Research on the Urban and Suburban Topography of Aquileia

Stefan Groh

Austrian Archaeological Institute,
Department of Studies of Central European Archaeology, 1190 Vienna, Austria
stefan.groh@oeai.at

Abstract. In 2011, the Department of Studies of Central European Archaeology of the Austrian Archaeological Institute started a new research project in the western part of the ancient town of Aquileia. The research project will focus on the diachronic development of the western part and the *suburbium* of the ancient town. The results of the first field campaigns in 2011 allow new conclusions regarding the urban development. Below the circus, constructed towards the end of the 3rd century, a suburban workshop quarter adjacent to a river or a canal could be recognised. In the south it was possible to identify a structure which is similar to the warehouses of the river harbour in the east of the city at the Natisone. Thus, in the Roman Imperial period, there must have been at least two harbour ports at Aquileia, namely at the Canale Anfora in the west and at the Natisone in the east. Therefore, with the abandonment of the workshop quarter and of the harbour at Canale Anfora in the late 3rd century A.D., and with the new construction of the city wall which enclosed the circus, the entire area underwent a transformation in function from suburban to urban area.

Keywords: Aquileia, Survey, Geophysics, GIS, Urbanism.

1 Introduction

In 2011, the Department of Studies of Central European Archaeology of the Austrian Archaeological Institute started a new research project in the western part of the ancient town of Aquileia. In collaboration with the Ministero per i Beni e le Attività Culturali (Soprintendenza per i Beni Archeologici del Friuli Venezia Giulia), the project addresses aspects of the urban topography, culture and economy of Aquileia. The project “Suburban and urban structures in the western part of Aquileia” will mainly

involve non-invasive archaeological methods to study the diachronic development of this trading metropolis at the upper Adriatic Sea.

Founded as a colonia latina in 181 B.C., Aquileia played a key role in the economical and political development of the northern provinces. As the political and administrative centre of the Regio X, it formed the starting (or end-)point of the amber route, and its river ports were a trading hub for the export of Mediterranean goods to the north. Besides, Aquileia also served as a central logistic base for the military campaigns in Illyria, Pannonia and Dalmatia under the reign of Octavian and Tiberius in the 1st centuries B.C. and A.D. as well as in the Marcomannic Wars in the 2nd c. A.D. and in Late Antiquity (Fig. 1) [4].

The research project will focus on the diachronic development of the western part of the ancient town and the suburbium of Aquileia. The dynamic development processes of a town are usually most tangible in its outer zones. In Aquileia, the gradual extension of the town is revealed by the spatial and chronological sequence of the Republican, Imperial and Late Antique-Byzantine defence walls. The settlement structures of the areas both in- and outside the fortifications illustrate the functional change of urban and suburban space.

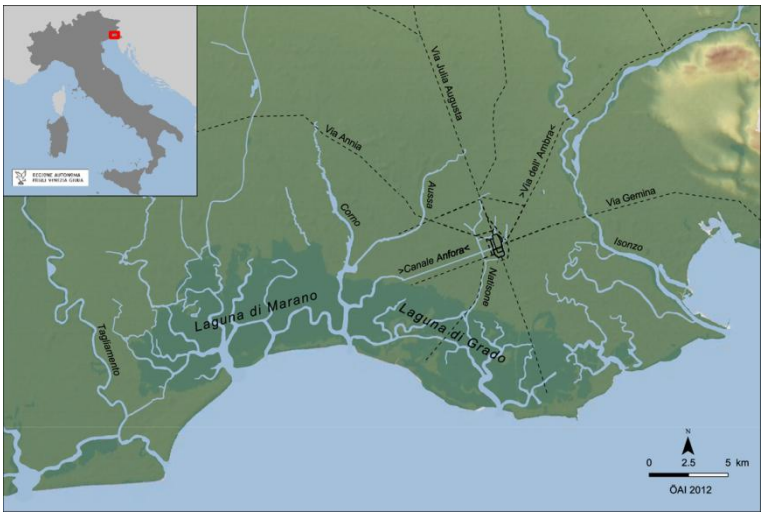

Fig. 1. The topography of Aquileia and the surrounding area with the main connection routes (Source: original street grid: [13], digital elevation model: Regione Autonoma Friuli Venezia Giulia: Cartografia (ÖAI, graphics: V. Lindinger)).

2 Results of the Geophysical Survey 2011

The initial geophysical (geomagnetic and Ground Penetrating Radar) survey carried out in 2011 covered an area of 25,7 ha (Fig. 2).1 Especially large scale geomagnetic surveying proved an efficient method to answer many questions about the urban topography of Aquileia, as first results already shed new light on the development of the town.2 The geophysical surveys have yielded important new insights into the street grid, river channels and canals, the urban and suburban building pattern and the defence system in the north-western part of the town. The survey area covers the circus and the area between the latter and the forum in the south, as well as the adjacent parts of the Late Antique ramparts in the north and west (Fig. 3).

Fig. 2. Geophysical survey by the Austrian Archaeological Institute 2011 in the north-western part of Aquileia (Italy). The campanile of the cathedral in Aquileia in the background (Source: ÖAI, photo: V. Lindinger).

[1] The magnetometry and Ground Penetrating Radar (GPR) surveys started in the north-western part of Aquileia in two campaigns from 28 March to 5 April and from 7 to 15 November 2011 respectively. The surveys were supervised by V. Lindinger and conducted by D. Hagmann, A. Langendorf, A. Schinagl and M. Vlach. The geomagnetic survey was carried out using a Geoscan FM 256 fluxgate gradiometer with an accuracy of 0.1 nT. Recordings were taken at 0.125 m sample intervals and 0.5 m traverse intervals. The measurements were triggered by a time pulse at a speed of 0.7-0.8 m/sec. The data were processed using the software program Geoplot 3.00 t (Geoscan Research). The GPR-survey was carried out with a GSSI SIR instrument equipped with a 400 MHz antenna at 0.5 m traverse intervals and 0.05 m sample intervals (time windows 60 ns, band-pass filter 100-800 MHz, dielectric constant 5, samp/sca 512, scans/sec 120). The data were processed using the software program RADAN 6.5.3.0. All data are managed in a GIS (ArcGIS 10 by ESRI) at the Austrian Archaeological Institute.

[2] The quality of the GPR measurements in Aquileia is highly dependent on the depth of the water table. A high water table causes reflections which reduce the value of the measurements.

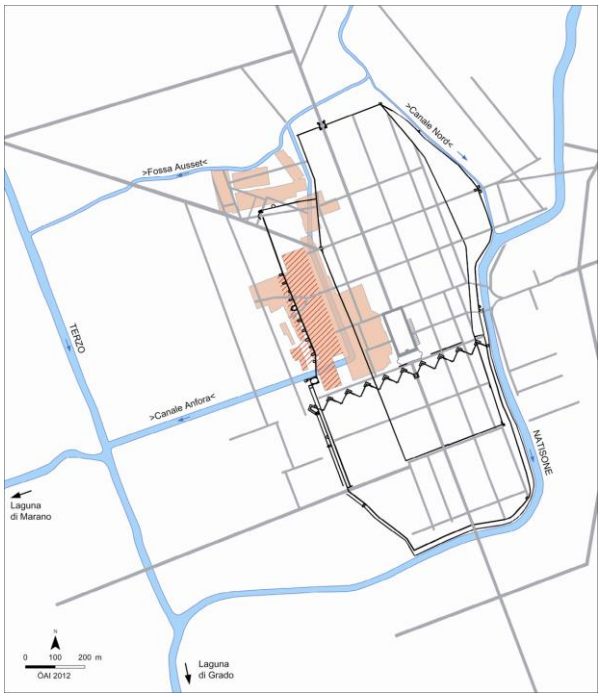

Fig. 3. Town plan of Aquileia showing the system of rivers and canals and the street grid (red: areas surveyed with magnetometry in 2011; hatched: area surveyed with GPR in 2011). (Source: after [3, 7] (ÖAI, graphics: V. Lindinger)).

2.1 New results on the urban topography of Aquileia

Aquileia and the Sea. The area between the Late Antique town wall M2 and the confluence of the "Canale Anfora" with the river Terzo in the westernmost part of the town – an area of about 40 ha which has hitherto hardly been studied – is of special importance for the understanding of Aquileia's urban topography. The "Canale Anfora" and the river Natisone connected Aquileia to the lagoon and thus to the open sea. Until the 3rd c. A.D. this presented the main access route to the lagoon and beyond that, to the Adriatic Sea. However, the "Canale Anfora" did not only lead to the sea, but was also connected via a canal system to the lagoons at the western Adriatic coast up to Chioggia [10]. It can be assumed that the major part of the transfer of goods to and from Aquileia took place via this canal until well into the 3rd c. A.D. Its mouth in the "Laguna di Marano" is nowadays located 6 km west of the ancient town centre (see Fig. 1).

The "Canale Anfora" joins a system of rivers and canals surrounding the town (cf. Fig. 3) [6, 8]. This includes the river Terzo in the west, the Natisone in the south and east, the "Canale Nord" in the northeast and the "Fossa Ausset" in the north [8, 21].

An extensive harbour on the river Natisone has been excavated in the eastern part of the town. The extension of the "Canale Anfora" points directly to the crossing of the cardo and decumanus in the centre of the forum (cf. Fig. 3). In Antiquity, the "Canale Anfora" ran up to the town. The question, to what extent it was used in what period, was still being discussed at the start of our project; in any case, the canal seems to have connected to a tributary of the Natisone in the town's centre ("Mill-stream") [9]. Topographically, Aquileia lay on an 'island' surrounded by rivers and canals [3, 7, 11, 22].3 The course of these rivers determined the centuriatio, the extent and infrastructure of the town [18-19]. The Republican town wall was already adjusted to this special natural geographical situation, as the irregular wall segments follow the riversides [8, 13, 20]. Environmental factors such as the progressive sedimentation of the canals and rivers may have had substantial impact on the urban geography of Aquileia in the course of its history.

A new River Channel: Geophysics and Archaeological Evidences. The geomagnetic data of 2011 reveal a river channel, which was filled up by sedimentation in Antiquity. It turns north in the extension of the "Canale Anfora" near the circus and from there it follows the course of the Republican town wall up to its mouth in the "Fossa Ausset" (Fig. 4). Before it turns north, this canal/river is ca. 20 m wide; after the turn, up to its mouth, it gets narrower to ca. 15 m. The "Canale Anfora", parts of which have been excavated east of its mouth in the Terzo in 1987-8, had an average width of 16 m and was about 4 m deep [1]. The distance between the Republican town wall M1 and the canal is ca. 10 m in the north and ca. 14 m in the south. Apparently, the "Canale Anfora" joined a river course, which delimited the Republican town to the west. The area west of this river shows a clear depression; the Republican town was laid out on the higher, eastern bank.

The following archaeological evidence supports this interpretation of the geophysical data (Fig. 5): the northwestern part of the survey area contains a wall segment of ca. 40 m, which was partly excavated. It lies outside the Republican town wall and follows the river course, so that it can be interpreted as its eastern quay wall. 26 m to the west of this wall, there is a residential building with a mosaic (showing the head of a triton), which shares the same orientation (transversal to the Republican/Imperial street grid). The mosaic can be dated to the beginning of the 3rd c. A.D. The house was abandoned when the circus was built [3, 12].

[3] The town plan of Aquileia, which is presented in this paper, is mainly based on previous versions by L. Bertacchi (2003). Some additions could be made based on the interpretation of aerial photographs by M. Buora and V. Roberto (2010), while the geophysical survey carried out by the Austrian Archaeological Institute revealed hitherto unknown parts of the street grid. The reconstruction of the river courses is based on the research of M.-B. Carre, with additional information from the geophysical survey data. So far, there is no conventional naming or numbering of the streets and insulae in Aquileia. The (discussed) diachronic development of Aquileia's layout was last pointed out by C. Tiussi (2009).

The excavations of 1891-92 by A. Maionica and more recently in 1996 already disclosed walls and a drain consisting of amphoras, which were interpreted as wharf elements, opposite the confluence of the "Canale Anfora" and the "Fossa Ausset". The excavated features imply that the banks of the canals and rivers to the north of the town were largely built up with wharves at least until the 3rd c. A.D., and that there probably was a bridgehead opposite the mouth of the "Canale Anfora" [16, 21].

During excavations at the zigzag wall M4, south of the circus, numerous covered sewers running off to the north were investigated. A central, ca. 1.6 m wide sewer, which L. Bertacchi even found to be still functioning, was joined by two narrower, secondary sewers [3]. The geophysical data reveal that the main sewer continues 74 m to the northwest and leads to the "Canale Anfora".

Fig. 4. Geomagnetic survey by the Austrian Archaeological Institute 2011 (Cadastral map: Agenzia del territorio; geophysics: ÖAI 2011 (Source: ÖAI, graphics: V. Lindinger)).

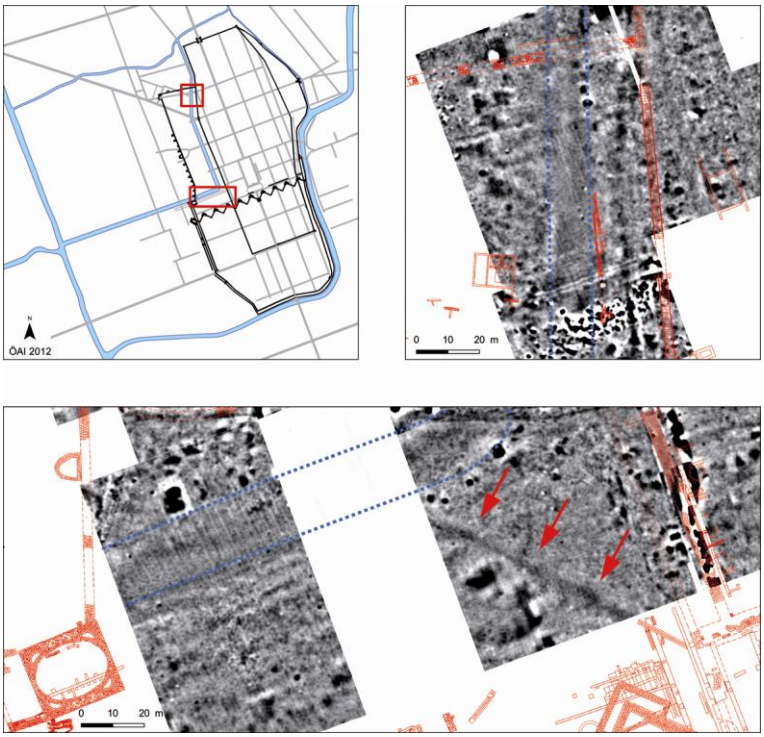

Fig. 5. The "Canale Anfora" in the geophysical data: quay walls and residential buildings along the canal in the northern part of the town, sewers in the central part of the town (Source: street grid and town plan after [3] (ÖAI, graphics: V. Lindinger)).

A new Harbour Port along the "Canale Anfora". The geophysical data also reveal two parallel, linear structures spaced ca. 10 m apart, which run from the Late Antique gate with an oval court to the east (Fig. 6). They can be traced over a distance of 167 m up to the Republican town wall. On the basis of the GPR-data the anomalies can be interpreted as walls. Part of the southern wall (with pilaster strips on the outer (south) face) has been excavated over a length of 26 m underneath the gate. The twin walls, which run at ca. 8 m parallel to the "Canale Anfora", can be seen to continue for about 96 m to the west on aerial photographs [5]. Thus, this hall has a total length of at least 290 m. The ground plan and the construction of the southern wall with its pilaster strips are similar to the western hall of the river harbour on the Natisone in the eastern part of the town [9]. The geophysical survey seems to have revealed another wharf structure on the southern bank of the "Canale Anfora" in the western suburbium of the Imperial town, which typologically resembles the contemporaneous western hall of the Natisone harbour. The latter is 296 m long, 13 m wide and also has pilaster strips on the eastern, outer wall. The hall is separated from the river Natisone by an 8-15 m wide quay. From this it can be concluded that Aquileia had at least two docks with storage halls in the period between the Republican era and the abandon-

ment of the harbour south of the circus in the 3rd c. A.D. (see below). They were located level with the forum in the western and eastern part of the town. The harbour on the "Canale Anfora", which stretched to about 100 m from the forum, was undoubtedly connected to the decumanus by a town gate and thereby well integrated in the intra-urban street system. Both the macellum and comitium, which were located north of the forum, are also closer to the harbour on the "Canale Anfora" than to the Natisone.

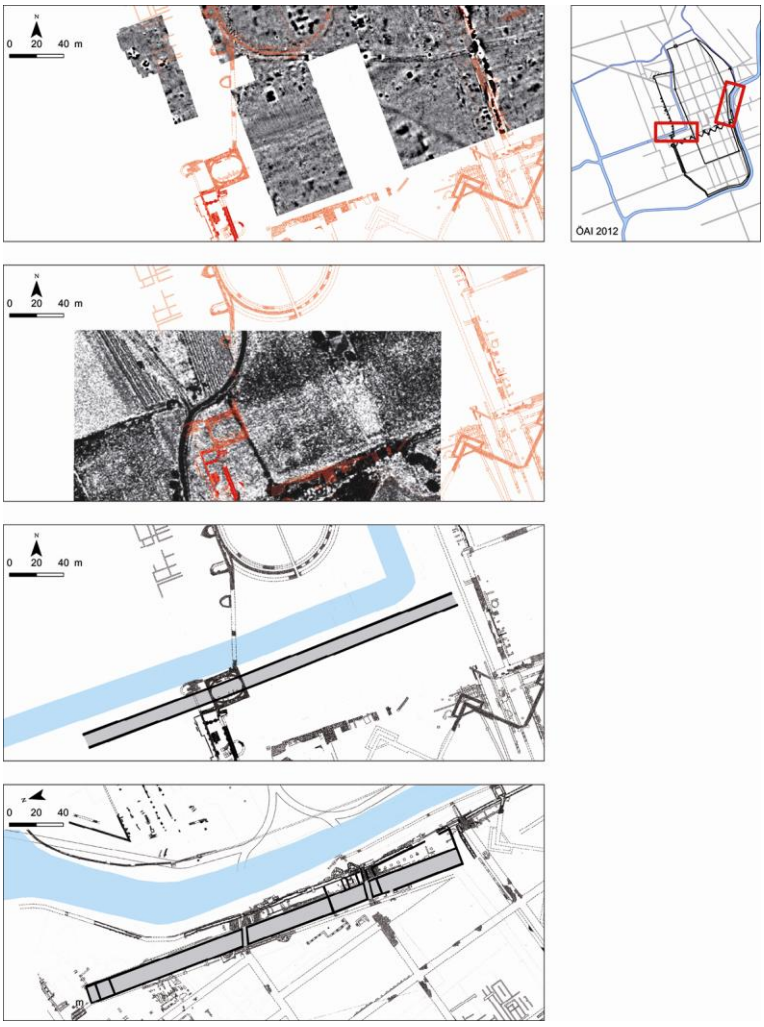

Fig. 6. The harbour on the "Canale Anfora" in the geophysical data 2011 and on an orthophoto from 2003. Interpretation and comparison with the harbour from the 1st c. A.D. on the Natisone in the eastern part of the town (Source: street grid and town plan after [3]; aerial photo [5] (ÖAI, graphics: V. Lindinger)).

An Artisan Quarter under the Circus. To the west of the N-S oriented canal segment, strong magnetic anomalies encountered in the geomagnetic survey indicate the presence of workshops. This artisan quarter stretches from the "Fossa Ausset" to the "Canale Anfora" over a length of ca. 730 m along the canal. The results of the survey show workshop buildings oriented towards the canal on strip plots underneath the later circus. The individual buildings in this quarter contain kiln batteries (cf. Fig. 4)4. The workshops benefited from the proximity of the main water resources and the favourable location close to the town's centre and between the harbour on the "Canale Anfora" and the Via Annia. A road leading from the town to the west across the canal leads more or less through the centre of the suburban artisan quarter between the Via Annia and the "Canale Anfora" [3].5 Ca. 100 m west of the Republican town wall M1, the street splits into two branches, which lead at least 70 m apart.

Prior to the extension of the modern graveyard, rescue excavations were carried out in the area between the Late Antique town wall and the circus from 1999-2002. The oldest identified structures were workshops abandoned at the end of the 2nd c. A.D. They were succeeded by residential structures aligned with the street and building grid of Aquileia in the 3rd c. A.D., which in turn were demolished for the construction of the circus [14]. The entire Imperial, suburban artisan and residential quarter was given up when the circus was constructed [17].

The town expanded over the area of the "Canale Anfora" after the connection of the latter to the "Fossa Ausset" had silted up (Fig. 7). The filling of the canal appears rather homogenous and seems to contain little anthropogenic waste material6. The silting of the river system also lead to the abandonment of the harbour. Excavations of the "Canale Anfora", which were done ca. 400 m west of the Late Antique town wall in 2004-5, have showed that the canal gradually silted up from the mid of the 1st c. A.D. The abandonment and complete silting can be dated to the central decades of the 3rd c. A.D. on the basis of African sigillata of the Hayes 14B and 31 type. This corresponds to the radiocarbon dates of wooden piles from the canal dated to cal. A.D. 233 ± 29 [15].

The circus was built over the former artisan quarter in a natural depression. It could be accessed from the north via the Via Annia [2]. The former area of the "Canale Anfora" formed an open space surrounding the circus and was hence not built over. This open space made it possible for large crowds to access the circus. Hence the choice of the circus' location seems to have been based on topographical and infrastructural criteria. At present we do not know whether the workshops west of the canal were still in use at that time.

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[4] The strongly, thermoremanently magnetised features reflect various artisanal activities.

[5] This street runs in the direction of the so called round temple 118, which contained the inscription *Tampia L. F./Diovei*. The mosaic inside the temple was not made before the 3rd c. A.D. The temple was later turned into a large, U-shaped tower of the Late Antique town wall.

[6] Waste material would cause a considerably higher magnetic contrast.

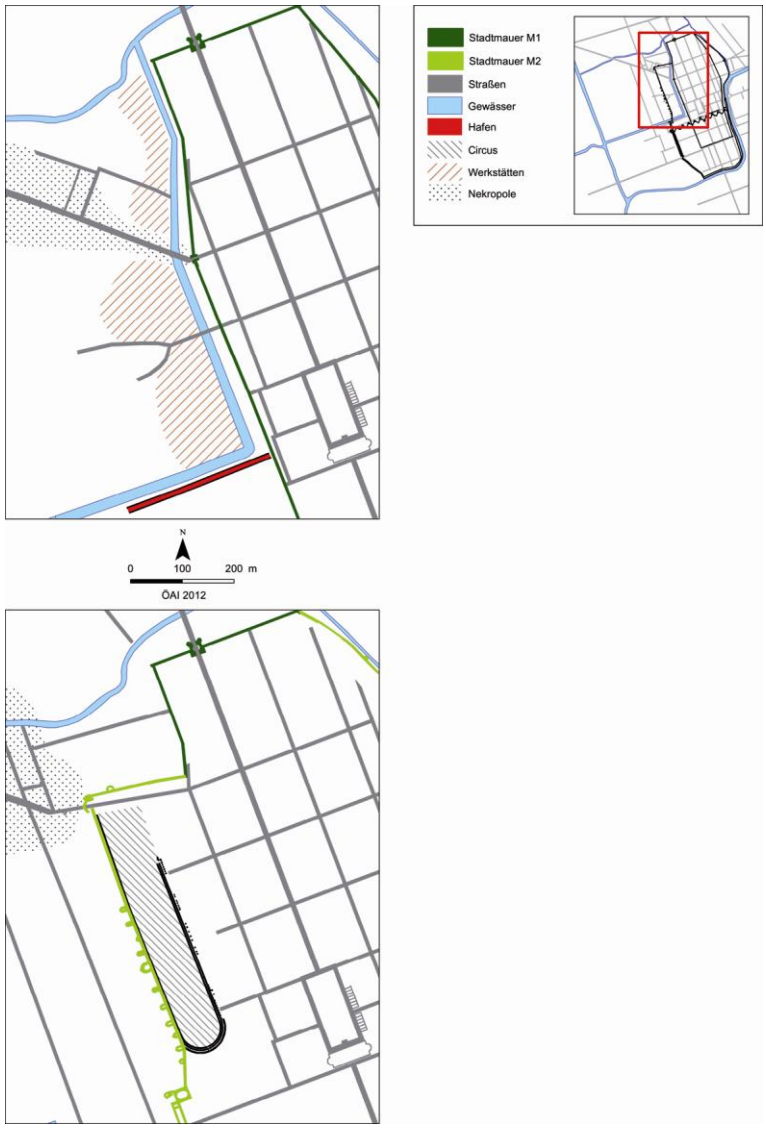

Fig. 7. The north-western part of Aquileia in the Imperial era and Late Antiquity: 1) Imperial settlement with artisan quarter in the suburbium. 2) Late Antique town wall and circus (Source: street grid and town plan after [3, 7, 11] (ÖAI, graphics: V. Lindinger)).

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