and additional actions at national level. Joint actions include amongst others the development of common standards for conservation, interpretation and research, and of a common framework for monitoring and reporting.
In the Thematic Study on the Frontiers of the Roman Empire it is suggested that a common framework for the management of all frontier sections in Europe should be developed 'to achieve common standards of identification, recording, research, protection, conservation, management, presentation and understanding of the Roman frontier, above and below ground, in an inter- disciplinary manner and within a sustainable framework'.[3] These aims are fully shared by Germany and the Netherlands.

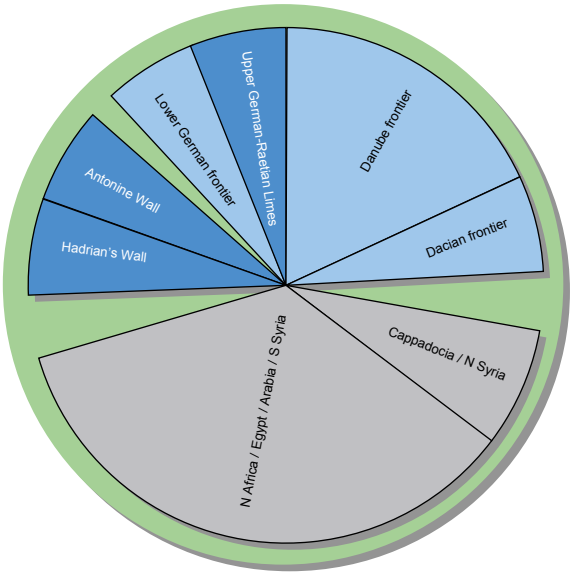

Fig. 3.12 The envisaged Frontiers of the Empire World Heritage Cluster. Dark blue: inscribed frontier sections. Light blue: envisaged new sections for Europe. Grey: sections in the Near East and North Africa which may be added at a later stage.

Since extension of the inscribed property *Frontiers of the Roman Empire* (Ref: 430ter) is no longer envisaged, a new overarching framework is needed to support international collaboration in those fields relevant to the overall management and development of the Frontiers of the Roman Empire in Europe as World Heritage. This common framework was agreed in September 2018, and has been labelled 'Frontiers of the Roman Empire World Heritage Cluster' (hereafter: Cluster). The Cluster includes both the inscribed and envisaged properties in Europe, and will be open to future extension with frontier sections in North Africa and the Near East (fig. 3.12).
The primary aims of the Cluster are the presentation of the World Heritage of the Roman frontiers as a single, coherent monument and the furthering of international cooperation to facilitate management and development of the properties. The existing Bratislava Group will form the basis of this international cooperation (fig. 3.13). The Bratislava Group is an international scientific advisory body with expert members from States Parties containing inscribed or potential parts within the Frontiers of the Roman Empire World Heritage Cluster. The Bratislava Group advises on the significance of the Roman frontiers and on the development of best practice guidance for their management and improving their understanding, and develops support structures such as an overall research strategy, an international Roman frontiers database and websites.

Long-term challenges

The long-term strategy for *Frontiers of the Roman Empire – The Lower German Limes* is aimed at preserving the Outstanding Universal Value and creating a common understanding of it. Protection and conservation of the nominated property in accordance with sustainable development is at the heart of long-term

[3] R. Ployer/M. Polak/R. Schmidt, The Frontiers of the Roman Empire – A Thematic Study and Proposed World Heritage Nomination Strategy. Advised by ICOMOS-International and commissioned by the Intergovernmental Committee of the 'Frontiers of the Roman Empire' World Heritage Site (UK, DE) and the Bratislava Group (Vienna, Nijmegen, Munich 2017) 105–107.

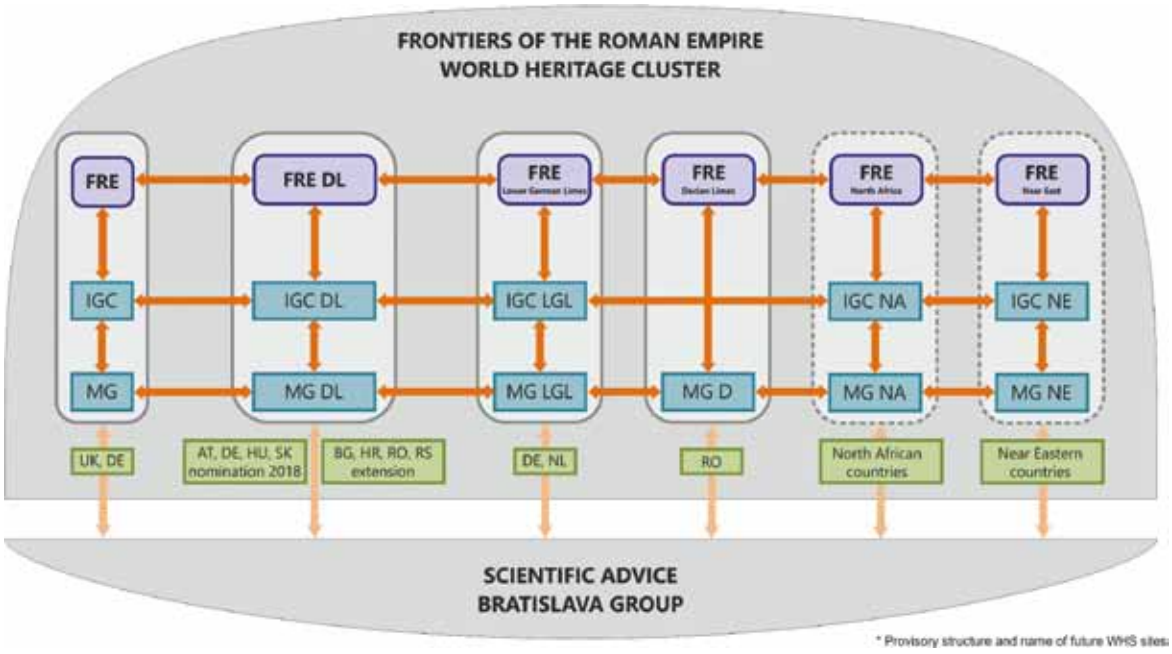

Fig. 3.13 Management structure for the 'Frontiers of the Roman Empire World Heritage Cluster'.

challenges. According to the World Heritage Sustainable Development Policy (WH-SDP) 'sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. The key task is for researchers, governments and stakeholders to work together in a coordinated manner on preservation and knowledge development. The aim is to strengthen understanding of *Frontiers of the Roman Empire – The Lower German Limes* as a transnation-al structure within the common framework of the Frontiers of the Roman Empire World Heritage Cluster. Transnational management is focused on guiding future developments and interventions in accordance with spatial planning tools. Involving all planning authorities and following building regulation principles at an early stage, prevents threats to those elements of the archaeological heritage that convey Outstanding Universal Value. A long-term goal is to prepare a joint sustainable tourism strategy with high quality presentation in museums and on site. Where appropriate, sites and museums should also be suitable for intensive use in primary and secondary education. Further development and management should be acceptable to local communities and allow active participation.
Further information on long-term challenges for protection and management are mentioned in the Management Plan (Annex 2).

3.2 Comparative analysis

Frontiers of the Roman Empire – The Lower German Limes is a river frontier that delineated a part of the Roman Empire from an area which it was unable to bring under its direct rule. Although the river Rhine constituted the external boundary of the Empire in this area, the importance of the river as a supply route for the military forces deployed on its left bank required that the army had some control over the opposite bank as well. It is argued below that there are no similar monuments from other periods. A comparison with other sections of the Roman frontiers demonstrates that *Frontiers of the Roman Empire – The Lower German Limes* has several distinctive characteristics which justify consideration of this nominated property for the World Heritage List.

External comparison

The frontier of the Roman Empire as a whole is often compared with the Great Wall of China (Ref: 438), presumably due to the considerable length of both boundaries, and to the superficial outward resemblance of the Great Wall to Hadrian's Wall in England (Ref: 430) (fig. 3.14). Although the latter, with its towers and forts, is the iconic frontier section of the Roman Empire, it is not very typical for the Roman frontier as a whole. Most sections were not connected by a continuous artificial barrier, but were laid out along natural barriers like rivers, mountain ranges and (semi-)deserts, and consisted of series of detached military posts. A comparison with artificial linear barriers in other areas and from other periods is therefore not relevant for *Frontiers of the Roman Empire – The Lower German Limes*.
The Roman Empire was neither the first nor the last state to use rivers as boundaries. Rivers constitute relatively clear dividing lines, although they may occasionally change their course or develop two or more parallel channels. When a river can be monitored from its banks and the number of crossings is lim-

Fig. 3.14 View on Hadrian's Wall in northern England, to the west of Housesteads.

ited, it can be an effective boundary between states, peoples or spheres of influence. River borders have existed and still exist on most continents, but none has served for many centuries as a heavily garrisoned frontier between major political powers, as the Roman river frontiers did. The river frontiers of the Roman Empire were therefore a phenomenon of their own.

Internal comparison

The inscription of Hadrian's Wall on the World Heritage List in 1987 (Ref: 430) demonstrated that the frontier of the Roman Empire is of (potential) Outstanding Universal Value. Under the joint name of Frontiers of the Roman Empire, the Hadrian's Wall section has been extended and added to with the Upper German-Raetian Limes in Germany in 2005 (Ref: 430bis), and the Antonine Wall in Scotland in 2008 (Ref: 430ter). Both new component parts were artificial linear barriers, and thus belonged to the same category as Hadrian's Wall. In the early 2000s the States Parties involved in the preparation of these and other sections of the Roman frontier had voiced the ambition 'to create a World Heritage site encompassing all the frontiers of the Roman Empire […] as evidence of the remains of one of the world's greatest civilisations and as a symbol of common heritage'.[4] This idea was recommended by the World Heritage Committee in 2005, at the inscription of the Upper German-Raetian Limes.[5] In 2004 the States Parties involved had agreed to define the frontiers of the Roman Empire in the context of World Heritage as 'the line(s) of the frontier of the height of the empire from Trajan to Septimius Severus (about AD 100–200), and military installations of different periods which are on that line'.[6] The relevant context for the comparison of *Frontiers of the Roman Empire – The Lower German Limes* is therefore that of other sections of the Roman frontier, on the line of the 2nd century AD.

An internal comparison of Roman frontier sections has already been made in the Thematic Study on the Frontiers of the Roman Empire which was written on the advice of ICOMOS, and presented to the World Heritage Committee at its 41st session in 2017.[7] This Thematic Study provided an overview of what remains of the Roman frontier, and argued that it is possible to distinguish discrete frontier sections that have the capacity to demonstrate Outstanding Universal Value and are manageable in a sustainable way. The main points of the internal comparison presented in the Thematic Study will be summarised here.

4 Quoted from the Summary Nomination Statement included in the nomination dossier for the Upper German-Raetian Limes p. 410 (< http://whc.unesco.org/uploads/nominations/430ter.pdf > [accessed 04.12.2019]).

5 Decision 29 COM 8B.46.

6 Nomination file 430ter, p. 427.

7 R. Ployer/M. Polak/R. Schmidt, The Frontiers of the Roman Empire – A Thematic Study and Proposed World Heritage Nomination Strategy. Advised by ICOMOS-International and commissioned by the Intergovernmental Committee of the 'Frontiers of the Roman Empire' World Heritage Site (UK, DE) and the Bratislava Group (Vienna, Nijmegen, Munich 2017) 83–91.

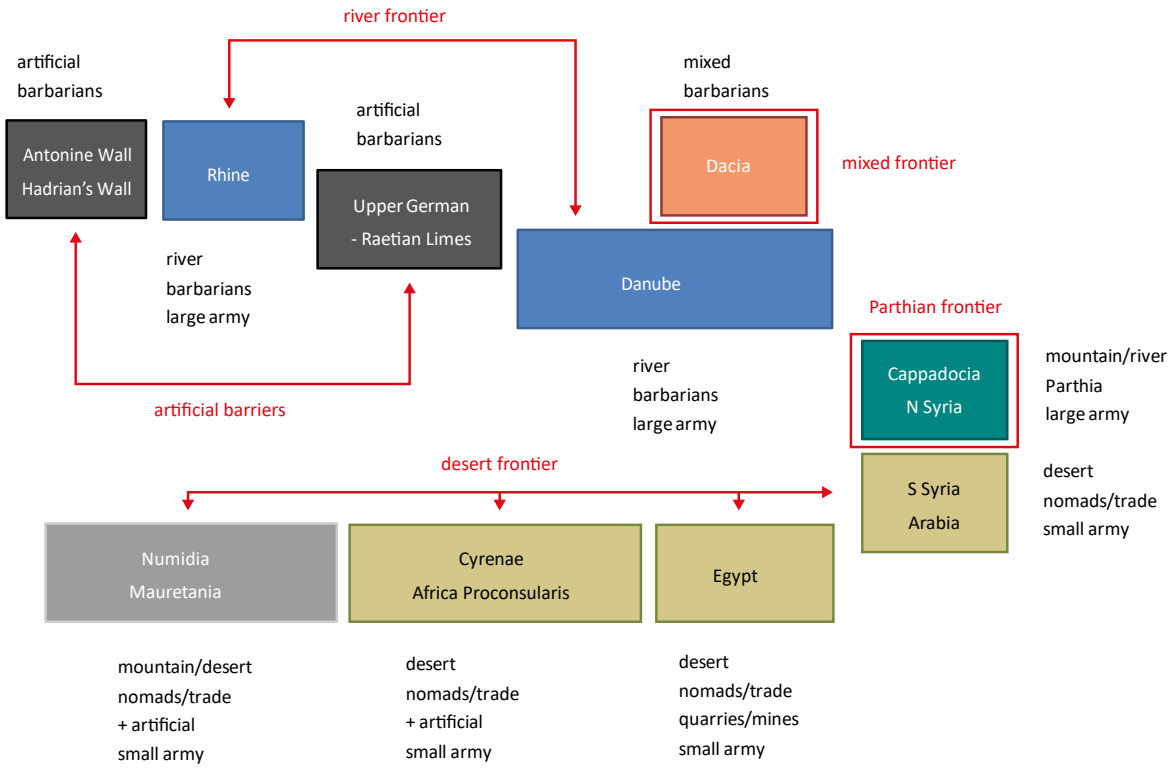

Fig. 3.15 Diagram of the Roman frontiers on three continents, with their main characteristics (frontier type, threats, garrisons). The attribution of frontier sections to five overarching groups is indicated in red.

The frontiers of the Roman Empire extend over areas differing in climatic and geographical conditions, habitation and land use, external threats and political interests. This variation is clearly reflected by the military infrastructure, although there was always a considerable degree of 'common ground' between the different regions, which was required for a flexible deployment of troops and army commanders throughout the Empire. The main similarities and dissimilarities between the frontier sections permit five groups of frontiers to be distinguished. These are visualised in a diagram (fig. 3.15) which is briefly explained here.

There are three frontier sections which consist of continuous artificial barriers: Hadrian's Wall in England, the Antonine Wall in Scotland and the Upper German-Raetian Limes in Germany. These three barriers, which are united in the World Heritage site Frontiers of the Roman Empire (Ref: 430ter), were built where no convenient rivers or other natural barriers were available as a frontier. They separated the Empire from societies that Rome considered as unreliable 'barbarians', who were insensible to the give-and-take approach of Roman diplomacy that had proved successful elsewhere. The rugged territories of these 'barbaric' tribes could not be effectively controlled by the Roman army, which relied strongly on the large-scale deployment of heavy infantry, trained for battle in open landscapes.

In northern Africa and the southern part of the Near East the military infrastructure served three purposes: protection of the towns and settled agricultural areas, control of nomadic movement, and supervision of long distance trade routes. The region was relatively peaceful, and the armies accordingly small. The Roman troops were deployed in fortlets and towers along the fringes of the (semi-)deserts, or in mountain ranges overlooking them; occasionally small posts were established in oases along trade routes through the deserts (fig. 3.16). In Egypt only the delta and valley of the Nile were habitable, and part of the military infrastructure was located within these areas – not on their periphery, as was usual elsewhere; additionally, a large cluster of small posts occurred in the Eastern Desert, securing the exploitation of valuable minerals and stone and controlling trade routes between the Nile and the Red Sea.

The river frontiers along the Rhine and Danube in Europe constitute another distinct type of frontier, separating the Empire from 'barbaric' peoples over some 3,000 km. The military installations along the rivers were built almost exclusively on the 'Roman' bank, but occasionally bridgeheads were built on the opposite bank for expeditions across the rivers. The spacing of the military installations was on the whole closer than along the deserts, with the density depending on accessibility, visibility and threats. Except in periods of severe frost and drought, rivers were effective barriers, in the absence of permanent bridges and with forts, towers and fleets to control them. The scale of the threats posed by the 'barbarians' is indicat-ed by the large size of the army garrisoned along the Rhine and Danube.

The Roman province of *Dacia* (in modern Romania), extending to the north of the Danube and existing only from AD 106–271, is a special case, as it provides a mixture of military solutions. Evidently, the main area

of interest was Transylvania, largely surrounded by the Carpathian Mountains and more or less separated from the Danube by the Wallachian/Romanian plain. To the east and north Transylvania was protected by a range of forts, with a screen of more than a hundred towers controlling the access routes, complemented with short banks and barriers in some areas. There is no similar shield to the west of Transylvania. The Romanian Plain is cut by two lines of fortifications which constitute a mixture of a river frontier and an artificial barrier.

The northern part of the Near East was also partly protected by a river frontier, along the Euphrates. The military installations were distributed over the west bank of the upper course of the Euphrates and northward through the mountains to the Black Sea. This was the boundary with the Parthian Empire, bordering on the heavily contested areas of *Armenia* and *Mesopotamia*. The disposition of Roman troops along the Euphrates and in the mountains to the north at first sight resembles that along the Rhine and Danube and in *Dacia*, but there is a fundamental difference. In the East, army units were often garrisoned in towns and villages, as in Africa. To Rome this was a familiar strategy, which it applied in all areas where urban centres were at hand, or other central places like the hillforts in Gaul and southern Britain. On the Rhine and Danube, however, the military infrastructure had to be built from scratch, in the absence of such centres.

Summing up, the frontier along the river Rhine differs clearly from most other sections of the Roman frontier. The most similar frontier is that along the Danube, but there are some fundamental differences between these two river frontiers. The first major difference is a chronological one. The Rhine was the first river to be transformed into a permanent linear defence system, in the early 1st century AD, several decades earlier than the Danube. On the other hand, the eastern segment of the Danube frontier (from Croatia to the Black Sea) retained its defensive function until the 7th century AD, as part of the Eastern Roman Empire, while the Rhine frontier was abandoned in the 5th century AD, shortly before the western segment of the Danube, when the Western Empire collapsed. The two river frontiers therefore cover different chronological ranges of the military history of the Roman Empire. The *Frontiers of the Roman Empire – The Lower German Limes* is the only frontier section which illustrates the entire history of the Western Empire, distinguished amongst other features by the very large and irregularly shaped bases characteristic of its early offensive stages.

The second major difference regards the relationship between the landscape and the military infrastructure. The Danube frontier runs through a variety of landscapes, with an alternation of wide floodplains and narrow gorges, and ends in a relatively small delta (fig. 3.17). The Rhine frontier extends through a lowland and a large delta, where the river had a very dynamic character. These different settings are reflected in the military infrastructure, with many fortlets, towers and bridgeheads on the Danube, often in

Fig. 3.16 The desert fort of Qasr al-Bashir in Jordan.

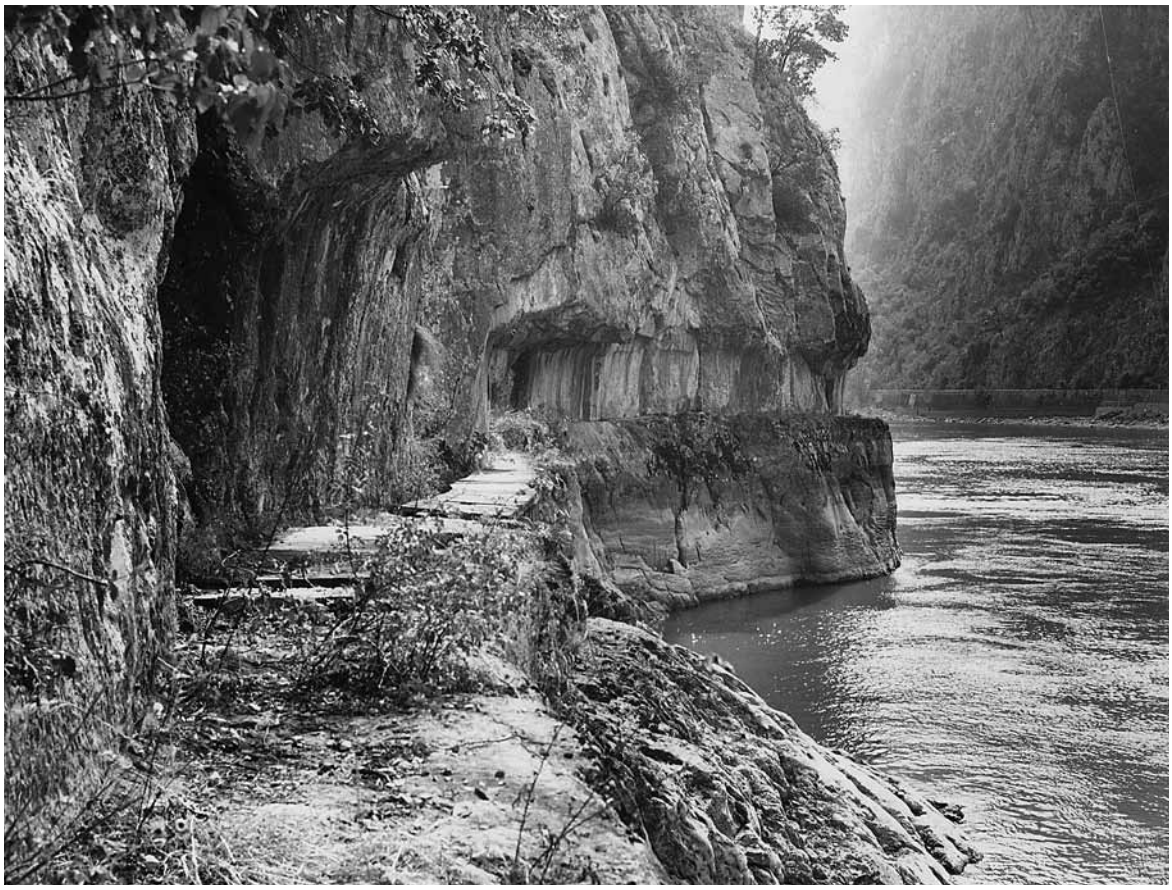

Fig. 3.17 Towpath cut into the rock of the Đerdap (Iron Gate) gorge in the river Danube near Kloadovo, Serbia, before the water level was raised for a hydro-electric power station.

elevated positions, and water management works and peculiar forts on the Rhine, often in vulnerable positions on the edge of the river.

The third major difference concerns the preservation of the military infrastructure. The Danube frontier has very good representation of standing remains of stone forts and towers, particularly from the Late Roman period, thanks to their incorporation in later buildings and to the location of many sites in rural areas. The Rhine frontier was largely situated in an area without natural stone reserves, which explains why abandoned forts were often largely or entirely robbed in the Middle Ages, to reuse the stone for new buildings. On the other hand the earlier, timber building phases of the military infrastructure are often very well preserved, which is rare across the whole of the Roman frontiers. Consequently, *Frontiers of the Roman Empire – The Lower German Limes* provides unparalleled insights into Roman military construction in timber, and into other aspects of frontier life represented by organic remains.

These three differences of chronological range, of the relationship between landscape and military infrastructure and the quality of preservation of timber and other organic remains, suffice to demonstrate that *Frontiers of the Roman Empire – The Lower German Limes* is a distinctive section of the frontiers of the Roman Empire, with the potential to demonstrate Outstanding Universal Value.

Selection of component parts

The nominated property *Frontiers of the Roman Empire – The Lower German Limes* as a whole must adequately convey the proposed Outstanding Universal Value, be in a good condition and not subject to significant threats. Since the Lower German Limes is a linear defensive system, the site selection must clearly bring out the linearity, which implies that it must be of sufficient size and that the selected sites must be adequately distributed. The occurrence of series of similar sites must be avoided, unless they are needed to express particular characteristics or to fill gaps in the linear arrangement. Following these criteria, the initial selections of sites for the German and Dutch parts of the frontier were reduced in several steps to the eventual joint selection of 44 sites, divided over 106 component parts.

The contribution of each of these 44 sites (component parts/clusters) to the proposed Outstanding Universal Value of *Frontiers of the Roman Empire – The Lower German Limes* as a whole can be seen in table 3.2. Representation within the 44 sites of the variety of military installations and associated structures and of the main values of the proposed Outstanding Universal Value has been discussed in section 3.1.c and is illustrated in tables 3.3–3.5. The integrity and authenticity of the remains included in the 106 individual component parts has been explained in section

4.a.1 and is illustrated in tables 4.2–4.3 and 4.5–4.6, respectively.
The selection process has been described at more length in section 2.a.5. Table 2.2 presents an overview of all 106 selected component parts, and also of a selection of rejected sites, with a focus on those which regularly occur in studies of the Lower German Limes but do not fulfil the criteria for nomination.

3.3 Proposed statement of Outstanding Universal Value

Brief synthesis

Frontiers of the Roman Empire – The Lower German Limes ran for 400 km along the Lower Rhine, along the north-eastern boundary of the Roman frontier province of *Germania inferior* (Lower Germany), from the Rhenish Massif south of Bonn (Germany) to the North Sea coast (the Netherlands). For more than 450 years from the late 1st century BC, it protected the Roman Empire against Germanic tribes which it considered as 'barbaric'.
The first military bases were built in the last decades BC, for the conquest of Germanic territories across the river Rhine. Once this ambition had failed the left river bank was converted into a fortified frontier separating Roman Gaul from the 'barbaric' foreland. Military installations of widely varying types and sizes and associated civil structures were built on the edge of the left river bank and linked by an infrastructural and logistical network. Having survived a crisis in the late 3rd century AD, the frontier shared the phased disintegration of the Western Roman Empire until the mid-5th century AD.
Frontiers of the Roman Empire – The Lower German Limes eminently illustrates the innovative responses of the Roman military engineers to the challenges posed by the dynamic landscape of a lowland river, as witnessed by the positioning and design of the military installations and by exceptional water management works. The entire range of large early bases to small late strongholds is represented, reflecting strategic adaptation and development of military engineering. The first military bases on the Lower Rhine represent the very beginning of the linear perimeter defence of the Roman Empire, which would develop into a coherent frontier system extending over three continents in the 2nd century AD. The military and civil structures associated with the military fortifications illustrate the formidable impact of the Roman military presence on the landscape and society of the periphery of the Empire.
The wetland conditions have led to an outstanding preservation of timber and other organic remains, providing unparalleled insights into military construction, shipbuilding, logistics and supply.
Criterion (ii): The extant remains of *Frontiers of the Roman Empire – The Lower German Limes* constitute significant elements of the Roman Frontiers present in Europe. With its legionary fortresses, forts, fortlets, watchtowers, linked infrastructure and civilian architecture it exhibits an important interchange of human and cultural values at the height of the Roman Empire, through the development of Roman military architecture, extending the technical knowledge of construction and management to the very edges of the Empire. It reflects the imposition of a complex frontier system on the existing societies of the north-western part of the Roman Empire, introducing for the first time military installations and related civilian settlements, linked through an extensive supporting network. The frontier did not constitute an impregnable barrier, but controlled and allowed the movement of peoples: not only the military units, but also civilians and merchants. (fig. 3.18) Hence, it triggered the exchange of cultural values through movement of soldiers and civilians from different nations. This entailed profound changes and developments in terms of settlement patterns, architecture and landscape design and spatial organisation.
Criterion (iii): As part of the Roman Empire's general system of defence, *Frontiers of the Roman Empire – The Lower German Limes* has an extraordinarily high cultural value. It bears an exceptional testimony to the maximum extension of the power of the Roman Empire through the consolidation of its north-western frontiers and thus constitutes a physical manifestation of Roman imperial policy. It illustrates the Roman Empire's ambition to dominate the world in order to establish its law and way of life there in a long-term perspective. It witnesses Roman colonisation in the respective territories, the spread of Roman culture and its different traditions – military, engineering, architecture, religion management and politics – and the large number of human settlements associated with the defences which contribute to an understanding of how soldiers and their families lived in this part of the Roman Empire.
Criterion (iv): *Frontiers of the Roman Empire – The Lower German Limes* was the earliest linear frontier of the Roman Empire, created as an answer to Rome's inability to control its northern neighbours by means of diplomacy. Its military installations outstandingly illustrate the development of the large operational bases of a field army to the varied range of smaller installations required by an extended frontier line. Situated in an area which has always been a wetland, with outstanding preservation conditions, *Frontiers of the Roman Empire – The Lower German Limes* exhibits unique testimonies of water management strategies and constructions employed by the military com-

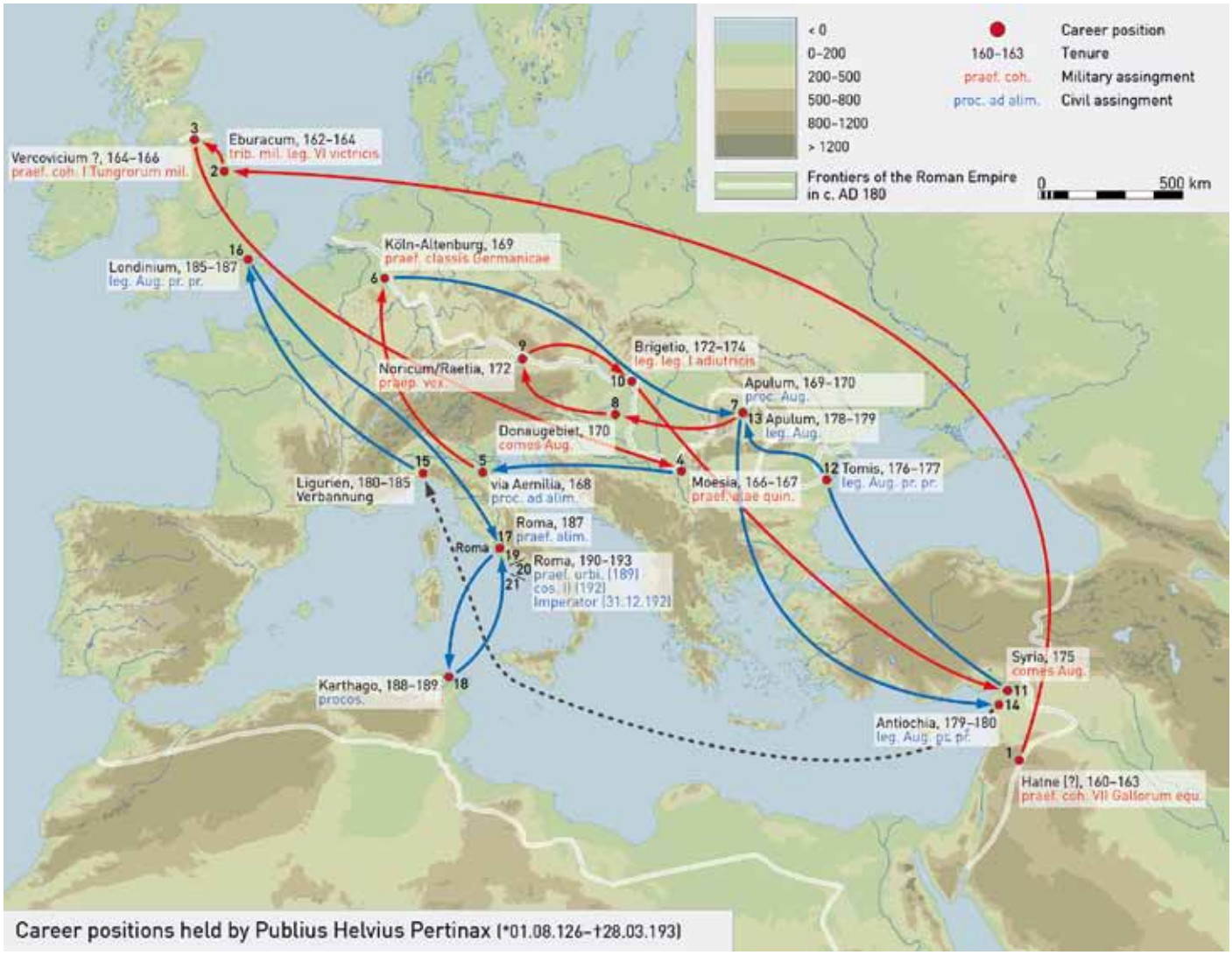

Fig. 3.18 Map with the locations and dates of positions held by P. Helvius Pertinax during his impressive career in public and military service before becoming emperor in AD 193.

mand of the Roman Empire. Buried riverine rubbish deposits constitute veritable treasure-chests of organic materials and artefacts bearing unique information on frontier life and on vanished traditions such as notably that of river boat building.

Integrity

The component parts of *Frontiers of the Roman Empire – The Lower German Limes* have been carefully selected to provide a good representation of the at-tributes and values of the proposed Outstanding Universal Value. They clearly bring out the early development of perimeter defence. They cover the entire range of military installations and relevant associated structures of a frontier system, explaining its functioning and development. Distinctive aspects which are clearly brought out by the component parts are the responses of the Roman army to the dynamic river landscape and the large impact of the frontier on the landscape and its inhabitants.
The general state of conservation is good to very good. More than three quarters of the component parts/clusters encompass nearly or largely complete elements of the frontier. All were exposed to the normal degradation of archaeological sites, but in most cases their intactness is good or very good, as witnessed by the presence of remains of the latest building phase. The rarity of aboveground remains is amply compensated by the outstanding preservation of the buried features. The sites are not exposed to significant threats, and current legislation warrants a proper protection of the property, enhanced by adequate buffer zones.

Authenticity

As an archaeological property, *Frontiers of the Roman Empire – The Lower German Limes* has a high level of authenticity. Virtually all the remains were buried during or soon after the Roman period and thus protected against later alterations. The authenticity of form and design of nearly all elements is unaffected, because they have not undergone any changes after the Roman period. At half of the sites stone walls or timber and organic remains have been preserved to a level which permits the rating of their authenticity as

unaffected. Elsewhere only the foundations of stone walls remain, or timber and organics have decayed, leading to a rating of the authenticity of materials and substance as fair. The location and setting of the elements of the frontier have in most cases considerably changed, by the embankment or canalisation of the Rhine, changes in land use and urbanisation. There are only four sites where the present setting is strongly reminiscent of the Roman landscape, although it can still be understood at half of the sites; at the other half the authenticity of location and setting is clearly compromised. Reconstructions occur at five sites, and these and other types of visualisation – evidently not pretending to be authentic – significantly contribute to the sustained protection of the property.

Protection and management requirements

The nominated property is legally protected by the national and state laws on heritage protection of Germany (federal states of North Rhine-Westphalia and Rhineland-Palatinate) and the Netherlands. Much of the responsibility rests with the owners and with local and regional authorities. The component parts will be primarily managed at the national (NL) and state (DE) levels, but the management of the nominated property is coordinated by a joint Dutch-German Management Group (MG-LGL), which is overseen by an Intergovernmental Committee (IGC-LGL). The joint Management Group sets out the main lines of the management and supervises the implementation of the na-tional management plans and the periodic reporting to UNESCO. The role of the Management Group and its procedures will be laid down in a Joint Declaration (cf. section 5.e).
The management structures of *Frontiers of the Roman Empire – The Lower German Limes* will cooperate intensively with their counterparts for the existing World Heritage site *Frontiers of the Roman Empire* (Ref: 430ter) and the nominated property *Frontiers of the Roman Empire – The Danube Limes (Western Segment)* (Ref: 1608, nominated 2018), and with States Parties preparing the nomination of other sections of the Roman frontiers. A framework for this international cooperation is provided by the 'Frontiers of the Roman Empire World Heritage Cluster' set up in 2018 to support international collaboration in those fields relevant to the overall management and development of the *Frontiers of the Roman Empire in Europe* as World Heritage.

4 State of Conservation and Factors affecting the Property

4 State of Conservation and Factors affecting the Property

4.a Present state of conservation

This section provides an overview of the state of conservation of the component parts of the nominated property *Frontiers of the Roman Empire – The Lower German Limes*. With only a few exceptions, the military installations and other elements of the Lower German Limes disappeared from sight in the Middle Ages, once the standing remains had been dismantled or become ruinous. Some sites were flooded and thus covered with a protective layer of sediment. Most sites were overgrown by forests, exploited as meadows or arable fields, or built over. These activities evidently affected the underground remains to some degree, but this is common to nearly all buried archaeological sites, and an inextricable part of their history and story. When corrected for this 'normal' degradation, the state of conservation of the *Frontiers of the Roman Empire – The Lower German Limes* can be assessed as good to very good.

Although the military installations and other elements have generally not been preserved in a complete state, the surviving parts are frequently in excellent condition. Due to their location in the landscape of a lowland river, timber remains are often still intact, on a scale which is rare throughout the Roman Empire. The authenticity of the surviving remains is overall high, especially considering the materials and substance; other aspects may need some explanation to be understood, for instance if the course of the Rhine is no longer visible from the site.

4.a.1 Assessment of the state of conservation

The state of conservation of *Frontiers of the Roman Empire – The Lower German Limes* has been assessed by evaluating the integrity and authenticity of its component parts. On the whole, the integrity is good to very good and the authenticity is high. For the assessment of integrity and authenticity a classification has been applied which is explained below.

In order to establish integrity, the wholeness, intactness and exposure to current threats are assessed through three ratings. Military installations and other elements of the frontier are not always preserved as a whole, but the component parts/clusters generally include one or more key values in a largely complete state. The intactness of the surviving remains is in many cases good or very good, with a complete or largely complete representation of all phases of their existence and occasionally partly standing walls or timber and other organic remains in an outstanding condition. Current threats are normally under control, while in several cases there are no significant threats.

To allow judgement of authenticity, three pairs of attributes have been evaluated: form and design, materials and substance, and location and setting; in each case, one of three ratings has been applied. Further, the issue of reconstruction is briefly discussed. With only a few exceptions, the form and design of individual elements and assemblages are fully authentic. The authenticity of materials and substance is often unaffected, as most remains are covered by post-Roman layers. Perishable materials are normally exposed to some loss of authenticity, but this is due to inevitable natural processes, while the robbing of stone walls is part of the history of the sites. The location and setting are usually the only aspects of authenticity which can be experienced at the surface. In most places the landscape of the Rhineland has changed so thoroughly that the setting of most sites

Fig. 4.1 Visualisation with modern materials of the fort of Leiden-Roomburg ▶5a, protecting the site against housing development.

is to some degree affected. This is especially the case where the Rhine has migrated away from a military structure, obscuring the tight relationship between the military infrastructure and the riverine landscape.
Reconstructions are limited to a lime kiln at Iversheim, the LVR-Archaeological Park Xanten (APX), part of a gate at Köln-Deutz and watchtowers at Neuss-Reckberg and Utrecht-Hoge Woerd. Elsewhere, some aboveground visualisations of a very different character occur. Their design and materials clearly demonstrate that they are artistic imaginations, not authentic reconstructions (fig. 4.1). They contribute to the protection of the sites by creating an awareness of the presence of Roman remains, while at the same time offering physical protection. It is proposed to consider these reconstructions and visualisations as parts of the buffer zone.

Integrity

The state of conservation of *Frontiers of the Roman Empire – The Lower German Limes* has been assessed by evaluating the aspects of wholeness and intactness of the component parts/clusters and the degree to which they are currently exposed to threats. For each aspect three ratings have been distinguished (table 4.1), to facilitate a general overview of the state of conservation.

aspect	rating	definition
wholeness	very good ●●●	The elements included in the component part (or cluster) are nearly complete.
	good ●●	The elements included in the component part (or cluster) are largely complete.
	fair ●	Representative parts of elements included in the component part (or cluster) are preserved.
intactness	very good ●●●	The surviving remains are nearly intact, including well-preserved remains of stone walls or earthen ramparts, or timber remains.
	good ●● ●●○	The surviving remains are largely intact and include the latest building phase. An additional open symbol (○) may occur in the case of partly standing walls or partly preserved timber remains.
	fair ●	Characteristic parts which have a clear added value for the nominated property are still present.
exposure to threats	minimal ●	The component part (or cluster) is not significantly exposed to threats.
	minor ●●	The component part (or cluster) is exposed to some threats, but these are currently under control. This applies amongst others to risks of being built over and agricultural use.
	moderate ●●●	The component part (or cluster) is exposed to some threats which need to be addressed in the near future.

Table 4.1 Aspects of the assessment of the integrity of *Frontiers of the Roman Empire – The Lower German Limes*.

Wholeness

Wholeness relates to the representation of attributes of the Outstanding Universal Value of the property as a whole. It has primarily been taken as a measure of completeness of the elements of a military complex, of the overall layout of an element and of ground plans of constituent parts.
The rating 'very good' is exemplified by the remarkable complex of temporary camps and more permanent forts at Till ▶22. The outlines of these military installations are entirely preserved, while only minor parts of their internal areas have been disturbed. An example of a site for which the wholeness has been rated as 'good' is provided by the fleet base of Köln-Alteburg ▶39, where most of the defences and three quarters of the internal area are preserved.
Herwen-De Bijland ▶19 and Valkenburg-Centrum ▶1 may serve as examples of the rating 'fair'. The military assemblage of Herwen-De Bijland has been considerably affected by river erosion, both during and after the Roman period. The attested remains of two or three camps are incomplete, but their immediate association with a major water management work of the Roman army is a valuable asset of *Frontiers of the Roman Empire – The Lower German Limes*. The fort of Valkenburg-Centrum has been affected by large-scale excavations, but the exceptional preservation of its timber building phases, representative parts of which are still preserved, is an important source for our knowledge of Roman military construction in timber.
The nomination does not include sites with a wholeness rating of less than 'fair'. Some forts, such as those of Zwammerdam and Alphen aan den Rijn, were excluded from the nomination because they have been largely excavated, although this has greatly contributed to our understanding of the Roman frontier in the Rhineland (fig. 4.2).

Intactness

Intactness relates to the physical preservation of the attributes represented. It has primarily been taken as a measure of completeness of the history of a site, and relates particularly to the presence of standing walls, earthen ramparts and timber remains. Intactness has been rated in relation to the surviving values or elements. An incompletely preserved fort, for instance, may have been rated as 'very good' for the aspect of intactness if the remains are well preserved and include standing remains of walls.
The lime kilns of Iversheim ▶43 exemplify a 'very good' intactness rating, with six preserved stone-built kilns with their walls still preserved up to 4 m

Fig. 4.2 Timber remains of a barrack of the fort at Alphen aan den Rijn, with each unit (A–B) housing eight soldiers. A: weapon room. B: sleeping room.

high, and parts of additional buildings. The legionary fortress of Nijmegen-Hunerberg ▶15 illustrates a 'good' intactness rating, with the stone walls of its latest building phase almost entirely robbed-out in the Late Roman period or Middle Ages, but their foundations still intact in many areas. Only at Dormagen has the intactness rating been classed as 'fair', due to the greater than average erosion of its upper levels.
The nomination does not include sites with an intactness rating of less than 'fair'. For example, several sections of the Limes road between Utrecht and Leiden were excluded from the nomination because the physical preservation is insufficient.

Current threats

The main current threats consist of development and infrastructure, agricultural exploitation, forestry, flooding and groundwater level reduction.
Housing development is particularly relevant to urban areas. Currently, there are no agreed large-scale housing development plans which pose a threat to the nominated property. Small-scale house building is a relevant issue for all component parts located within or adjacent to residential areas. The laws for heritage protection and the spatial planning systems constitute effective instruments to control such small-scale development. It is not impossible to replace existing buildings or to erect new buildings within component parts, as long as the values and attributes are not affected. Possible solutions include building on existing or shallow foundations or on a raised surface. In view of the opportunities for avoiding damage to the archaeological remains, housing development is considered as a minor current threat.
Industrial development is currently only a threat for Valkenburg-De Woerd ▶2, where conversion of a greenhouse area into a business park is envisaged. However, the development will have to comply with the national law for heritage protection.
The main threat posed by transportation and services infrastructure consists in the difficulty of avoiding damage to archaeological remains in cases of renovation and extension of linear infrastructure such as railway lines, motorways and major underground infrastructure (gas pipelines, main sewers etc.). Wind turbines pose a threat to views and settings, but at most sites these attributes are already considerably affected. There are no agreed plans for infrastructural development which are relevant to the nominated property.
The main risks in the domain of agricultural exploitation consist in ploughing and conversion of grassland into arable fields. Within the nominated property ploughing is legally confined to the topsoil. Nevertheless, some initiatives have already been taken by the authorities in both countries to acquire arable fields and convert these into grassland. Currently, degradation by ploughing is relevant to some sections of Corbulo's Canal ▶4, Bunnik-Vechten ▶11, Till ▶22, Kalkar-Bornsches Feld ▶24 and Xanten-Fürstenberg ▶28.
Aboveground and shallow buried remains which are overgrown by trees are exposed to damage by active forestry and incidental uprooting. On the other hand,

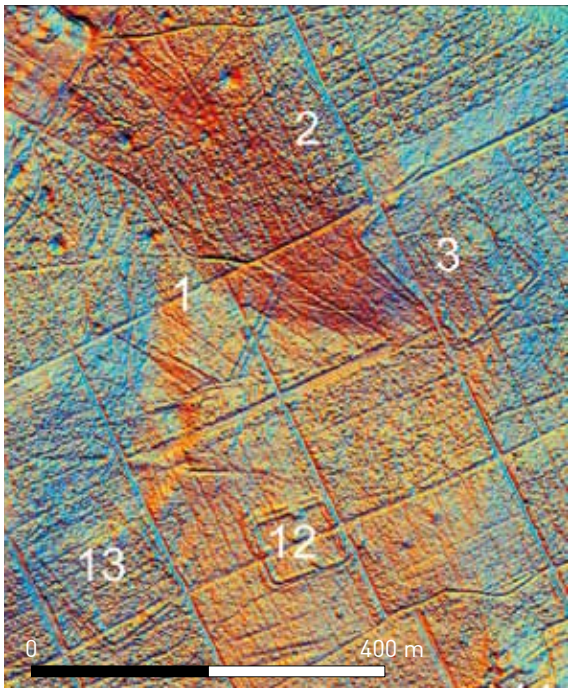

Fig. 4.3 Skid trails laid out in a regular pattern crossing the ramparts of Roman marching camps at Uedem-Hochwald ▶25. A detailed agreement with forest management authorities ensures a sustainable protection.

the root systems of trees protect against erosion of earthworks made of sandy soil. Both effects are particularly relevant to the concentrations of temporary camps at Uedem-Hochwald ▶25, Wesel-Flüren ▶26, Kottenforst Nord ▶40 and Kottenforst Süd ▶42 and to the aqueduct of Berg en Dal ▶17 and the amphitheatre of Xanten-Fürstenberg ▶28. Damage to temporary camps by forestry is being reduced by making agreements with the relevant services (fig. 4.3).

Flooding has always been a threat in the Holocene river plains of Germany and the Netherlands. Most of the Dutch and several German component parts are located in areas exposed to flooding, though artificial protective structures have reduced the annual risks to between 0.001 and 1 %. With the exception of Arnhem-Meinerswijk ▶12 and Monheim-Haus Bürgel ▶35 all component parts are protected by such structures, and the survival of the Roman remains at the two mentioned sites demonstrate that flooding is not a significant risk; damage is largely confined to the immediate surroundings of a broken dike. Nearly all the remains of Frontiers of the *Roman Empire – The Lower German Limes* are buried beneath the surface and are unlikely to be affected by flooding.

For a frontier zone with rare preservation of timber and organic remains the maintenance of water-logged conditions is of major importance. After the Second World War there has been a tendency in the Netherlands to reduce the groundwater level, to facilitate agricultural exploitation. The low rainfall of the past few years has clearly revealed the downsides of this strategy, which is increasingly leading to drying out of natural habitats and to subsidence of buildings due to decay of timber piles. This type of threat is relevant to all component parts with preserved organic remains. Recent excavations have indicated that it is currently not more than a minor threat, but it is an aspect which needs careful monitoring.

Specific threats relevant to individual component parts are discussed in the catalogue of component parts (Annex 1).

Overview of the aspects of integrity

The three aspects of integrity are summarised here through the perspective of clustered component parts, since several clusters consist of many similar component parts, in particular the temporary camps. Precise numbers and percentages can be found in table 4.2.

The wholeness of *Frontiers of the Roman Empire – The Lower German Limes* is very good to good, with over 80 % of the component parts/clusters including complete or largely complete elements conveying the attributes of the Outstanding Universal Value. The intactness has been rated as very good or good for nearly all component parts. For one third of the com-

Table 4.2 Overview of the integrity of *Frontiers of the Roman Empire – The Lower German Limes*, for individual component parts (upper part) and clustered component parts (lower part).
Legend: ●●● very good (wholeness, intactness) | minimal (threats). ●●○ good/very good (intactness only). ●● good (wholeness, intactness) | minor (threats). ● fair (wholeness, intactness) | moderate (threats).

	wholeness		intactness		exposure to threats	
	number	%	number	%	number	%
individual component parts (106)						
●●●	57	52	62	57	2	2
●●○			6	6		
●●	29	27	36	36	20	19
●	20	19	2	2	84	79
total	106	100	106	100	106	100
component parts/clusters (44)						
●●●	22	50	16	36	1	2
●●○			6	14		
●●	15	34	21	48	17	39
●	7	16	1	2	26	59
total	44	100	44	100	44	100

ponent parts/clusters the surviving remains are nearly intact, with well-preserved remains of stone walls or earthen ramparts of their latest building phases, or of early timber phases. More than half of the component parts/clusters have largely intact remains, extending to the latest building phase.

The current exposure to threats is minimal for 79 % of the component parts/clusters, and minor for another 19 %. The former indicates that they are not significantly exposed to threats, the latter that current threats are under control.

Overall, the integrity of *Frontiers of the Roman Empire – The Lower German Limes* and its component parts can be assessed as good to very good.

An overview of the aspects of the integrity of individual component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes* is provided in table 4.3 below. A justification for each rating can be found in the catalogue of component parts (Annex 1), in a separate section for each entry labelled 'Integrity'.

id		wholeness	intactness	exposure to threats
1a–d	Valkenburg-Centrum	●	●●●	●●
1a	*Kerkweg*	●	●●●	●
1b	*Centrum*	●	●●●	●●
1c	*Raadhuis*	●	●●	●
1d	*Kerkhof*	●	●●●	●
2a–b	Valkenburg-De Woerd	●	●●●	●●●
2a	*North*	●	●●●	●●●
2b	*South*	●	●●●	●●●
3	Voorburg-Arentsburg	●●	●●○	●●
4a–f	Corbulo's canal	●●	●●●	●●
4a	*Vlietwijk*	●●	●●●	●
4b	*Starrenburg*	●●	●●●	●●
4c	*Knippolder*	●●	●●●	●●
4d	*Vlietvoorde*	●●	●●●	●●
4e	*Rozenrust*	●●	●●●	●
4f	*Romeinsepad*	●●	●●●	●
5a–b	Leiden-Roomburg	●●●	●●○	●
5a	*Park Matilo*	●●●	●●○	●
5b	*Besjeslaan*	●	●●	●●
6	Woerden-Centrum	●●●	●●○	●●
7a–c	Utrecht-Limes road	●●	●●●	●
7a	*Zandweg*	●●	●●●	●
7b	*Veldhuizen*	●●	●●●	●
7c	*De Balije*	●●	●●●	●
8a–b	Utrecht-Hoge Woerd	●●	●●○	●
8a	*Castellum*	●●	●●○	●
8b	*Langerakbaan*	●	●●	●
9	Utrecht-Groot Zandveld	●●●	●●●	●
10	Utrecht-Domplein	●●●	●●●	●
11a–b	Bunnik-Vechten	●●	●●○	●
11a	*Marsdijk*	●●	●●○	●
11b	*Provincialeweg*	●	●●	●
12	Arnhem-Meinerswijk	●	●●	●
13	Elst-Grote Kerk	●●●	●●●	●
14a–b	Nijmegen-Valkhof area	●	●●	●
14a	*Valkhofpark*	●	●●	●
14b	*Hunnerpark*	●	●●	●
15	Nijmegen-Hunerberg	●●	●●	●●

Table 4.3 Overview of the integrity of the individual component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes*. Legend: ●●● very good (wholeness, intactness) | minimal (threats). ●●○ good/very good (intactness only). ●● good (wholeness, intactness) | minor (threats). ● fair (wholeness, intactness) | moderate (threats).

id		wholeness	intactness	exposure to threats
16a–e	Nijmegen-Kops Plateau	●	●●	●
16a	*West*	●	●●	●
16b	*North*	●	●●	●
16c	*East*	●	●●	●
16d	*Kopse Hof North*	●	●●	●
16e	*Kopse Hof South*	●	●●	●
17a–e	Berg en Dal-aqueduct	●●	●●	●
17a	*Mariënboom*	●●	●●	●
17b	*Swartendijk*	●●	●●	●
17c	*Cortendijk*	●●	●●	●
17d	*Louisedal*	●●	●●	●
17e	*Kerstendal*	●●	●●	●
18a–b	Berg en Dal-De Holdeurn	●●	●●	●
18a	*North*	●	●	●
18b	*South*	●●	●●	●
19	Herwen-De Bijland	●	●●	●
20	Kleve-Keeken	●●	●●	●●
21a–b	Kleve-Reichswald	●●	●●	●
21a	*West*	●●	●●	●
21b	*East*	●●	●●	●
22	*Till*	●●●	●●	●●
23	Kalkar-Kalkarberg	●●●	●●	●
24	Kalkar-Bornsches Feld	●●●	●●●	●●
25a–o	Uedem-Hochwald	●●●	●●●	●
25a	*Hochwald 1*	●●●	●●●	●
25b	*Hochwald 2*	●●●	●●●	●
25c	*Hochwald 3*	●●●	●●●	●
25d	*Hochwald 4*	●●●	●●●	●
25e	*Hochwald 5*	●●●	●●●	●
25f	*Hochwald 6*	●●●	●●●	●
25g	*Hochwald 7.1*	●●●	●●●	●
25h	*Hochwald 7.2*	●●●	●●●	●
25i	*Hochwald 8.1*	●●●	●●●	●
25j	*Hochwald 8.2*	●●●	●●●	●
25k	*Hochwald 9*	●●●	●●●	●
25l	*Hochwald 10*	●●●	●●●	●
25m	*Hochwald 11*	●●●	●●●	●
25n	*Hochwald 12*	●●●	●●●	●
25o	*Hochwald 13*	●●●	●●●	●
26a–d	Wesel-Flüren	●●	●●●	●
26a	*Flürener Feld 1*	●●●	●●●	●
26b	*Flürener Feld 2*	●●	●●●	●
26c	*Flürener Feld 3*	●●●	●●●	●
26d	*Flürener Feld 4*	●●●	●●●	●
27	Xanten-CUT	●●●	●●○	●
28	Xanten-Fürstenberg	●●●	●●●	●
29	Alpen-Drüpt	●●	●●	●●
30	Moers-Asberg	●●●	●●	●●
31	Duisburg-Werthausen	●●	●●	●●

id		wholeness	intactness	exposure to threats
32	Krefeld-Gellep	●●	●●	●
33	Neuss-Koenenlager	●●●	●●	●●
34a–b	Neuss-Reckberg	●●●	●●	●
34a	*Wachtturm*	●●●	●●	●
34b	*Kleinkastell*	●●●	●●	●
35	Monheim-Haus Bürgel	●●●	●●●	●
36	Dormagen	●●●	●	●●
37	Köln-Praetorium	●●●	●●●	●
38	Köln-Deutz	●	●●	●●
39	Köln-Alteburg	●●	●●	●●
40a–k	Kottenforst Nord	●●●	●●●	●
40a	*Am Weißen Stein 1*	●●●	●●●	●
40b	*Am Weißen Stein 2*	●●●	●●●	●
40c	*Domhecken 5*	●●●	●●●	●
40d	*Domhecken 1*	●●●	●●●	●
40e	*Domhecken 2*	●●●	●●●	●
40f	*Domhecken 3*	●●●	●●●	●
40g	*Domhecken 4*	●●●	●●●	●
40h	*Dürrenbruch 3*	●●●	●●●	●
40i	*Dürrenbruch 2*	●●●	●●●	●
40j	*Dürrenbruch 1*	●●●	●●●	●
40k	*Pfaffenmaar 1 and 2*	●●●	●●●	●
41	Bonn	●●●	●●	●●
42a–j	Kottenforst Süd	●●●	●●●	●
42a	*Oben der Krayermaar*	●●●	●●●	●
42b	*Villiper Bach*	●●	●●●	●
42c	*Professorenweg 1*	●●●	●●●	●
42d	*Professorenweg 2*	●●●	●●●	●
42e	*Riesenweg*	●●●	●●●	●
42f	*Wattendorfer Allee 2*	●●●	●●●	●
42g	*Wattendorfer Allee 1*	●●●	●●●	●
42h	*Bellerbuschallee*	●●●	●●●	●
42i	*Villiprot*	●●	●●●	●
42j	*Heiderhof*	●●●	●●●	●
43	Iversheim	●●●	●●●	●
44	Remagen	●●●	●●	●●

Authenticity

The Outstanding Universal Value of *Frontiers of the Roman Empire – The Lower German Limes* is expressed by the attributes of the elements represented in the component parts. The authenticity of these attributes is a relevant aspect of the state of preservation.
Of the types of attributes whose consideration is suggested in the Operational Guidelines three apply to *Frontiers of the Roman Empire – The Lower German Limes*:
- form and design
- materials and substance
- location and setting

For each pair of attributes three ratings have been distinguished (table 4.4), to facilitate a general overview of the state of conservation.
Since nearly all remains of the Lower German frontier are underground, most of their attributes cannot normally be experienced at the surface, while others may require quite some explanation to be understood.

Form and design

Form and design have been understood as the outline and inner structure of individual military installations or other elements, and the spatial relationships between associated elements within a component part/

aspect	rating	definition
form and design	unaffected ●●●	The outline and inner structure of the element(s) included in the component part have not been altered.
	fair ●●	The outline and inner structure of the element(s) included in the component part have undergone some changes, but they have retained most of their authenticity.
	affected ●	The outline and inner structure of the element(s) included in the component part have changed to such a degree that their authenticity has been compromised.
materials and substance	unaffected ●●●	Standing remains of stone walls, earthen ramparts or preserved timber are substantially represented.
	fair ●●	Stone walls have been robbed out and timber has decayed, but apart from this natural decay all materials are authentic.
	affected ●	This does not apply to any of the component parts, since non-authentic materials do not occur.
location and setting	unaffected ●●●	The Roman Rhine channel can be seen from the component part, or the overall original setting can still be experienced.
	fair ●●	The Rhine (not necessarily the Roman channel) is still present in the vicinity, allowing the strategic location of the site to be understood, or the general original setting to be explained.
	affected ●	The setting is altered to such a degree that the original state cannot be understood or easily explained.

Table 4.4 Aspects of the assessment of the authenticity of *Frontiers of the Roman Empire – The Lower German Limes*.

cluster, for instance between a fort and the adjacent civil settlement. For the assessment of the authenticity of form and design, what is decisive is whether these have been affected by alterations *after* the Roman period. Alterations made *during* the Roman period, like the reduction of a fort in the Late Roman period, are not considered as having affected the authenticity of form and design, because these alterations are an expression of the changing military strategies of the Roman Empire, which are part of the proposed Outstanding Universal Value.

In a large majority of cases the authenticity of form and design are 'unaffected'. Most sites were abandoned during or at the end of the Roman period and not reused in the Middle Ages. In these cases the form and design of the military installations and associated structures have not been subject to any changes, apart from degradation and destruction, which are addressed under the heading of integrity.

The Late Roman fort of Nijmegen-Valkhof ▶14 exemplifies the few instances where the authenticity of form and design has been rated as 'fair', because it is compromised to some extent. A large part of the military installation is buried under a succession of medieval palaces, and at least part of the defensive wall of the fort seems to have been reused in that period. The plan of the Late Roman fortification is only partly known, but its form and design may have been altered by its later reuse.

Materials and substance

Materials and substance have been understood as the physical materials used to construct the military installations and other elements. Durable materials – natural stone, mortar, bricks and tiles – have normally survived the centuries without too much degradation. The substance of perishable materials, however, has inevitably changed since the Roman period. It is only in water-logged conditions that timber has largely retained its original appearance, but once it is exposed to the open air it needs chemical or mechanical treatment to prevent rapid decomposition. In less favourable preservation conditions, timber structures have entirely decayed, but even so their traces can normally be distinguished from the surrounding soil. Objects of iron which were once part of buildings – including amongst others nails, hinges and locks – are normally heavily corroded and need mechanical cleaning and chemical treatment to be preserved; to a lesser degree this is also true of copper-alloy objects. Overall, it is evident that for perishable materials some loss of authenticity of their substance is normal, varying from minimal to considerable. Earthen ramparts of temporary camps constitute a special case; the survival of such earthen embankments is considered to demonstrate the unaffected authenticity of materials and substance, emphasising that they have not been reconstructed using soil from elsewhere.

The Late Roman fort of Haus Bürgel ▶35 and the Limes road at Utrecht ▶7 serve as illustrations of sites where the authenticity of materials and substance is 'unaffected'. The fort of Haus Bürgel is a rare instance of a site with aboveground remains, in this case of parts of its stone defensive wall which were included in the walls of a medieval and later castle. The Roman parts of the walls have not been altered and are fully authentic (fig. 4.4). A characteristic of the Limes road at Utrecht is the presence of timber reinforcement of the road embankment, comprising rows of posts, revetments and tie beams connecting the elements. Thanks to the high groundwater level the timber structures have survived in the best condition that can be expected for such remains from the Roman period.

All sites where the stone walls were robbed out, leaving only rejected debris from the wall core, or where the timber has entirely decayed to form dark humus soil, have been rated as 'fair' as far as the authenticity of materials and substance is concerned. This is true of half of the component parts/clusters.

Fig. 4.4 Stretches of original masonry of the Late Roman fortification are still visible in the facade of Haus Bürgel (▶35) today. The fortification's layout is marked out with cobblestones.

There are no cases where the authenticity of materials and substance is rated as 'affected'.

Location and setting

The location and setting of military installations and other elements of the Lower German frontier are the only aspects of authenticity which can be experienced at the surface for all the component parts/clusters. On the whole, the landscape of the Rhineland has so thoroughly changed since the Roman period that every site is somehow affected as far as its location and setting are concerned. For those elements which were positioned on the bank of the Roman Rhine the visibility of the river channel in the Roman period is an important factor in the assessment of these aspects. For elements which were located in elevated positions views to and from these positions are relevant. For all other sites an attempt has been made to compare their present setting to their original state.
The Late Roman fort of Köln-Deutz ▶38 is a good example of a site where the authenticity of the setting is rated as 'unaffected'. It still borders the Rhine, which has not significantly changed its course here since the Roman period. It offers a clear view to the opposite, left bank of the river, where the palace of the provincial governor at Köln-Praetorium ▶37 was once located. Kalkar-Bornsches Feld ▶24 exemplifies those sites where the original setting in an open riverine landscape can still be experienced, bounded by fossilised river channels, with the ice-pushed moraine in the rear of the fort and wide views in all other directions.
Valkenburg-Centrum ▶1 is representative of a series of forts for which the authenticity of location and setting has been rated as 'fair'. Here, the tight relationship of the military complex with the river can still be understood. The modern Rhine is located in the vicinity of the military settlement. Although it is not the authentic Roman water course, it nonetheless allows the original setting of the fort to be understood.
For quite a number of component parts/clusters the authenticity of location and setting has been rated as 'affected'. This applies for example to the series of temporary camps of Uedem-Hochwald ▶25, Wesel-Flüren ▶26 and Kottenforst ▶40 and ▶42 which are now located in forests and partly overgrown by trees and shrubs, when they were evidently originally established in an open landscape.

Overview of the aspects of authenticity

The three aspects of authenticity are summarised here from the perspective of clustered component parts, since several clusters comprise many similar component parts, in particular the temporary camps. Precise numbers and percentages can be found in table 4.5.
The authenticity of form and design of *Frontiers of the Roman Empire – The Lower German Limes* is rated in almost all cases as unaffected, with (possible) later changes occurring only at Utrecht-Domplein ▶10 and Nijmegen-Valkhof ▶14. The authenticity of materials and substance is unaffected at half of the component parts/clusters and fair at the remaining half; the latter generally implies only that stone walls have been

Table 4.5 Overview of the authenticity of *Frontiers of the Roman Empire – The Lower German Limes*, for individual component parts (upper part) and clustered component parts (lower part).
Legend: ●●● unaffected. ●● fair. ● affected.

	form & design		materials & substance		location & setting	
	number	%	number	%	number	%
individual component parts (106)						
●●●	103	97	77	73	4	4
●●	3	3	29	27	33	30
●	-	-	-	-	69	66
total	106	100	106	100	106	100
component parts/clusters (44)						
●●●	42	95	22	50	4	9
●●	2	5	22	50	21	48
●	-	-	-	-	19	43
total	44	100	44	100	44	100

robbed out in the Middle Ages or timber remains have suffered from natural decay. For location and setting the situation is less favourable. Due to the many changes to the landscape since the Roman period, the authenticity of these aspects is only rarely unaffected, and for nearly half of the component parts/clusters they require much explanation and imagination to be understood.
Overall, the authenticity of *Frontiers of the Roman Empire – The Lower German Limes* and its component parts can be assessed as high to very high, with the exception of their location and setting.
A general overview of the authenticity of the remains included in the component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes* is provided in table 4.6 below. A justification of individual ratings can be found in the catalogue of component parts (Annex 1), in a separate section for each entry labelled 'Authenticity'.

Table 4.6 Overview of the authenticity of the individual component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes*. Legend: ●●● unaffected. ●● fair. ● affected.

id		form & design	materials & substance	location & setting
1a–d	Valkenburg-Centrum	●●●	●●●	●●
1a	*Kerkweg*	●●●	●●●	●
1b	*Centrum*	●●●	●●●	●●
1c	*Raadhuis*	●●●	●●●	●
1d	*Kerkhof*	●●●	●●●	●
2a–b	Valkenburg-De Woerd	●●●	●●●	●
2a	*North*	●●●	●●●	●
2b	*South*	●●●	●●●	●
3	Voorburg-Arentsburg	●●●	●●●	●●
4a–f	Corbulo's canal	●●●	●●●	●●
4a	*Vlietwijk*	●●●	●●●	●●
4b	*Starrenburg*	●●●	●●●	●●
4c	*Knippolder*	●●●	●●●	●●
4d	*Vlietvoorde*	●●●	●●●	●●
4e	*Rozenrust*	●●●	●●●	●●
4f	*Romeinsepad*	●●●	●●●	●●
5a–b	Leiden-Roomburg	●●●	●●●	●
5a	*Park Matilo*	●●●	●●●	●
5b	*Besjeslaan*	●●●	●●●	●
6	Woerden-Centrum	●●●	●●●	●
7a–c	Utrecht-Limes road	●●●	●●●	●
7a	*Zandweg*	●●●	●●●	●
7b	*Veldhuizen*	●●●	●●●	●
7c	*De Balije*	●●●	●●●	●
8a–b	Utrecht-Hoge Woerd	●●●	●●●	●

id		form & design	materials & substance	location & setting
8a	*Castellum*	●●●	●●●	●
8b	*Langerakbaan*	●●●	●●●	●
9	Utrecht-Groot Zandveld	●●●	●●●	●
10	Utrecht-Domplein	●●	●●●	●
11a–b	Bunnik-Vechten	●●●	●●●	●
11a	*Marsdijk*	●●●	●●●	●
11b	*Provincialeweg*	●●●	●●●	●
12	Arnhem-Meinerswijk	●●●	●●●	●●
13	Elst-Grote Kerk	●●●	●●●	●
14a–b	Nijmegen-Valkhof area	●●	●●	●●
14a	*Valkhofpark*	●●	●●	●●
14b	*Hunnerpark*	●●	●●	●●
15	Nijmegen-Hunerberg	●●●	●●●	●●
16a–e	Nijmegen-Kops Plateau	●●●	●●	●●
16a	*West*	●●●	●●	●●
16b	*North*	●●●	●●	●●
16c	*East*	●●●	●●	●
16d	*Kopse Hof North*	●●●	●●	●
16e	*Kopse Hof South*	●●●	●●	●
17a–e	Berg en Dal-aqueduct	●●●	●●●	●●
17a	*Mariënboom*	●●●	●●●	●●
17b	*Swartendijk*	●●●	●●●	●●
17c	*Cortendijk*	●●●	●●●	●●
17d	*Louisedal*	●●●	●●●	●●
17e	*Kerstendal*	●●●	●●●	●●
18a–b	Berg en Dal-De Holdeurn	●●●	●●●	●●
18a	*North*	●●●	●●●	●●
18b	*South*	●●●	●●●	●●
19	Herwen-De Bijland	●●●	●●	●●
20	Kleve-Keeken	●●●	●●	●●
21a–b	Kleve-Reichswald	●●●	●●	●
21a	*West*	●●●	●●	●
21b	*East*	●●●	●●	●
22	Till	●●●	●●	●●●
23	Kalkar-Kalkarberg	●●●	●●	●●●
24	Kalkar-Bornsches Feld	●●●	●●●	●●
25a–o	Uedem-Hochwald	●●●	●●●	●
25a	*Hochwald 1*	●●●	●●●	●
25b	*Hochwald 2*	●●●	●●●	●
25c	*Hochwald 3*	●●●	●●●	●
25d	*Hochwald 4*	●●●	●●●	●
25e	*Hochwald 5*	●●●	●●●	●
25f	*Hochwald 6*	●●●	●●●	●
25g	*Hochwald 7.1*	●●●	●●●	●
25h	*Hochwald 7.2*	●●●	●●●	●
25i	*Hochwald 8.1*	●●●	●●●	●
25j	*Hochwald 8.2*	●●●	●●●	●
25k	*Hochwald 9*	●●●	●●●	●
25l	*Hochwald 10*	●●●	●●●	●

no		form & design	materials & substance	location & setting
25m	*Hochwald 11*	●●●	●●●	●
25n	*Hochwald 12*	●●●	●●●	●
25o	*Hochwald 13*	●●●	●●●	●
26a–d	Wesel-Flüren	●●●	●●●	●
26a	*Flürener Feld 1*	●●●	●●●	●
26b	*Flürener Feld 2*	●●●	●●●	●
26c	*Flürener Feld 3*	●●●	●●●	●
26d	*Flürener Feld 4*	●●●	●●●	●
27	Xanten-CUT	●●●	●●	●●●
28	Xanten-Fürstenberg	●●●	●●●	●●
29	Alpen-Drüpt	●●●	●●	●●
30	Moers-Asberg	●●●	●●	●●
31	Duisburg-Werthausen	●●●	●●	●
32	Krefeld-Gellep	●●●	●●	●
33	Neuss-Koenenlager	●●●	●●	●●
34a–b	Neuss-Reckberg	●●●	●●	●
34a	*Wachtturm*	●●●	●●	●
34b	*Kleinkastell*	●●●	●●	●
35	Monheim-Haus Bürgel	●●●	●●●	●●
36	Dormagen	●●●	●●	●
37	Köln-Praetorium	●●●	●●	●
38	Köln-Deutz	●●●	●●	●●●
39	Köln-Alteburg	●●●	●●	●●
40a–k	Kottenforst Nord	●●●	●●●	●
40a	*Am Weißen Stein 1*	●●●	●●●	●
40b	*Am Weißen Stein 2*	●●●	●●●	●
40c	*Domhecken 5*	●●●	●●●	●
40d	*Domhecken 1*	●●●	●●●	●
40e	*Domhecken 2*	●●●	●●●	●
40f	*Domhecken 3*	●●●	●●●	●
40g	*Domhecken 4*	●●●	●●●	●
40h	*Dürrenbruch 3*	●●●	●●●	●
40i	*Dürrenbruch 2*	●●●	●●●	●
40j	*Dürrenbruch 1*	●●●	●●●	●
40k	*Pfaffenmaar 1 and 2*	●●●	●●●	●
41	Bonn	●●●	●●	●●
42a–j	Kottenforst Süd	●●●	●●●	●
42a	*Oben der Krayermaar*	●●●	●●●	●
42b	*Villiper Bach*	●●●	●●●	●
42c	*Professorenweg 1*	●●●	●●●	●
42d	*Professorenweg 2*	●●●	●●●	●
42e	*Riesenweg*	●●●	●●●	●
42f	*Wattendorfer Allee 2*	●●●	●●●	●
42g	*Wattendorfer Allee 1*	●●●	●●●	●
42h	*Bellerbuschallee*	●●●	●●●	●
42i	*Villiprot 1*	●●●	●●●	●
42j	*Heiderhof*	●●●	●●●	●
43	Iversheim	●●●	●●	●●
44	Remagen	●●●	●●	●●

Reconstruction

Reconstruction is a further aspect which is relevant in the context of authenticity. Reconstructions are only considered as justifiable when they are based on a complete and detailed knowledge of the original state, while more conjectural reconstructions are seen as compromising authenticity.

Within the component parts of *Frontiers of the Roman Empire – The Lower German Limes* there are no reconstructions of military installations or other elements, with the exception of a lime kiln at Iversheim ▶43, a fort gate at Köln-Deutz ▶38, the archaeological park on the site of the Colonia Ulpia Traiana at Xanten ▶27 and watchtowers at Neuss-Reckberg ▶34a and Utrecht-Hoge Woerd ▶8. At Iversheim one of the excavated lime kilns was rebuilt in 1969 and a lime burning experiment carried out (fig. 4.5). At Köln-Deutz the lower courses of the walls of the east gate of the Late Roman fort were reconstituted in the early 1970s, using original stone blocks; it is not so much a reconstruction as a marking out on the surface. The reconstruction in 1991 of a stone watchtower at Neuss-Reckberg – 60 m southeast of the location of the original tower – followed from a civic initiative on the occasion of the celebration of the 2000th anniversary of Neuss in 1984. It is rather speculative, being largely based on examples from the Upper German-Raetian Limes, which owe much to the reliefs on Trajan's column at Rome. The reconstruction of the Utrecht watchtower was built in 2013. It is based on the excavation of several timber towers in the area, but not on the location of any known tower. As at Neuss-Reckberg, the reconstruction of the upper part is largely based on the reliefs on Trajan's column. The LVR-Archaeological Park Xanten (APX) is a special case. It was created in 1973 as a solution to protect the remains of the Roman town, which were threatened by gravel exploitation and industrial development. Sustainable protection of the area of c. 900 × 800 m (70 ha) was only deemed feasible if it could support an alternative economic function, as an open-air archaeological park with elements of the Roman town rebuilt at the original scale. Reconstructions here have always been preceded by scientific excavation conforming to the highest academic standards and by extensive studies of similar structures elsewhere. In the course of time, there has been an increasing awareness of the need to use authentic construction methods and materials – even when invisible to the visitor – and to avoid damage to the underlying structures. Considerable effort was made to develop foundation technologies with minimal impact on the underlying archaeological remains, setting high standards which have been copied elsewhere. The park serves an important aim in visualising the scale and outward appearance of a Roman town in its period of prosperity, in a part of the Empire which has only very few extant remains of Roman buildings. Dedicated communication is employed on site to help visitors distinguish original remains from reconstructions and to inform them about the positives and negatives of 1:1-scale models. Furthermore, the site increasingly serves as a laboratory for Roman construction techniques, providing many new insights through a process of experimental archaeology – learning-by-doing. The reconstructions follow the principles set out at international level in the Charter of Lausanne. The creation of the archaeological park has resulted in the comprehensive protection of the archaeological site, both legally and physically; nearly the entire area of the former town is now in public hands. The visualisation of the former Roman town encompasses original remains in protective shelters, reconstructed buildings, thematic pavilions and an on-site museum. The high academic standards in excavation, protection and presentation result in a site of outstanding integrity.

Fig. 4.5 Interior of the protective building at the lime production site of Iversheim ▶43. In the foreground, the remains of one of the massive lime kilns.

On several other sites aboveground visualisations of a very different character occur. Their locations and dimensions correspond to those of the underlying Roman forts and other structures, but design and materials – concrete, weathering steel, trees – clearly indicate that they are artistic imaginations, not authentic reconstructions. These modern visualisations have several important functions. First and foremost, they create an awareness of the presence of remains from the Roman past, which generates support for the sustained protection of the buried features. Further, they offer physical protection to these underground remains, without harming them; generally the ground surface was raised significantly before the visualisations were built. Finally, some of these visualisations accommodate communal facilities like children's farms and allotment gardens, connecting local communities to the Roman past of their environment. The

most pronounced examples of such visualisations may be found at Leiden-Roomburg ▶5, Bunnik-Vechten ▶16, Utrecht-Hoge Woerd ▶13 and Xanten-CUT ▶27 (the large bathhouse accommodating the LVR-RömerMuseum). These and other means of presentation to the wider public are listed in the catalogue of component parts (Annex 1), in a separate section for each entry labelled 'Presentation'.

It is proposed to exclude the reconstructions and visualisations mentioned above from the nominated property, and to consider them as parts of the buffer zone.

Part B of the management plan (national plan for the German part) contains strict regulations on conservation, restoration, reconstruction, rebuilding and protective covering, which are in line with those for the Upper German-Raetian Limes (Ref: 430ter) and for the German part of *Frontiers of the Roman Empire – The Danube Limes* (Western Segment) (nominated 2018, Ref: 1608).

4.a.2 Conservation measures

As there are very few aboveground remains of the Lower German Limes, protection against weathering and other environmental threats is rarely needed. Three of the lime kilns at Iversheim ▶43 are covered by a protective building.

In some cases underground remains of standing walls have been made accessible to the public, which may lead to some deterioration when the conditions are either humid or very dry. This applies to Köln-Praetorium ▶37, Köln-Deutz ▶38, Elst-Grote Kerk ▶13 (fig. 4.6) and minor parts of the fort of Utrecht-Domplein ▶10.

The remains of the governor's palace at Köln are being incorporated in the new LVR-Jewish Museum in the Archaeological Quarter Cologne (MiQua). Climate data will be collected and other measurements taken on a large scale in 2020–2021 across the whole area of the Praetorium, and conservation work will be carried out in preparation for the museum. From 2022 onwards, following opening of the MiQua, continuous climate-data monitoring will be a standard element of a monument protection programme for over 6,500 m² of underground archaeology.

The condition of the remains of the defensive walls of the Late Roman fort of Köln-Deutz, visible in the cellars of a home for the elderly, is not actively monitored as yet; a monitoring plan will be made in the process of preparing a local site management plan. The remains of the western gate are now hidden under the 'Rheinboulevard', but it is intended to present them to the public in a protective building in the near future. The walls of the eastern gate, the lower courses of which were reconstituted on the surface in the 1970s, were restored in 2018.

At Elst an excess of humidity in the cellar beneath the church was successfully countered in the 1980s by improving the ventilation. Since then, the conditions have been good and stable. Temperature and humidity are constantly monitored. At Utrecht four small stretches of the stone wall of the fort are accessible to the public, in one case alongside a cross-section of the archaeological stratigraphy for the Roman and medieval periods. At one location there is a slight concern over

Fig. 4.6 Wall remains of two successive Roman temples underneath the Grote Kerk at Elst (▶13). Background: temple II. Right: temple I.

the efflorescence of soluble salts, but this is being monitored, along with the condition of the cross-section.
Most of the remains of the frontier are buried underground and need no specific conservation measures besides the general protection provided by the state and national heritage laws. At Leiden-Roomburg ▶5, Utrecht-Hoge Woerd ▶6 and Bunnik-Vechten ▶11 the surface was raised artificially by a 50–70 cm thick layer of soil prior to the construction of modern visualisations.

4.b Factors affecting the property

The nominated property is not exposed to such threats that the elements constituting the Outstanding Universal Value would be impaired.
Many of the preserved archaeological remains are well protected against most threats by their underground location. Some elements preserved aboveground have been integrated into later buildings, a process that has ensured their preservation down to the present day. All elements are well protected by the national and state heritage protection laws.

(1) Development pressures

Frontiers of the Roman Empire – The Lower German Limes is characterised on the one hand by large areas of intensive agricultural use and on the other hand by urban areas up to one thousand years old. In consequence the main factors affecting the property are agricultural activities and urban and industrial growth.
German spatial planning law[1] aims to foster a balance of social, infrastructural, economic, ecological and cultural considerations. Urban sprawl should be avoided and an effective infrastructure maintained. Rural areas are to be developed and recreational areas promoted.
The State Development Plan of North Rhine-Westphalia[2] and Rhineland-Palatinate[3] aim to achieve sustainable development that balances social and economic spatial requirements with ecological requirements. Archaeological remains are mentioned several times in the context of protecting the cultural landscape. Within the federal states of North Rhine-Westphalia and Rhineland-Palatinate, regional plans[4] give functional substance to implementing the objectives formulated in the spatial planning law. The Lower German Limes features actively in the regional plan by being mentioned in the text and in overview maps. In the Netherlands an overall policy regarding space and mobility is formulated by the Ministry of Infrastructure and Water Management, based on the national planning law.[5] A vision up to 2040 has been laid down in a memorandum on infrastructure and spatial planning.[6] The balancing of landscape and urbanisation is the responsibility of the provinces, and their policies have been laid down in provincial memoranda.[7] Detailed planning is realised by the municipalities through zoning plans.

Fig. 4.7 Excavation of the pile foundation of the stone defensive wall of the fort of Utrecht-Domplein ▶10, buried deep below medieval layers.

Residential development

In all, 20 component parts/clusters are located in city centres or other built-up areas. In most cases the Roman remains are well protected by thick post-Roman settlement layers. At first sight overbuilding of archaeological sites may be seen as a threat to the underground remains, but there are many instances where it has protected the sites against later erosion. At Utrecht-Domplein ▶10, for instance, the Roman fort has survived in good condition thanks to the accumulation of thick medieval occupation layers (fig. 4.7). At Nijmegen-Hunerberg ▶15 and Bonn ▶41 studies of the areas occupied by the legionary fortresses have

1 Raumordnungsgesetz (1997, last revision 2017).
2 Landesentwicklungsplan Nordrhein-Westfalen (2016).
3 Landesentwicklungsprogramm Rheinland Pfalz (LEP IV) (2008).
4 Regionalpläne: Regierungsbezirk Düsseldorf (2018); Regierungsbezirk Köln Teilabschnitt Region Köln (2018); Regierungsbezirk Köln Teilabschnitt Region Bonn/Rhein-Sieg (2009); Regionaler Raumordnungsplan Mittelrhein-Westerwald (2017).
5 Wet ruimtelijke ordening (2018).
6 Structuurvisie Infrastructuur en Ruimte (2012). In June 2019 a draft has been presented of the National Environmental Vision [Nationale Omgevingsvisie], a memorandum which will replace the former document once the Environment and Planning Act [Omgevingswet] will enter into force in January 2021.
7 Gelderland: Omgevingsvisie Gelderland (2018). Utrecht: Provinciale Ruimtelijke Structuurvisie 2013–2028 (revised 2016). South Holland: Visie Ruimte en Mobiliteit (2014; revised 2018).

demonstrated that on the whole only the cellars of modern buildings have destroyed Roman remains, and that more than 80 % of the areas built over are sufficiently intact. Observations in built-up areas elsewhere point to similar conditions. In some cases, the layout of modern towns reflects the underlying Roman layout, as at Neuss-Koenenlager ▶33, where the main road through the legionary fortress is still recognisable in the modern street plan.
Small-scale threats caused, for example, by the installation of power cables do not affect the Outstanding Universal Value, even if they involve some loss of the original substance. These interventions often take place where the archaeological substance has already been destroyed by previous, similar interventions. More substantial interventions such as cellars or underground car parks are handled very restrictively, and rescheduling and shallow foundations are the usual responses. All interventions within the nominated property require permission in accordance with the monument protection laws and can only be carried out following approval by the responsible authorities, in accordance with the state and national heritage laws, and under archaeological supervision.
It is not always necessary to avoid building or rebuilding in protected areas, as long as the attributes of the Outstanding Universal Value are not affected. All underground works in the nominated property require permission in accordance with the state and national laws on heritage protection. Damage to archaeological remains can be prevented or reduced to a minimum by what is termed 'archaeology-friendly building'. This encompasses a broad range of measures including preparatory raising of the surface, adapting foundation plans and clustering underground infrastructure.
Many of the elements of *Frontiers of the Roman Empire – The Lower German Limes* have been scheduled monuments for decades and their protection by the judicial and administrative framework has been very successful. In agreement with the municipalities involved, protection of the nominated property is also set out in the management plan (sections B7 and C3).

Industrial development

Industrial development is largely confined to the periphery of cities. In Germany the planning of industrial areas is carried out on a long term basis and can be co-designed by the state conservation agencies. All underground works in the nominated property require permission in accordance with the monument protection laws. At Krefeld-Gellep ▶32 the nominated property lies directly next to an industrial area that has been expanded in recent years. During this expansion, restrictive measures were developed for the future in cooperation with the LVR-State Service for Archaeological Heritage and the municipality of Krefeld.
In the Netherlands, the planning of industrial areas is primarily a concern of the provinces, but the realisation is often carried out at the level of the municipalities. All activities disturbing the soil are subject to the regulations of the national heritage protection law. At Valkenburg-De Woerd ▶2 the area covered by the component parts is designated for development into a small business park, but the plans will have to comply with the national law on heritage protection. The component part Herwen-De Bijland ▶19 borders a small industrial area, but is designated for agricultural use in the current municipal zoning plan.

Traffic

The expansion of existing or construction of new roads and railway lines is difficult to forecast and to avoid. Each intervention requires the consent of the heritage protection laws and can only be implemented in accordance with these. In the case of existing infrastructure installations such as railway embankments it is quite possible that any remains underneath are well preserved and protected.
Roads running through component parts do not harm the underground substance. Traffic passing over Roman military installations and other structures (e.g. via country roads in Till ▶22 or a main road in Neuss ▶33) does not endanger the underlying structures. Exhaust gases do not damage the component parts in any way.
There is no case of interference with the archaeological substance by railway lines in any of the component parts. At Xanten-Fürstenberg ▶28, for example, the railway line is not included in the nominated property in the area where the line runs in a deep cutting, but is included further south where the railway embankment runs above the archaeological remains. At Bunnik-Vechten ▶11 a main railway line has been included in the buffer zone.

Wind energy

So far only two wind turbines occur in the immediate surroundings of the nominated property, in the buffer zone of Till ▶22. Visibility is not affected nor is any other aspect of the Outstanding Universal Value. In North Rhine-Westphalia wind turbines will not in future be allowed closer than 1.5 km from the nearest settlement.
The problem of wind turbines at World Heritage sites has received special attention in recent years[8]. At the time of writing, a 'Wind Energy Decree' is about to

[8] Deutsche Limeskommission (ed.), Regenerative Energien und Welterbestätten. Workshop der Deutschen Limeskommission am 23. November 2011 in Düsseldorf. Beiträge zum Welterbe Limes Sonderband 2 (Bad Homburg 2013).

Fig. 4.8 Visualisation with modern materials of the northern defensive wall and an interval tower of the fort at Bunnik-Vechten (▶11a). In the background the A12 motorway.

be published in the Ministerial Gazette of the State of North Rhine-Westphalia and thus to enter into force. The decree will make it difficult to build new turbines within this zone.
There are no conflict zones with wind turbines in Rhineland-Palatinate and the Netherlands.

Major linear facilities

At Bunnik-Vechten ▶11 a pipeline for aviation fuel runs immediately south of and parallel to the A12 motorway. Part of the pipeline was relocated southward during the extension of the motorway in c. 1995, but only following excavation of the area to be destroyed. In case of a further southward extension of the motorway – which is not currently foreseen, but may be unavoidable at some point in the future – the pipeline will have to be moved again. Both works require permission under the national heritage protection law (fig. 4.8).

Agriculture

Since Antiquity, the landscape along the Rhine has been well suited and used for agriculture and livestock breeding. Until recently these activities were not very detrimental to buried archaeological remains; the damage caused by ploughing with animal traction was limited. In the course of the 20th century, however, the threats posed by agricultural activities have increased: mechanical ploughing, intensive manuring, lowering of groundwater levels and artificial drainage have led to deeper disturbance of the soil and to degradation of metal objects and organic remains.

Ploughing can be a threat to buried remains. In very small areas at Kalkar-Kalkarberg ▶23 and Xanten-Fürstenberg ▶28 erosion through ploughing downhill is occurring. In recent decades more and more strategies have been developed by the farmers to reduce erosion and to improve the structure of the topsoil, especially by greening. Particularly in places where there is a risk of erosion, greening is often used and little ploughing is done. Sustainable land use is financially supported by the European Union. In general, ploughing is increasingly being abandoned and there is a general objective to convert arable fields into grassland in archaeologically sensitive areas. Ploughed areas are intensively monitored. A policy of providing farmers with detailed information and advice will increase awareness of the threats and possible solutions.
In the Netherlands, under the national heritage law grassland cannot be converted into arable fields within listed archaeological monuments without permission.
Intensive manuring, which contributes to the degradation of metal objects, receives more and more attention both at a national level and at the level of the European Union, primarily for its adverse effects on drinking-water quality. More stringent directives will gradually reduce this type of threat.

Forestry

In all, five component parts/clusters are largely or entirely located in forests; these include mainly temporary camps and the earthworks of an aqueduct. The

Fig. 4.9 Aerial view of the abandoned gravel extraction on the site of the legionary fortress *Vetera II* at Xanten.

remains of these structures are located at or above the present ground surface and are vulnerable to uprooting of trees and poor forest management. On the other hand, the root systems of trees protect against erosion of earthworks made of sandy soil.

Four clusters of temporary camps lie in forest areas in North Rhine-Westphalia: Uedem-Hochwald ▶25, Wesel-Flüren ▶26, Kottenforst Nord ▶40 and Kottenforst Süd ▶42. Explicit agreements have been made with the foresters responsible for these areas to avoid use of heavy harvesting machines. Soil compaction must also be avoided.

Quarrying

Downstream from Xanten, where the Rhine has deposited sediment during periods of flooding, the extraction of clay for the production of bricks and tiles has been a disturbing factor over recent centuries. The impact on the landscape can be observed in digital elevation models of rural areas in the delta, but it applies also to some areas which were built up after the clay extraction took place. The Limes road to the west of Utrecht-Veldhuizen ▶7 has been affected by clay extraction in many locations, so these westerly areas were not included in the nomination. Clay extraction within the nominated property is now prevented under the laws for heritage protection.

Sand extraction by shallow trenching over the centuries can result in some superficial damage but this has only been attested at Utrecht-Groot Zandveld ▶9.

Large-scale industrial extraction of gravel and sand is obviously entirely destructive. This occurs mainly on point bars of former meanders, where any settlement remains will already have been eroded by river activity. Attested cases are those of the successor of the legionary fortress of Xanten-Fürstenberg ▶28, where extraction has finished and the area designated as a nature reserve (fig. 4.9), and of the (supposed) latest fort at Herwen-De Bijland ▶19, at the bifurcation of the Rhine and Waal. In the latter area concessions have been granted in the past which will lead to extraction in the near future. However, extraction will take place in an area where only eroded Roman remains are expected and which has been placed in the buffer zone. The works will be carried out under archaeological supervision, to collect relevant information and finds.

(ii) Environmental pressures

Groundwater level reduction

In low-lying parts of the Netherlands the groundwater level has fallen significantly in the third quarter of the 20th century, as a result of increased extraction of drinking-water and intensified drainage of agricultural land. A growing awareness of the adverse effects of this development – e.g. drying out of nature reserves, land subsidence, and subsidence of buildings through decay of timber piles – is currently leading to initiatives to mitigate or reverse earlier measures.

Climate change

Global warming resulting from climate change may cause the water level of the Rhine to rise, increasing the risk of flooding of the nominated property in the future (cf. above). A warmer climate or higher water levels will not harm the organic deposits that are part of the Outstanding Universal Value.

Air pollution

No elements within the nominated property are endangered by air pollution. Underground remains in rural or urban areas are not affected. The above-ground remains of walls at Haus Bürgel ▶35 are not exposed to any danger as no vehicular traffic passes in proximity. Its location in a nature reserve and its function as an education and information centre for nature conservation offer additional protection. The component parts Utrecht-Domplein ▶10 and Köln-Praetorium ▶37, located in city centres, are well protected through their integration into underground museums, where they are not exposed to exhaust fumes.

(iii) Natural disasters and risk preparedness

Flooding and river erosion

River erosion has been countered in previous centuries by the construction of dikes and river bank revetments. However, these measures cannot provide full protection against flooding and erosion. As with any lowland riverine landscape, the Rhineland is still exposed to flooding in extreme conditions. On the whole, flooding is not a major threat as it normally results in sedimentation, providing a protective layer of sand or clay. Bursting of dikes and other bank reinforcements is more of a threat, but erosive impact is only very local.
The Lower German frontier is internationally renowned for the excellent preservation of organic remains, a result of its position in a lowland riverine landscape. However, the dynamics of the river Rhine have also led to erosion in some areas (fig. 4.10). For most of its course below Bonn, the river has remained very active in the medieval and early modern periods. Areas particularly affected by river migration are those (i) from Dormagen ▶36 to Moers-Asberg ▶30, (ii) near Xanten-Fürstenberg ▶28 and Xanten-CUT ▶27, (iii) from Kleve-Keeken ▶20 to Arnhem-Meinerswijk ▶12 and (iv) approximately halfway between Arnhem-Meinerswijk ▶12 and Bunnik-Vechten ▶11.
In Germany the current exposure to flooding is expressed by the *Jahrhunderthochwasser* (one-hundred-year flood) zone, which encompasses all areas at risk of a 1 in 100 year flood (i.e. an annual chance of 1 %). Component parts/clusters located *inside* this zone (i.e. exposed to flooding) are Kleve-Keeken ▶20, Till ▶22, Kalkar-Bornsches Feld ▶24, the harbour area at Xanten-CUT ▶27, Duisburg-Werthausen ▶31, Monheim-Haus Bürgel ▶35 and Köln-Deutz ▶38. With the exception of Monheim-Haus Bürgel ▶35, all the mentioned sites are separated from the active river by dikes and other protective structures.
In the Netherlands the coastal dunes and primary dikes protect against water levels which may occur with probabilities varying from 1/300 to 1/10,000 per year (i.e. an annual chance of 0.3–0.001 %). The areas affected if these water levels are exceeded cover approximately sixty percent of the Netherlands. Component parts/clusters located *outside* these risk areas (i.e. not exposed to flooding) are those in Voorburg-Arentsburg ▶3, Leiden-Roomburg ▶5, Utrecht-Hoge Woerd ▶8, Utrecht-Domplein ▶10 and Nijmegen and Berg en Dal (▶14–18). The only component part not protected by the primary river dikes is Arnhem-Meinerswijk ▶12. Since it has survived centuries of periodic flooding by the Rhine it can be assumed that the risk of degradation is minimal.

Earthquake

The sites from Remagen to Neuss in Germany are located in area 1 of the DIN EN 1998-1/NA:2011-01 earthquake zones. In area 1 there is a risk of 10 % in 50 years of the occurrence of an earthquake with an intensity of 6.5–7.0 on the European macroseismic scale (EMS-98), characterised as 'slightly damaging'. The expected magnitudes do not pose a substantial risk to the nominated property with its almost exclusively underground remains. The sites downstream from Neuss, including those in the Netherlands, are all located outside earthquake risk zones.
For some time, a crack in the walls of Köln-Praetorium ▶37 was thought to have been caused by an earthquake, but this supposition is now rejected by seismologists. It was caused by unstable ground beneath the building and subsidence of the soil.

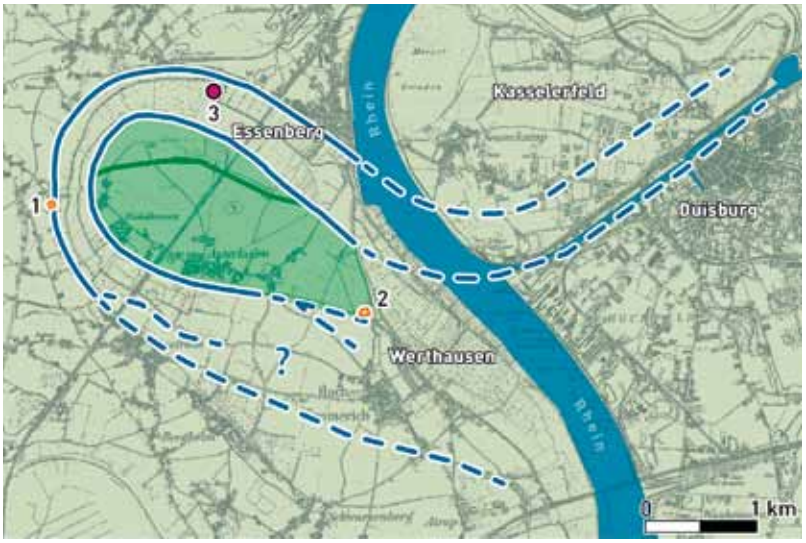

Fig. 4.10 Reconstruction of a silted-up oxbow of the Rhine of Late Roman date near the fort and *burgus* of Moers-Asberg ▶30 (*Asciburgium*) (1) and the fortlet of Duisburg-Werthausen ▶31 (2). The oxbow's banks are partially still discernible in the field today (solid line) or their course can be conjectured (dashed line) based on archaeological, geoarchaeological (3, coring) and archaeobotanical data.

id	museum	visitors per year	year
1	Torenmuseum Valkenburg	1,000	2018
6	Stadsmuseum Woerden	12,000	2018
8	Museum Hoge Woerd, Utrecht	100,000	2018
10	DOMunder, Utrecht	50,000	2018
11	Waterliniemuseum, Bunnik	40,000	2018
13	Tempel | Kerk Museum Elst	2,000	2018
14	Museum Het Valkhof, Nijmegen	110,000	2018
14	Museum De Bastei, Nijmegen	50,000	2018
17	Museumpark Orientalis, Berg en Dal	68,000	2018
27	LVR-Archaeological Park Xanten/LVR-RömerMuseum	590,000	2018
35	Haus Bürgel Monheim	10,050	2018
37	Köln-Praetorium (part of LVR-Museum MiQua as of 2022)	75,000	2018
43	Kalkbrennerei Iversheim	1,500	2018
44	Römisches Museum Remagen	2,327	2018

Table 4.7 Approximate numbers of visitors for museums located within the component parts of *Frontiers of the Roman Empire – The Lower German Limes*.

(iv) Other factors

Metal detecting

In Germany metal detecting is on the one hand considered as a threat to archaeological sites, on the other hand as a potential benefit when carried out responsibly by trained amateurs by contributing to our understanding of the past. In North Rhine-Westphalia metal detecting is only legally allowed with a permit in compliance with par. 13 of the monument protection law; the permit only allows metal detecting in the disturbed topsoil, and listed monuments, meadows and forests are explicitly excluded. In order to reduce illegal metal detecting the state authorities have produced an information leaflet which has been widely distributed and is available online. In Rhineland-Palatinate metal detecting is only allowed with a permit in compliance with par. 21 of the state law for heritage protection.

In the Netherlands metal detecting is increasingly seen as contributing to the general knowledge of archaeological sites, as demonstrated by the Netherlands Portable Antiquities academic programme through which finds of metal objects by private collectors are recorded and studied. Metal detecting is permitted, but not on listed monuments – thereby prohibiting metal detecting on the nominated property – and not deeper

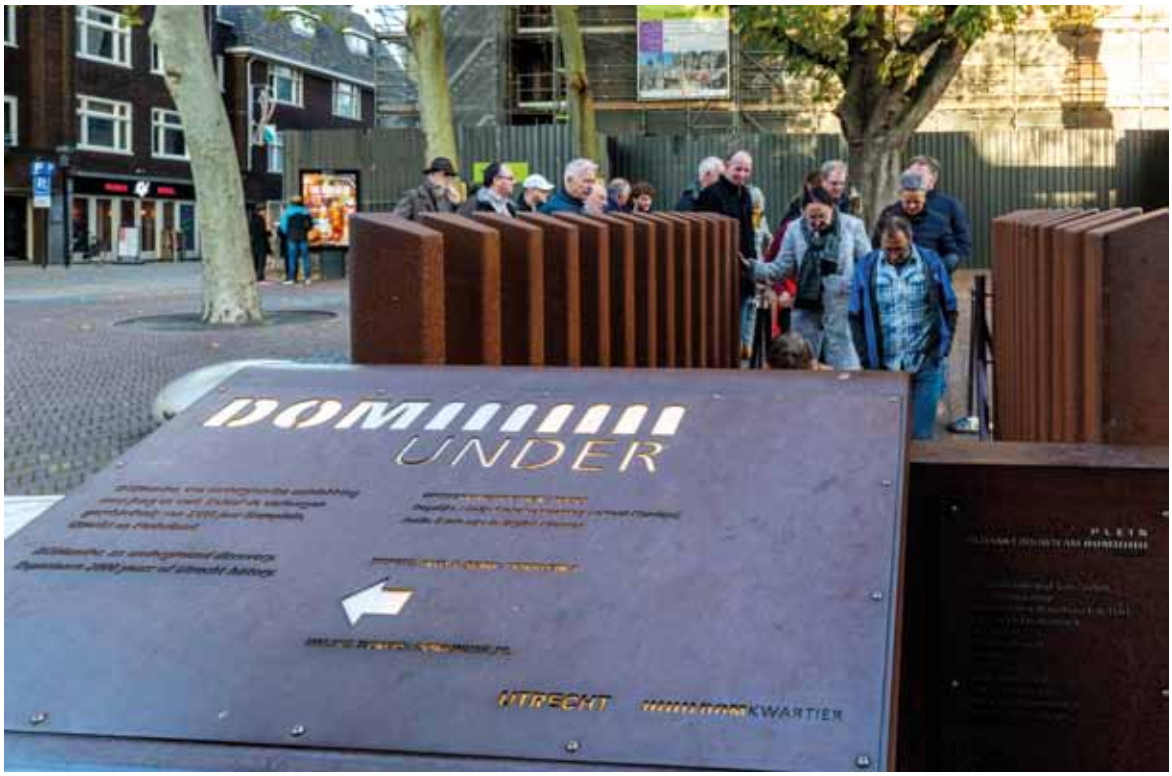

Fig. 4.11 Visitors descending into the underground visitor attraction DOMunder, presenting remains of the fort of Utrecht-Domplein ▶10.

than 30 cm below the surface, to mention the most relevant restrictions.

(v) Responsible visitation at World Heritage sites

So far, no damage has been caused to any sites by excessive visitor numbers. The intensity of visitation depends strongly on the preservation and presentation of the site. The flow of visitors to exposed archaeology in museums can easily be controlled and none of the existing facilities has reached the limits of their capacity. The numbers of visitors to the main museums are listed in table 4.7. The well-preserved stone walls of Köln-Praetorium ▶37, Monheim-Haus Bürgel ▶35, Elst-Grote Kerk ▶13 and Utrecht-Domplein ▶10 have been integrated into museums, thereby ensuring management of visitor flow and protection of the substance. In all areas where appropriate, hard surfaced walking routes enable visitor management and protection of buried archaeology (fig. 4.11).

Visitors to the LVR-Archaeological Park Xanten (APX) do not pose a high risk to the monument's substance. The scheduled archaeological monument is well protected as it remains buried. Restoration will only be partial and any excavations are limited to answering specific research questions. The majority of visitors to the APX use the modern surfaced routes. All exhibition areas, partial and full reconstructions and protective buildings with high visitor levels are monitored by trained staff throughout opening hours. In addition the majority of visits take place in the form of guided tours of the park.

Original structures are visible in a few places only, for example at the large thermal baths, in the craftsman's house B or in the 'Window into the past' pavilion. At all these points visitor access is by modern footbridges constructed along, beside or over the archaeological remains, and separated from them by railings or a handrail; direct contact with the archaeology is therefore not possible. Exposed remains are protected from the weather by roofs and protective buildings. In

id	component part	nominated property	buffer zone	total	year
1	Valkenburg-Centrum	57	1,487	1,554	2019
2	Valkenburg-De Woerd	10	43	53	2019
3	Voorburg-Arentsburg	225	300	525	2019
4	Corbulo's canal	6	6,155	6,161	2019
5	Leiden-Roomburg	94	553	647	2019
6	Woerden-Centrum	80	501	581	2019
7	Utrecht-Limes road	0	375	375	2019
8	Utrecht-Hoge Woerd	10	395	405	2019
9	Utrecht-Groot Zandveld	0	70	70	2019
10	Utrecht-Domplein	110	510	620	2019
11	Bunnik-Vechten	7	51	58	2019
12	Arnhem-Meinerswijk	0	0	0	2019
13	Herwen-De Bijland	0	6,727	6,727	2019
14	Elst-Grote Kerk	0	20	20	2019
15	Nijmegen-Valkhof area	0	1,956	1,956	2019
16	Nijmegen-Hunerberg	1,258	1,816	3,074	2019
17	Nijmegen-Kops Plateau	0	259	259	2019
18	Berg en Dal-aqueduct	0	131	131	2019
19	Berg en Dal-De Holdeurn	4	6	10	2019
20	Kleve-Keeken	25	450	475	2011
21	Kleve-Reichswald	0	0	0	2011
22	Till	30	20	50	2011
23	Kalkar-Kalkarberg	0	0	0	2011
24	Kalkar-Bornsches Feld	25	5	30	2011
25	Uedem-Hochwald	0	0	0	2011
26	Wesel-Flüren	0	520	520	2011
27	Xanten-CUT	175	340	515	2011
28	Xanten-Fürstenberg	15	265	280	2011
29	Alpen-Drüpt	90	45	135	2011
30	Moers-Asberg	125	1,460	1,585	2011

Table 4.8 Approximate numbers of inhabitants of the nominated property and buffer zone of *Frontiers of the Roman Empire – The Lower German Limes*, per component part/cluster.

id	component part	nominated property	buffer zone	total	year
31	Duisburg-Werthausen	10	20	30	2011
32	Krefeld-Gellep	5	30	35	2011
33	Neuss-Koenenlager	875	4,080	4,955	2011
34	Neuss-Reckberg	0	0	0	2011
35	Monheim-Haus Bürgel	5	0	5	2011
36	Dormagen	345	1,450	1,795	2011
37	Köln-Praetorium	0	6,100	6,100	2011
38	Köln-Deutz	95	25	120	2011
39	Köln-Alteburg	225	1,170	1,395	2011
40	Kottenforst Nord	0	0	0	2011
41	Bonn	3,335	16,165	19,500	2011
42	Kottenforst Süd	0	0	0	2011
43	Iversheim	0	0	0	2011
44	Remagen	112	3,988	4,100	2019
	total	**7,353**	**57,488**	**64,851**	

some cases the remains of the original ancient walls are built up with 'sacrificial layers' [*Opferschichten*] intended to protect the underlying archaeology. These sacrificial layers are partly accessible to visitors, for instance in the area of the outdoor facilities next to the large thermal baths, or next to the Roman hostel. 'Open' sections of Roman road drains are secured by railings, preventing direct access by visitors.

(vi) Number of inhabitants within the property and the buffer zone

Estimated population located within (table 4.8):
Area of nominated property: 7,353
Buffer zone: 57,488
Total: 64,851
Year: 2011 (DE), 2019 (NL)

5 Protection and Management of the Property

5 Protection and management of the property

5.a Ownership

Germany | North Rhine-Westphalia

The majority of the proposed component parts is in private or public ownership. All 24 component parts/clusters of the *Frontiers of the Roman Empire – The Lower German Limes* in North Rhine-Westphalia are protected monuments under the Cultural Heritage Protection Act of North Rhine-Westphalia (§ 3 DSchG NRW). Owners of protected monuments have to be informed by the responsible municipality according to § 6 of the Cultural Heritage Protection Act of North Rhine-Westphalia ('Verfahren bei der Unterschutzstellung von Denkmalbereichen').
Five of the six monuments with significant upstanding remains of stone foundations or walls requiring specific conservation strategies (Xanten-CUT ▶27, Hafentempel; Xanten-Fürstenberg ▶28, amphitheatre; Monheim-Haus Bürgel ▶35; Köln-Praetorium ▶37; Iversheim, lime kilns ▶43) are in public ownership. The upstanding remains of the Late Roman fortress of Köln-Deutz ▶38 are in ecclesiastical ownership.
In forest areas, many component parts are in public ownership (Uedem-Hochwald ▶25, Kottenforst ▶40, 42 temporary camps (partly); Kleve-Reichswald ▶21 Limes road) and managed by the State Forest Management Service of North Rhine-Westphalia [*Wald und Holz Nordrhein-Westfalen*]. Those component parts in private ownership (Wesel-Flüren ▶26 and Kottenforst ▶40, 42 temporary camps [partly]) are also mainly managed by the state forest management service.
The ownership of all other component parts in urban and rural areas is mixed, with a predominance of private ownership. There is some public ownership in each of these component parts (tab. 5.1).

Germany | Rhineland-Palatinate

The proposed component part of Remagen ▶44, the only one located in this federal state, is in private and public ownership (tab. 5.2). It is protected under the Denkmalschutzgesetz Rheinland-Pfalz (§ 22). Owners of protected monuments are informed in accordance with § 8 (6) of the Denkmalschutzgesetz Rheinland-Pfalz.
Those parts of the site with significant upstanding remains below ground (of the headquarters building and the defensive wall) are in public ownership.

Netherlands

In the Netherlands, ownership of real estate is registered by The Netherlands' Cadastre, Land Registry and Mapping Agency [*Kadaster*], which also has charge of the spatial data concerning individual plots. Ownership may be public or private (tab. 5.3). Public ownership includes ownership by the State, provinces, municipalities and water boards, and is often, but not always, related to infrastructure and public space. Private ownership includes not only ownership by private citizens, but also by churches and other legal bodies (e.g. associations for nature management, foundations, museums).

5.b Protective designation

5.b.1 Protective regulations and other instruments

Guiding framework

UNESCO	World Heritage Convention (Convention concerning the Protection of World Cultural and Natural Heritage)	1972
UNESCO	World Heritage and Buffer zones (World Heritage papers 25)	2008
UNESCO, ICCROM, ICOMOS, IUCN	Managing Disaster Risks for World Heritage	2010
UNESCO, ICCROM, ICOMOS, IUCN	Preparing World Heritage Nominations	2011
UNESCO, ICCROM, ICOMOS, IUCN	Managing Cultural World Heritage	2013
UNESCO	Operational Guidelines for the Implementation of the World Heritage Convention	2015

id	name	state	federal state	municipality	private	other
20	Kleve-Keeken				•	
21a–b	Kleve-Reichswald			•	•	
22	Till			•	•	•
23	Kalkar-Kalkarberg			•	•	
24	Kalkar-Bornsches Feld		•	•	•	
25a–o	Uedem-Hochwald		•			
26a–d	Wesel-Flüren				•	
27	Xanten-CUT		•	•	•	
28	Xanten-Fürstenberg		•	•	•	•
29	Alpen-Drüpt			•	•	
30	Moers-Asberg			•	•	
31	Duisburg-Werthausen			•	•	
32	Krefeld-Gellep			•	•	
33	Neuss-Koenenlager			•	•	
34a–b	Neuss-Reckberg			•	•	
35	Monheim-Haus Bürgel		•			•
36	Dormagen			•	•	
37	Köln-Praetorium			•		
38	Köln-Deutz			•	•	•
39	Köln-Alteburg			•	•	
40a–k	Kottenforst Nord			•	•	
41	Bonn			•	•	
42a–j	Kottenforst Süd	•	•		•	
43	Iversheim			•		

Table 5.1 Overview of ownership of the component parts in Germany (North Rhine-Westphalia). The column 'private' refers to ownership by private citizens, the column 'other' to other categories of private ownership.

id	name	state	federal state	municipality	private	other
44	Remagen	•	•	•	•	•

Table 5.2 Overview of ownership of the component parts in Germany (Rhineland-Palatinate). The column 'private' refers to ownership by private citizens, the column 'other' to other categories of private ownership.

International conventions and regulations

The Hague Convention (1954) The Convention for the Protection of Cultural Property in the Event of Armed Conflict (The Hague 1954) ensures the protection of cultural heritage in case of armed conflict and catastrophes. It recommends in particular an inventory of all sites requiring protection.

London Convention (1969) The Convention applies to all remains and objects, or any other traces of human existence, which bear witness to epochs and civili-sations for which excavations and discoveries are the main source, or one of the main sources, of scientific information. The Parties accept to delimit and protect sites and areas of archaeological interest and to create reserve zones for the preservation of material evidence to be excavated later.

UNESCO Convention (1970) With the UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (UNESCO Convention 1970), also called the UNESCO 1970 Convention, the States Parties announce as illicit the import, export and transfer of ownership of cultural property in a contrary way to the provisions adopted by this Convention. The States Parties must undertake to oppose such practices with the means at their disposal, and particularly by removing their causes, putting a stop to current practices, and by helping to make the necessary reparations.

World Heritage Convention (1972) The UNESCO Recommendation concerning the Protection, at National Level, of the Cultural and Natural Heritage (Paris 1972) proposes that each State Party should formulate, develop and apply as far as possible and in conformity with their jurisdictional and legislative requirements, a policy whose principal aim should be to coordinate and make use of all scientific, technical, cultural and other resources available to secure the effective protection, conservation and presentation of the cultural and natural heritage.

Granada Convention (1985) The main purpose of the Granada Convention is to reinforce and pro-

id	name	state	province	municipality	private	other
1a	Valkenburg-Centrum | Kerkweg				•	
1b	Valkenburg-Centrum | Centrum			•	•	•
1c	Valkenburg-Centrum | Raadhuis				•	
1d	Valkenburg-Centrum | Kerkhof					•
2a	Valkenburg-De Woerd | North			•	•	
2b	Valkenburg-De Woerd | South			•	•	
3	Voorburg-Arentsburg			•	•	
4a	Corbulo's canal | Vlietwijk			•		•
4b	Corbulo's canal | Starrenburg			•	•	
4c	Corbulo's canal | Knippolder			•	•	
4d	Corbulo's canal | Vlietvoorde			•	•	
4e	Corbulo's canal | Rozenrust			•	•	
4f	Corbulo's canal | Romeinsepad			•	•	
5a	Leiden-Roomburg | Park Matilo			•	•	
5b	Leiden-Roomburg | Besjeslaan			•	•	•
6	Woerden-Centrum			•	•	•
7a	Utrecht-Limes road | Zandweg			•		
7b	Utrecht-Limes road | Veldhuizen			•		
7c	Utrecht-Limes road | De Balije			•	•	
8a	Utrecht-Hoge Woerd | Castellum			•	•	
8b	Utrecht-Hoge Woerd | Langerakbaan			•	•	
9	Utrecht-Groot Zandveld			•		
10	Utrecht-Domplein	•		•	•	
11a	Bunnik-Vechten | Marsdijk	•	•		•	
11b	Bunnik-Vechten | Provincialeweg				•	
12	Arnhem-Meinerswijk	•				
13	Elst-Grote Kerk					•
14a	Nijmegen-Valkhof area | Valkhofpark			•		
14b	Nijmegen-Valkhof area | Hunnerpark			•		
15	Nijmegen-Hunerberg			•	•	•
16a	Nijmegen-Kops Plateau | West				•	
16b	Nijmegen-Kops Plateau | North				•	
16c	Nijmegen-Kops Plateau | East				•	
16d	Nijmegen-Kops Plateau | Kopse Hof North				•	
16e	Nijmegen-Kops Plateau | Kopse Hof South				•	
17a	Berg en Dal-aqueduct | Mariënboom			•	•	
17b	Berg en Dal-aqueduct | Swartendijk				•	•
17c	Berg en Dal-aqueduct | Cortendijk					•
17d	Berg en Dal-aqueduct | Louisedal					•
17e	Berg en Dal-aqueduct | Kerstendal			•	•	
18a	Berg en Dal-De Holdeurn | North	•			•	
18b	Berg en Dal-De Holdeurn | South				•	
19	Herwen-De Bijland				•	

Table 5.3 Overview of ownership of the component parts in the Netherlands. The column 'private' refers to ownership by private citizens, the column 'other' to other categories of private ownership.

mote policies for the conservation and enhancement of Europe's heritage. It also affirms the need for European solidarity regarding heritage conservation and is designed to foster practical cooperation among the Parties. It establishes the principles of 'European coordination of conservation policies' including consultations regarding the trust of the policies to be implemented.

The Valletta Convention (1992) The European Convention on the Protection of the Archaeological Heritage (Valletta Convention) aims to protect archaeological heritage sites as a source of common European mem-ory and serves as a tool for historical and scientific studies. The Convention provides for the establishment of a legal system regarding the identification of archaeological heritage sites, the designation of listed archaeological monuments and areas, the conservation and maintenance – preferably in situ – of archaeological heritage sites, the establishment of a reporting obligation for archaeological finds, the establishment of procedures for archaeological activities (the awarding of permits and supervision), the embedding of archaeology in spatial planning activities, the implementation of the principle that destruction must be paid for, the guarantee that work is carried out in a scientifically responsible manner by qualified and competent persons, the guarantee that environmental impact assessments and decisions that result from them take full account of archaeological sites and their context, and the introduction or modification of archaeological research, inventories and maps of archaeological sites.

UNIDROIT Convention (1995) The UNIDROIT Convention on Stolen or Illegally Exported Cultural Objects (Rome 1995) aims more particularly at the restitution of stolen or illegally exported cultural heritage.

Florence Convention (2000) The European Landscape Convention (Florence 2000) promotes the protection, management and planning of European landscapes and organises European cooperation on landscape issues.

Faro Convention (2005) This Convention is based on the idea that knowledge and use of heritage form part of the citizen's right to participate in cultural life as defined in the Universal Declaration of Human Rights.

International charters and recommendations

New Delhi Recommendation (1956) The UNESCO Recommendation on International Principles Applicable to Archaeological Excavations (New Delhi 1956) is a document setting recommendations for the protection of archaeological heritage on an international level and sets regulations for the implementation of archaeological excavations.

Venice Charter (1964) In the Venice Charter the term 'monument' was defined at the international level. In this context, it was determined in the international framework which objectives the care of monuments should have in the future with respect to conservation, restoration, excavation, documentation, and publication. The Venice Charter is founded on the basic principles of monument conservation and care as stated in the Athens Charter (1931) and the New Delhi Recommendation (1956).

Washington Charter (1987) This charter concerns historic urban areas, large and small, including cities, towns and historic centres or quarters, together with their natural and man-made environments. Beyond their role as historical documents, these areas embody the values of traditional urban cultures.

Lausanne Charter (1990) The charter drawn up by the ICOMOS General Assembly in Lausanne accords with the criteria and procedures of the Venice Charter (1964), but relates in particular to the protection and care of archaeological heritage. Set forth in the Lausanne Charter were the principles regarding different aspects of dealing with archaeological monuments.

Nara Document (1994) The Nara Document on Authenticity (1994) is a document that addresses the need for a broader understanding of cultural diversity and cultural heritage in relation to conservation in order to evaluate the value and authenticity of cultural property more objectively.

Protective regulations relating to component parts

Germany | National level

Germany is a federal country and the federal states [Bundesländer] are responsible for culture and cultural affairs. The heritage management of ancient monuments is regulated by the individual monument protection law of each of the federal states. It is fulfilled by the individual state services for the protection of archaeological monuments.

Besides the specific individual heritage protection laws of the federal states, common regulations concerning spatial development on a national level [*Bundesgesetze*] provide additional frameworks for better protection of monuments. These are listed below (tab. 5.4).

In addition to the general protection provided by the Federal Nature Conservation Act, certain zones are subject to more intensive protection through designation as nature reserves or landscape protection areas. Within these areas, destruction, damage or changes to the landscape, which often also includes cultural landscapes, are prohibited or subject to conditions (tab. 5.5).

legislation	article	type	announcement (as amended)
Raumordnungsgesetz (ROG) Spatial planning act	§ 2 ROG – provides principles concerning cultural landscape with special respect to UNESCO cultural and natural World Heritage sites	Federal legislation	2008 (2017)
Gesetz über die Umweltverträglichkeitsprüfung (UVPG) Environmental Impact Assessment Act	§ 2 UVPG – ensures the assessment of the impact of certain projects, plans and programmes on the environment, in particular for listed and suspected archaeological monuments.	Federal legislation	2010 (2017)
Baugesetzbuch (BauGB) Building Code	§ 1 para. 6 – provides principle planning regulations	Federal legislation	1960 (2017)
Kulturgutschutzgesetz (KGSG) Act on the Protection of Cultural Property	Article 24 para. 1 no 2 – regulates the cross-border movement of archaeological objects within the Federal Republic of Germany to protect being taken out of the country	Federal legislation	2016
Bundeswaldgesetz (BWaldG) Act for the Preservation of the Forest and for the Promotion of Forestry	§ 11 – defines forest as an archive for the historic cultural landscape with regard of its protection	Federal legislation	1975 (2017)
Bundes-Bodenschutz-Gesetz (BBodSchG) Act on Protection against Harmful Changes to Soil and on Rehabilitation of Contaminated Sites	§ 17 – provides principles for agricultural and forest management to avoid erosion and soil compaction and therefore providing additional support for protection of archaeological monuments	Federal legislation	1998 (2017)
Bundesnaturschutzgesetz (BNatSchG) Federal Nature Conservation Act	§ 1 (4) – provides principles for protection also of the cultural landscape, including also archaeological monuments § 23 – regulates the legal protection of natural reserves § 26 – regulates the legal protection of landscape protection areas	Federal legislation	1976 (2019)
Wasserhaushaltsgesetz (WHG) Act on the Regulation of the Water Household	Regulates the protection of water bodies	Federal legislation	1957 (2019)
Bundes-Immissionsschutzgesetz (BImSCHG) National Emission Act	§ 6 para. 1,2 – ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes (mainly in case of planning wind power plants)	Federal legislation	1974 (2019)
Bundesfernstraßengesetz (FStrG) National Highway Act	§ 17 para. 1 – ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes of highways ('Autobahnen' and 'Bundesstraßen')	Federal legislation	1953 (2018)
Energiewirtschaftsgesetz (EnWG) Energy Industry Act	§ 43 para. 3 – ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes of gas pipelines and high current cables	Federal legislation	2005 (2019)
Allgemeines Eisenbahngesetz (AEG) General Railway Act	§ 18 para. 1 – ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes of railways	Federal legislation	1993 (2019)

Table 5.4 Legislation in Germany on national level relevant for monument protection.

id	site	natural reserve after Federal Nature Conservation Act	landscape protection area after Federal Nature Conservation Act	bird direction guideline (EU-Vogelschutzgebiet)	habitats directive (Flora-Fauna-Habitat-Gebiet)
20	Kleve-Keeken			•	
21	Kleve-Reichswald		•		
22	Till				
23	Kalkar-Kalkarberg		partly		
24	Kalkar-Bornsches Feld		•		
25	Uedem-Hochwald		•		
26	Wesel-Flüren		•		
27	Xanten-CUT		•		
28	Xanten-Fürstenberg	•	•		
29	Alpen-Drüpt				
30	Moers-Asberg				
31	Duisburg-Werthausen				
32	Krefeld-Gellep				
33	Neuss-Koenenlager				
34	Neuss-Reckberg		•		
35	Monheim-Haus Bürgel		•		
36	Dormagen				

Table 5.5 Protected landscape areas by European and national acts.

id	site	natural reserve after Federal Nature Conservation Act	landscape protection area after Federal Nature Conservation Act	bird direction guideline (EU-Vogelschutzgebiet)	habitats directive (Flora-Fauna-Habitat-Gebiet)
37	Köln-Praetorium				
38	Köln-Deutz				
39	Köln-Alteburg				
40	Kottenforst Nord	partly	•		
41	Bonn		partly		
42	Kottenforst Süd	•	partly		•
43	Iversheim	•			•
44	Remagen				

Germany | North Rhine-Westphalia

All component parts are listed archaeological monuments according to the Monument Protection Law of North Rhine-Westphalia (§ 2 para. 5 DSchG NRW). Many protective regulations are valid even if the archaeological site is not a listed monument. All archaeological monuments in North Rhine-Westphalia re-ceive special protection status under § 3 DSchG NRW (listed monuments) and § 29 DSchG NRW (specific properties suspected of containing archaeological monuments).
Spatial planning has to be in accordance with § 1 (3) and the responsible authorities have to be involved. Any alteration of an archaeological monument requires permission from the responsible authorities (§ 9 DSchG NRW). Also any archaeological excavation requires permission under § 13 DSchG NRW.

Key sections from the Monument Protection Law of North Rhine-Westphalia (1980, amended 2013):

§ 1 (3) (3) In the scope of public planning and public measures, adequate consideration shall be given to the concerns of protection and conservation of monuments. The authorities competent for the protection and conservation of monuments shall be involved at an early stage and shall be included in the process of weighing their concerns against other concerns with the aim of enabling the preservation and use of monuments and monument conservation areas as well as an adequate design of their sur-roundings. On their part, the protection and conservation of monuments work towards the integration of monuments into regional planning and development, urban development and landscape conservation and towards their reasonable use.

§ 2 (5) Archaeological monuments are movable or immovable monuments which are, or were, located in the ground. Also considered to be archaeological monuments are: evidence of animal or plant life of geological time as well as changes and discolourations in the natural condition of the soil caused by archaeological monuments which are no longer independently identifiable, in as far as they meet the conditions laid down in paragraph 1.
§ 3 (1) Monuments shall be registered in the list of monuments, broken down into historic monuments, fixed archaeological monuments and movable monuments; movable monuments shall only be registered if this seems appropriate because of their particular importance which may also be a historically founded relationship to the location. Through registration or temporary listing of buildings, these monuments shall be subject to the provisions of this Act. If movable monuments are cared for by a public institution, they do not need to be registered in the list of monuments; they shall nevertheless be governed by the provisions of this Act. The provisions of paragraphs 1 para. 3, 11, 13 to 17, 19, 28 and 29 shall apply independently of the registration of archaeological monuments in the list of monuments.
§ 9 (1) Permission of the Lower Monument Authority is required for
a) removal, modification, relocation or change of the previous use of historic monuments or fixed archaeological monuments,
b) creation, modification or removal of facilities in the close surroundings of historic monuments or fixed archaeological monuments if this affects the appearance of the monument,
c) removal or modification of movable monuments
(3) If a measure subject to permission requires official approval of the plan, authorisation, per-

mission, approval or consent under other legal provisions, the competent authorities shall take adequate consideration of the concerns of monument protection and conservation in accordance with this Act. In case the authorisation or consent of the building supervisory authority or under emission control law is required, the permission according to paragraph 1 may also be applied for separately.
§ 13 (1) For the purpose of excavating archaeological monuments or rescuing archaeological monuments from waters, the permission of the Upper Monument Authority shall be required. Investigations which are carried out under the responsibility of the State, Regional Council or the city of Cologne (§ 22 para. 5) shall be exempted from this requirement.
(2) The permission shall be granted if the intended excavation or rescue does not endanger archaeological monuments or the preservation of sources for research purposes.
(3) The permission may be granted subject to conditions and obligations relating to the planning and execution of the excavation or rescue, the direction by trained specialists, the treatment and safeguarding of archaeological finds, the documentation of excavation finds, the reporting and final restoration of the excavation site. The permission may also be granted subject to the condition that execution shall be done according to a plan approved by the Upper Monument Authority

Further legislative acts are relating to the protection of monuments in North Rhine-Westphalia. They apply to the nominated property and to the buffer zones (tabs 5.6–5.7).

Germany | Rhineland-Palatinate

The only component part located in this federal state, Remagen ▶44, is a listed archaeological monument under the Cultural Heritage Protection Act of Rhineland-Palatinate (§ 22 and § 3 DSchG RLP). Any alteration of an archaeological monument requires permission from the responsible authorities (§ 21 para. 2 DSchG RLP).

Key sections from the Cultural Heritage Protection Act of Rhineland-Palatinate:

§ 3: The term 'cultural monument'
(1) Cultural monuments are objects from the past that:
1. a) in particular bear testimony to intellectual or artistic creativity, craftsmanship or technical skill or historical events or developments;
b) constitute traces or remnants of human life; or
c) are characteristic features of cities, towns or municipalities and
2. whose preservation and conservation or scientific research and documentation is in the public interest for historical, scientific, artistic, or urbanistic reasons.
(2) Cultural monuments are objects from the past that bear testimony to or constitute traces or remnants of the evolution of soil or of flora or fauna and whose preservation and conservation or scientific research and documentation is in the public interest within the meaning of § 1 no 2.

§ 21: Approval of investigations, notification of works, reimbursement of costs
(1) Investigations, in particular site inspections with metal detectors and excavations with a view to discovering cultural monuments have to be approved by the lower monument protection authority [*untere Denkmalschutzbehörde*], which shall decide in agreement with the

Table 5.6 Relevant legislation on federal state level.

legislation	article	type	announcement (as amended)
Verfassung für das Land Nordhein-Westfalen Constitution of North Rhine-Westphalia	§ 18 (2) – defines the obligation for the protection of cultural monuments by the federal state, the municipalities and the municipal associations	State legislation	1950 (2019)
Landesnaturschutzgesetz (LaNatSchG) Natural Protection Act	§ 9 ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes of railways § 10 (1) – aims to protect the cultural landscape § 13 (1) – protection and care of the cultural landscape are part of landscape development plans	State legislation	2000 (2016)
Straßen- und Wegegesetz des Landes Nordrhein-Westfalen Act on roads and ways	§ 38 ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes of public roads, ways and places	State legislation	1995 (2019)
Landeswassergesetz (LWG) Water Act	§ 22 para. 3 ensures the integration of public concerns (i.e. cultural heritage assets) in planning processes of water regulation constructions	State legislation	1995 (2019)
Landesforstgesetz – (LFoG)	§ 1b ensures the use of soil conserving techniques in forest cultivation	State legislation	1980 (2019)

id	name	year(s) of designation
20	Kleve-Keeken	exp. 2020
21a–b	Kleve-Reichswald	exp. 2020
22	Till	exp. 2020
23	Kalkar-Kalkarberg	exp. 2020
24	Kalkar-Bornsches Feld	1992, extended 2013, further extension exp. 2020
25a–o	Uedem-Hochwald	2015
26a–d	Wesel-Flüren	exp. 2020
27	Xanten-CUT	1984
28	Xanten-Fürstenberg	1991, extension exp. 2020
29	Alpen-Drüpt	exp. 2020
30	Moers-Asberg	1986, extended 1991
31	Duisburg-Werthausen	1991
32	Krefeld-Gellep	1991
33	Neuss-Koenenlager	exp. 2020
34a	Neuss-Reckberg | Wachtturm	exp. 2020
34b	Neuss-Reckberg | Kleinkastell	1993
35	Monheim-Haus Bürgel	1987
36	Dormagen	1986
37	Köln-Praetorium	1986
38	Köln-Deutz	1991
39	Köln-Alteburg	1986
40a–k	Kottenforst Nord	
40a	*Am Weißen Stein 1*	exp. 2020
40b	*Am Weißen Stein 2*	exp. 2020
40c	*Domhecken 5*	exp. 2020
40d	*Domhecken 1*	1993
40e	*Domhecken 2*	1993
40f	*Domhecken 3*	exp. 2020
40g	*Domhecken 4*	exp. 2020
40h	*Dürrenbruch 3*	exp. 2020
40i	*Dürrenbruch 2*	exp. 2020
40j	*Dürrenbruch 1*	exp. 2020
40k	*Pfaffenmaar 1 and 2*	exp. 2020
41	Bonn	1990
42a–j	Kottenforst Süd	
42a	*Oben der Krayermaar*	1985
42b	*Villiper Bach*	exp. 2020
42c	*Professorenweg 1*	1984
42d	*Professorenweg 2*	exp. 2020
42e	*Riesenweg*	exp. 2020
42f	*Wattendorfer Allee 2*	exp. 2020
42g	*Wattendorfer Allee 1*	1984
42h	*Bellerbuschallee*	1987
42i	*Villiprot*	exp. 2020
42j	*Heiderhof*	exp. 2020
43	Iversheim	1985

Table 5.7 Overview of the legal protection under the Heritage Act of the component parts in North Rhine-Westphalia.

state conservation office [*Denkmalfachbehörde*]. Should no agreement be initiated, the lower monument protection authority may deviate from the opinion of the state conservation office provided that the upper monument conservation authority [*obere Denkmalschutzbehörde*] approves this. § 13 para. 3 sentences 1 to 4 and § 13a para. 4 shall apply accordingly. Investigations conducted at the responsibility of the state conservation office do not require approval under this Act.
(2) The state conservation office shall be notified timely of any earthworks or construction work that may be expected to unearth cultural monuments.
(3) Sponsors of public or private construction or land development projects or of plans to extract raw materials or mineral resources and whose total outlay in each case exceeds €500,000 may be obliged, as instigators, to refund reasonable costs of geological or archaeological studies, including the documentation of any findings. This decision, including the determination and requesting of the amount to be refunded, which as a rule may not exceed 1 % of the total cost of the projects, shall be taken by the state conservation office. The ministry responsible for monument conservation shall enact the administrative regulation governing the application of this arrangement.

§ 22: Protected excavation areas
(1) Delimited areas may be declared excavation protection areas by ordinance if there is just cause to believe that they conceal cultural monuments. § 6 shall apply accordingly. § 7 shall apply with the proviso that para. 2 shall only apply to built-up or enclosed plots of land, unless the measures planned pursuant to § 7 para. 1 could change the land in question. § 8 para. 4 and § 9 shall apply correspondingly for the enactment of the ordinance.
(2) An ordinance may also justify provisional protection. § 8 para. 4 and § 11 para. 1 sentence 1 and para. 2 shall apply accordingly.
(3) Projects conducted in excavation protection areas that may pose a threat to hidden cultural monuments must be approved by the lower monument protecting authority. § 13 para. 3 sentences 1 to 4, § 13a para. 4 and § 21 para. 1 sentence 2 shall apply accordingly.
(4) The location of excavation protection areas has to feature in the geospatial information provided by the official surveying authority.
No other laws are relevant for the component part located in the inner city (tab. 5.8).

Table 5.8 Legal protection under the Heritage Act of the component part in Rhineland-Palatinate.

Netherlands | Legislation on national level

Protection at national level is primarily based on the Heritage Act [*Erfgoedwet*] and, until 2021, on the Spatial Planning Act [*Wet ruimtelijke ordening*] and Water Act [*Waterwet*]. In 2021, the Environment and Planning Act [*Omgevingswet*] will replace the latter two acts. Other laws, decrees and policies provide additional protection (tab. 5.9).

National Policy Strategy for Infrastructure and Spatial Planning [*Structuurvisie Infrastructuur en Ruimte 2012*] *valid until 1-1-2021*
Central government has adopted the National Policy Strategy for Infrastructure and Spatial Planning [*Structuurvisie Infrastructuur en Ruimte*] in 2012. In this National Policy Strategy, the government outlines its ambitions for the Netherlands in 2040. Based on the responsibilities of the government, the ambitions have been laid down in government objectives, indicating which national interests are at stake. Room for the preservation and strengthening of unique national and international cultural, historical and natural qualities is identified as a national interest (national interest 10). The Lower German Limes is indicated as one of the objects of national interest, to be protected through national spatial policy. The Spatial Planning (General Rules) Decree [*Barro*] is the legal instrument that arranges this protection. Additionally, archaeology, and in particular the Lower German Limes, is mentioned as one of the interests which must be taken into account in the planning process for the main pipeline network (national interest 3).

National Environment Vision – Draft [*Ontwerp Nationale Omgevingsvisie*] *agreed version to be valid from 1-1-2021*
The National Environment Vision will enter into force in 2021, as a successor to the National Policy Strategy. It is self-binding and addresses the national interests in relation to the environment, and the role of the state. World Heritage sites and sites on the Tentative List are mentioned as items of national interest 19: Preserving and strengthening cultural heritage, landscapes and natural qualities of (inter)national interest. The protection of World Heritage sites is addressed as a responsibility at all government levels, taking into consideration international conventions such as Valletta, Granada and the World Heritage convention. The national government is responsible for an effective legal system for protection of the Outstanding Universal Value of these sites. This is effected through the Living Environment Quality Decree [*Besluit kwaliteit leefomgeving*].

id	name	year(s) of designation
44	Remagen	2006

government	regulation	type	validation date
Kingdom of the Netherlands	Heritage Act	national legislation	July 2016
Kingdom of the Netherlands	Environment and Planning Act	national legislation	January 2021
Kingdom of the Netherlands	Spatial Planning Act until 1-1-2021	national legislation	October 2006
Kingdom of the Netherlands	Spatial Planning (General Rules) Decree (*Barro*) until 1-1-2021	order in council	August 2011
Kingdom of the Netherlands	Water Act until 1-1-2021	national legislation	February 2010
Province of South Holland	Environmental Vision South Holland [*Omgevingsvisie Zuid-Holland*]	self-binding legislation	20-4-2019
Province of South Holland	Environmental Ordinance	ordinance	2019
Province of Utrecht	Spatial Ordinance	ordinance	2016 until 1-1-2021
Province of Utrecht	Structure plan	self-binding legislation	2016 until 1-1-2021

Table 5.9 Overview of legislation in the Netherlands, relevant to the protection of *Frontiers of the Roman Empire – The Lower German Limes*.

Heritage Act [Erfgoedwet]

The Heritage Act [*Erfgoedwet*] regulates the designation and the preservation of archaeological monuments. Specific provisions relating to archaeological conservation that are not directly or not exclusively related to the physical environment are included in the Heritage Act. This concerns the regulations regarding the designation of archaeological national monuments, the provision of subsidies, regulations regarding excavations, a reporting obligation for archaeological finds, the ownership of archaeological finds and archaeological depots.

Key sections from the Heritage Act [*Erfgoedwet*]:

Section 3.1: Designation as national monument

1. Our Minister, acting ex officio, may designate a monument or archaeological monument which is of general interest because of its beauty, scholarly significance, or cultural-historical value as a national monument.

Section 5.1: Prohibition on excavation

1. It is prohibited, without a certificate for that purpose, to carry out actions involving the detection, investigation, or acquisition of cultural heritage, or parts thereof, which results in disturbance of the soil or disruption or total or partial displacement or removal of an archaeological monument or of underwater cultural heritage.

The Heritage Act provides the legal basis for the designation of national archaeological monuments by the Minister of Education, Culture and Science (tab. 5.10).

Under the Heritage Act it is prohibited, without a certificate, to carry out actions involving the detection, investigation or acquisition of archaeological monuments, or parts thereof, which result in disturbance of the soil, disruption, total or partial displacement or removal of the archaeological monument (Heritage Act, section 5.1). In an Order of Council an exception to this rule is made for searching with a metal detector, on the provision that the soil is not disturbed for more than 30 cm below the surface; this exception does not, however, apply to listed monuments (*Besluit Erfgoedwet archeologie, 8 april 2016*, art. 2.2), and thus not to the component parts of *Frontiers of the Roman Empire – The Lower German Limes*.

The Heritage Act is a revision of parts of the earlier Monuments Act [*Monumentenwet 1988*]. Other parts from the Monuments Act will be included in the Environment and Planning Act [Omgevingswet], which will enter into force in January 2021 (cf. below); until then, these latter parts of the Monuments Act will remain valid, as stated in chapter 9 of the Heritage Act (Transitional law). These parts include the prohibition to damage or destroy a listed monument, and to disturb or otherwise change a listed monument without a permit granted by the Minister of Education, Culture and Science.

Key sections from the Monuments Act [*Monumentenwet 1988*] which remain valid until the Environment and Planning Act [Omgevingswet] will have entered force:

§ 2: Permits for modification, demolition or disposal

Article 11

1. It is prohibited to damage or destroy a listed archaeological monument.
2. It is prohibited, without or by derogation of a permit, to:

a. demolish, disturb, relocate a listed archaeological monument, or to alter it in any way.

id	name	year(s) of designation
1a	Valkenburg-Centrum | Kerkweg	1982
1b	Valkenburg-Centrum | Centrum	1982, exp. 2020
1c	Valkenburg-Centrum | Raadhuis	1982
1d	Valkenburg-Centrum | Kerkhof	1982
2a	Valkenburg-De Woerd | North	1982
2b	Valkenburg-De Woerd | South	1982, exp. 2020
3	Voorburg-Arentsburg	1998
4a–f	Corbulo's canal	exp. 2020
5a	Leiden-Roomburg | Park Matilo	1978, 2010
5b	Leiden-Roomburg | Besjeslaan	1978
6	Woerden-Centrum	2013
7a	Utrecht-Limes road | Zandweg	exp. 2020
7b	Utrecht-Limes road | Veldhuizen	exp. 2020
7c	Utrecht-Limes road | De Balije	2011
8a–b	Utrecht-Hoge Woerd	1969, 1998, exp. 2020
9	Utrecht-Groot Zandveld	2011
10	Utrecht-Domplein	2010
11a	Bunnik-Vechten | Marsdijk	1969
11b	Bunnik-Vechten | Provincialeweg	exp. 2020
12	Arnhem-Meinerswijk	1983, exp. 2020
13	Elst-Grote Kerk	2011
14a–b	Nijmegen-Valkhof area	1991
15	Nijmegen-Hunerberg (part)	1981
16a	Nijmegen-Kops Plateau | West	1981
16b	Nijmegen-Kops Plateau | North	exp. 2020
16c	Nijmegen-Kops Plateau | East	1981
16d	Nijmegen-Kops Plateau | Kopse Hof North	1981
16e	Nijmegen-Kops Plateau | Kopse Hof South	1981
17a	Berg en Dal-aqueduct | Mariënboom	2011
17b	Berg en Dal-aqueduct | Swartendijk	2013
17c	Berg en Dal-aqueduct | Cortendijk	2012
17d	Berg en Dal-aqueduct | Louisedal	2012
17e	Berg en Dal-aqueduct | Kerstendal	2012
18a	Berg en Dal-De Holdeurn | North	1974
18b	Berg en Dal-De Holdeurn | South	1973
19	Herwen-De Bijland	exp. 2020

Table 5.10 Overview of the legal protection under the Heritage Act [*Erfgoedwet*] of the component parts in the Netherlands. The procedure for the legal protection of parts marked with 'exp. 2020' has started in 2019 and is expected to lead to designation in 2020. The protective regulations of the Heritage Act already apply to these parts.

Spatial Planning Act [Wet op de ruimtelijke ordening] *valid until 1-1-2021*

Until 2021, the spatial protection of heritage values will be regulated through the Spatial Planning Act [*Wet op de ruimtelijke ordening – Wro*]. The Spatial Planning Act sets out the instruments for each level of government to regulate land-use within its territory. Each level of government (central, provincial and municipal) bears its own responsibility. Regulations or rules at a higher level need to be adopted in plans and instruments at a lower level.

A key instrument under the Spatial Planning Act are the land-use plans [*bestemmingsplannen*] drawn up by the municipal authorities. These plans provide the framework for the assessment of applications by initiators of developments.

When drawing up and implementing spatial planning policies, the governments are required to take account of cultural heritage, as arranged in the Heritage Act.

Spatial Planning (General Rules) Decree [*Besluit algemene regels ruimtelijke ordening*] *valid until 1-1-2021*

At the time of nomination the wider Roman frontier zone is protected through national regulation, by means of the Spatial Planning (General Rules) Decree [***B**esluit **a**lgemene **r**egels **r**uimtelijke **o**rdening – **Barro***]. In this decree the state has formulated an extra protection policy specifically for the preservation of existing World Heritage sites and sites on the Tentative List.

In this decree the Roman frontier is indicated as a wide zone. The provinces are required to develop policies to protect the key archaeological values within this zone. In 2021, when the Environment and Planning Act will enter into force, the *Barro* will be followed up by the Living Environment Quality Decree [*Besluit kwaliteit leefomgeving*].

Water Act [*Waterwet*] *valid until 1-1-2021*

The Water Act is the legal framework for water management. An adequate groundwater level is a key aspect of management for those component parts where (expected) organic remains are part of the Outstanding Universal Value. The Water Act sets out that the water board is the competent authority for regulating groundwater abstraction and infiltration (with the exception of a number of categories falling under provincial competence; see art. 6.4 Water Act). Most types of groundwater abstraction, such as sources or abstraction for soil and groundwater remediation, irrigation or livestock watering are regulated via the water boards. Abstracting groundwater is prohibited without a permit from the water boards, and in deciding on such a permit archaeological values will be taken into account.

Under Article 5 of the Water Act regional water boards can issue a water level decision [*peilbesluit*]. This is a legal document in which a water board lays down the

water levels that it maintains within a certain area. In 2021 the Water Act will be integrated in the Environment and Planning Act.

Environment and Planning Act [*Omgevingswet*]
valid from 1-1-2021
The Environment and Planning Act is the national law that provides a legal framework for the rules relating to land-use planning, environmental protection, nature conservation, construction of buildings, protection of cultural heritage, water management, urban and rural redevelopment, development of major public and private works, mining and quarrying. It defines the tasks and responsibilities of the administrative bodies within the planning system, the use of land and the effect of various sectoral legislations. The Environment and Planning Act was adopted in 2016 and integrates numerous sectoral laws, including the Water Act and the Spatial Planning Act. The Environment and Planning Act will enter into force in January 2021 (fig. 5.1).

Living Environment Quality Decree [*Besluit kwaliteit leefomgeving*] *valid from 1-1-2021*
The Living Environment Quality Decree is one of four instructional rules that implement the Environment and Planning Act. The aim is to protect through instructional rules the national interests regarding the quality of the living environment as mentioned in the National Environment Vision. Through these instructional rules, provincial authorities and the State are entitled to impose conditions regarding the manner in which tasks are carried out by decentralised governments, where this concerns a provincial or national interest for which the province or the State takes responsibility with regard to the protection and representation of those higher interests. Since World Heritage is one of the national interests laid down in the National Environment Vision, rules related to the (Dutch part of) the Lower German Limes are laid down in article 7 of the Decree.

Regulations regarding the Lower German Limes in the Living Environment Quality Decree:

Article 7.3
The Roman Limes is the location known as a series of archaeological monuments concerning the former Roman frontier, which runs from Katwijk aan Zee to the border with Germany over the territories of the provinces of South Holland, Utrecht and Gelderland, the geometric boundaries of which were laid down by ministerial decree.

Article 7.4
The key attributes of World Heritage and heritage on the Tentative World Heritage List, referred to in Article 7.3, are the essential characteristics of the existing landscape and cultural heritage outlined in Annex XVII in the interest of preserving the outstanding universal values of world heritage.
The key attributes are specified in detail in the Environmental Ordinances.

The Living Environment Quality Decree will enter into force in January 2021. The boundaries of the relevant areas will be designated by ministerial decree and will be defined following the decision of the World Heritage Committee on the proposed nomination; up to that point the Spatial Planning (General Rules) Decree [*Barro*] will remain valid for the Lower German frontier zone in the Netherlands.

Living Environment Activities Decree [*Besluit activiteiten leefomgeving*] *valid from 1-1-2021*
The Living Environment Activities Decree is one of four instructional rules that implement the Environment and Planning Act. Together with the Living Environment Quality Decree, the decree contains the

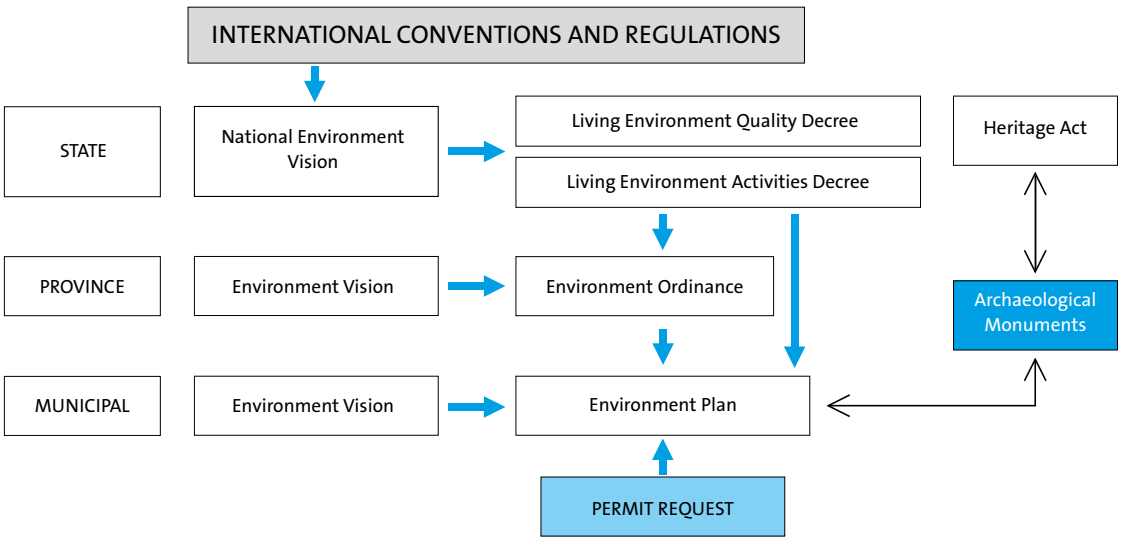

Fig. 5.1 Overview of relevant protective regulations relating to the component parts in the Netherlands under the Environment and Planning Act.

general rules that citizens and companies must adhere to when they perform certain activities in the physical living environment. The decree also determines for which activities an environmental permit is required. This decree aims protect the environment – including cultural heritage – from unwanted damage from certain activities.

Regulation regarding World Heritage in the Living Environment Activities Decree:

Article 14.9
Anyone who carries out an activity relating to World Heritage and knows or may reasonably suspect that this activity may lead to the damage or destruction of World Heritage or a part thereof, is, insofar as it affects the Outstanding Universal Value, obliged to take all measures that could reasonably be expected to prevent this damage or destruction.

Netherlands | Legislation on provincial level

At the provincial level, a structure plan [*Structuurvisie*] defines the spatial policy of the provinces. It describes the goals to be achieved, the policy that aims to achieve these goals and the instruments intended for implementation. Protecting the existing landscape and heritage values constitutes a predominant part of the ambition. The structure plan is a self-binding document, meaning it can only bind the province itself; in order to bind other parties regulation needs to be put into place. Hence the structure plan is accompanied by a provincial ordinance that gives general rules regarding specific values for municipalities to observe when drafting their land-use plans.
Both the structure plan and the ordinance are based on the Spatial Planning Act [*Wet op de ruimtelijke ordening*]. Once the Environment and Planning Act [*Omgevingswet*] enters into force (January 2021), they will be replaced by the Environmental Vision and an Environmental Ordinance. These are currently in preparation, will be largely similar in content and will take into account the instructional rules set out at the national level.

PROVINCE OF SOUTH HOLLAND
Environmental Vision [*Omgevingsvisie Zuid-Holland*] (2019)
The Lower German Limes is part of the designated 'World Heritage Zone', with the ambition to preserve and strengthen the unique and universal values of World Heritage in South Holland. The Mill Network at Kinderdijk-Elshout, inscribed on the World Heritage List as a cultural property (Ref: 818), is also located within this zone. The province regulates its ambitions by setting out rules through the environmental ordinance.

Environmental Ordinance [*Omgevingsverordening Zuid-Holland*]
Article 6.27 (Archaeology and Roman Limes) of the Environmental Ordinance requires that land-use plans within the 'Limes zone', defined on a map, contain designations and associated rules protecting the known archaeological values. These rules prohibit works or work where the soil might be disturbed deeper than 30 cm below ground level unless it has been demonstrated through archaeological research that the archaeological values are not affected, or that by their nature the activities concerned do not affect the archaeological values.
To protect archaeological remains that have not yet been established, but are to be expected, municipalities should require a mandatory archaeological investigation for any project that exceeds an area of 100 m² and a depth of 30 cm. The provincial ordinance does not contain the boundaries of the nominated component parts. As the component parts will be protected as listed archaeological monuments, this has no effect on the nominated property.
The protection provided in the current provincial ordinance for the buffer zone is generally comparable to what is needed, though in specific cases it needs adjustment. This will be actioned in the first revision of the Environmental Ordinance, planned for 2020/21.

Statements (paraphrased) concerning the Lower German Limes in ordinances and policy documents of the province of South Holland:

Environmental Vision:
The province wishes to preserve her unique heritage for future generations, by protecting, preserving and presenting it.
The aim is to preserve the archaeological values 'in situ', meaning that, in principle, archaeological heritage may not be disturbed.
The aim is that developments [within the Limes zone] contribute to the preservation and recognisability of the Limes and its elements.

Environmental Ordinance:
Art. 6.27: A land-use plan for areas with high or very high expectations for archaeological values within the Limes zone shall include designations and associated regulations which protect these values. These regulations shall include the condition that archaeological research is carried out for any developments with a surface area exceeding 100 m² and a disturbance of the soil to a depth exceeding 30 cm.

Policy document Cultural Heritage and Cultural Facilities 2017–2020 [*Beleidsvisie Cultureel Erfgoed en Basisvoorzieningen Cultuur 2017–2020*]
This policy document on cultural heritage identifies the ambitions concerning cultural heritage, including the division of budgets, for a four-year period. The new provincial executive (appointed 2019) will formulate new policy goals for the new government period of four years.

PROVINCE OF UTRECHT
Environmental Vision [*Provinciale Ruimtelijke Structuurvisie 2013–2028*] (2016) (PRS)
The Lower German Limes is defined in the PRS as a broad zone, transecting the province from east to west. Within this zone the aims are to protect the archaeological remains (preferably in the ground; otherwise, by means of professional excavation), to promote experiencing their existence and the past they represent and where appropriate to use them as an inspiration for spatial developments.

Environmental Ordinance [*Provinciale ruimtelijke verordening 2013*] (2016) (PRV)
Article 1.7 of the PRV requires that municipal spatial plans need to protect the existing archaeological values and cannot allocate land-use that will harm these in a disproportionate way. In the clarifying note to the article it is mentioned that in order to effectively protect known archaeological remains, projects that go deeper than 30 cm are not permitted unless it has been ascertained that no harm will come to the remains. To protect archaeological remains that have not yet been established, but are to be expected, municipalities should require a mandatory archaeological investigation for any project that exceeds an area of 100 m² and penetrates deeper than 30 cm. The PRS and PRV do not contain the specific outlines of the nominated component parts. As the component parts will be protected as listed archaeological monuments, this has no effect on the nominated property.

Statements (paraphrased) concerning the Lower German Limes in ordinances and policy documents of the province of Utrecht:

Environmental Vision:
Section 5.1.4: Our policy is aimed at furthering the sustained preservation and management of the archaeological remains below the surface ('in situ'). In case of unavoidable spatial interventions we demand attention for proper archaeological research. We are aiming at enhancing the visibility and recognisability of archaeological heritage, amongst others as a source of inspiration for spatial development.

Environmental Ordinance:

Article 1.7: A spatial decision for areas including the Limes includes destinations and regulations protecting its values, and does not include new destinations and regulations leading to disproportional damage to these values.
Preservation 'in situ' is always to be preferred. In case of attested high or very high archaeological values, interventions disturbing the soil to a depth exceeding 30 cm need to be prevented, unless it has been attested that the values will not be damaged. In case of high or very high expectations for archaeological values, archaeological research is required for interventions with a surface area exceeding 100 m² and a disturbance of the soil to a depth exceeding 30 cm.

Additionally, most of the area of the military complex of Bunnik-Vechten ▶11 is protected in the PRV as a 'Nature network' area (PRV, article 2.4), as part of an interconnected ecological network in order to safeguard and reinforce biodiversity. The National Nature Network [*Natuurnetwerk Nederland*] is the Dutch network of existing and planned nature conservation areas. The National Nature Network has wider boundaries than the Natura 2000 network of the European Union. Its legal basis comprises the Spatial Planning Act [*Wet ruimtelijke ordening*] (2006) and the Nature Conservation Act [*Wet natuurbescherming*] (2017). It supports the conservation of the Outstanding Universal Value by limiting large-scale ground compaction (i.e. construction and new functions that result in an increase in the number of visitors or traffic movements – for example recreation areas).

Ordinance Nature and Landscape [*Verordening Natuur en Landschap 2017*] (2016)
The Ordinance Nature and Landscape [*Verordening Natuur en Landschap 2017 (VNL)*] offers protection to archaeological remains by installing a general prohibition on levelling the ground surface. The Province of Utrecht can make exemptions if this is deemed necessary and proportionate. The VNL, like all spatial ordinances, will be incorporated in the Environmental Ordinance (2021).

Environmental Vision and Environmental Ordinance *as of 2021*
The protection in the current PRS/PRV (cf. above) for the buffer zone complies generally with what is needed, though in specific cases it is either too strict or too lenient. This will be addressed in the Environmental Ordinance. In practice this does not pose a problem in the meantime, since the municipalities have already set out the necessary protection for the buffer zone in their spatial plans.

Water Regulations
The groundwater level depends on various factors. In higher-lying, areas, the groundwater level depends on precipitation, evaporation and groundwater extraction. To guarantee the groundwater level, water boards and water managers make mutual agreements.
The policy and the preconditions of the province under the current law are set out in the Soil, Water and Environmental Plan. This also indicates in which areas regional water boards need to maintain a certain groundwater level in order to prevent damage to archaeological remains in general. A map is included in the water management regulations of the water boards. This lists the areas where water boards are required to take water level decisions to protect specific values.
The Water Act will be integrated into the Environment and Planning act and the Water Policy will be integrated in the new Provincial Ordinance. For the component parts within the Province of Utrecht that depend on a sufficient groundwater level, regulations will be formulated in the ordinance to protect the Outstanding Universal Value.

PROVINCE OF GELDERLAND
Environmental Ordinance [*Omgevingsverordening Gelderland*] (2018)
The ordinance requires that land-use plans within the 'Limes zone', indicated on a map, take into account the values of the Lower German Limes. Developments that may harm the key values of the Lower German Limes are not allowed. The protection in the current ordinance for the buffer zone needs adjustment. Some buffer zones fall outside the 'Limes zone', and a particular approach is needed for the Berg en Dal-aqueduct ▶17 (to protect potential visibility) and for the Herwen-De Bijland ▶19. Other regulations need to be in line with the common approach on buffer zones. This will be addressed in the revision of the Environmental Ordinance.

Statements (paraphrased) concerning the Lower German Limes in ordinances and policy documents of the province of Gelderland:

Environmental Ordinance:
Art. 2.59: Core values of the Limes are forts, civil settlements, cemeteries and the military infrastructure, consisting of roads, water management works, watchtowers and shipwrecks.
Art. 2.60: Land-use plans for areas within the Limes zone do not allow activities which affect the core values.

Netherlands | Legislation on municipal level

Under the current Spatial Planning Act [*Wet op de ruimtelijke ordening*] the municipal authorities specify the designated use of areas of land in land-use plans [*bestemmingsplannen*]. The municipal land-use plan sets out rules and preconditions for land-use within the municipality and constitutes an important instrument for protecting existing and expected archaeological values. Municipalities are obliged to integrate archaeological policy into their land-use plans. The municipal land-use plan is legally binding. It designates land-use and constitutes the legal basis for granting permits for development. For this reason, protective measures have to be established in these municipal plans. Rules set out in general Orders in Council at the national level and provincial ordinances have to be integrated into these municipal land-use plans.
Under the new Environment and Planning Act, municipalities have to develop a self-binding environment vision and legally binding environment plan, integrating spatial planning with sectoral regulations. Where under the existing legislation listed archaeological monuments are not integrated in the land-use plans, the new Environment and Planning act requires that a listed archaeological monument is integrated into these plans. Existing land-use plans will remain in force until replaced with an environment plan by the municipalities. Protection of the monuments will be safeguarded during the transition phase.
Besides the existing land-use plans and the new environment plan and vision, municipalities can develop self-binding programmes and policies, for instance in the fields of tourism, education, culture, etc. These policy documents often constitute the backbone of the environment vision, plan and local budget planning.
An overview of the existing land-use plans and relevant sectoral plans for all the component parts is given in section 5.d.

Netherlands | Water Boards

The maintenance of a proper water level in polders and waterways is the responsibility of the water boards. Water level maintenance is covered by the Water Act [*Waterwet*], which places much authority in the hands of the water boards, which are supervised by the provinces. The Dutch component parts are divided over five regional water boards. A water board manages the water system or systems of a unit-area, consisting of one or more polders. The unit-area is a hydrological unit, often a catchment area or part of a catchment area.
For those component parts where organic material is part of the Outstanding Universal Value, a sufficient groundwater level is essential for maintaining the quality of the sites. Because of the often direct relationship between surface water and groundwater, especially in the lowlands, groundwater management very often means surface water management. The ground-

water level can be influenced by varying the level of the surrounding surface waters, by building weirs and by installing drains.

5.b.2 Rationale of the buffer zone

Although a buffer zone may not be needed for properties where the potential Outstanding Universal Value is underground – as is largely the case for *Frontiers of the Roman Empire – The Lower German Limes* – all the component parts have been provided with buffer zones. These buffer zones have several purposes, and their application varies according to the local situation. Although consistency has been strived for, the complexity of archaeological site assemblages and of embedding valuable underground remains into the dynamic environment of present-day society does not allow rigid application of the declared principles.

Purposes of buffer zones

Buffer zones give an added layer of protection to a property. An important function is the protection of views and of the setting. For *Frontiers of the Roman Empire – The Lower German Limes* the buffer zones often have an important additional function, of safeguarding information which is relevant to the understanding of the values and features included in the property.
This additional function applies amongst others when relevant attributes are projected, but have not been securely attested. They may for instance have been suggested by surface finds, or hinted at by limited observations during small-scale building activities. In such cases there is normally not enough archaeological evidence to meet the conditions of protection under the national or state laws, thereby not allowing inclusion in a component part.
The additional function is also applicable when attested attributes cannot be sustainably protected, for instance because they are located near vital infrastructure which is likely to need extension in the future, or in areas where urban development is inevitable. Inclusion in a buffer zone guarantees that the preserved information can be collected by excavation conforming to the highest scientific standards. Evidently, this implies that buffer zones may occasionally contain attributes of the proposed Outstanding Universal Value, but the selection of component parts warrants an adequate representation of all attributes within the property as a whole (cf. section 3.1.c).
A final application of the additional function is not related to attributes which are still present, but rather to attributes that have been lost in the past. Exclusion of eroded or otherwise destroyed parts of military complexes from component parts may result in their extent or outline being blurred, hampering the understanding of the complex as a whole. Inclusion of such lost parts in a buffer zone assists in clarifying the original coherence of the complex for management purposes and for public presentation.
In summary, a buffer zone of *Frontiers of the Roman Empire – The Lower German Limes* may serve one or more of the following purposes:

A. It includes parts of the overall archaeological assemblage or element where values or features are expected, but have not yet been attested.
B It clarifies the coherence of the overall archaeological complex or element, by including parts that have been (partly) destroyed or cannot be sustainably protected.
C It protects important views and elements of the setting.

The application of principles A–C may vary, depending on:

- The dynamics of the setting of the archaeological complex or element.
  As a rule, in towns and other highly dynamic environments only military installations are included as component parts, while associated structures such as civil settlements and cemeteries may be included in buffer zones. In rural areas and other areas with low dynamics – which comprise some town parks – associated structures may be included in component parts along with the military installations, or in buffer zones.
- Whether or not the element is a linear structure.
  A linear structure (road, canal) may be represented by two or more detached component parts which are connected by a buffer zone to clarify the linear character. This may occur when intermediate parts have been excavated or destroyed, or when their sustainable protection is not feasible.

The above principles are not mutually exclusive, so more than one principle may apply to the buffer zone of an individual component part (or cluster). The practical application of the mentioned principles may be illustrated by some examples:

A It includes parts of the overall archaeological assemblage or element where values or features are expected, but have not yet been attested.
  (i) The fort of Remagen ▶44 is part of a large military settlement which included the Limes road, a civil settlement, one or more cemeteries and quays and revetments along the Rhine. The extent of this complex can be estimated from small excavations and observations during building projects, but precise identification of the archaeological evidence revealed is in most cases impossible. The buffer zone includes the projected remains

of the wider military settlement located outside the fort itself which constitutes a component part of the nominated property.

(ii) The fort at Köln-Alteburg ▶39 was the base of the provincial fleet of Lower Germany, as indicated by inscriptions. The fort itself is clearly attested and included in the nomination as a component part. Remains of the associated harbour on the bank of the Rhine can be expected, but have not been attested so far. The presumed area of the harbour is therefore included in the buffer zone.

B It clarifies the overall archaeological assemblage or element, by including parts that have been destroyed or cannot be sustainably protected.

(i) At Nijmegen-Kops Plateau ▶16 substantial excavated parts of the fort and its annexes have been included in the buffer zone to clarify the extent of these military installations and the coherence of the component parts. In these excavated areas all archaeological remains have been entirely documented, but no remains have been preserved.

(ii) At Valkenburg-Centrum ▶1 the north-eastern part of the fort has been eroded by the Rhine in the post-Roman period. To clarify the shape and extent of the fort this eroded part has been included in the buffer zone, which additionally encompasses most of the civil settlement and cemeteries – excavated parts as well as parts which cannot be sustainably protected.

C It protects important views and elements of the setting.

(i) The remains of several forts at Herwen-De Bijland ▶19 have been eroded by the Rhine in the medieval and modern periods. The military settlement owed its strategic importance to the nearby presence of a groyne at the bifurcation of the rivers Rhine and Waal. The buffer zone includes areas containing projected remains of eroded forts and the presumed location of the bifurcation in the Roman period.

(ii) The series of forts and temporary camps at Till ▶22 are located in a landscape which was and still is confined by pre-Roman channels of the Rhine. The buffer zone includes the whole of this natural setting, in which several structures associated with the military installations may be expected, such as the Limes road and cemeteries.

The overall application of the principles of the buffer zone to all component parts (or clusters) is summarised in table 5.11. A detailed explanation of the character and boundaries of the buffer zone(s) can be found in the catalogue of component parts (Annex 1), in a separate section for each entry labelled 'Buffer zone'. Finally, later developments overlying the remains of the Lower German Limes, as well as reconstructions and modern visualisations, are treated as vertical buffer zones.

Boundaries, protection and management

The boundaries of each buffer zone have been delineated to encompass all the elements necessary to serve its purposes and to ensure it is easily identifiable from a management perspective. Where its purpose is related to the landscape, the boundaries preferably follow features such as ditches and edges of fields and woods. In the absence of such a purpose or of the possibility of following such natural boundaries, other visible markers or administrative boundaries have been used as much as possible, including roads, walls or boundaries of property ownership; this applies particularly to buffer zones in built-up areas. Using such markers and boundaries in the interests of clarity and legibility results in some buffer zone boundaries having a somewhat ragged appearance.

In Rhineland-Palatinate archaeological features in the buffer zone are protected by § 21 DschG RLP and § 22 DSchG RLP (protected excavation areas).

In North Rhine-Westphalia archaeological features in the buffer zone are protected by § 29 DSchG NRW (specific properties suspected of containing archaeological monuments). Many protective regulations are valid even if the archaeological site is not a listed monument (§ 3 para. 1 DSchG NRW).

In the Netherlands protection of the buffer zones is regulated by the provincial Environmental Ordinances and the municipal land-use plans (to be replaced by environment plans under the new Environment and Planning Act, as of 1-1-2021). The protective regulations impose limits on the horizontal and vertical extent of potentially damaging activities which may be carried out without a formal permit granted by the competent authorities. The regulations provide an opportunity to promote less damaging alternatives or to enforce prior archaeological research conforming to the highest scientific standards, recording the preserved archaeological information in order to enhance understanding of the attributes and values included in the neighbouring component parts. The land-use plans generally prohibit any disturbance of the soil exceeding a surface area of 100 m² and a depth of 30 cm, but currently the norms differ between municipalities and between different areas within municipalities (table 5.12). In the local site management plans that will be developed in the coming years any necessary changes will be implemented, following the

id	name	dynamics	purpose			boundaries		
		High/Low	expected values	clarify element(s)	views/ setting	natural	other visible	adminis-trative
1a–d	Valkenburg-Centrum	H	•	•			•	•
2a–b	Valkenburg-De Woerd	H	•				•	•
3	Voorburg-Arentsburg	H	•			•	•	•
4a–f	Corbulo's canal	H	•	•		•	•	•
5a–b	Leiden-Roomburg	L	•				•	•
6	Woerden-Centrum	H	•				•	•
7a–c	Utrecht-Limes road	L	•	•				•
8a–b	Utrecht-Hoge Woerd	L	•				•	•
9	Utrecht-Groot Zandveld	L	•				•	•
10	Utrecht-Domplein	L	•				•	•
11a–b	Bunnik-Vechten	L	•					•
12	Arnhem-Meinerswijk	L	•	•			•	•
13	Elst-Grote Kerk	L	•				•	
14a–b	Nijmegen-Valkhof area	L	•				•	•
15	Nijmegen-Hunerberg	H	•	•			•	•
16a–e	Nijmegen-Kops Plateau	L	•	•			•	•
17a–e	Berg en Dal-aqueduct	L	•		•		•	•
18a–b	Berg en Dal-De Holdeurn	L	•					•
19	Herwen-De Bijland	L	•		•	•	•	•
20	Kleve-Keeken	L	•					•
21a–b	Kleve-Reichswald	L	•	•				•
22	Till	L	•			•		•
23	Kalkar-Kalkarberg	L	•					•
24	Kalkar-Bornsches Feld	L	•			•		•
25a–o	Uedem-Hochwald	L			•			•
26a–d	Wesel-Flüren	L	•		•			•
27	Xanten-CUT	L				•		•
28	Xanten-Fürstenberg	L	•			•		•
29	Alpen-Drüpt	L	•			•		•
30	Moers-Asberg	H	•			•		•
31	Duisburg-Werthausen	H	•					•
32	Krefeld-Gellep	H	•					•
33	Neuss-Koenenlager	H	•			•		•
34a–b	Neuss-Reckberg	L	•		•	•		•
35	Monheim-Haus Bürgel	L	•				•	•
36	Dormagen	H	•					•
37	Köln-Praetorium	H	•	•	•		•	•
38	Köln-Deutz	H			•			•
39	Köln-Alteburg	H	•		•	•	•	•
40a–k	Kottenforst Nord	L						•
41	Bonn	H	•			•		•
42a–j	Kottenforst Süd	L						•
43	Iversheim	L	•			•		•
44	Remagen	H	•				•	•

Table 5.11 Overview of relevant aspects of the buffer zones of (clusters of) component parts of *Frontiers of the Roman Empire – The Lower German Limes.*

guideline of a maximum of 100 m²/30 cm, with less stringent norms allowed only if their applicability has been attested by archaeological research.
The management of buffer zones lies in the competence of authorities of different states and at different administrative levels, with their own regulations. Consequently, the management of buffer zones is more complex than that of the component parts. Coordination at national levels in Germany and the Netherlands and at the level of the nominated property as a whole is provided for in the management structure, and ensures optimal harmonisation and cooperation.
In Rhineland-Palatinate and North Rhine-Westphalia the management of buffer zones is part of the competence of the responsible heritage agencies.
In the Netherlands the management of buffer zones lies in the competence of the provinces, the municipalities and non-governmental bodies (e.g. district water boards), depending on ownership and use of the areas involved. Coordination of management at the national level is warranted by a Management Group (MG LGL-NL).

5.c Means of implementing protective measures

Germany | North Rhine-Westphalia

In accordance with the heritage protection law of North Rhine-Westphalia § 1 para. 3 DSchG, the interests of all listed archaeological monuments and properties suspected of containing archaeological monuments have to be considered in spatial planning processes. The high importance of protecting heritage in planning processes is also by the 'Umweltverträglichkeitsgesetz' (UVPG). The responsible heritage agencies are included in the planning system as 'agents of public interests' [*Träger öffentlicher Belange*]. Cooperation between all planning authorities, mainly municipalities and districts, and other public and private planning agencies for implementing protection strategies in planning processes is further regulated by § 11 DSchG. Early involvement of the responsible heritage agencies in planning processes is regulated by § 1 para. 3.

id	name	surface > m²	depth > cm
1a–d	Valkenburg-Centrum	100	30
2a–b	Valkenburg-De Woerd	0 / 100	30
3	Voorburg-Arentsburg	100	30
4a–c	Corbulo's canal, mun. Voorschoten	0 / 30 / 100 / 1,000	0 / 30 / 100
4d–f	Corbulo's canal, mun. Leidschendam-Voorburg	100	30
5a–b	Leiden-Roomburg	30 / 100	30
6	Woerden-Centrum	0 / 30 / 50	30 / 50
7a–c	Utrecht-Limes road	50	50
8a–b	Utrecht-Hoge Woerd	50	30
9	Utrecht-Groot Zandveld	0 / 50	20 / 30
10	Utrecht-Domplein	0 / 50	20 / 50
11a–b	Bunnik-Vechten	0 / 100 / 500	30 / 50
12	Arnhem-Meinerswijk	0	0
13	Elst-Grote Kerk	0 / 100	20
14a–b	Nijmegen-Valkhof area	50	30
15	Nijmegen-Hunerberg	50	30
16a, c–e	Nijmegen-Kops Plateau, mun. Nijmegen	50	30
16b	Nijmegen-Kops Plateau, mun. Berg en Dal	30 / 50 / 100 / 1,000	30
17a–b	Berg en Dal-aqueduct, mun. Nijmegen	50	50
17b–e	Berg en Dal-aqueduct, mun. Berg en Dal	0 / 100	40 / 50
18a–b	Berg en Dal-De Holdeurn	0 / 100	30 / 40
19	Herwen-De Bijland	100 / 2,500	30 / 100 / 150

Table 5.12 Overview of surface and depth values above which soil disturbance is not allowed in the buffer zone without a formal permit in the component parts/clusters in the Netherlands.

Heritage Act arranges:	Environment and Planning Act arranges:
• Rules regarding deposition of archaeological finds	• Permits regarding archaeological monuments (this may also concern refusing a permit)
• Rules regarding archaeological finds	• Rules regarding the shutdown of activities in the event of accidental archaeological finds
• Funding for the preservation of built monuments	• The obligation of taking cultural heritage into account in environmental plans
• Certification of archaeological contractors	
• Prohibition of excavation without permits	
• Rules and procedures regarding designation of archaeological monuments	
• Rules and procedures regarding designation of archaeological monuments	

Table 5.13 Main arrangements relevant to the protection of archaeological monuments in the Heritage Act and the Environmental Planning Act in the Netherlands.

Germany | Rhineland-Palatinate

The system of spatial planning in Rhineland-Palatinate is decentralised. Each level of government bears its own responsibility. The basis of the system is the municipal authority's land-use plan [*Bebauungsplan*]. This provides the framework for assessment of applications by initiators of developments. When drawing up and implementing spatial planning policies, the municipalities must contact the Landesarchäologie Rheinland-Pfalz (Denkmalfachbehörde) to check whether excavation or further research are needed. The organisation and the responsibilities are specified in § 2, § 24 and § 25 Denkmalschutzgesetz Rheinland-Pfalz.

Under existing legislation, any activity that alters or impacts an archaeological monument requires a permit from the Ministerium für Wissenschaft, Weiterbildung und Kultur. The duty of conservation and maintenance of archaeological monuments is regulated in § 2 Denkmalschutzgesetz Rheinland-Pfalz. In case of destruction, the procedure is regulated in § 12, § 13 and § 14 Denkmalschutzgesetz.

Netherlands

The protection of the component parts is covered by the Heritage Act (cf. section 5.b). However, mechanisms for dealing with these archaeological sites are implemented through the planning system (Spatial Planning Act, and from 2021 Environmental Planning Act). How both laws complement each other, is explained in table 5.13.

Under the existing legislation any activity that alters or impacts a listed archaeological monument requires a permit from the Minister of Education, Culture and Science. This permit is issued on behalf of the minister by the Cultural Heritage Agency. Under the new Environment and Planning Act the permit process is placed under the authority of the municipalities. When a permit for any building or ground working activity on a listed monument is requested, the municipality is the competent authority, but the Minister of Education, Culture and Science holds an advisory role with the right of consent when granting a permit; a municipality cannot deviate from this advice.

Not all activities require a permit: a limited number of activities listed in the inscription document of the archaeological monument – such as normal maintenance or activities in the disturbed upper layer of the soil – are excluded. For each monument a dispensation depth has been determined, based on the attested depth of the archaeological levels (tab. 5.14). For the component parts this dispensation depth varies from 0–50 cm, with the exception of Herwen-De Bijland ▶19, where the dispensation depth is likely to be established at 120 cm, since a thick layer of river sediment has been deposited over the Roman levels here. A permit is not needed for activities within this dispensation depth range.

The land-use plan, and from 2021 onwards the environment plan, provides the legal basis for the assessment of applications submitted by initiators of developments such as building, potentially damaging activities or functional changes in land-use. Interventions requiring a permit include the (re)construction of sheds, houses or business premises, the construction of paving, the digging of trenches, (re)excavation or filling-in of ditches and canals, deep ploughing, the construction of drainage pipes, reduction of the groundwater level and conversion of grassland into arable land, (glass) horticulture, bulb-growing or fruit-growing. Superficial soil interventions such as garden work do not require a permit because they do not change or disturb the archaeological values.

For component parts not protected as national archaeological monuments, protection through the planning system is acceptable, but only when potentially damaging activities can be ruled out by the planning regulations. Municipalities can protect the Outstanding Universal Value by setting out regulations that require permits for all activities that could harm the archae-

id	name	monument no	dispensation depth (cm)	additional regulations
1a	Valkenburg-Centrum | Kerkweg	46140	50	no
1b	Valkenburg-Centrum | Centrum	46140	50	no
		extension exp. 2020	*	
1c	Valkenburg-Centrum | Raadhuis	46140	50	no
1d	Valkenburg-Centrum | Kerkhof	46140	50	no
2a	Valkenburg-De Woerd | North	46141	30	no
2b	Valkenburg-De Woerd | South	46141	30	no
		extension exp. 2020	*	
3	Voorburg-Arentsburg	508083	0	no
4a	Corbulo's canal | Vlietwijk	exp. 2020	*	
4b	Corbulo's canal | Starrenburg	exp. 2020	*	
4c	Corbulo's canal | Knippolder	exp. 2020	*	
4d	Corbulo's canal | Vlietvoorde	exp. 2020	*	
4e	Corbulo's canal | Rozenrust	exp. 2020	*	
4f	Corbulo's canal | Romeinsepad	exp. 2020	*	
5a	Leiden-Roomburg | Park Matilo	45576	0	no
		531040	30	yes
5b	Leiden-Roomburg | Besjeslaan	45576	0	no
6	Woerden-Centrum	531056	50	yes
7a	Utrecht-Limes road | Zandweg	exp. 2020	*	
7b	Utrecht-Limes road | Veldhuizen	exp. 2020	*	
7c	Utrecht-Limes road | De Balije	531057	20	yes
8a	Utrecht-Hoge Woerd | Castellum	46097	0	no
		493578	0	no
8b	Utrecht-Hoge Woerd | Langerakbaan	46097	0	no
		493578	0	no
9	Utrecht-Groot Zandveld	531048	20	yes
10	Utrecht-Domplein	531049	20	yes
11a	Bunnik-Vechten | Marsdijk	45717	30	no
11b	Bunnik-Vechten | Provincialeweg	exp. 2020	*	
12	Arnhem-Meinerswijk	45126	0	no
13	Elst-Grote Kerk	531051	20	yes
14a	Nijmegen-Valkhof area | Valkhofpark	395952	50	yes
14b	Nijmegen-Valkhof area | Hunnerpark	395952	50	yes
15	Nijmegen-Hunerberg (part)	45811	0	no
16a	Nijmegen-Kops Plateau | West	45809	20	no
16b	Nijmegen-Kops Plateau | North	exp. 2020	*	
16c	Nijmegen-Kops Plateau | East	45809	20	no
16d	Nijmegen-Kops Plateau | Kopse Hof North	45809	20	no
16e	Nijmegen-Kops Plateau | Kopse Hof South	45810	30	no
17a	Berg en Dal-aqueduct | Mariënboom	531084	0	no
17b	Berg en Dal-aqueduct | Swartendijk	531052	0	no
17c	Berg en Dal-aqueduct | Cortendijk	531053	0	no
17d	Berg en Dal-aqueduct | Louisedal	531055	20	yes
17e	Berg en Dal-aqueduct | Kerstendal	531054	0	no
18a	Berg en Dal-De Holdeurn | North	46057	0	no
18b	Berg en Dal-De Holdeurn | South	45420	30	no
19	Herwen-De Bijland	exp. 2020	*	

Table 5.14 Overview of depths of known disturbance for the component parts in the Netherlands. Dispensation depths indicated with an asterisk (*) have to be established in the course of the procedure to designate the component part as a listed monument, started in 2019 and expected to be completed in 2020.

ological values. In the case of densely populated areas that have not been protected as an archaeological monument in the past, protection through the planning system is more feasible and can have the same effect. Especially in the more elevated areas where there are no peat soils, protection through the planning system is sufficient. In the case of *Frontiers of the Roman Empire – The Lower German Limes*, Nijmegen-Hunerberg ▶15 will be protected through the planning system.
When drawing up and implementing spatial planning policies, municipalities are required to take account of archaeology (Valetta Convention, cf. section 5.b.1) and of regulations formulated at a higher government level such as the state and the provinces.
In the case of the Lower German Limes, the State has formulated an extra protection policy for the conservation of World Heritage sites in general; this is binding at the provincial level. The provinces in their turn translate this policy into regulations for municipalities. In this way, the actual safeguarding of the Outstanding Universal Value of *Frontiers of the Roman Empire – The Lower German Limes* is ensured through municipal land-use plans and environment plans.
At the present time, all provinces have regulations for the Lower German Limes in their spatial ordinances. However, this is a more general obligation for municipalities to take the interests of Roman archaeology into account in their spatial planning. In the framework of the World Heritage nomination, the provinces have agreed to develop a common framework for the provincial regulations regarding *Frontiers of the Roman Empire – The Lower German Limes* – defining common standards for the protection of the component parts and the buffer zones. In 2020, all provincial regulations will be revised and these common standards will be integrated in new provincial ordinances. These regulations will enter into force in 2021.

Enforcement

Municipalities are responsible for the enforcement of spatial policy. Pursuant to the General Provisions for Environmental Law Act [Wet algemene bepalingen en omgevingsrecht] and the General Administrative Law Act [Algemene Wet Bestuursrecht], municipalities can stop activities that conflict with the land-use plans and take other sanctions – such as fines – where needed. Under the new Environment and Planning Act this authority remains with the municipalities. Municipalities have the capacity within their civil service to perform this task.

Heritage Impact Assessment

Since 2013, The Netherlands have been employing the Heritage Impact Assessment (HIA) as an instrument to assess the impact on Outstanding Universal Value of potential developments in or near a (future) World Heritage site. The content of these HIA's is based on the Guideline for Heritage Impact Assessments on World Cultural Heritage (ICOMOS, 2011). Although not foreseen in the case of *Frontiers of the Roman Empire – The Lower German Limes*, it cannot be excluded that in the future developments of regional or national importance are initiated in or near to component parts. In such cases, the instruments of the HIA can assess the alternatives and impact and will be part of the decision-making process. If present, possible effects on the Outstanding Universal Value will also be discussed through the Intergovernmental Committee (IGC-LGL), and if needed ICOMOS advice can be requested.

5.d Existing plans

Germany | North Rhine-Westphalia

Under § 13 (1) ROG, the federal states are obliged to draw up a state development plan for their territory (Landesentwicklungsplan) and spatial development plans for sub-areas (regional plans). The aim of state planning in North Rhine-Westphalia is sustainable development that reconciles social and economic spatial requirements with ecological requirements (tab. 5.15). The preservation of the cultural landscape is also a continuous task in the regional planning process.

Germany | Rhineland-Palatinate

According to § 13 (1) ROG, the federal states are obliged to draw up a state development plan for their territory (Landesentwicklungsprogramm) and spatial development plans for sub-areas (regional plans) (tab. 5.16).

Netherlands

According to the national legislation all municipalities regulate the land-use through land-use plans. All the component parts in the Netherlands are covered by such plans, mainly focusing on maintaining the already existing land-use. The relevant plans are listed in table 5.17. In the nomination phase, plans are foreseen for five component parts/clusters that may potentially impact the Outstanding Universal Value of the Lower Germans Limes.

id	document name	document type	date
all	Landesentwicklungsplan Nordrhein-Westfalen	state development plan	2019
	Regionalplan Düsseldorf	regional plan	2018
	Regionalplan Ruhr	regional plan	2018
	Fachbeitrag Kulturlandschaft zum Regionalplan Ruhr	regional plan	2014
	Regionalplan für den Regierungsbezirk Köln – Teilabschnitt Region Bonn/ Rhein-Sieg	regional plan	2009
	Regionalplan für den Regierungsbezirk Köln – Teilabschnitt Region Köln	regional plan	2018
	Fachbeitrag Kulturlandschaft zum Regionalplan Köln	regional plan	2016
	Agglomerationskonzept Köln/Bonn	development strategy	2019
20; 21	Flächennutzungsplan Kleve	land-use plan	2014
22	Flächennutzungsplan Bedburg-Hau	land-use plan	2013
23; 24	Flächennutzungsplan Kalkar	land-use plan	2017
25	Flächennutzungsplan Uedem	land-use plan	2013
26	Flächennutzungsplan Wesel	land-use plan	2011
27; 28	Flächennutzungsplan Xanten (CUT)	land-use plan	2019
27; 28	Flächennutzungsplan Xanten-Fürstenberg	land-use plan	2019
29	Flächennutzungsplan Alpen	land-use plan	2011
30	Flächennutzungsplan Moers	land-use plan	2007
31	Flächennutzungsplan Duisburg	land-use plan	2018
32	Flächennutzungsplan Krefeld	land-use plan	2015
33; 34	Flächennutzungsplan Neuss	land-use plan	2013, 2017 (draft)
35	Flächennutzungsplan Monheim	land-use plan	2019
36	Flächennutzungsplan Dormagen	land-use plan	2017 (draft)
37; 38; 39	Flächennutzungsplan Köln	land-use plan	2018
40a	Flächennutzungsplan Bornheim	land-use plan	2011
40b, d–k	Flächennutzungsplan Alfter	land-use plan	2009
40c	Flächennutzungsplan Swisttal	land-use plan	2016
41; 42a–j	Flächennutzungsplan Bonn	land-use plan	2019
43	Flächennutzungsplan Bad Münstereifel	land-use plan	2000

Table 5.15 Spatial planning tools for the individual component parts in North Rhine-Westphalia.

Masterplan Valkenburg (Katwijk) Valkenburg-De Woerd ▶2 in the municipality of Katwijk is part of the Valkenburg urban development area. A masterplan to transform this area into a large-scale housing scheme was adopted by the municipality of Katwijk in 2013. In this masterplan the location De Woerd is designated for a small-scale business park development. Preservation of the listed archaeological monument and thus of the two component parts representing the archaeological complex is a condition for this development.

Vlietvoorde (Leidschendam-Voorburg) Between the built-up areas of Leidschendam-Voorburg and Voorschoten a former greenhouse area is being transformed into a green corridor with small housing areas. One of these areas is the location Vlietvoorde. One of the sections of Corbulo's canal ▶4 is located in the core area of Vlietvoorde (4d). Within the development plan the canal section is designated as an open area, with one road traversing it. To reference to the former canal function, the municipality is exploring development of a wetland area over the line of the canal.

Domplein (Utrecht) Part of the Roman fort of Utrecht-Domplein ▶10 was excavated c. 1930 and has recently been made accessible to the public. The management organisation of this underground visitor

id	document name	document type	date
44	Landesentwicklungsprogramm Rheinland Pfalz (LEP IV)	state development plan	2008
	Regionaler Raumordnungsplan Mittelrhein – Westerwald	regional plan	2017
	Flächennutzungsplan der Stadt Remagen	land-use plan	2004

Table 5.16 Spatial planning tools for the component part in Rhineland-Palatinate.

id	province/municipality	document name	document type	date
1, 2, 3, 4, 5	prov. Zuid-Holland	Omgevingsverordening Zuid-Holland	provincial ordinance	20-04-2019
1, 2	mun. Katwijk	Bestemmingsplan Archeologie gemeente Katwijk	land-use plan	29-10-2009
1	mun. Katwijk	Valkenburg Dorp	land-use plan	29-11-2012
2	mun. Katwijk	Landelijk gebied 1994	land-use plan	18-10-1995
3	mun. Leidschendam-Voorburg	Rotterdamsebaan	land-use plan	12-11-2013
3	mun. Leidschendam-Voorburg	Voorburg West/Park Leeuwenbergh	land-use plan	11-10-2016
4a	mun. Voorschoten	Voorschoten Oost	land-use plan	16-05-2012
4a	mun. Voorschoten	Reconstructie Vlietwijk	land-use plan	01-10-2014
4b, 4c	mun. Voorschoten	Buitengebied (2010)	land-use plan	13-06-2012
4d, 4e, 4f	mun. Leidschendam-Voorburg	Beheersverordening 2017 Leidschendam-Voorburg	management ordinance	30-05-2017
4d	mun. Leidschendam-Voorburg	Duivenvoordecorridor	land-use plan	05-09-2007
4e	mun. Leidschendam-Voorburg	Veursestraatweg 2007	land-use plan	02-10-2007
4f	mun. Leidschendam-Voorburg	De Rietvink 2009	land-use plan	18-05-2010
5	mun. Leiden	Roomburg	land-use plan	10-05-2013
6, 7, 8, 9, 10, 11	prov. Utrecht	Provinciale Ruimtelijke Verordening, geconsolideerd (incl. herijking 2016, correctie 2017 en 2e partiële herziening 2018)	provincial ordinance	10-12-2018
6	mun. Woerden	Bestemmingsplan Woerden binnenstad	land-use plan	06-07-2009
7a, 8, 9, 10	mun. Utrecht	Chw Algemene regels over bouwen en gebruik	land-use plan	30-11-2017
7a	mun. Utrecht	Vleuterweide, Vleuten	land-use plan	12-06-2014
7b, 7c	mun. Utrecht	Veldhuizen (geconsolideerd)	management ordinance	04-12-2014
7b	mun. Utrecht	Chw Veldhuizen, De Meern (ontwerp)	land-use plan	14-06-2014
7b	mun. Utrecht	Chw Veldhuizen, De Meern (ontwerp)	land-use plan	14-06-2014
8	mun. Utrecht	Hoge Woerd, 1e Herziening	land-use plan	05-07-2018
9	mun. Utrecht	Leidsche Rijn Utrecht 1999	land-use plan	27-02-2002
9	mun. Utrecht	Het Zand	land-use plan	27-02-2013
10	mun. Utrecht	Binnenstad	land-use plan	25-01-2012
11	mun. Bunnik	Buitengebied Bunnik 2011	land-use plan	24-11-2011
11	mun. Bunnik	Parapluherziening Buitengebied Bunnik	land-use plan	01-11-2018
11a	mun. Bunnik	Fort bij Vechten	land-use plan	02-05-2012
12, 13, 14, 15, 16, 17, 18, 19	prov. Gelderland	Omgevingsverordening Gelderland (december 2018)	provincial ordinance	19-12-2018
12	mun. Arnhem	Stadsblokken-Meinerswijk 2015	land-use plan	28-09-2015
13	mun. Overbetuwe	Elst, Centrum	land-use plan	20-10-2005
14, 15, 16a, 16c–e, 17a	mun. Nijmegen	Facetbestemmingsplan Archeologie	land-use plan	25.06.2014
14	mun. Nijmegen	Nijmegen Centrum-Binnenstad	land-use plan	28.11.2012
15, 16a, 17c–e	mun. Nijmegen	Nijmegen Oost	land-use plan	26.06.2013
16b, 18a	mun. Berg en Dal	Stuwwal en beschermd dorpsgezicht Ubbergen	land-use plan	27.06.2013
17b–e, 18b	mun. Berg en Dal	Buitengebied Groesbeek	land-use plan	29.08.2013
17a–b	mun. Nijmegen	Nijmegen Groenewoud Kwakkenberg	land-use plan	15.02.2017
17e	mun. Berg en Dal	Berg en Dal	land-use plan	25.07.2007
19	mun. Zevenaar (Rijnwaarden)	Bestemmingsplan Buitengebied 2008	land-use plan	19.05.2009

Table 5.17 List of land-use plans and other relevant instruments for spatial planning.

centre, 'DOMunder', has plans to further excavate some already disturbed parts of the Roman fort, with a view to making these parts accessible to the public.

The IJsselpoort River Climate Park (Arnhem) The IJsselpoort River Climate Park is part of the Multi-year Programme for Infrastructure, Spatial Development and Transport (MIRT). In this project a large-scale development is foreseen in an area around the Rhine

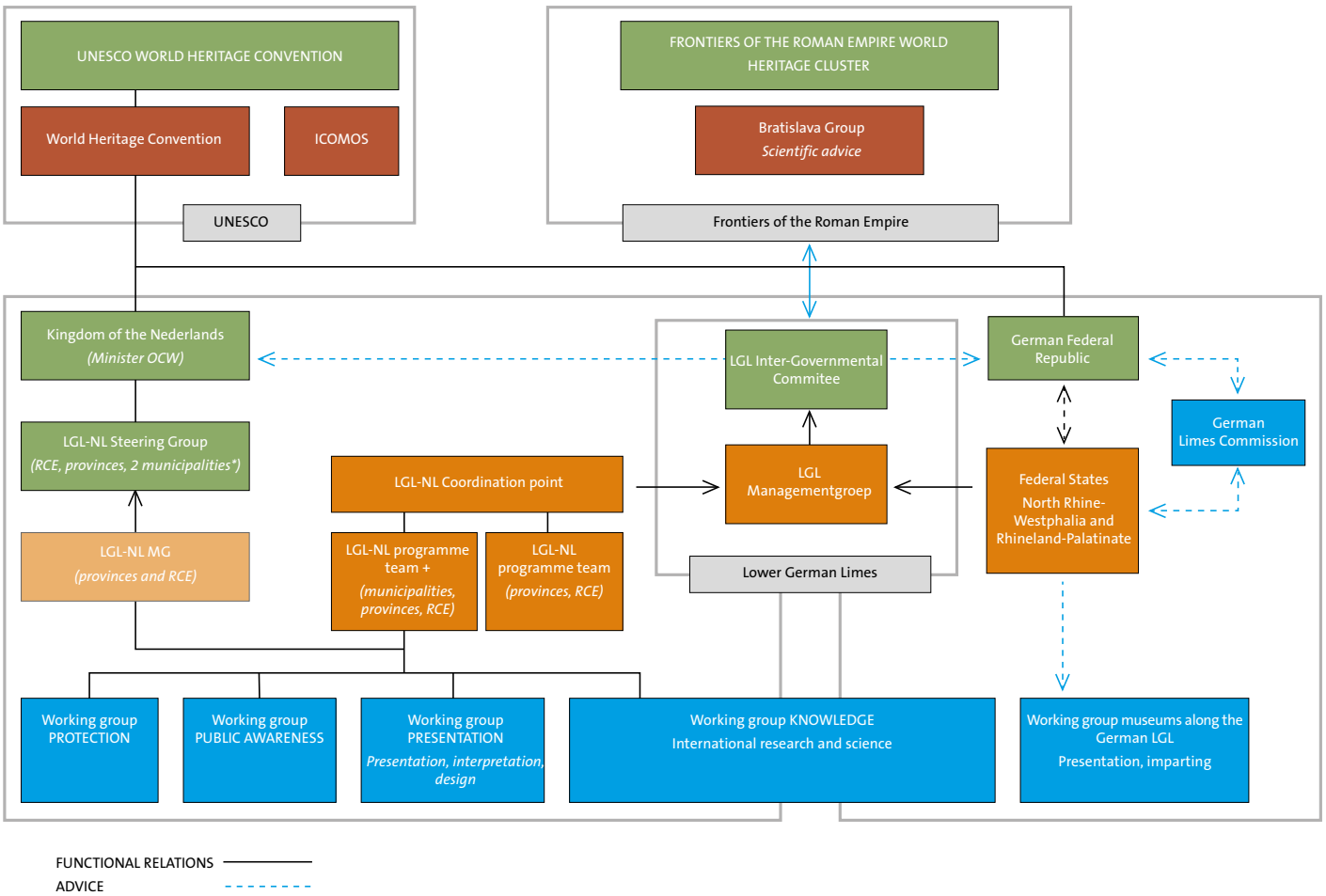

Fig. 5.2 Overview of the joint structure for management of *Frontiers of the Roman Empire – The Lower German Limes.*

near Arnhem, focusing on river management, nature development and economic development. A preliminary study has been carried out. In this study the Roman fort of Arnhem-Meinerswijk ▶12 is not affected and measures are envisaged that could decrease the risk of flooding of the military settlement. Further elaboration of the plans will take place in 2019 and thereafter. The status of the fort as a listed archaeological monument and the associated restrictions will be taken into account in this process.

'Voorverkenning Kop van de Betuwe' (Arnhem and Zevenaar) A preliminary study has been conducted on possible water safety measures in the framework of the Water Protection Program, in an area which includes the forts of Arnhem-Meinerswijk ▶12 and Herwen-De Bijland (mun. Zevenaar) ▶19. The study focuses on the flooding areas along the Rhine. Within this study, the Lower German Limes is identified as a key value that should be taken into account in future developments.

5.e Property management plan

All component parts are well protected under monument protection laws. In addition, the management plan (MP) constitutes the basis for long-term and sustainable protection and appropriate handling of the nominated property (fig. 5.2). For this purpose, an appropriate management plan has been developed in a joint Dutch-German working group, divided into three parts: a common overarching structure containing all principles and the management structure, and two national parts adapted to the respective monument protection. The complete Management Plan is included as Annex 2.

International framework

Frontiers of the Roman Empire – The Lower German Limes is nominated as a transnational serial property. Germany and the Netherlands are jointly responsible for the protection of the Outstanding Universal Value. They are also jointly responsible for effective, long-term implementation of the management plan for the nominated property and for timely compliance with procedural requirements, allowing for verification by UNESCO through periodic reports based on monitoring.

Basic organisational principles are:

- taking into account the differences between the two countries;
- acting in accordance with each partner's own responsibility;
- decision-making to focus as much as possible on consensus;

- adopting, where possible, guidelines developed at the level of the Frontiers of the Roman Empire World Heritage Cluster (cf. section 3.1.e).

The Netherlands and Germany both have their own spatial and archaeological policies. There are differences in custom and practice at national, regional and local level between the two countries. At the delivery level therefore, both countries have their own management structure for implementing the management plan. After nomination, their function and procedures will be laid down in a Joint Declaration which will follow the existing one.

Common objectives

The long-term strategy for *Frontiers of the Roman Empire – The Lower German Limes* is to preserve the Outstanding Universal Value and encourage a common understanding of it. This long-term strategy is translated into six long term aims:

1. *Frontiers of the Roman Empire – The Lower German Limes* is part of the Frontiers of the Roman Empire as a whole, represented by the Frontiers of the Roman Empire World Heritage Cluster. At the level of the Cluster there is alignment with regard to preservation, interpretation, research and public access.
2. The core values of *Frontiers of the Roman Empire – The Lower German Limes* are sustainably protected. Researchers and governments work together on preservation and knowledge development.
3. *Frontiers of the Roman Empire – The Lower German Limes* is known and acknowledged as a transnational structure within both countries and abroad.
4. *Frontiers of the Roman Empire – The Lower German Limes* is used as an educational resource in primary and secondary education.
5. *Frontiers of the Roman Empire – The Lower German Limes* is known as a structure that stretches along the Rhine, running through both countries. This structure is accompanied by high quality presentations (museums/landscape) and used for leisure and as a tourist destination.
6. *Frontiers of the Roman Empire – The Lower German Limes* is a source of inspiration for the local environment/communities. Residents are proud of the presence of the historical frontier.

National management structure | Germany

The federal states involved have an obligation to preserve the archaeological monument known as the Lower German Limes. To ensure its permanent survival it is necessary that as many people and institutions as possible in the vicinity of *Frontiers of the Roman Empire – The Lower German Limes* share this interest in its preservation. Actions which serve to ensure the protection of *Frontiers of the Roman Empire – The Lower German Limes* or public awareness of it must therefore be continually revised to align with changing social and technical conditions. Significant areas of cooperation and management have already been agreed between the institutions concerned along the Lower German Limes during composition of the documentation for the application for inscription as a World Heritage site.
Having direct responsibility for the protection and development of *Frontiers of the Roman Empire – The Lower German Limes* within a process of effective monument management, the local authorities also bear great responsibility for the monument. For this reason they will be involved in the continuing development of this plan.

National management structure | Netherlands

The Provinces of South Holland, Gelderland and Utrecht have worked together on the nomination of *Frontiers of the Roman Empire – The Lower German Limes* since 2011. In 2014 they signed a joint declaration, together with 26 municipalities and the Ministry of Education, Culture and Science. In 2015, an international cooperation document was signed with the German federal states of North Rhine-Westphalia and Rhineland-Palatinate.
In 2019 the provinces of South Holland, Utrecht and Gelderland agreed on long term cooperation to preserve *Frontiers of the Roman Empire – The Lower German Limes* to act together as site holder and to coordinate management and protection, public awareness, presentation and interpretation, visitor management and research. An administrative partnership will be created to formalise this cooperation.
So as to integrate the interests and expertise of local authorities and other stakeholders involved in the management of *Frontiers of the Roman Empire – The Lower German Limes*:

1. a national steering committee will be established with responsibility for managing *Frontiers of the Roman Empire – The Lower German Limes* and for monitoring and reporting to UNESCO, including representatives of the three provinces, a representative of the Cultural Heritage Agency, and two representatives from the municipalities as advisory members;
2. multiple working groups will be created in the fields of science, interpretation and presentation, public outreach and preservation.

The existing coordination unit will continue, funded by the three provinces, with the responsibility to en-

sure the necessary communication, harmonisation, coordination, and cooperation between the different groups on a national as well as an international level, in order to manage *Frontiers of the Roman Empire – The Lower German Limes* effectively.

5.f Sources and levels of finance

Germany | North Rhine-Westphalia

The management organisation in North Rhine-Westphalia will be financed by the Ministry of Regional Identity, Communities and Local Government, Building and Gender Equality of the Land of North Rhine-Westphalia [*Ministerium für Heimat, Kommunales, Bau und Gleichstellung*] who grants an annual financial support programme for heritage management projects ('Denkmalförderprogramm') in which the support for the inscribed nomination is included. The Municipal Association of the Rhineland [*Landschaftsverband Rheinland, LVR*] provides the financial support for a fixed post for an archaeologist for coordinating the management of the German part of the nominated property with additional fees for running costs.
The major cities of Cologne, Neuss, Krefeld and Duisburg provide financial support for fixed posts for archaeologists dealing with the nominated property in their respective areas and run the major museums presenting the nominated property.
Conservation and care for archaeological monuments is the responsibility of the owners (§ 7 Monument Protection Law of North Rhine-Westphalia). Monuments of the nominated property that need significant conservation strategies and costs are in public ownership (Köln-Praetorium ▶37; Monheim-Haus Bürgel ▶35, Xanten-CUT ▶27) and sustainable financial support for conservation and presentation is guaranteed.

Germany | Rhineland-Palatinate

Immovable cultural monuments according to § 4 of the Monument Protection Law (Denkmalschutzgesetz, DSchG) are covered by monument protection by act of law in accordance with § 8 para. 1 Nr. 1 DSchG. Under § 2 para. 1 DSchG, the obligation to preserve and maintain cultural monuments within reasonable limits rests with the owners or possessors of the monuments in question, or other holders of the right of disposal. Physical maintenance is therefore primarily the responsibility of the owners, who usually provide the financial resources. State or federal subsidies are available to assist maintenance, funded through a range of support programmes.
The museum in Remagen and the Limes Information Centre in Rheinbrohl are important institutions for tourism development and interpretation for the Lower German Limes. These institutions can, supported by the federal state of Rhineland-Palatinate, raise third-party funds to enlarge, develop and improve exhibitions and interpretation activities.

Netherlands

The management structure in the Netherlands will be financed by the three provinces of Gelderland, Utrecht and South Holland. These organisations have formally agreed on long-term cooperation and the provision of funds for delivery of the overall tasks involved in managing *Frontiers of the Roman Empire – The Lower German Limes* in the Netherlands: general management, knowledge development, public awareness, visitor facilities and education. For the first four-year period a budget of 2.3 Million euro is reserved for delivery of these tasks. Other stakeholders will be approached to participate and co-fund on a project basis, in order to increase the impact.
The municipalities within the provinces of Gelderland, Utrecht and South Holland will perform the regular tasks needed for the conservation of the component parts at their own expense. This includes preservation of the monument and law enforcement tasks.
The archaeological monuments are mostly owned by governments and private owners. Only a small number is owned by non-governmental organisations such as 'Staatsbosbeheer' (land owner and manager of natural reserves). In most cases there are no specific costs related to conservation of the sites, and existing land-use can be continued. In cases where maintenance might be needed, national funding is available for maintaining the monument [*Subsidieregeling instandhouding monumenten (Sim)*].

5.g Sources of expertise and training in conservation and management techniques

The expertise and training necessary to preserve and manage the World Heritage site are provided through various sources. These are discussed below by State Party.

Germany

In North Rhine-Westphalia and Rhineland-Palatinate the State Conservation Offices (LVR-ABR, RGM, GDKE) manage the archaeological cultural heritage of each federal state within the relevant jurisdiction. Academically and technically trained employees work in these authorities. The same applies to the responsible city archaeologists and the excavation companies that regularly carry out excavations or watching briefs on construction sites.

Archaeology of the Roman Provinces can be studied in Germany at six universities up to doctoral level (tab. 5.18). Four universities or technical universities or colleges offer complete courses of study in monument preservation, heritage management and conservation. The State Services for Archaeological Heritage are involved in university education, working alongside academic staff. Professional staff from these Services provide courses for archaeologists, architects and landscape planners in both scientific and monument conservation subjects, as well as courses related to the interpretation and teaching of archaeological heritage.
The Conservation Offices also make a significant contribution to the education of archaeologists and technicians. There are a variety of offers ranging from internships and traineeships to the employment of students in the head office and outposts, as well as employment in the processing of archaeological objects as part of their graduate thesis.
Additionally, specialist staff from these Offices regularly participate in the Management Group (Hexham Group) of the existing Frontiers of the Roman Empire World Heritage site, which offers opportunities for intensive exchange of skills and experience with specialist colleagues entrusted with management of World Heritage.
In Germany, excavation technicians are given certificated training through an established system monitored by the Association of State Archaeologists and the Romano-Germanic Commission [*Verband der Landesarchäologen* and *Römisch-Germanische Kommission (RGK)*]. An obligatory three-year training programme within the State Offices for Cultural Heritage is required to attain the necessary qualifications. Annual regional symposia report on new discoveries from all periods, but also on monument law procedures and fields of action. In addition, archaeologists with responsibilities for *Frontiers of the Roman Empire – The Lower German Limes* attend topic-specific conferences on the Limes, such as the International Limes Congress which takes place every three years, and the Limes Colloquium of the German Limes Commission [*Deutsche Limeskommission* (*DLK*)], which is held every two years.

Netherlands

To ensure the best possible conservation of *Frontiers of the Roman Empire – The Lower German Limes* as a World Heritage site, appropriate expertise is deployed at different levels. The available resources of knowledge of and experience in the protection of archaeological monuments, the management of heritage sites and the characteristics of Roman frontier archaeology are optimally accessed to achieve effective management and appropriate measures for protection of this composite World Heritage site.

Governments

State Protection of listed archaeological monuments is primarily overseen by the Cultural Heritage Agency of the Netherlands. Besides formulating and implementing national heritage policy and rules and legislation concerning heritage in collaboration with the Ministry of Education, Cultural Affairs and Science, the Agency also develops practical operational knowledge and provides advice on listed monuments, landscape and the living environment, archaeology and portable heritage. The Agency also directs national policy for Cultural World Heritage sites. The Agency has about 350 employees divided over 18 departments working at the interface between management, science and society. Experts of the Agency work together with managers of individual component parts to protect and manage the World Heritage site as effectively as possible.
Provinces All three provinces have archaeologists on their staff. They are, amongst other matters, concerned with safeguarding the archaeological values within the provincial territory in spatial planning and with supporting public outreach. Within all three provinces, regional heritage agencies [*Erfgoedhuizen*] operate to support volunteer organisations through edu-

institution	studies of Archaeology of the Roman Provinces	studies on heritage management, conservation/restoration and excavation engineering
Johann Wolfgang Goethe-Universität Frankfurt am Main	•	
Albert-Ludwigs-Universität Freiburg	•	
Universität zu Köln	•	
Ludwig-Maximilians-Universität München	•	
Otto-Friedrich-Universiät Bamberg	•	•
Universität Osnabrück	•	
Hochschule für Technik und Wirtschaft Berlin		•
Technische Universität Berlin		•
Brandenburgische Technische Universität Cottbus – Senftenberg		•

Table 5.18 Universities providing courses in the Archaeology of the Roman Provinces and heritage management, conservation and excavation engineering

cation programmes and to promote public awareness through targeted campaigns.
Municipalities Most of the municipalities have archaeologists on their staff, depending on the size of the organisation. Some of the smaller municipalities outsource this field of expertise. A working group will be established in the field of conservation, to share best practice and exchange knowledge between municipal site managers.

Coordination unit

The coordination unit for management of the Dutch part of *Frontiers of the Roman Empire – The Lower German Limes* will have an archaeological expert in Roman Archaeology on the staff, working together with government experts.
The management structure of *Frontiers of the Roman Empire – The Lower German Limes* will include a research group, with representatives from universities, museums, and partner organisations. Members of the group will identify gaps in existing knowledge, hold workshops to discuss potential research themes and develop a research strategy to better understand the working and conservation of the Lower German Limes. A staff member from the coordination unit will chair this expert team.

Universities

In the Netherlands six universities and a university of applied sciences offer archaeology programmes including courses on Roman archaeology (tab. 5.19). Four of the universities have complete archaeology programmes at both bachelor's and master's level. Together with the Cultural Heritage Agency of the Netherlands, they collaborate in ARCHON, the Dutch inter-university research and graduate school for archaeology.

Knowledge networks

Most specialists working in the field of archaeology keep abreast of developments in the field by regularly attending national and international conferences and congresses, for instance the triennial international Congress on Roman Frontier Studies, which will be held in the Netherlands in 2021, and the annual meeting on Roman Archaeology at VU Amsterdam.

5.h Visitor facilities and infrastructure

Depending on the characteristics of each component part, local infrastructure and facilities have been geared to the number of expected visitors and their needs and expectations as well as the management of the component parts. For instance, the LVR-Archaeological Park Xanten attracts considerably more visitors than the watchtower visualisation at Utrecht-Groot Zandveld, and is therefore purposely equipped to receive more than 500,000 visitors per year. Visitor facilities and infrastructure are thus managed by property, with close attention to the preservation of the archaeological remains, but are overseen centrally to ensure that the information and tools provided to visitors provide a coherent understanding of *Frontiers of the Roman Empire – The Lower German Limes* as a World Heritage site.

Germany

Accessibility and infrastructure at the site

Almost all of the sites are accessible and the whole of the property area can be visited (tab. 5.20). Since most of the sites are underground, they are very well protected even from large numbers of visitors. However, since they are not visible, they have to be well communicated and visualised. Goals for this are set out in the Action Plan of the MP (cf. section 5.e). Currently there is a wide range of visitor infrastructure, communication types and access provision, from an archaeological park with museum to no information or infrastructure at all. None of the existing installations threatens the archaeology in any way.
Many sites are already easily accessible by bicycle (es-

institution	complete archaeology programmes	courses on Roman archaeology	courses on archaeological heritage management
University of Amsterdam (in collaboration)	•	•	•
VU Amsterdam (in collaboration)	•	•	•
Groningen University	•	•	
Leiden University (in collaboration)	•	•	•
Saxion University of Applied Sciences (in collaboration)	•	•	•
Radboud University		•	
Utrecht University		•	

Table 5.19 Overview of universities and universities of applied sciences in the Netherlands offering archaeology programmes.

id	name	accessibility of the nominated property	protection of the property with regard to tourism	information board on site	museum/ info pavilion on site	accessibility: walking connection to bicycle path, car parking, public transport	restaurant, toilet etc available
20	Kleve-Keeken	view at it	✓	-	-		-
21	Kleve-Reichswald	✓	✓	-	-		-
22	Till	✓	✓	✓, 1	-		-
23	Kalkar-Kalkarberg	view at it	✓	-	-		-
24	Kalkar-Bornsches Feld	✓	✓	-	-		-
25	Uedem-Hochwald	✓	✓	-	-		-
26	Wesel-Flüren	✓	✓	-	-		-
27	Xanten-CUT	✓	✓	✓, several	✓, APX		✓
28	Xanten-Fürstenberg	✓	✓	✓, c. 5	-		-
29	Alpen-Drüpt	✓	✓	-	-		-
30	Moers-Asberg	✓	✓	✓, 3	-		-
31	Duisburg-Werthausen	✓	✓	✓, 1	-		-
32	Krefeld-Gellep	✓	✓	-	-		-
33	Neuss-Koenenlager	✓	✓	✓, c. 3	-		-
34	Neuss-Reckberg	✓	✓	-	-		-
35	Haus Bürgel	✓	✓	✓	✓		✓
36	Dormagen	✓	✓	✓	-		-
37	Köln-Praetorium	✓	✓	✓	✓		(✓)
38	Köln-Deutz	✓	✓	✓	-		-
39	Köln-Alteburg	✓	✓	-	-		-
40	Kottenforst Nord	✓	✓	-	-		-
41	Bonn	✓	✓	✓, several	-		-
42	Kottenforst Süd	✓	✓	-	-		-
43	Iversheim	✓	✓	✓	✓		-
44	Remagen	✓	✓	✓	✓		✓

Table 5.20 Overview of the accessibility of the component parts/clusters of *Frontiers of the Roman Empire – The Lower German Limes in Germany.*

pecially in rural areas) or by public transport (especially in cities).
After the nomination, multilingual, up-to-date information boards written by specialists will be installed at all sites, replacing or supplementing existing provision. The homepage of the Heritage State Office provides information about World Heritage sites and existing centres for information and education (https://bodendenkmalpflege.lvr.de/de/projekte/niedergermanischer_limes_1/niedergermanischer_limes.html).

Museums

Along the Lower German Limes there are several larger and smaller museums which provide information about local and regional aspects of the Lower German Limes and the wider context of the Frontiers of the Roman Empire. Together with the sites that form part of the World Heritage nomination, these are integrated into an interpretation framework. Current and planned presentations and exhibitions in the participating museums are listed in table 5.21. Some of the museums like the MiQua and the Römisch-Germanisches Museum in Köln (RGM) are currently under development and will be not be open for several years.

Netherlands

Facilities

The archaeological remains contained within the component parts are in most cases buried and well-covered, keeping the risk of damage by visitors to a very low level. At the same time however, this means that there are few clearly visible remains at any of the individual locations. Moreover, these remains are often situated in built-up areas. This makes it very important to visualise these buried Roman remains aboveground and to provide visitors with extra information and interpretation facilities.

Table 5.21 Current and planned on-site presentations and exhibitions in the participating museums.

municipality	museum/visitor facility	remark/description	referring to id
Xanten	CUT/LVR-Archaeological Park Xanten	Museum topics are: • Harbour and harbour temple • Legionary fortress Vetera I/II • Brickyards • Cemeteries • Military history • Temporary camps In planning: • Protective buildings with interpretation concepts covering the archaeological remains of the ○ Harbour ○ *Tricensima* ○ Limes road • Info-installations in the archaeological park for the Lower German Limes and ship-building • Part of the state exhibition 'Archaeology in NRW' [*Archäologie in NRW*] in 2021 ○ Permanent archaeological summer camps for scholars and students ○ Wide spread network of schools and educational institutions	27; 28
	Vetera Site	Existing: • Information boards in the landscape • Archaeological trail Xanten-Fürstenberg	27
	Dorfdeichmuseum Wesel	In planning: • Connection between the museum/permanent exhibition in Wesel and the site of four temporary camps in Wesel-Flüren (▶ 26a–d) • Archaeological trail	26
Moers	Grafschafter Museum im Moerser Schloss	Existing: • Objects and Finds from *Asciburgium* presented in the museum • Archaeo-historical trail with 35 stations and 12 information boards (*Asciburgium* included)	30
Duisburg	Kultur- und Stadthistorisches Museum Duisburg	Existing: • Fortlet Duisburg-Werthausen (▶ 31) with outdoor marking of the layout and information board • Programmes for children/school classes • Museum with a permanent, small scale Roman exhibition gallery; Topics are: ○ Military life of legionaries ○ Death and burial ○ Roman administration ○ Religion ○ Trade and crafts In planning: • Webpage dealing with the fortlet of Duisburg-Werthausen	30; 31
Krefeld	Museum Burg Linn	Existing: • Museum with permanent exhibition ○ *Gelduba* fort and the Batavian Revolt ○ Excavations and objects from huge Roman and early medieval cemeteries ○ Info-point 'WHS – The Lower German Limes' In planning: • 'Outdoor Archaeological Park' at the site	32
Neuss	Clemens-Sels-Museum Am Reckberg	Existing: • Museum with a permanent Roman gallery (new concept in planning) ○ Legionary fortress of *Novaesium* ○ Objects and finds from *Novaesium* • Marking and interpretation of ○ Legionary fortress ○ Fortress, Limes road and watchtower Reckberg (reconstruction) ○ Archaeological tour in the city ○ Landscape (ditches, *mansio*, *villa rustica*) In planning: • Information boards • Outdoor marking of the *via principalis* • Connection between museum and site • Interpretation region Neuss – Haus Bürgel – Dormagen	33; 34

municipality	museum/visitor facility	remark/description	referring to id
Monheim	Haus Bürgel	Existing: ● Museum with a permanent Roman gallery (information boards, models, 3D-reconstruction, interactive stations); topics are: ○ Roman history ○ History of the courses of the Rhine ○ Military life ○ Death and burial ○ Archaeological methods ○ Experimental archaeology ○ Interpretation region Neuss – Haus Bürgel – Dormagen ● NGO-based activities with local municipality and schools In planning: ● new concept for the museum ● NGO-based activities with local municipality and schools In planning ● new concept for the museum	35
Dormagen	Römerkeller Dormagen, Geschichtsverein Dormagen e.V.	Existing: ● NGO-based activities in the 'Römerkeller' ● 'Römerkeller' and 'Historical Town Hall', with presentation of topics including: ○ Fort of *Durnomagus* ○ Workshops and brickyard ○ Mithraeum ○ Roman street system ○ Interpretation region Neuss – Haus Bürgel – Dormagen In planning: ● Info about common aspects of the Lower German Limes ● 3D-reconstructions and life-sized model of Roman rider ● Outdoor information boards ● Floor-marking ● Guided tours	36
Köln	Romano-Germanic Museum Cologne (RGM)	Existing: ● Museum with permanent exhibition about the Roman Rhineland and the urban organism of the *Colonia Claudia Ara Agrippinesium*. Currently closed to renew the building and exhibition. ○ Opening of interim 'RGM in the Belgian House' in 2019 ○ State exhibition 'Archaeology in NRW' in 2022 ○ Reopening planned for 2024/25	37; 38; 39
	Köln-Deutz	Existing: ● Marking of the eastern gate and structure of the Late Roman fort ● Guided tours to the original remains with NGOs In planning: ● Info-point archaeological park Deutz ● Information boards and 3D-installations	38
	Köln-Alteburg	In planning: ● Virtual/augmented reality tour ● Marking of the fort	39
	MiQua. LVR-Jewish Museum in the Archaeological Quarter Cologne	In planning: ● Museum currently being redeveloped. The architectural concept is a protective building over the original remains of Roman and Medieval Cologne. ○ State exhibition 'Archaeology in NRW' [*Archäologie in NRW*] in 2022 ○ Opening planned for 2023 ○ Permanent exhibition of the in-situ Praetorium and the context of Lower German Limes	37
Bonn	LVR-Landes-Museum Bonn	Existing: ● Museum with permanent exhibition on the topics: ○ Holistic presentation of history and development of the Lower German Limes ○ 'Rome's Eagle on the Rhine' [*Roms Adler am Rhein*] ○ Legionary fortress and military installations ○ Mobility and migration ○ Continuity In planning: ● Elaborated didactic programmes, e.g. interactive model of Roman *Bonna*; 3D-models, interactive stations ● Widespread network of activity with universities, schools and learning institutions ● Extension of the permanent exhibition about the Romans and the Lower German Limes in progress (opening in 2020) ● Part of state exhibition 'Archaeology in NRW' [*Archäologie in NRW*] in 2021	41; 42

municipality	museum/visitor facility	remark/description	referring to id
		• Outdoor activities: ○ Marking and information boards for a reconstructed harbour crane ○ Information boards and archaeological path 'Legionary fortress' ○ Archaeological trail to ramparts of training camps in Kottenforst Süd (▶ 42a–j) ○ Extension of the 'Masterplan Castra Bonnensia' ○ Interpretation region Vinxtbach – Bonn	
Bad Münstereifel	Iversheim	Existing: • Protective building with permanent exhibition • NGO based interpretation work on the history and technological aspects of the Iversheim lime kilns. Topics are: ○ Mining, craftsmanship and raw materials of antique lime kilns ○ The 30th Legion and the operation of an industrial complex In planning: • 'outdoor schools learning location'	43
Remagen	Roman Museum Remagen	Existing: • Museum with permanent small exhibition. Topics are: ○ Fort of Remagen with *principia*, *praetorium* ○ fortification walls ○ Roman road • Guided tours • Printed guide • Information boards	44
Rheinbrohl	'Römerwelt Rheinbrohl', Foundation Caput Limitis	Existing: • Archaeological park • Interpretation focused on the Upper German-Raetian Limes and the Lower German Limes In planning: • New exhibition and interpretation concept	44

Different approaches have been chosen for the different component parts, often depending on the setting of the component part (rural/urban) and on the ideas and wishes of local communities or governments. An overview of the different approaches is given in table 5.22. In the first management period it is aimed to develop a new information system for those sites with no or outdated information panels concerning *Frontiers of the Roman Empire – The Lower German Limes* and the Frontiers of the Roman Empire.

Besides on-site presentations, numerous presentations and interpretive installations in the wider frontier zone are dedicated to Roman history. At Alphen aan den Rijn-Zwammerdam a small visitor centre was built to interpret the Roman cargo ships excavated in front of the fort of Zwammerdam. The Open Air Museum (Arnhem) and the National Museum of Antiquities (Leiden) both present the Lower German Limes as a historical structure of national importance. In rural areas along the south bank of the Rhine various interpretive installations and artworks reference the Roman history of this region. Although outside the component parts, these interpretive installations and artworks play an important role in promoting and understanding the Lower German Limes.

At the time of writing, development of digital applications is being researched with particular attention being paid to projects already in development for the World Heritage site Frontiers of the Roman Empire (Ref: 430ter). For the Antonine Wall in Scotland and the Raetian Limes in Germany, digital content has already been developed through the Advanced Limes Applications project (ALApp). This international project is supported by the European Union's Creative Europe programme. Participation in the ALApp project will be explored as a means of achieving wider promotion and visibility for the Lower German Limes.

Infrastructure

The majority of the Dutch component parts are situated in built-up areas, which makes them generally easily accessible. Locations with leisure or tourism potential, such as Museum Het Valkhof (Nijmegen), DOMunder (Utrecht) and Park Matilo (Leiden) are often provided with parking facilities or are easily accessible by public transport. In the first management period, a management plan will be prepared for each component part/cluster to give better insight into visitor numbers, and whether the existing facilities are sufficient or extra facilities are needed.

A long-distance cycling route and a long-distance hiking trail have both been developed in 2018 and provide another way of accessing most of the component parts. They make the Lower German Limes better accessible for these specific visitors' groups and allow visitors to explore the site from a different perspective and in an environmentally friendly way.

id	name	landscape references	art works	information panels	digital visualisation	visitor centre/ museum
1	Valkenburg-Centrum	•		•	•	•
2	Valkenburg-De Woerd					
3	Voorburg-Arentsburg			•	•	
4	Corbulo's canal		•			
5	Leiden-Roomburg	•		•	•	
6	Woerden-Centrum	•		•		•
7	Utrecht-Limes road	•	•	•		
8	Utrecht-Hoge Woerd	•		•	•	•
9	Utrecht-Groot Zandveld		•	•		
10	Utrecht-Domplein	•		•		•
11	Bunnik-Vechten	•		•		•
12	Arnhem-Meinerswijk	•		•		
13	Elst-Grote Kerk	•		•		•
14	Nijmegen-Valkhof		•	•		•
15	Nijmegen-Hunerberg	•		•		
16	Nijmegen-Kops Plateau			•		
17	Berg en Dal- aqueduct			•		•
18	Berg en Dal-De Holdeurn		•	•		•
19	Herwen-De Bijland		•	•		

Table 5.22 On-site facilities at component parts in the Netherlands (at the time of nomination).

Access to information

At the time of writing, responsibility for coordination of raising public awareness of the Lower German Limes lies in the hands of the joint regional heritage agencies [*Erfgoedhuizen*], one for each of the three provinces involved. Together with the RomeinenNU organisation, they maintain a website (https://www.romeinen.nl) which provides a central point where visitors can obtain information about the Netherlands during the Roman period, with a focus on the Lower German Limes (including a special education platform), the individual sites and museums that can be visited and the World Heritage nomination process. Dur-ing the first management period, the working group with responsibility for public awareness will further develop digital communications for different target groups, in order to inform a wider public and engage a larger audience.

For more in-depth information and presentation visitors are directed to several museums in the wider frontier zone, which further reveal and promote the archaeological value of the Lower German Limes. One of the prime priorities for the first period of the management plan is to establish formal co-operation between the various museums presenting objects and information associated with the Lower German

id	museum	relation with the Lower German Limes		
		highlights & general story	local finds & site story	planned visitor hub
1	Torenmuseum Valkenburg		•	
6	Stadsmuseum Woerden		•	
8	Museum Hoge Woerd, Utrecht		•	•
10	DOMunder, Utrecht		•	
11	Waterliniemuseum, Bunnik		•	
13	Tempel | Kerk Museum Elst		•	
14	Museum Het Valkhof, Nijmegen	•	•	•
14	Museum De Bastei, Nijmegen		•	
17	Museumpark Orientalis, Berg en Dal	•	•	

Table 5.22 Museums located within component parts in the Netherlands.

Limes, and between these museums and the individual archaeological sites (cf. section 5.e). In some cases, where museums are situated directly on site, the cooperation between museum and site is inherent. Nine Dutch museums are housed in buildings located within component parts (table 5.23).

5.i Policies and programmes related to the presentation and promotion of the property

Various programmes and policies have been planned and initiated to reveal and promote the value of *Frontiers of the Roman Empire – The Lower German Limes*. A freely downloadable publication The Lower German Limes, published in 2018 as part of the series Frontiers of the Roman Empire provides an umbrella function. This publication aims to both inform the interested visitor about the Limes and serve as a guide. The other programmes and policies will be discussed be each State Party.

Germany

Presentation

A wide range of approaches to public presentation of the component parts of the nominated property *Frontiers of the Roman Empire – The Lower German Limes*:

- Hidden monuments, in urban areas such as the legionary fortresses of Bonn ▶41 or Neuss ▶33 and in rural areas such as the legionary fortress of Xanten ▶28. Public access through local information or archaeological trails. Information provided includes the protection of monuments and the interaction of monuments with the surrounding cultural or urban landscape.
- Conserved or restored remains (e.g. Köln-Praetorium with the city wall ▶37 and Köln-Deutz ▶38).
- Conserved or restored remains in museums like the MiQua (Köln-Praetorium ▶37). Visitors will have the opportunity of seeing monuments from the last two millennia in their original location. These include the impressive ruins of the Roman governor's palace, the Praetorium, over four different building phases.
- Roman life animated and brought to life in the particular cases of Xanten-CUT and the LVR-Archaeological Park (APX) ▶27, with large buildings and the infrastructure of a Roman city, enabling visitors to understand the scale and dimensions, shape and appearance of Roman buildings and urban structures.
- Local and communal museums with large collections of finds and long-term histories of research such as Gellep with the Burg Linn Museum or Neuss with the Clemens-Sels-Museum. In the museums, interpretive approaches encompass objects, models, maps, reconstructions and films either exist or are in development.

Interpretation Framework

The Interpretation Framework is of particular importance for promoting and presenting the Lower German Limes as an integral part of the management. Like the management plan itself, the Interpretation Framework will be reviewed and updated as required. The Interpretation Framework functions as an advisory tool for interpretation and access to the monuments and sites. The core concept of comparable Interpretation Frameworks like the one for the Danube Limes in Austria and Bavaria or the Hadrian's Wall Interpretation Framework is the identification of an overarching narrative and lead themes or storylines. The narrative and themes should guarantee diversity and improvement of the permanent exhibition of the museums along the river Rhine, with coherent, high quality, differentiated but complementary interpretation and visitor experiences.
The Interpretation Framework should also guarantee a well-organised and structured family of regional and extra-regional museums, contributing to a fascinating and inspiring experience of visiting the museums and sites. This includes a better understanding of the World Heritage site concept in general through the example of the *Lower German Limes*, its significance and its conservation for the future. A side-effect of a coordinated and well-developed museums' concept and communication is the strengthening of social and cultural engagement of local communities with World Heritage through the identification and enhanced visibility of local monuments and sites.
Useful guidance to define the function of museums in this sense is the 'Recommendation concerning the protection and promotion of museums and collections, their diversity and their role in society', adopted by the UNESCO in 2015. Visitors should be able to understand the Lower German Limes as part of the Frontiers of the Roman Empire. The Interpretation Framework contributes to understanding the Outstanding Universal Value of the future World Heritage site.
It is natural that permanent exhibitions should be renewed and adjusted in accordance with the latest scientific results and changes in museological methodology and educational approaches. Temporary exhibitions and events assist in fulfilling the goals of the Interpretation Framework.
Individual experiences of visitors and audiences stand alongside shared experience through the role of museums and sites as places for lifelong learning and education. Consequently the intellectual range of the offer will be based on analysis of target groups and on archaeological and educational evaluations of relevant

sites of the Lower German Limes and their associated finds, in terms of their individual potential to interpret the Lower German Limes for all members of the public.

Activities and programmes

Various tourism products have been in existence for many years to promote single monuments as well as the Lower German Limes in general. These include regular guided tours of the monument, offered by various participants such as museums, associations or the state service, public lectures to inform interested parties and residents, frequent reports on new archaeological finds and research in newspapers and on television, action days at sites of historical interest and Roman festivals which are highlights of public relations activity.
The development of offers for children and school classes is planned as well as cooperation with the German Limes road association to extend walking and cycle trails along the Lower German Limes.

Netherlands

Interpretation Framework

An Interpretation Framework for the Dutch part of the Lower German Limes was established in 2016. This Interpretation Framework identifies several core themes or storylines for interpreting the Roman history along the Rhine and gives direction to the presentation of these storylines through spatial planning and through displaying material culture associated with the Lower German Limes at visitor nodes and museums.
The term 'framework' has been used very deliberately to describe a flexible approach that sets out guidelines to help local organisations present the frontier by focusing on complementary storylines and using different forms of presentation, supporting local partners to build or improve their presentations to create a coherent, differentiated and complementary visitor experience. The Framework proposes an overall thematic structure comprising eight diverse themes relevant to interpreting the values of the Lower German Limes.
In 2017–2018 a pilot project was executed with two expert teams supporting local groups to implement the Interpretation Framework on site: one focusing on spatial planning and landscape design, the other on supporting visitor nodes and museums in improving their presentation. This approach has been evaluated, and based on the outcomes of this evaluation a quality advisory board will be created as part of the new management structure to advise governments and institutions on their presentation of the Limes, outside and inside.

Visitor management programme

Raising awareness and understanding of the archaeological, historical and other values of the Lower German Limes is undertaken through publications of all types, and through promotion via the media, museums, on-site interpretation and digital resources. With the development of multiple resources such as the Interpretation Framework, a brand-identity, an online photo archive and a website, new resources have been developed to support partners to improve on-site presentation and promotion of the Lower German Limes over the past few years.
In 2019 a project was set up through the three regional heritage agencies to develop a four-year programme (2020–2023) to increase public awareness of the Lower German Limes by identifying and delivering projects to improve the accessibility of the Lower German Limes to local, regional, national and global audiences.

Visitor hub project

In 2018 a project was started exploring the possibility of developing one or more visitor hubs along the Lower German Limes, providing visitor gateways intended to introduce visitors to the Outstanding Universal Value and the different sites. Further development of these hubs will depend on the outcomes.

Provincial programmes on funding regional projects

In addition to the joint programme for the Lower German Limes, the three provinces also define their own policies with regard to archaeology and heritage in general, often supported by specific funding programmes on research and public access. An example is the funding programme *Erfgoedlijnen* in South Holland. Multiple projects and events have been supported through these programmes, improving site presentation and public awareness. Following elections in 2019, new policies have yet to be developed. However, it is expected that future regional programmes will be available.

5.j Staffing levels and expertise

Because of the transnational character of the property, the levels and expertise of the personnel involved with the protection and management of the property will be discussed in two sections. The transnational character in conjunction with the large number of component parts of *Frontiers of the Roman Empire – The Lower German Limes* entails that staffing as well as experience will be multilevel.

At the highest level, it is the task of the Intergovernmental Committee for *Frontiers of the Roman Empire – The Lower German Limes* (IGC-LGL) to coordinate all activities at a strategic level. This management body is responsible for the long-term protection of the Outstanding Universal Value of the World Heritage site, but the ultimate responsibility for the supervision of its component parts rests with the States Parties. Vot-ing members of the IGC are the UNESCO focal points of both States Parties: a representative of the Netherlands and a representative of Germany.
The IGC-LGL is primarily advised by the international Management Group for *Frontiers of the Roman Empire – The Lower German Limes* (MG-LGL). This Management Group consists of representatives of both States Parties who are responsible for the implementation of the management plan. The members play an important role in the exchange of knowledge about daily site management and in the guidance of transnational projects.

Germany | North Rhine-Westphalia

About 50 archaeologists in permanent positions (full time equivalent [fte]) are responsible for heritage management, interpretation, and finds processing in museums within the area through which the Lower German Limes runs. Additionally, several teams of excavation specialists in control and recording and restoration specialists are involved in work on the World Heritage site.
For coordinating the nominated property, the LVR-State Service for Archaeological Heritage supports the costs of an archaeologist.

Germany | Rhineland-Palatinate

In Rhineland-Palatinate archaeological monuments and archaeological world heritage sites are protected, managed and researched by the Landesarchäologie Rheinland-Pfalz. Three archaeologists, four specialists for practical excavations and at least five temporarily employed archaeologists or specialists are responsible for monument protection and are based in the headquarters in Koblenz.

Netherlands

Central management structure

Frontiers of the Roman Empire – The Lower German Limes runs through three provinces, namely South Holland, Utrecht and Gelderland. Together these three provinces constitute the siteholder of the nominated property within the Netherlands [*Nederlandse Limes Samenwerking* or Dutch Limes Association – DLA]. The DLA does not take on the responsibilities of other governments or other stakeholders.
The main responsibilities of the management structure are:
- seeing to the protection and promotion of the Outstanding Universal Value of the World Heritage site,
- ensuring cooperation at a transnational level,
- ensuring cooperation between the different stakeholders,
- implementing actions as laid down in the management plan.

The human resources capacity of around 4 fte that will be available for carrying out the management tasks will be funded from the budget set for this. The coordination unit for *Frontiers of the Roman Empire – The Lower German Limes* includes:
- the programme manager of *Frontiers of the Roman Empire – The Lower German Limes* (0.5 fte)
- a representative from each of the three provinces (in all 1.5 fte)
- a representative from the National Heritage Agency (p.m.)
- an archaeological expert (0.5 fte)
- programme staff member (1.0 fte)

In addition:
- the management structure has four working groups comprising members of the DLA (provinces) and of representatives of relevant heritage institutions, other governments and other relevant organisations for the fulfilment of the management tasks. These working groups will be funded from the available budget.
- a wider community is involved in individual projects. They are organised in regional networks and consist of museum employees, volunteers, archaeologists, etc.

Day-to-day management of the site

The primary responsibility for day-to-day management and physical maintenance of the individual component parts resides with the owners and municipalities. The capacity needed to fulfil this duty exists already within the local governments.

On-site presentations

The management and maintenance of on-site presentations is under the responsibility of different organisations. These can be professional institutions such as museums or municipalities, but also organisations staffed by volunteers, or a mix of both. A cooperation agreement between the three regional heritage agencies [*Erfgoedhuizen*] and Romeinen.NU [*Romeinse*

Limes Nederland (*RLN*)] supports all these professional and volunteer organisations along the Lower German Limes. Examples are support with events, joint communication, knowledge-sharing, excursions, network-ing and combined fundraising.

6 Monitoring

6 Monitoring

Permanent monitoring of the nominated property is essential for its preservation. The most important task is to closely monitor the state of conservation as well as possible threats that could harm aspects of the Outstanding Universal Value.

Monitoring is primarily the responsibility of the monument preservation agencies in Germany and the Netherlands, but it is coordinated by the joint Management Group (MG-LGL) and supervised by the joint Intergovernmental Committee (IGC-LGL). In the first management period common strategies for monitoring, conservation and protection will be developed.

6.a Key indicators for measuring state of conservation

The monitoring indicators and methods which will serve to assess the state of conservation and its development are listed in table 6.1. A first group of indicators (1) concerns the preservation of the integrity, that is of the physical condition of the component parts. A second group (2–4) is related to the risk factors which have been addressed in section 4.b. Threats concerning conservation are listed in the site catalogue for each component part and include measures of dealing with the threat involved.

id	indicator	method	periodicity	responsible authorities & location of records
1	integrity			
1a	state of conservation of aboveground remains	visual inspection; hygrometer	annually	responsible monument preservation agencies; museums
1b	state of conservation of buried remains	visual inspection and aerial reconnaissance	annually	responsible monument preservation agencies
1c	state of conservation of buried organic remains	coring (oxidation/reduction, sulphide, calcium)	6 years	responsible monument preservation agencies
1d	erosion, integrity of topsoil, sediment cover	visual inspection; airborne laser scan	annually; 5 years	responsible monument preservation agencies
1e	damaging vegetation	visual inspection	annually	responsible monument preservation agencies
1f	illegal metal detecting or excavation	visual inspection	in case of event	responsible monument preservation agencies
1g	ploughing	visual inspection	continuously	responsible monument preservation agencies
2	development			
2a	urban and industrial development	spatial planning processes and visual inspection	continuously	responsible monument preservation agencies
2b	infrastructural development	spatial planning processes	continuously	responsible monument preservation agencies
2c	expansion of extraction areas	spatial planning processes and visual inspection, aerial reconnaissance	continuously	responsible monument preservation agencies
2d	change of land use	spatial planning processes/visual inspection	continuously	responsible monument preservation agencies
3	climate and nature			
3a	flooding, earthquake	visual inspection	in case of event	responsible monument preservation agencies
3b	groundwater level	data check	5 years	responsible monument preservation agencies (DE); provinces, municipalities, water boards (NL)
4	visitation & facilities			
4a	number of visitors	visitor counting	annually	museums/responsible agencies/ associations

Table 6.1 Key indicators for measuring the state of conservation.

id	indicator	method	periodicity	responsible authorities & location of records
4b	condition of protective buildings	visual inspection	annually	museums/responsible agencies/ associations
4c	condition of reconstructions and marked out structures	visual inspection	annually, in advance of events	responsible monument preservation agencies; responsible museum
4d	safety for visitors	visual inspection	annually, in advance of events	responsible museum; owners
4e	condition of panels/signs	visual inspection	annually	responsible monument preservation agencies; museums
4e	condition of panels/signs	visual inspection	annually	responsible monument preservation agencies; museums

6.b Administrative arrangements for monitoring property

Germany

On-site monitoring by visual inspection of the monuments is conducted by the state services for archaeological heritage and the municipalities. The state services for archaeological heritage provide digital data systems with current information on all spatial planning processes and archaeological activities within the nominated property and provide an optimal basis for the documentation and desktop monitoring of the monuments. The databases enable continuous monitoring for all parties involved and make it easy to inform stakeholders and residents.

North Rhine-Westphalia

In North Rhine-Westphalia, the state service for archaeological heritage and city archaeologists are responsible for monitoring.

LVR-Amt für Bodendenkmalpflege im Rheinland
(LVR-State Service for Archaeological Heritage)
Endenicher Str. 133
53115 Bonn
T +49 228 98340
F +49 228 9834119
M bodendenkmalpflege@lvr.de
W https://bodendenkmalpflege.lvr.de/

Römisch-Germanisches Museum der Stadt Köln
(Romano-Germanic Museum Cologne)
Amt für Archäologische Bodendenkmalpflege und -denkmalschutz
Roncalliplatz 4
50667 Köln
T +49 221 24438 and +49 221 24590
F +49 221 24030
M rgm@stadt-koeln.de
W http://www.roemisch-germanisches-museum.de/Bodendenkmalpflege

Stadtarchäologie Krefeld
(Krefeld Municipal Archaeological Heritage Service)
Museum Burg Linn
Rheinbabenstraße 85
47809 Krefeld
T +49 2151 15539144
F +49 2151 15539150
M dr.h.p.schletter@krefeld.de
W http://www.museumburglinn.de/de/stadtarchaeologie

Stadtarchäologie Duisburg
(Duisburg Municipal Archaeological Heritage Service)
Hoist-Haus
Friedrich-Wilhelm-Str. 96
47051 Duisburg
T +49 203 2836766
F +49 203 2834318
M t.platz@stadt-duisburg.de

Stadtarchäologie Neuss
(Neuss Municipal Archaeological Heritage Service)
Stadt Neuss
Amt für Stadtplanung/Abt. Denkmalangelegenheiten – Bodendenkmalpflege
Untere Denkmalbehörde
Hansemannstr. 35
41468 Neuss
T +49 2131 908614
M Karin.Striewe@stadt.neuss.de

Rhineland-Palatinate

In Rhineland-Palatinate, the state service for archaeological heritage is responsible for monitoring.

Generaldirektion Kulturelles Erbe Rheinland-Pfalz
Direktion Landesarchäologie
Außenstelle Koblenz
Niederberger Höhe 1
56077 Koblenz
T +49 261 6673000
F +49 261 66753010
M landesarchaeologie-koblenz@gdke.rlp.de
W www.gdke.rlp.de

Netherlands

In the Netherlands, the national cultural heritage agency is responsible for monitoring the state of conservation of listed archaeological monuments, which are at the basis of the nominated component parts. The agency maintains a digital monuments register which can be accessed online, and various categories of information can be downloaded for use in other digital information systems (cf. section 7.c). Through either of these routes provinces and municipalities can identify potential threats to the component parts, for instance by comparing the location of building plans.

Rijksdienst voor het Cultureel Erfgoed
(Cultural Heritage Agency)
Smallepad 5
3811 MG Amersfoort
T +31 33 4217421
M info@cultureelerfgoed.nl
W www.cultureelerfgoed.nl

Other categories of monitoring information are assembled by the national management organisation. The information is provided by the provinces, municipalities, museums and other bodies involved.

Nederlandse Limes Samenwerking
(Dutch Limes Association)
p/a Provincie Utrecht
Archimedeslaan 6
3584 BA Utrecht
T +31 30 2589111
M info@limessamenwerking.nl
W www.limeswerelderfgoed.nl

6.c Results of previous reporting exercise

So far, no reports on monitoring have been written explicitly for the Lower German Limes.

Germany

Some projects on this topic have been carried out and are summarised in short reports. For the areas of the legionary fortresses in Bonn ▶41 there is a cellar cadastre which describes the status of interference. Such maps are planned for the future for other urban areas. The extensive geophysical investigations on the Lower Rhine at Kleve-Keeken ▶20, Till ▶22, Kalkar-Bornsches Feld ▶24 and Xanten-Fürstenberg ▶28 also document the extension of the site and the buildings. They provide information for better understanding of the amount of erosion.
In addition, the archives of the state services for archaeological heritage responsible for monitoring and protecting the monuments contain extensive files on all previous investigations. Reports on conservation work of aboveground remains and ruins are available for:

- Uedem-Hochwald ▶25
  - Report St. Bödecker on preservation (unpublished, Archive of LVR-State Service for Archaeological Heritage [LVR-ABR])
- Xanten-CUT ▶27
  - P. Kienzle, Wind und Wetter: die Konservierung von freiliegenden römischen Mauern im LVR-Archäologischen Park Xanten. In: J. Kunow/M. Trier (eds.), Archäologie im Rheinland 2014 (Darmstadt 2015) 252–254.
- Xanten-Fürstenberg ▶28 (amphitheatre)
  - M. Brüggler/J. Tieke, Amphitheater des Legionslagers Vetera I, Xanten-Birten. Sachverhaltsermittlung zum Sanierungsvorschlag (unpublished, Archive of LVR-ABR, Akt.-Nr. NI 2018/0001)
- Monheim-Haus Bürgel ▶35
  - Architectural documentation in 1953 (OA Nr. 1862 001; Akt.-Nr. OA 1953/0093)
- Köln-Praetorium ▶37
  - Architectural documentation with laserscanning in 2008 (unpublished, data in the archive of the MiQua/LVR-Jewish Museum in the Archaeological Quarter Cologne). Since 2017: Damage mapping and damage analysis of the walls
- Köln-Deutz ▶38
  - Architectural documentation with laserscanning (unpublished, archive of the Römisch-Germanisches Museum Köln)
- Iversheim ▶43
  - Documentation of restoration (unpublished report and photographs, archive of the LVR-State Service for Archaeological Heritage, OA 0288 022)

Netherlands

In the Netherlands the Cultural Heritage Agency has started a benchmark project for the nominated component parts in 2019, consisting of a visual inspection (a.o. land use, vegetation, disturbance) of all sites and of corings for those sites where it is feasible (a.o. oxidation/reduction boundary, depths of calcium and sulphide). The results of this project are stored in a database and will serve for comparison with new data in a 6-year cycle.
Earlier records, of the then existing listed monuments which are at the basis of the nominated component parts, were aggregated during the Actualisering Monumentenregister (Updating Monument Register) project carried out by the Cultural Heritage Agency in 2001–2006. The activities included desktop studies of

available information, and in some cases a visual inspection of sites, field survey or corings, to provide data for an assessment of the extent and physical condition of the monuments. The unpublished reports of this project are kept at the archives of the agency.
Prior to 2000 visual inspections have been carried out incidentally by the Cultural Heritage Agency. Unpublished brief reports and photos are kept in its archives.

7 Documentation

7 Documentation

7.a Photographs and audio-visual image inventory and authorisation form

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
		1 Valkenburg-Centrum						
1	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	01 Valkenburg-Centrum.pdf
2	digital photo	View to the modern Rhine from the approximate location of the front gate of the Valkenburg fort. View to the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg view to the modern Rhine 01b 01 01.tif
3	digital drawing	Artist impression of the Valkenburg fort during one of its timber building phases, and of the civil settlement to its south and west. View from the northeast.	04-2017	M.H. Kriek	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-Centrum Artist impression.tif
4	digital drawing	Plan of the stone fort of period 6, with projection of the component parts.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-Centrum plan per 6 with projection property.pdf
		1a *Kerkweg*						
5	scanned photo	View of the excavations in 1941, with the building in the background marking the location of the Kerkweg component part. To the left the stone basement of an altar, in the inner court of the headquarters building. View from the east.	?-1941	RIjksuniversiteit Groningen (NL)	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no	Valkenburg inner court headquarters 1941-289.tif
6	scanned photo	View of the excavations in 1941, immediately north of the Kerkweg component part. In the foreground the northwest corner of the headquarters from the earliest building period, with its wattle-and-daub walls preserved to a height of c. 0.5 m. View from the west.	?-1941	RIjksuniversiteit Groningen (NL)	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no	Valkenburg NW corner headquarters per 1 1941-512.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
		1b *Centrum*						
7	digital photo	Setting of the Centrum component part. View from the centre to the west.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-Centrum view to the west 01b 04 02.tif
8	digital photo	Plan of a tower of the south gate of the stone fort in the pavement of the Centrum component part. View from the south to the interior of the fort.	07-2016	Geert van der Wijk	Geert van der Wijk	geertfotografeert.nl	no	Valkenburg-Centrum gate in pavement.tif
		1c *Raadhuis*						
9	digital photo	Setting of the Raadhuis component part. View from the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-Raadhuis modern setting 01b 07 01.tif
		1d *Kerkhof*						
10	scanned photo	View of the excavations in 1948, with the southwest corner of the fort's defensive walls and ditches from successive timber building phases, immediately west of the Kerkhof component part. View from the west.	?-1948	RIjksuniversiteit Groningen (NL)	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no	Valkenburg SW corner fort defences 1948-137.tif
11	scanned photo	View of the excavations in 1948, with a large part of the southern defensive wall of the stone fort collapsed into a defensive ditch. View from the west.	?-1948	RIjksuniversiteit Groningen (NL)	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no	Valkenburg collapsed S fort wall 1948-57.tif
12	digital photo	Setting of the Kerhof component part. View from the southeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-Kerkhof modern setting 01a 01 04.tif
		2 Valkenburg-De Woerd						
13	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	02 Valkenburg-De Woerd.pdf
14	digital drawing	Schematic overview of the Limes road and the adjacent civil settlement, with to ranges of buildings (green, orange), as excavated in 1972 between the two component parts.	?-2011	W. K. Vos	Hazenberg Archeologie (NL)	Hazenberg Archeologie, Van Bemmelenstraat 33, 2313 RA Leiden, Netherlands	no	Valkenburg-De Woerd 1972 simplified plan.tif
15	digital drawing	Artist impression of the Limes road and adjacent civil settlement. View from the south.	09-2011	M. H. Kriek	Mikko Kriek & Hazenberg Archeologie (NL)	Hazenberg Archeologie, Van Bemmelenstraat 33, 2313 RA Leiden, Netherlands	no	Valkenburg-De Woerd artist impression.tif
		2a *North*						
16	digital photo	Two parallel rows of posts lining the Limes road, excavated in 2018 immediately north of De Woerd. View from the south.	10-2018	ADC Archeoprojecten	ADC Archeoprojecten (NL)	ADC Archeoprojecten, Postbus 1513, 3800 BM Amersfoort, Netherlands	no	Valkenburg-Weerdkampen Limesweg 2018 DJI_0080.tif
17	digital photo	Setting of the North component part. View from the northwest.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-De Woerd North modern setting 02a 01 01.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
		2b *South*						
18	digital photo	Setting of the southern end of the South component part. View from the west.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Valkenburg-De Woerd South modern setting 02b 01 03.tif
19	scanned photo	Excavation of a wine barrel, used for the lining of a well, in 1972.	?-1972	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Valkenburg-De Woerd 1972 excavation well.tif
		3 Voorburg-Arentsburg						
20	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	03 Voorburg-Arentsburg.pdf
21	digital image	Plan of *Forum Hadriani* after the supposed extension of the town to the east.	?-2010	T. Buijtendorp	T. Buijtendorp	VU Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands	no	Voorburg-Arentsburg plan after enlargement.tif
22	digital image	Coloured lithography of the excavation of a cellar in 1827–1834.	?-1830	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	no	Voorburg-Arentsburg lithography cellar 1827-1834.tif
23	scanned photo	Re-excavation in 1988 of the cellar uncovered in 1827–1834.	?-1988	C. Milot	Archeologische Werkgroep Leidschendam-Voorburg (NL)	info@alwv.nl	no	Voorburg-Arentsburg re-excavation cellar 1988 Cees Milot.tif
24	digital photo	Three parallel rows of heavy posts lining the harbour, representing two successive stages of an embankment, dating to c. AD 160 and 210. View from the south.	04-2008	Universiteit van Amsterdam	Universiteit van Amsterdam (NL)	Universiteit van Amsterdam, Faculteit Geesteswetenschappen, Archeologie, Postbus 94203, 1090 GE Amsterdam, Netherlands	no	Voorburg-Arentsburg harbour 2008.tif
25	digital photo	Setting of the northern part of the component part. View from the south-west.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Voorburg-Arentsburg setting north with grass 03 01 01.tif
26	digital photo	Setting of the component part, showing the park covering much of the area excavated in 1827–1834. View to the west. To the right of the path one of the 'city beacons' explaining the site.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Voorburg-Arentsburg setting with park 03 03 01.tif
27	digital photo	Setting of the southern part of the component part, with the modern Vliet following approximately the same course as Corbulo's canal here.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Voorburg-Arentsburg south setting with Vliet 03 06 01.tif
		4 Corbulo's canal						
28	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property (4a-4d) and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	04 Corbulokanaal 4a-4d.pdf
29	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property (4d-4f) and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	04 Corbulokanaal 4d-4f.pdf

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30	digital photo	View over the modern Vliet, which runs more or less parallel to Corbulo's canal. On the right bank the Vlietwijk component part (4a). View to the southwest.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo Vliet and Vlietwijk 04a 02 02.tif
		4a *Vlietwijk*						
31	digital photo	Setting of the northern part of the Vlietwijk component part, with the modern Vliet running parallel to it. View to the southwest.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Vlietwijk view from north 04a 02 03.tif
32	digital photo	Setting of the southern part of the Vlietwijk component part, with the modern Vliet running parallel to it. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Vlietwijk view from south 04a 01 03.tif
		4b *Starrenburg*						
33	digital photo	Setting of the Starrenburg component part, with the modern Vliet running to its southeast and cutting it in the background. View to the north.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Starrenburg view to north 04b 01 03.tif
34	digital photo	Setting of the southern end of the Starrenburg component part. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Starrenburg view to northeast 04b 02 02.tif
		4c *Knippolder*						
		4d *Vlietvoorde*						
35	digital photo	Section through the canal in the Vlietvoorde component part. View to the east.	05-2017	C. Thunnissen	(free)	https://commons.wikimedia.org/wiki/File:Leidschendam_Opgraving_Kanaalv-Corbulo_Vlietvoorde_fotoCThunnissen.jpg	yes	Corbulo-Vlietvoorde excavation.tif
		4e *Rozenrust*						
36	digital photo	Setting of the Rozenrust component part. View to the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Rozenrust view to east 04e 01 05.tif
37	digital photo	Setting of the Rozenrust component part. View to the north.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Rozenrust view to north 04e 01 10.tif
		4f *Romeinsepad*						
38	digital photo	Visualisation of the canal, crossed by a bridge, immediately next to the buried remains of the canal. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Corbulo-Romeinsepad visualization canal 04f 02 08.tif
		5 Leiden-Roomburg						
39	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	05 Leiden-Roomburg.pdf

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40	digital photo	Visualisation of the Roman fort with clearly non-anuthentic materials.	10-2013	Buro JP	Gemeente Leiden (NL)	Gemeente Leiden, Postbus 9100, 2300 PC Leiden, Netherlands	no	Roomburg-Matilo visualization Buro JP.tif
		5a *Park Matilo*						
41	digital photo	Visualisation with modern materials of the fort of Leiden-Roomburg, protecting the site against housing development.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Leiden-Roomburg visualization 05a 01 18.tif
		5b *Besjeslaan*						
42	digital photo	Setting of the eastern half of the Besjeslaan component part. View to the south.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Roomburg-Besjeslaan east view to south 05b 01 01.tif
		6 Woerden-Centrum						
43	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	06 Woerden-Centrum.pdf
44	digital photo	South-western defensive ditch of building phase 3, lined with alder beams.	?-2003	unknown	Hazenberg Archeologie (NL)	Hazenberg Archeologie, Van Bemmelenstraat 33, 2313 RA Leiden, Netherlands	no	Woerden ditch with alder beams.tif
45	digital photo	Setting of the western part of the component part. View to the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden Kerkplein 13 02 04.tif
46	digital photo	View from the heart of the component part to the east, approximately along the main road through the fort.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden Kerkplein alley 13 03 01.tif
47	digital photo	Marking of the eastern defensive wall and gate in the pavement. View to the south.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden east gate 13 04 05.tif
48	digital photo	View of the 'Castellum' underground car park, with cases exhibiting Roman objects to the right.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden parking overview 13 parkeer 11.tif
49	digital photo	Vertical photo of the excavation of a cargo ship in 2003, exhibited in the underground car park.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden parking ship 13 parkeer 01.tif
50	digital photo	Panels with information on the Roman past of the fort area in the underground car park.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden parking panels 13 parkeer 05.tif
51	digital photo	Exhibition of parts of an excavated cargo ship in the underground car park.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Woerden parking diorama 13 parkeer 07.tif

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		7 Utrecht-Limes road						
52	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	07 Utrecht-Limes road.pdf
		7a *Zandweg*						
53	digital photo	Setting of the eastern half of the Zandweg component part, with footpath following the course of the Limes road. View to the east.	02-2007	E. Graafstal	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht Limes road Zandweg view to east Graafstal DSC_0229.tif
54	digital photo	Artistic reference to the watchtower adjacent to the Zandweg component part, with an explanatory panel. View to the west.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht Limes road Zandweg tower 12a 01 03.tif
		7b *Veldhuizen*						
55	digital photo	Setting of the Veldhuizen component part. View to the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht Limes road Veldhuizen overview 12b 01 01.tif
56	digital photo	Explanatory panel at the eastern edge of the Veldhuizen component part. View to the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht Limes road Veldhuizen panel 12b 01 04
57	scanned diapositive	Rows of posts lining the embankment of the Limes road close to the Veldhuizen component part.	?-1998	H. Wynia	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht Limes road Veldhuizen excavation overview 12b 01 01.tif
		7c *De Balije*						
58	digital drawing	Plan of two successive watchtowers at the Balije component part, and the adjacent shifting river bend. The direction of the river migration is indicated by arrows. The eastern tower is still partly preserved.	?-2010	unkown	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht Balije excavation plan watchtowers.tif
59	digital drawing	Plan of the easterly of the two cargo ships excavated at the Balije component part. The ship is still partly preserved.	?-2010	unkown	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht Balije excavation ship DM4.tif
60	digital photo	Setting of the western half of the Balije component part, with footpath following the course of the Limes road. View to the northwest.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht Limes road Balije western half 12c 05 01.tif
61	digital photo	Western end of the Balije component part, with the course of the Limes road spared out between apartment blocks.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht Limes road Balije cutting through apartments 12c 05 03.tif
62	digital photo	Cargo ship with remains of a deck cabin excavated at the Balije component part in 2003.	?-2003	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Utrecht Balije cargo ship detail K801215A.tif
63	digital photo	Block plane found in the deck cabin of a cargo ship excavated at the Balije component part.	?-2003	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Utrecht Balije block plane.tif

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64	digital photo	Tool box found in the deck cabin of a cargo ship excavated at the Balije component part.	?-2003	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Utrecht Balije tool box Img138445.tif
		8 Utrecht-Hoge Woerd						
65	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	08 Utrecht-Hoge Woerd.pdf
66	digital photo	Multi-functional visualisation of the fort, with the site museum in the upper left quarter. View to the southeast.	11-2016	unknown	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht-Hoge Woerd overview visualization.tif
67	digital photo	View of the building accommodating a site museum, theatre and restaurant, in the interior of the fort visualisation. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Hoge Woerd site museum 13a 02 06.tif
68	digital photo	Roman cargo ship excavated at the Balije component part (7c), exhibited in the site museum.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Hoge Woerd ship Balije DM1 in site museum 13a museum 01.tif
69	digital photo	Walking path with cases showing finds from the cargo ship, leading up to the entrance of the theatre integrated in the site museum.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Hoge Woerd gallery with cases 13a museum 07.tif
		8a *Castellum*						
70	scanned photo	Excavation in 1940 of the stone foundations of the bathhouse outside the fort.	?-1940		Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht-Hoge Woerd bathhouse excavation.tif
71	digital photo	Location and visualised plan of the bathhouse outside the fort. View to the north.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht Hoge Woerd visualization bathhouse 13a 03 02.tif
72	digital photo	Suggestion of waves, visualizing the Roman Rhine to the west of the fort. View to the northwest.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Hoge Woerd visualization Rhine 13a 04 01.tif
		8b *Langerakbaan*						
73	digital photo	Cremation burial with an intact glass unguent bottle.			Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht-Hoge Woerd Langerakbaan grave.tif
74	digital photo	Car park covering the northern end of the Langerakbaan component part.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Hoge Woerd Langerakbaan 13b 01 01.tif
		9 Utrecht-Groot Zandveld						
75	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	09 Utrecht-Groot Zandveld.pdf

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76	digital drawing	Plan of the excavated parts of the watchtower and surrounding defensive ditch.			Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht-Groot Zandveld excavation plan.tif
77	digital photo	Setting of the Groot Zandveld component part, with an artistic reference to the watchtower. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Groot Zandveld artistic reference 14 01 01.tif
		10 Utrecht-Domplein						
78	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	10 Utrecht-Domplein.pdf
79	scanned drawing	Plan of the stone building phase of the fort.	?-1989	H.J.M. Burgers	VU Amsterdam (NL)	VU Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands	no	Utrecht-Domplein fort plan period 5.tif
80	scanned photo	Collapsed wall of the headquarters building of one of the timber building phases of the fort. View to the east.	?-1938	unknown	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no	Utrecht-Domplein road or collapsed wall 1938 afb 52.tif
81	scanned photo	Stone remains of the Roman fort and an Early Medieval chapel. In the foreground the base of one of the pillars surrounding the inner court of the headquarters buidling. View to the northwest.	?-1993	unknown	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no	Utrecht-Domplein collapsed wall principia 1938 afb 39.tif
82	digital photo	Presentation of the remains of the headquarters building in the DOMunder underground visitor centre.	?-2014	M. Bink	DOMunder Utrecht (NL)	DOMunder, Domplein 4, 3512 JC Utrecht, Netherlands	no	Utrecht-Domplein Domunder principia 3329484600_708d92d647_o.tif
83	digital photo	The entrance to the area of the Roman fort is marked by a band of weathering steel into which the outlines of several sections of the Roman frontier have been engraved (Servetstraat: Britain). View to the east.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Domplein Servetstraat overview 15 01 05.tif
84	digital photo	At night the band of weathering steel is light is projected from below this steel band while a fine water spray is projected upwards (Servetstraat). View to the east.	06-2009	B. ter Mull	DOMunder Utrecht (NL)	DOMunder, Domplein 4, 3512 JC Utrecht, Netherlands	no	Utrecht-Domplein Servetstraat at night Markering (4).tif
85	digital photo	The entrance to the area of the Roman fort is marked by a band of weathering steel into which the outlines of several sections of the Roman frontier have been engraved (Domplein: North Africa). View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Utrecht-Domplein overview 15 03 04.tif
86	digital photo	At night the band of weathering steel is light is projected from below this steel band while a fine water spray is projected upwards (Domplein). View to the northwest.	06-2009	B. ter Mull	DOMunder Utrecht (NL)	DOMunder, Domplein 4, 3512 JC Utrecht, Netherlands	no	Utrecht-Domplein at night Markering (2).tif

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		11 Bunnik-Vechten						
87	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	11 Bunnik-Vechten.pdf
88	scanned drawing	Plan of the stone building phase of the fort.	?-2011	R.P. Reijnen	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Bunnik-Vechten plan period III.tif
89	digital photo	Visualisation with modern materials of the defences and headquarters building of the stone fort. In the background the A12 motorway. View to the northeast.	09-2016	Stichting Tijdlijn	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten visualization bird view_NLS_3367 9016435_0.tif
		11a *Marsdijk*						
90	scanned photo	View of an excavation in 1894. Timber posts and revetments protecting the bank of the Roman Rhine north of the stone fort. View to the east.	?-1894	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	yes	Bunnik-Vechten revetments 1894.tif
91	scanned photo	Excavation trench of 1926 revealing the rectangular plan of the southern tower of the east gate of the stone fort.	?-1926	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	yes	Bunnik-Vechten East gate 1926 C 1236.tif
92	digital photo	Setting of the western part of the component part, north of the Marsdijk. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten W to NE 16a 01 01.tif
93	digital photo	Setting of the southern part of the component part, south of the Marsdijk. View to the southeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten W to SE 16a 03 01.tif
94	digital photo	Setting of the central part of the component part, with a glimpse of the modern visualisation of the stone fort on the elevated part. View to the west.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten fort area to W 16a 05 01.tif
95	digital photo	Setting of the eastern part of the component part, with the well-disguised fort of the New Dutch Waterline in the background. View to the west.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten view to W waterline fort 16a 07 08.tif
96	digital photo	Modern visualisation of the defences of the stone fort by a concrete plinth. View along the northern wall, with an interval tower. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten visualization to NE 16a 04 13.tif
97	digital photo	Explanatory texts and selected finds in the top of the concrete plinth visualising the stone fort.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten visualization to SW with texts and finds 16a 04 36.tif
98	digital photo	Objects collected during a field survey in 2009–2010, cast in the top of the concrete plinth visualising the stone fort.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten visualization to SW with sherds 16a 04 39.tif

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99	digital photo	Cast of the face mask of a cavalry helmet, in the top of the concrete plinth visualising the stone fort.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten visualization face mask 16a 04 32.tif
		11b *Provincialeweg*						
100	digital photo	Setting of the southern part of the component part, with the top of a shelter from the First World War rising from the elevated car park. In the background the railway line.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Bunnik-Vechten Provincialeweg to SE 16b 01 02.tif
		12 Arnhem-Meinerswijk						
101	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	12 Arnhem-Meinerswijk.pdf
102	scanned drawing	Plan of the headquarters building and rear gate during the stone building phase of the fort.	?-2000	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Arnhme-Meinerswijk plan headquarters.tif
103	digital photo	Visualisation by gabions of the known remains of the stone fort.	?-2016	Stichting Tijdlijn	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Arnhem-Meinerswijk visualization overview via NLS.tif
104	digital photo	Setting of the component part. View from the southwest to the visualisation of the headquarters building and rear gate.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Arnhem-Meinerswijk overview to NE 18 01 01.tif
105	digital photo	Setting of the component part. View to the visualisation of the headquarters building and rear gate, from the west.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Arnhem-Meinerswijk visualization to E 18 03 01.tif
106	digital photo	View to the modern course of the Rhine, to the west of the site of the fort. View to the west.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Arnhem-Meinerswijk view to Rhine W 18 02 02.tif
107	digital photo	Frame with seethrough pane explaining the visualisation of the gate of the fort.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Arnhem-Meinerswijk visualization with panel 18 05 02.tif
		13 Elst-Grote Kerk						
108	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	13 Elst-Grote Kerk.pdf
109	digital photo	Setting of the component part, with the Grote Kerk seen from the southwest.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Elst view church NE 20 02 03.tif

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110	digital drawing	Plans of the successive Roman temples and Medieval and later churches. A: temple I. B: temple II.	?-2008	B. Brouwenstijn	VU Amsterdam (NL)	VU Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands	no	Elst plan church and temples Derks et al 2008.tif
111	scanned drawing	Reconstruction of temple II., with the high central building surrounded by a colonnade.	?-1955	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Elst reconstruction drawing.tif
112	digital photo	Outline of temple II marked out with stones and red gravel in the church yard. View to the northeast.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Elst visualization outside 20 01 14.tif
113	scanned photo	View of the excavations inside the church building in 1947, from the west. The L-shaped wall of temple I is wedged between the massive side walls of the central building of temple II.	?-1947	D. de Boer	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Elst excavation 1947.tif
114	digital photo	Visible wall remains of the Roman temples underneath the modern church. Northern wall of temple I (A) cut by the foundation (B) and east wall (C) of the central building of temple II.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Elst underground remains 20 03 03.tif
		14 Nijmegen-Valkhof area						
115	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	14 Nijmegen-Valkhof area.pdf
116	scanned photo	The two parallel lines of the external ditch system of the Late Roman fort, surrounded by Early Roman and Medieval remains.	?-1981	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Nijmegen-Valkhof Late Roman outer ditches.tif
117	digital photo	View along the Medieval Voerweg, separating the Valkhofpark (right) and Hunnerpark (left) component parts. View to the west.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Valkhof Voerweg 22a 02 02.tif
		14a *Valkhofpark*						
118	digital drawing	Overview of the known and presumed defenses of the Late Roman fort, and of the Medieval palace (green).	?-2014	A. den Braven	A. den Braven	Universiteit Leiden, Faculteit Archeologie, Postbus 9514, 2300 RA Leiden, Netherlands	no	Nijmegen-Valkhof plan Late Roman Early Medieval.pdf
119	digital photo	Setting of the Valkhofpark component part, with the Late Medieval Nicolaaskapel in the background. View to the north.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Valkhof park with chapel 22a 03 12.tif
120	digital photo	Wide view over the river Waal from the northern edge of the Valkhof hill. View to the northeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Valkhof view over river 22a 06 01.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
121	digital photo	View to the Valkhof hill from the level of the river Waal, with possible Roman wall remains included in the Medieval wall below the Nicolaaskapel. View to the southeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Valkhof chapel from below 22a 01 01.tif
		14b *Hunnerpark*						
122	digital drawing	Schematic overview of the layout of part of the early civil settlement with strip houses (red) with back-yards (green), facing one of two parallel roads (grey).	?-2010	H. van Enckevort and T. van der Weyden	Gemeente Nijmegen (NL)	Gemeente Nijmegen, Bureau Archeologie en Bodemkwaliteit, Postbus 9105, 6500 HG Nijmegen, Netherlands	no	Nijmegen-Valkhof plan Claudio-Neronian.tif
123	digital photo	Setting of the Hunnerpark component part, with Late Medieval town wall in the background. View to the northwest.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Valkhof Hunnerpark 22b 03 03.tif
124	scanned photo	Cellar of one of the early town houses, with rare stone walls.	?-1993	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Nijmegen-Valkhof cellar town house.tif
		15 Nijmegen-Hunerberg						
125	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	15 Nijmegen-Hunerberg.pdf
126	digital drawing	Overview of the attested remains of the early operational base.	?-2001	M. Polak	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Nijmegen-Hunerberg plan early base.pdf
127	digital photo	Setting of the western part of the Hunerberg, from the western ditches of the early camp towards its centre. View to the southeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Hunerberg setting early camp 23 01 03.tif
128	digital photo	Section through the two ditches on the eastern side of the early operational base of Nijmegen-Hunerberg. View from the south.	?-2001	R. Mols	Gemeente Nijmegen (NL)	Gemeente Nijmegen, Bureau Archeologie en Bodemkwaliteit, Postbus 9105, 6500 HG Nijmegen, Netherlands	no	Nijmegen Hunerberg ditches early camp.tif
129	scanned drawing	Overview of the attested remains of the standard legionary fortress.	?-1995	J.K. Haalebos and E.J. Ponten	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Nijmegen-Hunerberg plan legionary fortress.tif
130	digital photo	Setting of the central part of the Hunerberg, from the western ditches of the legionary fortress towards its centre. View to the southeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Hunerberg setting legionary fortress 23 02 03.tif
131	scanned photo	Stone foundations of a *mansio* (rest station) in the civil settlement, west of the standard legionary fortress. View to the southeast.	?-1987	unknown	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Nijmegen-Hunerberg Mansio.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
132	scanned photo	Section through a stone-built water channel in the civil settlement, west of the standard legionary fortress. View to the northeast.	?-1987	unknown	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Nijmegen-Hunerberg water channel.tif
133	digital photo	Visualisation of the postholes of the eastern gate of the early camp in the pavement. View to the southeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Hunerberg visualization gate early camp 23 06 10.tif
134	digital photo	Visualisation of the foundations of the eastern gate of the legionary fortress. View to the north.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Hunerberg visualization gate legionary fortress 23 06 01.tif
		16 Nijmegen-Kops Plateau						
135	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	16 Nijmegen-Kops Plateau.pdf
136	digital drawing	Simplified plan of the fort with its main features and annexes.	?-2013	M. Polak	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Nijmegen-Kops Plateau simplified plan.pdf
137	scanned photo	Aerial view of the Kops Plateau during the excavation of the southeastern corner.	?-1995	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Nijmegen-Kops Plateau aerial view.tif
138	digital photo	Most of the Kops Plateau is now used as a park.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau now in use as a park 24a 03 02.tif
		16a *West*						
139	scanned photo	Defensive ditch (left) and two parallel lines of postholes remaining from the timber facings of the wall revetment in the southwestern part of the fort.	?-1990	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no	Nijmegen-Kops Plateau ditch and wall_RCE.tif
140	digital photo	Setting of the southwestern part of the component part. View to the east.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau West setting SW part 24a 01 01.tif
		16b *North*						
141	scanned photo	Layered rubbish deposites down the slope of the ice-pushed moraine during excavation in 1972.	?-1972	unknown	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no	Nijmegen-Kops Plateau North layered rubbish deposit UBB-KOP_12934.tif
142	digital photo	View over the river plain from the north-eastern edge of the Kops Plateau. View to the northeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau North view over river plain 24b 02 01.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
143	digital photo	View down the steep slope of the ice-pushed moraine, just outside the fort. View to the northeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau North view down steep slope 24b 01 02.tif
		16c *East*						
144	digital photo	Setting of the component part. View to the west.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau East setting view to W 24c 01 07.tif
		16d *Kopse Hof North*						
145	digital photo	Setting of the component part. View along the street to the south of the component part. View to the west.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau Kopse Hof North 24d 01 02.tif
		16e *Kopse Hof South*						
146	digital photo	Setting of the component part. View to the south.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Nijmegen-Kops Plateau Kopse Hof South view to S 24e 01 01.tif
		17 Berg en Dal-aqueduct						
147	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	17 Berg en Dal-aqueduct.pdf
148	digital elevation model	Digital elevation model of the earthworks of the aqueduct, showing their elevated position.	08-2018	M. Polak, map data AHN3	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	no	Berg en Dal-aqueduct digital elevation model.tif
149	digital photo	Viewing platform at the upper end of the Kersten-dal component part. View to the south.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aqueduct viewing platform Kersten-dal 25e 01 03.tif
		17a *Mariënboom*						
150	digital photo	South-eastern end of a shallow channel excavated to allow the water to cross a low hill. The channel is flanked by narrow mounds of spoil on either side. View to the northwest.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aque-duct Mariënboom view to NW 25a 01 01.tif
		17b *Swartendijk*						
151	digital photo	View along the Swarten-dijk dam. View to the north.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aque-duct Swartendijk view to N 25b 01 07.tif
		17c *Cortendijk*						
152	digital photo	View to the Corten-dijk dam. View to the northeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aque-duct Cortendijk view to NE 25c 01 05.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
		17d *Louisedal*						
153	digital photo	View through the eastern part of the Louisedal earthwork, with the channel flanked by mounds of spoil on either side. View to the northeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aqueduct Louisedal view to NW 25d 01 01.tif
		17e *Kerstendal*						
154	digital photo	View through the northern end of the Kerstendal component part. View to the southwest.	10-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aqueduct Kerstendal view to SW IMG_7549.tif
155	digital photo	Presumed reservoir for the storage of water from the Kerstendal earthwork. View to the east.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-aqueduct Kerstendal water reservoir 25e 02 01.tif
		18 Berg en Dal-De Holdeurn						
156	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	18 Berg en Dal-Holdeurn.pdf
157	scanned drawing	Plan of the excavations in 1938–1942, with kilns ('terrein I') and a large building flanked by loam pits ('terrein II').	?-1946	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	yes	Berg en Dal-Holdeurn excavation plan.tif
158	digital photo	Sunken lane separating the two component parts. View to the norhtwest.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn sunken road 26 scheidingsweg 01.tif
159	digital photo	Information panel outside the hotel situated on the edge of the buffer zone.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn information panel outside hotel 26b 04 01.tif
160	digital photo	Display of photos of the 1938–1942 excavations in the lobby of the hotel situated on the edge of the buffer zone.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn excavation photos in hotel lobby 26b 04 04.tif
		18a *North*						
161	digital photo	Rugged terrain characteristic of the component part.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn North rugged terrain 26a 01 06.tif
		18b *South*						
162	scanned photo	Workers posing between the remains of large tile kilns excavated in 1938–1942. View to the west.	?-1940	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	yes	Berg en Dal-Holdeurn workers posing between kilns C 1825.tif
163	digital photo	Green area covering the remains of a large building. View to the northeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn South site of building 26b 01 01.tif

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
164	digital photo	Setting of the northern part of the component part. View to the north-west.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn South northern part 26b 02 01.tif
165	digital photo	Large loam pit near the centre of the compo-nent part. View to the southeast.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Berg en Dal-Holdeurn South loam pit 26b 03 09.tif
		19 Herwen-De Bijland						
166	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	19 Herwen-De Bijland.pdf
167	digital drawing	Simplified impression of river migration (light > dark) in the Middle Ages, with location of the com-ponent part.	?-2011	unknown	BAAC Archeologie en Bouwhistorie (NL)	BAAC Archeologie en Bouwhistorie, Graaf van Solmsweg 103, 5222 BS 's-Hertogen-bosch, Netherlands	no	Herwen-Bijland medieval river migration.tif
168	digital photo	Setting of the component part, located behind the trees. View to the northeast.	10-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Herwen-Bijland setting to NE IMG_7588.tif
169	digital photo	Information panel and replica of a gravestone, on the dike separating the component part from the quarry pool.	10-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Herwen-Bijland information panel IMG_7575.tif
170	digital photo	Replica of an Early Roman gravestone of a legionary soldier from De Bijland, recording that he was bur-ied 'at Carvium, near the groyne' (*Carvio ad molem*).	10-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Herwen-Bijland replica inscription IMG_7579.tif
171	digital photo	Information panel and wire mesh image of a Roman centurion, on the edge of the quarry pool with eroded remains of a Roman fort.	10-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes	Herwen-Bijland centurion wire mesh IMG_7616.tif
		20 Keeken						
172	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.		St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	20_Keeken.pdf
173	digital photo	Cropmarks of the NW cor-ner of the fort at Keeken from 2014.	05-2019	E. Rung, map data Geobasis NRW 2019	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	20-1 Keeken_aer-ial_photo_NW-corner.tif
174	digital drawing	Course of the defensive ditches of the fort at Keeken drwan from several aerial images	04-2019	E. Rung	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	20-2 Keeken_plan.tif
		21 Kleve-Reichswald						
175	digital drawing	Digital terrain model based on LiDAR scan of the Roman road embankment at Keeken-Reichswald.	12-2014	H. Ber-kel, map background Geobasis NRW 2015	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	21-1 Kleve-Reichs-wald_DTM.jpg

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
176	digital drawing	Cross-section of a Roman road near Kleve-Reichswald with the different layers of its substructure clearly visible.	12-2014	H. Berkel	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	21-2 Kleve-Reichswald_profile.jpg
		22 Till						
177	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	22_Till.pdf
178	digital drawing	Interpretation of the geophysical survey of the auxiliary fort Till-Steincheshof.	12-2011	M. Buess, M. Nieberle, M. Heinzelmann, map background Geobasis NRW	Universität zu Köln	Universität zu Köln Archäologisches Institut Albertus-Magnus-Platz 50923 Köln	no	22-1 Till_geomagnetic_plan.tif
179	digital image	Results of the geophysical surveys carried out at Till. Corner of a large marching camp with a single ditch (a) and corner of a fortress with several ditches (b).	08-2018	L. Berger, St. Bödecker, E. Rung, map background Geobasis NRW 2019	LVR-Amt für Bodendenkmalpflege im Rheinland; Deutsches Archäologisches Institut	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	22-2 Till_geomagnetic.pdf
		23 Kalkar-Kalkarberg						
180	digital drawing	Excavation plan of the Roman sanctuary for Vagdavercustis.	11-2010	H. Berkel	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	23-1 Kalkar-Kalkarberg_plan.tif
181	digital photo	Selection of finds from the sanctuary Kalkar-Kalkarberg.	06-2010	Ch. Linke	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 47–50, 46509 Xanten, Germany	no	23-2 Kalkar-Kalkarberg_finds.tif
		24 Kalkar-Bornsches Feld						
182	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	24_Kalkar-BornschesFeld.pdf
183	digital image	Results of the geophysical surveys carried out at Kalkar-Bornsches Feld (Burginatium).	08-2019	L. Berger, St. Bödecker, E. Rung, map background Geobasis NRW 2019	LVR-Amt für Bodendenkmalpflege im Rheinland; Deutsches Archäologisches Institut	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	24-1 Kalkar-Bornsches Feld_geomagnetic.jpeg
184	scanned drawing	Grave stele of C. Iulius Primus. Iulius was born in the civitas Treverorum (region of today Trier) and served in the ala Noricorum, a cavalry regiment raised in the Alpine region.	1839	Ph. Houben	free from rights	free from rights	free from rights	24-2 Kalkar-Bornsches Feld_drawing_gravestone.jpg
185	digital photo	Collection of Roman leather fragments, mainly parts of shoes found at the silted up Roman Rhine course near Kalkar-Bornsches Feld (*Burginatium*).	06-2014	J. Vogel	LVR-LandesMuseum Bonn	LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn	no	24-3 Kalkar-Bornsches Feld_finds.tif
186	digital photo	Structures of the fort at Kalkar-Bornsches Feld (*Burginatium*) reveal themselves as crop-marks in this aerial photograph. The combination of different survey methods, such as aerial photography, geophysics or LiDAR, are very likely to lead to the discovery of sites yet unknown.	07-2016	B. Song	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	24-4 Kalkar-Bornsches Feld_aerial_photo.jpg

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
		25 Uedem-Hochwald						
187	digital image	Digital elevation model of the temporary camps at Uedem-Hochwald. North at top.	06-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	25-1 Uedem-Hochwald_DEM.tif
188	digital photo	Detail of the temporary camps at Uedem-Hochwald. 3D-view of the digital terrain model. In the foreground camp 12 ▶25n. Facing North.	07-2019	St. Bödecker, map basis Geobasis NRW 2019	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	25-2 Uedem-Hochwald_DTM.tif
189	digital photo	Digital elevation model of the temporary camps at Wesel-Flüren. North at top.	08-2015	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	26-1 Wesel-Flueren.tif
		27 Xanten-CUT						
190	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	27_Xanten-CUT.pdf
191	digital drawing	Plan showing the *Colonia Ulpia Traiana* in the 2nd and 3rd centuries AD and the Late roman fortress *Tricensimae* in the 3rd and 4th century AD.	09-2009	H. Stelter	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstrasse 46–50, 46509 Xanten, Germany	no	27-1 Xanten-CUT_plan.jpg
192	digital photo	The flat-bottom ship from Xanten (b) may have also been used as a reaction ferry to cross the Rhine.	?	A. Thünker DGPh	LVR-Archäologischer Park Xanten / LVR-RömerMuseum	LVR-Archäologischer Park Xanten / LVR-RömerMuseum, Bahnhofstrasse 46–50, 46509 Xanten, Germany	no	27-2 Xanten-CUT_photo_ship.JPG
193	digital image	Artist's impression of the *Colonia Ulpia Traiana* in the 2nd century AD. The city's internal layout is defined by streets laid out in a grid pattern forming square blocks of buildings, so called *insulae*.	?-2015	Faber Courtial GbR	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 47–50, 46509 Xanten, Germany	no	27-3 Xanten-CUT_3d_reconstruction.jpg
194	digital photo	Timber structures of the harbour of Xanten-CUT during excavation.	?-1977	unkown	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no	27-4 Xanten-CUT_photo_harbour.tif
		28 Xanten-Fürstenberg						
195	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	28_Xanten-Fürstenberg.pdf
196	digital photo	Reconstruction model of the headquarter building (principia) of the legionary fortress Vetera castra at Xanten-Fürstenberg. The principia of Vetera was one of the largest Roman buildings along the Rhine.	?-2014	St. Arendt	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no	28-1 Xanten-Fuerstenberg_reconstruction_principia
197	digital photo	Cenotaph for the centurion Marcus Caelius, garrisoned at *Vetera castra* and killed in the battle of the Teutoburg Forest in AD 9.	08-2010	J. Vogel	LVR-LandesMuseum Bonn	LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn	no	28-2 Xanten-Fuerstenberg_gravestone_caelius.jpg
198	digital drawing	Results of the geophysical surveys carried out at Xanten-Fürstenberg. Indicated are the fortresses of the Augustan and Claudio-Neronian periods.	08-2019	L. Berger, St. Bödecker, F. Lüth, E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland; Deutsches Archäologisches Institut	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	28-3 Xanten-Fuerstenber_geophysics.pdf

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
199	digital drawing	Details of the results of the geophysical surveys carried out at the legion-ary fortress of Xanten-Fürs-tenberg. Rampart (A) and parade ground (B) of the latest period from the 60s AD. Roads (C) and baracks (B) of the preceeding early 1th century fortress.	08-2019	L. Berger, St. Bödecker, F. Lüth, E. Rung	LVR-Amt für Boden-denkmalpflege im Rheinland; Deut-sches Archäologi-sches Institut	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	28-4 Xanten-Fu-erstenberg_geo-physics_detail.tiff
		29 Alpen-Drüpt						
200	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	29_Alpen-Drüpt.pdf
201	digital photo	Cropmarks of the the structures of the fort at Alpen-Drüpt.	11-2016	B. Song	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	29-1 Alpen-Druept_aer-ial_photo.jpg
202	digital drawing	Roman fort (A) and marching camps (B-C) at Alpen-Drüpt (D: undated enclosure).	05-2017	St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	29-2 Alpen-Druept_plan.pdf
		30 Moers-Asberg						
203	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone of Moers-Asberg and Duisburg-Werthausen.	12-2019	St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	30_31_Moers_Duisburg.pdf
204	digital photo	Results of the excavations at Moers-Asberg (*Asciburgium*) with an interpretat-ion plan of the latest period (orange colour).	12-2016	S. Held, St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	30-1 Moers-As-berg_groundplan.pdf
205	digital photo	Information panel made by local residents at Moers-Asberg (Asciburgi-um) demonstrating the identification with the roman history at this site.	04-2019	St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	30-2 Moers-As-berg_panel.tif
206	digital photo	Glass vessels from a cremation burial unco-vered in Moers-Asberg (*Asciburgium*).	08-2009	M. Thuns	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	30-3 Moers-As-berg_glass.tif
		31 Duisburg						
207	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone of Moers-Asberg and Duisburg-Werthausen.	12-2019	St. Bödecker	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	30_31_Moers_Duisburg.pdf
208	digital drawing	Reconstructed oxbow of the Rhine of Late Roman date near the fort and *burgus* of Moers-Asberg ▶30 (*Asciburgium*) (1) and the fortlet of Duisburg-Werthausen ▶31 (2). The river's banks are partially still discernible in the field today (solid line) or their course can be conjectured based on archaeological, geoarchaeological (3, cor-ing) and archaeobotanical data (dashed line).	12-2019	R. Gerlach, R. Lubberich	LVR-Amt für Boden-denkmalpflege im Rheinland	LVR-Amt für Boden-denkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	31-1 Duisburg_fig_4.10.jpg

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
209	digital drawing	Results of the excavations at the fortlet of Duisburg-Werthausen.	04.2019	L. Berger, Th. Becker, map background Geobasis-NRW	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	31-2_Duisburg_grounplan.jpeg
210	digital photo	Today situation of the site of the fortlet of Duisburg-Werthausen facing south.	03.2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	31-3_Duisburg_situation.JPG
		32 Krefeld						
211	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	32_Krefeld-Gellep.pdf
212	digital photo	Horse burial from Krefeld-Gellep (*Gelduba*) on the battlefield of AD 69.	12-2017	H.-P. Schletter	Stadtarchäologie Krefeld	Stadtarchäologie Krefeld, Burg Linn, Rheinbabenstraße 85, 47809 Krefeld, Germany	no	32-1 Krefeld_photo_horse.JPG
213	digital photo	Excavation of one of the interval towers from Krefeld-Gellep (*Gelduba*).	?	Museum Burg Linn	Stadtarchäologie Krefeld	Stadtarchäologie Krefeld, Burg Linn, Rheinbabenstraße 85, 47809 Krefeld, Germany	no	32-2 Krefeld_tower.JPG
214	digital drawing	Layout Roman fort of *Gelduba* and archeological features of different types and dating in its vicinity.	04-2019	L. Berger	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	32-3 Krefeld_plan.tiff
		33 Neuss-Koenenlager						
215	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	33_Neuss-Koenenlager.pdf
216	scanned drawing	Early drawing of a section of a Roman aquaeduct in the fortress of Neuss by Constantin Koenen from the beginning of modern archeology.	?-1900	C. Koenen	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	33-1 Neuss-Koenenlager_profile_drain.tif
217	scanned photo	Constantin Koenen was one of the pioneers of Roman archaeology in the Rhineland and the first to conduct scientific excavations on the site of the legionary fortress of Neuss-Koenenlager (*Novaesium*).	?-1900	unknown	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	33-2 Neuss_Koenenlager_photo_koenen.tif
218	digital drawing	Neuss-Koenenlager (*Novaesium*) features the most complete ground plan of a legionary fortress known today. After its abandonment in c. AD 100, the site of the fortress was occupied by a cavalry fort).	05-2011	S. Held	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	33-3 Neuss-Koenenlager_plan.pdf
		34 Neuss-Reckberg						
219	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	34_Neuss-Reckberg.pdf
220	scanned plan	Plan of the fortlet at Neuss-Reckberg.	?-1895	C. Koenen	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	34-1 Neuss-Reckberg_plan.jpg

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
		35 Monheim-Haus Buergel						
221	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	35_Monheim-HausBürgel.pdf
222	digital photo	Outer wall of the Roman fortress at Monheim-Haus Bürgel preserved in the wall of the middle age manor.	04-2015	J. Vogel	LVR-Landesmuseum Bonn	LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn	no	35-1 Monheim-Haus Buergel _wall.jpg
223	digital photo	Upstanding remains and marked out parts of one of the defensive Roman towers.	07-2011	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	35-2 Monheim-Haus Buergel_tower.jpg
224	digital photo	Museum at Monheim-Haus Buergel with remains of the Roman wall.	07-2011	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	35-4 Monheim-Haus Buergel_museum.jpg
225	digital photo	Late Roman wine service from Monheim-Haus Buergel.	?-2010	A. Thünker DGPh	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	35-5 Monheim-Haus_bronze_vessels.jpg
		36 Dormagen						
226	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	36_Dormagen.pdf
227	digital photo	Roman cavalry mask and its reconstruction.	07-2019	J. Vogel	LVR-Landesmuseum Bonn	LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn	no	36-1 Dormagen_ mask.jpg
228	digital drawing	Plan of the fort at Dormagen.	04-2007	Th. Becker, St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	36-2_Dormagen_ plan.tif
		37 Köln-Praetorium						
229	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone of Köln-Praetorium and Köln-Deutz.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	37_38_Köln-Praetorium-Divitia.pdf
230	digital image	Artist's impression of the Praetorium on top of the preserved remains.	04-2019	Architectura Virtualis	MiQua – LVR-Jüdisches Museum im Archäologischen Quartier Köln	"LVR- Dezernat Kultur und Landschaftliche Kulturpflege, Stabsstelle 90.70 Gürzenich Quartier Augustinerstr. 10 50667 Köln "	no	37-1 Koeln-Praetorium_reconstruction.jpg
231	digital image	Digital visualisation of the remains of the Praetorium.	04-2019	Architectura Virtualis	MiQua – LVR-Jüdisches Museum im Archäologischen Quartier Köln	"LVR- Dezernat Kultur und Landschaftliche Kulturpflege, Stabsstelle 90.70 Gürzenich Quartier Augustinerstr. 10 50667 Köln"	no	37-2 Koeln-Praetorium_remains.png
232	digital drawing	Plan of the Praetorium. Blue: Late Roman period, red: city wall of the CCAA.	?-1985	Römisch-Germanisches Museum	Römisch-Germanisches Museum	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no	37-3 Koeln-Praetorium_plan.tif
		38 Köln-Deutz						
233	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone of Köln-Praetorium and Köln-Deutz.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	37_38_Köln-Praetorium-Divitia.pdf

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
234	digital photo	Interval tower of *Divitia*, preserved and accessable in a modern cellar.	04-2012	S. Walz	Römisch-Germanisches Museum	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no	38-1 Koeln-Deutz_tower.tif
235	digital photo	East gate of *Divitia*. The original remains of the wall are conserved by modern covering.	08-2014	U. Karas	Römisch-Germanisches Museum	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no	38-2 Koeln-Deutz_gate_visualisation.jpg
236	digital drawing	Plan of *Divitia*	11-2019	G. Wagner	Römisch-Germanisches Museum	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no	38_Köln-Deutz_plan.pdf
		39 Köln-Alteburg						
237	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	39_Köln-Alteburg.pdf
238	digital image	Results of ground-penetrating radar reveiling the parts of the headquarters of the fleet base at Köln-Alteburg	04-2019	G. Wagner	Römisch-Germanisches Museum	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no	39-1 Koeln-Alteburg_geomagnetic_plan.jpg
239	digital image	Excavation of a part of the baracks in the fleet base at Köln-Alteburg	?-2000	S. Siegers	Römisch-Germanisches Museum	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no	39-2 Koeln-Alteburg_photo_excavation.tif
240	digital photo	Gravestone of one Horus from Alexandria in Egypt who served in the fleet on the Rhine ('EX CLASSE') garrisoned in Köln-Alteburg.	08-2012	Ph. Groß	Forschungsarchiv für Antike Plastik der Universität zu Köln	Universität zu Köln Archäologisches Institut Albertus-Magnus-Platz 50923 Köln	no	39-9 Koeln-Horus.tif
		40 Kottenforst Nord						
241	digital drawing	Multi-hillshading of airborne laserscan data of the cluster of camps in the Kottenforst (northern part).	09-2019	St. Bödecker, data provided by Geobasis NRW 2018	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	40-Kottenforst-Nord_LiDAR.pdf
242	digital drawing	Plans of the cluster of camps in the Kottenforst (northern part).	09-2019	St. Bödecker, data provided by Geobasis NRW 2018	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	40-2_plans.jpeg
243	digital drawing	Comparison of the plans demonstrating similarites in the internal order of the clusters of camps in the Kottenforst (northern part)	09-2019	St. Bödecker, data provided by Geobasis NRW 2018	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	40-3 Kottenforst Nord_groundplans.tif
		41 Bonn						
244	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	12-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	41_Bonn.pdf
245	digital drawing	Plan of the legionary fortress of Bonn. In red: modern cellars and underground parking.	05-2009	St. Bödecker, data provided by Geobasis NRW 2018	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	41-1 Bonn_plan.tif
246	digital image	Artist's impression of the Roman legionary fortress at Bonn, facing south.	?-2016	L!NK 3D, Digitale Archäologie	LVR-LandesMuseum Bonn	LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn	no	41-2 Bonn_3d.jpg
		42 Kottenforst Süd						
247	digital image	3D-view of airborne laserscan data of the camps at Heiderhof, Kottenforst (southern part), comp. part (42j).	05-2009	St. Bödecker, data provided by Geobasis NRW 2018	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	42-1 Kottenforst Heiderhof_DTM.jpg

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights	File name
248	digital image	Hillshaded digital terrain model of two of the camps in the Kottenforst (southern part), component parts (40f–g).	05-2009	St. Bödecker, data provided by Geobasis NRW 2018	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	42-2 Kottenforst Süd_LiDAR.tif
		43 Iversheim						
249	digital photo	Protective building and museum of the Roman lime kilns at Iversheim.	06-2006	M. Thuns	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	43-1 Iversheim_ photo_museum. jpg
250	digital photo	One of the Roman lime kilns at Iversheim	03-2016	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	43-2 Iversheim_ photo_kiln.jpg
251	digital drawing	Plan of the lime kilns at Iversheim.	02-2019	L. Berger	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes	43_3 Iversheim_ plan.tif
		44 Remagen						
252	digital drawing	Overview of the elements of the archaeological complex, with projection of the nominated property and buffer zone.	04-2019	A. Schmidt	Generaldirektion Kulturelles Erbe Rheinland-Pfalz	Generaldirektion Kulturelles Erbe Rheinland-Pfalz Direktion Landesarchäologie Außenstelle Koblenz Niederberger Höhe 1 56077 Koblenz	no	44-1 Remagen map.tif
253	digital drawing	Plan of the excavated areas at Remagen.	?-2008	S. Friedrich, B. Streubel	S. Friedrich	Generaldirektion Kulturelles Erbe Rheinland-Pfalz Direktion Landesarchäologie Außenstelle Koblenz Niederberger Höhe 1 56077 Koblenz	no	44-2 Remagen plan.tif
254	digital photo	Photo of Early Roman timber revetment on the river bank at fort of Remagen.	?-1906	LVR-Landesmuseum Bonn	LVR-Landesmuseum Bonn	LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn	yes	44-3 Remagen_ photo_timber.jpg

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights
Executive Summary							
1	digital drawing	Location of the nominated serial property *Frontiers of the Roman Empire – The Lower German Limes*.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
Chapter 1							
1	digital drawing	Location of Germany and the Netherlands, with the extent of the Lower German Limes.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
2	digital drawing	Location of the federal states of North Rhine-Westphalia and Rhineland-Palatinate (Germany) and of the provinces of Gelderland, Utrecht and South Holland (Netherlands), with the extent of the Lower German Limes.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
3	digital drawing	Location of the nominated serial property *Frontiers of the Roman Empire – The Lower German Limes*, with indication of four sections illustrated in figs 1.4–1.7.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
4	digital drawing	Overview of section I of *Frontiers of the Roman Empire – The Lower German Limes* (Valkenburg-Centrum to Bunnik-Vechten) with numbers of the component parts/clusters.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
5	digital drawing	Overview of section II of *Frontiers of the Roman Empire – The Lower German Limes* (Arnhem-Meinerswijk to Kleve-Reichswald) with numbers of the component parts/clusters.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
6	digital drawing	Overview of section III of *Frontiers of the Roman Empire – The Lower German Limes* (Till to Krefeld-Gellep) with numbers of the component parts/clusters.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
7	digital drawing	Overview of section IV of *Frontiers of the Roman Empire – The Lower German Limes* (Neuss-Koenenlager to Remagen) with numbers of the component parts/clusters.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
Chapter 2							
1	digital drawing	Map of the Roman Empire under the Emperor Antoninus Pius (AD 138–161).	00-2008	Frontiers of the Roman Empire Culture 2000 project (2005-2008)	Frontiers of the Roman Empire Culture 2000 project (2005-2008)	n.a.	CC BY-NC 3.0
2	digital drawing	The existing property *Frontiers of the Roman Empire* (in blue) and the three envisaged additional properties for the European frontiers (in red).	04-2017	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
3	digital photo	Riverine landscape near Xanten. The site of the double-legionary fortress of Xanten-Fürstenberg ▶28 (centre right) situated today on the left bank of a now abandoned river course of medieval date (right), todays course of the Rhine (top right corner), the modern-day village of Xanten (top left corner) and Xanten-CUT ▶27 (far top left corner).	08-2015	B. Song	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
4	digital drawing	Neuss-Koenenlager (*Novaesium*) ▶33 features the most complete ground plan of a legionary fortress known today. After its abandonment in c. AD 100, the site of the fortress was occupied by a cavalry fort (ditch in purple).	05-2011	S. Held	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
5	digital photo	Relief from a burial monument today in the LVR-LandesMuseum Bonn depicting the horned and bearded personification of the river Rhine (Rhenus bicornis).	09-2009	J. Vogel	LVR-LandesMuseum Bonn	LVR-LandesMuseum Bonn, Colmantstr. 14–16, 53115 Bonn, Germany	no
6	digital drawing	Simplified model of a meandering river, showing the process of accretion and erosion in the inner and outer river bends.	11-2019	R. P. Reijnen, M. Polak	M. Polak	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights
7	digital photo	Section through the two ditches on the eastern side of the early operational base of Nijmegen-Hunerberg ▶15. View from the south.	00-2001	R. Mols	Gemeente Nijmegen (NL)	Gemeente Nijmegen, Bureau Archeologie en Bodemkwaliteit, Postbus 9105, 6500 HG Nijmegen, Netherlands	no
8	scanned photo	Section through Corbulo's canal near the Romeinsepad ▶4f. The clay filling of the c. 14 m wide and 1.2 m deep canal stands out clearly from the peat layers in which it was excavated.	00-1989	M. van Veen	M. van Veen	Gemeente Den Haag, Vrije Tijd en Recreatie, Afdeling Archeologie, Postbus 12651, 2500 DP Den Haag, Netherlands	no
9	scanned photo	Southwest corner of successive defensive walls of the fort at Valkenburg-Centrum ▶1. Left: track of horizontal beams constituting the base of an earthen rampart. Centre: sleeper beams of the fronts of two successive earth-and timber ramparts. Right: collapsed remains of a stone wall.	00-1948	RIjksuniversiteit Groningen	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no
10	digital photo	Large cargo ship (a) excavated at Utrecht-Limes road | De Balije ▶7c now exhibited in the site museum Utrecht-Hoge Woerd. The flat-bottom ship from Xanten (b) may have also been used as a reaction ferry for crossing the Rhine.	a: 11-2016; b: ?	a: ?; b: A. Thünker DGPh	a: Gemeente Utrecht (NL); b: LVR-Archäologischer Park Xanten	a: Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands; b: LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no
11	scanned photo	Excavation of a ship and the Limes road at Utrecht-Balije ▶7c in 1997. Front: rear part of a cargo vessel. Centre: parallel rows of posts lining the embankment of the Limes road, with horizontal planks on the inner sides. View from the north.	00-1997	M. Polak	M. Polak	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	yes
12	scanned image	Lithography showing the first scientific excavation (1827–1834) at Voorburg-Arentsburg ▶3 (*Forum Hadriani*), with foundations of stone buildings in the centre of the Roman town. The remains in the centre of the image are probably still preserved.	00-1828	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	CC-BY 3.0 license
13	digital drawing	Layout plans of military installations at common scale. Legionary fortress Neuss-Koenenlager (*Novaesium*) ▶33 (a), auxilliary fort Valkenburg-Centrum | Kerkweg ▶1a (period 6) (b) and fortlet Duisburg-Werthausen ▶31 (c). Football pitch as benchmark.	02-12-2019	E. Rung, St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
14	digital photo	Remains of leather shoes from Voorburg-Arentsburg ▶3 (*Forum Hadriani*): single-piece shoe (carbatina) for a child (a), soles of nailed sandals (b).	00-2008	A. Dekker	Universiteit van Amsterdam (NL)	Universiteit van Amsterdam, Faculteit Geesteswetenschappen, Archeologie, Postbus 94203, 1090 GE Amsterdam, Netherlands	no
15	digital photo	Visor of a cavalry helmet found in the northern outlet of the fossa Corbulonis just outside the northwest gate of the auxiliary fort of Leiden-Roomburg | Park Matilo ▶5a.	08-2013	C. Raddato		https://www.flickr.com/photos/carolemage/9570870150/in/set-72157635189135590	CC BY-NC-SA 2.0 licence
16	digital image on digital photo	Results of the geophysical surveys carried out at Xanten-Fürstenberg ▶28. Indicated are the fortresses of the Augustan and Claudio-Neronian periods.	08-2019	L. Berger, S. Bödecker, F. Lüth, E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
17	scanned drawing	Reconstructions of successive earth-and-timber walls of the Roman fort at Valkenburg-Centrum ▶1, phases 1–3 (left to right).	00-1944	R. Woudstra	Collectie Rijksuniversiteit Groningen/Groningen Instituut voor Archeologie (NL)	Rijksuniversiteit Groningen, Groningen Instituut voor Archeoogie, Poststraat 6, 9712 ER Groningen, Netherlands	no
18	digital photo	Aerial view of Monheim-Haus Bürgel ▶35. Parts of Late Roman masonry are still visible in the buildings' facade today.	14-05-2015	B. Song	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
19	digital elevation model	Digital elevation model of the temporary camps at Uedem-Hochwald ▶25. North at top.	06-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
20	digital image on digital photo	Gravestone of one Horus from Alexandria in Egypt who served in the Rhine fleet ('EX CLASSE') garrisoned in Köln-Alteburg ▶39.	08-2012	Ph. Groß	Forschungsarchiv für Antike Plastik der Universität zu Köln	"Universität zu Köln Archäologisches Institut Albertus-Magnus-Platz 50923 Köln"	no

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights
21	digital image on digital photo	Results of the geophysical surveys of the civil settlement (*vicus*) west of the fort of Kalkar-Bornsches Feld ▶24.	09-2019	L. Berger, S. Bödecker, E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
22	digital photo	Glass vessels from a cremation burial uncovered in Moers-Asberg (*Asciburgium*).	08-2009	M. Thuns	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
23	digital drawing	Cross-section of a Roman road near Kleve-Reichswald ▶21 with the different layers of ist substructure visible (nos 7–10).	12-2014	H. Berkel	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
24	digital photo	Tableware and coarse pottery made by and for the legio X stationed at Nijmegen.	00-2005	Th. van de Ven	Museum Het Valkhof, Nijmegen (NL)	Museum Het Valkhof, Postbus 1474, 6501 BL Nijmegen, Netherlands	no
25	digital photo	The remains of the Roman earthworks at Berg en Dal-aqueduct ▶17 are still clearly visible in the landscape today.	03-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
26	digital drawing	Artist's impression of the *Colonia Ulpia Traiana* in the 2nd century AD. The city's internal layout is defined by streets laid out in a grid pattern forming square blocks of buildings, so called insulae.	00-2015	Faber Courtial GbR	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no
27	digital photo	Selection of finds from the sanctuary Kalkar-Kalkarberg ▶23.	06-2019	Ch. Linke	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no
28	digital photo	Timber structures of the harbour of Xanten-CUT ▶27 during excavation.	00-1977	unknown	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no
29	digital photo	Frame saw (a) and block plane (b) recovered from a Roman cargo vessel excavated at the Utrecht-Limes road | De Balije ▶7c.	00-2003	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no
30	scanned photo	Section through the silted-up channel of the Roman Rhine at Alphen aan den Rijn. The dark area with the collapsed embankments dates to the Roman period, the lighter fine-layered upper fill is medieval.	00-2002	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no
31	digital image on digital photo	Results of the geophysical surveys carried out at Till ▶22. Corner of a large marching camp with a single ditch (a) and corner of a fortress with several ditches (b).	08-2018	L. Berger, S. Bödecker, E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
32	digital photo	Trial trench at the Herwen-De Bijland ▶19, excavated in December 2019 to verify the results of a coring survey. View from the southwest.	12-2017	J. Verhagen	J. Verhagen	VU Amsterdam, De Boelelaan 1105, 1081 HV Amsterdam, Netherlands	no
33	digital photo	Miniature glass head of Augustus. Today in the Römisch-Germanisches Museum of Köln.	03-2013	A. Wegner	Römisch-Germanisches Museum der Stadt Köln	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no
34	digital photo	Projecting towers, as attested at the east gate of the Late Roman bridgehead fort of Köln-Deutz ▶38 for instance, provided enough space to mount artillery. Today, the layout of the gate is marked out with masonry erected on top of the actual features.	21-08-2014	U. Karas	Römisch-Germanisches Museum der Stadt Köln	Römisch-Germanisches Museum der Stadt Köln, Roncalliplatz 4, 50667 Köln	no
35	digital drawing	Roman Emperors from Augustus to Carinus with their respective dates of reign.	06-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
36	digital photo	Brandmarks with the abbreviated names of the Emperor Caligula on staves of wine barrels found at Valkenburg (a) and Vechten (b).	a: 00-1974; b: 00-1997	a: F. Gijbels; b: M. de Jong	a: Universiteit van Amsterdam (NL); b: Provincie Utrecht (NL)	a: Universiteit van Amsterdam, Faculteit Geesteswetenschappen, Archeologie, Postbus 94203, 1090 GE Amsterdam, Netherlands; b: Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	no

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights
37	digital photo	Horse burial from Krefeld-Gellep (*Gelduba*) ▶32 on the battlefield of AD 69.	12-2017	H.-P. Schletter	Stadtarchäologie Krefeld	Stadtarchäologie Krefeld, Burg Linn, Rheinbabenstraße 85, 47809 Krefeld, Germany	no
38	digital photo	Inner face of a military diploma found at Elst, issued to a Batavian horsemen on his release from the auxiliary forces of the Roman army. The document lists nearly all auxiliary units present in Lower Germany in February AD 98.	06-2009	Museum Het Valkhof, Nijmegen (NL)	Museum Het Valkhof, Nijmegen (NL)	Museum Het Valkhof, Postbus 1474, 6501 BL Nijmegen, Netherlands	CC-BY-SA
39	digital drawing	Western and Eastern Roman Emperors' dates of reign.	06-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
40	scanned drawing	Coloured engraving of the Brittenburg made by Abraham Ortelius in 1581 showing the remains of the westernmost fort of the Lower German Limes, as seen at very low tide in the 16th century.	00-1581	A. Ortelius	(free)	https://upload.wikimedia.org/wikipedia/commons/3/39/Brittenburg-Ortelius-1581.jpg	yes
41	scanned drawing	Drawing of the remains of the Roman bridge over the river Erft in the vicinity of Neuss-Koenenlager (*Novaesium*) ▶33 made c. 1620/30.	00-1620/30	unknown	Clemens Sels Museum Neuss	Clemens Sels Museum Neuss, Am Obertor, 41460 Neuss, Germany	no
42	scanned manuscript	Fragment from a manuscript of the Historia Episcoporum Ultrajectensium by Wilhelmus Heda, published c. 1520–1524. In the left part a now lost building inscription dateable to AD 200–204 is mentioned, which was probably either found at Katwijk-Brittenburg or at Leiden-Roomburg. Utrecht University Library ms. 0 b 6, 12 verso	00-1520	W. Heda	Universiteit Utrecht (NL)	Universiteit Utrecht, Universiteitsbibliotheek, Postbus 80124, 3508 TC Utrecht, Netherlands	http://hdl.handle.net/1874/319029
43	digital photo	Roman finds and inscriptions incorporated in the facade ornamented the exedra-shaped tomb of Count John Maurits, Prince of Naussau (1604–1679) at Kleve. The finds have been replaced by reproductions in modern times.	07-2017	W. Wegener	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
44	scanned photo	Constantin Koenen was one of the pioneers of Roman archaeology in the Rhineland and the first to conduct scientific excavations on the site of the legionary fortress of Neuss-Koenenlager (*Novaesium*) ▶33.	1900 (?)	unknown	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
45	scanned photo	Grote Kerk at Elst ▶13 in 1948, heavily damaged by bombardments in 1944–1945. View from the northeast.	03-1948	unknown	Collectie Rijksdienst voor het Cultureel Erfgoed (NL), objectnummer 24772	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	CC-BY-SA 4.0
46	digital photo	Remains of the governor's palace in Köln ▶37 have been preserved underground and made accessible to the public.	03-2019	M. Jakobs	MiQua. LVR-Jüdisches Museum im Archäologischen Quartier Köln	MiQua. LVR-Jüdisches Museum im Archäologischen Quartier Köln, Ottoplatz 2, 50679 Köln, Germany	no
47	digital photo	Structures of the fort at Kalkar-Bornsches Feld (*Burginatium*) ▶24 reveal themselves as crop-marks in this aerial photograph. The combination of different survey methods, such as aerial photography, geophysics or LiDAR, are very likely to lead to the discovery of sites yet unknown.	07-2006	B. Song	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
48	digital photo	The course of the defensive wall of the fort of Utrecht-Domplein ▶10 is indicated by a band of weathering steel, into which the outlines of several sections of the Roman frontier have been engraved. When dark at night, light is projected from below while a fine water spray is projected upwards, creating the impression of a vertical line.	06-2009	B. ter Mull	DOMUnder Utrecht (NL)	DOMUnder, Domplein 4, 3512 JC Utrecht, Netherlands	no

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Chapter 3							
1	digital elevation model	Digital Elevation Model (DEM) of the area around the fort of Remagen ▶44 (*Rigomagus*) situated on the left bank of the Rhine. Somewhat up-stream, the rivulet Vinxtbach (Latin *Ad Fines*, 'At the borders') marked the border between the Roman provinces *Germania inferior* and *Germania superior* (dotted line). On the Rhine's opposite bank lies the endpoint (*Caput Limitis*) of the Upper German-Raetian Limes (dotted line).	09-12-2019	A. Schmidt	Generaldirektion Kulturelles Erbe, Direktion Landesarchäologie – Außenstelle Koblenz	Generaldirektion Kulturelles Erbe, Direktion Landesarchäologie – Außenstelle Koblenz, Niederberger Höhe 1, 56077 Koblenz, Germany	no
2	digital photo	Metal vessels salvaged during gravel extraction near Xanten. The unstratified finds are assumed to have got lost in the course of the Batavian Revolt AD 69/70.	08-04-2008	A. Thünker DGPh	LVR-Archäologischer Park Xanten	LVR-Archäologischer Park Xanten, Bahnhofstraße 46–50, 46509 Xanten, Germany	no
3	scanned photo	Partially collapsed revetments along the channel of the Roman Rhine at Bunnik-Vechten, excavated in 1932.	00-1932	unknown	Rijksmuseum van Oudheden, Leiden (NL)	Rijksmuseum van Oudheden, Rapenburg 28, 2311 EW Leiden, Netherlands	no
4	digital photo	Detail of the rear part of a Roman cargo vessel excavated at the Utrecht-Limes road |De Balije ▶7c, with standing walls of a deck cabin.	00-2003	unknown	Rijksdienst voor het Cultureel Erfgoed (NL)	Rijksdienst voor het Cultureel Erfgoed, Postbus 1600, 3800 BP Amersfoort, Netherlands	no
5	digital photo	Rim sherd of a ceramic vessel (Terra sigillata) found outside the fort of Krefeld-Gellep (*Gelduba*) bearing in Aramaic scripture the name of one Baresamias. In view of the linguistic features of the graffiti Baresamias presumbly originated from Osrhoene, a region in what is today the north of Syria.	11-05-2016	J. Vogel	LVR-LandesMuseum Bonn	LVR-LandesMuseum Bonn, Colmantstr. 14–16, 53115 Bonn	no
6	digital photo	Vehicle-towed sixteen channel magnetometer (SENSYS MAGNETO®-MX ARCH) used for surveying several Roman military sites along the Lower German Limes	12-2016	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
7	digital drawing	Assessment of the integrity of the 44 component parts/clusters of *Frontiers of the Empire – The Lower German Limes*.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
8	digital photo	The Cortendijk dam belonging to the Berg en Dal aqueduct ▶17c.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
9	digital photo	Copper-alloy casing of a military pickaxe, from the Rhine bed in front of the fort at Alphen aan den Rijn. The casing was marked by its owner, Aquilius Severus from the unit of Licinius.	09-2004	L. van Amerongen	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no
10	digital drawing	Assessment of the authenticity of the 44 component parts/cluster of *Frontiers of the Empire – The Lower German Limes*.	09-2019	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
11	digital photo	Wide view over the river plain to the northeast of the large army base of Nijmegen-Hunerberg ▶15.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
12	digital drawing	The envisaged Frontiers of the Empire World Heritage Cluster. Dark blue: inscribed frontier sections. Light blue: envisaged new sections for Europe. Grey: sections in the Near East and North Africa which may be added at a later stage.	03-2017	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
13	digital drawing	Management structure for the '*Frontiers of the Roman Empire* World Heritage Cluster'.	09-2018	G.I. Farkas	Prime Minister's Office, Department for Cultural Heritage Protection and Development (HU)	Prime Minister's Office, Department for Cultural Heritage Protection and Development, Táncsics M. u. 1, 1014 Budapest, Hungary	yes
14	digital photo	View on Hadrian's Wall in northern England, to the west of Housesteads.	10-2007	S. Fruitsmaak	public domain	https://commons.wikimedia.org/wiki/File:Hadrian%27s_Wall_west_of_Housesteads_3.jpg	yes

No	Format	Caption	Date of photo (mo/yr)	Creator	Copyright owner	Contact details of copyright owner	Non-exclusive cession of rights
15	digital drawing	Diagram of the Roman frontiers on three continents, with their main characteristics (frontier type, threats, garrisons). The attribution of frontier sections to five overarching groups is indicated in red.	03-2017	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
16	digital photo	The desert fort of Qasr al-Bashir in Jordan.	01-2013	B. Tabbah	B. Tabbah	https://commons.wikimedia.org/wiki/File:Qasr_Bashir.jpg	CC-BY-SA 4.0
17	scanned photo	Towpath cut into the rock of the Đerdap (Iron Gate) gorge in the river Danube near Kloadovo, Servia, before the water level was raised for a hydro-electric power station.	00-1965	unknown	Institute of Archaeology, Belgrade (RS)	Institute of Archaeology, Kneza Mihaila 35-IV, Belgrade, Serbia	no
18	digital drawing	Map with the locations and dates of positions held by P. Helvius Pertinax during his impressive career in public and military service before becoming emperor in AD 193.	08-2015	J. Fink	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
Chapter 4							
1	digital photo	Visualisation with modern materials of the fort of Leiden-Roomburg ▶5a, protecting the site against housing development.	10-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
2	scanned photo	Timber remains of a barrack of the fort at Alphen aan den Rijn, with each unit (A–B) housing eight soldiers. A: weapon room. B: sleeping room.	00-2001	unknown	Radboud Universiteit Nijmegen (NL)	Radboud Universiteit Nijmegen, Faculteit Letteren, Archeologie, Postbus 9103, 6500 HD Nijmegen, Netherlands	no
3	digital elevation model	Skid trails laid out in a regular pattern crossing the ramparts of Roman marching camps at Uedem-Hochwald ▶25. A detailed agreement with forest management authorities ensures a sustainable protection.	06-2019	St. Bödecker	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
4	digital photo	Stretches of original masonry of the Late Roman fortification are still visible in the facade of Haus Bürgel (▶35) today. The fortification's layout is marked out with cobblestones.	04-2015	J. Vogel	LVR-LandesMuseum Bonn	"LVR-LandesMuseum Bonn, Colmantstraße 14–16, 53115 Bonn"	no
5	digital photo	Interior of the protective building at the lime production site of Iversheim ▶35. In the foreground, the remains of one of the massive lime kilns.	03-2016	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
6	digital photo	Wall remains of two successive Roman temples underneath the Grote Kerk at Elst (▶13). Background: temple II. Right: temple I.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
7	digital photo	Excavation of the pile foundation of the stone defensive wall of the fort of Utrecht-Domplein ▶10, buried deep below medieval layers.	09-2008	unknown	Gemeente Utrecht (NL)	Gemeente Utrecht, Stadsplateau 1, 3521 AZ Utrecht, Netherlands	no
8	digital photo	Visualisation with modern materials of the northern defensive wall and an interval tower of the fort at Bunnik-Vechten (11a). In the background the A12 motorway.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
9	digital photo	Aerial view of the abandoned gravel extraction on the site of the legionary fortress Vetera II.	?	B. Song	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
10	digital drawing	Reconstructed oxbow of the Rhine of Late Roman date near the fort and burgus of Moers-Asberg ▶30 (*Asciburgium*) (1) and the fortlet of Duisburg-Werthausen ▶31 (2). The river's banks are partially still discernible in the field today (solid line) or their course can be conjectured (dashed line) based on archaeological, geoarchaeological (3, coring) and archaeobotanical data.	12-2019	R. Gerlach, R. Lubberich	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
11	digital photo	Visitors descending into the underground visitor attraction *DOMUnder*, presenting remains of the fort of Utrecht-Domplein ▶10.	11-2019	J. Savelkouls	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	

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Chapter 5							
1	digital drawing	Overview of relevant protective regulations relating to the component parts in the Netherlands under the Environment and Planning Act.	12-2019	Ch. Duntze, T. Leene	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
2	digital drawing	Overview of the joint structure for management of *Frontiers of the Roman Empire – The Lower German Limes*.	12-2019	T. Leene	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
Management Plan							
1	digital drawing	*Frontiers of the Roman Empire*.	04-2017	M. Polak	Nederlandse Limes Samenwerking (NL)	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
2	digital drawing	LGL in the Netherlands, North Rhine Westphalia and Rhineland-Palatinate.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
3	digital drawing	Overview of the position of the selected component parts of the LGL.	11-2019	E. Rung	LVR-Amt für Bodendenkmalpflege im Rheinland	LVR-Amt für Bodendenkmalpflege im Rheinland, Endenicher Straße 133, 53115 Bonn, Germany	yes
4	digital drawing	Organisational structure of the '*Frontiers of the Roman Empire – Lower German Limes*' World Heritage site	12-2019	Ch. Duntze	T. Leene	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
5	digital drawing	Management structure for the '*Frontiers of the Roman Empire* World Heritage Cluster'.	09-2018	G.I. Farkas	Prime Minister's Office, Department for Cultural Heritage Protection and Development (HU)	Prime Minister's Office, Department for Cultural Heritage Protection and Development, Táncsics M. u. 1, 1014 Budapest, Hungary	yes
6	digital drawing	Management structure for the Dutch Part of the Lower German Limes.	12-2019	Ch. Duntze	T. Leene	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes
7	digital drawing	Overview of relevant protective regulations relating to the component parts in the Netherlands under the Environment and Planning Act.	12-2019	Ch. Duntze	T. Leene	Nederlandse Limes Samenwerking, Provincie Utrecht, Archimedeslaan 6, 3584 BA Utrecht, Netherlands	yes

7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the property

In this section all documents are listed which are mentioned in chapters 5.b, 5.d and 5.e. The full texts of these documents may be found on DVD, in separate sections for the two State Parties, under the numbers indicated here.

General

1. Management Plan for *Frontiers of the Roman Empire – The Lower German Limes*, containing a general part for the whole of the nominated property and separate, national management plans for the German and Dutch parts.

Germany | Federal

1. Raumordnungsgesetz (ROG)
2. Gesetz über die Umweltverträglichkeitsprüfung (UVPG)
3. Baugesetzbuch (BauGB)
4. Kulturgutschutzgesetz (KGSG)
5. Bundeswaldgesetz (BWaldG)
6. Bundes-Bodenschutz-Gesetz (BBodSchG)
7. Bundesnaturschutzgesetz (BNatSchG)
8. Wasserhaushaltsgesetz (WHG)
9. Bundes-Immissionsschutzgesetz (BImSCHG)
10. Bundesfernstraßengesetz (FStrG)
11. Energiewirtschaftsgesetz (EnWG)
12. Allgemeines Eisenbahngesetz (AEG)

Germany | North Rhine-Westphalia

1. Verfassung für das Land Nordrhein-Westfalen
2. Denkmalschutzgesetz Nordrhein-Westfalen
3. Landesnaturschutzgesetz (LaNatSchG)
4. Straßen- und Wegegesetz des Landes Nordrhein-Westfalen
5. Landeswassergesetz (LWG)
6. Landesforstgesetz (LFoG)
7. Landesentwicklungsplan NRW (2016)
8. Regionalplan Regierungsbezirk Düsseldorf (2018)
9. Regionalplan Regierungsbezirk Köln (2018)
10. Development plans/Flächennutzungspläne for the individual municipalities

Germany | Rhineland-Palatinate

1. Denkmalschutzgesetz Rheinland-Pfalz
2. Landesentwicklungsprogramm Rheinland Pfalz (2008)
3. Regionaler Raumordnungsplan Mittelrhein – Westerwald (2017)
4. Flächennutzungsplan der Stadt Remagen (2004)

Netherlands

Protective designation

NATIONAL

Laws and policy documents valid until and after 1-1-2021

1. Heritage Act | Erfgoedwet [English translation]

Laws and policy documents valid until 1-1-2021

2. Monuments Act | Monumentenwet 1988
3. Spatial Planning Act | Wet op de ruimtelijke ordening
4. Spatial Planning (General Rules) Decree | Besluit algemene regels ruimtelijke ordening
5. National Policy Strategy for Infrastructure and Spatial Planning | Structuurvisie Infrastructuur en Ruimte 2012
6. Water Act | Waterwet

Laws and policy documents valid as of 1-1-2021

7. Environment and Planning Act | Omgevingswet [Dutch version and unofficial English translation]
8. National Environment Vision – Draft | Ontwerp Nationale Omgevingsvisie
9. Living Environment Quality Decree | Besluit kwaliteit leefomgeving
10. Living Environment Activities Decree | Besluit activiteiten leefomgeving

PROVINCE OF SOUTH HOLLAND

11. Environmental Vision | Omgevingsvisie Zuid-Holland
12. Environmental Ordinance | Omgevingsverordening Zuid-Holland
13. Policy document Cultural Heritage and Cultural Facilities 2017–2020 | Beleidsvisie Cultureel Erfgoed en Basisvoorzieningen Cultuur 2017–2020

PROVINCE OF UTRECHT

14. Provinciale Ruimtelijke Structuurvisie 2013–2028 (2016) | Environmental Vision
15. Provinciale Ruimtelijke Verordening 2013 (2016) | Environmental Ordinance

PROVINCE OF GELDERLAND

16. Omgevingsverordening Gelderland | Environmental Ordinance

Letters of approval of boundaries of component parts and buffer zones

The municipalities involved in the component parts in the Netherlands have been consulted about the boundaries of the component parts and buffer zones included in this nomination. Each municipality has confirmed its consent with the proposed boundaries in a letter.

17. Municipality of Arnhem
18. Municipality of Berg en Dal
19. Municipality of Bunnik
20. Municipality of Katwijk
21. Municipality of Leiden
22. Municipality of Leidschendam-Voorburg
23. Municipality of Nijmegen
24. Municipality of Overbetuwe
25. Municipality of Utrecht
26. Municipality of Voorschoten
27. Municipality of Woerden
28. Municipality of Zevenaar

Agreed plans

MUNICIPAL LAND-USE PLANS
The listed plans are those referred to in section 5.d and in the catalogue of component parts (Annex 1). Table 5.16 explains for each plan to which component part(s) it refers.

29. Arnhem: Stadsblokken-Meinerswijk 2015
30. Berg en Dal: Berg en Dal
31. Berg en Dal: Buitengebied Groesbeek
32. Berg en Dal: Stuwwal en beschermd dorpsgezicht Ubbergen
33. Bunnik: Buitengebied Bunnik 2011
34. Bunnik: Fort bij Vechten
35. Bunnik: Parapluherziening Buitengebied Bunnik
36. Katwijk: Bestemmingsplan Archeologie gemeente Katwijk
37. Katwijk: Landelijk gebied 1994
38. Katwijk: Valkenburg Dorp
39. Leiden: Roomburg
40. Leidschendam-Voorburg: Beheersverordening 2017 Leidschendam-Voorburg
41. Leidschendam-Voorburg: De Rietvink 2009
42. Leidschendam-Voorburg: Duivenvoordecorridor
43. Leidschendam-Voorburg: Rotterdamsebaan
44. Leidschendam-Voorburg: Veursestraatweg 2007
45. Leidschendam-Voorburg: Voorburg West/Park Leeuwenbergh
46. Nijmegen: Facetbestemmingsplan Archeologie
47. Nijmegen: Nijmegen Centrum-Binnenstad
48. Nijmegen: Nijmegen Groenewoud Kwakkenberg
49. Nijmegen: Nijmegen Oost
50. Overbetuwe: Elst, Centrum
51. Utrecht: Binnenstad
52. Utrecht: Chw Algemene regels over bouwen en gebruik
53. Utrecht: Het Zand
54. Utrecht: Hoge Woerd, 1e Herziening
55. Utrecht: Leidsche Rijn Utrecht 1999
56. Utrecht: Chw Veldhuizen (ontwerp)
57. Utrecht: Veldhuizen (geconsolideerd)
58. Utrecht: Vleuterweide, Vleuten
59. Voorschoten: Buitengebied (2010)
60. Voorschoten: Reconstructie Vlietwijk
61. Voorschoten: Voorschoten Oost
62. Woerden: Woerden binnenstad
63. Zevenaar: Buitengebied 2008

7.c Form and date of most recent records or inventory of property

Germany

In North Rhine-Westphalia the records of the archaeological monuments are held by the LVR-Amt für Bodendenkmalpflege im Rheinland and the Römisch-Germanisches Museum der Stadt Köln (for the area of the city of Cologne). In Rhineland-Palatinate the records of the archaeological monuments are held by the Generaldirektion Kulturelles Erbe Rheinland-Pfalz, Direktion Landesarchäologie, Außenstelle Koblenz.
All three institutions collect of and provide access to all relevant data for planning processes and for scientific research within GIS-based applications.

Netherlands

In keeping with section 3.3 of the Heritage Act, the National Monuments Register (Rijksmonumentenregister) is maintained by the Minister of Education, Culture and Science, and open for consultation by all. On behalf of the Minister, the Register is held and updated by the Cultural Heritage Agency.
The Register, containing over 60,000 national monuments, can be consulted online.[1] The online access provides basic information on the monuments, including their location on a map (only points, no boundaries). The Register is updated on a daily basis. Additionally, the register is available as a Web Feature Service (WFS)[2] and a Web Map Service (WMS)[3] in Nationaal Georegister, a national online platform

1 https://monumentenregister.cultureelerfgoed.nl/ (accessed 10.12.2019)
2 http://services.rce.geovoorziening.nl/rce/wfs?&request=GetCapabilities&service=WFS (accessed 1-12-2019).
3 http://services.rce.geovoorziening.nl/rce/wms?&request=GetCapabilities&service=WMS (accessed 1-12-2019).

for geographic information;[4] through these services the locations, boundaries and basic information of all monuments can be displayed in any Geographic Information System (GIS) which can process such services. The services are continually updated along with the Register.
Further, the location (only points, no boundaries) and information can be downloaded from the Nationaal Georegister in various other formats for use in Geographical Information Systems and online map environments; these downloadable layers are updated once a month.

7.d Address where inventory, records and archives are held

Germany

Records of the archaeological monuments for North Rhine-Westphalia are held by

LVR-Amt für Bodendenkmalpflege im Rheinland
Endenicher Str. 133
53115 Bonn
T +49 228 98340
F +49 228 9834119
M bodendenkmalpflege@lvr.de

Römisch-Germanisches Museum der Stadt Köln
(for the city of Cologne)
Roncalliplatz 4
50667 Köln
T +49 221 22124438 and 22124590
F +49 221 22124030
M rgm@stadt-koeln.de

Records of the archaeological monuments for Rhineland-Palatinate are held by

Generaldirektion Kulturelles Erbe Rheinland-Pfalz
Direktion Landesarchäologie
Außenstelle Koblenz
Niederberger Höhe 1
56077 Koblenz
T +49 261 66753000
F +49 261 66753010
M landesarchaeologie-koblenz @gdke.rlp.de

Netherlands

Inventories, records and archives referring to excavations and finds are for the most part held by the Cultural Heritage Agency and the provinces, and by the municipalities of Utrecht and Nijmegen, which possess an excavation licence and certified storage facilities. Minor archives are held by universities and the National Museum of Antiquities (not listed below).

Rijksdienst voor het Cultureel Erfgoed (Cultural Heritage Agency)
Smallepad 5
3811 MG Amersfoort
T +31 33 4217421
M info@cultureelerfgoed.nl
W www.cultureelerfgoed.nl

Provinciaal Archeologisch Depot Zuid-Holland
Kalkovenweg 23
2401 LJ Alphen aan den Rijn
T +31 070 4416611
M archeologischdepot@pzh.nl

Provinciaal Depot voor Bodemvondsten Utrecht
Vlampijpstraat 87a
3534 AR Utrecht
T +31 30 2583658
M depotutrecht@provincie-utrecht.nl

Provinciaal Depot voor Bodemvondsten Gelderland
Museum Kamstraat 45
6522 GB Nijmegen
T +31 24 3608805
M pdb@museumhetvalkhof.nl

Gemeente Nijmegen
Afdeling Stadsontwikkeling
Korte Nieuwstraat 6
6511 PP Nijmegen
T +31 14 024

Gemeente Utrecht
Ruimtelijke en Economische Ontwikkeling, Erfgoed
Stadsplateau 1
3521 AZ Utrecht
T +31 30 2860000

Reports and data of recent excavations (obligatory since 2007) and not a few from earlier ones are accessible in an online repository.[5]

[4] http://nationaalgeoregister.nl (accessed 10.12.2019).

[5] https://easy.dans.knaw.nl/ (accessed 1-12-2019).

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8 Contact information of responsible authorities

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8.a Preparer

General

Nederlandse Limes Samenwerking
(Dutch Limes Association)
T. Leene
p/a Provincie Utrecht
Archimedeslaan 6
3584 BA Utrecht
T +31 30 2589111
M tamar.leene@limessamenwerking.nl

Germany | North Rhine-Westphalia

LVR-Amt für Bodendenkmalpflege im Rheinland
St. Bödecker
Endenicher Straße 133
53115 Bonn
T +49 228 98340
F +49 228 9834119
M steve.boedecker@lvr.de

J. Wegmann
Endenicher Straße 133
53115 Bonn
T +49 228 983140
F +49 228 9834119
M jens.wegmann@lvr.de

L. Berger (until 10-2019)

Germany | Rhineland-Palatinate

Generaldirektion Kulturelles Erbe Rheinland-Pfalz
Direktion Landesarchäologie
Außenstelle Koblenz
P. Henrich
Niederberger Höhe 1
56077 Koblenz
T +49 261 66753000
F +49 261 66753010
M peter.henrich@gdke.rlp.de

Netherlands

Nederlandse Limes Samenwerking
(Dutch Limes Association)
M. Polak
p/a Provincie Utrecht
Archimedeslaan 6
3584 BA Utrecht
T +31 30 2589111
M m.polak@let.ru.nl

8.b Official local institution/agency

Germany | North Rhine-Westphalia

LVR-Amt für Bodendenkmalpflege im Rheinland
Endenicher Straße 133
53115 Bonn
T +49 228 98340
F +49 228 9834119
M bodendenkmalpflege@lvr.de

Römisch-Germanisches Museum
Roncalliplatz 4
50667 Cologne
T +49 221 22124438 and +49 221 22124590
F +49 221 22124030
M rgm@stadt-koeln.de
Germany | Rhineland-Palatinate

Generaldirektion Kulturelles Erbe Rheinland-Pfalz
Direktion Landesarchäologie
Außenstelle Koblenz
Niederberger Höhe 1
56077 Koblenz
T +49 261 66753000
F +49 261 66753010
M landesarchaeologie-koblenz @gdke.rlp.de

Netherlands

Nederlandse Limes Samenwerking
(Dutch Limes Association)
p/a Provincie Utrecht
Archimedeslaan 6
3584 BA Utrecht
T +31 30 2589111
M info@limessamenwerking.nl

8.c Other local institutions

Allard Pierson Museum
Oude Turfmarkt 127
1012 GC Amsterdam
The Netherlands

Torenmuseum Valkenburg
Castellumplein 1a
2235 CN Valkenburg
The Netherlands

Rijksmuseum van Oudheden
Postbus 11114
2301 EC Leiden
The Netherlands

Museum Swaensteyn
Herenstraat 101
2271 CC Voorburg
The Netherlands

Erfgoedhuis Zuid-Holland
Oude Delft 116
2611 CG Delft
The Netherlands

Museumpark Archeon
Archeonlaan 1
2408 ZB Alphen aan den Rijn
The Netherlands

Archeologiehuis Zuid-Holland
Archeonlaan 1a
2408 ZB Alphen aan den Rijn
The Netherlands

Ipse de Bruggen
Spoorlaan 19
2471 PB Zwammerdam
The Netherlands

Streekmuseum Reeuwijk
Oudeweg 3
2811 NM Reeuwijk
The Netherlands

Stadsmuseum Woerden
Kerkplein 6
3441 BG Woerden
The Netherlands

Castellum Hoge Woerd
Hoge Woerdplein 1
3454 PB Utrecht
The Netherlands

Centraal Museum
Agnietenstraat 1
3512 XA Utrecht
The Netherlands

Waterliniemuseum Fort bij Vechten
Achterdijk 12
3981 HE Bunnik
The Netherlands

Landschap Erfgoed Utrecht
Bunnikseweg 25
3732 HV De Bilt
The Netherlands

Museum Dorestad
Markt 24
3961 BC Wijk bij Duurstede
The Netherlands

Streekmuseum Baron van Brakell
Provincialeweg 21
4032 NZ Ommeren
The Netherlands

Nederlands Openluchtmuseum
Hoeferlaan 4
6816 SG Arnhem
The Netherlands

Erfgoed Gelderland
Westervoortsedijk 67-D
6827 AT Arnhem
The Netherlands

Stadsmuseum Hof van Hessen
Vierakkerstraat 39
6851 BB Huissen
The Netherlands

Tempel | Kerk Museum Elst
Grote Molenstraat 2
6661 DJ Elst
The Netherlands

Liemers Museum
Kerkstraat 27
6901 AA Zevenaar
The Netherlands

De Bastei
Waalkade 83
6511 XR Nijmegen
The Netherlands

Museum Het Valkhof
Postbus 1474
6501 BL Nijmegen
The Netherlands

Gelders Archeologisch Centrum
Museum Kamstraat 45
6522 GB Nijmegen
The Netherlands

Museumpark Orientalis
Profetenlaan 2
6564 BL Heilig Landstichting
The Netherlands

Städtisches Museum Kalkar
Grabenstraße 66
47546 Kalkar
Germany
T +49 2824 13118
M museum.kalkar@kalkar.de
W www.kalkar.de/de/inhalt/staedtisches-museum
Germany

LVR-Archäologischer Park Xanten/ LVR-RömerMuseum
Bahnhofstraße 46–50
46509 Xanten
Germany
T +49 2801 7120
M apx@lvr.de
W www.apx.de

Museum Burg Linn
Rheinbabenstraße 85
47809 Krefeld
Germany
T +49 2151 155390
M burglinn@krefeld.de
W www.museumburglinn.de

Clemens-Sels-Museum
Am Obertor
41460 Neuss
Germany
T +49 2131 904141
F +49 2131 902472
M service@clemens-sels-museum-neuss.de
W www.clemens-sels-museum-neuss.de

Haus Bürgel
Urdenbacher Weg
40789 Monheim am Rhein
Germany
T +49 2173 9518930
M hausbuergel@monheim.de
W www.hausbuergel.de/roemisches-museum

Römisch-Germanisches Museum
Roncalliplatz 4
50667 Cologne
Germany
T +49 221 22124438 and +49 221 22124590
F +49 221 22124030
M rgm@stadt-koeln.de
W www.roemisch-germanisches-museum.de

MiQua. LVR-Jüdisches Museum im Archäologischen Quartier Köln
Augustinerstraße 10
50667 Cologne
Germany
M miqua@lvr.de
W www.lvr.de/de/nav_main/kultur/museen/miqua/miqua.jsp

LVR-LandesMuseum Bonn
Colmantstraße 14–16
53115 Bonn
Germany
T +49 228 2070351
M info.landesmuseum-bonn@lvr.de
W www. landesmuseum-bonn.lvr.de

Römisches Museum Remagen
Kirchstraße 9
53424 Remagen
Germany
T +49 2642 20187
M k.kleemann@remagen.de
W www.roemer-spuren.de

Römerwelt Rheinbrohl, Stiftung Caput Limitis
Arienheller 1
56598 Rheinbrohl
Germany
T +49 2635 921866
M stiftung@roemer-welt.de
W www.roemer-welt.de

Landesmuseum Koblenz
Festung Ehrenbreitstein
56077 Koblenz
Germany
T +49 261 66750
M landesmuseum-koblenz@gdke.rlp.de
W www.tor-zum-welterbe.de/landesmuseum-koblenz/

8.d Official web address

www.limeswerelderfgoed.nl

www.bodendenkmalpflege.lvr.de/de/projekte/niedergermanischer_limes_1/niedergermanischer_limes.html

www.deutsche-limeskommission.de

9 Signed on behalf of the State Parties

Paris, 09.01.2020

H. E. Hans Carel Wesseling
on behalf of the Netherlands

Kingdom of the Netherlands

Paris, 09.01.2020

H. E. Dr. Peter Reuss
on behalf of Germany

Federal Foreign Office

9 Signatures - Involved Authorities

NETHERLANDS

Leiden, 06.12.2019

Mrs drs Ingrid K. van Engelshoven
Minister of Education, Culture and Science

Rijksdienst voor het Cultureel Erfgoed
Ministerie van Onderwijs, Cultuur en Wetenschap

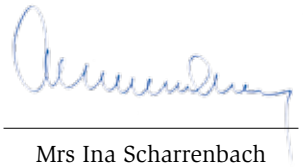
provincie Gelderland

provincie ZUID HOLLAND

PROVINCIE :: UTRECHT

GERMANY | NORTH RHINE-WESTPHALIA

Düsseldorf, 05.12.2019



Mrs Ina Scharrenbach
Minister of Regional Identity, Communities and Local Government, Building and Gender Equality of the Land of North Rhine-Westphalia

Ministry for Regional Identity, Communities and Local Government, Building and Gender Equality of the Land of North Rhine-Westphalia

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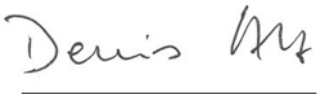
Mainz, 04.12.2019



Mr Dr. Denis Alt
Secretary of State, State Commissioner for UNESCO World Heritage in Rheinland-Palatinate

RheinlandPfalz
MINISTERIUM FÜR WISSENSCHAFT, WEITERBILDUNG UND KULTUR