

**THESIS SUBMITTED FOR THE DEGREE OF DPHIL IN  
ARCHAEOLOGY**

***AQUEDUCTS AND WATER SUPPLY IN THE  
TOWNS OF POST-ROMAN SPAIN  
(AD 400-1000)***

**VOLUME I**



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Michaelmas Term 2013**

## ABSTRACT

### *Aqueducts and Water Supply in the Towns of Post-Roman Spain (AD 400-1000)*

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Despite the recent interest in late antique archaeology and the increasing number of publications on the transformations of towns (both in Spain and in the Roman world as a whole), the concern shown towards aqueducts has been almost non-existent. Some studies have focused on exceptional local examples, such as Rome or Constantinople, but there have been neither general nor regional syntheses of the chronology of the abandonment of aqueducts on a broad regional scale. This thesis consequently fills this gap in our knowledge by offering an all-encompassing study and compilation of the available material and written evidence for aqueducts in Spain in Late Antiquity, it looks at aqueducts in the late Roman period, and how they evolve through the Visigothic and the Umayyad centuries.

For this purpose, each aqueduct in the Iberian Peninsula is assessed according to the available information and studied in its wider urban context. By the end of the thesis it is possible to put forward some clear results on the degree of continuity of aqueducts in Spain. The information is used to analyse how the presence or absence of aqueducts affected the development of urban settlement and housing patterns away from a traditional Roman context. Aqueducts had not been at first an essential part of urban life, yet by Late Antiquity they had become so intimately related to it that the end of aqueduct supply modified urban landscapes. Finally, I present various scenarios to explain why aqueducts ceased to function and how the various elite groups of the period (urban aristocrats, the Church, the Visigothic monarchy and the Umayyads) tried to take over the control of the aqueducts, as they were not only extremely useful functional monuments, but also reminders and legitimising links to the Roman past.

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*Matri carae* (†2012):

*Mente igitur tali tamque alta praditus, inter maritum, gratos,  
fratres interque filios, omnibus illaesis morienti sensibus, aitum  
obtulit illi animum dederat qui caelitus, ea nunc addatcum coelo  
gaudiisque repleat almis; nempe sui memores reficit nos mortua  
heroína.*

Adapted from Juan Hurtado de Mendoza (attrib.) 1540  
“Hyspana Georgii Manrrici Carmina” *versio Latina* of the  
“Coplas” by Jorge Manrique.

## ACKNOWLEDGEMENTS

*Arduum videre res gestas scribere*, Gregory of Tours, *DLH* VII.1

This thesis is the result of nine years of research. Not that I spent nine years writing a thesis, but this marks the end of the nine years I have spent in Oxford, six of which I spent as a research student. This thesis however, as tends to be the case, is hardly the work of one single person. It is true that I have put together the ideas, compiled the data, and written everything together, but still, this would not have been possible without the help of many people in many places.

First and foremost, I have to thank my supervisor, Bryan Ward-Perkins, who has been a constant support through these years and has suffered many early versions of this text. I am still very surprised that he decided to read through all those paragraphs of rather “inventive” English without sending them back. The great interest he has always shown for my work certainly kept me going chapter after chapter. Similarly, Lukas Schachner, who co-supervised this thesis in its early stages, was always very supportive.

I have been very fortunate to be in Oxford during the last years, where I had the opportunity to discuss my research (and have it amended and corrected) by experts in the subject, both “resident” and “visiting”, especially Andrew Wilson, Janet DeLaine, Mark Whittow, Rob Portass, Nicola Clarke, Ann Christys, Helena Kirchner and Elena Sánchez. Elsbeth van der Wilt further volunteered to review parts of the text with me. Above all I should thank Isaac Sastre, who became not only a colleague but also a friend. He has been very helpful not only with his opinions (and the subsequent

discussions), but also because together we set up a research project which has culminated in the various excavation seasons at Casa Herrera, in Mérida.

Besides Oxford, I was able to carry out research all over Spain. Mérida has been one of my key examples, and there I was kindly hosted by the Consorcio de Mérida. I should give special thanks to both Miguel Alba, Rafa Sabio, and Pedro Dámaso who have shown a great interest and with whom I have shared lengthy conversations. Together with Mérida, Reccopolis has played a central role in this thesis, and this is all thanks to Lauro Olmo, who offered me the unique chance to survey and study the aqueduct. It is true too that without the help of Manuel Castro, Joaquín Checa and Amaya Gómez I would not have been able to carry it out there in the field. I also had the opportunity to visit Córdoba, whose aqueducts were further explained to me by Antonio Vallejo, Javier “Secretario” Díaz, and Guadalupe Pizarro. Similarly, Carme Miró and Encarnació Cobo helped me out in Barcelona. Josefa Martí, Mirella Machancoses, Bernat Cucarella and Albert Ribera (and Rita and Teresa Picó) were very helpful when I was researching the aqueduct of Valencia. Both in Madrid and Oxford I was able to discuss with Eduardo Manzano the Islamic period, and similarly, in Oxford and Alicante I had the unique opportunity to talk with Sonia Gutiérrez. During my stay in Madrid, at the Instituto Valencia de Don Juan, everything would have been much more difficult without the help of Mari Ángeles, who managed to find so many odd and old books for me. In Seville I was guided and housed by Adrián Santos, Javier Fernández, and archaeologist extraordinaire Daniel Zambrana.

These opportunities I had to do field work and research were possible thanks to the generosity and support of Lincoln College, the School of Archaeology through the Meyerstein fund, the Craven Committee of the Classics Faculty, the Oxford Centre for Late Antiquity, and the De Osma Studentship awarded to me by the Vice Chancellor. I

also greatly benefited from the discussions and exchange of impressions at the Princeton-Oxford-Vienna Graduate Exchange, at the Early Medieval Student Symposia of 2011 and 2013, and the four one-day colloquia on Hispanic Late Antiquity (2010-2013) I partially organised.

I also want to thank, for various other different reasons, all my students at the excavations of Mérida and Reccopolis. Besides them, José Moreno, Carlos Tejerizo, Aitor Fernández, Jordi López, José Carlos Sánchez, George Artley, José Carvajal, Chema Tejado, Carlos Cabrera, Marlena Whiting and Ulises Rodríguez, all good friends and researchers, have all been very important and influential (regardless of the degree of inebriation).

Finally, many other friends in Madrid, Oxford and Alicante have made my long years in Oxford much better. I know they will excuse me if I do not list them all, because they know I have included them already. They deserve most of my non-scientific acknowledgements, but not all; to conclude, but yet even more important, my brothers Arturo and David, my father and my late mother are the ones I really want to thank, because it is because of them that I have written this thesis.

## A NOTE ON NAMES

For the sake of consistency, proper names of sites and other geographical accidents will be given in the local language (i.e. Catalan for elements in Catalonia, Valencia or the Balearic Islands and Galician for those in Galicia, and Castilian for the rest), excepting those cases where there are widely accepted English names (e.g., the Tagus River or the Pyrenees). Towns and cities are named according to their official name in Spain (indicating the name in Spanish if it does not correspond with the local name, excepting Seville for being the accepted English name). Latin terms and texts will be italicised, as well as texts inserted in other languages (translations provided in inverted commas).

## GLOSSARY OF NON-ENGLISH WORDS MOST COMMONLY USED

*ar = Arabic, ca = Catalan/Valencian, ga = Galician, la = Latin, sp = Spanish.*

Acequia (sp), sèquia (ca)	Irrigation channel
Acueducto (sp), aqüeducte (ca)	Aqueduct
Alcázar (sp), alcazaba (sp)	Castle, palace of Arabic origin
Arc (ca), arco (sp), arquet (ca)	Arch
Arroyo (sp)	Small river
Avda., Avenida (sp), Avinguda (ca)	Avenue
<i>Balneum, balineum</i> (la)	Private/domestic baths

Barranc (ca), barranco (sp)	Creek
C/, Calle (sp), Carrer (ca)	Street
Camino (sp), camí (ca)	Road
<i>Caput [aquae]</i> (la)	Source of the aqueduct
Carretera (sp, ca)	Paved road
Casa (sp, ca)	House
<i>Castellum divisorium/aquarum</i> (la)	Terminal/distribution tank
Cerro (sp)	Hill
Cortijo (sp)	Large rural estate
<i>Cuniculus</i> (la)	Tunnel
<i>Domus</i> (la)	Urban house
<i>Fons</i> (la), font (ca), fuente (sp)	Fountain, spring
Hamмам (ar)	Baths
<i>Nymphaeum</i> (la)	Monumental fountain
<i>Opus caementicium</i> (la)	Mortared rubble
<i>Opus quadratum</i> (la)	Ashlar masonry
<i>Opus testaceum</i> (la)	Brick-faced concrete
<i>Opus signinum</i> (la)	Water-proof concrete

Piscina limaria (la)	Settling tank
Pl., Plaça (ca), Plaza (sp), Praza (ga)	Square
Pont (ca), puente (sp)	Bridge
Puerta (sp), porta (ca, ga)	Gate, door
Río (sp), riu (ca)	River
Rua (ga)	Street
<i>Spiramen, -ina</i> (la)	Manhole
<i>Specus, -ūs</i> (la)	Conduit

## 1. INTRODUCTORY CONCEPTS

When I first approached a research topic for my MPhil thesis back in 2008, I chose Roman urbanism. Or rather, I focused on its late antique and early medieval version in Spain. The increasing scientific interest in Late Antiquity, especially amongst Spanish scholars and the escalating number of publications made it easy to compile a wide-ranging bibliography for a master's dissertation, which looked at both the evolution of towns after AD 400 and how the different periods of crisis and political transformation affected these slow transformations.<sup>1</sup> At this point I first encountered some references to aqueducts, almost always in the context of abandonment and usually in this aspect with a very vague dating. During the spring of 2009 I worked in Rome at the British School on a project on aqueducts in the Ostrogothic period,<sup>2</sup> so this was already something that had caught my attention, and the lack of general consensus for the Spanish examples prompted me to address this issue in my doctoral research.

After some preliminary reading, it was clear that there was a gap in our knowledge; the issue of abandonment and reuse of aqueducts was generally left unaddressed.<sup>3</sup> This is due to several reasons: a lack of general studies of aqueducts and a comprehensive overview of archaeological material related to aqueducts and water-related structures. This offered a very good opportunity to expand it into a broader study of urbanism and the evolution of towns from an innovative point of view (for this period).

Unlike Roman towns, medieval towns are not imagined with aqueducts, and this is a deeply-rooted thought in popular culture (fig. 1.1). The period of transition between

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<sup>1</sup> The propositions made there will turn up throughout this thesis: Martínez Jiménez 2013.

<sup>2</sup> Martínez Jiménez 2010.

<sup>3</sup> In fact, the most recent publication on the archaeology of the late Roman period, *The Roman West, AD 200-500: An Archaeological Study* (by Simon Esmonde Cleary, 2013) has a very complete index, but lacks any entries for 'aqueduct' or 'water supply'.

both moments is usually not considered, beyond the idea of a collapsed, falling Rome. In this context, aqueducts disappear in burning cities raided by barbarians.<sup>4</sup> Of course, academic perspectives on this are very different, but still, when it comes to aqueducts in this period, research has been close to nought. Some thorough studies have been carried out in Italy and Constantinople, where the evidence is plentiful, but otherwise, the scanty nature of the evidence and the difficulty in dating abandonment layers have led to this neglect. Despite this, it is perhaps the study of aqueducts and water supply that shed new light, and new thoughts, on our understanding of the evolution of Roman urbanism, Roman society, construction techniques, elite culture, and regional economics. Aqueducts are not only an indicator of Roman urbanism, but also symbols of Roman culture, because of their link to baths.

The following thesis is not simply a catalogue of aqueducts and dates of abandonment, although it does include a new and detailed description of the dating (putting together various types of evidence) of all the sites for which late antique continuity in aqueducts can be inferred (chapter 3). To the best of my knowledge, there is no comparable overview available either for Italy or Gaul, probably because of the same problem of evidence that is scattered in various publications. An absence of academic dialogue has not stimulated scholars in this direction. It will be put forward here that there is indeed much more evidence than what was originally supposed. This is preceded by a chapter describing the methodology used in this study (chapter 2), and later followed by a section on the various alternative systems of water supply available in towns in the period of study (chapter 4). With this settled, it will be possible to approach the two main interpretative questions that can be addressed by the study of aqueducts (considering both those that continued in use and those that did not), which

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<sup>4</sup> Ward-Perkins 2005: 1-10.

are the impact aqueducts had on urbanism (chapter 5) and their social and political importance (chapter 6).

First of all, it is necessary to address some concepts as a way of introduction, especially to the chronological and geographical framework, but also to Roman water culture and the transformations of Late Antiquity. These introductions will serve as a basis for the arguments that will be expanded later, without the need of further referring to them, and more generally to give a broad view on the situation of towns and aqueducts at the time of the end of the Roman period in Spain.

## **1.1 CHRONOLOGICAL AND GEOGRAPHICAL SETTING**

Even if most of the sites mentioned in the text will be well known (as they mostly are towns inhabited today), in order to understand the location of the towns and the distribution of aqueducts better it will be necessary to briefly explain the geomorphology and climatology of the Iberian Peninsula. Similarly, the periodisation and chronology of the Iberian Peninsula needs some clarification, as the terms used to label periods in Spanish history may not correspond with the general chronology usually linked to them.

### **1.1.1 Geography and hydrology of the Iberian Peninsula**

Located in south-western Europe, the Iberian Peninsula is large and square, roughly 750km on each side, linked to the mainland by the stretch of land formed by the Pyrenees. It was formed out of very old geological shields, continuously eroded and deeply affected by the Hercinian and Alpine orogenies, which has resulted in its very

particular topography (fig. 1.2). As a consequence, the peninsula is divided into various clearly-defined geographic regions.

The central plateau, or *meseta*, occupies most of central Spain (Castile), and it is on average 700m a.s.l. Old mountain ranges divide it in two halves (northern and southern *mesetas*) in a south-west – north-east line. The meseta itself is surrounded by high mountains on three of its sides (north, south and east), the west being open towards Portugal and the Atlantic Ocean. Three main rivers cross this plateau from the mountains in the east into Portugal and the ocean: the Tagus, the Duero and the Guadiana. These flat highlands are very rich, but suffer from extreme climatic conditions. Furthermore, the high mountains that border it isolate the meseta from the wealthier and better-connected coastal regions.

The mountains bordering the meseta descend very rapidly into the sea on its north face, creating a thin strip of land from the Pyrenees down to Portugal that is very mountainous and crossed by deep valleys. This area is called the Cantabric region, but also referred to as “Green Spain” (*la España verde*), due to its abundant vegetation and high rainfalls (fig. 1.3). In the south, the mountains separate the meseta from the Guadalquivir valley, what is now Andalucía, a region of Atlantic orientation, but Mediterranean in climate with very fertile soils. The valley itself is separated from the Mediterranean basin and the Strait of Gibraltar by yet another mountain range. Similarly, the mountains that border the meseta are separated from the Pyrenees by the second main valley in the peninsula, that of the Ebro.

The meseta, the Ebro and Guadalquivir valleys, as well as the Mediterranean coast form “Dry Spain” (*la España seca*), which receives very little rainfall, although the abundance of mountains produces a considerable number of rivers. These are not comparable in size or length to the main European rivers, but they play very important

roles on a local scale. Despite this, the great climatic variation between summer and winter usually generates long dry summers, in which droughts are not uncommon.

### **1.1.2 Periodisation and chronologies**

This thesis is mostly focused on late antique and early medieval Spain and consequently it is necessary to briefly introduce to the various periods subdivisions in them.

“Late Antiquity” is a very broad term covering roughly the time between the third or fourth centuries (perhaps the Tetrarchy can be used as a divider) up to the mid-eighth century.<sup>5</sup> It overlaps with the “Early Middle Ages”, which range from the end of Roman power in the fifth century to the tenth and eleventh centuries. The choice between these two concepts with regard to the chronological overlap is usually a reflection of the background of the author, whether he or she believes there is rupture or continuity with the Roman past. In the Spanish case-study, it is common to find rural settlements and burial practices referred to as “early medieval”, whereas urban contexts in the same chronology are “late antique”.

One way to avoid these terminologies is to use “late Roman” or “post-Roman”, the former referring to the fourth and fifth centuries, and the latter to the sixth century and beyond. This is a chronological and political division, using the presence or absence of the Roman state as a marker, which can be put around AD 450. Other chronological labels are “Visigothic”, “Byzantine”, “Suevic” and “Umayyad”. “(Visi)gothic” refers to any given element which is geographically and chronologically inside the Visigothic kingdom or its area of influence. This ranges between AD 418 and 711, and although the Visigothic control over Spain only really begins in the 450s, it is not until

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<sup>5</sup> For this definition I have taken the scope considered by the Oxford Centre for Late Antiquity, which includes the “late Late Antiquity”.

the sixth century that it can be considered to be effective (the “early Visigothic period”). Within the Visigothic period, the years AD 570-630 are usually referred to as the period of state formation. After 630, and into the eighth century, it is not unusual to see the term “late Visigothic period”. Similarly, “Suevic” refers to the kingdom established by the Suevi in north-western Iberia between AD 411 and 580, so this term is not only chronological, but also geographical. In Spain, the “Byzantine period” covers the seventy years between the 550s and the 620s, during which the imperial troops controlled parts south of the peninsula. The presence of many lingering Roman cultural elements at various levels (monuments, material culture, law, etc) makes post-Roman a generic and adequate term to cover these three periods.

Finally the “Islamic period” starts in AD 711, and it only came to an end in AD 1492, although for the purpose of this thesis only the Umayyad period will be taken into account. The years in between the Islamic conquest (711) and the establishment of the Umayyads (754) can be referred to as “early Islamic” (although this would cover usually the whole eighth century) or “pre-Umayyad”, which is rare. The “Umayyad period” covers the years between AD 754 and AD 1031 (“early Umayyad” covers the period between 754 and 929 and “late Umayyad” between 929 and 1031). The political extent of the Islamic state in Spain, known as al-Andalus, reached only up to the northern meseta and the Ebro valley. The various polities which emerged in northern Spain during the Islamic period are generically referred to as the “Christian kingdoms” or “early medieval kingdoms”, although these will not play an important role in this thesis.

This terminology is perhaps better exemplified in figure 1.4.

### **1.1.3 Setting limits**

Considering these period divisions, the chronological limits set to this thesis are easily described, but defined only with difficulty. The starting date will be AD 400, just before the arrival of the Germanic peoples to Spain. This may be quite an arbitrary choice, and even if most of the late antique transformations begin already in the fourth century, they are much clearer in the fifth. Furthermore, the changes of the fourth century are far too complicated to be discussed in depth in this thesis, especially when the primary interest is to understand the evolution of aqueducts into the Visigothic period and beyond; The abandonment of aqueducts during the fourth century usually happened in small secondary settlements, where it is not possible to identify any of the main transformations that characterised the post-Roman period. The arrival of the Germanic invaders in the peninsula marked the beginning of a period in which Roman towns, which had been going through a long process of evolution, were under social, political and economic stress, which greatly affected urban populations and traditional Roman urbanism.

The closing date is less clear. Ideally it would be at the time when aqueducts finally go out of use. This should be understood as uninterrupted use, although the very interesting transformations of the Umayyad period mean that this period is slightly expanded into the tenth and eleventh centuries. Later medieval reuses and reconstructions, after long periods of abandonment will be mentioned, but not taken into full account. One of the main problems is the reuse of many aqueducts in the Islamic period (especially under the Umayyads). This means that many old Roman aqueducts were repaired. These repairs not only destroyed any trace of late antique use or abandonment (especially if the abandonment layers were removed to unblock the

conduit), but they also make it difficult to distinguish between aqueducts which were in constant use and those that were once abandoned in Antiquity and then put back to use.

As far as the geographical limits are concerned, this thesis considers the Iberian Peninsula as a whole, Spain and Portugal, as well as the Balearic islands. The Spanish enclave of Ceuta has been considered as well, as it was (and is) very closely linked to the Iberian Peninsula. In this period it is clear that it was a Byzantine outpost, so there is some literary context as well. Where possible, examples from northern Morocco (ancient Tingitania) and the Languedoc in southern France (Septimania) have been considered as well, because of the very close political links these regions had in this period. Highly politically incorrect as it may be from a Portuguese perspective, “Spain” and “Spanish” will be used as a generic term, rather than “Hispanic” or “Iberian”.

## **1.2 WATER CULTURE IN ROMAN SPAIN**

This thesis is about transformations and adaptations, so it is important to establish what exactly is being transformed. Water culture in the Roman period has been widely studied, and there are innumerable publications on aqueducts, baths and bathing culture, from historical, archaeological and architectural perspectives. In order not to take things for granted, a brief introduction to how this developed in Spain is necessary.

### **1.2.1 What is an aqueduct?**

Aqueducts (*aquae ductus*, “water conduit”) are long-distance water supply systems, developed in Antiquity in various urban cultures, wherever water supply became an issue.<sup>6</sup>

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<sup>6</sup> Wilson 2012:1-3.

The Romans mastered their construction and spread their use at the pace of the Romanisation. Aqueducts tap water from a source (a dam, a spring, a river), which is usually referred to as the *caput aquae*. From there, a conduit is built in masonry walls (*substructio*), cut in the rock, or dug into the soil, leading the water to its final destination, the *castellum aquae* or *castellum divisorium*, where the water was redistributed throughout the city. Because the conduit has a constant slope with a pre-calculated gentle gradient, most conduits are built following terrain contour lines, but when it becomes necessary to keep the gradient over the ground for a long distance, normally arches (*arcuationes*) would be built. Even if these are the most famous “aqueducts”, they correspond to a minimal percentage of an aqueduct’s course. Along the way there may be settling tanks (*piscinae limariae*). The conduit is almost always covered (with slabs, tiles or vaults), to protect water from the light and the elements, whereas the conduit itself is lined so to make it water-tight, either with clay or *opus signinum*.

Aqueducts usually run on gravity flow, but whenever necessary, the Romans could build pressurised conduits in lead, stone or clay pipes. This usually was done in order to cross deep valleys without building high bridges. This solution is called an inverted siphon, because it functions with the basic hydrostatic principles by which gravity pushes water into the pressurised conduit, and by atmospheric pressure it emerges on the exit side at the same height as the intake.

Most of our knowledge on Roman aqueducts derives from the works of Frontinus and Vitruvius, although aqueducts have been extensively studied in the recent literature by Trevor Hodge, who laid the foundations for modern aqueduct studies.<sup>7</sup>

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<sup>7</sup> *Roman Aqueducts and Water Supply* (Hodge 1992) is perhaps his *magnum opus*.

### 1.2.2 Romans, baths and aqueducts

Despite some badly founded claims that Sagunto had an aqueduct built by the Iberians before the Second Punic War, and the existence of irrigation channels in the late first-century BC Ebro valley (mentioned in the *tabula Contrebiensis*), long distance urban water supplies arrived in Spain with the Romans.<sup>8</sup>

Iberia's own geographic diversity helps to explain its historical evolution. The Mediterranean coast and the great valleys have usually been very different from the meseta and the northern coast. The former were the regions where Romanisation was most evident, perhaps because it was the first area to be conquered. In fact the Roman conquest began in this area at the time of the Second Punic War, and slowly advanced to the northmost corner of Asturias, which was conquered only two hundred years later by Augustus.<sup>9</sup> At this time, Hispania was divided into three provinces: Tarraconensis, Lusitania, and Baetica. Soon Spain reached a high degree of Romanisation, comparable to southern Gaul and North Africa, in which towns were monumentalised and villas were common in the countryside. Yet, there is a visible divide between the most densely urbanised areas of the Mediterranean coast and the Guadalquivir and Ebro valleys, and the rest of the peninsula.

The most important transformation that took place in this period was perhaps the Edict of Vespasian, by which all towns in Spain acquired Latin rights, virtually blurring the juridical status between native settlements and Roman towns. This led to an increasing interest in the urban elites to demonstrate their *Romanitas*. It is in this period when most of the monumental city centres of Roman towns in Spain were erected, leaving aside those of the Augustan colonies or re-foundations such as Mérida (*Emerita*

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<sup>8</sup> Sagunto: Civera 2004, 2008, 2009; *Tabula Contrebiensis*: Abadía Doñaque 1995.

<sup>9</sup> For a general overview, see Keay 1988.

*Augusta*), Zaragoza (*Caesaraugusta*) or Tarragona (*Tarraco*). Between the Flavian and the Antonine period, a wave of monumentalisation swept the peninsula, as inter-town competition, and peer-polity interaction prompted the development of large fora, basilicas, baths, and aqueducts.<sup>10</sup>

As has been shown, the uneven distribution of rainfall in the peninsula (fig. 1.3) meant that many towns had to rely on long-distance aqueducts to secure water for their new baths rather than on rainwater cisterns. In northern Spain, aqueducts are much less common as the local geology favours thermal springs.<sup>11</sup> Despite all this, aqueducts were built in the important towns of these northern areas (Lugo, Braga and Conimbriga) and at the main legionary base at León. This hints towards the more subtle but important role of aqueducts as symbolic elements of *Romanitas*, which went beyond their mere functionality.<sup>12</sup> Tables 1 and 2 show the total data on urban aqueducts which were in use in AD 200, and figure 1.5 shows a distribution map, which may explain these issues better.

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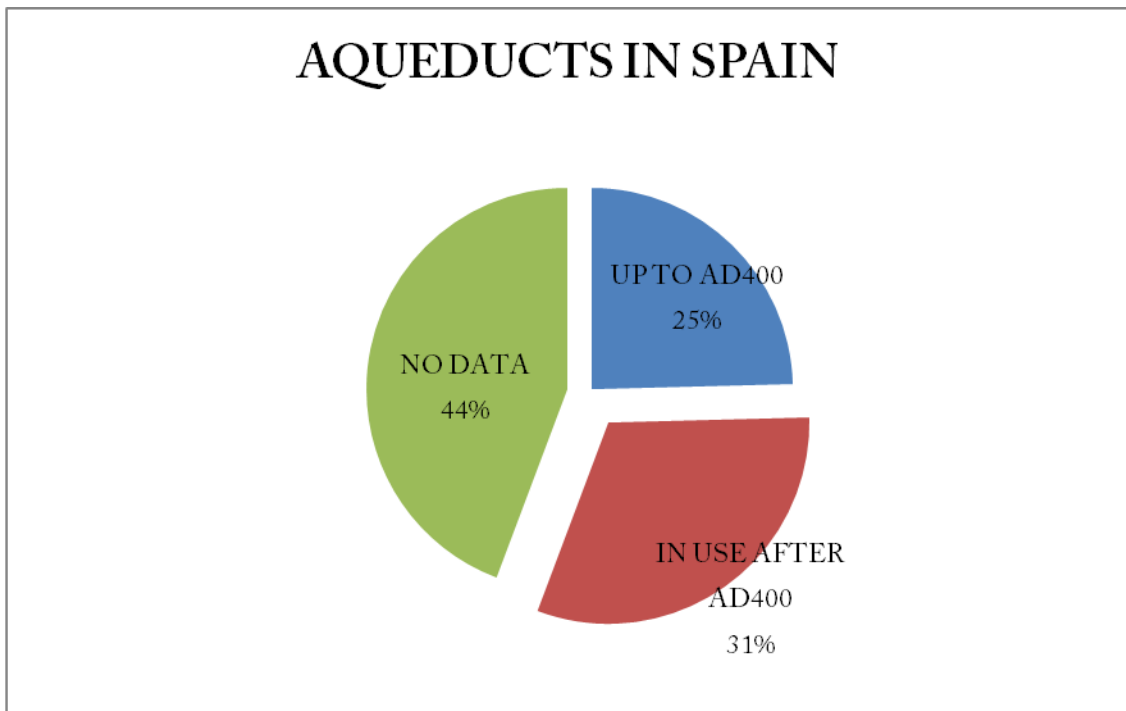
<sup>10</sup> Laurence et al. 2011: 23-30, 122-3. Roman foundations were sometimes equipped with aqueducts from their very beginnings; after all, one of the pluses of having an aqueduct is that immediate water availability ceases to be a constraint for settlement location: Cf. Ward-Perkins 1974: 3-4; Hodge 1989: 128-9.

<sup>11</sup> See below, ch. 4.

<sup>12</sup> González Román 2010: 41; Laurence et al. 2011: 95, 203-4.

SITE	AQUEDUCTS	UP TO AD400	AFTER AD400	UNDATABLE
<i>Almuñécar</i>	1		1	
<i>Andelos</i>	1	1		
<i>Arucci</i>	1			1
<i>Aurgi</i>	1			1
<i>Baelo Claudia</i>	3	3		
<b><i>Barcelona</i></b>	1		1	
<i>Braga</i>	2			2
<i>Begastri</i>	1	1		
<i>Cádiz</i>	1			1
<i>Cartagena</i>	1	1		
<b><i>Ceuta</i></b>	1		1	
<i>Chaves</i>	1			1
<i>Chelva</i>	1			1
<b><i>Conimbriga</i></b>	1		1	
<i>Consuegra</i>	1			1
<b><i>Córdoba</i></b>	5	2	3	
<i>Ebusus</i>	1	1		
<i>Egabrum</i>	1			1
<i>Fuenteovejuna</i>	1			1
<i>Granada</i>	1	1		
<i>Itálica</i>	1			1
<i>Ilibri</i>	1			1
<i>Lacipo</i>	1			1
<i>León</i>	1	1		
<i>Lisboa</i>	1			1
<i>Lodosa</i>	1			1
<i>Los Bañales</i>	1	1		
<b><i>Lugo</i></b>	1		1	
<b><i>Mérida</i></b>	4		3	1
<i>Ocuri</i>	1			1
<i>Onuba</i>	1			1
<i>Pollentia</i>	1			1
<b><i>Reccopolis</i></b>	1		1	
<i>Ronda</i>	1			1
<i>Sagunto</i>	2			2
<i>Segóbriga</i>	1			1
<b><i>Segovia</i></b>	1		1	
<b><i>Sevilla</i></b>	1		1	
<b><i>Tarragona</i></b>	4	1	3	
<i>Tiermes</i>	1	1		
<i>Toledo</i>	1	1		
<i>Ucubi</i>	1			1
<i>Uxama</i>	3			3
<b><i>Valencia</i></b>	1		1	
<b><i>Zaragoza</i></b>	1		1	
<b>TOTAL AQQ</b>	61	15	19	27
	(=100%)	(=25%)	(=31%)	(=44%)
<b>TOTAL TOWNS</b>	33	12	1213	22

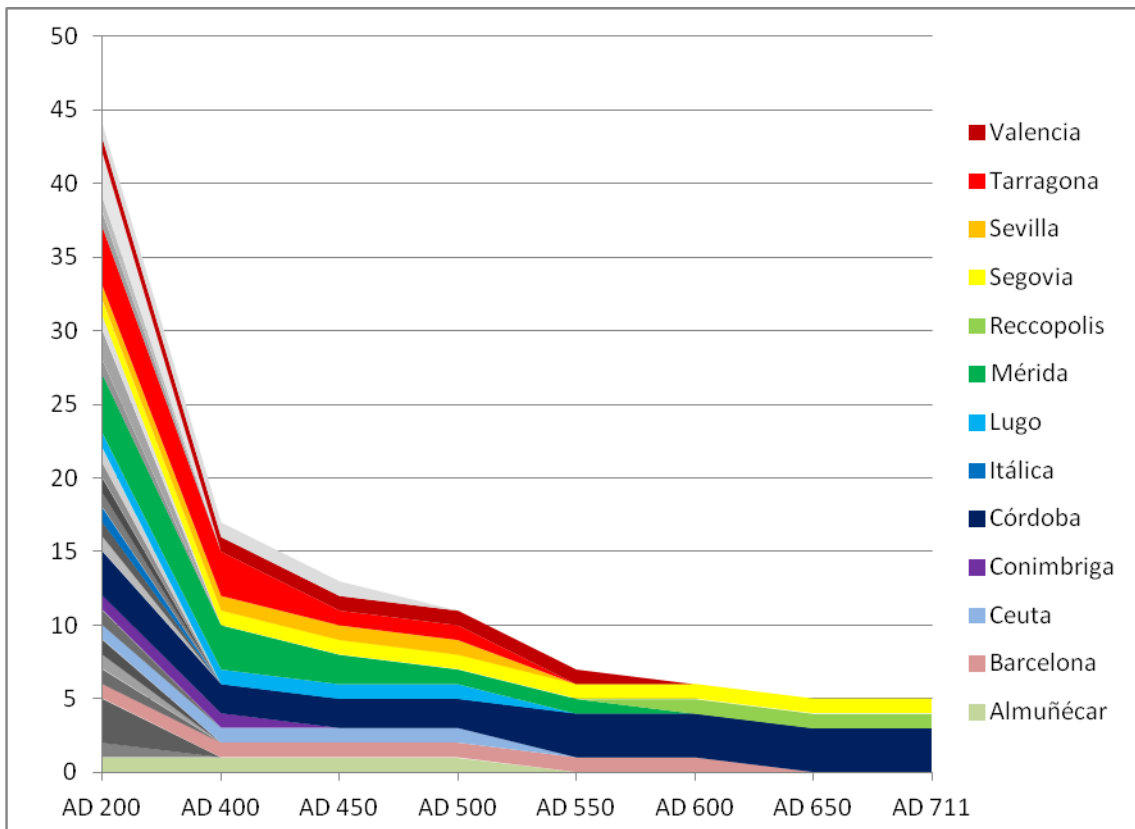
Table 1: List of all the towns in Roman and Visigothic Spain with aqueducts, indicating the number of aqueducts and the approximate date of abandonment. It specifies whether it is clearly pre- or post-AD 400, or undatable. The ones studied in depth in this thesis are indicated in bold.



Graph depicting the data of table 1, grouping the aqueducts of the Iberian Peninsula according to their abandonment date, contrasting it to the overall amount of aqueducts.

Site	AD 200	AD 400	AD 450	AD 500	AD 550	AD 600	AD 650	AD 711
<i>Almuñécar</i>	1	1	1	1	1?	0		
<i>Andelos</i>	1	0						
<i>Baelo Claudia</i>	3	0						
<i>Barcelona</i>	1	1	1	1	1	1	1?	1?
<i>Begastri</i>	1	0						
<i>Cádiz</i>	1	0						
<i>Cartagena</i>	1	0						
<i>Ceuta</i>	1	1	1	1	1?	0		
<i>Chelva</i>	1	0						
<i>Conimbriga</i>	1	1	1?	0				
<i>Córdoba</i>	3	2	2	2	3	3	3	3
<i>Ebusus</i>	1	0						
<i>Granada</i>	1	0						
<i>Itálica</i>	1	?	0					
<i>León</i>	1	0						
<i>Lisboa</i>	1	0						
<i>Lodosa</i>	1	0						
<i>Los Bañales</i>	1	0						
<i>Lugo</i>	1	1	1	1	1?	0		
<i>Mérida</i>	4	3	2	1	1	1?	0	
<i>Pollentia</i>	1	0						
<i>Reccopolis</i>	0	0	0	0	0	1	1	1
<i>Sagunto</i>	2	0						
<i>Segóbriga</i>	1	0						
<i>Segovia</i>	1	1	1	1	1	1	1	1
<i>Sevilla</i>	1	1	1	1	1?	0		
<i>Tarragona</i>	4	3	1	1	1?	0		
<i>Tiermes</i>	1	0						
<i>Toledo</i>	1	0						
<i>Uxama</i>	3	0						
<i>Valencia</i>	1	1	1	1	1	1?	1?	1?
<i>Zaragoza</i>	1	1	1	1?	0			
<b>TOTAL</b>		17		11		6		5

Table 2: List the most relevant towns with aqueducts of the Iberian Peninsula, indicating for each year the number of functional aqueducts in each. NB it does not include all the aqueducts of table 1, but only those with a secure dating.



Graph depicting the data of table 2, showing the evolution over time of the number of functioning aqueducts in the peninsula. Note the sharp drop from the early into the late Empire, and the somewhat standard trend in the early Visigothic period.

As known from Pliny, aqueducts were very expensive to build and many towns came close to bankruptcy trying to build them in order to make a very powerful statement.<sup>13</sup> Aqueducts were a source of urban pride, especially because they enabled the construction of the Roman feat of civilisation: baths.<sup>14</sup>

Baths are the most common type of Roman public building.<sup>15</sup> They were a symbol of *Romanitas*, an indicator of civilisation, which each aristocrat wanted in his town.<sup>16</sup> In Spain, baths became commonplace in the Flavian period, as bathing is closely linked to the spread of Roman urban habits, although baths had been built before that, the earliest ones being the forum baths of Valencia, which are republican in date.<sup>17</sup> Many Roman baths are known from Spain, mostly private, but also various public ones.<sup>18</sup> Overall, in Spain there are no large public baths of “imperial” scale, as those of Rome, Carthage, Arles, or Constantinople. Public baths tended to be smaller, but they still could service the needs of local inhabitants. Furthermore, baths became widespread in all towns, not only in Roman foundations, but also in Romanised native settlements, and even in remote areas, where aqueducts were built simply for the purpose of feeding the baths, as it could be the case of León, Los Bañales, or Braga.

Even if the distribution throughout the peninsula of aqueducts (fig. 1.5) and baths is not even, there are enough examples to consider them very widespread, and an essential part of Roman urban elite culture. This link between elite water culture and baths and aqueducts is something very important to keep in mind throughout the thesis.

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<sup>13</sup> *Epistulae* X.46.

<sup>14</sup> Hodge 2000a: 46-7; Yegül 1992: 390-4. Although baths existed and functioned in many places before aqueducts were first constructed.

<sup>15</sup> Laurence et al. 2011: 203.

<sup>16</sup> Laurence et al. 2011: 203-4, 215.

<sup>17</sup> Marín and Ribera 2000.

<sup>18</sup> Both rural and urban: García-Entero 2005.

### **1.3 THE TRANSFORMATIONS OF LATE ANTIQUE SPAIN**

At the beginning of Late Antiquity, around AD 300, towns in Spain were not only heavily monumentalised, but most of them were equipped with aqueducts, and it is safe to say that all of them had a set of baths. This would cease to be the norm after the fourth century. In this section, the transformations which mark the development of Late Antiquity will be outlined, together with some of the other most important transformations of the period.

The political changes of Late Antiquity may help to our understanding of the transformation of towns. After all, the transformation of urban landscapes owes as much to decline, abandonment and destruction as it does to new development and new constructions. Usually each state and each administration will need its own architecture of power to substitute the previous one. In post-Roman Spain there was a succession of political entities going through processes of state formation, developing their own urbanism and monuments as a result of the collapse of the Roman state and the successive waves of invaders.

The fourth century set the basis for the most important transformations of Late Antiquity. Firstly, it is the century of widespread Christianisation of society, the elites, and the urban landscape. Secondly, the administrative reforms of the late Empire carried out by Diocletian and Constantine meant that local elites became much less involved in local politics (and therefore in public munificence), as they lost all incentives in taking

part in local politics now that traditional curial magistracies held no real power. This is an empire wide-trend, which affected mostly the Western provinces.<sup>19</sup>

The most important events in late antique Spain took place after a period of power vacuum and invasions during most of the fifth and the early sixth century: the Visigothic process of state formation. As outlined above, this happened between 570 and 630, and was prompted by the arrival of imperial troops in the peninsula during the Visigothic civil war. This period saw the reorganisation of the urban administration, tax collection, court ceremonial and various other elements that looked back at the East Roman Empire. The Roman past was always very present, and aqueducts played an ambiguous role in the Visigothic agenda, as shall be discussed below. The impact of the Visigothic reorganisation on urbanism was not only by direct intervention, but also by the promotion of the new elites. New towns were founded in order to ensure royal control over “unurbanised” areas of the kingdom, and new administrative centres (“palaces”) were built to substitute the redundant old Roman administrative buildings.

This time of stability was followed by a period of crisis (partly economic and political, partly natural linked to droughts and waves of plague), which lasted until the early eighth century. This in turn facilitated the Islamic conquest of 711. For most of the eighth century, the Iberian Peninsula was simply a remote corner of the Umayyad caliphate, but after the 750s it became the core of a new Umayyad polity, focused on Córdoba. The Umayyad emirate (and then, the caliphate) introduced a completely new administrative system, and new religious beliefs that required a completely new type of urbanism. The arrival of new elites forced the transformation of the local aristocracies,

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<sup>19</sup> Spain (Kulikowski 2001: 149), Gaul (Young 2001: 26), and Italy (Ward-Perkins 1984: 4-19; 1999: 225). Cf. Liebeschuetz 1992 and Esmonde Cleary 2013.

who not only converted to the new religion but also had to integrate themselves with the newly arrived Umayyad elite and their imported networks of patronage.<sup>20</sup>

After the demise of the Umayyad caliphate, society and towns had gone through too many transformations. By now there were very few things that could link these new now purely medieval towns and their inhabitants to their fourth-century equivalents, except the ruinous-but-standing aqueducts.

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Overall, it is clear that aqueducts were too massive and too useful to be consciously pulled down without a specific reason, but their functional continuity is quite a different story. As with many other Roman buildings, they went through a process of slow decline, which is roughly covered by the chronological framework of this thesis. Still, the reasons for this slow decline are quite intriguing.

In order to identify these reasons it is necessary to look at the archaeological evidence for aqueducts and their urban contexts, not only in chronological sequence, but also from a diachronic perspective. The social and political context will be equally important, because the transformation of Roman society is deeply interdependent with the evolution of urban townscapes and infrastructure. It is one of the key points of this thesis that aqueducts were elements of the Roman city, built with a specific purpose, in a specific context and for a specific audience. Late Antiquity was, after all, a period of transformation away from the Roman period, a transformation of the Roman world, and the role of aqueducts in this new context had to be renegotiated.

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<sup>20</sup> Clarke 2012; Manzano Moreno 2006.

## 2. METHODOLOGY

A necessary step preceding the analysis of the archaeological evidence is to explain the methodology, and the different approaches taken. This is also the best way to explain the questions that arise through the thesis, and how they can be answered.

### 2.1 WRITTEN SOURCES AND EARLIER RESEARCH

Before addressing the archaeological methodology, it is important to outline the few available written sources, which are useful to fill in the gaps left by the archaeology, and the extent of previous research on aqueducts in Spain. From our perspective, aqueducts are great monuments, but outside Rome (where they are constantly praised by ancient authors) their monumentality seems to have been eclipsed by their tremendous functionality. They hardly appear in texts from the provinces, just as modern literature only mentions water pipes if necessary and incidentally.<sup>1</sup>

In the Visigothic period at least, none of the written sources mention or describe aqueducts. The basic sources of late Roman and Visigothic Spain can be divided into schematic general chronicles (Hydatius' *Chronica subita*, John of Biclar's *Chronica*, the anonymous *Chronica Caesaraugustana*, and Isidore's *Chronica* and the *Historia [de Regibus] Gothorum*) or hagiographies (like the *Vitae Sanctorum Patrum Emeritensium* or the *Vita Aemiliani confessoris*). The *Historia regis Wambae* by Julian of Toledo is a short account of a military campaign. These sometimes mention elements of urbanism or the construction of churches, but not much else. Visigothic laws, most of

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<sup>1</sup> Those ancient writers had a clear agenda behind them: Strabo (*Geographica* III.8) was dedicating his work to Augustus, Frontinus (*De Aquis* I.16) was the *curator aquarum*, and Cassiodorus (*Variae* VII.vi.2) praises them in the formula in which the "count of the aqueducts" is instituted.

which collected older Roman legislation still in use, do not mention aqueducts. They only regulate the use of irrigation channels in rural areas (*LV VIII.iv.31: De furantibus aquas ex decursibus alienis*). National church councils are not helpful either, and Isidore's *magnum opus*, his *Etymologies*, only mentions baths as urban buildings, and water pipes as parts of the house.<sup>2</sup> Isidore's mention of pipes as part of the house shows that he was familiar with piped water in urban domestic contexts, although how much his knowledge derives from the writings of Vitruvius or Frontinus (such as the fact that pipes are classified according to their capacity) and how much from his own personal experience is not known.

In the Islamic period, however, we are more lucky, as emirs and caliphs recorded their works on aqueducts in public inscriptions. These are also recorded in the chronicles, e.g. the *Chronicle of al-Nasir*, the *Akhbar Maymu 'a* or the *Bayan* by Ibn 'Idari. Islamic geographers such as al-Idrisi, al-Bakri and al-Himyari were very interested in Roman monuments, including aqueducts, although by this time most of them were certainly out of use, as they are described as abandoned ruins. Latin and Romance writers of the medieval period mention the aqueduct of Segovia (as Rodrigo Ximénez de Rada, in his *De Rebus Hispaniae*) and that of Barcelona (which must have been a preeminent monument in the landscape, as it is used constantly as a reference in charters),<sup>3</sup> but these mentions are often incidental.

The first modern enquiries about Roman aqueducts seem to have been carried out by order of Queen Isabella I (r. 1474-1504), who commissioned the restoration of the

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<sup>2</sup> *Balnea and thermae: Etym.* XV.ii.39-40. Pipes: *Etym.* XV.viii.17; although the mention of pipes seems to refer back to the works of Frontinus, mentioning how pipes are classified according to their capacity: *Fistulae aquarum sunt dictae quod aquas fundant et mittant; nam στολα Graece "mittere" est. Formae earum pro magnitudine aquae et capacitatis modo fiunt* – Water pipes are called this because they carry water, for "stola" is "carry" in Greek. Their different types are classified according to the amount of water [that flows in them].

<sup>3</sup> Mayer and Rodá 1977.

aqueduct of Segovia.<sup>4</sup> From the modern period, there are several studies of the Roman monuments of Spain, like Pons D'Icart's 1572 *Grandezas de Tarragona*. The most extensive study of an aqueduct was made by Andrés Gómez de Somorrostro, who wrote his *El acueducto y otras antigüedades de Segovia* in 1820, which included a complete study of its course, its architecture and its design (until then all previous studies were largely descriptive). In a similar fashion, Pascual Madoz published his *Diccionario Geográfico* in 1849, in which he described most of the aqueducts still standing in his day. This tradition of architectural description of the aqueducts continued well into the twentieth century.

The first true archaeological studies of the aqueducts in Spain were carried out not by an archaeologist, but by a civil engineer, Dr. Carlos Fernández Casado, who was the provincial engineer of Granada. In the early 1930s he began to record and to study Roman infrastructures, not only aqueducts, but also roads and bridges.<sup>5</sup> This allowed him to record the Roman aqueduct of Granada, now completely disappeared and his study and survey of the aqueduct of Almuñécar was so precise that recent archaeological surveys confirm his proposed course with only a very small margin of error.<sup>6</sup> After the Civil War (1936-39) he was deprived of his title of engineer and his right to teach, so he began to study history, law, and geography. After obtaining his second degree he was given back his title of engineer and was teaching in the University in Madrid while he obtained his doctorate in civil engineering. Carlos Fernández Casado is responsible for the only extensive publication on Roman aqueducts in Spain, in which he put together all the information he had compiled in his early years as an engineer. Published in 1972 and re-printed in 2008, this is still the main reference work

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<sup>4</sup> Fernández Casado 2008 (1972): 65. Although previous medieval repairs are possible – see below 3.6.2.

<sup>5</sup> I have to thank Carlos Fernández Casado's grandson, Javier Muñoz-Rojas Fernández, for his help in compiling the information published by Fernández Casado, and for facilitating my access to his archive.

<sup>6</sup> Sánchez and Moreno 2012.

for aqueduct studies in Spain.<sup>7</sup> The fully-illustrated publication gives a detailed account of the engineering, the architecture and (to an extent) the archaeology of the monumental aqueducts of Spain, including written references to the structures. The main problem with his work is that, because of the nature of his publication (a study of Roman engineering), he only considered aqueducts to be the arched structures, leaving aside or barely mentioning underground conduits. This explains why he left out of his publication the works on the aqueduct of Valencia, published in 1958 by Domingo Fletcher Valls. Despite this, Fernández Casado's work is impressive and unsurpassed to this day.

Maybe by coincidence, all the archaeological publications of the main aqueducts of the peninsula post-date 1972, when Fernández Casado published his work. From this point onwards, each major aqueduct has been surveyed and studied in the 1970s and 1980s, leading to their basic publication.<sup>8</sup> In the early twenty-first century, aqueducts have been studied again, revising old publications and introducing the contributions of urban rescue archaeology and GIS modeling, greatly improving our knowledge of those aqueducts belonging to continuously-occupied cities. This led to the 2002 monographic edition of the journal *Empúries*, the 2009 congress on ancient hydraulic technology “*Aquam perducendam curavit*” held in Cádiz (published in 2010), and the 2011 publication on Roman sewers edited by J. A. Remolà and J. Acero, *Sordes urbis*. Fernández Casado's work remains the only monograph of the aqueducts in Spain, and, despite the recent publications, very few scholars have tackled the late phases or abandonment of the aqueducts.

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<sup>7</sup> Badly adapted into English (Leather 2002).

<sup>8</sup> Almagro and Caballero 1977 and Ramírez Gallardo 1975 (Segovia); Álvarez Martínez 1977 (Mérida); Argente and Díaz 1980 (Tiermes); Canto 1978 (Itálica); Étienne and Alarcão 1974 (Conimbriga); Jiménez 1974 (Baelo Claudia); Mayer and Rodá 1977 (Barcelona); Sáenz Ridruejo 1977 and Cortés et al. 1989 (Tarragona).

## 2.2 THE IMPORTANCE OF ACCURATE CHRONOLOGIES

This thesis is mostly about continuities and abandonments, and thus a precise chronology becomes essential, not only because vague terms such as ‘late antique’ or ‘early medieval’ could mean anything between the fourth and the seventh centuries, as already mentioned (fig. 1.4), but also because there is a great difference between terms usually found such as ‘fourth to fifth century’, ‘late fourth’ and ‘early fifth’.<sup>9</sup> Many times, when discussing aqueducts, Spanish scholars have used these (or even vaguer) terms to date the abandonment of aqueducts, despite their inaccuracy. One of the purposes of this thesis is to analyse each individual case using all the available evidence in order to obtain a more precise chronology.<sup>10</sup> This is obtained through a careful examination of the archaeological material, as the written sources of this period are hardly of any help. Besides that, there is the added problem of dating (and identifying) abandonment contexts. This is always complicated, as these need to be carefully registered and excavated, which sadly in Spain is only the case in the past twenty years.

On the plus side, in those twenty years there has been an explosion in late antique archaeology, and with its increasing popularity, ceramic typologies (which are the essential key to date most archaeological contexts) have become more accurate and precise. This does not only apply to imported materials and *ARS*, but also to local

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<sup>9</sup> Sadly there are some cases in which the chronology cannot be more precise than that.

<sup>10</sup> Canto 1979: 336, for instance. This happens in Gaulish examples as well: Rigal (1997: 313) mentions for the aqueduct of Cahors: *la date d’abandon est très envisageable au vu d’autres aqueducs gallo-romains (...)* – “the abandonment date is very predictable based on [those of] other Gallo-Roman aqueducts”.

productions, especially thanks to the excavations of sites like Reccopolis, the theatre of Cartagena or El Tolmo de Minateda.<sup>11</sup>

Obviously, chronological data obtained directly from the aqueducts is preferable, because it provides primary dating information on repairs, maintenance, destruction, abandonment or continuity of the conduit. Alas, because of the nature of the conduits (closed and usually vaulted), dating material (mostly pottery) made its way into aqueducts only with great difficulty, so indirect information about water-consuming structures will also be taken into consideration, because this will be the largest part of the available corpus of data.

### **2.3 DIRECT INFORMATION**

The direct archaeological excavation of aqueducts is rare, and most of the early studies carried out is done on the over-ground sections, which only constitute a small portion of their total length. However, in those cases in which these interventions have taken place, the information from these interventions is very useful.

#### **2.3.1 Relative chronology**

Well-dated contexts excavated from aqueducts are the most useful way to create a relative chronology, as they provide either a *terminus ante quem* or a *terminus post quem* for the abandonment. Other factors, such as the nature of the context (if it was sealed, or closed, or if it is an abandonment layer) also have much to say about the reliability of the relative dating. In this way, good dating material found inside a closed

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<sup>11</sup> Mostly compiled in Olmo Enciso (ed.) 2008 and the several publications of the *Reunió d'Arqueologia Cristiana Hispànica*, together with the conferences organised by the National Research Council (CSIC) called "Visigodos y Omeyas" and the 2009 conference on late antique urban landscapes held in Toledo, published in 2010.

context will give us a precise *post quem* for the layers on top of this context and an *ante quem* for the layers below it. For instance, the coin of Trajan found inside the bottom *opus signinum* layer of the *specus* of the aqueduct of Segovia, does not only indicate that the *specus* was lined with a high degree of certainty *during or after* the reign of Trajan, but also that the subsequent linings must post-date the early second century AD.<sup>12</sup> Likewise, the presence of an African-imitation amphora fragment dated to the seventh century found in the sediment inside the *specus* of the aqueduct of Barcelona indicates that at some point in the seventh century, or perhaps later, the water had probably ceased to flow, although it is difficult to determine exactly when.<sup>13</sup> Finally, the presence of a dump in a terminal cistern of one of the aqueducts of Córdoba provides a *terminus ante quem* for the abandonment of the aqueduct. It must have been out of use by the time the tank was turned into a dump, which dated to the tenth century due to the presence of glass rejects in the abandonment layer.<sup>14</sup>

Other elements providing relative chronologies are restorations, repairs, and other elements that may indicate continued (or secondary) use. Some Iberian aqueducts present restorations even if this is more widely known for examples outside Spain, like the brick reinforcements of the aqueducts of Rome or the reconstructions of Arles and Nîmes.<sup>15</sup> The only way to date these restorations is normally by means of their construction technique, which is not necessarily a good indicator, as the dates are usually estimates. For example, the buttresses placed on the sides of the pillars of one of the aqueducts of Mérida were built in a different construction technique, which would only indicate that the aqueducts were repaired at a later date (fig. 2.1).<sup>16</sup> At least for this period it is assumed that, the coarser the technique, the later its date. Despite being very

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<sup>12</sup> Zamora Canellada 2007: 137.

<sup>13</sup> Giner Iranzo 2007.

<sup>14</sup> Carmona et al. 2008.

<sup>15</sup> Fabre et al. 1991a; 1991b; Martínez Jiménez 2010; Raffard et al. 2000.

<sup>16</sup> Fernández Casado 2008 (1972).

‘catastrophist’, this assumption assumes a decline and loss of technical abilities (or simply of skilled labour),<sup>17</sup> and it has some truth behind it at least as far as hydraulics are concerned: the increasing size of *caementa* in the *opus signinum* is a constant from the second into the fourth centuries, and the Visigothic *opus signinum* from Reccopolis, Mérida and Toledo seems to have been made with chunks of tiles and pots that were not even properly crushed.<sup>18</sup> Such arguments about the date of different construction techniques has led to intense debates about the date of the dams of Proserpina and Cornalvo outside Mérida, traditionally considered to be Roman, and the problem is still unresolved.<sup>19</sup> In a few cases the use of earlier material or *spolia* in later constructions provides a *post quem* for these, as with the Roman column drums moved from the curia of the forum of Valencia (which was still standing in the late Visigothic period) and used to build a new Islamic water conduit.<sup>20</sup>

In some cases it is possible to give relative dates on the basis of the new technological developments or the abandonment of old Roman practices in the Islamic period. The clearest examples are the abandonment of *opus signinum* as lining for conduits and cisterns in favour of water-tight red stucco.<sup>21</sup> The introduction of this technique can be dated to the late emirate and the early caliphate, in the early tenth century.<sup>22</sup> Despite this, the Islamic wide knowledge of hydraulic engineering meant that many aqueducts were reused and as mentioned above, this was often done after removing all archaeological traces of late antique evidence (abandonment layers, sinter deposits, repairs, etc.).

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<sup>17</sup> Cf. the discussion in Ward-Perkins 1997 and 2005: 104-110.

<sup>18</sup> Lamprecht 1987: samples 5.15, 6.22 and 17.23, for instance; cf. the typologies in Palestine made by Porath (2002a).

<sup>19</sup> Feijoo Martínez 2006, further discussed below, section 3.4.3.1.

<sup>20</sup> Martí and Pascual 2000.

<sup>21</sup> Ventura Villanueva 1993: 33-4.

<sup>22</sup> However, Umayyad aqueducts in the Levant in the seventh and early eighth century are built with *opus signinum* linings (Porath 2002a: 35), indicating that the stucco lining may be in fact a new development after the knowledge of *opus signinum* construction had been lost in the West.

Finally pipes should be mentioned, even if they hardly survive in the archaeological record. The fact that they were usually made out of lead means that they were an easy target for theft and recycling, and the material obtained from the spoliation trench indicates a probable *terminus ante quem* for the abandonment of the aqueduct, because that should predate the removal of the pipes.

### 2.3.2 Scientific dating, sinter deposits and ESR dating

Only in few cases it is possible to obtain an absolute chronology to date the construction/abandonment/destruction of an aqueduct, largely because of the nature of the dating methods. Current scientific dating methods, such as radiocarbon, thermoluminescence (TL)<sup>23</sup> or electron spin resonance (ESR)<sup>24</sup> may be used to date abandonment of aqueducts in an absolute sense with various degrees of accuracy. However, radiocarbon dating would not be as useful as there are hardly any organic remains to be found in aqueducts,<sup>25</sup> but these studies have not been carried out yet for this purpose.

Sinter is a precipitation of the carbonates dissolved in the water. The calcium carbonate (CaCO<sub>3</sub>) could be scientifically dated and that would give an absolute date for when water was running. However, sinter can be equally useful without the need for scientific dating because it forms annual layers. This precipitation rate is not universal or constant, because it depends on the type of water, the gradient of the conduit, seasonal flows and the action of microorganisms (stromatolites), which accelerate the deposition rate.<sup>26</sup> For this reason, the precipitation rate varies between 0.0123 to 1.6

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<sup>23</sup> Brothwell and Pollard (eds.) 2001: 47-50, 58-60.

<sup>24</sup> Brothwell and Pollard (eds.) 2001: 48-9; Renfrew and Bahn 2000 (1991): 155.

<sup>25</sup> Brothwell and Pollard (eds.) 2001: 23-35; Renfrew and Bahn 2000 (1991):138-45.

<sup>26</sup> Fabre et al. 1991a: 172-9

mm/year, although the average seems to be 1mm/year.<sup>27</sup> For approximate estimates, either the average or the maximum precipitation rate can be used as a rough guide to date sinter deposits. In this way, the thickness of the concretion indicates for how long water was flowing through the conduit.

## **2.4 INDIRECT INFORMATION AND COMPARANDA**

Whereas the dating obtained directly from an aqueduct is the most desirable and the most specific, we often have to rely on water-related structures to infer the continuity of the aqueduct. The problem with this approach is that the link between aqueducts and water consuming structures cannot be taken for granted, when it is perfectly possible that the water consuming buildings (baths, fountains) functioned without an aqueduct supply system. The real difference between the direct information mentioned above and the indirect information below is that the latter cannot be used independently to date the continuity/end of the aqueduct (whilst the former certainly can). Thus it is necessary to use the different pieces of indirect information together in order to make a coherent statement of continuity, although ideally the combination of both types of evidence will give the most accurate answer to the question of dating the use of the aqueduct.

### **2.4.1 Water consuming structures: baths, baptisteries, fountains and industries**

The most evident water consuming structures, and those most visible in the archaeological record due to their usually lavish decorations and mosaics, are baths,

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<sup>27</sup> Fabre et al. 1991a: 191; Hodge 2000a: 60-1; Keenan-Jones et al. 2008: 331.

baptisteries, and (to a lesser extent) fountains. Furthermore, as these structures are notable features of Roman and late Roman urbanism, they not only provide dating evidence for the aqueduct, but also for distribution patterns and social use of water.

Baths were a key element in Roman towns and continued to be so in Late Antiquity. In the sixth century for instance, during the Gothic wars, the main concern of the citizens of Rome once the aqueducts were cut was that they could not take baths anymore, because these were fed by the aqueducts.<sup>28</sup> Even if during the late antique period bathing had to face the partial opposition of the Church (which opposed the pagan connotations of bathing and imposed new concepts on what was luxurious and what was needed)<sup>29</sup> many baths survived the fourth century, and continued well into the fifth. This is evident because baths are almost constantly in need of repair and maintenance. Baths in fact required extensive resources for their functioning and repair, which were difficult to achieve in Late Antiquity, but which was done because baths were still elements of civic pride.<sup>30</sup> Whenever a bath continues to function into the fifth century or later, it is probable that it was supplied water by an aqueduct. With new baths built in this period, it is also possible to assume a similar situation. Overall, unless a clear alternative water-supply system is identifiable, as happens with the sixth-century baths of Tarragona which were supplied by a well, baths are good indicators of continuing aqueducts.<sup>31</sup> Likewise, any modification to the bath design (baths seem to have reduced or abandoned their hot rooms in Late Antiquity)<sup>32</sup> or infrastructure gives further information about the use and availability of water.

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<sup>28</sup> According to *BellGoth* I.xix.28 and I.xx.5.

<sup>29</sup> This is further discussed in section 6.3.

<sup>30</sup> Blyth 1999: 90-1; Yegül 1992: 321-3; Cf. regarding the expenses for timber, for instance Meiggs 1982: 258; *CTheod* 13.5.10 and 14.5.1.

<sup>31</sup> Remolà and Ruíz de Arbulo 2002; 63.

<sup>32</sup> DeLaine 1997: 39-40; Nielsen 1990: 57. Beyond the Italian examples mentioned by DeLaine and Nielsen, in Visigothic Gaul (fifth and sixth centuries) the baths of Clos de la Lombarde (Narbonne) lost their hot rooms, but kept the cold ones (Bouet 2003 vol. 2: 179).

Baptisteries are a different issue, because they certainly require water but not a permanent supply, especially because in this period baptism was only done once a year, at Easter. In theory these structures do not need piped water, even though there are examples in Gaul where this was the case (like in Lyon, Poitiers, Aix-en-Provence and Venasque; fig. 2.2).<sup>33</sup> In the Spanish examples there is no direct evidence to link piped water with baptisteries, but the presence of baptisteries close to other water-consuming structures (like a fountain in Valencia or a bath complex in Barcelona) can be considered as a possible indicator of a functioning aqueduct.<sup>34</sup>

Fountains can only work if there is running water, which is what differentiates them from wells, cisterns and other sources of water. Usually fountains are dedicated with an inscription, which tends to date their construction and indicates a time in which the aqueduct was still in use, even though late fountains are rare (only one inscription possibly referring to a fountain is known in Spain for this period).<sup>35</sup> Archaeological dating for repairs/maintenance of fountains can be linked to a functioning aqueduct with a high degree of certainty, although an abandoned or destroyed fountain is not always indicative of a destroyed or abandoned aqueduct: one of the fountains of Tarragona was abandoned in the course of the sixth century, but sediment coming through the spout mixed with the water kept falling into and finally covering the fountain itself.<sup>36</sup>

Lastly, industries and workshops many times required running water for either cleaning the facilities, powering machinery or even actually in the final product.<sup>37</sup> Even if Roman legislation prohibited the presence of industries and workshops inside cities,

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<sup>33</sup> Benoit and Roillard 2000: 168; Grewe 1991: 19-25; the case of Lyon is evidenced by the presence of lead pipes: “l'eau arrivait par un tuyau de plomb ; elle s'évacuait d'abord par deux tuyaux de plomb, puis l'on aménagea un conduit taillé dans les blocs de pierre” Goudineau and Guilaine 1989: 530.

<sup>34</sup> Bonnet and Beltrán 2002:74; Ribera Lacomba 2005: 218-9.

<sup>35</sup> From Tarragona: *CIL* II.4109 – further discussed below.

<sup>36</sup> Remolà and Ruíz de Arbulo 2002: 41-7.

<sup>37</sup> Wilson 1997: 173-82.

these may have been located in the suburbs, and could have benefitted from the presence of aqueducts.

The most common type of industrial complex in Spanish coastal towns are fish factories, where *garum*, salted fish, and other fish-derived products were processed.<sup>38</sup> In these, water was needed for the elaboration of some products, and also for boiling the fish guts, cleaning the fish, the vats, and the employees.<sup>39</sup> The abandonment of a fish factory indicates a rather unreliable *terminus ante quem* for the abandonment of the aqueduct: the end of the aqueduct could cause the end of the fish factory (unless an alternative water supply, like cisterns, is evident), as may have been the case with the aqueduct of Baelo Claudia, which was destroyed by an earthquake, soon followed by the abandonment of the fish factories.<sup>40</sup> This, however, is not necessarily a *sequitur*, as the aqueduct could potentially have continued functioning after the end of the fish industries, supplying the city.

There are not many other known industries inside Spanish Roman towns, or at least not through their archaeological remains. Some olive and wine presses are known in Valencia and Barcelona for the earliest part of the period considered in this thesis, but these do not directly need a constant source of water, like tanners, dyers or fullers.<sup>41</sup> The only other industrial complexes intra-muros from the Visigothic period are the glass and gold workshops of Reccopolis, located outside the palace complex, but these do not provide any concrete dating evidence linked to its aqueduct.<sup>42</sup>

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<sup>38</sup> In particular in the late period, as only those fish factories that were located in urban or suburban areas survived in the fifth century; Lagóstena Barrios 2001:355-6.

<sup>39</sup> Wilson 1997: 180.

<sup>40</sup> Jiménez 1974: 293; Lagóstena Barrios 2001: 124-5.

<sup>41</sup> Álvarez et al. 2005; Beltrán de Heredia 2002b. A *tinctoria* is known from Barcelona, but it is dated to the earlier Roman period: Beltrán de Heredia 2002a.

<sup>42</sup> Castro and Gómez 2008.

#### 2.4.2 Drains, sewers and latrines

Because of the nature of Roman hydraulics, water was constantly flowing through pipes and conduits as if the aqueduct flow were to be stopped, the water would overflow in the conduits, damaging the structure.<sup>43</sup> That is why drains and sewers were essential in cities with aqueducts, so water could be evacuated away from the streets. Therefore, and in theory, non-functional or collapsed sewers would indicate that the aqueduct was out of use about the time in which the sewers were not in use. However, it would be too risky to assign a direct causal relationship between the end of functional sewers and the end of functional aqueducts, especially because drains can survive after the end of the aqueduct, and alternatives (e.g. over-ground drains) are possible.

Aqueduct overflow is not the only source of water for sewers, and in fact sewers may have originated as ways to prevent flooding or to limit the risk of damage caused by rain-water, so the construction of new drains, like those of Cartagena cannot be linked to a functional aqueduct.<sup>44</sup>

The knowledge of drains in Roman cities in Spain is, alas, limited to a few sites, as shown in a recent publication that compiles the information known on Spanish Roman sewer systems.<sup>45</sup> The evidence for continuity of sewer systems is not plentiful, and only in a few cases late antique levels are known. Even if many sewer systems seem to be abandoned or appear to have collapsed at some point in Late Antiquity, it is equally true that many Roman drains were constantly maintained and in use (especially in the Umayyad period, but some even into our day). This constant cleaning has probably destroyed any stratigraphic information about late antique use or

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<sup>43</sup> Hodge 2000a: 48.

<sup>44</sup> Egea Vivancos 2002: 27; Egea et al. 2011.

<sup>45</sup> Remolà and Acero (eds.) 2011 – it contains papers on fourteen different sites, including Córdoba, Barcelona, Valencia, Sevilla, Lisbon, Zaragoza, Valencia and Cartagena.

abandonment. Likewise, it is possible to identify several new drains built after the fifth century in Barcelona, Seville and Cartagena.<sup>46</sup>

### **2.4.3 Cisterns**

Cisterns are large tanks of water that create a reservoir from which to draw when needed, and their presence in late antique contexts has normally been taken as a sign of an abandoned aqueduct, as it is assumed that this system is linked to the collection of rainwater and substituted the lack of piped water.<sup>47</sup> However, I believe that in some cases cisterns could indicate a functioning aqueduct, and it is clear that cisterns and aqueduct coexisted in the Roman period. They indicate the need to create a domestic water reservoir perhaps linked to a seasonal flow or to a leaking or unreliable conduit; overall, cisterns could have been used as ways of storing water and of maintaining the hydraulic pressure inside pipes. Cisterns also stored water during the night, when water consumption is virtually none, thus collecting the constantly flowing water so it could be used during the day. This is essential in sites where the flow was seasonal or reduced.<sup>48</sup> They fulfil the function of terminal tanks, but on a smaller scale, and there are various examples in the Roman world that support this idea. In Rome, huge cisterns were added at the terminal deposit of the Aqua Antoniniana, which supplied the Baths of Caracalla. In Leptiminus, the strontium analyses applied to the sinter deposits of domestic cisterns indicate that they were partially filled with aqueduct water, not only with rain water.<sup>49</sup> This is comparable to later Islamic practices in Spain, by which the rural irrigation systems were diverted once a week to the city conduit in order to fill the

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<sup>46</sup> On these problems, see Acero Pérez 2011: 163; Beltrán de Heredia and Carreras 2011 (Barcelona); Egea Vivancos 2002 (Cartagena); Jiménez Sancho 2011 (Sevilla).

<sup>47</sup> Bosch et al. 2005: 170.

<sup>48</sup> Cf. Brunn 2000b: 219-20.

<sup>49</sup> Bagust et al. 2011: 459; Yegül 1991: 393.

private domestic cisterns.<sup>50</sup> Lastly, the large cisterns of Constantinople, built at least 30 years after the construction of the aqueduct, could in fact be related to the need for a larger water storage capacity prior to the expansion of the aqueduct to sources further away (fig. 2.3).<sup>51</sup>

Of course, cisterns on their own (unless they have been analysed for strontium isotopes as in Leptiminus) cannot demonstrate the functioning of an aqueduct, so they have to be considered in their own context. In Tarragona, for instance, cisterns only appear in the upper town, next to the terminal tank of the aqueduct and far from the water table, whereas in the lower city, wells (and not cisterns) are more numerous.

#### 2.4.4 Late Roman water legislation

Roman law included various provisions on aqueducts, regulations on who was responsible for their maintenance and who actually owned the infrastructure.<sup>52</sup> The evolution into the post-Roman period of the maintenance systems and the ownership of the aqueducts may shed some light on the evolution and abandonment of water supply systems.

Roman water law is based on the private ownership of springs and small rivers, and the public nature of big (navigable) rivers, although water could be diverted from them if a permit was issued.<sup>53</sup> This means that “public” aqueducts were in fact private property of the city councils who had the property rights over the springs and rivers, even if the supply was provided as a public service. It is not clear what happened to the aqueducts after curial administration disappeared, but the ownership of the aqueducts

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<sup>50</sup> Glick and Kirchner 2000: 305.

<sup>51</sup> Crow et al. 2008: 15 – although many are late, such as the Basilica cistern, which is Justinianic in date.

<sup>52</sup> Compiled in Brunn 2000a; 2012. Cf. early Roman municipal laws from Spain (the *lex Ursoensis* and the *lex Irnitana*) which deal with *duumviri* and water management: González Román 2010: 59.

<sup>53</sup> Springs: *Dig.* XLIII 20.3.3 (*aqua, quae in rivo nascitur, tacite lucri fit ab eo qui dicitur*); Rivers: *Dig.* XLIII 12.2 (*quominus ex publico flumine ducatur aqua, nihil impedit nisi imperator aut senatus vetet*) and XXXIX 3.10.2.

may well have been transferred to the new elites.<sup>54</sup> Whereas Frontinus gives a detailed account of how the water system of Rome worked in the early second century AD, it is necessary to look at the Theodosian and Justinianic law codes to see how aqueduct legislation worked in Late Antiquity. Up to then, the owner of the conduit (private individual or public authority) was responsible for its maintenance, and the owner needed to obtain a permit from (and pay a compensation to) those landowners whose lands were crossed by the conduit.<sup>55</sup> However, in Late Antiquity the lack of public funds changed this situation, and landowners whose lands were crossed by a public aqueduct were freed from certain taxes, but had to be responsible for the cleaning and maintenance of those conduits:

*Possesores, per quorum fines formarum meatus transeunt ab extraordinariis oneribus volemus esse immunes, ut eorum opera aquarum ductus sordibus oppleti mudentur nec ad aliud superindictae rei onus isdem possessoribus attinendis, ne circa res alias occupati repurgim formarum facere non occurrant.*

“We wish landowners whose lands are crossed by the course of aqueducts (*formarum*) to be exempt from extraordinary burdens (*oneribus extraordinariis*) so instead they may keep the aqueducts free from filth (*sordibus*), nor are there other requirements to be made from such owners, lest being occupied with other things they fail to clean the aqueducts”.<sup>56</sup>

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<sup>54</sup> This is explored in length in chapter 6 below.

<sup>55</sup> *Clust XI.xliii.11*; Cf. *CIL XI.3003*: *Mummius Niger Valerius Vegetus Consular aquam suam (...) quae nascitur in fundo antoniniano maiore P. Tulli Varronis cum (...) duxit per millia passum (...) in villam suam (...) ex permissu S.C.* – “Mummius Niger Valerius Vegetus Consular led his aqueduct which flows out of the Antoninianum Maius property [belonging to] P. Tullius Varro for a mile into his villa with the permission of the Senate”.

<sup>56</sup> *CTheod XV.2.1*; *Clust XI.xliii.1.1*.

Nevertheless, it is difficult to assess how far imperial legislation is a reflection of provincial practices.

#### 2.4.5 Comparanda

The fragmentation of the Roman world during Late Antiquity is evident not only in the political sphere, but also in the economic and social ones, as Chris Wickham has explained in his *magnum opus*, *Framing the Early Middle Ages*,<sup>57</sup> and this affected the way towns and urbanism developed in each different region.<sup>58</sup> Thus, the way aqueducts fared in each region varied greatly, even within the Iberian Peninsula, as will be evident in the next chapter. Taking this into account, the use of comparanda from other regions of the Mediterranean will not be a precise way to analyse Spanish aqueducts. However, an overall picture of continuity or abandonment may serve as a good basis from which to develop arguments and theories about the Iberian aqueducts.

Firstly, it is clear that in those areas where strong local elites (especially bishops) were present, or where state intervention is known, aqueducts seem to have continued in use during Late Antiquity. Secondly, there is a visible gap between the seventh century, when it seems that the last Roman aqueducts ceased to function, and the eleventh, when old abandoned structures are put back in use.

##### 2.4.5.1 Italy

Italy saw the origin of Roman aqueducts and it is where most of these structures are known. Not only the volume of the archaeological material favours Italy; the amount of available written evidence is also more abundant than that of any other region. This may be the reason behind the various studies carried out on the fate of water supply

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<sup>57</sup> Wickham 2005.

<sup>58</sup> As has been long established: cf. Liebeschuetz 1992.

systems in Italy, mostly compiled by Paolo Squatriti based on the earlier work of Bryan Ward-Perkins.<sup>59</sup> The water supply system of Rome, with its fourteen aqueducts (according to Procopius)<sup>60</sup> and the ideological capital of the Empire, has received much attention. The most prominent researcher on this topic is Robert Coates-Stephens though perhaps Rome is so special and unique that it would not be a fair comparison to provincial towns like those from Spain.<sup>61</sup>

In the beginning of the period, Rome had a very complex system of aqueducts developed over four hundred years, which was already in decline by the year AD 400 (some of the lowest aqueducts had ceased to function) and a great deal of money was invested in its maintenance by the imperial authorities. After a troublesome fifth century in which the aqueducts were neglected, the Ostrogothic administration took over the responsibility of the aqueducts and repairs were carried out in several sections, parallel to a renewed legislation (fig. 2.4).<sup>62</sup> The city was badly damaged during the Gothic wars, when the aqueducts were cut by Totila in 537. Despite the provisions for their repair included in Justinian's *Pragmatic Sanction* of 554, Pope Gregory the Great complained already in 604 that the few still functioning aqueducts were on the verge of collapse.<sup>63</sup> From this point on, the popes took over the responsibility for the aqueducts but only a couple of the aqueducts which directly linked the papal complexes of the Vatican and the Lateran were maintained or even re-built (especially by pope Hadrian in the eighth century).<sup>64</sup> This information largely provided by the written sources is

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<sup>59</sup> Squatriti 1998; Magnusson and Squatriti 2000; Ward-Perkins 1984.

<sup>60</sup> *BellGoth* I.xix.13 – On these numbers, see Martínez Jiménez 2010.

<sup>61</sup> Coates-Stephens 1998, 2003a, 2003b, 2004.

<sup>62</sup> *Variae* VII.6.2 for the creation of the *Comitiva formarum Urbis*, or “Office of the count of the aqueducts of the City” (cf. the general approach to old Roman monuments by Theoderic in I.25.1 and III.30.1). Martínez Jiménez 2010. NB that the *Comitiva* was just a new administrative framework for the old Roman office of the curator aquarum.

<sup>63</sup> Cf. Section 5.1.4 below.

<sup>64</sup> Coates-Stephens 1998; 2003a.

confirmed in the archaeological record, as the presence of late repairs in coarse *opus vittatum* and late brickwork seems to indicate.<sup>65</sup>

State intervention is also evident in Ravenna, the capital of the Ostrogoths, as the sources mention clearly that the conduit built by Trajan had ceased to function long before Theoderic decided to restore it.<sup>66</sup> Similar to this renewed water supply system, new baths (for the palace and for the episcopal complexes) are known to have existed.<sup>67</sup>

From the eighth century onwards, monasteries as well as bishops began to repair abandoned Roman aqueducts for their own private supply, but new urban water systems would not appear until the thirteenth century.<sup>68</sup>

Elsewhere in Italy, the fate of aqueducts, as already mentioned, was linked to the fate of their elites, and bishops seem to have taken over most of the aqueducts as natural heirs to municipal power, many times at the expense of the local inhabitants. The clearest examples are perhaps those of Naples and Nola.<sup>69</sup>

As far as baths are concerned, a transition from Roman public munificence (investing in luxurious bathing) to an austere Christian sporadic charity can be seen in Italian cities.<sup>70</sup>

#### 2.4.5.2 *Gaul*

Very little is known about the Merovingian phases of aqueducts in Gaul, even if Gaul has some of the most impressive aqueducts of the Roman Empire, including the

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<sup>65</sup> Martínez Jiménez 2010. Specific examples: Ashby 1935: 65, 114, 127, 240, 259-63, 314; Van Deman 1934: 42, 65, 138-9, 155-6, 186, 330. Although, of course, construction technique is not the most reliable dating method, so this assertion has to be considered with caution.

<sup>66</sup> *Excerpta Valesiana* II.12.71. It was later restored by the Byzantine administration in AD 600 – Ward-Perkins 1984:132.

<sup>67</sup> *Variae* II.37.

<sup>68</sup> Magnuson and Squatriti 2000: 246-50; Squatriti 1998: 18.

<sup>69</sup> Squatriti 1998: 12-7.

<sup>70</sup> Ward-Perkins 1984: 119, 135-40.

Pont du Gard at Nîmes.<sup>71</sup> Nevertheless, two patterns are appreciable in the post-Roman period.

Firstly, in Septimania and southern Gaul there seems to have been some degree of aqueduct continuity, especially during the fifth and the sixth centuries.<sup>72</sup> The baptistery of Lyon has already been mentioned above as an example of a water consuming structure, but there are also notices of functioning baths in cities with aqueducts, such as Narbonne (whose aqueduct had been already repaired in the course of the fourth century)<sup>73</sup> at the suburban site of Clos de la Lombarde. Furthermore, baths, fountains, and arches (perhaps the aqueduct?) are present in a poem of Sidonius Apollinaris dedicated to Narbonne.<sup>74</sup> Baths were also built in the episcopal complex of Aix-en-Provence. These were built around the year AD 500 with a *caldarium* and a *frigidarium* and were in use into the seventh century. These cases should be considered exceptional, as collapsing and ruinous baths, as known from the writings of Caesarius of Arles in Provence, were probably far more common.<sup>75</sup> In Aquitaine, which was under Visigothic control for most of the fifth century, there is also evidence for continuity of hydraulic infrastructure in Cahors and Toulouse, with both aqueducts in use at least into the fifth century (according to the abandonment of their respective baths). The baths of Toulouse

<sup>71</sup> Fabre et al. 1991b; pp. 86-7 offer an overview on the abandonment.

<sup>72</sup> Bouet 2003: vol. 1: 342-3; vol. 2: 10-1, 179.

<sup>73</sup> *CIL* XII 4355; dated according to the lettering: *Pontem portas aqueduct(um) quaru(m) r[erum] usus longa incuria et vetustate co[...]/rat civitati restauravit ac redd[edit] et ad Praetorianam Gall(iae) Pr(a)efect[uram] iudicio a(u)gust(a)e remuneration[nis] causa* – “[Someone] restored and repaired the bridge, the gates and the aqueduct, whose use due to long neglect and old age [...], for the city [of Narbonne] and for the Praetorian Prefecture of Gaul for the sake of a venerable reward”.

<sup>74</sup> For the aqueduct, see: Andrieu and Cazal 1997, esp. 112-21. Sidonius Apollinaris, *Carmina* XXIII: (...) *Salve, Narbo, potens salubritate/ Urbe et ruri simul bonus videri/ Muris, civibus, ambitu, tabernis/.../ thermis, arcubus, horreis, macellis / (...)* – “Hail, Narbo, strong in health; both the city and the countryside seem [equally] good, with walls, citizens, shops (...), **baths, arches**, granaries, markets”.

<sup>75</sup> *Vita Caesarii* II.22: “[a] bath house had been built there with high walls. If anyone at any given moment happened to go by it (...) [he would look] with fear at huge stones falling in front of his feet or behind him”

are very interesting, as they seem to have been built during the fourth century in a newly urbanised area, and were in use up to the fifth/sixth centuries.<sup>76</sup>

Besides these immediate post-Roman examples of continuity there are later medieval examples of hydraulic architecture, especially in the ninth century. In the late Merovingian period (late eighth century) a new water conduit was built in Saint-Denis with mortared limestone slabs, in order to feed the monastic community. This aqueduct ran mostly underground from the *fons Sancti Remigii*, and seems to be largely unrelated to the Roman methods of aqueduct construction, for no levelling of the slope is noticeable, and it seems to be a crude ashlar conduit built in order to divert a stream.<sup>77</sup> Later in the Carolingian period, just as in Italy, bishops can be linked to the construction of water-supply systems reusing the old abandoned Roman conduits, such as those of Beziers or that of Le Mans, repaired by bishop Aldric.<sup>78</sup>

#### 2.4.5.3 Constantinople<sup>79</sup>

The capital of the Eastern Empire had the longest aqueduct ever built in the Roman and medieval periods, stretching for over 470km, carrying water from Thrace into the city on various monumental arches and bridges (fig. 2.5). This long aqueduct was a new late antique conduit that complemented the old Hadrianic aqueduct which fed the early Roman settlement. The fact that Constantinople had no true local water sources made long-distance water supplies a necessity. This large construction project was only possible with direct imperial intervention, simply because of its scale, so it would not be a fair comparison with most of the Spanish aqueducts. However, the fact that it was still built following the Roman method is very interesting, because it

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<sup>76</sup> Bouet 1997: 138; Rigal 1997: 312-3; 2011.

<sup>77</sup> Benoit and Rouillard 2000: 167-8; Wyss 1996: 188-9, 303.

<sup>78</sup> Benoit and Rouillard 2000: 167.

<sup>79</sup> Crow et al. 2008, *passim*; Crow 2012.

indicates that a precise knowledge of engineering continued into the Byzantine period during the fifth, sixth and seventh centuries. It also gives an idea of the priorities of the late Roman state in terms of public works.

The large open reservoirs or cisterns built in the fifth and sixth centuries in Constantinople also give clues regarding the use given to water in this period: baths and palaces were the main consumers of water, but intramural industrial areas and agricultural irrigation (especially in the area between the Constantinian and the Theodosian walls) seem to have been very important too. The aqueduct could have been abandoned for a long period of time after the Avar-Sassanid siege (AD 626), but it was later repaired in the Middle Byzantine period, when the Empire was powerful enough to devote itself to such constructions, and it was kept in use into the eleventh century.

#### *2.4.5.4 Palestine*

Palestine and the Iberian Peninsula, despite having completely different urban histories (towns and cities in Palestine mostly predated the arrival of the Romans, as opposed to what happened in Spain), have in common that both were conquered and ruled by the Umayyads, which could provide a point of comparison for the latest period discussed in this thesis.

In Palestine there are several aqueducts which continue into Late Antiquity, and even into the Umayyad period. Different construction techniques have been identified for the Roman, Byzantine and Umayyad periods, making the identification of repairs and new conduits somewhat easier than in other regions.<sup>80</sup> In the Justinianic period, the work of bishops in parallel to that of the local authorities is evident in the continuity of most of these structures; they are present in inscriptions and written texts in sites such as

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<sup>80</sup> Porath 2002a.

Bostra, Scythopolis and Caesarea Maritima.<sup>81</sup> The inscription of archbishop Anastasius of Bostra (fl. AD 540) testifies to the interest shown by bishops as leaders of the local communities in aqueducts and water supply, even if the text itself indicates imperial intervention:

† ἐκ φιλοτιμ(ίας) τοῦ δεσπ(ότου) Ἰουστινιαν[οῦ] / παρασχηθίση[ς ἐ]κ  
πρεσβία(ς) τοῦ ὀσίου / ἀρχιεπισκ(όπου) Ἰωάννου ἀνηνεώθη ὁ  
ἀγωγ/[γ]ὸς δι(ὰ) Ἀναστασίου τῶν Μαρ[ί?]ας ἀργυρο[ποιοῦ]

Thanks to the generosity of the Emperor Justinian, facilitated by the embassy of the holy archbishop John, the aqueduct (ἀγωγός) was renovated (ἀνηνεώθη) through Anastasius, treasurer of those [belonging to the church of?] Mary.<sup>82</sup>

In Caesarea Maritima, one of the old provincial capitals, the aqueduct was repaired after a popular rebellion against the local authorities caused by the lack of aqueduct water. Choricus of Gaza recorded how in the year 530 the governor carried out again the usual maintenance duties linked to the aqueduct after a long time of neglect, and the aqueduct was in use until the seventh century, when the city itself was abandoned.<sup>83</sup>

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<sup>81</sup> DiSegni 2002: 58-66.

<sup>82</sup> *IGLS* 13.1, 9129; Amendment of the text and translation from the Greek by Aitor Blanco (Christ Church, Oxford).

<sup>83</sup> Porath 2002b: 125-7; Mayerson 1986: 270-1 (citing *Choricii Gazaei Opera*, 45): “Such things [aqueducts] need to have very frequent care; consequently, since there was neglect, there was no longer as unhindered a passage for the flowing water as before”.

### **3. THE AQUEDUCTS OF THE IBERIAN PENINSULA IN LATE ANTIQUITY**

As explained above, the fifth century, with the collapse of the Roman administration and the emergence of local authorities and Germanic kingdoms, clearly marked a point of no return for towns in Spain, deeply affecting their urbanism and infrastructure – and their aqueducts. This chapter is a catalogue of all the 61 aqueducts in the Iberian Peninsula, organised according to their abandonment date; whether clearly out of use before the fifth century, or certainly working later, mentioning too those of which nothing certain can be said, because of the lack or the nature of the evidence (table 1).<sup>1</sup>

#### **3.1 AQUEDUCTS ONLY DATABLE UP TO AD 400**

In this section all the Roman aqueducts which were in use into the fourth century are included. Most of these aqueducts were either small or belonged to secondary towns which were in decline already in the early stages of Late Antiquity as a result of the administrative reorganisation early in the fourth century. Paradoxically, the longest aqueducts of Spain (Cádiz and Toledo) are included in this section.

##### **3.1.1 Roman aqueducts without datable evidence**

There are several Roman aqueducts in Spain where abandonment cannot be dated with certainty, due to the lack of available material, either from the aqueduct itself, or from the town that was supplied by it, many times because these are places which have

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<sup>1</sup> 61 aqueducts in 33 towns, a similar ratio to the 49 urban aqueducts of Byzacena, but far from the ratio of Zeugitana (249 rural and urban aqueducts in 202 sites) – Casagrande 2010.

been continuously occupied. The only datable evidence we have for these is that they are Roman, and that they were largely built during the first or second centuries AD.

The worst-case scenario we find is the aqueduct of Granada, which we know existed; but all the standing remains disappeared during the course of the 20<sup>th</sup> century, and were never satisfactorily recorded.<sup>2</sup> Although there is one set of baths in Granada that may be late in date, there is basically nothing known about Granada in this period.<sup>3</sup> Two further examples are the aqueducts of Chelva (near Valencia) and of Lodosa/Calagurris: the first is an impressive structure towering up to 27m over a cliff, and linked to rock-cut conduits along 11km;<sup>4</sup> the second is a structure crossing over the river Ebro where 13 arches remain of the 108 it used to have.<sup>5</sup> Both are impressive aqueduct bridges, but alas it is not known with certainty where they carried water to.

Even more impressive must have been the aqueduct of Cádiz, the longest in the peninsula (almost 75km), which crossed the bay into the island-city by means of several inverted siphons made of stone pipes that ran on the bottom of the lagoon, and the remains of which impressed even Islamic chroniclers.<sup>6</sup> Despite the fact that its course is roughly known (thanks to recent surveys), no excavation of the conduit has taken place, and there are no Roman baths or houses known from the city of Cádiz that could provide us with concrete dating evidence.<sup>7</sup> Besides that, the whole city seems to have been greatly affected by events in the course of the third and fourth centuries, including the silting of the harbour, which had been in use since Phoenician times, and already the

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<sup>2</sup> Fernández Casado 2008 (1972) and Fernández García 1992: 142. Recent surveys seem to indicate that the aqueduct of Roman date which Fernández Casado mentioned may not have been built to supply the city, but rather to irrigate fields: González Román 2010.

<sup>3</sup> García-Entero 2005: 704.

<sup>4</sup> Cantó and Curiel 1998; Pérez Mínguez 2006: 30-2. Escribá et al. (2005: 268-9) explain how it may have fed the Roman town of Edeta, of which no water consuming-structure is known, besides a set of baths which by the 6<sup>th</sup> c. had been turned into a church, and a thermal sanctuary turned into a monastery.

<sup>5</sup> Fernández Casado 2008 (1972); Mezquíriz 2004a.

<sup>6</sup> Al-Makkari I.6, p. 77.

<sup>7</sup> Fernández Casado 2008 (1972): 202; Lagóstena and Zuleta 2009; Pérez and Bestué 2008, 2010; Vizcaíno Sánchez 2009: 143-4.

late Roman poet Avienus in his fourth-century *Ora Maritima* mentions the city as “a field of ruins”.<sup>8</sup>

Another striking example is that of Itálica, the first Roman colony in Spain. Even if much is known about the early town, the later phases are very obscure. The original foundation is currently under an early modern village, Santiponce, so very little is known of it. The large Hadrianic expansion of the city, however, is better known. However, in the fourth century most of this new urban area was abandoned, as the inhabitants built a new defensive wall that left outside the Hadrianic *urbs nova*.<sup>9</sup> It is generally assumed that the area outside these new walls was largely abandoned, and that the population fled to the fortified area. These were later restored by Liuvigild during Hermengild’s rebellion in AD 579.<sup>10</sup> The city had become a bishopric at some point earlier in the fifth century, and a very active sixth-century mint.<sup>11</sup>

The first-century AD aqueduct of Itálica is relatively well known,<sup>12</sup> and it is possible to distinguish two different phases: a first one related to the *urbs vetus* and a new expansion linked to the Hadrianic urban development. The aqueduct has not been excavated, and the baths were badly excavated in the early twentieth century, so there is no direct evidence available from either.<sup>13</sup> Perhaps the mentioned reconstruction of the walls by Liuvigild in the sixth century indicates to me a possible (although impossible to demonstrate) sixth century restoration: wall and aqueduct repairs were normally

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<sup>8</sup> Avienus, *Ora Maritima* 271-2; *nunc egena, nunc brevis, nunc destituta, nunc ruinarum ager est* – “[Cádiz] is now poor, now small, now abandoned, now a **field of ruins**”.

<sup>9</sup> Rodríguez Hidalgo 1997.

<sup>10</sup> *Liuvigildus muros Italicae antiquae civitatis restaurat, quae res maximum impedimentum Hispalensi populo exhibuit*; “Liuvigild restored the walls of the old city of Itálica, which proved a great misfortune for the people of Sevilla”. John of Biclar, s.a. 584.1.

<sup>11</sup> Caballos et al. 1999: 35-6; CNV # 33: *Cum deo Italica*.

<sup>12</sup> The course is repeatedly described in Canto 1979; Fernández Casado 2008 (1972); González and Bestué 2006: 270-1; Luzón and Mañas 2007.

<sup>13</sup> Caballos et al. 1999; García-Entero 2005: 709-17; Stephan 1995.

closely related, as seen in fifth century Rome during the reign of Arcadius and Honorius.<sup>14</sup> This however is only a supposition, based on the lack of data.

Finally, some other minor towns, like Segóbriga,<sup>15</sup> Sagunto (with its two aqueducts),<sup>16</sup> *Pollentia* (in Mallorca),<sup>17</sup> Lisboa,<sup>18</sup> Consuegra (in Toledo),<sup>19</sup> Chaves<sup>20</sup> or *Uxama*,<sup>21</sup> had aqueducts, but there is not enough information about the late antique levels to provide any important datable evidence. Added to these, 10 minor urban settlements in Baetica (*Arucci*, Ronda, *Argi*, *Iibli*, *Egabrum*, *Lacipo*, *Ucubi*, Fuenteobjuna, *Onuba* and *Ocuri*) are considered to have had some long-distance Roman water supply system.<sup>22</sup> Braga, in northern Portugal, is another example, but this will be discussed in depth later.<sup>23</sup> In total, these constitute up 26 aqueducts in 22 sites (44% of the total).

### 3.1.2 Aqueducts abandoned by AD 400

There are several aqueducts which are known with a high degree of certainty, according to the excavated material linked to them, to have been out of use by the end of the fourth century.

The fourth century is a century of many changes at many levels (religious, social, political, economic, etc.), which really sets the beginning for Late Antiquity. However, for the sake of keeping the thesis focused on the long continuity and the later life of

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<sup>14</sup> Ashby 1935: 92; Van Deman 1934: 186.

<sup>15</sup> Almagro and Abascal 1999.

<sup>16</sup> Aleixandre 2008; Civera 2004, 2008, 2009; Pérez Centenero 1996-1997. The (allegedly three) aqueducts of Sagunto are badly known (they are only mentioned by this author and his immediate collaborators, cf. Llobregat 1992), for they seem to have been preserved in modern-day irrigation channels and have not been excavated.

<sup>17</sup> Arribas et al. 1973: 24-6; Cau and Chávez 2003: 37.

<sup>18</sup> Almeida 1969.

<sup>19</sup> Giles Pacheco 2010.

<sup>20</sup> SIPA 2011. Jorge López Quiroga (2004: 80-1, 3) claims that the dam should be dated to the late fourth century, based on a very dubious inscription which mentions no date whatsoever.

<sup>21</sup> García Merino 2007; 2010.

<sup>22</sup> González Román 2010 – most of these are simply known from inscriptions.

<sup>23</sup> Morais 2010. See section 4.1.

these structures, it is necessary to leave most of the fourth century material aside, especially with those aqueducts which can be certainly be dated as out of use by then. In the following chapters the transformations of the fifth centuries will be discussed in depth, although references to fourth-century material may appear.<sup>24</sup>

For now, it suffices to mention that throughout the fourth century most minor and secondary provincial towns lost their prominent role as regional nuclei, and this together with the increasing taxation made these minor towns less capable of preserving their infrastructure, and in many cases they even ceased to exist as urban centres, as for instance the sites of Los Bañales (province of Zaragoza)<sup>25</sup> or *Begastri* (in Murcia),<sup>26</sup> both of which had first and second-century aqueducts. In these cases, the abandonment of the aqueduct is linked to the abandonment of the settlement. In some other cases, like *Ebusus* (Ibiza),<sup>27</sup> *Andelos* (Navarre)<sup>28</sup> or *Tiermes* (province of Soria),<sup>29</sup> the terminal cisterns or the conduits of the aqueducts were abandoned (or re-used as churches, for instance) with plenty of fourth-century material retrieved from excavations, while the town preserves some degree of urban nature, but these towns too were abandoned during the fifth century (if not earlier). In a couple of cases, we know of aqueducts damaged and abandoned as a consequence of earthquakes (and never repaired), as the three aqueducts of *Baelo Claudia* (in Cádiz),<sup>30</sup> or the *Aqua Augusta* of Córdoba, further described below. Lastly some single-purpose aqueducts linked to more or less still vibrant settlements in Late Antiquity fall into this category, such as that of León, built in

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<sup>24</sup> See ch. 5, in particular section 5.3.1.

<sup>25</sup> Beltrán 1977; Fernández Casado 2008 (1972); Jiménez 1974.

<sup>26</sup> Abandoned at some point in the fourth century, the aqueduct was later pulled down and its stones used to build a wall in the Visigothic period: González Blanco 2007: 560.

<sup>27</sup> Abandoned in the third century, Castro and Roig 2009; Cf. with the lack of material of the main settlement by the time of the Byzantine period, Ramon 2005: 487-8.

<sup>28</sup> Mezquíriz 2004b.

<sup>29</sup> Argente and Díaz 1980, 1984; Díaz and Argente 1984. Although doubts regarding this material are presented in Martínez 2007.

<sup>30</sup> Alarcón Castellano 2009; Fernández Casado 2008 (1972); Grützner et al. 2010; Jiménez 1974. Followed soon by the abandonment of the fish industries: Bernal et al. 2007. Although, as clearly pointed out in Bernal et al. 2011, there is no conclusive evidence whatsoever to date any of the aqueducts.

order to supply the baths of the legionary camp, and that must have been in use only during the lifetime of these baths (up to the third century).<sup>31</sup>

Besides these examples of minor settlements, Cartagena and Toledo should be mentioned. The truth is that both settlements, even if they had been important in the republican period, had become secondary nuclei by the third century, which may account for why their aqueducts were out of use by the fourth century, as the local elites could not maintain the water infrastructure.<sup>32</sup> Only in the post-Roman period did they become increasingly important as Cartagena was turned into the capital of the Byzantine province of Spania after the 550s and Toledo became the Visigothic royal capital also by the late sixth century. In the case of Cartagena, the aqueduct was already in disuse by the third century, as the materials retrieved from the distribution cistern and the Cerro del Molinillo indicate.<sup>33</sup> Something similar can be said about Toledo, where the abandonment layers of the *castellum aquae* (the so-called “caves of Hercules”) are consistently fourth-century in date.<sup>34</sup> As will be discussed later, the new late antique relevance of these two sites did not lead to the revival of the old aqueduct systems; these were left abandoned and unused, even in the Islamic period.<sup>35</sup>

In total, there are 15 aqueducts in 12 sites known to have been abandoned during the fourth century. These 15 constitute the 25% of the total number of aqueducts known in the peninsula.

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<sup>31</sup> Campomanes 2006; Campomanes and Sánchez 1989; San Román et al. 2006.

<sup>32</sup> More on this will be explained in ch. 5.

<sup>33</sup> Egea Vivancos 2002; Ramallo et al. 2010.

<sup>34</sup> Aranda et al. 1997: 334-6; Arenillas and Barahona 2008; Arribas Domínguez 2008; Ferández Casado 2008 (1972); Porres Martín-Cleto 1970. Dates for the collapse of the caput of this aqueduct, the Consuegra dam, are still unavailable.

<sup>35</sup> Sections 4.2, 5.2.3.2 and 6.4

Having briefly considered the 26 aqueducts that are not datable (but probably abandoned early) and the 15 that were apparently abandoned in the fourth century, we can turn to the remaining aqueducts (31% of the total) that continued in use into the fifth century and that are the main focus of this thesis.

## 3.2 BARCELONA

### 3.2.1 Barcelona in Late Antiquity

Barcelona (*Barcino*) was during Late Antiquity one of the most important towns of the north-eastern Iberian Peninsula. The old Roman colony had been founded on two hills between two small rivers overlooking the Mediterranean coast, and it was back then a secondary regional town within the area of influence of Tarragona, the provincial capital. Its political importance grew during Late Antiquity, and during the Visigothic period it replaced Tarragona as the regional capital.

#### 3.2.1.1 *The increasing political importance of Barcino*

Barcelona began to develop as a political centre during the early fifth century, when it became the seat of power of Athaulf and Galla Placidia (410-15),<sup>36</sup> probably because of its location close to Gaul, its good harbour, and its walls (built during the course of the fourth century).<sup>37</sup> It became part of the Visigothic kingdom in the 470s, and it seems that there was a Gothic royal palace there (which probably dated back to the times of Athaulf), when it became the *sedes regia* of kings such as Gesalec (507-

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<sup>36</sup> Ripoll López 2002: 34.

<sup>37</sup> Pallarés Salvador 1969; Puig and Rodá 2007.

511).<sup>38</sup> However, it was because of the presence of a bishop that Barcelona became the key city in the province of Tarraconensis.

The city had been an episcopal see at least since the fourth century, and it was both a Catholic and an Arian bishopric until the third Council of Toledo in AD 589. In the year 592, king Reccared invested the bishop of Barcelona with the power to collect the taxes in the territory of three other adjacent bishoprics, including the metropolitan see of Tarragona, in a document called *De fisco Barcinonensi*.<sup>39</sup> The power of the bishop was thus increased, allowing him to enlarge and develop the episcopal complex of the city, which was located in the north-eastern quarter of the town.

The episcopal complex of Barcelona (fig. 3.1) is a very good example of well-researched urban archaeology. The excavations below the Plaça del Rei, the cathedral and the Museu d'Historia de la Ciutat have revealed a large site which was most probably the political centre of Barcelona. This has been identified as the episcopal complex, which can be dated to the fifth century, with an important expansion in the sixth. The complex and the cathedral were originally (during the fourth century) located on an industrial area which included a *fullonica* and *tinctoria*, and a fish sauce factory (*cetaria*).<sup>40</sup> The *episcopium* back then consisted of a large residence constructed over a previous *domus*, the cathedral basilica itself, and an audience hall, all of which were contained into a single street-block.<sup>41</sup> However, probably during the late sixth century (perhaps related to the powers granted to the bishop by the *De fisco Barcinonensi*), the whole area underwent a major reconfiguration: the industrial buildings were finally abandoned and substituted by new structures belonging to the episcopal complex: the

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<sup>38</sup> *Gesalecus Goericum Barcinone in palatio interfecit*; "Gesalec killed Goericus in Barcelona in the palace" – *Chronica Caesaragustana* s.a. 510; Cf. *HistGoth* 38; Ripoll López 2002.

<sup>39</sup> Palol and Ripoll 1988: 2; discussed in Wickham 2005: 96-79.

<sup>40</sup> Beltrán de Heredia 2002a, 2002b – the fifth-century abandonment contexts of these structures give a *post quem* date for the construction of the episcopal complex.

<sup>41</sup> Bonnet and Beltrán 2002: 74-6. Cf. Miller 2000: 13-20.

cathedral was enlarged, the baptistery was remodelled, a new cross-shape building (identified as a church) was erected, and a new U-shaped building (maybe the *palatium comitis*?) was built.<sup>42</sup> In order to build this large complex several transverse streets were blocked and included inside the complex. A new bath complex was built in the sixth century too, as will be set out below.

The rest of the town remains largely unknown for this period, but it seems, from the evidence of extensive reuse of materials in the episcopal complex, that whatever traditional public structures still survived were pulled down in order to obtain new building material.<sup>43</sup> Outside the walled town, a new sixth-century suburb developed towards the north-west.<sup>44</sup>

### 3.2.1.2 Late antique baths

Of the few structures known from late antique Barcelona outside the episcopal complex, baths are the most abundant. Some new large baths were constructed during the course of the fourth century, which might have been public, but it is not known when they ceased to function. Two other late baths belonging to aristocratic *domus* are known: those of Bisbe Caçador (belonging to a fourth-century *domus*) and Pati Llimona (dated to the fifth century). Both seem to have continued until the sixth century at least, parallel to the abandonment or re-conversion of the *domus*, although the dates of these baths are not certain.

The *balneum* of the domus at Carrer Bisbe Caçador is a large set of baths, with five rooms (fig. 3.2) which include an *apoditerium*, two *frigidaria*, a *tepidarium* and a

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<sup>42</sup> Bonnet and Beltrán 2002: 78-87 – this identification is based on the fact that it is located next to the episcopal complex, but does not seem to have any access to/from it.

<sup>43</sup> Beltrán de Heredia 2002c.

<sup>44</sup> Gurt and Godoy 2000: 458.

*caldarium*, paved in *opus sectile*.<sup>45</sup> It was built on top of the *intervallum*, so it has been dated to the fourth or fifth centuries. The bath furnace was shut by the end of the fifth century, but this does not prove that the bath cease to function; it rather indicates that the baths may have continued to function simply with cold water.<sup>46</sup> The *domus* itself was abandoned in the seventh century, and by then the baths must certainly have been out of use.

The baths of the Pati Llimona *domus* (fig. 3.3) are smaller than those of Bisbe Caçador, but are very well preserved. They are also linked to a private house, which was also built on the *intervallum*. The bath with its hypocaust floor was in use until the sixth century, according to the abandonment layers.<sup>47</sup>

### 3.2.2 The aqueducts

#### 3.2.2.1 Sources, course and distribution

The aqueduct (or aqueducts) of Barcelona are partially still standing in the northern part of the old Roman city, exactly where they cross the walls next to the north gate, at the Plaça Nova. They were thought to have disappeared long ago, and 19<sup>th</sup> and 20<sup>th</sup> century scholars argued about the location of the aqueduct, which was known from written medieval sources and from a Roman inscription, which reads as follows:

*L(ucius) Min[ucius] L(uci) f(ilius) Galeria Na]talis (...) et L(ucius)  
Minicius L(uci) f(ilius) [Natalis Quadro]nius Verus f(ilius) (...) balineum  
c[um port]icibus solo suo et/ du[ctus aquae] fecerunt.*

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<sup>45</sup> García-Entero 2005: 207; Martín et al. 2000: 283; Miró and Puig 2000: 175.

<sup>46</sup> A typical feature noticeable in other late antique baths, as described in chapter 2.

<sup>47</sup> García-Entero 2005: 211; Miró and Puig 2000: 175; Oliver and Riu 1987.

“Lucius Minucius Natalis,<sup>48</sup> son of Lucius, of the Galerian tribe (...) and [his] son Lucius Minicius Natalis Quadronius Verus, son of Lucius (...) built a bath with porticoes and an aqueduct on his own land”<sup>49</sup>

Then, during the construction of a new public square at Barcelona (the Plaça Nova) in the 1950s, the remains of the arches for two conduits appeared again inside the Casa del Arcediano (a Renaissance palace built adjacent to the town gate), projecting outside the walls (figs. 3.4, 3.5). It was evident then that the aqueducts were included in the Roman and medieval fortifications.<sup>50</sup> In this site, two different water conduits are now standing, built in parallel and following the same construction technique.

They are built in *opus vittatum* with regular ashlar blocks quarried from the nearby hill of Montjuïc. The pillars, which are 5x5 Roman feet (1.55 x 1.55m), are built on top of solid bases which rest on the soil. The pillars culminate in impostes which are  $1\frac{1}{2}Rf$  thick, on top of which rest the arches. The arches are round or voussoir arches,  $5Rf$  in radius at the intrados (3.10m total width), and the voussoirs themselves are  $1\frac{3}{4}Rf$  high. The *specus* is built on a box lying just above the horizontal formed by the extrados,  $5Rf$  wide and  $3\frac{1}{2}Rf$  tall, 7 metres above the ground.<sup>51</sup> The western aqueduct, known as the Collserola aqueduct (app. I), has the biggest *specus*, is box-shaped, measures 60 x 60cm and is lined in *opus signinum*. The eastern aqueduct, known as the Moncada aqueduct (app. II), is built with slightly smaller stones. Its *specus* is U-shaped, measuring 60 x 72cm, and is also covered in *opus signinum*, but its level is 15cm higher than that of the Collserola aqueduct (fig. 3.6).<sup>52</sup>

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<sup>48</sup> The rest of the inscription mentions that he served as governor of Africa under Trajan, thus dating these baths to the early 2<sup>nd</sup> c.

<sup>49</sup> *CIL* II 4509; Mariner Bigorra 1973 #30.

<sup>50</sup> Fernández Casado 2008 (1972): 219; Mayer and Rodá 1977: 271.

<sup>51</sup> Miró and Orengo 2010: 114.

<sup>52</sup> Miró and Orengo 2010: 115.

The existence of two different conduits entering the town has generally been taken as proof for the existence of two different aqueducts, but according to recent research both conduits are part of a single aqueduct which branched at some point between the source and the city.<sup>53</sup>

### 3.2.2.2 The Moncada aqueduct

The course of the Moncada aqueduct (app. II) can be traced fairly accurately beyond the Plaça Nova thanks both to archaeological data and written references, as is repeatedly mentioned in medieval documents (*archos antiquos, arcos, aquaria*, etc) in the surroundings of Barcelona.<sup>54</sup>

The aqueduct turns north from the Plaça Nova and is found again at the Plaça de Durán i Bas: when a house was demolished there in 2010, and once the debris was removed, a section of the aqueduct was uncovered inside the wall of the adjacent house. This section perfectly preserves four more arches (five pillars) and its *specus*. It is also built in the same 5Rf-moduled *opus vittatum*. Because it is still imbedded in the house's wall, and holding its weight, it is not possible to clear the in-filled masonry in order to render it free standing (fig. 3.7).<sup>55</sup> The next known section is located at the site of Carrer Magdalenes 25, by an old nunnery. These remains were identified in 2005, and were part of the *specus* and its surrounding *opus vittatum*, which had been reused after Antiquity and were all covered in lime mortar.<sup>56</sup>

The next location of the aqueduct is known from three written sources in the current urban area of Barcelona. These indicate that the aqueduct was standing in 1763

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<sup>53</sup> Orengo and Miró 2011.

<sup>54</sup> Compiled in Mayer and Rodá 1977: 266-7.

<sup>55</sup> Miró and Orengo 2010: 113.

<sup>56</sup> Miró and Orengo 2010: 112.

inside a house at the area known as the *Archs de Jonqueres*,<sup>57</sup> next to the Lesser Count's Palace in 1116,<sup>58</sup> and by the De las Puel·las (formerly, St. Peter's) monastery in 1044.<sup>59</sup>

Six kilometres away from the last attested location, at the site of Sant Andreu (Carrer Palomares and Carrer Coronel Monasterio), excavations have revealed more sections of the aqueduct. The remains were located in 2006, and stretch over 90 metres, and were identified in several survey trenches and excavated in depth in three different sondages. They are built in *opus caementicium*, with a total width of 1,30m, the *specus* being about 60cm wide. This is lined in *opus signinum*, on top of which sinter crusts between 2 and 14cm formed (this may indicate a very long period of flowing water, because the source of the aqueduct is naturally poor in calcium). Several *cippi* (markers) and *spiramina* (manholes) have also been identified there.<sup>60</sup>

The source of the aqueduct is identified thanks to a final reference, dated to 987, which mentions the aqueduct next to a Roman road (*ipsa Aquaria Antiqua vel in via*), which from the context of the manuscript is identified as the road next to the Tapioles river and the Moncada mine.<sup>61</sup> This mine was a source of drinking water in the Middle Ages, and can therefore be associated with the original Roman source for the aqueduct. Thus the aqueduct had an approximate length of 11,3km, and a drop of 18,12m.<sup>62</sup>

The course (fig. 3.8) given by the evidence for the Moncada aqueduct fits perfectly with the route of the main Roman road, running parallel to it for the most of its course, which would further confirm that it is a correct route. Furthermore, the aqueduct itself seems to be running parallel to a later medieval (11<sup>th</sup> c.) water conduit, the Rec Comtal (app. III), which fed water to the many feudal mills of the counts of Barcelona

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<sup>57</sup> Miró and Orengo 2010.

<sup>58</sup> ACA [= *Archivo de la Corona de Aragón*] Ramón Berenguer III #191.

<sup>59</sup> CSCugat [= *Cartulari de Sant Cugat*] II 575, p. 240: *ad ipsos archos prope domum Scti. Petri coenobia*.

<sup>60</sup> Giner Iranzo 2007: 43-4, 47-9, 71-3, 87-11, 128, 131 (sinter); Miró and Orengo: 117-8.

<sup>61</sup> CSCugat I f. 344 #981

<sup>62</sup> Miró and Orengo 2010: 119-20.

before arriving at the Count's Palace (built during the 11<sup>th</sup> c. on top of the old sixth-century Episcopal complex).<sup>63</sup>

### 3.2.2.3 The Collserola aqueduct

The other aqueduct, named after the spring of Collserola (app. I), has been located archaeologically only in the area around the Plaça Nova. From the standing remains, and heading north-west, several pillars were excavated at the Plaça itself, at the Col·legi d'Arquitectes, and then only identified later at Carrer dels Arcs, whose name makes reference to the aqueduct itself.<sup>64</sup> All of these locations are only 200m away from the Plaça Nova, so it is not easy to reconstruct the rest of the aqueduct's course, especially because the written sources do not refer to this aqueduct at all.

The identification of the spring of Colserolla with the source for this second aqueduct is only because a later medieval (14<sup>th</sup> c.) aqueduct was built bringing water from there. This medieval aqueduct was built, according to the sources, not like a Roman aqueduct with an open *specus*, but was a conduit of subterranean pipes (*subtus terram in canonibus a pede montanearum collis de Cerola* – “underground in pipes from the foot of the mountains of Collserola”).<sup>65</sup> If the aqueduct were to come from this source, it would have had an approximate length of 6km, while the drop would be close to the 246m, which is considerably more (46m/km average drop) than that of other Roman aqueducts.<sup>66</sup>

For this reason it has been suggested that the “Collserola” aqueduct was in fact a ramification of the Moncada aqueduct, which branched off at some point in order to supply water to rural establishments on its way back to Barcelona, approaching the

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<sup>63</sup> Mayer and Rodá 1977: 273; Miró and Orengo 2010: 120.

<sup>64</sup> Fernández Casado 2008 (1972): 219-21; Miró and Orengo 2010: 121; Sol Vallés 1977.

<sup>65</sup> Mayer and Rodá 1977; Miró and Orengo 2010: 121.

<sup>66</sup> Vitruvius recommends 5m/km and Pliny 0.2m/km drops; Cf. Miró and Orengo 2010: 123.

town from the north-west (as opposed to the Moncada conduit, which does it from the north-east).<sup>67</sup> It is not uncommon to find aqueduct branches to supply other areas without the need of building a new one (as is the case of Rome with the Arcus Neroniani, which was a suburban branch of the Aqua Claudia).<sup>68</sup> The difference between the heights of the *specus* of both aqueducts at the point at which they enter the town is just 15 cm, which may confirm that they share a similar source and a similar gradient, one of them with a slightly longer course.

#### 3.2.2.4 Distribution and disposal of water

Inside the walls, the water seems to have been distributed from the *castellum*, which is thought to have been underground, by the forum, which is the highest part of town. From there water would have been supplied, through pressurised pipes and open conduits, to other parts of the town. One of these distribution conduits has been located at the Carrer Palma de Sant Just (app. IV), which at the time of its discovery (1904) was considered to have been the *cloaca maxima* or main drain.<sup>69</sup>

This conduit is a mortared-rubble, vaulted structure known for approximately 21 metres. It ran underground in Roman times, but recent studies suggest that this was not a drain, but a conduit of clean water. The arguments for this are its orientation along the *decumanus maximus* (from the forum terminal deposits towards the southern baths) and that it does not match other sewers of the city either in orientation or construction technique. Even if it is not lined with *opus signinum*, there are examples in Spain of

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<sup>67</sup> Miró and Orengo 2010: 124.

<sup>68</sup> Frontinus *De Aquis*. I.20, II. 76, 87; Ashby 1935: 244, 250-1; Coates-Stephens 2004: 63; Van Deman 1934: 266.

<sup>69</sup> Miró and Orengo 2010: 125-8.

aqueducts carrying clean water for baths (not necessarily drinking water) in clay-lined conduits, as in Pamplona, Valencia and León.<sup>70</sup>

As far as sewers are concerned, there are not that many known from Barcelona, but the most important for our study are those located at the episcopal complex. The old Roman sewers were completely reformed in the fourth century, but then seem to have been neglected and probably abandoned by the sixth century, but when the episcopal complex was developed, new drains were constructed. It is not clear if the drainage linked to the episcopal bath led to the main sewer or to a sewage-pit, but this drain was clearly built reusing the hydraulic systems of the pre-existing structures.<sup>71</sup>

#### *3.2.2.5 Chronology and dating evidence*

The aqueduct was built during the Flavian period, according to the material obtained from the foundation trench at the site of Sant Andreu, but what is really important is that there is plenty of evidence available from Barcelona to study the evolution of water supply during Late Antiquity.<sup>72</sup> The aqueducts themselves are exceptional, as they seem to have been in use at least until the seventh century. The arches and conduits may have been standing for longer, as evidenced by the written documents mentioned above, but this continuity does not necessarily mean that their use continued, especially after the eleventh century when the Rec Comtal (app. III) was constructed.<sup>73</sup>

Focusing now on the late antique material, it is evident that the aqueducts were working in the fourth century: when the walls were expanded in this century, the

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<sup>70</sup> For Pamplona, Unzu et al. 2006; for León, see Campomanes 2006; for Valencia, see below section 3.8.1.

<sup>71</sup> Beltrán de Heredia 2002c: 102; 2008, 282. Beltrán de Heredia and Carreras 2011: 240-2.

<sup>72</sup> Forms Dragendorff 27b and 29, which can be dated between to AD 40-89 and AD 40-50 respectively: Miró and Orengo 2010: 111.

<sup>73</sup> There are 34 mentions to the aqueducts between the years 987 and 1219.

aqueducts that entered the city at Plaça Nova were kept intact, and the tower built on the side of the gate was built aligned with the aqueducts, respecting their course and structure (fig. 3.4).<sup>74</sup> Likewise, the water-consuming structures dated to the fourth century (the *cetaria*, the *fullonica*, and the new private baths built then), and the renovated sewer system indicate that running water was still available. The new baths constructed in the fifth century (Pati Llimona and Bisbe Caçador) further demonstrate this point.

The material from the episcopal complex, expanded during the sixth century, also shows that the supply was maintained in the Visigothic period. On the one hand, the baptistery might have needed running water, but this is not necessarily an indication of a continuing supply. The baptismal font (fig. 3.9) is an octagon 4m across, and it has a drain to empty it of water, so it is conceivable that it was fed by piped water instead of being a bucket-filled structure.

What indicates a functioning supply in the late sixth and early seventh centuries is the new episcopal *balneum* (fig. 3.10), which was built reusing the hydraulic infrastructure of the industrial area during the sixth century, as is evidenced by the presence of a large pool lined in *opus signinum*. The pool of the *frigidarium* was fed by a water pipe, as the imprint of the pipe has been preserved, which can be linked to the continuation of aqueduct water supply. Even though only the *frigidarium* has survived, it is possible that it had hot rooms too, but these lie beyond the area of excavation. It has not been possible to date archaeologically the abandonment of these baths. The baths were discovered in the 1950s and partially dismantled, but in those excavations a latrine

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<sup>74</sup> This dating is given by several authors (Pallarés 1969; Puig and Rodá 2007) based on similarities with other dated walls and the fact that they are built out of reused material, as no excavated material can date the expansion of the early imperial walls. Allegedly, this must have taken place before Athaulf took over the city. Until the 19<sup>th</sup> c. they were thought to be Punic.

was also identified, which in the Roman period also worked with constantly running water.<sup>75</sup>

There is further evidence to suggest that the aqueduct was still working during the seventh century: at the Coronel Monasterio (Sant Andreu) excavation, where the Moncada aqueduct has been identified, a fragment of an African-imitation Hispanic amphora (dated to the late-sixth/early-seventh centuries; fig. 3.11) was found mixed with other Roman material in the abandonment layers (UE 120) of the *specus* of sector 100B, giving a *post quem* date for the context. There was another abandonment layer at this site, (UE 108), on top of the one with the late material, which contained largely Roman remains (fig. 3.12). From this very site, sinter deposits were obtained, which could provide further dating evidence through microscopic and isotopic analyses.<sup>76</sup>

There is no datable evidence for the use of the aqueducts beyond the seventh century. Afterwards, the available information relates to the actual abandonment and destruction of the aqueducts. The most important piece of evidence is a document dated to AD 1017, which reads as follows:

*intus in civitate barchinona iusta ipsos archos priscos ... in praenominatis archis priscis unde **olim aqua consuerit decurrere.***

“(...) inside in the city of Barcelona next to those old arches (...) in the aforementioned old arches from which water **once used to flow**”<sup>77</sup>

This indicates that the aqueducts were out of use in the early eleventh century. The aqueducts had probably been pulled down during the course of the late ninth or the tenth century, which is when the Romanesque cathedral and the new Count's palace

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<sup>75</sup> Beltrán de Heredia 2002c: 102; 2008: 282; García-Entero 2005: 213; Miró and Puig 2003: 175.

<sup>76</sup> Miró and Orengo 2010: 112; Giner Iranzo 2007: 44; Carme Miró (*pers. comm.*).

<sup>77</sup> L'Antiq. I 599, f. 222v, as quoted from Mayer and Rodá 1977.

were built after the Frankish conquest, but it is impossible to tell if the aqueducts were carrying water then or if they were already out of use.<sup>78</sup>

### 3.2.3 Discussion

There is certainly enough datable evidence to suggest that the aqueducts of Barcelona were in use all through Late Antiquity, and probably maintained and preserved, as late as the seventh century. The presence of this working water supply allowed the construction of a new set of baths in the sixth century, which must have been a source of great prestige for the bishop who built them. The repairs and the baths clearly show that the bishop of Barcelona was a very powerful individual, especially after the *De fisco Barcinonensi* was issued; the political and economic powers bestowed upon the bishop are certainly responsible for the new palace complex of the sixth and seventh centuries.

It is not possible to tell if these aqueducts were properly working at full capacity at such a late date, or if they were only partially working. It is not possible to tell either when exactly the aqueducts ceased to function. The seventh-century amphora *terminus post quem* date for the abandonment layers at Coronel Monasterio, and the construction of the Romanesque cathedral in the late ninth, a *terminus ante quem*, leaving us with a two century gap in which the aqueduct presumably ceased to function.

The two main historical mentions of Barcelona in this period, the sieges by Wamba (673)<sup>79</sup> and by Louis the Pious (801)<sup>80</sup>, do not mention the aqueducts at all, or if they were damaged as a result of the sieges, but it is very doubtful that these events had any direct impact on the aqueduct.

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<sup>78</sup> Miró and Orengo 2010: 130.

<sup>79</sup> *Prima enim ex rebellionem omnium civitatum Barcinona in potestate principis religiosi adducitur* – “Barcelona was the first out of all the cities of the rebellion which was put under the power of the pious prince (i.e., Wamba)”: Julian of Toledo, *Historia Wambae Regis*, 11; Cf. Ripoll López 2002: 36.

<sup>80</sup> Astronomer, *Vita Hludowici Imperatoris*, 13 (further discussed later in section 5.1.2).

### 3.3 CÓRDOBA

#### 3.3.1 Late antique *Corduba*

Córdoba was one of the key cities in Roman Spain. It was the capital of the province of Baetica, the richest and most Romanised of all the provinces, with important contacts with the imperial family and a very strong and influential landed aristocracy linked to the production of olive oil. In Late Antiquity it lost some of its importance, as the provincial capital was moved to Seville, where the archbishopric was established.

Córdoba was, nonetheless, still a very important city in the early fourth century. The most important building of fourth-century Córdoba was the suburban palace-complex of Cercadilla, identified in 1991 when the train station was expanded.<sup>81</sup> This site includes not only a large residence, which has been linked to the Tetrarch Maximian's (290-305) family, but was later expanded with a basilica, and may have come to serve as the early episcopal complex.<sup>82</sup> The complex included a set of baths too (the only known set of baths of late antique Córdoba), which may have been working up to the fifth or sixth century, which is the moment at which the palace as a whole seems to have declined.<sup>83</sup> The entire complex was equipped from its beginnings with a new aqueduct.

During the fifth century, the city went through similar processes to other towns of Hispania: the streets and the forum were encroached upon by private buildings, the marble decorations of the theatre were dismantled and turned into lime in kilns, and it seems that it was sacked by the Rhine invaders during the early decades of the

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<sup>81</sup> Causing the complete destruction of the site; Marfil Ruiz 2000a: 159.

<sup>82</sup> The interpretations are however weak and lack adequate evidence.

<sup>83</sup> García-Entero 2005: 702.

century.<sup>84</sup> The main sewers inside the walls seem to have collapsed and no longer been maintained properly, although again, the evidence for this is quite thin.<sup>85</sup>

Córdoba became during the mid sixth-century a major source of problems for the Visigothic kings, because following the Byzantine invasion of 551, the city refused to side with either Goths or Romans, and remained largely autonomous, especially after the rebellion against the Gothic king Agila (r. 549-554).<sup>86</sup> This caused several sieges and attacks on the city,<sup>87</sup> which resulted in great disruption in the urban layout: the destruction layers observed in the excavation of Cercadilla have been linked to Agila's attack on the city.<sup>88</sup> In this period, the episcopal complex was moved inside the walled enclosure, next to the location where the new Visigothic *palatium* was built, although Cercadilla remained an important centre of cult and burial.<sup>89</sup> This intra-mural palace was later turned into the Islamic palace, known in the early period as the *Ballat Ludhriq*, or the palace of Roderic (last of the Visigothic kings).<sup>90</sup> The population of Córdoba decreased during this period, as the north part of the walled perimeter was abandoned, or at least became far less densely occupied, from then on clustering around the new cathedral-palace complex, as evidenced by the distribution of intramural burials.<sup>91</sup>

The city became heavily Christianised, and many churches were built. There were three early suburban churches, including the church of St. Acisclus on the grounds of Cercadilla. The intramural churches were St. Vincent's (the new sixth-century cathedral) and St. Catherine's, allegedly (according to one of the excavators) built in a

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<sup>84</sup>Hidalgo Prieto 2005: 402 (theatre), 403 (encroachment); Marfil Ruiz 2000a: 159 (invaders).

<sup>85</sup> Marfil Ruiz 2000b: 119.

<sup>86</sup> Thompson 2007 (1969): 381; *HistGoth* 45.

<sup>87</sup> The city had to be twice taken by Liuvigild, who commemorated his victory in coins reading *Corduba[m] bis optinuit - CNV #30*.

<sup>88</sup> Marfil 2000a: 159; 2000b: 121, 123.

<sup>89</sup> At least three bishops were buried around this area: *CIL* II<sup>2</sup> 7.644, 7.693 (Marfil 2000a: 159).

<sup>90</sup> *Vallat (=Palatium) Ruderici* in the Latin Chronicles: *Chronica Rotensis* 6.

<sup>91</sup> Arjona Castro 2001: 17; Hidalgo Prieto 2005: 406.

Greek-cross plan.<sup>92</sup> During the seventh century there were new church dedications (some as late as AD 667),<sup>93</sup> and apparently king Sisebut dedicated yet another church.<sup>94</sup>

It is during the early Islamic period that Córdoba got completely rebuilt, when it became the capital of the new state, especially after 750.<sup>95</sup> The status as capital meant many things, amongst them that the population grew, and newcomers were settled in newly built suburbs.<sup>96</sup> The Gothic *palatium* became the new Umayyad palace, and the mint continued to produce coin.<sup>97</sup> The new emirs were responsible for great construction works, which include the new Great Mosque with its forest of columns with superimposed double arches on the site of the old cathedral (built in 754).<sup>98</sup> Emirs Abd al-Rahman I (754-788) and his son Hisham (788-796) also repaired the city walls and the Roman bridge.<sup>99</sup> The palace and the mosque were further expanded during the ninth century, but the height of Córdoba's Islamic power was during the mid-tenth century, when Abd al-Rahman III proclaimed himself Caliph (AD 929). Córdoba was by then so packed and crowded that he even decided to build a new city 8km away from Córdoba, *Madinat al-Zahra* (الزهراء مدينة).<sup>100</sup> The Umayyad rulers of Córdoba were very keen on reusing and maintaining Roman water conduits, and at least four major repairs/adaptations are known, which will be detailed below.<sup>101</sup>

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<sup>92</sup> Marfil Ruiz 2000a.

<sup>93</sup> *CIL* II<sup>2</sup> 7.640, 7.638; Hidalgo Prieto 2005: 407, 467.

<sup>94</sup> Marfil Ruiz 2000a: 160 – “St. Catherine’s” is a very imaginative interpretation of the evidence.

<sup>95</sup> *Continuatio Hispanica*, 54, 64, 88; *Chronica Rotensis* 8.

<sup>96</sup> South suburb: Arjona Castro 2001: 41-5. East suburb: Manzano Moreno 2006: 250, 254.

<sup>97</sup> Arjona Castro 2001: 20-4; Diller 2009: 831, 923.

<sup>98</sup> Arjona Castro 2001: 69, 81; Salcedo Hierro 2000: 17-8, 174.

<sup>99</sup> Arjona Castro 2001: 67, 80.

<sup>100</sup> The classical work on the archaeology of the site is López-Cuervo 1985. The most recent, Vallejo Triano 2010.

<sup>101</sup> Ventura Villanueva 2002: 126.

### 3.3.2 The early Roman aqueducts

The proximity to Córdoba of mountains with many water springs prompted the construction of aqueducts by the Romans. Up to five different conduits can be identified of Roman or post-Roman date.

#### 3.3.2.1 The aqueduct of Valdepuentes

The first aqueduct Córdoba had is still standing in several sections in the mountains west of the city, the most prominent remains being those located at Valdepuentes (literally, “the valley of the bridges”), which has given its name to the whole of the aqueduct. Its course is very well known (fig. 3.13) thanks to the surveys carried out by Ángel Ventura Villanueva in the 1980s and early 1990s, although these only showed the course of the aqueduct before it approached the city (app. Va).<sup>102</sup>

In his first study, Ventura describes in detail the aqueduct’s course in five main sectors from its caput at the Bejarano river dam as far as Madinat al-Zahra and the Granja Agrícola. It runs mostly underground in its upper course (although some parts of it are built on solid walls), in a vaulted *opus caementicium* structure lined with *opus signinum*, and up to 64cm across in the *specus*. Only when it has to go over a creek does the aqueduct go on arches. One of the most interesting features of this aqueduct is that, in order to bring the water down from the mountains to the plain in a short distance, 40 consecutive vertical drops (up to 25m apart) were constructed, allowing the aqueduct to descend 200m in just under 2km of its course (fig. 3.14).<sup>103</sup>

Since this work was published, many other remains of this aqueduct have been discovered archaeologically. In total up to 60 new sections, which ran on the surface at

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<sup>102</sup> Ventura Villanueva 1993.

<sup>103</sup> Ventura Villanueva 1993: 73-83, fig. 59.

ground level until it approached the city, have been identified so far (2010).<sup>104</sup> The aqueduct seems to have entered the city over a long bridge of lofty arches, measuring up to 4.5m in height.

This aqueduct has been identified with the Aqua Augusta mentioned in the inscriptions retrieved from the public fountains of the city, two of which read as follows:

*Aqua Augusta. L(ucius) Cornelius Serg(ia) aed(ilis) Ilvir lacus siliceos, effigies aheneas de sua pecunia fecit.*

“The aqueduct of Augustus. Lucius Cornelius, of the Sergia tribe, aedile, and duumvir built with his own money the stone fountains and the bronze statues”<sup>105</sup>

The name “Augusta” indicates that the construction of the aqueduct must have been during the reign of Augustus himself (27BC – AD 14). Later on (3<sup>rd</sup> c.?), a secondary aqueduct bringing water from the snow springs of Vallehermoso was added to this conduit.

The aqueduct itself appears to have collapsed during an earthquake in the third century: fallen remains have been found on top of late Roman floors. This is further reinforced by the ruptures of the conduit in sections 12 and 13, where the conduit was broken in different places and shifted from its original location.<sup>106</sup> Until this earthquake the aqueduct had been properly maintained, as there are no signs of sinter deposits inside these broken conduits (fig. 3.15). However, the presence of calcareous concretions in some sectors of the upper course shows that the water was still flowing, even if it did not reach the city. The analysis of these deposits has demonstrated that the

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<sup>104</sup> Pizarro Berengena 2012: 82-4; Ventura and Pizarro 2010: 181-5, 191-2.

<sup>105</sup> *CIL* II<sup>2</sup> 7.217-8.

<sup>106</sup> Numeration according to Ventura and Pizarro’s 2010 study.

sinter had formed 39 annual-layers (fig. 3.16), indicating that water was running through the collapsed aqueduct for 39 years before the *caput* blocked. Furthermore, the *Aqua Maximiniana* (see below), which was built to feed the palace of Cercadilla (AD 290-305?), was built cutting through the Valdepuentes *specus*, rendering it completely useless (figs. 3.17a-b) thus dating the collapse and of the Aqua Augusta to 39 years before that, in the 250's or 260's if we accept the chronology for Cercadilla.<sup>107</sup>

The aqueduct was abandoned until the early medieval period when Abd al-Rahman III repaired and restored it in order to supply water to his new city of Madinat al-Zahra, as commemorated by this inscription now in at the Museum of Córdoba:

“...] (...) The beginning of the works on this water conduit, from its very source, [was] in Shawwal of the year 328 (10<sup>th</sup> July until 7<sup>th</sup> August, 940). These works were carried out under the supervision of his (Abd al-Rahman's) client (*mawlà*), his vizier and City magistrate (*sahib al-Madina*) ‘Abd [Allāh] ben Ba[d]r[...’<sup>108</sup>

The Umayyads reused the course of the aqueduct from its source as far as Madinat al-Zahra, including the shafts and wells mentioned above (app. Vb). New bridges were built when necessary, such as the bridge of Valdepuentes itself, but the new Islamic conduits were not lined in *opus signinum*, but in water-proof stucco.<sup>109</sup> The bridge at Valdepuentes was actually built *ex novo*, after the old damaged bridge was pulled down. It is lavishly decorated on the side facing the valley (and it is not decorated at all on the side facing the mountain), and it is argued that it was the central decorative element of the landscape, as all the mountain was a private hunting ground for the Caliph. The old

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<sup>107</sup> Pizarro Berengena 2012: 112-3; Ventura and Pizarro 2010:193-9.

<sup>108</sup> Translated in Ventura Villanueva 2002 – This inscription has been linked to Madinat al-Zahra, although it has been suggested that it may have related to an aqueduct built to supply a private estate of the Caliph. This could also be the conduit mentioned by al-Makkari (III.4).

<sup>109</sup> Ventura Villanueva 1996: 33-5.

Roman conduit was diverted into a new conduit outside the walls of Madinat al-Zahra, built in ashlar blocks and lined with red stucco (fig. 3.18, because the Roman conduit flowed too low to supply the Caliph's palace. The old conduit, however, was not fully abandoned, as was reused at the same time as a sewer.<sup>110</sup>

### 3.3.2.2 The Arroyo Pedroche aqueducts

The second aqueduct that fed the city is known as the Arroyo Pedroche aqueduct due to the place where it was first identified. It seems, however, that its ancient name was Aqua Nova Domitiana, as shown by an inscription mentioning the name: *Aqua nova [[Domitiana]] Aug(usta)*,<sup>111</sup> the name of Domitian having been erased after his *damnatio memoriae*. This aqueduct has only been studied in detail by Ángel Ventura, in his 1996 work (app. VI).

In it, he describes how the aqueduct did not have a *caput aquae*, but four. Water was collected from four different springs to the north-east of the city (fig. 3.19), and was taken into Córdoba in four different conduits that merged into a single one. This unified aqueduct approached the city at ground level, and at some point was diverted by means of an inverted siphon, after which its course cannot be traced. The individual feeding aqueducts range between 3.4 and 0.9km in length, whereas the unified conduit is known for 2.9km, only 5m of which are actually on arches. The aqueduct is built in *opus caementicium*, but curiously, it is not lined with *opus signinum*, although the walls of the *specus* were lined with lime and clay.<sup>112</sup>

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<sup>110</sup> Vallejo Triano 2010: esp. 95-101 and 228-54. I have to thank Antonio Vallejo for his guided tour to the site and the visit to the hidden aqueduct of Valdepuentes.

<sup>111</sup> *CIL* II<sup>2</sup> 7.219.

<sup>112</sup> Pizarro Berengena 2012: 104-8; Ventura Villanueva 1996: 43-61.

The only dating evidence for this aqueduct is the inscription that names the structure, although it can typologically be linked to other late 1<sup>st</sup> and early 2<sup>nd</sup> c. aqueducts, like that of Itálica.<sup>113</sup>

### 3.3.2.3 Early imperial water consumption

These two aqueducts supplied water to the early imperial city (1<sup>st</sup>-3<sup>rd</sup> c. AD), and many water-consuming structures dated to this period have been identified. Unsurprisingly, most of these structures are generally not considered to have been working in the late Roman period (largely because many are old discoveries that cannot now be properly dated). These structures include 7 *lacus* (public fountains), 2 baths and up to 14 private (domestic) fountains.<sup>114</sup>

Two of these public fountains, located at Calle Ramírez de las Casas 13 and Calle Ambrosio Morales 4, were built in the early imperial period, dated by the inscriptions they bore (*CIL* II<sup>2</sup> 7, 217 and 7, 218) and were out of use in Late Antiquity (sixth-century *t.a.q.*). The first one seems to have been dismantled then, according to the stratigraphy of the site, and the pilaster that held the spout was reused in a caliphal (10<sup>th</sup> c.) nearby wall. The second *lacus* was also out of use by the Islamic period, as its inscription too was used in a wall dated to this period.<sup>115</sup> A third fountain, located at Calle Maese Luis 20 (eastern suburb, fed by the Pedroche aqueduct), was excavated in 1993; it seems that the entire *vicus* surrounding the fountain was out of use by the fourth century.<sup>116</sup>

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<sup>113</sup> Ventura Villanueva 1996: 58-9.

<sup>114</sup> Ventura Villanueva 1996: 94-125.

<sup>115</sup> Ventura Villanueva 1996: 95-8.

<sup>116</sup> Ventura Villanueva 1996: 99.

### 3.3.3 Late antique water conduits

#### 3.3.3.1 The Western aqueduct: *Fontis Aureae aquaeductus*?

The first of the late antique aqueducts is a suburban conduit (app. VII), the Western aqueduct, discovered on the site of the modern Bus Station (hence its alternative name, the “Bus Station aqueduct”). Excavations in the early 1990s revealed at this spot a 100m long section of a Roman aqueduct, built in *opus caementicium*, but surprisingly its inside lacks an *opus signinum* lining. The excavation also revealed the *castellum divisorium*, the distribution tank, where two different conduits met (fig. 3.20a-b).<sup>117</sup> This *castellum* is a small rectangular structure, lined in lead (in fact, re-using a lead sarcophagus), into which the water fell from the aqueduct. The *castellum* has two outlets that through two bronze pieces led the water into lead pipes, either for immediate distribution (for the suburban *vicus* and for the near-by circus), or to take the water elsewhere through long-distance pipes.<sup>118</sup> It seems, nonetheless, that this aqueduct supplied the suburban *vicus* west of Córdoba, as the walled city was already supplied by two other aqueducts.

Its source may have been located at the springs of La Albaida (fig. 3.21), some eight kilometres west of the city, and though the original Roman structure has not been identified, it is very probable that it is located below a late tenth-century structure.<sup>119</sup> The route between the caput and the *castellum*, however, is completely unknown.

The construction of the aqueduct can be dated to the early imperial period by its construction technique; it is similar to other aqueducts of Flavian/Trajanic date.<sup>120</sup> It is also known that probably during the third century the aqueduct may have fed piped

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<sup>117</sup> Pizarro Berengena 2012: 102.

<sup>118</sup> Ventura Villanueva 2002: 118-20. Compare this distribution with that of the aqueduct of Metz; Lefebvre 1997.

<sup>119</sup> Moreno and Pizarro 2010.

<sup>120</sup> Ventura Villanueva 1996: 186. The most recent interpretation, however, suggests a Neronian date (Pizarro Berengena 2012: 99).

water to a *nymphaeum* built next to the Puerta de Gallegos, although it is not known for how long it was in use.<sup>121</sup> However, there is no evidence to confirm that it continued working during Late Antiquity, although we know it was working during the Islamic period.

The Islamic sources of the eighth and tenth centuries mention the existence near of a fountain (ʿayn) called *funt awrya*, which, according to Ángel Ventura, is not an Arabic name, but the preservation of a Latin one (*fons aurea* [sic]) referring to the bronze outlets of the terminal tank found at the bus station.<sup>122</sup> This led him, rather fancifully, to reconstruct the ancient name as the *aquaeductus fontis aureae*. More important than its name is the fact that a fountain was working in the north-western suburb in the early Islamic period (according to the sources), which may have been supplied by the aqueduct located at the bus station.

The original aqueduct was put out of use in AD 967, when, according to the sources, Caliph Al-Hakam II redirected the Roman water source in order to feed the fountains and pools of the Great Mosque, which was until then supplied by a wheel.

“In this year of 356, water began to fill the tanks and the eastern and western ablution pools [of the Mosque]. It was pure water that came from a spring in the mountains of Córdoba, and looking for it the soil was excavated. It was brought [to the city] in a stone conduit, built solid and artistically, in which lead tubes were placed, so the water would not be polluted. Water first ran on Friday, ten days having elapsed in the month of Safar [25<sup>th</sup> January 967] (...)”<sup>123</sup>

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<sup>121</sup> The approximate date is given by the stratigraphy of the *nymphaeum*, Murillo et al. 2002: 265. Plus, it could not have been fed by the Alcázar conduit (see below section 3.3.3.3) because this was not a pipe-conduit, and may not even have been built yet.

<sup>122</sup> Pizarro Berengena 2012: 104; Ventura Villanueva 1996: 186; 2002: 119. *Fons*, *-tis* is however a masculine noun (*OLD*), which would require the adjective to be *aureus*.

<sup>123</sup> Ibn ʿIdari, *Bayan*, II (Arjona Castro 1982, #180). Cf. Al-Makkari III.2, p. 226.

Archaeologists think that he used the water that supplied the aqueduct located at the bus station. This new conduit left out of use the old Roman conduit, as the tenth-century diversion tower which blocks the Roman conduit and the new Islamic aqueduct are still visible at the bus station (fig. 3.22). This is further confirmed by the presence of tenth-century glass vessels in the abandonment layers inside the Roman conduit and the lead-lined distribution tank, which indicate that the aqueduct was out of use by then.<sup>124</sup> The text mentions that the water source was buried underground and that it was opened up and built again. This probably is the tenth century structure found at La Albaida. This Islamic conduit is still in use and supplying water to the fountains of the Cathedral.<sup>125</sup>

### 3.3.3.2 The “Aqua Maximiniana” or the Cercadilla aqueduct

Another suburban aqueduct was identified in several excavations north-west of Córdoba (app. VIII).<sup>126</sup> Its source seems to have been at the “neveros” (snow springs) of Arruzafa, where an *opus caementicium* conduit of Roman date has been identified, linked to a large water cistern (fig. 3.23), which measures 77 x 5m and is lined with *opus signinum*. It has two construction phases, the earliest of which can be dated, according to the material from the foundation trench, to the fourth century.<sup>127</sup> This cistern is not the actual source of the conduit, which is located at some distance, but it may have served as a settling tank or a reservoir.

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<sup>124</sup> Carmona et al. 2008.

<sup>125</sup> Pizarro Berengena 2012: 155-6; Ventura Villanueva 2002: 120. Indeed, a small manhole close to the archaeological remains of the bus station still marks where the water flows now, as indicated not only by the sign which reads “aguas de la catedral” (Cathedral’s waters) but also by the constant sound of flowing water.

<sup>126</sup> Ventura and Pizarro 2010: 196-9; Ventura Villanueva 2002: 125.

<sup>127</sup> Ventura and Pizarro 2010: 197; Murillo 2009: 463-71.

The main characteristic of this conduit is the lack of *opus signinum* lining, the narrow *specus*, and its brick and tile covering, all of which point towards a masonry case for a pipe conduit (fig. 3.24). A conduit of the same characteristics, and following the same direction as that identified at Arruzafa was excavated at Cortijo del Cura, breaking through the old Aqua Augusta (app. Va), which had collapsed in an earthquake during the third century. If the route of this aqueduct is continued, it reaches the palace of Cercadilla (fig. 3.25), built in the late third or early fourth century, which has been linked to the tetrarch Maximinian (thus the hypothetical name of *Aqua Maximiniana*). It has been proposed that this aqueduct was used to feed the *nymphaeum* and the baths located at the complex.<sup>128</sup> At some point after the fourth century, the complex was turned into a religious centre, probably dedicated to St. Acisclus.<sup>129</sup>

It is around this time that the baths of the palace ceased to function, as the rooms were reused as burial spaces, which typologically can be linked to the sixth century, and the baths were stripped off all marble decorations and lead pipes. This dating is further confirmed by the presence of African red-slip wares in some of the tombs, in particular form Hayes 104a, dated between 530 and 580.<sup>130</sup> Even if the baths were out of use, however, this does not mean that the aqueduct itself ceased to function.

It is known that during the Islamic siege of Córdoba, if Cercadilla can be identified as St. Acisclus' church, the aqueduct may have still been working. The siege of the church of St. Acisclus in 711, just after the battle of Guadalete, took place

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<sup>128</sup> Hidalgo Prieto 1996; Pizarro Berengena 2012: 109, 114-8. A section of an aqueduct carried on arches has been found east of the Cercadilla complex, and despite the lack of information on its source, course and destination, it has been suggested that it could have been a secondary conduit to Cercadilla (Pizarro Berengena 2012: 118-23).

<sup>129</sup> Hidalgo Prieto 2002: 344, 358-9. For alternative locations of St. Acisclus' basilica, Marfil Ruiz 2000a: 157.

<sup>130</sup> Hidalgo Prieto 1996: 81; Fuertes et al. 2013.

between the few remaining Gothic soldiers and the advancing troops of Tariq. It can be reconstructed from three different Islamic texts.<sup>131</sup>

“... But he [the Gothic leader], knowing that the Muslims had entered the city [Córdoba] left by the western gate. ... With 400 or 500 soldiers of his and some others he sought refuge in the church dedicated to Shant Aylah [= St. Acisclus] ... which was firm, solid and strong. [Mugheyth, the Moorish leader] came out [of Córdoba] and besieged the Christians in the church.<sup>132</sup> ¶... When the Christians sought refuge at the church, next to which **an aqueduct (saqiya)** ran, Tariq sent one of his men, who was black ... to spy [on the Christians].<sup>133</sup> ... ¶ ... Great was the fright, and at the same time the astonishment, which the sight of the black man caused to the Christians, for they had never seen a man of his colour before; they surrounded him on every side, they gazed at him with astonishment, and thinking he was painted or dyed with some substance that made him look black, they rushed along, he in the midst of them, towards the **subterranean conduit (qanat)** by means of which the garrison was supplied with water; and there they began washing and scraping him with water and a hard brush ... one night this black man ... escape[d], and arrive[d] safe at the camp of the Amir Mugheyth, to whom he related his adventures, informing him at the same time of the result of his observations, as well as of the direction of the subterranean conduit which supplied the garrison with water. Immediately after Mugheyth summoned before him some expert people, who looked for the conduit in the place, pointed out by the black man, and, having found it, succeeded in stopping

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<sup>131</sup> Compiled in Arjona Castro 2001: 21-7.

<sup>132</sup> *Akhbar Maymu`a*, 9.

<sup>133</sup> Ibn al-Sabbat, *Kitab al-`ibar* (quoting Ibn al-Fayyad).

it; the church was from that moment deprived of water, and its garrison doomed to death.”<sup>134</sup>

In these accounts, the aqueduct is mentioned as working, and although important, it seems that the robustness of the church was the main reason for the Goths fleeing there. No suburban church around Córdoba has been identified which could hold 400 or 500 men during a siege, unless we accept that Cercadilla was in fact the church in question.<sup>135</sup>

Finally, there is archaeological evidence that confirms the information provided by the written sources. The source of this aqueduct can be found at a location known as Arruzafa, as explained above. The big cistern excavated there was abandoned between the late seventh and the early eighth century, according to the pottery excavated from these strata, thus giving a date for the last use of the cistern.<sup>136</sup> This could confirm that the aqueduct was still able to feed the church of St. Acisclus in 711, although it may not have worked for much longer.

### 3.3.3.3 *The Alcázar conduit*

The last conduit that should be mentioned is the Alcázar conduit, of which very little is known, except that it was in use in the emiral period (app. IX). This conduit has been identified at two different locations next to the western wall of Roman Córdoba, at the Puerta de Gallegos (fig. 3.26) and at the Vial Norte excavation, both sections follow the same route north-south. It thus comes from the north, and it has been suggested that it went directly to the Alcázar, the citadel located on top of the old Visigothic *palatium*.

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<sup>134</sup> Al-Makkari, IV.3, p. 278-9.

<sup>135</sup> Hidalgo Prieto 2002: 365. Cf. Pizarro Berengena 2012, which suggests that this took place not in Cercadilla, but in the bus station.

<sup>136</sup> Murillo Redondo 2009: 463-71.

The conduit itself must be early medieval due to the stratigraphy of the sites where it has been excavated, because it is located in an abandoned burial area, sitting on top of late Roman (3<sup>rd</sup>/4<sup>th</sup> c.?) mosaics and below the tenth-century levels.<sup>137</sup> The conduit itself is built using new (not reused) material, put together in mortared rubble, and its 45cm wide *specus* is lined in *opus signinum*, which can be paralleled with the aqueduct of Reccopolis, dated to 578, although without a more detailed typological analysis it is impossible to link both conduits chronologically with certainty.

However, this conduit can also be linked with a filtration gallery dated to the earliest Umayyad period, and this would mean that the conduit itself was an Islamic conduit. This would thus mean that the Alcázar conduit could be the *Qanat Amir* (the “aqueduct of the emir”) mentioned in the Islamic sources, and that it was built in the eighth century.<sup>138</sup>

This was still working in the early tenth century, as its fountain of piped water was still functioning, according to this fragment of the *Chronicle of al-Nasir*:

“In the year 306 [14<sup>th</sup> June 918 – 2<sup>nd</sup> June 919], al-Nasir li-din Allah [future Caliph Abd al-Rahman III] gave order to (...) build a pool next to the Fountain of the Pipe, located at the entrance of the palace, next to its gate, known as the Transenne Gate. The work was done with much care, and three water mugs were added to it, for the comfort of those who sought it. It was finished within a year (...)”<sup>139</sup>

### 3.3.4 Discussion

With five main water conduits (three of them working in Late Antiquity), the city of Córdoba is certainly one of the clearest examples of continuity of water supply

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<sup>137</sup> Ventura Villanueva 2002: 125.

<sup>138</sup> Pizarro Berengena 2012: 137-40 – there an Islamic date is strongly defended.

<sup>139</sup> *Chronicle of al-Nasir*, 28. The conduit was later mentioned by al-Makkari (III.1, p. 208).

systems, and the dating for these structures is consistent. However, whereas the dating for the Roman period is clear, the dates for the Visigothic period are not that certain. As has been said: “for sixth-century Córdoba, we deal with a field full of hypotheses which are difficult to confirm”.<sup>140</sup>

It can be claimed that, overall, public water supply ceased to function in intramural Córdoba by the fourth and fifth century, as the collapsed fountains and sewers indicate.<sup>141</sup> This can be linked to the collapse of the Aqua Augusta after the 250's earthquake, although it is not possible to date the end of the Aqua Nova. Water supply inside the walls must have thus relied on wells or cisterns, as seems to have been the case during the Islamic period.<sup>142</sup> The only structures supplied with water inside the wall enclosure were the Visigothic (later Umayyad) palace and the Great Mosque.

It is only in the Western suburb that running water continued to function during Late Antiquity. The Cercadilla aqueduct, which supplied the complex, is known to have been working non-stop from the fourth up to the eighth century, according to the archaeological and written evidence (Cercadilla *nymphaeum*, Al Rusafa cisterns, accounts on St. Acisclus' siege). The Western aqueduct is another good example, because both written sources and archaeology indicate a continuous water supply until the tenth century, even if the overall course of the aqueduct is not known, the small excavated parts have provided very telling datable material. Thus there seems to have been a late antique supply to the north-western suburb of the city and the early episcopal complex, which may have been diverted or piped to the south-western corner of the walled city, where the Visigothic *palatium* and the later episcopal complex was built. The presence of some large hydraulic structures (6 x 6 x 2.30m) excavated at the

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<sup>140</sup> “*Para la Córdoba del s. VI nos movemos en un campo lleno de hipótesis difíciles de confirmar*” – Pizarro Berengena 2012: 127.

<sup>141</sup> Some sewers, however, were constantly maintained and repaired into the Caliphal period (Sánchez Velasco 2011: 140-1).

<sup>142</sup> Ventura Villanueva 2002: 123.

foundations of the Mosque (fig. 3.27), which are thought to correlate to a large, sixth-to-seventh century civic building, may suggest that piped water reached this area.<sup>143</sup>

The Umayyads inherited the urban water supply system, which they repaired and re-adapted to suit their own agendas. The re-use, repair, and maintenance of these structures took place largely during the early Emirate (second half of the eighth century) and in the early Caliphate (mid-tenth century), which were the moments of greatest urban construction (the Great Mosque, the palace, Madinat al-Zahra, etc.). The attitude of the new Islamic governors towards public water supply, however, was the opposite to that of the original Roman builders, as the water system was intended for the private use of the Umayyads (reuse of Valdepuentes for Madinat al-Zahra, fig. 3.28, Alcázar conduit) or for public buildings closely linked to the rulers (like the fountains of the Mosque).

### 3.4 MÉRIDA

#### 3.4.1 Mérida, capital of Hispania

Mérida (*Emerita Augusta*) was founded as a veterans' colony by Augustus early in the Principate.<sup>144</sup> It was built with a pre-designed street-grid, walls, two monumental fora, and a north-east *spectacula* complex which included a circus, an amphitheatre and a theatre (fig. 3.29). The city is located between two rivers, the Guadiana (*Anas*) and the Albarregas (*Barraeca*), with a fertile land and a rich hinterland.

The city became the capital of the province of Lusitania, and during the late Empire it was also the capital of the *Dioecesis Hispaniarum*. During the fourth century the city prospered, as new large houses were being built (allegedly, partially

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<sup>143</sup> Pizarro Berengena 2012: 137.

<sup>144</sup> An overview of the evolution of Mérida in Late Antiquity can be found in Alba and Mateos 2008, Alba Calzado 2005.

encroaching upon the minor back streets). Only the suburbs west and east seem to have been in recession at this point. However, things changed abruptly in the fifth century. Archaeologically, it is possible to identify the dismantling of the forum and the street porticoes, the abandonment of the *spectacula* and a change in the housing patterns, where many of the old luxurious *domus* were subdivided into multi-family dwellings.

This sudden transformation is normally related to the attacks the city suffered early in the fifth century, it was first besieged by the Suevi in 429 and later captured in 439. Then Theoderic II of the Visigoths besieged it in 456 unsuccessfully, and it was finally captured by the Goths a couple of years later, after the battle of the Urbicus river.<sup>145</sup> The city thus came under the control of the Visigoths, and during the reign of Euric, in 483, duke Salla and archbishop Zeno were responsible for the restoration of the walls and the bridge, according to an inscription.<sup>146</sup>

Beyond that, we know very little of the urban development of the city in the Visigothic period. According to the *Lives of the Fathers of Mérida*, there was an archiepiscopal palace and a cathedral in the old forum, two other intra-muros churches and a large cult complex in the suburb dedicated to the martyr Eulalia. This suburban basilica has been excavated recently, confirming the data provided by the sources. Powerful archbishops such as Massona were responsible for several new buildings, like a *xenodochium* or pilgrims' hospital. This splendour visible in the written text is not yet matched archaeologically, where it is evident that during the seventh century the city's Roman infrastructure was in clear decline, as evidenced by the increasing amount of arable plots and animal pens inside the walls. There is one seventh century inscription, dated to the reign of Chindaswinth (r. 642-653) which may relate to a new building.<sup>147</sup>

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<sup>145</sup> Hydatius, *Chronica*, 80, 106, 111, 126, 161, 163-8, 175.

<sup>146</sup> ICERV 363. Cf. fig. 5.2.

<sup>147</sup> ICERV 366: [Chi]ndasvintus rex pi[...].]s in <im>perio | [C]hindasvintus.

On the eve of the Umayyad invasion, the city still had a strong local aristocracy, which fought against the invaders after the battle of Guadalete. Even if the city finally surrendered, the locals kept rebelling against the emirs, so to prevent further uprisings of the local Mozarabs, a citadel (*alcazaba*) was built inside the walled enclosure early in the ninth century.

### 3.4.2 The water supply

Mérida, located several kilometers inland in the flat valley of the Guadiana river, suffers from recurrent droughts, unpredictable rains and very hot summers, which made water supply a serious issue even back in Roman times.<sup>148</sup> That is why the city had to rely on various sources of water for its inhabitants: wells and cisterns are very common in the early Roman period and in Late Antiquity, but in order to supply water *en masse*, four aqueducts were built in the early years of the colony.

#### 3.4.2.1 *Los Milagros or Proserpina aqueduct*

Of the four aqueducts of Mérida, that known as de los Milagros (“of the miracles”) is probably the most famous (app. X). Its present name was given in the 16<sup>th</sup> century because most of the arches had gone, but the pillars were still standing, which seemed to be a miracle (fig. 3.30).

The aqueduct itself is only about 6km long, and has its caput at the Proserpina Dam (a name only given it in the 19<sup>th</sup> century), running on its upper course in a rock-cut conduit.<sup>149</sup> Very early on, however, it approaches the city mostly above ground, and sections are known to have existed (or are still standing) at the site of Canja, El Sapo

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<sup>148</sup> Not only because of its scarcity, but also because of the suddenness and stormy nature of floods, which were periodical and very harmful, as narrated for the Visigothic period in the *Lives of the Fathers of Mérida* (VPE II.21): “... the Guadiana flooded and having broken its banks, spread its waters far and wide, laying in ruins many buildings in the little villages by its stream...”.

<sup>149</sup> Despite the controversy about the source, see section 3.4.3.1 below for S. Feijoo’s thesis.

and the Carretera de Montijo (sections which measure between 20 and 130m), so its course is very well known (fig. 3.31). In these sites, the size of the aqueduct and the *specus* seems consistent: 140cm total width and 56cm *specus* width, lined in *opus signinum*.<sup>150</sup> Its *specus* was thought to have been open, but in the 2000 excavations it was demonstrated that it was covered with a barrel vault for most of its course.<sup>151</sup>

The aqueduct enters Mérida by means of a 285 metre-long, 35 metre-high bridge, (fig. 3.30).<sup>152</sup> The pillars of this bridge are built with a core of *opus caementicium* and an ashlar facing. These are on average 7m apart, and their height varies between 35 and 15m. These pillars were originally 2.9 x 2.9m (10 x 10Rf) in section, but 2.1m (7Rf) reinforcement buttresses were added on the sides. The pillars are sustained by three rows of super-imposed arches, which alternate granite ashlar blocks with red brick, thus increasing the stability of the pillars (fig. 3.32). The bridge crosses over the Albarregas river, and the two pillars inside the river are reinforced with strong granite sterlings.

This section of the aqueduct begins at a settling tank and ends in a supposed distribution *castellum*, which nowadays is considered to also have been a *nymphaeum* (fig. 3.33), and just before crossing the walls it divided into two branches, one of which went to the north-west suburb, whereas the main branch supplied the low-lying western city.<sup>153</sup>

#### 3.4.2.2 San Lázaro aqueduct

The San Lázaro aqueduct (also known as Las Tomas or Rabo de buey; app. XI) is the second aqueduct of Mérida. Its course is the best known, because even if it was

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<sup>150</sup> Álvarez Martínez 2007: 198

<sup>151</sup> Feijoo Martínez 2005.

<sup>152</sup> Fernández Casado 2008 (1972): 126-34.

<sup>153</sup> Alba Calzado 2007:151; Mateos et al. 2002: 74.

largely destroyed, its course was repaired in the 16<sup>th</sup> century (and still carries water) and because of the 19<sup>th</sup> century careful topographic study it received.

The aqueduct has three main feeding branches (comparable with the Arroyo Pedroche aqueduct of Córdoba) which obtain water from underground streams and from springs, known by the names of the springs they tap: Valhondo, Las Lomas and Casa Herrera (fig. 3.31). The Valhondo spring currently produces 259.9m<sup>3</sup>/day, which is much less than other aqueducts such as the Western aqueduct of Córdoba (10-20,000), the Valdepuentes aqueduct of Córdoba (25,000) and the aqueduct of Valencia (105,000), although it is still much more than the aqueduct of Segovia (72). The three feeding conduits met outside Mérida and continue for 4km in an underground channel, for which 99 *spiramina* have been located. When it comes to the surface, the conduit is carried on several arches built in *opus quadratum*, on top of which brick-and-rubble pillars were erected (fig. 3.34), although sadly now most of the Roman arches have been substituted or destroyed by the 16<sup>th</sup> century aqueduct (fig. 3.35).<sup>154</sup>

This aqueduct entered Mérida crossing the Albarregas, close by the circus, the theatre and the amphitheatre, which may have been supplied by it, although the aqueduct must have also fed water to the eastern part of the city.<sup>155</sup>

### 3.4.2.3 Cornalvo aqueduct

The Cornalvo aqueduct, or *Aqua Augusta* (according to an inscription located in recent excavations at the conduit), was the longest of the aqueducts of Mérida (app. XII).<sup>156</sup>

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<sup>154</sup> Álvarez Martínez 2007: 196; Fernández Casado 2008 (1972): 134-7; Gómez et al. 2009: 134-5; Mateos et al. 2002: 73.

<sup>155</sup> Jiménez 1977: 279.

<sup>156</sup> Hiernand and Álvarez 1982.

Its source was considered to have been at the Cornalvo dam,<sup>157</sup> but it is now known that the conduit begins 5km beyond the dam, and it seems that an extra feeding branch was added to the aqueduct, diverting the spring of El Borbollón.<sup>158</sup> Its 25km course is very well known, because most of it (16km) runs in a semi-subterranean conduit parallel to the Albarregas river (fig. 3.31).<sup>159</sup> Along the valley of the Albarregas, there are several points at which the aqueduct needs to go above ground: at Caño Quebrado (“broken conduit”) one arch remains of what must have been a 30-arched structure and 30m of a wall have been located at Cerro Gordo.

The aqueduct entered the city from the east, next to the *spectacula* complex, and from there it went towards the southern part of the city, parallel to the wall, as evidenced by the excavations at the headquarters of the Guardia Civil, Villaemerita, Bodegones, and at Via Ensanche, where 85.7m of the conduit are still visible (fig. 3.36). It seems as if the aqueduct fed the theatre and amphitheatre, although because it is the one which arrives at the highest point, this aqueduct may well have originally fed the whole city. Its name also would indicate that it was the first aqueduct to have been built.<sup>160</sup>

#### 3.4.2.4 Las Abadías aqueduct

The fourth and least-known aqueduct of Mérida, that of Las Abadías (app. XIII), was only identified in 2005, when the first remains were excavated, and made public in the recent International Congress of Classical Archaeology (Mérida, 2013). The aqueduct is built following the same construction technique of the other aqueducts of Mérida, but its dimensions are different. The aqueduct has been identified in two

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<sup>157</sup> Fernández Casado 2008 (1972): 117; Cf. the note on the source of Los Milagros aqueduct.

<sup>158</sup> Alba Calzado 2007: 160; Álvarez Martínez 2007: 193; Gómez et al. 2009: 133.

<sup>159</sup> Mateos et al. 2002: 72-3.

<sup>160</sup> Alba Calzado 2007: 154-5; Álvarez Martínez 2007: 194; Hernández Carretero 2003: 47-52; Mateos et al. 2002: 72; Pérez Maestro 2005: esp. 276.

different locations. The first one is at the site of Las Abadías, where 115.3m of the conduit have been excavated. Even if the conduit runs mostly underground, at some point it went over the surface, and four collapsed pillars were excavated at the site. The second location is Calle Medea, where a single pillar was later found.

The aqueduct probably tapped water from Arroyo del Sapo, and it supplied the north-western part of the city.<sup>161</sup>

### 3.4.3 Dating evidence

#### 3.4.3.1 Feijoo's thesis and the chronology of the dams

In 2005 and 2006, archaeologist Santiago Feijoo Martínez published in two articles his thesis which proposed that Roman aqueducts could not have been supplied by reservoir dams, and citing various authorities (Pliny, Vitruvius, Palladius, Frontinus) argued that water from reservoirs is not and was not drinkable. He draws a distinction between reservoir dams (that make a reservoir by blocking a river) and diversion dams, which simply took water from a flowing river, diverting it into the aqueduct conduit. The former were not suitable for human use, but the latter were, although their water may not have been the most ideal for drinking (as opposed to rain water and spring water).<sup>162</sup>

Feijoo further argues that *opus signinum* was used in cisterns not only as a way of insulating the structure, but also because its pinkish-reddish colour countered the growth of algae and other microbes, which are greatly affected by that wavelength (their optimal wavelength being green-blue).<sup>163</sup> However, recent studies on the quality of the water of these dams demonstrates that, despite slight pollution caused by animal fecal bacteria (which would not have existed in the Roman period, as that area was not used

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<sup>161</sup> Méndez Grande 2010.

<sup>162</sup> In fact, most Spanish aqueducts are fed by diversion dams: Aranda et al. 2006 (*contra* Feijoo).

<sup>163</sup> Feijoo Martínez 2006.

for animal husbandry), the water is drinkable according to modern standards, without the need for fluoridation, only needing filtering and decantation – purification techniques available to the Romans.<sup>164</sup>

This ground-breaking proposition directly affects our knowledge of the aqueducts of Mérida, for two of them are generally believed to have been supplied by dammed reservoir water: those of Cornalvo and Proserpina (Los Milagros). Feijoo's arguments state that the dams could not have been the source of the aqueducts, because they would have carried non-drinkable water to a city located next to two rivers with easy access to abundant water for other purposes.<sup>165</sup> However, this proposal does not seem to have a solid basis. First, his analysis of the text of Vitruvius is simplistic and acritical, as Vitruvius' text ought not to be taken as an accurate description of how things were meant to be. For instance, Feijoo argues that according to Vitruvius the *castella divisoria* gave maximum priority to public fountain supply and less priority to private individuals and industrial complexes, so aqueducts are necessarily supplying the same water to both drinking fountains and industrial areas, which would make little sense if the water that ran in the conduit was not drinkable.<sup>166</sup> However, Vitruvius' description of the *castellum divisorium*, for instance, does not match those which are known nowadays, like those of Pompeii, Metz or Nîmes, which distributed water "according to the geography of the areas served: pipes from the *castellum* carried water along main streets to designated neighbourhoods, and the same branch lines supplied both public basins and private homes".<sup>167</sup> In fact, several aqueducts supplied the same water for industrial complexes and for dwelling areas, as the Aqua Traiana in Rome or the

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<sup>164</sup> Aranda et al. 2006: 508-15

<sup>165</sup> Cf. Fernández Casado 2008 (1972): 117.

<sup>166</sup> Feijoo Martínez 2006: 146-7.

<sup>167</sup> Evans 1994: 8 (quoted). See also Fabre et al. 1991a: 119-32 and Fabre et al. 1991b for Nîmes and Lefebvre 1997 for Metz. Brunn 2000b: 219 gives further arguments on Vitruvius being wrong.

aqueduct of s'Argamassa, next to the Roman town of *Ebusus* (Ibiza), which supplied both a fish factory and a rural settlement.<sup>168</sup>

Then, Feijoo's study of the construction technique of both dams argues that the Proserpina Dam was built at some point in the early Middle Ages (7<sup>th</sup>-9<sup>th</sup> c.) and later expanded (fig. 3.37), using other Visigothic and emiral buildings of Mérida as comparisons. He therefore proposes that the dams were built for agricultural or animal herding purposes once the aqueducts had ceased to function.<sup>169</sup> Feijoo further criticises the scientific dating methods which have been used to date the dam, disregarding them as unreliable because of the sampling methods and the way the data are interpreted partially without considering other datable materials from the same context.<sup>170</sup> The archaeology of the building phases of the dam do clearly point to different construction phases, but overall, Feijoo's argument against the Roman date of the dam are not solid enough. The lower sections of the dams seem to be really Roman and in direct relationship with the aqueduct.

Finally, when the issue of the available water is analysed in more detail, we see even if the water was not perhaps the most ideal to drink, it was still necessary: Mérida needed four aqueducts to supply its population, not because they consumed ludicrous amounts of water, but rather because it is located in a very dry area of Spain, and all available sources of water were considered, including dams.<sup>171</sup>

#### 3.4.3.2 Further dating evidence

In the past few years, there has been an increasing amount of available data from the excavated sections of the aqueducts in Mérida. This contrasts with earlier

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<sup>168</sup> Wilson 2000; Gurrea and Fernández 1995

<sup>169</sup> Feijoo Martínez 2006: 157.

<sup>170</sup> These include radiocarbon dates from a small timber that was found in the water when the dam was emptied (dated to the 2<sup>nd</sup> c.).

<sup>171</sup> Aranda et al. 2006: 501-3.

publications, most of which argued for a fifth century abandonment, although there is no mention of what led the scholars concerned to propose that date in any of their publications. The abandonment of the aqueducts has even been linked to the sieges and attacks on the city by Suevi and Visigoths during the first decades of the fifth century, which is too simplistic.<sup>172</sup>

There is much debate about the phases and dates of the repairs of the Proserpina aqueduct, repairs which are clearly seen in some places where the construction technique changes (fig. 3.38). The interpretations of authors differ considerably: from Claudian, to Trajanic, Hadrianic, Severan and Constantinian, without a general consensus.<sup>173</sup> Thermoluminescence analyses of the bricks have revealed that those that were sampled can be dated to AD 288±85 [*cal.* 98%], which is not very helpful, but indicates a third-fourth century date for some of the repairs.<sup>174</sup> After this, there is evidence for a fourth or fifth century abandonment for this aqueduct: a bronze coin of Constantine was found inside the remains of a collapsed vault of the specus during the 2000 excavations west of Mérida, giving only a loose *terminus post quem*, considering the extended use of these coins through the following centuries, both for the collapse of this vault and the abandonment of the conduit.<sup>175</sup> Besides this, there is a possible Visigothic repaired pillar at the Los Milagros aqueduct, identifiable due to its different construction technique, reusing material from the original fallen pillars but in a completely different way. This pillar is built out of the building material of other collapsed pillars but in a completely different technique (fig. 3.39), perhaps indicating an attempt to restore the arcades which must have collapsed earlier before.<sup>176</sup>

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<sup>172</sup> Acero Martínez 2007: 427.

<sup>173</sup> Fernández Casado 2008 (1972): 137; Jiménez 1977: 272-3.

<sup>174</sup> Blasco et al. 1993: 251.

<sup>175</sup> Silva Cordero 2003.

<sup>176</sup> Alba and Mateos 2008: 267. Further discussed in section 5.1.4.

The Cornalvo aqueduct offers more precise dating evidence, as ten burials excavated inside the conduit at the site of Los Bodegones can be dated to the early Islamic period (eighth/ninth centuries).<sup>177</sup> This, together with the construction of a large public bath complex behind it in the sixth century (fig. 6.40) which was fed by a well rather than by the near-by conduit, may indicate a pre-sixth century abandonment date.<sup>178</sup>

One of the feeding branches of the San Lázaro aqueduct, that of Casa Herrera, has been recently partially excavated, next to the site of the sixth-century rural church (figs. 3.41-2).<sup>179</sup> The excavations there have not only revealed a probable rural settlement with a double-apsed church, but also an underground section of the aqueduct. The aqueduct was cut into the soil and covered by a masonry barrel vault. This section seems to have been working until the *specus* (lined in *opus signinum*, and measuring 40 x 45cm) was finally blocked with sediment. Inside the sediment, fifth century material has been located, while in the robber trench where the vault once was, a potsherd of the Mérida typology S-shaped rim (eighth-century in date) together with various other sixth and seventh century shards have been located. The abandonment of the conduit must be placed during or after the fifth century, after which the vault was removed and the remaining trench filled with rubbish of the Visigothic period. It is probable that the settlement or the Church used this branch of the aqueduct first as a source of water (the construction of the basilica and the abandonment of the aqueduct overlap), but then the

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<sup>177</sup> Delgado Molina 2006, esp. 291. The necropolis was in use from the sixth century into the Islamic period, as indicated by an inscription in Greek, which has “S[ub] EPA XIA”, which should be read “era 614”, which equals to AD 576, and not to AD 476 as the author claims.

<sup>178</sup> The date of this bath remains unpublished, even if it was excavated recently. I thank Miguel Alba Calzado, director of the Consorcio de Mérida for pointing this out to me during my fieldwork in Mérida. For earlier publications on the bath, see García-Entero 2005: 527-9.

<sup>179</sup> The excavation of this site was carried out in 2012 and 2013 thanks to the support of Lincoln College, the Craven Committee, the FECYT, and the Consorcio de Mérida. The excavation was co-directed by Dr Isaac Sastre and myself, with the help of Valentín Mateos, Miguel Alba, Gilberto Sánchez, Pedro Dámaso and Sara Rodríguez. The site was mentioned already in Fernández Casado 2008 (1972).

inhabitants must have been responsible for the removal of the vault – ideally once the aqueduct carried water no more.<sup>180</sup>

Besides the evidence from the aqueducts, there is plenty of information on water consuming structures in Mérida. The abandonment of the public fountains, for instance, is generally dated to the fifth century because supposedly it is then that the lead pipes were stolen.<sup>181</sup> However, no dating material is presented from the spoliation trenches, and in reality only the assumption that this happened in the fifth century dates the spoliation. The abandonment of the only three structures which have been excavated that could be considered to be public fountains has been dated in this fashion, but no dating material has been provided.<sup>182</sup>

It is curious that the *Lives of the Fathers of Mérida* mention the city baptistery in the late sixth century, located separated from the cathedral in a “little basilica” of St. John the Baptist (*basilicula*), which may have been a baptismal church, but still in the same episcopal complex, although we know nothing about where it obtained its water from.<sup>183</sup>

Concerning baths, there are several private and public bathing complexes known from Mérida whose life can be dated into the fifth century and beyond. Of the private baths, the first example is the *balneum* of Calle General Aranda 15, which was excavated in the 1920s and was dated to the fourth and fifth centuries on the basis of the decorative motifs of its wall paintings and floor mosaics.<sup>184</sup> The second example is the *balneum* of the Casa de los Mármoles, in the site of Morería, which was a private bath

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<sup>180</sup> Cordero and Sastre 2010, esp. 214; Gómez et al. 2009: 139-41; Sastre and Martínez 2012; 2013.

<sup>181</sup> Alba Calzado 2007: 163.

<sup>182</sup> Mateos et al. 2002: 77.

<sup>183</sup> VPE IV.ix.5: *cum laudibus pervenerunt ab ecclesia sanct(a)e Mari(a)e ad basiliculam sancti Iohannis in qua baptisterium est, quae nimium contigua antefat(a)e basilica(a)e, pariete tantum interposita; utraeque unius tecti tegmine conteguntur* – “they went singing praises from the church of St. Mary to the little basilica of St. John the Baptist, where the baptistery is. This is hard fast by the church mentioned before: there is merely a wall between them and both are covered by the same roof”. This can be immediately linked to the episcopal complexes of Barcelona and Valencia.

<sup>184</sup> García-Entero 2005: 558-9.

linked to a wealthy *domus*. It had two main phases, the last one spanning between the third and fifth centuries, when the site as a whole was destroyed by fire (an event linked to the Suevic siege?), being reoccupied in the late fifth century, according to the pottery, as a simple domestic structure.<sup>185</sup> The last bath is the one excavated at Calle Nerja, which was located in the suburbs. It is a bath belonging to a late suburban *domus*, built in the sixth century and abandoned in the ninth. The bath itself is built using early imperial reused material. Its furnace has been dated through radiocarbon dating (from ash samples) to AD 607-694 [cal 98%], and in the foundation trench of the drain a potsherd with an S-shaped rim (dated to the eighth century) was uncovered. However, the bath seems to have been fed by a water wheel from the Albarregas river, rather than by piped water.<sup>186</sup> Some other minor baths are known at the Train Station and in the Resti suburb, which during the Visigothic period (sixth/seventh c.) were turned into houses according to the material retrieved from the fills of the vats. The one known public bath of Mérida, located below the Alcazaba (the Islamic citadel), was also turned into a residential area in the Visigothic period, although when exactly it is not possible to tell.<sup>187</sup>

The sewers are also generally considered to have collapsed and been out of use by the fifth century, despite some minor and extraordinary examples of continuity into the Islamic period.<sup>188</sup>

#### 3.4.3.3 Islamic reuse?

Al-Idrisi (1100-1165), in his work *The Description of Spain* mentions an aqueduct of Mérida. This was possibly the aqueduct of Los Milagros, on the grounds that this was

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<sup>185</sup> This example is particularly well and securely dated: García-Entero 2005: 540-1.

<sup>186</sup> García-Entero 2005: 560-1.

<sup>187</sup> Alba and Mateos 2008: 268.

<sup>188</sup> Acero Pérez 2011.

the most impressive one and its location west of the city fits his description, although considering the orientation of Islamic cartography (where north is south), we may understand “east” for “west”, which would rather point to the San Lázaro aqueduct. His description, written in 1154, may indicate that the aqueduct was in use:

“Amongst these constructions we will mention west of the city a great bridge with a great number of tall arches, whose top offers a wide passage. In the top fabric that overlies the arches there is a vaulted corridor which links the inner city with the far end of the bridge: it is possible to go through this without being seen. Inside this vaulted corridor there is a **pipe** which reaches the city. Men and beasts walk over [under?] these arches, which are of solid construction and notable quality”.<sup>189</sup>

The conduit is described as a secret passage into the city, and as enclosing a pipe, which may have carried water. The pipe must have been a later addition, because in Roman times the aqueduct carried the water in the *specus*, not by means of a pipe. This may suggest that the aqueduct may have been out of use in the early medieval period, and then put back into use at some point during the Caliphate (929-1031) by means of a pipe, just as the aqueducts of Valencia, Córdoba and Tarragona were.<sup>190</sup> This theory would explain the existence of two huge pipe outlets at the base of the Proserpina dam (fig. 3.37).<sup>191</sup>

Several pillars had collapsed in the Proserpina aqueduct by the Visigothic period, but likewise we do not know how complete the San Lázaro aqueduct was in Islamic times, so it is not possible to claim through which conduit this “pipe” passed.

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<sup>189</sup> Al-Idrisi, *Description of Spain*, as cited in Fernández Casado 2008 (1972): 152 [my translation from his Spanish].

<sup>190</sup> Cf. Procopius’ story about how the aqueduct of Naples was used by Belisarius to take the city: *BellGoth* I.ix.10-18. This was also attempted in Rome the following year (V.xix.13).

<sup>191</sup> Feijoo Martínez 2006: 151.

### 3.4.4 Discussion

The dating evidence is very inconclusive. The overall picture seems to indicate that at some point during the early Visigothic period most water-consuming structures fell out of use, although this is a circular argument in which the aqueducts cease to function because there are no more water consuming structures, which are not working because the aqueducts are out of use. All this is based on the assumption that the fifth century attacks caused great damage to all four aqueducts.

However, considering the increasing number of private baths in the fourth century,<sup>192</sup> all of which suddenly seem to end in the fifth century, is this really a circular argument? Or is there some reasoning behind it? The city seems to have suffered greatly from the Suevic attack, when a whole section of the city seems to have been burned. I do not believe that the Suevi consciously pulled down the aqueducts; but it may be simply that after this the water-consuming infrastructure had been too damaged to be useful.

The Proserpina aqueduct was clearly abandoned by the Visigothic period (late antique coin in the abandonment layers, Visigothic pillar), and the Cornalvo aqueduct was most probably out of use by the sixth century (theatre baths, Islamic burials). A similar date is proposed for the San Lázaro aqueduct, as the results of the excavation at Casa Herrera point out.

It is also curious that the powerful archbishops of Mérida did not take over the control of water supply in the sixth and seventh centuries as it seems to be the case in other cities. Considering that they were clearly in control of the city building basilicas and a *xenodochium*, the lack of interest by the church on the water supply in the

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<sup>192</sup> Alba Calzado 2005: 128, 135.

Visigothic period may indicate that the aqueducts were either not needed (lack of functioning baths) or were beyond repair (which may explain the possible Islamic repairs inferred from the pipe mentioned by Idrisi).<sup>193</sup>

There is no positive evidence to suggest that the water supply was fully functional in the sixth century inside Mérida (Casa Herrera and the suburb excepted). Only again in the Islamic period does it seem that the aqueduct of San Lázaro was repaired (probably during the Caliphate), parallel to other Islamic repairs elsewhere in Spain. This would thus explain Idrisi's mention of a pipe inside the "bridge" as mentioned above.

### 3.5 TARRAGONA

Tarragona (fig. 3.43) is a Mediterranean city, located on the north-eastern coast of Spain. It was one of the first cities founded by the Romans outside Italy and it was, from its very early beginnings, the provincial capital of Hispania Citerior (later Hispania Tarraconensis). The city's layout was greatly modified by Augustus, who spent a year there while he organised the Cantabrian wars (26-25BC). After this remodelling, Tarragona was divided into three main areas: an upper city around the temple of the imperial cult and the *concilium provinciae* (a great public space linked to the provincial administration), a lower city, south of the circus which included the old colony's forum and a theatre, and lastly an extra-muros, sea-front harbour suburb.

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<sup>193</sup> E.g. *VPE*, IV.vi.7, V.iii.4, 11; Caballero and Mateos 1995. For the very doubtful identification of the *xenodochium*, see Mateos Cruz 1995.

### 3.5.1 Tarragona in Late Antiquity

During Late Antiquity, the city remained as the last bastion of imperial power, as it was the *de facto* capital of the *Dioecesis Hispaniarum* after Mérida was lost to the Suevi early in the 420s, and it was the last city to fall to the Goths in 475. Throughout the fifth and into the sixth century, Tarragona maintained its ecclesiastical importance as an archiepiscopal see, but it lost most of its political importance to sites like Zaragoza or Barcelona, especially after 592 when Barcelona took over the administrative responsibility of this region.<sup>194</sup> The city entered into a period of steep decline which continued up to the eighth century, as evidenced by the increasing number of abandoned structures in the lower city and the decline of imports identified from the harbour. Soon after, the city was abandoned by the Muslim garrison and only became again a centre of political relevance in the 12<sup>th</sup> century, when it was conquered by the Christians.<sup>195</sup>

The archaeology of the city reflects the history of this waning provincial capital. Only the forum appears to have been maintained functional throughout the fifth century, as evidenced by the lack of encroaching structures in it.<sup>196</sup> But beyond that, there is enough evidence to suggest that the city was polarising into two foci, as the population abandoned the lower city and moved either up to the upper one (where the Visigothic episcopal complex was built) or to the harbour suburb, which had been expanding towards the mouth of the Francolí river, around the Christian martyrial complex built in the late Roman period.

Most of the old houses and industrial buildings were abandoned during the course of the sixth century, and those that were built anew are to be found outside the walls. The circus was then quarried, and the amphitheatre was turned into a centre of Christian

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<sup>194</sup> According to the *De fisco Barconinensi* mentioned above. An extensive and up-to-date study on Tarragona has been carried out by Meritxell Pérez Martínez (2012).

<sup>195</sup> Carreté et al. 1995; Panzram 2002: 111-20.

<sup>196</sup> Bosch et al. 2005: 168, 171.

cult in 555 with the construction of a church in the arena. Similarly, the finds of the new fifth-century harbour indicate that Tarragona was slowly losing importance in broader commercial networks, and imports cease to appear in the archaeological record by the end of the seventh century, when the few identifiable finds seem to have been of local or regional origin.<sup>197</sup>

### 3.5.2 The multiple water supply systems

Tarragona is located both next to a river (the Francolí) and on a karst platform in which the water table is readily accessible, which benefitted supply in the early years of the colony. Despite this, during the early Empire, in the period of urban reorganisation, the city built three new aqueducts.

In the Early Modern period however, when Pons d'Icart (1572) undertook the first studies on the aqueducts of Tarragona, only one conduit was known, the so-called “bridge of the devil” or *Pont del Diable* (fig. 3.44), which was linked to the few and fragmentary remains known from the city.<sup>198</sup> This first study linked the bridge with two possible sources (the Gaià and the Francolí rivers), although over time the source of the Pont del Diable aqueduct was considered to be the Gaià river alone (an opinion followed by Fernández Casado).<sup>199</sup>

However, later in the last century this was proved wrong, because the 1972 survey put together the information obtained from field work with a new study of 18<sup>th</sup> century maps. It was then clear that there were two aqueducts, one obtaining water from the Francolí (the Pont del Diable) and another obtaining it from the Gaià river.

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<sup>197</sup> A complete overview of the evolution of Tarragona can be obtained from these papers: Adserias et al. 2000; Dupré 1990; Macias Solé 2008; Macias and Remolà 2005a.

<sup>198</sup> Pons d'Icart 1572: fols. 210-3.

<sup>199</sup> Fernández Casado 2008 (1972): 29. Fernández Casado's description of the course is completely outdated, but his notes on the remains which were standing when he did his research in the 1940's and 1950's are still important and unparalleled.

Nowadays, we know of the existence of three different aqueducts.

### 3.5.2.1 The Francolí aqueduct

The water conduit to which the Pont del Diable belongs, as we have said, is now linked to the Francolí river (app. XIV).<sup>200</sup> Its course is now relatively well known, especially due to the early topographical surveys and maps done in the 1740's as well as to the aforementioned 1972 survey. Its total length is 45km, which makes it one of the longest in Spain, together with the aqueduct of Toledo (50km).<sup>201</sup> Its source, at the Alçada (hill) del Rovel was finally identified in 1989, as previously it was thought to be further down river at Puigdelfí.<sup>202</sup>

From this area in the hills, the aqueduct continued towards the sea partially excavated in the rock, and partially vaulted, as the sections identified in the municipality of La Secuita show (fig. 3.45), something which is characteristic of most Roman aqueducts.<sup>203</sup> There are several remains located throughout the countryside between La Secuita and the Pont del Diable (barranc Blanquet, barranc Castellot).

The Pont del Diable was built over the Ferreras (Spanish) or Ferreres (Catalan) creek (hence its alternative name, *aqüeducte de les Ferreres*); it measures 200m in length and up to 26m in height. It is organised in two rows of voussoir arches (25 arches on the top row and 11 on the bottom one) which measure 5.90m in diameter (20Rf), and are built in ashlar blocks (fig. 3.44).<sup>204</sup> From this point, the aqueduct followed the contour lines until it approached the city from the north, by the slopes of the hill of La Oliva, where it is still visible in Camí de l'Àngel (fig. 3.46) and the Avinguda de

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<sup>200</sup> Aquilué et al. 1991; Cortés et al. 1989; Sáenz Ridruejo 1977: 351-3.

<sup>201</sup> Cortés et al. 1989: 1092.

<sup>202</sup> Remolà and Ruiz de Arbulo 2002: 33. Cf. Sáenz Ridruejo 1977.

<sup>203</sup> Cortés et al. 1989: 1096-8: sections labelled LS10 and LS44.

<sup>204</sup> Fernández Casado 2008 (1972): 31-40.

Catalunya (and where it used to be visible at Quatre Garrofers), supplying water to the lower city (fig. 3.47).<sup>205</sup>

### 3.5.2.2 The Gaià aqueduct

A second aqueduct reached Tarragona from the Gaià river, without passing by the Pont del Diable as previously thought (app. XV). The course of this aqueduct is not well known outside the city, although its source at the Port d'Armentera and its approximate length (15km) are widely accepted.<sup>206</sup>

Inside Tarragona it is better known (fig. 3.47), and it seems clear that it fed the upper city. Ten sections of it have been recently excavated, which show that it divided into two conduits just before entering Tarragona at La Oliva hill. The first conduit, is a vaulted conduit, lined in *opus signinum* and built in mortared rubble, and has been identified in several places of Carrer Rovira i Virgili, and went straight towards the circus area. The second branch went towards the upper city, and according to the pillars found at Carrer Sant Agustí, it reached this part by means of an inverted siphon. There are some remains still standing at the Campo de Marte (fig. 3.48) at the point where the aqueduct crossed the walls. From this point it seems, according to the distribution of the finds, that most of the water was carried up to the *castellum* located in the archiepiscopal palace, whereas another section of the aqueduct went parallel to the walls, in the via del Imperi Romà.<sup>207</sup>

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<sup>205</sup> Aquilué et al. 1991: 96-7; Fernández Casado 2008 (1972); Macías et al. 2007 #697, 699; Sánchez et al. 1994.

<sup>206</sup> Remolà and Ruiz de Arbulo 2002: 33; Cortés et al. 1989: 1092;

<sup>207</sup> Macias et al. 2007; #24, 69, 86, 166, 181, 719, 726, 728, 729, 733. Sáenz et al. 1994.

### 3.5.2.3 *The suburb aqueduct*

A third and much debated aqueduct (which in 2003 was still unknown archaeologically, although it was inferred)<sup>208</sup> supposedly fed the harbour suburb and the sea front residential area (app. XVI). Now there are archaeological remains that may indicate that this aqueduct existed: a section was excavated at Carrer Dr. Mallafré which because of its altitude (30m a.s.l.) cannot be considered as a suburban branch (similar to the secondary branch of the Gaià aqueduct that goes towards the circus) of the two other aqueducts (which in this area are located 50/60 m a.s.l.).<sup>209</sup>

This suburban aqueduct is thought to come from the Francolí river, diverting water at some point down river from the Francolí aqueduct, in the place known as Sant Pere Sescelades. Even if its course is largely unknown, it is possible that it followed the later medieval water conduit known as the Rec Major, which was used to power the mills of the city, also located in the suburb.<sup>210</sup>

The lack of archaeological evidence prevents us from making strong statements on the nature of this aqueduct, beyond the safe assumption that it fed the suburb, possibly supplying the baths and baptistery of the suburban episcopal complex.

### 3.5.2.4 *The lake and the cuniculus*

The karst platform on which Tarragona is located, which contained an underground lake, is made water easily available to the city.<sup>211</sup> At some places by the harbour suburb the water even naturally sprung out of the soil.<sup>212</sup> This would also

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<sup>208</sup> Macias and Remolà 2005a: 186.

<sup>209</sup> Sánchez et al. 1994: 113.

<sup>210</sup> Cortés et al. 1989: 1091; Remolà and Ruiz de Arbulo 2002: 33-4.

<sup>211</sup> Burés et al. 1998: 183.

<sup>212</sup> Remolà and Ruiz de Arbulo 2002: 42.

explain the presence of deep wells all over the lower city (22 are known in the archaeological record).<sup>213</sup>

This underground water seems to have been conducted by means of an aqueduct excavated in the rock, or a *cuniculus* (app. XVII, fig. 3.49), which has been located during some rescue excavations at Carrer Gasòmetre n. 32, originally discovered in 1849.<sup>214</sup> This conduit, located very close to the *forum coloniae*, is known only for 68 twisting and turning metres. The conduit is cut into the bedrock, and took water from the lake and led it to somewhere by the main harbour. Its cross-section is shaped like an inverted-bottle 2.5m high (fig. 3.50), with its vault measuring 80cm in width, the passageway 50cm and the conduit itself, at the bottom, just 30cm. The access to this tunnel was through six *spiramina*.

Hardly anything else is known about this conduit, although other similar structures have been located in recent excavations, of which even less is known, but that would indicate that Tarragona's underground waters were commonly used. Some of these conduits seem to be related to the water supply of the theatre *nymphaeum*.<sup>215</sup>

The public fountain located at Carrer Pere Martell, in the old harbour suburb, seems to have been fed directly by water springing from the ground, and not to any known excavated conduit. This natural spring (fig. 3.51) was enclosed in a pool measuring 15x3m with several sculptured spouts. It was monumentalised in the early imperial period with a vaulted roof, which substituted the late republican simple tiled roof and colonnade. In the late Empire it was almost abandoned after its partial collapse, although the pool of the spring was kept accessible and in use.<sup>216</sup>

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<sup>213</sup> Macias et al. 2007: chap. VI.

<sup>214</sup> Burés et al. 1998; Remolà and Ruiz de Arbulo 2002: 38-40.

<sup>215</sup> Macias et al. 2007 #453, 464, 469, 498, 511; Remolà and Ruiz de Arbulo 2002: 34.

<sup>216</sup> Remolà and Ruiz de Arbulo 2002: 41-63.

### 3.5.3 The chronology of the water supply

Our uneven knowledge of the aqueducts prevents us from making any clear statements on their chronology. The construction of the Francolí aqueduct has been dated to the Augustan period, on the sole basis of its ashlar construction technique and because Augustus himself was in Tarraco in 26-25BC, and was responsible for the great urban development of the city.<sup>217</sup> Out of the excavated sections, no conclusive datable material has been obtained, so all the information necessarily has to come from indirect evidence.

Only the underground conduit, the *cuniculus*, has provided datable material. It seems that the tunnel was partially out of use by the fourth century, because a section of it had by then been turned into a rubbish pit.<sup>218</sup>

#### 3.5.3.1 The late fifth century inscription.

One piece of evidence which may possibly indicate a continuing supply of piped water during the course of the fifth century is the plaque found at Camí del Cementiri n. 7. This small plaque (40 x 45cm) has an inscription which mentions to the emperors Leo and Anthemius, and has thus been dated to AD 468-73.<sup>219</sup> This small plaque has a small hole in its centre which is certainly contemporary with the inscription (since the letters avoid the hole), and which may be related to a pipe (fig. 3.52), as if the plaque were a fountain head with a spout.<sup>220</sup> As the inscription was discovered in the 19<sup>th</sup> century in the wall of a house, it is difficult to identify where it came from, but if it was originally found nearby, it would come from La Oliva hill, where the Gaià aqueducts passed.

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<sup>217</sup> Fernández Casado 2008 (1972): 40.

<sup>218</sup> Burés et al. 1998: 191.

<sup>219</sup> *CIL* II 4109.

<sup>220</sup> Ch. Witschel 2009: *Last Statues of Antiquity* #1986.

The inscription of the plaque reads as follows: *BF.S DD[omini] NN[ostr] Leonis et Anthemi Augg[ustorum]*, which translates as “BFS (?) of our lords emperors Leo and Anthemius”. The letters BFS have no clear meaning, although several interpretations have been proposed, which include *B(onum) F(actum) S(aluti)*, “A good thing, made for the salvation...” and *B(eatissimo) F(elicissimo) S(aeculo)*, “In the most blessed and happy times...”. It would be tempting to see the F being the abbreviation of *fons* (e.g. *bonae fons saluti*, “the fountain to the good health...?”), although other public fountains with inscriptions of Spain (like those in Córdoba)<sup>221</sup> use *lacus* instead to refer to the fountain basin.

If this inscription was linked to a fountain, the hole through the plaque may have been for the spout or the pipe, now gone. It measures roughly 10cm in diameter, which is the equivalent diameter to an *octonaria* (8-digit pipe, according to Frontinus), which is just only slightly bigger in diameter than the standard pipe (the *quinaria* or 5-digit pipe)<sup>222</sup>, but contained just over twice the amount of water than the *quinaria*.<sup>223</sup> This matches perfectly with the data given by Frontinus for the water consumption of the fountains of Rome, where the Aqua Virgo, for instance, fed 51 *quinariae* of water to 25 public fountains, the Aqua Iulia 28 *quinariae* to 65 fountains and the joined Aqua Claudia-Anio Novus, 481 *quinariae* to 226 fountains.<sup>224</sup>

If this plaque were indeed part of a fountain fed by piped water, the Gaià aqueduct must have been functioning in the late fifth century.

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<sup>221</sup> *CIL* II<sup>2</sup> 7.217-8.

<sup>222</sup> Water consumption, as measured by Frontinus (and thus applied to all the Roman world) was based on the capacity of water held by the five-digit pipe and its larger versions.

<sup>223</sup> *De Aquis* I.42: *Fistula octonaria: diametri digitos duos... caput quinarias IIS££ [= capacity of 2 quinariae plus ½ plus 1/24 plus 5/288]*

<sup>224</sup> *De Aquis*, II; Cf. table IV in the LOEB edition.

3.5.3.2 Cisterns as indicators.

The presence of many late antique cisterns has been used to suggest an end of the piped water supply, and a return to previous systems of water supply.<sup>225</sup> However, this could be an indicator of an unreliable and seasonally variable aqueduct, as explained above.<sup>226</sup>

In the case of Tarragona, the large cisterns located at the cathedral (Plaça de la Seu excavations) could be considered to be one of these terminal cisterns.<sup>227</sup> This cistern (fig. 3.53) has been dated to the Visigothic period according to its construction technique and its location, re-using a wall of the *cryptoporticus* of the imperial cult *temenos* (which is considered to have been abandoned by the late fifth century). All this fits with the sixth-century transformation of the precinct into the newly-built episcopal complex. The cistern measures 45.83m<sup>2</sup> and it is covered with a 25cm thick *opus signinum* lining. It is a barrel-vaulted structure, with an overall capacity of 147m<sup>3</sup>, which is very big. This cistern, furthermore, is very close to the archiepiscopal palace (fig. 3.54), where the *castellum* of the Gaià aqueduct has been identified, and it is very possible that it fed the cistern although this is not certain.

Other cisterns in the same area of the city may have also been built to store water coming from the Gaià aqueduct. The *cryptoporticus* cisterns, for instance, were built in the late Empire, after lining in *opus signinum* three rooms in the *cryptoporticus*, one of which preserves an access stair. It is possible that the *specus* which has been identified in this excavation (which came from the aqueduct itself) was used to fill these cisterns. These were in use up to the end of the fifth or into the early sixth century, when the pottery indicates that they were transformed into a dwelling space.<sup>228</sup>

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<sup>225</sup> Macias and Remolà 2005a.

<sup>226</sup> Section 2.4.3 above.

<sup>227</sup> Bosch et al. 2005; Macias et al. 2007 #25.

<sup>228</sup> Macias et al. 2007 #85.

Other cisterns located in the immediate area have also been dated to the Visigothic or late antique period, although they seem to be too low to be linked in any way to a terminal deposit of the aqueduct. This of course does not imply that they could not still be fed by aqueduct water that was piped from the terminal deposit. The cistern in the Col·legi d'Arquitectes has been dated to the early Visigothic period (500/525-550), and its size (40m<sup>3</sup>) may indicate that it was a domestic cistern. The date is given by the ceramic material retrieved from other contexts in the same excavation, although there is no specific mention to datable finds in the cistern. Because of the location of these cisterns, it may be possible to link them also to the episcopal complex. Very similar is the cistern of Plaça d'en Rovellat, which is linked to a residential area built in the late fifth and early sixth centuries, according to the excavated pottery.<sup>229</sup>

### 3.5.3.3 Baths in Late Antiquity

There were plenty of bath complexes at Tarragona (21 have been excavated in total),<sup>230</sup> both public and private, with the latter more numerous. All of the known baths are located either in the lower city and the harbour area or in the western suburb, which means that they were fed by the Francolí aqueduct, the underground *cuniculus*, or the alleged third aqueduct.

The main (and only known) public baths, located on the harbour front, were excavated at the Carrer Sant Miquel, and were very well preserved. This made it possible to obtain a full stratigraphic sequence from their origins up to Late Antiquity. The baths themselves were organised with a main axial room and two adjacent wings (fig. 3.55). They were supplied by the underground conduit and were originally built in

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<sup>229</sup> Bosch et al. 2005; Macias et al. 2007 #27, 107. For the Col·legi d'Arquitectes material, Aquilué 1993: 97-123, 193-5; Macias and Remolà 2005b.

<sup>230</sup> According to the compilation of Macias et al. 2007.

the early Empire, being completely refurbished in the third century.<sup>231</sup> These baths remained functional until Late Antiquity, when the bathing rooms were filled in with mid-fifth century material, including Hayes forms 57, 58b, 58, 61a, 67, 75, 91, 131 and 200, as well as some amphorae like LRA 3 and Keay 25b. The structure of the baths was turned into a house which was in use during the sixth and seventh centuries, until the Muslim conquest (AD 713) according to the excavators.<sup>232</sup>

Five other private baths continued to function into the late antique period, which is a quarter of the total number of known baths. Those of Parc Central and the Francolí Christian suburb seem to have been functioning up to the fifth century (later being remodelled into a baptistery).<sup>233</sup>

Two other *balnea*, excavated during the urban development project known as PERI-2, continued in use well into the Visigothic period. That located in plot 22 was a fourth-century domestic *balneum* built in a suburban *domus*, and was in use until the second half of the seventh century, according to the excavated material, which mostly (over 60% of the datable material) consisted of seventh-century coarse wares. The other bath, located in plot 31 was built at the same time as the previous example, but this bath was by the mid-sixth century a burial area. These two baths seem to have been supplied by underground water.<sup>234</sup>

The last example is the *balneum* of the *domus* at Carrer d'Apodaca, in the lower city, inside the wall precinct. This bath was built in a house located on top of the main

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<sup>231</sup> Macias et al. 2007: #498.

<sup>232</sup> Díaz et al. 2000: 114-24; Macias Solé 2004 (esp. 58-62, 83-4); Macias et al. 2007 #497; Remolà and Ruiz de Arbulo 2002: 34.

<sup>233</sup> García-Entero 2005: 270-2; Macias et al. 2007 #647,

<sup>234</sup> Adserías et al. 2000: 141-2; Macias et al. 2007 #620, 609; Macias and Remolà 2005b; Remolà and Ruiz de Arbulo 2002: 59-63.

sewer, and was in use until the beginning of the sixth century, according to the excavated material.<sup>235</sup>

As already mentioned, there are many other baths excavated in Tarragona, but the rest were either abandoned by the fourth century, were not properly excavated, or did not produce datable stratigraphic material.<sup>236</sup>

#### *3.5.3.4 The Islamic period*

The aqueducts of Tarragona, like many others in the peninsula, were not commented on at all by Classical authors, and it is only in the Islamic period when geographers paid attention to these huge structures. In the case of Tarragona, the aqueduct is mentioned by Ibn Ghálib, a 12<sup>th</sup> century scholar, whose text is lost but has been preserved by the 17<sup>th</sup> century compiler, al-Makkari.

“[Ibn Ghálib mentions that the aqueduct] conveyed the water from the sea [sic] to the city by a gentle level, and in the most admirable order, and served to put in motion all the mill-stones in the town, the whole being one of the most solid, magnificent, and best contrived buildings that ever were erected”<sup>237</sup>

The text must certainly refer to the Pont del Diable, the Francolí aqueduct, as the other aqueducts have not left remains that could deserve such praise, and it is clearly saying that an aqueduct of Tarragona was still functioning at the time of the Christian conquest (AD 1116).

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<sup>235</sup> Macias et al. 2007 #355.

<sup>236</sup> Most of these excavations were rescue excavations, in which either the archaeological company did not carry out careful excavations, did not hand in the final report, or even were forced by the authorities to make ‘sample sondages’ in sites which required open-area excavations (Cf. Macias et al. 2007: #612), presumably in order to speed up the construction.

<sup>237</sup> Al-Makkari, I.6, p. 77.

The fact that the aqueduct was still functioning in the twelfth century does not mean that it had been working continuously since the Roman period, as the evidence presented above indicates. Several modern authors, however, mention that the aqueduct of Tarragona was repaired in the tenth century by caliph Abd al-Rahman III, and even mention that these repairs are “clearly visible in the current monument”.<sup>238</sup> Yet I have not been able to find a picture of these repairs, a reference to excavated material or a primary Arabic source which mention these repairs. However, these alleged repairs are not impossible, as we know of Islamic repairs in Córdoba and Valencia, and they would explain the comment of Ibn Ghálib, although we cannot tell if the repairs were aimed at the functioning of mills, or at the supply of the city, of which we know very little for the tenth century – or indeed for the entire the Islamic period of Tarragona.

### 3.5.4 Discussion

Even if there is not enough direct evidence from the aqueducts to determine when they ceased to function, there is indirect evidence, which may point towards the sixth century as the end point of these structures, or at least one of them. It seems that one might have been in use and repaired again in the Islamic period, although there is no solid evidence to confirm this.

A possible *post quem* date for the abandonment of the Gaià aqueduct is AD 468, if the inscription dated to the reign of Anthemius and Leo was really related to a fountain head, which is unclear. The proliferation of sixth century cisterns in the upper city (some of them linked to in-flowing *specūs*) would give another, rather later, *post quem* date. This argument, however, relies on the assumption that the huge cisterns located in the area of the cathedral can be linked to a partially functioning aqueduct and to a means

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<sup>238</sup> Most prominently, Fernández Casado 2008 (1972): 29, whom the quote belongs to.

of maintaining a regular water supply, as happened with the terminal cisterns of the Aqua Antoniniana of Rome. This suggests parallels with the continuing aqueducts in the episcopal complexes of Barcelona and Valencia, and may hint at a direct involvement in the water supply systems by the Church.<sup>239</sup>

It should be remembered that one of the branches of the Gaià aqueduct fed the lower city, just like the Francolí aqueduct. Furthermore, in this area we know the baths of Carrer d'Apodaca, which as we have mentioned, were in use until the beginning of the sixth century. This could support the dating proposed for the Gaià aqueduct, unless the baths were linked to the Francolí aqueduct.

As for the two Francolí aqueducts, the main one (the one which goes over the Pont del Diable) cannot be certainly linked to any water-consuming structure, and the existence of the secondary one is in doubt, so there is very little that can be said about them. It would seem that the harbour area and the lower city relied on underground water for their supply (as evidenced by the many wells in houses),<sup>240</sup> which can be further confirmed by the fountain located at Carrer Pere Martell (fig. 3.52), which seems to have been in use until the seventh century, when the pool was finally filled with sediment and datable ceramic material.<sup>241</sup> The presence of four private *balnea* in this area, dated up to the fifth and even the seventh century, could indicate that the water supply continued to function, but it seems that water was obtained from the subsoil rather than from pipes.

However, the public baths from Carrer Sant Miquel were in use until the mid-fifth century, whereas the conduit that fed them water (the *cuniculus*) was out of use by the fourth. If these baths were functioning until then, they must have been fed by the Francolí aqueduct, because it fed that area. There is the chance, though, that in that

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<sup>239</sup> Further discussed in section 6.3.

<sup>240</sup> Macias and Remolà 2005a: 181-3.

<sup>241</sup> Remolà and Ruiz de Arbulo 2002: 7.

period the baths were supplied from another subterranean source of water of which we know nothing.

Overall, the aqueducts of Tarragona do not seem to have survived beyond the Visigothic period, and the only solid evidence points towards an end during the sixth century for the Gaià aqueduct. Regarding the two other aqueducts, only suppositions based on little solid evidence, point towards a late-fifth abandonment date.

## **3.6 SEGOVIA**

### **3.6.1 Ancient Segovia**

Segovia is built on a granitic plateau in the Duero basin, 50ha in extension and situated 1000m a.s.l., between two rivers (which are at points 70m below the cliffs of the north-western end), making it only accessible from the south-east.

Our knowledge of pre-medieval Segovia is almost non-existent, even if paradoxically it has the most famous Roman structure of the Iberian Peninsula: its aqueduct. The historical centre is in its entirety covered by medieval buildings, and there have been very few excavations inside the upper town, although it is supposed that the original pre-Roman and the Roman settlements were both there, thus the need for an aqueduct. The archaeological information for late antique Segovia is, needless to say, simply non-existent, which means that it is omitted from general and even regional studies of late antique towns.<sup>242</sup> There are several “Visigothic” necropoleis in the province, but nothing easily linked to Segovia itself.

We know that Segovia was a bishopric in the Visigothic period, as its bishops were present at the 3<sup>rd</sup>, 4<sup>th</sup>, 11<sup>th</sup>, 12<sup>th</sup>, 14<sup>th</sup> and 16<sup>th</sup> Councils of Toledo, and since it was a

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<sup>242</sup> Abásolo 1999, which is the synthetic work for the late antique Duero basin, does not mention Segovia at all.

bishopric it must have been an important place for Visigothic administration, although it does not seem to have been a mint.<sup>243</sup>

### 3.6.2 The aqueduct

#### 3.6.2.1 Sources, course and distribution

The course of the aqueduct is considered to be well-known, because the fifteenth-century reconstruction is still clearly visible from the source up to the beginning of the Roman *arcuatio*. However, excavations in the 1970's at one of the settling tanks have revealed that the 15<sup>th</sup> century and the Roman conduits did not, in fact, follow exactly the same route.<sup>244</sup> However, this difference between courses at this specific spot may not have been typical, and it is safe to assume that the late medieval aqueduct followed roughly the original course, since this is the easiest one in practical terms.

Thus, the aqueduct begins at the Río Frío dam, and then continues for 9km at ground level through an open channel up to the forest of Valsaín, at which point the aqueduct goes underground, only to emerge close to the first settling tank, over 8km away from Valsaín. It then continues above ground on a solid wall until the second settling tank, from which the *arcuatio* begins (fig. 3.56). The work on arches runs for 958m, in three different consecutive sections, with a total of 75 single and 44 double arches.<sup>245</sup> From here, the Roman course is not known archaeologically, but if it were to follow the fifteenth-century route, it would continue underground up to the Alcázar, at the north-western end of the plateau (app. XVIII).<sup>246</sup>

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<sup>243</sup> Vico et al. 2006.

<sup>244</sup> Almagro and Caballero 1977: 36.

<sup>245</sup> Fernández Casado 2008 (1972): 56-87.

<sup>246</sup> Zamora Canellada 2007: 135.

3.6.2.2 Chronology and dating evidence

With such a complete course but such an obscure town, the datable material has to come entirely from the aqueduct itself.

The construction of the aqueduct can be securely dated to the late first century AD, thanks to several inscriptions. Some of them (*CIL* II 2739, 2746, 2751) are simply reused tombstones, which according to the type of lettering can be dated to the early first century AD. The most important of all, however, has not been preserved, which is the one situated on the aqueduct itself, just before it enters the city. It has been reconstructed several times based on the position of the clamps that once held the bronze letters, the most recent reconstruction being that of late G. Alföldy.<sup>247</sup> The inscription, according to this optimistic reconstruction, is dated to Trajan's second consulate, in AD 98, and commemorates a restoration of the aqueduct.<sup>248</sup> This is further suggested by the presence of a coin of Trajan in the mortar of the *specus*.<sup>249</sup> This interpretation, however, is not widely accepted, and there are various other alternative readings.<sup>250</sup>

There is further evidence to suggest that the aqueduct was working and repaired throughout Antiquity, as up to three layers of *opus signinum* are visible inside the *specus* (fig. 3.57). They are below the fifteenth-century repairs made in stone, which they must pre-date; the upper layers are made in an *opus signinum* coarser than that of the original work, which may indicate late imperial or even post-imperial repairs of the conduit.<sup>251</sup>

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<sup>247</sup> As in Fernández Casado 2008 (1972): 100-2.

<sup>248</sup> Alföldy 1992; Contreras 2007. [*Imp(eratoris) Nervae Traiani Caes(aris) Aug(usti) Germ(anici) P(ontificis) M(aximi) trib(unicia) pot(estate) II co(n)s(ulis) II patris patriae iussu P(ublius) Mummius Mummianus et P(ublius) Fabius Taurus Ilviri muni(cipii) Fl(avii) Segoviensium aquam restituerunt*]

<sup>249</sup> Almagro and Caballero 1977; Zamora Canellada 2007: 137.

<sup>250</sup> Fernández Casado 2008 (1972): 89-94

<sup>251</sup> Almagro and Caballero 1977: 37; Jurado 2002.

The important question is whether the aqueduct continued to function after Antiquity, for which there is no clear evidence, but which is an intriguing possibility.

It has been claimed that the aqueduct was destroyed in 1071, when the city was raided by the Muslim king of Toledo, according to a later chronicler, Luis del Mármol.

*... por este tiempo Ali Maimón, rey de Toledo, rompiendo las treguas que tenía con el rey don Sancho de Castilla cercó la ciudad de Segovia, y (...) la destruyó y asoló toda*

“... around that time [1071] Ali Maimón [al-Mamun, r. 1043-1075], King of Toledo, breaking the truce he had with king don Sancho [II] of Castile, besieged the city of Segovia, and (...) he destroyed and devastated all of it”.<sup>252</sup>

This destruction of the city is certainly exaggerated, and it is not possible to link the destruction of the city with a possible destruction of the aqueduct. However, it is still claimed by scholars that this attack caused the destruction of 36 arches, as the twelfth-century walls include some cornice-stones from the aqueduct, allegedly from the destroyed arches.<sup>253</sup> This is taken as a fact because in the later Middle Ages (1484 and 1505) the aqueduct was heavily repaired, as evident from the presence of Gothic arches (fig. 3.58).<sup>254</sup> Nevertheless, the supposed destruction of 1071 until repairs in the late fifteenth century is contradicted by the evidence of the historian and Archbishop of Toledo Rodrigo Ximenez de Rada who wrote in his *Historia de Rebus Hispaniae*, that the aqueduct that supplied water to the city had been built by king Hispan, a friend of

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<sup>252</sup> As quoted in Somorrostro 1820: 237.

<sup>253</sup> Fernández Casado 2008 (1972): 65.

<sup>254</sup> The repair charters given by Queens Isabella (1484) and Joanna (1505) are printed in Somorrostro 1820, appendices 1 and 2. The Gothic arches are described in Fernández Casado 2008 (1972): 59-61.

Hercules, and that it still carried water in his day (AD 1243), as the use of the present of the deponent verb *famulor* indicates:

*Hyspan autem vir industrius, strenuus (...) civitatem etiam iuxta iugum  
Dorii h(a)edificavit (...) Secobia nuncuptur, ubi aqu(a)eductum construxit,  
qui miro opera civitati aquarum iniectioibus **famulatur**.*

“Hispan [was] also a hard-working, strong man (...) [who] also built a city next to the Duero mountain range, which is called Segovia, where he built an aqueduct which with wonder **serves** the city with the inflow of waters”<sup>255</sup>

This would hint at some Romanesque repairs of the aqueduct in the twelfth or thirteenth centuries or no great damage caused in 1071. The aqueduct was certainly extensively repaired in the fifteenth century, by command of kings John II, Henry IV and Isabella of Castile, and was last repaired in 1868. In 1925 a water pipe was put on top of the fifteenth-century *specus* (fig. 3.57), and this was only removed during the restoration works of 1973, effectively putting to an end the working life of the aqueduct of Segovia.<sup>256</sup>

### 3.6.3 Discussion

There is a big gap between the last un-datable, but still in a Roman tradition, layers of *opus signinum* from the *specus* and the late eleventh century, when the *arcuatio* of the aqueduct is allegedly destroyed first (1071 attack) and repaired later (Gothic arches). In between those dates (we do not know exactly for how long) the arches were still standing, which together with the qualities of the water and the

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<sup>255</sup> Rodrigo Ximenez de Rada, *De Rebus Hispaniae* I.vii; Fernández Casado 2008 (1972); Zamora Canellada 2007: 133.

<sup>256</sup> Fernández Casado 2008 (1972): 64-5; Jurado 2002; Zamora Canellada 2007.

information from Ximenez de Rada means that aqueduct was probably still functioning: First of all, because the conduit carried very little water and that water has a very low content of carbonates, which means that the conduit was not greatly affected by the flowing water. Secondly, because the structure is very solid and strong: the arches and pillars are still standing. The use of blocks of granite without mortar means that the structure is more robust, and is not as badly damaged by frost or ice (typical in winter in this region) as if it had mortar joints. Finally, recent surveys carried out by engineers demonstrate that only in recent years (due to increasing air pollution) is the stone suffering, though the structure is still robust.<sup>257</sup> The fact that we know nothing about the archaeology of Segovia further obscures the picture we have, but what we know indicates that the aqueduct was certainly standing, and probably working, all throughout the early medieval period.

### 3.7 RECCOPOLIS

Reccopolis was founded in the year 578 by king Liuvigild (r. 568-586), the foundation being best described in the words of John of Biclar:

*Liuvigildus rex extintis undique tyrannis et pervasoribus Hispaniae superatis sortitus requiem propriam cum plebe resedit. Civitatem in Celtiberia ex nomine filii condidit, quae Recopolis nuncupatur: quam miro opere et in moenibus et suburbanis adornans privilegia populo novae Urbis instituit.*

“King Liuvigild, once the tyrants were destroyed on all sides and the invaders of Spain overcome, had his own peace to settle with the people.

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<sup>257</sup> Jurado 2002.

He founded a city in Celtiberia, which he named Reccopolis after his son [Reccared]. He endowed it with splendid buildings, both within the walls and in the suburbs, and he established privileges for the people of the new city”<sup>258</sup>

The date is clearly given in the chronicle, and the reasons behind the foundation are clear: the city was founded as a celebration of the newly established peace in the kingdom, shortly before the rebellion of Hermengild. It is not clear, however, if this date relates to the inauguration of the city or the beginning of the works, as the city certainly took several years to build. It may have been also a way to celebrate the *decennalia* of his reign. Beyond the statement given by the chronicle, the foundation of the city was yet another step forward by Liuvigild to strengthen the Visigothic kingdom, by which the Visigothic king took over powers which *de iure* belonged to the emperor (like minting coins with his own name, fixing taxes, wearing purple robes, and founding cities).<sup>259</sup> The city should not be seen as an empty act of propaganda, because it soon became a centre of glass and gold production, as well as a mint, so it is sensible to assume that it functioned as a major economic centre in the region.<sup>260</sup>

### 3.7.1 The city of Reccopolis

The excavations at Reccopolis have revealed two main areas (fig. 3.59): an upper town, which consisted of a public enclosure, linked to the palace, and a lower town where houses and shops were located. The city wall with its towers have also been partially excavated, and encircle an area of 15ha.<sup>261</sup> The upper city, the so-called palace

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<sup>258</sup> John of Biclar, s.a. 578.4; *HistGoth* 51.

<sup>259</sup> *HistGoth* 49-51; Chrysos 2003: 17; Thompson 2007 (1969): 78-83, 107-12.

<sup>260</sup> Castro and Gómez 2008; Olmo Enciso 2008: 43.

<sup>261</sup> Gómez de la Torre 2008.

complex, consists of several buildings located at the north end of the city. Two long (120m), aisled, parallel buildings, built in mortared masonry, with tiled roofs and paved in *opus signinum* are the main structures, located at the north and south sides of the upper terrace. Both structures were double-storied and were separated by an open courtyard. The east end of the courtyard was closed by a small porticoed structure of similar characteristics as the two mentioned above and by a three-aisled cruciform basilica with an attached baptistery. The basilica is linked to the south main building by a monumental archway, which led to the main street going southwards, linking the palace courtyard with the rest of the city.<sup>262</sup>

The lower city, south of this arch, has only been partially excavated. The main street is flanked on both sides by workshops where glass furnaces and traces of goldsmithing have been identified, in what seems to have been the commercial centre of the city.<sup>263</sup> It has been claimed that this pattern imitates that of Constantinople (palace complex – monumental archway – main street – city gate), and despite the huge distances that separate the two and the massive difference in scale, there may actually be some truth in where the inspiration came for the layout.<sup>264</sup> Behind these workshops several houses built around courtyards have been identified.

There are some water-related structures at Reccopolis, but none can be directly linked to the aqueduct. There is the baptistery mentioned above, built by the basilica, and there is also a big public cistern (fig. 3.60), built on the main street and accessible through a paved porch, but it is not possible to tell where the water came from. Some drains are known as well. If Reccopolis was a royal foundation and a royal seat,<sup>265</sup> it would not be surprising to find a bath complex, as the Germanic kings seem to have

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<sup>262</sup> Olmo Enciso 2008.

<sup>263</sup> Castro and Gómez 2008.

<sup>264</sup> Olmo Enciso 2008: 50-1.

<sup>265</sup> Arguments for and against this supposition are plenty: in favour, Ripoll and Velázquez 2008. Against: Arce 2010.

been very fond of them, as testified by those of Ravenna, Pavia, Rome, Alianae or Paris.<sup>266</sup> Out of the 30ha of the overall site,<sup>267</sup> only 1.3ha have actually been excavated, so there is always the possibility of still finding a set of baths.

The chronology of the site is largely based on the archaeological record. Besides the mention by John of Biclar about the foundation (confirmed by the chronology of the coins deposited in the foundation trench of the basilica),<sup>268</sup> nothing else is known of Reccopolis in the sources. There seem to be four main phases, including an early Umayyad one. The city was in decline from the mid-seventh century onwards, when its planned urbanism was abandoned and new structures were built encroaching onto the streets. In this moment, imported materials cease to be present on the site. By the end of the eighth century the city was largely substituted as a regional centre of power by the nearby Umayyad settlement (*jund*) of Zorita (which is where the modern village is). Reccopolis and Zorita struggled for control over the territory for some time, when the palace-complex seems to have been turned into a citadel, while the houses below were largely abandoned. This situation came to an end in the 850s, when the site of Reccopolis was finally destroyed by fire, and abandoned until the Christian reoccupation of the area in the twelfth century.<sup>269</sup>

### 3.7.2 The aqueduct

#### 3.7.2.1 The survey campaigns of 2010 and 2011

The aqueduct of Reccopolis (app. XIX) has been known for several years, and mentions to it can be found in publications about Reccopolis, but no study of the

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<sup>266</sup> Ravenna: Cassiodorus, *Variae* V.38. Pavia: Paul the Deacon, *Historia Langobardorum* VI.20. Paris: Périn 1990. Rome: Martínez Jiménez 2010. Alianae (Africa): Chalon et al. 1985, esp. 226-8.

<sup>267</sup> That includes 15ha inside the walled enclosure and the area surrounding the hill.

<sup>268</sup> Castro 2008.

<sup>269</sup> Bonifay and Bernal 2008; Olmo et al. 2008; Sanz Paratcha 2008; for the *junds*, see Manzano Moreno 2006: 112.

remains had been made.<sup>270</sup> In 2010 and 2011, I carried out two field surveys in the territory of the site, and in the course of these two campaigns the aqueduct's course has been identified for over 2km in the hinterland (fig. 3.61).<sup>271</sup> These remains have been identified in the areas where the hill's slopes are the steepest, because in the other areas the whole of the mountain has been levelled by agricultural terraces after the Spanish Civil War (1936-1939), which destroyed all remains of the aqueduct. The remains which have been discovered are at some points badly damaged by pine trees planted in the early 2000s.

The source of the aqueduct has not been located, despite attempts in 2010 to locate it around the many springs that can be found in the proximity of Reccopolis. Topographical observations in the area indicate that the source must be close to the arroyo Madre Vieja, a small river which carries water all year long and which is extensively used for agricultural purposes. Attempts to trace a possible course of the aqueduct in this area with the purpose of locating a possible source, have not been successful due to the heavy transformation of the terrain in the recent years, so it is not at present possible to be more accurate in pin-pointing of the source.

The remains which are actually known spread intermittently over 2.3km. The remains closest to the source are those located on the Loberón hill, identified in two different sectors (Loberón 1 and 2). Loberón 2 are the closest to the river, and as preserved today are an abandoned irrigation channel, although its identification as part of the aqueduct is not completely certain. The next remains are Loberón 1.3, followed by Loberón 1.4, Loberón 1.2 and Loberón 1.1.

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<sup>270</sup> Olmo Enciso 2000; 2006; 2008: 54-5. Martínez Jiménez 2015.

<sup>271</sup> Generously funded by the Craven Committee, the School of Archaeology (Meyerstein Research Award), and Lincoln College. The field work was part of the Reccopolis Archaeological Project "Construcción y dinámicas del paisaje Medieval (HAR-2009-11627)" included in the I+D+I National Plan of the Spanish Government's Ministry of Science and Innovation, directed by prof. Lauro Olmo Enciso (Universidad de Alcalá), who has been most helpful in encouraging these field surveys as part of his scientific project. I also want to thank my team: María Lloret, Miguel Martínez, José M<sup>a</sup> Moreno, Ulises Rodríguez, Ángel Santos, and Marlena Whiting for their help in the field.

Loberón 1.3 consists of three different fragments of wall varying between 1.1m and 2.6m in length, heading north-west (bearing 305°-330°), stretching over 69m. In this sector, only the left wall is preserved, which is made of mortared rubble (figs. 3.62), and seems to have been cut into the soil. The next section is Loberón 1.4, a 44 metre-long section which consists of 8 fragments of the left wall of the aqueduct (lengths vary between 0.77m and 3.95m), mostly built on top of the rock, following roughly the same bearing as the previous section. In one place the *specus* was preserved in this section, directly cut into the rock. The aqueduct disappears for a couple of hundred metres, although chunks of mortar and fragmented rubble are visible, until the section numbered as Loberón 1.2, which is a section of some 20m in length in which the two walls that enclose the *specus* are visible, although the conduit itself is covered by earth, and it has not been possible to excavate (fig. 3.63). At this point the aqueduct is 1.40m wide (which will be constant from now on for the rest of the sections identified) and the *specus* is calculated to have been at least 40cm wide. The aqueduct follows the hill's contour line with a constant gradient but it has been at this point badly damaged by pine trees. The last section identified on this hill, Loberón 1.1 clearly shows this (fig. 3.64). The walls are gone and only the bright white remains of the destroyed *opus signinum* indicate where the aqueduct once was. This section is 32.5m long, and only a metre wide.

The aqueduct crossed from this hill to the next one, and although this crossing has been lost, remains of the aqueduct appear again on the Boneta hill. The area immediately opposite to Loberón 1.1 across the valley is Boneta 2.4. This section was apparently excavated in the 1980s, but the report of this work is lost. The section is 17m long, and the two walls as well as the *specus* are visible (fig. 3.65), even if most of the aqueduct is covered by rubble thrown by tractors over the edge of the field. At this point

the aqueduct is slightly wider (1.65m the structure and 60cm the *specus*), probably because here the aqueduct had made a very steep turn, going from 155° at Loberón 1.1 to 265° here; so in order to reduce the water pressure, the conduit was widened. The Boneta hill is also covered with pines, or else contains ploughed fields.

Twenty metres away from this section are the most monumental remains of the aqueduct. The Boneta 1 sector was until 2010 the only known and standing remains of the aqueduct, known amongst the locals as *la pared de los moros* (“the wall of the Moors”), and includes the sections Boneta 1.1 and 1.2 (figs. 3.66-7), the former standing up to 2.10m tall, and 22.5m apart from the latter, separated by a small depression. The *specus* is perfectly preserved, with its *opus signinum* lining mostly intact, although the structure itself is nearly collapsing, as the fabric has been eroded by the weather and burrowing animals. Section 1.1 is 9.7m long, and there the *specus* is up to 52cm wide, again probably because it is here where the aqueduct made a very tight turn (changing from 200° in 1.1 to 260° in 1.2). 1.2 is a bit shorter (8.8m), and has a narrower *specus* (43cm).

The gradient of these sections can be calculated because the *specus* is visible: that of Boneta 1.1 is 22.7m/km (22cm difference in 9.7m length), whereas the gradient of the missing section between 1.1 and 1.2 is 21.3m/km (48cm drop in 22.5m). These gradients are much larger than those suggested by classical authors and very different to those found in other Spanish aqueducts, like those of Valencia (2.44m/km), Segovia (1.2m/km), or the Francolí aqueduct of Tarragona (4m/km)<sup>272</sup>. Only the aqueduct of Carthage seems to have a similar gradient (up to 28m/km) at least in its upper course, but of course, the Zaghouan aqueduct is almost 100km long, and much sturdier;<sup>273</sup> so one might wonder if the collapse of the Reccopolis aqueduct may have been caused by

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<sup>272</sup> Vitruvius recommends 5m/km (*De Arch.* VIII.vi.1) and Pliny 0.2m/km drops; Cf. Miró and Orengo 2010: 123

<sup>273</sup> Crow et al. 2008: 121; Wilson 1997.

the excessive force of the water in the conduit. It is true however that the section that has been measured corresponds only to a small part of the aqueduct, where the *specus* was visible; it is not representative of the whole of the aqueduct, as in the Loberon hill, GIS calculations have given an average gradient of 1.45 m/km.<sup>274</sup>

The aqueduct in fact collapsed at some point, and the collapsed remains of it are littered between sections 1.1 and 1.2 at the Boneta hill. Sections 1.7 and 1.8 seem to have been the pillars for the arches of the bridge that crossed over the small valley, linking 1.1 with 1.2, and are still in situ (fig. 3.68). Both are roughly 1.40m long (1.4m being the width of the aqueduct), although they are not as wide; but they are badly preserved, so it is not too wild to suggest that these were two 1.40x1.40m pillars sustaining an arch 1.40m wide, which is the distance between the two bases. However, this cannot be confirmed until the area can be excavated. Other remains in this part are obviously collapsed with their *specus* facing down.

As the Boneta hill continues towards the west, the aqueduct follows the contour line, although it is only partially visible in some areas in which the masonry is directly built into the hill, as in Boneta 3.2. The aqueduct is hardly visible for a couple of hundred metres, but then crosses through the hill, and is visible inside the Camino del Noguerón. This sector (Boneta 3.3) is a 12 metre-long structure of which only the top of the walls that flank the *specus* are visible (fig. 3.69). Once the road was cleaned, and with an adequate light, it was possible to identify not only the course of the aqueduct, indicated by the parallel walls of mortared rubble, but also how the *specus* was perfectly straight and very well preserved, even the *opus signinum* lining was still visible in parts (fig. 3.70).

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<sup>274</sup> Martínez Jiménez 2015.

The last remains of the aqueduct have been recognised 20m away from the last section, at a site known as La Paeriza, where two sections (Paeriza 1.1 and 1.2) have been identified. Both sectors are very well preserved, as the structures were reused as a field boundary. They are two sections of mortared rubble, in which up to three layers of rubble are visible, and on the outside they seem to have been covered with mortar (fig. 3.71). The sections measure 5.8m and 11.5m respectively, but only the left wall is visible, the *specus* and the right wall being still covered by soil. In one point the *specus* can be told apart, as the two walls that frame it are visible (fig. 3.72), although it would be necessary to excavate in order to find out more.

After the section located at Paeriza 1.2, the aqueduct disappears, cut during the olive plantation of the 1940s, the remains of it still spread around the olive groves. No more remains have been found, and the access to Reccopolis is yet to be found. The absolute lack of remains beyond this point creates a doubt over whether the aqueduct was ever actually finished, but the fact that the *opus signinum* is already put on the *specus* indicates that the work was indeed completed.

### 3.7.2.2 Chronology and dating evidence

At first, there were doubts over whether the aqueduct was in fact supplying Reccopolis or if it was Visigothic at all, but the results of the survey confirm both its function and dating.<sup>275</sup> Firstly, the course which has been identified in recent years shows that the conduit went towards Reccopolis, as is especially clear from the sections Boneta 3.3 and Paeriza 1.1 and 1.2.

On the chronology of the aqueduct, the fragments of pottery retrieved from the *opus signinum* (in particular fragments REC'10/13/273, REC'11/16/1 and REC'11/17/4-5-

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<sup>275</sup> Javier Arce's strong views on this issue are reflected in his 2010 paper.

7-8; fig. 3.73) are of Visigothic date, according to their decoration and typology. Plus, much of the other material found in the environs of the structure also matches this chronology. The construction technique is also an indicator of Visigothic construction, in particular the use of mortared rubble and the coarse *opus signinum*, in which the fragments of pot have hardly been crushed and most of the material consists of tile.<sup>276</sup> This, together with the fact that there is no other Visigothic site known in the environs, further links Reccopolis with the conduit, which allows us to propose a broad chronology ranging from AD 578 (foundation of Reccopolis) to c. 850 (abandonment of the site). It is not possible to give a more precise chronology because it has not been possible to excavate the remains of the aqueduct and because the water consuming structures of the site (namely the baptistery and the great cistern) were either excavated in the 1940s without any right indicator of date being identified, or have not provided any dating material. However, the most likely date for such an unusual structure is the time of the royal foundation of the city.

The sections of the aqueduct close to the source may have carried water for a longer period of time, and it seems that parts of the aqueduct were reused recently as irrigation channels. Locals mention stories told by the parents of the elders of the nearby villages (Albalate de Zorita and Almonacid de Zorita) in which the aqueduct (the “wall of the moors”) still carried water, which may confirm that large sections of the aqueduct were only destroyed after the war, when intensive agriculture led to the construction of cultivation terraces.

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<sup>276</sup> The bigger and coarser the *caementa*, the later the *opus signinum* seems to be. Cf. in particular with the samples 5.15, 16.22 and 17.23 by Lamprecht (1987).

### 3.7.3 The last aqueduct of Antiquity

The field survey confirms that the remains located at the Boneta hill can be linked with certainty to Reccopolis. The construction technique (use of mortared rubble similar to that of Reccopolis) and the ceramic remains indicate Visigothic craftsmanship, while the concept and the use of (very coarse) *opus signinum* as a water-proof lining corresponds clearly with Roman patterns of construction.<sup>277</sup> The aqueduct was almost certainly constructed at the same time as the city, so by the 580s it must have already been functioning, although the end of its useful life is difficult to determine, as there are no water-consuming structures known that can provide any hint.

The aqueduct is itself a feat of post-Roman engineering, even if only because of its dimensions, the resources needed to build it and the effort and cost that its construction implied. The gradient that has been calculated indicates that it is not, in fact a technological wonder, and this raises a question regarding the engineers who built this, as we shall see later.

## 3.8 OTHER IBERIAN AQUEDUCTS WITH POSSIBLE LATE ANTIQUE PHASES

### 3.8.1 Valencia

Valencia is one of the towns about which we know a certain amount for the Visigothic period, and it had an aqueduct, although the dating evidence for it is quite scanty.

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<sup>277</sup> Especially as later Islamic aqueducts in the peninsula are built using brick and are lined with water-proof stucco – Canto 1979: 329; Ventura Villanueva 1996: 34.

3.8.1.1 Valencia in Late Antiquity

Valencia was a small coastal town in the province of Carthaginensis, located on the south bank of the Turia River, and apparently destroyed during the course of the third century, and later rebuilt.<sup>278</sup> When it was rebuilt, it was fully furnished with new buildings, including a curia and a lavish *nymphaeum* in the forum, which was in turn enclosed by a wall. Later on, in the area of the forum where the *kardo maximus* and the *decumanus maximus* met, a new sewer was built during the fourth century to substitute the old decumanus sewer that had collapsed.<sup>279</sup> The town had a circus too, which was in use until the fifth century, when the town as a whole entered a period of crisis.<sup>280</sup> Only in the mid-sixth century did Valencia recover from this period of crisis, because of the political autonomy acquired under the Visigothic kingdom and especially thanks to the works of bishop Justinian (fig. 3.74).<sup>281</sup>

The presence of a bishopric in Valencia has been dated back to the time of Saint Vincent, who preached and was martyred there. The presence of a local martyr allowed Valencia to generate a local cult. By the time Justinian was bishop there were several churches in Valencia, as he claimed to have repaired them in his funerary inscription.<sup>282</sup>

<sup>278</sup> Ribera Lacomba 2008: 303.

<sup>279</sup> Ribera Lacomba 2005: 210-2.

<sup>280</sup> Ribera and Rosselló 2000a: 156-7.

<sup>281</sup> Linage 1972; Ribera Lacomba 2005: 208-9, 214.

<sup>282</sup> IHC 409 = ICERV 279: ... *Iustinianus caelebs pontifex sacerdos/no<v>a te(m)pla co(n)struens vetustaq(ue) rest[aurans]/... - ...* “Justinian, famous bishop and priest,/ building new temples and repairing the old ones/ ...”

Another inscription was retrieved in five fragments from the site of L'Almoína (although not in the recent excavations), close to the mausoleum, recorded as follows in *CIL II*<sup>2</sup> 14. 90: (cross) *constructu(m) r[...cu]urrunt/, fastigium quis[...a]ula/ nempe nam im[...a]nnos/ hoc pro<v>idens [...]ntis/ tertio antist[es...] anno/ robore contri[...rimbi/ aptantur hi mir[...s]ius idem/ ful<v>ida pr(a)etera [...]a prossus/ lammina sub lato [...]mine aur i/ [cu]lmine cu(m) solid[...] quinque [...].*

The text certainly mentions a bishop (*antistes*) which could have been Justinian, as the text clearly mentions (new?) constructions. As it is written in dactylic hexameters (—), so various reconstructions have been attempted, all of them highly hypothetical, as recorded in ICERV 356:

*constructum r[enovator opus dum s(a)ecula c]urrunt,  
fastigium quis[ nam grandi super extulit au]lla  
nempe nam im[modicos fastiscens egerat a]nnos  
hoc pro<v>idens [tectis et Iustinianus av]it is  
tertio antist[es regnantis Theudis in] anno  
rob<u>re contri[buunt arcus tegulisque co]rimbi*

Amongst these, the excavated suburban martyrial centre and monastery are likely candidates.<sup>283</sup> He was also probably responsible for the construction of the cathedral which has been excavated at the site of l'Almoína, on the site of the forum (fig. 3.75). Though only the apse and part of its outer walls have been excavated, it is possible to tell that the cathedral, even if built by the forum, maintained the orientation of the urban grid, and did not block any existing streets.<sup>284</sup> As time passed, this original complex was expanded, and two cross-shaped structures were built in the late sixth century at either side of the apse, this time directly on top of the *kardo maximus*.<sup>285</sup> These two structures have been identified as a mausoleum or funerary chapel for the bishops of Valencia (known as the "Prison of Saint Vincent") and as a baptistery with a drain leading to the main sewer.<sup>286</sup>

Still in the forum area, north of the cathedral, during the seventh century new buildings were erected on top of the previously public spaces, which include an apsidal structure (probably a martyrial shrine), a large monumental well (the "great well") and a polygonal building (called *macellum* by the excavators). These buildings, however, respected the still-standing and still-functioning Roman structures that occupied that part of the forum: the curia and the *nymphaeum*.<sup>287</sup>

Besides the excavations at l'Almoína showing the Christian monumentalisation of the forum, little is known from the rest of Valencia. We know, for instance, that the circus was partially reconstructed as a fortification during the last decades of the sixth century, and this has been explained by Albert Ribera and Miquel Rosselló as the result

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*aptantur himi tem[pli ob ips]ius ideam  
ful<v>ida pr(a)etera [stant acroteri]a possus  
lamina sub lato [lu]mine au[rata renidens]  
[cul]mine cu(m) solid[o fulcitur] quinque [columnis].*

<sup>283</sup> Ribera and Rosselló 2000a: 160; Ribera Lacomba 2008: 304.

<sup>284</sup> Ribera Lacomba 2005: 214; 2008: 307.

<sup>285</sup> Ribera Lacomba 2005: 219.

<sup>286</sup> Ribera Lacomba 2005: 218-9; Soriano Sanchez 2000.

<sup>287</sup> Ribera Lacomba 2005: 228-33; Ribera and Rosselló 2000b: 179-80.

of the full incorporation of Valencia into the Visigothic kingdom during the reign of Liuvigild (568-586).<sup>288</sup> As Valencia was very close to the imperial territories on the south-eastern coast, it became important to take control of Valencia to create a definite border against the Romans. This is further supported by the construction in the late sixth century (according to the excavation material) of the fortification of València la Vella, a 4ha *castrum* ten miles away from the city,<sup>289</sup> which further indicates the military presence of the Visigoths in the region. It is certain that by 546 (when a synod was celebrated) Valencia was only loosely controlled by the Visigoths, but during the last part of the sixth century the city was finally included in the Gothic kingdom.<sup>290</sup> Beyond the evidence for this given by the fortifications, new burials have been identified in the forum area.

During the later Visigothic and the early Islamic period, the site of l'Almoína hardly changed and was only slightly transformed. During the course of the late seventh century a workshop area developed in the northern sector of the old forum. The eighth century is described as the darkest century of the archaeology of Valencia, because very little is known, and what is known can only be ascribed to this century with great difficulty. According to the written sources, the city was destroyed in the year 778 by the troops of emir Abd al-Rahman, although this destruction has not been identified yet archaeologically. It is not until the ninth century when real changes in the layout can be seen, with the construction of a *hamman* (Islamic bath) in the cross-shaped mausoleum, the erection of new great cisterns and the construction of a new water supply conduit, which is thought to have supplied the emiral citadel (as will be explained in detail below).<sup>291</sup>

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<sup>288</sup> Rosselló 1996: 445-6; Ribera Lacomba 2008: 313; Ribera and Rosselló 2000a: 157.

<sup>289</sup> Martí Matías 2001; Rosselló Mesquida 1996, 2000; Ribera Lacomba 2008: 313.

<sup>290</sup> Ribera and Rosselló 2000a: 152.

<sup>291</sup> Martí and Pascual 2000: 501, 510-11; Ribera Lacomba 2005: 237-8.

### 3.8.1.2 The aqueduct

The aqueduct of Valencia (app. XX) is not very well known, for two main reasons: the course inside the city is documented in only three sites (one unpublished), and outside the town all the Roman water conduits are considered to be rural watering channels.

The rural aqueducts have been surveyed on both sides of the river Turia, and four are known on the north side while five are known on the south side. The north ones cannot be linked to Valencia because their courses go deep into the agricultural region north of the city.<sup>292</sup>

The five conduits known from the south bank had only been partially studied until very recently. The only major study until 2008 was a short work which dealt only with the sections standing in the municipality of Riba-roja de Túria, published by Domingo Fletcher Valls in 1964, based on an 1849 unpublished survey and his own field work. In his work, Fletcher mentions two different conduits: he identifies one of them as an irrigation channel branching away from the other, the urban aqueduct, which in turn can be identified in nine different sections. The main problem with Fletcher's work is that his chronology is not reliable (he describes the site of València la Vella as a Roman camp), and most if not all of the sections he mentions as existing in 1964 have certainly now disappeared under new urban developments, so it may be impossible to compare the date of these standing sections.

Fletcher proposed a hypothesis for the urban aqueduct: its source may have been a diversion dam located at the Turia river in the village of Vilamarxant, located on the

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<sup>292</sup> These are the aqueducts of *Chulilla*, *les Llometes*, *la Covatella* and *Mandor*, as listed in Pérez Mínguez 2006: 33-7.

right bank.<sup>293</sup> The aqueduct would then continue its course parallel to the river on its south bank until it appears again at the site of València la Vella, in the village of Ribarroja (16km from Valencia). Fletcher mentions sections standing at the sites of Perpinyanet, Muncholina and Porxinos (all between Vilamarxant and València la Vella), and Barranc del Pou,<sup>294</sup> these are the names of creeks (*barrancs*) that flow into the River Turia, and are therefore the logical places to find an aqueduct bridge. It would then continue towards Valencia, appearing again at Manises, assuming that the Islamic bridge located there (and popularly known as *els arquets*, or “the little arches”) is a reconstruction of an original Roman structure.<sup>295</sup>

However, Ignacio Hortelano Uceda published in 2008 an up-to-date study of the aqueducts of the south bank (fig. 3.76). He identified five different aqueducts, which he classifies as rural watering systems, on the grounds that they are not covered (following Vitruvius’ advice), and that they are cut into the soil rather than built out of masonry.<sup>296</sup> The only parts of these aqueducts which are built on masonry structures and lined with *opus signinum* are those parts when bridges needed to be built in order to pass over a *barrancs*. The conduits themselves are very wide (over 1.5m on average) which is also unusual for urban aqueducts in Spain. All of these aqueducts are fed from river diversion dams (which have been preserved), which Hortelano also points to as a sign that they were not intended for urban supply.<sup>297</sup> He argues that they ceased to function in the fifth century.

According to him, these conduits can only be linked to Roman rural settlements, and that they cannot be linked to the one Visigothic settlement known for this period, the palace of Pla de Nadal. However, the Visigoths mention very specifically rural

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<sup>293</sup> Martí Matías 2001: 24; Cf. Glick 1970: 190-2.

<sup>294</sup> Fletcher Valls 1964.

<sup>295</sup> Martí Matías 2001; Fletcher Valls 1964.

<sup>296</sup> *De Arch.* VIII.i.6-7 and vi.1; Hortelano Uceda 2008, esp. 80-1.

<sup>297</sup> This is probably influenced by Feijoo’s thesis (Feijoo Martínez 2005, 2006).

water conduits (*aquae inrigae*) in their laws, and it is evident that there was a pre-existing irrigation network around Valencia before the Muslim invasion.<sup>298</sup> The assumption that river water was not apt for urban supply is, nevertheless, not valid, as there are many examples of uses of river water (from the upper course) for urban supply, including Sagunto, only 30km away from Valencia.<sup>299</sup>

Furthermore, Hortelano claims that none of these aqueducts could have possibly continued towards Valencia.<sup>300</sup> Hortelano presents in his paper a model for each of the five aqueducts, in order to estimate their course beyond the point where they are last attested but without any archaeological evidence to support it, and his model predicts that all aqueducts would have turned south, towards the agricultural hinterland of Valencia (known as the Pla de Quart), where he identifies a great number of rural settlements. Aqueduct number 5, which is the one proposed by Fletcher as the one continuing towards the city, also turns south in Hortelano's model, so according to him it could not have fed the city.

Certainly, if any of these canals continued as far as the city, its course is unknown until it reaches Valencia itself, as the whole bank of the river between Manises and Valencia is heavily built over. The aqueduct has been located in three different excavations along the ancient road leading west, a continuation of the *decumanus maximus* (fig. 3.77-8). In the 1930s a section was located outside the provincial gaol (current Carrer Castán Tobeñas), but was later destroyed, although nearby on January 2013 a new section was identified.<sup>301</sup> Down the road, the excavations at Carrer Cavallers and Carrer de Quart that took place in the 1990's confirm that the aqueduct continued in a straight line towards the centre of the town, although at some point it

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<sup>298</sup> LV VIII.iv.31 "De furantibus aquas ex decursibus alienis"; Glick 1970: 190-2.

<sup>299</sup> Civera 2009: 262-4.

<sup>300</sup> Hortelano Uceda 2008: 83-4.

<sup>301</sup> Glick 1970: 190. The new section was brought to my attention by Mirella Machaconses (University of Valencia), and is still unpublished.

turned south, towards the *Porta Sucronensis* (southern gate),<sup>302</sup> where the *castellum aquarum* is supposedly located according to a fragmentary inscription recorded by Schulten, which reads:

*...Jum qui aquam trahi[t... / ...]m a Porta Sucronens[i... / ...] empturum V kal(endas) maias.*

“... who brought the aqueduct... / ... from the Sucronensis gate... / ... he will buy (?). [Given] on the fifth day before the calends of May [26<sup>th</sup> of April]”<sup>303</sup>

It would then be distributed from there to the rest of the town. This included the supply to the monumental forum, with its *nymphaeum* and, later on, its baptistery. Close to the southern gate, the *Porta Sucronensis*, 1993 excavations at Carrer Avellanes unearthed a couple of pillars, which have been identified as two aqueduct pillars, which could confirm the text of the inscription although their dating is doubtful (fig. 3.79).<sup>304</sup>

The aqueduct identified at these sites (Castán Tobeñas, Cavallers and Quart) forms a straight line which runs parallel to the main road that linked Valencia with Segóbriga and Toledo, and as Roman aqueducts normally ran parallel to main roads (which made repairs and maintenance easier) this adds value to the argument that links the urban aqueduct with a source on the right (south) bank of the Turia, despite Hortelano’s arguments.<sup>305</sup>

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<sup>302</sup> Guillén Fernández 2003: 7-8; Herreros Hernández 1996: 9-19; Viñes Pérez 1997: 19-20.

<sup>303</sup> Schulten 1955, as recorded in Martí Macias 2001: 25.

<sup>304</sup> Algarra et al. 1993: 14.

<sup>305</sup> Morote Barberá 2002: 241-1.

3.8.1.3 Chronology and dating evidence

There is very little evidence to date the aqueduct of Valencia *per se*, and the available evidence is difficult to interpret. It is clear that it had stopped functioning between the seventh and the eleventh centuries, but the continuity between the fourth and fifth centuries is doubtful.<sup>306</sup>

On the one hand, it is possible to say that the construction in the late sixth century of a large fort outside of Valencia (the site of València la Vella) in order to control the town and its territory, would make more sense if Hortelano's aqueduct #5 was still functioning, so it could supply water to the garrison there.<sup>307</sup> The source of this aqueduct is about a kilometre away from the site, so it could have been easily maintained, if at all needed.

On the other hand, there is excavated material, obtained from the inside of the *specus* of the Roman aqueduct located at Carrer de Quart, which ranges from the Roman period to the eleventh century.<sup>308</sup> The *specus* located there was totally filled with clay sediments (fig. 80a-b). There was plenty of material in these sediments, securely dated between the Roman and the Islamic periods.<sup>309</sup> The bottom-most context sitting on top of the clay *specus* (1147 in fig. 80a) had two heavily eroded shards of Hayes 32B and 196, which are generally dated to the third century AD. The layers above it (1144-1146) were all much thinner and all contained eleventh-century pottery and debris. This means that at least until the eleventh century the aqueduct was still carrying water, when it was completely packed with clay, becoming useless.

The nature of these sediments in context 1147 (very fine clay) may indicate that it brought river water from a diversion dam, water that would later be cleaned and

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<sup>306</sup> Albert Ribera (2011: 342) suggests a fifth century abandonment; Nuria Romaní dates it to the third century (2012: 863). Cf. Martínez Jiménez 2011.

<sup>307</sup> Martí Macias 2001.

<sup>308</sup> Martí and Pascual 2000: 513.

<sup>309</sup> Herreros Hernández 1996: 15-6.

decanted at the settling tank (*castellum*). This would thus hint at where the water came from. However, the chronological issues are more intriguing. Context 1147 must have formed after the third century due to the *t.p.q.* given by the two ARS forms. This would seemingly match the third-century destruction of Valencia. However, the layer is very thick, which implies that it carried water for a long period of time, perhaps malfunctioning: the presence of post-third century water-consuming infrastructure in the forum may imply that the aqueduct was still in use then. The presence of Islamic material in the contexts immediately on top of 1147, together with the fact that 1147 was then compacted by a gravel layer, 1146 (which served as the base for the new Islamic phase of the aqueduct), may indicate that in the Islamic period the conduit was cleaned and put back into use, which would mean that the contexts between the third and the eleventh century had been removed.

Beyond the data obtained from the aqueduct itself, it is possible to obtain information on the continuity of the water-supply from water-related structures of Valencia, namely the baptistery, the *nymphaeum*, the old basilica, the sewers, the great well, and the new Islamic conduit.

The baptistery as discussed above was first built during the sixth century, added to the west end of the cathedral, north of the apse. It was first identified in the 2002 excavation, but it has not been fully excavated due to the nature of the site.<sup>310</sup> Nevertheless, the excavation has shown that it had a pool with a drain, which could have led the blessed water out of the baptistery into a basin on the street, where the faithful could collect it.<sup>311</sup> It is not clear where the water for the baptistery came from,

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<sup>310</sup> This has made the identification of this structure as a baptistery quite dubious, but it is a structure with hydraulic infrastructure (*opus signinum* floor with a sewer) located by the apse of a cathedral. A baptistery is the most sensible guess. Of course it could be something else (a bath?), but the point is that: (a) it is a water-related structure, and (b), it can be securely dated to the late sixth-century.

<sup>311</sup> Ribera Lacomba 2008: 306; 2005: 218-9.

but it is not impossible that being so close to the *castellum*, it was fed with water from the aqueduct.

The so-called *nymphaeum* was built during the early years of the colony, although back then it seems to have been simply a sacred pool, linked to some water cults.<sup>312</sup> The imperial *nymphaeum* is divided into two areas (fig. 3.81), although only half of the front one has been excavated. It is all enclosed in an *opus vittatum* precinct measuring 20 x 11m. The front part, which faces north, includes two twin pools and two water fountains fed by pipes; the pools are lined with a layer of *opus signinum* 30cm thick.<sup>313</sup> Although it was originally a sacred well, the presence of lead pipes underneath the first-to-third century pavements suggests that it was fed by the aqueduct, especially as the *Porta Sucronensis* is only 100m away.<sup>314</sup> The main pool is now below an Islamic pool, so it is not possible to know when this pool went out of use, although preliminary material suggests an eleventh-century abandonment (fig. 3.82a).<sup>315</sup> The *nymphaeum* was monumentalised in the fourth or fifth century, refurbished and repaved with new tiles, although some of the walls were pulled down in the fifth century according to the pottery retrieved from the trenches. This, though, did not mean that the *nymphaeum* went out of use, as the fountain was still standing and accessible during the sixth and seventh centuries, as a new marble slab pavement indicates.<sup>316</sup> During the sixth century some obscure, and very difficult to interpret, timber structure (evidenced by the presence of postholes) was erected in the precinct of the *nymphaeum*, but it did not block access to the pool (fig. 3.82b).<sup>317</sup>

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<sup>312</sup> Albiach et al. 2009: 418-22.

<sup>313</sup> Albiach et al. 2009: 422.

<sup>314</sup> Albiach et al. 2000b: 84. Albiach et al. 2009: 424.

<sup>315</sup> Álvarez and Ribera 2003: 135; Albiach et al. 2000a: 68; Ribera Lacomba 2005: 239.

<sup>316</sup> Albiach et al. 2009: 424.

<sup>317</sup> Álvarez and Ribera 2003: 87, 106; Marín and Ribera 2000: 155-6; Ribera and Rosselló 2000b: 183; Ribera Lacomba 2003: 48; 2005: 210, 239; 2008: 306.

In the area between the curia and the cathedral, facing the *kardo maximus*, once stood the old Roman basilica, which in the fourth century was re-modelled to serve a different purpose. The old building was divided into several rooms around a courtyard with a drain and a large water basin (4,4 x 9m) lined in *opus signinum* (fig. 3.83). One of the rooms had a press, and together with the material retrieved from the building (including fish bones, grape seeds, charred plants and fish and oil amphorae) indicates that the basilica had been turned into a food-processing building. The basin, the drains and the vat indicate that the building was consuming water until its final abandonment in the second half of the fifth century.<sup>318</sup>

The “great well” was built in the north area of the forum, in front of the apsidal structure thought to be a martyrial shrine, and both were probably part of the same construction effort, which would point towards a liturgical function.<sup>319</sup> The well was lined with reused slabs and ashlar blocks during the seventh century, according to the stratigraphy.<sup>320</sup> The presence of this well could be an indicator of a non-functioning aqueduct by the seventh century, built in order to provide water to the core of the episcopal complex and the hub of the city. It was finally abandoned in the eleventh century, according to the material obtained from inside the well, which includes Andalusian large globular *pithoi*, with weathered walls and remains of leather around the neck (showing how water was drawn from the inside).<sup>321</sup> The well must have supplied water at this stage to the workshops that had been built in the north Almoína sector during the course of the tenth century.

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<sup>318</sup> Álvarez et al. 2005: 243-7. The date is given by the amphorae (which include Keay IV, XXXV, XIII, XXIII and XIX) and the coins found in the abandonment layers.

<sup>319</sup> Vizcaíno Sánchez 2009: 365.

<sup>320</sup> Ribera Lacomba 2005: 233; 2008: 313; Ribera and Rosselló 2000b: 179-80. The foundation trench includes Hayes 58 and 59 (dated to the fourth century), as well as 91, 99 and 104 (dated to the sixth-seventh centuries), together with amphorae Keay LXI, LXII and LXV, which give a similar date, Álvarez and Ribera 2003: 108-9.

<sup>321</sup> Martí and Pascual 2000: 509.

Lastly, the new Almoina water conduit (app. XXI) provides us with further evidence to suggest that the aqueduct was operational during the middle Islamic period. This new underground water conduit was constructed in the tenth century (according to the material retrieved from the foundation trench) most probably to supply water to the Islamic citadel, and maybe indirectly from there to the *hammam*.<sup>322</sup> Even if it is impossible to indicate with certainty where it came from or where it went to (because it is only known from this excavation), it probably was a branch diverting from the original Roman aqueduct (see fig. 3.84a-b) heading towards the palace mentioned earlier, located to the east of the site of l'Almoina, because it crosses the whole of the excavated site from west to east. What seems clear is that the conduit was built out of reused material (ashlar blocks, column drums, millstones) and mortared rubble, and that it crossed the old forum without supplying water to the workshops that had been constructed there. This suggests that the water supply system in this period was not openly public and was limited to the palace supply, and maybe perhaps the *hammam* (which it is not clear if it was private or public).

The *hammam* (fig. 3.85) was built in the mausoleum at some point after the construction of the Almoina conduit (ninth century), which allegedly fed the baths, and was in use until the eleventh century. This date is given by the presence of green-and-brown Andalusian pottery in the abandonment layers. The old mausoleum was subdivided with walls, and its floor was raised, in order to warm the rooms. A furnace was added outside the apse, where the hot room was built.<sup>323</sup>

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<sup>322</sup> Albiach et al. 1999: 46-8; Martí and Pascual 2000: 510-2.

<sup>323</sup> Martí and Pascual 2000: 510.

3.8.1.4 Islamic repairs or evidence for Gothic continuity?

With the available archaeological evidence it seems clear that the aqueduct was functioning until the eleventh century, with a gap in the evidence between the seventh and the ninth, and a degree of uncertainty between the fourth and the seventh. This chronology is built by the several *t.p.q.*'s and *t.a.q.*'s given by the dated material.

The *post quem* dates include the reconstruction of the *nymphaeum* (3<sup>rd</sup>-4<sup>th</sup> c.), the food-processing building of the forum (4<sup>th</sup>-early 5<sup>th</sup> c.), the probable use of running water in the baptistery (late 6<sup>th</sup> c.) and the public accessibility to the pool of the *nymphaeum*, and its late repairs (6<sup>th</sup> c.). The *ante quem* dates (excluding the great well) all turn around the eleventh century: the destruction of the *nymphaeum*, the final blocking of the Roman aqueduct at Quart, and the end of the Almoína water conduit. It is the evidence for the ninth century (the *nymphaeum* cisterns and the construction of the Almoína conduit) that generates most doubts.

The new constructions of the ninth century clearly point towards a renewal in hydraulic engineering, probably linked to a new urban period of revival, which would indicate a reconstruction of the aqueduct, which had been out of use probably since the sixth/seventh century. However, the evidence can also be interpreted in a different way, as the repairs of the ninth century removed all late antique layers from the conduit, so it could have been the case that water flowed into and beyond the Visigothic period.

### 3.8.2 Seville

The city of Seville (*Hispalis*) was in Late Antiquity one of the most important cities of the peninsula, as a main harbour that linked the Guadalquivir valley with the Atlantic and Mediterranean, and one of the most active mints of the period.<sup>324</sup> Perhaps

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<sup>324</sup> Tarradellas Corominas 2000: 282-3. Cf. the coins of Liuvigild *CUM D(E)O OPTIN(U)IT [HI]SP(A)LI[M]*; CNV #31, 32. Friend and colleague Carlos Cabrera (Brasenose College, Oxford) is currently working on

because of this, Seville was one of the main targets of fifth-century Suevic raids and was also chosen (for a short time) as a *sedes regia* in the Visigothic period.<sup>325</sup> It was also an archbishopric, the most famous bearer of its mitre being Saint Isidore. The city was a stronghold, together with Córdoba, of the old Hispano-Roman elite, and it was here that Hermengild placed his capital during his rebellion against his father in the 580s.<sup>326</sup> Hermengild was even commemorated by an inscription.<sup>327</sup>

Sadly, very little else is known of the city for this period, because the erosive action of the Guadalquivir on the one hand and the continuous habitation of its old urban centre have badly damaged the archaeological record of ancient Hispalis.<sup>328</sup> Three Visigothic churches are known, although only from the written sources.<sup>329</sup> Two baths are known archaeologically to have existed into the fifth and sixth centuries.

In the early Islamic period, it seems that the churches were still standing, at least in the early period, when one of them was shared with the Muslims as a centre of cult.<sup>330</sup> Then, the urban layout began to quickly change, and the old Roman grid was abandoned in favour of the current street layout as the first *souks* emerged.

### 3.8.2.1 The aqueduct

The aqueduct of Seville, popularly known as *los caños de Carmona* (“the pipes of Carmona” referring to the 16<sup>th</sup> c. piped conduit that ran on top of it) is today hardly visible, although its course is very well known (fig. 3.86; app. XXII). Even though its remains impress locals and visitors for over a thousand years, they did not impress urban developers, who with the consent of the local authorities pulled the aqueduct

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his thesis about the harbour of late antique Sevilla, on which he will soon provide new and very interesting information.

<sup>325</sup> Hydatius, *Chronica subita*, 115; *HistGoth*, 41-4; *DLH*, III.30.

<sup>326</sup> John of Biclar, s.a. 574, 585; *HistGoth*, 49; *DLH*, V.38.

<sup>327</sup> *IHC* 76; Fernández and Gómez 2001.

<sup>328</sup> García Vargas 2012: 884-6.

<sup>329</sup> García Vargas 2012: 893-900; Tarradellas Corominos 2000: 286.

<sup>330</sup> Manzano Moreno 2006: 256.

down: of the 410-odd arches standing in 1848, 400 of them were still visible in 1901, but only 15 were standing by the 1960s.<sup>331</sup>

These ran for over 4km, in a single row of arches, 3.9m in diameter on average, and built in *opus testaceum*. The three sections standing today show that at points the aqueduct had to run on double arcades (fig. 3.87), and from old illustrations it is possible to show that some pillars had reinforcing buttresses, which could indicate a late repair. The aqueduct approached the city from the east, parallel to the road to Córdoba.<sup>332</sup>

The water was obtained from an underground aquifer, by means of a 3km tunnel, which has been recently explored and mapped by speleologists. This exploration has revealed that not only is the water still drinkable, but also that the tunnel was carved into the rock with constant dimensions of 2x0.85m (fig. 3.88).<sup>333</sup>

Recent archaeological excavations have unearthed a large (450m<sup>2</sup>) three-aisled terminal cistern that could be linked to the aqueduct, at the Plaza de la Pescadería (fig. 3.89). It is located outside the old walled enclosure, and it is too low-lying to have fed the Roman city, so it is believed that it was part of a (supposed) branch that supplied the (known) Flavian suburb, although it is not certain whether if this cistern was in the suburb or not, as the city wall is till unidentified.<sup>334</sup>

### 3.8.2.2 *An uncertain chronology*

The destruction of most of the aqueduct and the lack of any indication of water consumption prevents the formulation of a certain chronology. The construction of the aqueduct itself can only be ascribed to the second century on the grounds of its

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<sup>331</sup> Fernández Casado 2008 (1972): 168.

<sup>332</sup> Fernández Casado 2008 (1972): 159-70; González and Bestué 2006: 274.

<sup>333</sup> GEOS 2010.

<sup>334</sup> García García 2007: 138; García Vargas 2012: 888.

construction technique and its similarity to that of the aqueduct of Itálica, which would fit with the date of the construction of the Plaza de la Pescadería cistern (fig. 3.90).<sup>335</sup>

The abandonment of the cistern is also used as an indicator of the end of the aqueduct, but there is no clear archaeological correlation between the cistern and the aqueduct. The earliest ceramic material that has been located in the abandonment layers of the cistern can be dated to the late fifth and early sixth centuries, and these were located in the eastern aisle (where the aqueduct entered the cistern). Another part of the cistern was slightly later turned into a dwelling (?), as the nave was divided by an *opus listatum* wall (fig. 3.91), that has been broadly dated to the Visigothic period. It was then continuously occupied until the eleventh century.<sup>336</sup> A sixth century date can be given for the abandonment of the Flavian suburb branch of the aqueduct, but nothing is known about the main aqueduct. However, considering the peak of floods in this period, especially after the fourth century, it would not be surprising to see the aqueduct being badly damaged by the river, which was crossed by an aqueduct bridge.<sup>337</sup>

Close by the location of the possible Visigothic cathedral, a possible baptistery has been identified at the site of Patio de Banderas, which has been dated after the fifth century, on the basis of the pottery located in the preparation level of the *opus signinum* floor (Hayes 93A and Keay LIV).<sup>338</sup> Despite it having a large *opus signinum* pool, the baptistery did not necessarily require piped water. However, considering the examples of Valencia, Tarragona and Barcelona (where the episcopal complex is closely linked to the Roman water distribution network), a requirement of piped water is possible.

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<sup>335</sup> Fernández Casado 2008 (1972); García García 2007: 136.

<sup>336</sup> García García 2007; García Vargas 2012: 900-5.

<sup>337</sup> García Vargas 2012: 884. The increased number of damaging floods in this period is recorded in the *VSPE* (mentioned above), and in the sedimentation columns of the old harbour.

<sup>338</sup> Tarradellas Corominos 2000: 287-8: Hayes 93A is dated to 470-500 (Hayes 1972: 148). Recently opinion has shifted against the identification of this structure as a baptistery (García Vargas 2012: 893).

There are two baths known archaeologically which can be dated, according to the material finds, to the fifth and even the sixth centuries: the Cuesta del Rosario baths and the Palacio Arzobispal baths.<sup>339</sup> Apart from these baths, which do not provide any further dating evidence to contradict the dating suggested by the cistern, the excavations at the Plaza de la Encarnación have revealed very interesting domestic fifth-century contexts: in the *domus* known as the Casa de la Columna, a new lead pipe was built into a floor securely-dated to the fifth century (fig. 3.92), and the whole area seems to have maintained the second-century sewers in use.<sup>340</sup>

It is clear that the aqueduct was out of use in the late Islamic period, because according to the Almohad chronicle of Ibn Sahibsala, it was then rebuilt. The chronicle mentions that Abu Jacob Yusuf inaugurated the aqueduct to supply the Alcázar on the 13<sup>th</sup> of February of 1172. This new conduit was working until the 17<sup>th</sup> century.

“He [Abu Jacob Yusuf] is responsible for the water conduction by means of a conduit (saqiya) for the supply of the inhabitants of Seville and for its alcázar ... on the old road that leads to this city [i.e., Seville] there was an old conduit (saqiya) that the soil had covered, so it had been turned into a row of stones by the road, but without anyone knowing what it was... [so the engineer then excavated it, revealing] the remains of a pipe or a conduit which used to supply water to Seville, a work of the first kings of the old Romans [the text continues, to say how the engineer excavated a fountain and later found the source of the aqueduct]”<sup>341</sup>

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<sup>339</sup> González Acuña 2011: 487, 492. Another bath is mentioned constantly in the literature, although there seems to be no archaeological trace of it: Fuentes Domínguez 2000:144.

<sup>340</sup> González Acuña 2011: 380-1.

<sup>341</sup> Fernández Casado 2008 (1972): 181; González and Bestué 2006: 274 [my translation of his Spanish].

Furthermore, A. Canto suggests that all the standing remains of the aqueduct have to be dated to this Islamic phase, accounting for inconsistencies in Fernández Casado's description (who based his work on the few standing remains and on old pictures).<sup>342</sup> However this may be, the standing remains do not provide us with any dating evidence, so this whole issue can be mentioned, but not resolved.

Overall, the aqueduct of Seville may well have been in use into the fifth century, and probably ceased to function at some point in the sixth century, when the terminal cistern is definitely out of use, perhaps as a consequence of a flood.

### 3.8.3 Zaragoza

The city of Zaragoza was one of the most important cities in the Visigothic kingdom, as it was strategically located between Toledo and Gaul. Founded as an Augustan colony (its Roman name is *Caesaraugusta*) on top of a previous Iron-age settlement, the city is located at the right (south) bank of the Ebro, which was crossed by a now disappeared stone bridge. The city still preserves today most of its Roman street-grid, as well as its impressive third-century walls.

In the early seventh century the city was a centre of learning, as the letters of bishop Braulio (who kept a long correspondence with Isidore of Seville, and mentions the exchange and writing of many books) indicate. It was also one of the main mints, and its territory included the fertile valley of the Ebro river. Its prosperity and importance is also reflected in the several attacks known on the city during the fifth, sixth and seventh centuries, the most important being those of the *bagaudae*,<sup>343</sup> those of

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<sup>342</sup> Canto 1979: 329.

<sup>343</sup> Hydatius, *Chronica subita*, 133-4.

the Frankish kings in 541 (who besieged the city for 49 days until, impressed by the power of St. Vincent, the Franks left)<sup>344</sup>, and then in the 620s by the Basques.<sup>345</sup>

### 3.8.3.1 The little known aqueduct

Zaragoza is the first city in Spain which we know had a water supply system (ignoring the “Iberian” aqueduct of Sagunto), as mentioned in a law of the first century BC, known as the *tabula Contrebiensis*. In this inscription Rome acts as a mediator between the local Celtiberian towns of *Salduie* (the pre-Augustan name of Zaragoza) and *Contrebia*, because both claimed the use of an irrigation channel. This may also have been a water supply system to Salduie itself, if this channel can be identified with a later medieval one which ran into the city.<sup>346</sup> Despite the inscription, which is very important because it shows the imposition of Roman water law in the Iberian Peninsula, the conduit referred to is hardly known, and it does not seem to have been a proper aqueduct, monumental or otherwise.

It has been traditionally held that the aqueduct was built in the Claudian period, and that it brought water from the Gállego river, a main tributary of the Ebro on its left (north) side. This is, however, only based on the existence of two pieces of evidence (app. XXIII). The first one is the conduit known as the *acequia de Urdán*, a 500m long rock-cut conduit coming from the north of Zaragoza. The second are the lead pipes located at the bed of the Ebro river in 1804 and 1805.<sup>347</sup> They were recorded and published then, but during the Peninsular War (1808-1814), during which Zaragoza was besieged on three occasions, the pipes seem to have been used to make bullets to fight the French. The importance of these pipes resides not only in the inscriptions they

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<sup>344</sup> *Chronica Caesaraugustana*, s.a. 541; Gregory of Tours *DLH* III.29.

<sup>345</sup> Narrated by Braulio, and mentioned by Isidore, *HistGoth* 63.

<sup>346</sup> Abadía 1995: 7.

<sup>347</sup> Published in a manuscript by Juan Antonio Fernández – Cf. González et al. 1994.

bore,<sup>348</sup> but also in the fact that they indicate that the aqueduct crossed the river by means of an inverted siphon along the bridge (fig. 3.93), that it entered the city through its north gate, and that its *castellum* may well have been in the forum area, which is just adjacent to the north gate that faced the bridge.<sup>349</sup>

This course of the aqueduct is highly hypothetical, because it is only sustained by the existence of the water-pipes, and it would imply perhaps an unnecessarily long aqueduct if water dams existed on the south banks of the Ebro. Another much more plausible (and more recent) hypothesis is that the aqueduct was diverted from the Huerva river (a tributary to the Ebro on its right side – i.e., where Zaragoza stands), and that the pipes actually fed the suburb on the other side of the river. This hypothesis is not only based on various facts, which include the large terminal (?) cisterns located east of the city and the presence of several Roman dams on the Huerva, especially at the site of Las Adulas, which has been suggested as the caput of the aqueduct.<sup>350</sup>

### 3.8.3.2 Dating evidence

Given the lack of information about the aqueduct, all the dating evidence has to be obtained from indirect sources. The one certain piece of chronological information is that in the Islamic period there is no mention to any water-conduit, and the palace seems to have been fed by a huge water wheel.

Concerning the continuity of Roman baths, there seem to be two phases of abandonment of baths: one in the third century (when the private baths of Calle Ossau and those of Calle Gavín y Sepulcro were abandoned) and another in the fifth.<sup>351</sup> It is

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<sup>348</sup> CIL II 2992: *M(arci) Iul(ii) Antoniniani Aed(ilis)*. The name suggests a second-to-third century date for the pipes.

<sup>349</sup> Abadía 1995: 20-3; Bestué and González 2006; García-Entero 2005:279; Vázquez and González 1988: 38-41, 54.

<sup>350</sup> Escudero and Galbe 2011.

<sup>351</sup> García-Entero 2005: 283-4.

during the fifth century that the rest of the private baths were abandoned (like those at Calle Carrillo, the baths at Calle Universidad, and the suburban baths of Calle Alfonso V)<sup>352</sup> as well as the public ones. The two public baths of Zaragoza were abandoned in the fifth century: those opposite to the bridge earlier in the century than those at Calle Santa Marta, which were in use until the mid-fifth.<sup>353</sup> However, of the latter only the hot rooms are known to have been abandoned for certain, since the cold ones could not be properly excavated (as they were beyond the excavation limits): considering that hot rooms were generally the first ones to be abandoned, there is a small possibility that the baths continued to function during the second half of the fifth century.

Finally, most of the evidence points towards a functioning aqueduct into the early fifth century, probably up to the first decades of the second half (Santa Marta baths), as after this there is no evidence to prove that the aqueduct was functioning. Any standing remains of the aqueduct were destroyed with the bridge in the ninth century, or unknown to contemporaries in the Islamic period, who used water from the Ebro river for their needs.

#### 3.8.4 Almuñécar

Almuñécar (the ancient *Sexi*) was a Phoenician colony in southern Spain, which became a *municipium* in the early Empire, and this promotion prompted a period of urban development which included the construction of an aqueduct and a set of baths linked to it.<sup>354</sup> The city itself was built on top of a hill, overlooking a harbour, and it seems to have been primarily a centre of *garum* production, like many other coastal towns of this region.

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<sup>352</sup> Beltrán Llorís 2007: 42; Casabona and Delgado 1991; García-Entero 2005: 287.

<sup>353</sup> García-Entero 2005: 281.

<sup>354</sup> Sánchez and Moreno 2012.

Very little is known of the archaeology of Almuñécar in Late Antiquity, but it seems that by the time of the Byzantine invasion (550s) the city was largely abandoned, including the large *garum* factories. The city had already ceased to mint coin in the fifth century, and even if it might have still preserved some minor importance as a harbour, by the 7<sup>th</sup>-8<sup>th</sup> c. the site may well have been deserted, as no material is known from the site or its environs datable to that period.<sup>355</sup>

The site still functioned as a harbour during this period, even if the archaeology indicates that it was a rather small one, because in AD 750 Abd al-Rahman I landed here after fleeing from the Abbasid Revolution there. The site was only again re-occupied in the ninth century.<sup>356</sup>

#### 3.8.4.1 *The remains and course of the aqueduct*

The aqueduct of Almuñécar is fairly well known all along its 7km, and its impressive remains are still standing and, in some sections, still carrying water for the neighbouring fields (fig. 3.94; app. XXIV). It draws water from an aquifer up in the mountains around Almuñécar (the site of La Angostura), and by means of a partially subterranean conduit takes the water along the valley of the Verde river, visible at Barranco de Antequera and Barranco del Olivillo. In this part, the aqueduct goes over the Torrecuevas creek on an impressive 17 arched structure. A few metres away, the aqueduct goes into a tunnel to the valley of the Seco river, on the other side of the mountain. There, the creeks and ravines are deeper, and up to three bridges were built (numbered aqueducts I, II and III), which vary between 43m with 4 arches (I) and 72m with 9 arches (III).<sup>357</sup>

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<sup>355</sup> Gómez Becerra 1995: 184-90.

<sup>356</sup> Gómez Becerra 1995: 191.

<sup>357</sup> The course is generally described in Fernández Casado 1949, with some minor modifications identified in the recent campaigns (Sánchez et al. 2010; Sánchez and Moreno 2011).

After aqueduct III, the conduit reaches a settling tank which is the head of an inverted siphon that takes the water up to the hill where Almuñécar is, crossing the valley in between (fig. 3.95). The *venter* (low point) of the siphon has been located recently; it ran on clay pipes over the deck of an arched structure (fig. 3.96).<sup>358</sup> The final tank of the aqueduct was for a long time believed to have been the “cave of the seven palaces”, a Roman vaulted structure, but this lacked any water-tight lining (according to the recent excavations), and it seems more plausible that the current bell tower of the Encarnación church (which is a reused Roman tower) was the aqueduct’s final destination. The tower would allow the de-pressurisation of the water, which would match the description given by al-Idrisi in the twelfth century, who mentions:

“... [in Almuñécar] there is a square construction, similar to a column, wide in its base, narrow in its top. On two of its sides there are carvings [imprints of pipes?] that merge together on the top. At the angle formed by the side there is a sunken vat in the floor, which received the waters brought from a mile away by an aqueduct of many arches built in hard stone [at this distance, it must have been the venter of the siphon]. The learned men of Almuñécar say that in former times the water went up to the top of the obelisk and went down the opposite side, towards a small mill...”<sup>359</sup>

A branch of this aqueduct may have been identified at the El Majuelo *garum* factory, at the foot of the hill of Almuñécar (fig. 3.97), which brought the water needed to clean the fish and vats. Although the connection is not confirmed, the presence of a vaulted conduit lined in *opus signinum* could only point towards an aqueduct; if it was

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<sup>358</sup> Such *venter* was predicted by Fernández Casado (1949), and documented in the 1990s: Leather 2002: 84; Bestué and González 2006; Sánchez et al. 2010.

<sup>359</sup> Quoted in Fernández Casado 2008 (1972): 205 [my translation of his Spanish].

not coming from the main aqueduct of Almuñécar, it must have been a new conduit that brought water from elsewhere.<sup>360</sup>

#### 3.8.4.2 Chronology and dating evidence

Various Arabic sources (al-Idrisi, al-Himyari, ibn al-Khatib) mention the aqueduct of Almuñécar or its terminal deposit, copying the text of Idrisi quoted above. But all of them mention it as a ruin which no longer functioned, although it was obvious to them that it was a water conduit.<sup>361</sup> Al-Idrisi, the earliest of these writers, wrote in the early twelfth, giving us a rather vague and unhelpful *terminus ante quem*.

For an earlier *ante quem* we have to look at the lack of datable pottery for the seventh century from the town itself, which would indicate an abandonment of the site (parallel to other similar sites in the Byzantine province, like Málaga, *Carteia* or *Traducta*). Presumably by then the aqueduct had already ceased to function.

The only other dating evidence is the abandonment of the fish industries at El Majuelo, dated to the late fourth or early fifth (although the pottery has been recently reassessed as late fifth),<sup>362</sup> giving a possible *t.a.q.* for the end of the aqueduct. The end of the fish factories of Almuñécar could in fact be directly related to the end of the aqueduct, although this is not terribly useful dating evidence, as discussed above. The baths located at the *venter* of the siphon were very badly damaged by ploughing, and have not provided any dating material for its late and abandonment phases.

In the best of cases, the aqueduct may have been working into the fifth century, although there is no hard evidence to prove this.

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<sup>360</sup> Sánchez et al. 2010: 209.

<sup>361</sup> Compiled in Fernández Casado 2008 (1972): 205.

<sup>362</sup> Gómez Becerra 1995: 185; Lagóstena Barrios 2001: 154.

### 3.8.5 Conimbriga and Lugo: aqueducts in the Suevic area

Both Conimbriga and Lugo are located in the north-western quarter of the Iberian peninsula, in what came to be the Suevic kingdom, and the Suevic presence greatly affected the evolution of these two cities in Late Antiquity. Both were minor towns in the far corners of Lusitania (Conimbriga) and Gallaecia (Lugo), but were important local centres, as they became episcopal sees during the fourth century, in the same period in which they too obtained new walls and fortifications (fig. 3.98). In the case of Conimbriga, the wall enclosure did not correspond with the size of the city, which was reduced to two-thirds of its size with this new fortification.<sup>363</sup>

The whole of Gallaecia and northern Lusitania were taken by the Suevi in the year 411, but their authority over the territory was weak and many areas beyond their capital at Braga went through a period of crisis, power vacuum and war. The walls only temporarily prevented the Suevi from taking both cities, but in the end Conimbriga was sacked and destroyed (AD 467), and Lugo conquered (AD 460) only to be sacked later by the invading Visigoths in the same year, according to Hydatius.<sup>364</sup> Archaeological evidence for Conimbriga indicates an abrupt end of Roman urban life in the fifth century, and several sectors of the city show evident signs of violent destruction (including the forum and the *domus*).<sup>365</sup> Nothing is known of Lugo for the period after the Suevic attack.

New signs of urban development only appear again in the late sixth century: In Conimbriga, a small, poorly-built fortification has been identified on the far west end of the city, which has been identified as a Visigothic fortification, probably linked to the occupation of Liuvigild of this region (fig. 3.99).<sup>366</sup> It is known that after the

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<sup>363</sup> De Man 2007: 704, 708.

<sup>364</sup> *Chronica subita*, 225 and 237 for Conimbriga, 199 and 201 for Lugo.

<sup>365</sup> Alarcão and Etienne 1977: 165.

<sup>366</sup> Alarcão and Etienne 1977: 165-8; De Man 2010.

ecclesiastical reorganisation of the Suevic kingdom by St. Martin of Braga, Lugo became an archbishopric, and it is then in the late sixth century that two new churches (including a large basilica) were built.<sup>367</sup>

Beyond that, Conimbriga seems to have been largely abandoned, as its inhabitants moved to Aeminium (current-day Coimbra).<sup>368</sup> Lugo was still an important bishopric and a mint in the later Visigothic period, but very little is known archaeologically of the development of its urbanism.

### 3.8.5.1 The aqueduct of Conimbriga

The aqueduct of Conimbriga (app. XXV) was surveyed and studied in the 1970s, and its course was fully identified then.<sup>369</sup> Its course is known from its source (an Augustan spring basin) up to its *castellum* inside the city. From the *castellum* the aqueduct went to a *piscina limaria* or settling tank, which is nowadays the chapel to St. Antony of the village of Condeixa-a-Velha. From there the aqueduct runs, alternating underground sections and surface structures, so it is visible in 25 different locations. Just before Conimbriga, the aqueduct had to go over arches for 108 metres, although sadly most of these are now gone. The *specus* was lined in *opus signinum* and the conduit had an average slope of 2.6m/km, the total length of the aqueduct being 3,443m.

The aqueduct was not excavated, only surveyed, so all the dating information available comes from indirect evidence, mostly the excavated baths of Conimbriga, although there is also the notice of a possible baptistery located beyond the east gate,

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<sup>367</sup> Councils of Braga I and II (572) – Vives 1963: 61, 78; Fernández et al. 2005: 99; López Quiroga 2004: 47.

<sup>368</sup> NB the translocation of the toponym from the abandoned cite into the new settlement.

<sup>369</sup> Alarcão and Etienne 1977: 52-7; Etienne and Alarcão 1976.

which is the access point of the aqueduct to the city.<sup>370</sup> The three public baths were excavated in the 1970s, and no abandonment layer could be identified or dated, although the Baths of the Aqueduct seem to have been used into the fifth century. Only one of the private *balnea*, that of the House of Cantaber, has produced late antique material.<sup>371</sup>

The *balneum* of this *domus* seems to have been abandoned at some point early in the fifth century, because the hydraulic infrastructure of the baths seems to have broken and flooded the installation, which was then abandoned. This at least indicated that the aqueduct was working early in the fifth century. The house as a whole, together with its bath seems to have been destroyed in the Suevic attack, and it was not inhabited again afterwards.<sup>372</sup>

If the city was largely abandoned after the Suevic attack, as Hydatius suggests, then the aqueduct may have been out of use only because nobody was there to use it. The Visigothic occupation in the far west section, 120 years after the alleged abandonment of the aqueduct, may have been supplied with water from the aqueduct if it still functioned, but probably (this is not certain, as it has not been excavated) it relied on cisterns, or perhaps to the spring, which is 3.5km away.

#### 3.8.5.2 The aqueduct of Lugo

The aqueduct of Lugo (app. XXVI) has been only very recently identified with certainty and excavated. There were 17<sup>th</sup> century notices of a Roman water conduit, and in 1975 only two sections were known: the underground *specūs* of Rua das Norenas and Praza de Santa Maria (fig. 3.100).<sup>373</sup> It was not until the late 1990s that new sections

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<sup>370</sup> Palol 1967:169.

<sup>371</sup> Correia and Reis 2000.

<sup>372</sup> García-Entero 2005: 567.

<sup>373</sup> Abel and Arias 1975.

were identified, and the most recent discoveries date to March 2011,<sup>374</sup> which confirmed the course of the aqueduct proposed in the first publication of the aqueduct, in 2003.<sup>375</sup>

Considering this information, it is possible to claim that the aqueduct had its *caput* at the spring of O Castiñeiro, at the site of As Pias, 2.1km away from the distribution tank that is thought to be in the Praza do Santo Domingo, opposite to the Pazo do San Marcos. The aqueduct is identified at some distance from the spring, at the site known as Lamas de Prado, where 8.7m of the aqueduct were identified in 2001, wholly built in *opus caementicium* and without any hint of *opus signinum* lining (fig. 3.101). In fact, the base of the conduit was tiled with bricks, which has lead archaeologist to argue for a piped conduit. Continuing downhill, two different *opus caementicium* walls have been recently linked to the aqueduct, although it is impossible to confirm this, as these sections (at Rua Juana la Loca and Rua Mazaria, where 200m are visible) are covered in thick vegetation. A small sondage at Camiño Real, not far away from the Rua Mazaria revealed an underground channel with the same orientation as the walls mentioned above, and not far away, at Praza da Milagrosa, a 26m *opus caementicium* structure revealed the existence of the foundations for several pillars which would have supported the *arcuatio* of the aqueduct. The *specus* then ran underground, as identified in the 2011 excavations in front of the Provincial Palace (Pazo de San Marcos). The aqueduct will have finished at the distribution tank identified next to the old forum, at Praza Santo Domingo, where a rectangular pool lined with *opus signinum* and linked to several lead pipes has been excavated.<sup>376</sup>

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<sup>374</sup> *Xornal de Galicia* (xornal.com) “Aparecen restos de un acueducto romano en unas obras en Lugo” and “Unas obras frente a la Diputación descubren un acueducto en Lugo”, 8th March 2011; *El País* Galicia edition (elpais.es) “Los restos del acueducto de Lugo se abrirán al público en verano”, 12th April 2011; *ABC* (abc.es) “Lugo mostrará en San Marcos el acueducto que traía agua a la ciudad romana”, 6th June 2011. Compiled and briefly mentioned in Rodríguez Colmenero 2011.

<sup>375</sup> Álvarez et al. 2003: 20.

<sup>376</sup> Álvarez et al. 2003:23-40; González Fernández 2012.

None of the excavated sections has provided any dating material that could date the abandonment of the aqueduct,<sup>377</sup> so again, only through indirect information is it possible to roughly date the abandonment. It is important to avoid the Suevic conquest as an easy solution for this problem, not only because this is not accurate, but also because modern scholars consider that Lugo was destroyed,<sup>378</sup> when Hydatius does not say so.<sup>379</sup>

The baths of the city of Lugo provide very thin evidence, because two of them are known to have been built *ex novo* in the fourth century (as the baths of Praza de Santa Maria, dated because of a mosaic excavated in the 1960s) or remodelled in the same period (as the baths of Rua de Armanyá).<sup>380</sup> It was also in the fourth century that the sewers were re-built, as shown in the excavations of the Porta Miñá.<sup>381</sup> The Bridge baths, however, seem to have been in use during the fifth century, when the pagan altars to the nymphs were destroyed and thrown into the pool, according to the pottery found in it. These baths, however, were built using the natural thermal water that sprung from the ground, rather than the water brought by the aqueduct.<sup>382</sup> There are several pottery workshops in Lugo, which would have required water, but no dating evidence is available.<sup>383</sup> There is nothing more that can be said, as expressed in a recent publication (2011) “considering our current knowledge, if we were asked if we would be able to tell the differences between the Suevic-Visigothic urbanism of *Lucus Augusti* and the original Roman one we would have to answer ‘no way’, because the textual and

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<sup>377</sup> Álvarez et al. 2003: 46.

<sup>378</sup> Abel and Arias 1975; García-Entero 2005.

<sup>379</sup> *Per Suevos Luco habitantes, in diebus paschae, Romani aliquanti cum rectore suo honesto natu repentino securi de reverentia dierum occiduntur incursu* – “In the days of Easter in Lugo, a good number of inhabitants together with their leader of noble birth, feeling safe [because of] the holiness of the days, were killed in an attack by the Suevi”.

<sup>380</sup> García-Entero 2005: 250-1; Arias and de Vega 1997.

<sup>381</sup> González and Carreño 2007: 259-60. Vaulted sewers only appear in the fourth century, as opposed to what happens elsewhere in Spain, when sewers begin to decline (González Fernández 2011:299-306).

<sup>382</sup> Meijide and Herves 2000.

<sup>383</sup> Rodríguez Colmenero 2011: 87.

epigraphic sources are virtually none and the archaeological evidence is as yet unexplored”.<sup>384</sup>

The water supply was certainly working in the mid/late fourth century, and it is conceivable that it was still working in the fifth, when we know, as mentioned by Hydatius, that there was still a strong elite in the city that could possibly have taken care of it. Without any hard evidence, however, it is not possible to make any claims on the date of the abandonment, despite recent unfounded claims which claim that the aqueduct may well have been in use until the Islamic invasion of 711.<sup>385</sup>

### 3.8.6 Ceuta

The city of Ceuta is located on Africa’s northernmost tip, opposite to the Iberian Peninsula, and traditionally considered as one of the Pillars of Hercules (the other being Gibraltar) that marked the end of the Mediterranean and of the known world. It is located on a small peninsula linked by an isthmus to the mainland. Its connection with the Iberian Peninsula has always been very strong, stronger even than with the rest of north Africa (the province in which it is located, Mauretania Tingitana, belonged to the diocese of Spain and not to Carthage), as it is a key point to control the transit through the Strait of Gibraltar. Furthermore, Tangiers (old *Tingis*), the closest episcopal see (which probably Ceuta belonged to) was included in the Spanish Church still in the seventh century.<sup>386</sup> The site does not seem to have been a Roman city of importance, although there was a strong fortified settlement (*oppidum*) on the isthmus and the slopes of the peninsula, which lived, as many other settlements of the region, off the

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<sup>384</sup> Rodríguez Colmenero 2011: 228; “En el estado actual de nuestros conocimientos. Si se nos demandase diferenciar el urbanismo suevo-visigodo de Lucus Augusti del romano originario ¿podríamos hacerlo? De ninguna manera, tendríamos que responder, por cuanto las fuentes textuales y epigráficas son casi nulas y las arqueológicas inexploradas todavía”.

<sup>385</sup> Again, Rodríguez Colmenero 2011: 229.

<sup>386</sup> Gozalbes Cravioto 2000: 837.

production of fish products, taking advantage of the migratory movements of fish (tuna, mackerel) from the Mediterranean into the Atlantic and vice versa.

The settlement seems to have been deeply affected by the crossing of the Vandals in the late 420s, when one of the necropoleis and some domestic structures were finally abandoned. Or at least this is what the little known excavated remains of the isthmus indicate.<sup>387</sup> The Vandals do not seem to have settled there, as told by Procopius in his account of the Byzantine conquest of AD 534.<sup>388</sup> Justinian's planned invasion of Ceuta was a way to control events in the Visigothic and Frankish kingdoms, but the city indubitably was also an important landmark (the Pillars of Hercules) and a stronghold for the later invasion of Spain in the 550s.<sup>389</sup> The imperial occupation of Ceuta meant a new period of urban development, partially planned by the central government (Procopius mentions the restoration of the basilica of the Theotokos and of the walls),<sup>390</sup> but also by the local authorities (the construction of a new street leading to the harbour may be related to this) and private initiative (as indicated by the construction of new houses).<sup>391</sup>

Ceuta remained in imperial hands until the 680s (despite Visigothic attacks on the city),<sup>392</sup> and was then taken over by the Visigoths. According to legend, Julian, the Visigothic count in 711 was responsible for the crossing of the Umayyad troops into Spain, causing the end of the kingdom.<sup>393</sup>

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<sup>387</sup> Bernal Casasola 2008.

<sup>388</sup> Procopius, *Aed*, VI.vii.14; Cf. *Clust* I.xxvii.

<sup>389</sup> Vizcaíno Sánchez 2009: 130-2.

<sup>390</sup> *Aed*, VI.vii.14.

<sup>391</sup> The archaeological excavations carried out in the 1990s have revealed all that is known about Byzantine Ceuta; the basilica (Bernal and Pérez 2000: 123, 131), the new street (Bernal et al. 2005: 440-1) and the new housing (Bernal and Pérez 2000: 124; Bernal et al. 2005: 438). All summarised in Bernal Casasola 2008: 374-5 and Vizcaíno Sánchez 2009: 130-3.

<sup>392</sup> *HistGoth* 42.

<sup>393</sup> Ibn Abd al-Hakam, *Futuh Ifriqiya wa-l-Andalus* 42; *Continuatio Hispanica* 68. Cf. Paul the Deacon, *Historia Langobardorum* VI.46.

### 3.8.6.1 *The lost aqueduct of Ceuta*

Two factors favoured the construction of an aqueduct in Ceuta: firstly the lack of easily accessible water in the settled area and secondly the production of fish products. The aqueduct is today completely lost, and its course has to be reconstructed from the evidence noted down earlier in the twentieth century and in the description of the city of Ceuta by eleventh-century Abu Abdullah al-Bakri (1014-1094), who also recorded the Roman aqueduct of Tangiers.<sup>394</sup>

The aqueduct (app. XXVII) is described in full by Carlos Posac Mon in his three-paged 1977 article.<sup>395</sup> The source of the conduit is located at the Arroyo de las Colmenas, known in al-Bakri's text as the Awiyāt river, from which it went, following the contour lines for 3km up to the southern bay of Ceuta, where the Roman settlement was located (fig. 3.102). The source says that this conduit fed the Main Mosque, where the Cathedral is located today. Archaeologically, two sections are known, although they have now disappeared. Soon after the aqueduct left the Arroyo de las Colmenas, the aqueduct had to cross over a valley, which was done by means of a 15m-tall, triple-arched bridge (fig. 3.103), and further downstream, a section was located in 1901, known as the *specus* of La Almadraba. The latter remains were destroyed at the time of the Spanish Protectorate (1913-1956), when a new road was built between Ceuta and Tétouan, which followed the same contour line as the aqueduct.

### 3.8.6.2 *Dating evidence and chronology*

With the aqueduct gone, and without any extensive archaeological study, all the dates are hypothetical. The aqueduct is supposed to be Roman in origin and the construction technique suggests this is so. It has to pre-date the eleventh century, when

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<sup>394</sup> Siraj 1995: 493.

<sup>395</sup> Posac Mon 1977; Pons and Lagóstenga 2010: 535.

al-Bakri describes it, and possibly has to be dated before the second century, when the fish factories at Calle Gómez Marcelo were established,<sup>396</sup> even if al-Bakri indicates that it was built in the 710s by Count Julian, who is a figure deeply shrouded by mystery.<sup>397</sup>

The date of the fish factories is key, as I would suggest that the settlement, not being an important town in the Roman period, built the aqueduct for this only purpose. Thus the second century AD could be an acceptable date for its construction. As far as the abandonment is concerned, the evidence is less solid. The only fish factories known from Ceuta ceased to function in the fourth century, when a new large structure was built on top of the vats, but this does not necessarily mean that those were the only fish factories (especially because these are only partially known thanks to a rescue excavation).<sup>398</sup> The production of amphorae in Ceuta (types Keay XIX A and B) has been confirmed by means of petrological and chemical analyses, and these typologies are dated between the third and the mid fifth century.<sup>399</sup> This type of amphora, furthermore, is linked to the transport of fish products (remains of mackerel have been identified in several amphorae of this type in Ceuta), so it is reasonable to assume that the production of fish products continued beyond the abandonment of our only known factory. Both fish industries as well as pottery productions require large amounts of water, which are not easily available in Ceuta, unless water was brought by means of an aqueduct. This would make a fifth-century continuity of the aqueduct much probable.

After the end of amphora productions, there is no known element of the urbanism of Ceuta that would have required a supply of aqueduct water. Once Ceuta became a Byzantine fortified enclave and a main harbour (with an increase in the number of

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<sup>396</sup> Bernal et al. 2005: 436; Pons and Lagóstena 2010: 535.

<sup>397</sup> Posac Mon 1977: 327. It would be incredibly interesting if this had been the case.

<sup>398</sup> Bernal et al. 2005: 436.

<sup>399</sup> Bernal Casasola 1996: 1213-21.

imported eastern materials, indicating an active trade), it could be argued that a supply of water was needed for the garrison or for the navy, but this is highly hypothetical. However, it would be surprising if Procopius failed to mention any repair of the aqueduct in a city with such a symbolic importance, which was considered the “threshold of the Empire”, so it is doubtful that the aqueduct was repaired by the imperial administration, although this does not exclude the tiny possibility that it was still working.

One last thing should be noted, and it is that in al-Bakri’s story the aqueduct reached the mosque, which may indicate that just as happened in Córdoba, an old water conduit was repaired or diverted to feed the fountains of the mosque at some point before the eleventh century (probably, as in the case of Córdoba, in the ninth or tenth centuries). This is again parallel to his description of the aqueduct of Tangiers, which is said to have still supplied the Roman city in the tenth century, although allegedly, the inhabitants did not know where the water came from.<sup>400</sup>

### **3.9 A SURPRISING DEGREE OF CONTINUITY**

On the basis of this survey of aqueduct continuity, one of the most striking facts that emerges from the data is the percentage of aqueducts continuing beyond the fourth century. It is true that the majority of the aqueducts of Spain were out of use by then, but most of these were, as mentioned, minor towns or secondary nuclei (69%). The fact that 31% of the Roman aqueducts were in use in various degrees after AD 400 is striking, especially as these 19 aqueducts are concentrated in 13 towns, which out of 33 towns which aqueducts means that 39.4% - that is 2 in 5 - of towns with aqueducts

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<sup>400</sup> Gozalbes Cravioto 2000: 840.

preserved their long-distance water supply system. These figures are surprising, and indicate a high degree of continuity (although it would be very interesting to compare the Spanish data with statistics from elsewhere in the Empire).

Not only is the degree of continuity really interesting, but also the amount of available data, which simply needed to be collected. There is far more than what could have been originally thought, as I hope to have demonstrated.

#### 4. ALTERNATIVES TO AQUEDUCT SUPPLY: SPRINGS, WELLS AND RAINWATER CISTERNS

Springs, wells, rainwater cisterns and rivers were the only pre-aqueduct sources of water in towns, and they continued to be so while aqueducts functioned, and after the aqueducts fell out of use. This is a common feature of all the urban or proto-urban settlements of pre-Roman Spain, as well as of the first Roman republican settlements. Even Rome had a pre-aqueduct phase, as Frontinus records in his *De Aquis*:

*Ab urbe condita per annos quadringentos quadraginta unum contenti fuerunt Romani usu aquarum, quas aut ex Tiberi aut ex puteis aut ex fontibus hauriebant.*

“For four hundred and forty-one years from the foundation of the City, the Romans were satisfied with the use of such waters as they drew from the Tiber, from wells, or from springs”.<sup>1</sup>

The importance of water explains this diversity of resources; water is obtained from as many sources as possible. However, it should be noted that these sources of water were not all sources of drinking water: water from rivers may have been used for things other than drinking or cooking (like washing or cleaning), as it may not have been healthy to drink it (as claimed by Vitruvius).<sup>2</sup> Cisterns of rainwater or springs may have been more desirable sources for this.

The coexistence of these various systems continued during the Roman period, despite the presence of aqueducts, and it is thus not surprising that wells, springs and cisterns appear (or rather, continue to be in use) in the Visigothic period and beyond.

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<sup>1</sup> Frontinus *De Aquis*, I.4

<sup>2</sup> *De Arch.* VIII.

This will be explored in this chapter, looking at different types of sites: firstly those which never had aqueducts (or which had lost them before our period), new foundations without aqueducts, then those towns which lost their aqueduct supply during this period, and lastly towns in northern Spain, where water was always much more abundant.

Springs are places where water flows naturally out of the ground, and Frontinus mentions them as one of the main sources of water in the city of Rome, especially because they were healthy and even curative.<sup>3</sup> The importance of springs in Rome is also seen in the writings of Procopius, who mentions that during the Ostrogothic siege of 537, the inhabitants of Rome obtained their water from springs, and the only inconvenience caused by the cutting of the aqueducts was that the baths ceased to function.<sup>4</sup> Intra-mural and peri-urban springs seem also to have been very common in Spanish towns, and even though there is little evidence for their use in Late Antiquity, it is very probable that they were used alongside aqueducts, and even more once these ceased to function. The one with a known chronology is the harbour spring or fountain of Tarragona, discussed above,<sup>5</sup> which was in use into the seventh century, and was fed by the karst aquifer of the city. In various other sites, natural springs are known archaeologically inside the city, like the two of Mérida (found at Calle Arquitas and Plaza de Pizarro), and Málaga.<sup>6</sup> At Cartagena, Reccopolis, and Segovia springs near the urban nuclei are also known to have existed. Similarly, Córdoba had, according to the Islamic sources, many springs, at least one per neighbourhood (a total of 21)<sup>7</sup>.

Wells are pits dug into the soil that reach the water table, and despite the procedures mentioned by Vitruvius on how to find a good spot, it seems that well-

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<sup>3</sup> Frontinus, *De Aquis* I.4.

<sup>4</sup> *BellGoth*, I.19-20.

<sup>5</sup> See above, 3.5.2.4.

<sup>6</sup> Feijoo Martínez 2006: 156; Peral Bejarano 1995: 121.

<sup>7</sup> Al-Makkari III.1, p. 201.

digging was highly speculative.<sup>8</sup> Because of their nature, in which water needs to be pulled out of the well, well-shafts need to be lined (with masonry, brickwork and even old barrels), lest they collapsed, and must have some sort of support to allow the rope to be pulled; all of which should make wells clearly visible in the archaeological record.<sup>9</sup> In purely archaeological terms, wells are negative structures, so they can easily be given relative chronologies based on the contexts they are cut into, and their abandonment is dated by the infill – in practice their abandonment are hard to date, because normally very little material capable of being accurately dated ends up in wells.

#### 4.1 TOWNS THAT NEVER HAD AQUEDUCTS: NORTHERN SPAIN

Towns in “Green Spain” rarely had aqueducts, as the constant rains (fig. 1.3) and the geology of the terrain facilitated the construction of cisterns and wells, whenever there were no immediate springs around. Only a few sites such as Lugo, Braga, Chaves and Conimbriga had aqueducts, and these should be seen, as already presented, as elements of *Romanitas* and were not a needed infrastructure.<sup>10</sup> These sites, together with the military fortress of León, were the main Roman centres, where the local aristocracy could deploy such luxurious buildings.<sup>11</sup> The majority of the second-ranking towns of the area, like those of Asturias (*Gigia*, modern Gijón) or the Basque country (*Veleia*, modern Iruña de Oca, or *Oiasso*, modern Irún) never had aqueducts.

For example, we can look more carefully at Pamplona (*Pompaelo*). Pamplona, founded by Pompey the Great in Navarre, was an important town during the late

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<sup>8</sup> *De Arch.* VIII.i.1-7; Hodge 1992: 50.

<sup>9</sup> Hodge 1992: 52-3.

<sup>10</sup> See above, 1.2 and 3.8.5.2.

<sup>11</sup> For León see Campomanes 2006; Campomanes and Sánchez 1989; San Román et al. 2006.

Roman period, and became increasingly important during the Visigothic period as the centre of the local nobility and an episcopal see (which would in the end lead to the creation of the kingdom of Navarre in the Carolingian period). It became of key importance for the Visigothic kings in their campaigns against the Basques, and later an Umayyad garrison seems also to have been established there.<sup>12</sup> Excavations in Pamplona have revealed that the town was largely supplied by wells, which were kept in use into the Medieval period. Its public baths, which have been excavated, also benefitted from the high water table, so into the fifth century the baths were fed by a well (fig. 4.1).<sup>13</sup>

Furthermore, a very common phenomenon in this area is the presence of geothermal springs. In this area the vast majority of baths were built on natural springs, some of them thermal, around which towns developed. If baths were the main consumers of water and natural hot springs were present, there was no need to build any long-distance water supply system, and water for daily use could be obtained from the abundant wells. In some cases, aqueducts were built to bring cold water to the baths (either to mix it with the hot water or to fill the *frigidaria*), as seems to have been the case in Lugo and Braga.<sup>14</sup> In the latter, once the aqueducts were out of use, and in order to preserve the alternative supplies to the baths, wells were dug, which enabled the baths to continue in use up to the fifth century. At Orense, which was originally a small road-side *mansio*, that in the sixth century was promoted to a bishopric, the hot springs were still in use in this period, but in this case, without any other water alternative.<sup>15</sup>

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<sup>12</sup> Faro et al. 2007/2008; Mezquíriz Irujo 2004c.

<sup>13</sup> Unzu et al. 2006: 432-5.

<sup>14</sup> García-Entero 2005: 292-3; López Quiroga 2004: 75; Morais 2010.

<sup>15</sup> López Quiroga 2004: 87-9.

Finally, in this region where water is very abundant in various manifestations, there was no need to build aqueducts in order to show public munificence when a spring could be monumentalised. One example of this could be the Foncalda spring at Oviedo, the ex-novo ninth-century foundation capital of the Asturian kingdom, which was monumentalised with an ashlar aedicule and an *opus signinum* lined basin by the ninth century (fig. 4.2).<sup>16</sup> A last example could be the spring near the church of San Juan de Baños (“Saint-John-of-the-Baths”) in Valladolid, which was originally built by king Recceswinth in AD 661, and around which a small aedicule was also built although this is not linked to any major settlement.<sup>17</sup>

#### 4.2 TOWNS WITHOUT AQUEDUCTS BY AD 400: THE BYZANTINE ENCLAVES OF CARTAGENA AND MÁLAGA

Cartagena and Málaga, the two main towns (together with Ceuta)<sup>18</sup> of the Byzantine province of *Spania*, do not seem to have had functioning aqueducts in Late Antiquity. Whereas for Málaga no aqueduct is known at all, the aqueduct of Cartagena was out of use by the third century. It was built apparently by Pompey the Great, and it was in use at least until the third century, after which there is no secure evidence for its functioning. Its course is scarcely known, but remains at the Cerro del Molinete (the terminal deposit), together with an inscription mentioning arches attest its presence. The *castellum* seems to have been abandoned in the mid-imperial period as indicated by pottery obtained from the Molinete excavations, although it is not until the Byzantine

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<sup>16</sup> Ríos González 1997; García de Castro 1995: 493-501.

<sup>17</sup> Escorza 1997; the church, as it stands now, is certainly not Visigothic as traditionally thought (Utrero Agudo 2006: 493), although it is built reusing materials from an earlier church.

<sup>18</sup> See section 3.8.7 above.

period that it was turned into a dwelling area.<sup>19</sup> There is some evidence to suggest a possible fifth-century phase (repairs? reconstruction?) in the *castellum* and the baths, but this is unconvincing.<sup>20</sup>

In Cartagena, which is built on a hilly peninsula surrounded by marshes (fig. 4.3), the water table is very high, and water is easily accessible with wells, but this water is not good for drinking, as it is partially mixed with sea water. The biggest known well is that of the late Roman market. The presence of a well in a market was probably due to the need of cleaning and washing the market, similar to the “great well” located in the forum of Valencia.<sup>21</sup> Cisterns seem to have been common, and 21 are known archaeologically, dating to the republican and imperial periods, the most impressive ones being those of the theatre,<sup>22</sup> although no new ones can be dated to the Byzantine period.<sup>23</sup> The only hydraulic infrastructure built in this period is the late-fifth century drain system, built not to deal with the aqueduct overflow, but most probably to control the torrential rains<sup>24</sup>. The inhabitants of Cartagena, therefore, had to rely on natural springs for their drinking water.

There are three springs in Cartagena which provide enough water all year round. One of them is conveniently located inside the city walls, at the Cerro de San José; two others are located outside the walled enclosure, the Fuente de Cubas and the Fuente Santa, located two and three kilometres away respectively (see fig. 4.3), and it is known from written evidence of the Islamic and the Christian periods (in fact, well into the Modern period) that people went to these springs to get their drinking water.<sup>25</sup> As Cartagena has not been extensively excavated, our evidence is very limited. The case of

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<sup>19</sup> *CIL* II.3421; Egea Vivancos 2002: 17-8; Martín et al. 1996: 89; Ramallo et al. 2010.

<sup>20</sup> Egea Vivancos 2002: 27; Vizcaíno Sánchez 2009: 351, 363.

<sup>21</sup> See section 3.8.1.3 above.

<sup>22</sup> For the wells and cisterns, see Egea Vivancos 2002: 20-3.

<sup>23</sup> Vizcaíno Sánchez 2009: 400.

<sup>24</sup> Vizcaíno Sánchez 2009: 361.

<sup>25</sup> Egea Vivancos 2002: 17; Martín et al. 1996: 90; Ramallo et al. 2010: 217.

Málaga is similar, although its evidence goes further into the Islamic period. In Málaga (fig. 4.4), just as in Cartagena, rains are few and very seasonal (cf. fig. 1.3), so the town needed to secure the supply for its inhabitants in some other way. However, unlike in Cartagena, the underground water of Málaga seems to have been of good quality. In Roman times, a spring existed next to the theatre which was monumentalised into a fountain. Once the theatre was abandoned, the water from this spring was piped to feed the *garum* factories.<sup>26</sup> It is conceivable that once the *garum* factories were abandoned (in this case, between the fourth and fifth centuries, certainly before the Byzantine invasion) the spring was again accessible for public use. From the evidence available for the Islamic period, it seems that the water table was high enough in the later medieval period (after the thirteenth century) so that neither cisterns nor conduits were necessary to supply the population.<sup>27</sup>

In both towns it is clear that the imperial authorities carried out several fortification efforts to secure their military control over the area, as well as new harbour developments that would enable the *annona* supply to the garrisons, but there were no known works to the hydraulic infrastructure.<sup>28</sup> This may be surprising, but it follows the suggestions and indications of early Byzantine military treatises such as the *Strategikon* of Maurice, which says that cisterns should be built if no aqueducts, springs or wells can be found.<sup>29</sup> It would seem that the wells of Málaga and the springs and cisterns of Cartagena were a supply secure enough for imperial troops.

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<sup>26</sup> Peral Bejarano 1995: 121.

<sup>27</sup> Peral Bejarano 1995: 123.

<sup>28</sup> Navarro et al. 2000: 273; 2001: 684, 687-9; Vizcaíno Sánchez 2008; 2009: 346; *CIL* II.3420.

<sup>29</sup> Maurice, *Strategikon*, X.4.

### 4.3 ADAPTING IN LATE ANTIQUITY: TARRAGONA AND MÉRIDA

Tarragona and Mérida, as we have seen, were two of the main Roman towns in Spain, both were provincial capitals and both had aqueduct systems that ceased to function during Late Antiquity. They serve as good examples of adaptation by towns which had had aqueducts.

In both cases, cisterns and wells seem to have been the most common solution, despite the presence of intramural springs in both sites. In Tarragona at least, we know of an increasing number of wells in the harbour suburb, which is where the aqueducts had ceased to flow during Late Antiquity. At least two of them can be securely dated between the fifth and eighth centuries, and they are related to dwelling areas and not to industries, which were the common structures of that area in the previous period.<sup>30</sup> Another one was in use beyond the fifth century,<sup>31</sup> and there are many others which cannot be securely dated.<sup>32</sup> In Mérida the situation is very similar, and wells are present in the courtyards of many houses (there the water table is easily reached),<sup>33</sup> as the excavations at the Calle Morería have shown. In this site, the old aristocratic *domus* were subdivided into several family dwellings. This reorganisation included the transformation of the old peristyle into a communal courtyard, in which a well was always built to supply the neighbours once the aqueducts had ceased to function (figs. 4.5-6).<sup>34</sup>

Beyond these wells, there were other new water structures built in this period. In Tarragona, for instance, the episcopal suburb of the Francolí river (built in the fifth century) was surrounded by some rural establishment with two new water supply

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<sup>30</sup> Macias et al. 2007 #507.

<sup>31</sup> Macias et al. 2007 #403.

<sup>32</sup> Seven in total: Macias et al. 2007 #23, 42, 180, 271, 324, 342, 420.

<sup>33</sup> Gómez et al. 2009: 130.

<sup>34</sup> Alba Calzado 2005: *passim*, esp. 132.

systems. The first (in the excavation known as Sector VA) is a fifth-century cistern fed by a series of ceramic pipes, which probably collected rainwater from the rooftops.<sup>35</sup> The second (in sector VB) is also a fifth-century large cistern, built not far away from the well; it is a rectangular structure (16 x 6m) built in *opus caementicium* with various buttresses, and lined in *opus signinum*. The presence of sinter may indicate that it was originally fed by the aqueduct (and not by rainwater), and as it was an open-air structure, it has been suggested that it had a rural/irrigation function. The presence of a large well (130cm in diameter and more than 4m deep) next to this structure has not been satisfactorily explained, because no water-lifting devices that could explain how the cistern could be fed from the well have been located (as has been suggested).<sup>36</sup>

#### 4.4 EL TOLMO (EIO): NEW FOUNDATIONS WITHOUT AQUEDUCTS

The site of El Tolmo de Minateda (near Hellín, in the province of Albacete), is a hill-top settlement, which has been excavated for the last 20 years by prof. Sonia Gutiérrez, from the University of Alicante, and has provided much evidence for the late Visigothic and early Islamic periods. The site was an old Roman *oppidum*, abandoned in the imperial period and then built again in the course of the late sixth century. The site has been correctly identified with the old Visigothic episcopal see of Eio or Elo, created to counter the imperial presence in the area, introducing a Visigothic centre of power very close to the frontier in a period (the reign of Reccared), when conflict was constant.<sup>37</sup>

The late antique phase includes, as far as the excavations can tell, the re-erection of the city fortifications, and the construction of an episcopal complex (basilica,

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<sup>35</sup> López Vilar 2006: 171-3.

<sup>36</sup> López Vilar 2006: 173-82.

<sup>37</sup> Gutiérrez et al. 2005.

baptistry, and palace; fig 4.7), and of several houses. All of the constructions seem to have been built following a pre-conceived plan, and the architects chiselled the outline of the buildings on the bare rock, on top of which the buildings were erected.<sup>38</sup>

The site itself is built on a rocky hill, and without a known aqueduct, so the new settlement had to rely on rainwater collected in cisterns, and the best known are those from the episcopal complex and those of the acropolis.

The acropolis is a fortified area on a spur of the hill, built on the opposite end from the entrance, and there two large rainwater cisterns have been identified and excavated. The other group of cisterns known are the pair located at the *episcopium*. These two were located on opposite sides of the basilica: north and south of the main building, and were fed by the rain water collected from the roofs, which was then led into the cisterns through rock-cut drains (one of which crosses the floor of the basilica; fig. 4.8) and through natural cracks in the rock which may have acted as filters. These cisterns are relatively big (the north cistern measures 270 x 210 x 190cm and the south one 390 x 250 x 250cm), holding 10m<sup>3</sup> and 24m<sup>3</sup> respectively, and were lined in *opus signinum*.<sup>39</sup>

In the Islamic period, before the site was abandoned in the ninth century, the domestic structures that were built on top of the basilica and the *episcopium* do not have any cisterns or wells, although it is possible that the episcopal cisterns were still in use. Beyond this, there is evidence to suggest that liquid was stored inside houses in large ceramic containers (*tinajas*) which in rural Spain are traditionally used to hold normally water, but also wine.<sup>40</sup>

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<sup>38</sup> Abad et al. 2008: 329-30; Gutiérrez et al. 2005: 346-7.

<sup>39</sup> Abad et al. 2000:195-202.

<sup>40</sup> Gutiérrez and Cañavate 2010: 131, 147.

## 5. AQUEDUCTS AND URBANISM

In this period when Roman towns and their water supply systems were going through deep transformations, it is logical to look for interrelated patterns of transformation. The evolution of both urbanism and water supply are so deeply linked that there is a causal relationship between some of the processes, both in the cases of continuity and lack of continuity, which will be explored in this chapter.

### 5.1 WHY DID AQUEDUCTS CEASE TO FUNCTION?

No matter how, all Roman aqueducts at some point ceased to function. The immediate physical reasons behind this vary from active disruption to passive abandonment, but it may be possible to go a step further and look at the wider context searching for social, economic or political motivations.

#### 5.1.1 Lack of proper maintenance

The most usual damage caused to aqueducts is the formation of calcareous crystals: the so-called sinter, which, as already explained, forms on the interior of the *specus*, increasing the pressure, the speed of the flow, and reducing the quality of the water.<sup>1</sup> The escalating speed and pressure is particularly dangerous for an over-ground conduit, because an increase in the pressure in a bend or corner could cause the aqueduct to slowly tilt outwards, causing its final collapse. In extreme cases, sinter could totally choke a conduit blocking the channel, forcing it to burst.

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<sup>1</sup> See above, section 2.3.2; Cf. Dessales 2011.

Sinter was constantly chiselled out of conduits, in order to keep them clean, and it has been suggested that boiling acids (like vinegar) may have been used to dissolve it inside pipes.<sup>2</sup> This must have been done on a regular basis, but at some point during the late Roman period it became a rare practice. For example, in Córdoba a sinter crust of over 12cm formed in the *specus* of the aqueduct of Valdepuentes (Aqua Augusta) during the third century (fig. 3.16).<sup>3</sup> This is chronologically parallel to what happens at the aqueduct of Nîmes, although in the Spanish example the aqueduct was finally abandoned, whereas the French one was (badly) repaired and put back to use with a new lining of *opus signinum* on top of the sinter crust.<sup>4</sup>

Other problems derived from a lack of proper maintenance include leaks and fissures, plant growths and water pollution caused by an inadequate sediment decantation, mentioned in late Roman laws as *sordes*, which may seem minor complications, but which could develop into major problems.<sup>5</sup> Seemingly, these kinds of minor problems were left unrepaired or unattended in minor towns in the third and fourth centuries, which led to the final abandonment of several aqueducts. This could be behind the abandonment of the *cuniculus* of Tarragona, the aqueduct of Toledo, and that of Tiermes amongst others.<sup>6</sup>

### 5.1.2 *Vis maior* and unavoidable damage

Of course, there were other events, unpredictable in nature, which could render aqueducts useless. Earthquakes were a major cause of damage to aqueducts, which are

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<sup>2</sup> Heaps of chiselled sinter are found outside some aqueducts, as in Nîmes (Fabre et al. 1991b). For the use of acid, see Fahlbusch 1991: 7, 9-11.

<sup>3</sup> Ventura and Pizarro 2010: 193-9; mentioned above, section 3.3.2.1.

<sup>4</sup> Fabre et al. 1991b: 85-6.

<sup>5</sup> Dessales 2011.

<sup>6</sup> (Tiermes) Argente and Díaz 1980, 1984; (Toledo) Aranda et al. 1997: 334-6; (Tarragona) Remolà and Ruiz de Arbulo 2002: 41-63.

very susceptible to them when carried on arches.<sup>7</sup> This is especially true for the southern part of the Iberian Peninsula due to its high seismological activity (fig. 5.1), as the collapse of the aqueducts of Valdepuentes in Córdoba and the aqueducts of Baelo Claudia reflect. In fact, Cartagena and Granada are in two very seismically active areas, and it is possible that earthquakes were the cause of the collapse of their respective aqueducts.

Perhaps not a direct consequence of earthquakes, but one of the consequences of seismic activity is the alteration of the water table. If an aqueduct was fed by a spring, and this spring's level was modified by seismic activity, then the supply would be disrupted. If the spring began to flow at a lower level, then the whole aqueduct was rendered useless. This has been proposed for the case of Metz, although not for any Spanish example.<sup>8</sup>

War and sieges have been seen usually as a source of unavoidable damage to aqueducts, but a brief *caveat* should be made. It is too easy to link the end of aqueducts to violent destruction during the course of a war or invasion, especially in this period in which Spain was invaded by the Germanic peoples, the Byzantines, the Franks and the Arabs, and was also deeply affected by civil wars.

When a city is under siege, the besiegers intend to take the town, so radically damaging its aqueduct would seem to be counter-productive, although it is true that cutting the supply was a way to accelerate the fall of a city. The clearest example from this period is Rome: in the course of the Gothic wars Totila marched towards Rome and besieged Belisarius, who would not surrender, and then Totila cut the aqueducts that fed the city, in an attempt to force the population to hand over the city. This stratagem,

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<sup>7</sup> Vertical uprights in general are very weak against side movements, such as earthquakes; Cf. the identification of earthquake damage to columns at the site of Eio (El Tolmo de Minateda): Rodríguez et al. 2010.

<sup>8</sup> Lefebvre 1997: 409.

however, did not work, because Rome had several springs inside its walls, and cisterns were plentiful. Actually, the main concern of the Romans was that they could not go to the baths anymore, because there was no water to supply them.<sup>9</sup> The overall damage to the aqueducts will not have been extensive or permanent, but will have consisted of selective blockings or piercings that could be easily repaired, as happened in the year 554, when the imperial authorities issued the Pragmatic Sanction.

Besides, none of the sources which mention sieges of towns (which are many, including sieges of important cities such as Mérida, Barcelona, Córdoba and Seville) mention the cutting of aqueducts. The one notable exception is the case of the aqueduct which fed the church of Saint Acisclus in Córdoba, which was cut in AD 711 by the Islamic forces as their last resource to force the surrender of the Visigothic garrison, and even then the hydraulic infrastructure could be later repaired, as we know through archaeology.<sup>10</sup> None of the Visigoths, the Suevi, the Vandals or the Franks seem to have been capable of taking cities by force, and all the sieges mentioned in the sources end by either attrition or treachery. The most famous “sieges” are those of Lugo by the Suevi,<sup>11</sup> Córdoba by the Goths<sup>12</sup> and Barcelona by the Franks in 801,<sup>13</sup> and in all cases the besieging army seems to have camped outside ravaging the countryside, but the

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<sup>9</sup> Mentioned above.

<sup>10</sup> Cf. section 3.3.3.2.

<sup>11</sup> Actually, Lugo may have been taken by force, although the sources are not clear: *Per Suevos Luco habitantes, in diebus paschae, Romani aliquanti cum rectore suo honesto natu repentino securi de reverentia dierum occiduntur incursu* – In the days of Easter in Lugo, a good number of inhabitants together with their leader of noble birth, unaware [because of] the holiness of the days, were killed in a [surprise] attack by the Suevi; Hydatius, *Chronica subita*.

<sup>12</sup> *Agila (...) adversus Cordubensem urbem praelium movens, dum in contemptum catholicae religionis beatissimi martyris Aciscli iniuriam inferret, hostiumque ac iumentorum cruore sacrum sepulcri eius locum, ut profanator, pollueret* – Agila, while waging war against the city of Córdoba, in contempt for the Catholic religion, offended most blessed martyr Acisclus. This profane man desecrated the sacred place of his sepulchre [=the suburban basilica] with the blood of his enemies and his horses; *HistGoth* 45.

<sup>13</sup> *Venit ergo [Hludowicus] ad exercitum suum urbem vallantem, atque indesinenti opugnatione sex [h]ebdomadibus pertinacissime perduravit* – So he (Louis) came to his army which was surrounding the city with a ditch, and the obstinate siege lasted for six weeks; Astronomer, *Vita Hludowici Imperatoris*, 13.

sources are silent regarding the cities' aqueducts, so despite it being an argument *ex silentio*, one assumes that no damage was done to them on purpose.

Just as mentioned above with the minor maintenance problems, if by any chance in the early Roman period an aqueduct collapsed or suffered major damage (as happened in Arles, Cahors or Baelo Claudia),<sup>14</sup> there was the will (and resources, manpower and skilled labour) to put it back into use again, but this does not seem to have happened in Spain during Late Antiquity. It is therefore not so much the source of damage as the failure to repair it that needs further discussion.

### 5.1.3 Maintenance costs and expenses

There is nothing innovative or remarkable about the points which have just been made, as these are standard facts common to aqueducts across the Empire. A simple conclusion which can be drawn from them is that in Late Antiquity, for some reason, less care was taken in aqueduct maintenance and major repair.

We know from the sources that aqueducts were very expensive to build, but the maintenance they required in the long term also constituted a large expenditure.<sup>15</sup> It is difficult however to assess how much the maintenance of an aqueduct cost in Late Antiquity, although we know from several Gaulish examples that emperors and other high officials (such as the Prefect of Gaul) were responsible for the repairs of aqueducts in Metz and Narbonne.<sup>16</sup> Similarly, in Italy we know that king Theoderic restored the repairs of an aqueduct: Cassiodorus *Variae* IV.31.<sup>17</sup> In the East, municipal authorities could not face large expenditure without seeking help from the central administration

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<sup>14</sup> Raffard et al. 2000: 125-7; Rigal 2011.

<sup>15</sup> Cf. Pliny, *Epist.* X.37. Cf. a similar later example in Ostrogothic Italy, which features the unfinished repairs of an aqueduct: Cassiodorus *Variae* IV.31.

<sup>16</sup> Halsall 1996: 239 (Metz); *CIL* XII 4355 (mentioned above, section 2.4.5.2) and Solier 1991: 15 (Narbonne).

<sup>17</sup> Martínez Jiménez 2010.

either, and this certainly also included the maintenance of aqueducts, as we see in Caesarea Maritima.<sup>18</sup>

As has been explained in chapter 2, Roman law considered public aqueducts as the “private property” of the town councils, which were wholly responsible for their maintenance and upkeep.<sup>19</sup> These expenses were probably covered by urban taxation, the *ex officio* payments of magistrates (*munera*), but also perhaps by means of the free labour offered by criminal convicts (suffering *damnatio ad opus publicum*) and public slaves.<sup>20</sup> In Late Antiquity, however, it seems that the maintenance responsibility was passed on to those landowners whose lands were crossed by the aqueduct, although public slaves linked to aqueduct maintenance seem also to have existed in Rome.<sup>21</sup> The law which mentions the obligation of landowners, which originally dates from the reign of Constantine and was addressed to the “Consular of the Waters” (*consularis aquarum*) of Rome seems to have still been enforced all over Italy in the Ostrogothic period.<sup>22</sup> The law’s existence reflected the fact that the urban councils lacked funds for proper maintenance.<sup>23</sup> In the East, however, the imperial administration (as attested in the *Novellae* of Justinian) handed all responsibility on aqueduct maintenance to bishops and provincial governors.<sup>24</sup>

If the situation in Spain was similar to that in Rome, then the continuity of almost a third of the peninsula’s aqueducts would imply a real preoccupation of the local

<sup>18</sup> Saradi 2006: 345; *IGLS* 13.1, 9129; Witthow 1990: 8-10.

<sup>19</sup> Cf. the example of Dyrrachium, where it is explicitly stated in inscriptions: Deniaux 2011:30-1. A similar case is attested in Spanish municipal laws (*lex Ursoensis*): González Román 2010: 59.

<sup>20</sup> Duncan-Jones 1985: 28-9. Cf. Ward-Perkins 1974: 14-7, 36-7.

<sup>21</sup> *CTheod* XV.2.1 = *Clust* XI.xliii.1.1; Brunn 2000a, 2012 mentioned above in section 2.3.5. As for the slaves, they are referred to as *hydrophilaca* in the legal texts, and simply as “slaves of the aqueducts” (*servitio formarum*) in Cassiodorus (*Variae* III.31).

<sup>22</sup> Cassiodorus *Variae* V.38. The office of *consularis aquarum* was transformed in the Gothic period into that of the *comes formarum* (“count of the aqueducts”; *Variae* VII.6).

<sup>23</sup> This was not only the case of aqueduct maintenance; see Whittow 1990: 8.

<sup>24</sup> Saradi 2006: 344. *Novellae* XVII.4, XXIV.3, XXV.4, XXVI.4 and XXX.8 are examples of special taxes and municipal revenues being raised for the maintenance of public monuments, aqueducts included. Procopius, on the other hand, was keen to show Justinian as repairing aqueducts himself: *Aed.* II.5.11.

landowners for the public water infrastructure, or else that some other provincial or municipal laws applied. The lack of any sort of written evidence leaves the topic open to discussion, but a hypothetical model can be proposed on the basis of the available evidence.

There is a pattern amongst those aqueducts which continued in use. Of the aqueducts which continued working (Almuñécar, Barcelona, Ceuta, Conimbriga, Córdoba, Lugo, Mérida, Segovia, Seville, Tarragona, Valencia and Zaragoza), none seems to have undergone any major repairs after the fourth century – the aqueducts seem to have been kept in use through basic maintenance and simple cleaning duties. This cannot have been that expensive, especially if landowners were willing to collaborate in the maintenance of the aqueducts *in rure*. This lack of major maintenance works and repairs, however suggests that, even if there was overall an intention to keep aqueducts functioning, when faced by serious structural problems there was little that could be done.

From what we know from construction and maintenance of public infrastructure in this period, there were skilled builders around. The work on the walls and the bridge of Mérida (fig. 5.2), the episcopal complexes of Barcelona and Valencia, the new suburb of Toledo, fortifications in Cartagena, and a long *et cetera*, all indicate this. Nevertheless, specialised builders do not necessarily mean specialised engineers. Perhaps it was not a lack of interest or a lack of funds that lay behind these abandonments, but rather simply a lack of skilled engineers capable of repairing and reconstructing these structures. The exceptional example of Reccopolis could, however, indicate that there was a demand for such skilled workers.

#### **5.1.4 Specialised workmen (or the lack thereof)**

The end of highly specialised craftsmen in the west during Late Antiquity is not a new issue, but still it deserves more discussion.<sup>25</sup> The end of many of these aqueduct case-studies can be linked to major damage caused by the lack of proper repairs, even if they derive from long-lasting minor problems. Disregarding the regular maintenance that Spanish aqueducts may have been going through in their last centuries of existence, most of these structures were over three centuries old by Late Antiquity, and the cumulative effect of age, decay and minor problems could readily have caused their end (table 2).

Despite our fragmented knowledge of most of the Spanish aqueducts, as mentioned above, there is a lack of evidence for late antique repairs or reconstructions, evident in other European examples.<sup>26</sup> This means that by the sixth century, when we find again new attempts to repair old, and construct new, aqueducts (at Mérida and Reccopolis), over a hundred years had passed from the last major repair, which could be linked to the total loss of the technological skills necessary to maintain or repair an aqueduct.

Let us return to Mérida, where new buttresses and reinforcement arches were added at the Proserpina (Los Milagros) aqueduct during the mid-Empire (figs. 2.1, 3.32, 3.38). These works were large scale structural repairs, carried out to reinforce the aqueduct pillars. This Roman work contrasts greatly with the Visigothic (sixth-century?) repairs that have been identified on the same aqueduct, built in a completely different construction technique (reusing different-sized ashlar and bricks whenever

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<sup>25</sup> Ward-Perkins 2005.

<sup>26</sup> E.g., Martínez Jiménez 2010 for Rome; Rigal 2011 for Cahors.

gaps could not be filled), which, according to Miguel Alba, corresponds to other Visigothic constructions of Mérida.<sup>27</sup>

The Visigothic repairs consisted of the reconstruction of one of the pillars that had collapsed, but there is no evidence to suggest that the arches or the conduit were ever finished (fig. 3.39). The aqueduct's failure can be inferred from the lack of water-consuming buildings datable to the sixth century inside the walls of Mérida. Furthermore, the reconstructed pillar, located close to the surviving section of Roman arches, is separated by a gap from the settling tank. In this gap there are no traces of pillars or arches, so it is possible that these were never built (fig. 5.3). As Miguel Alba points out, this failed attempt at restoration, that there was the will and intention to preserve and hopefully restore the aqueducts one day, but there was a lack of knowledge and skill, or perhaps resources to complete the job.<sup>28</sup> Re-erecting the pillars (and the arches?) may have been a great achievement, but we cannot confirm that a successful restoration of the conduit took place. Levelling and creating a conduit that would fit into the old Roman one required a knowledge of engineering which I doubt was available in Visigothic Mérida.

Similarly, the re-lining with *opus signinum* of the *specus* of the aqueduct of Segovia or of the pool of the *nymphaeum* in Valencia were feasible repairs which were successfully achieved, but this does not mean that their builders could have built an aqueduct. *Opus signinum* was indeed very common in this period, even if it was less refined than it had been in the Roman past, and despite its increasingly popular use as a luxury pavement in churches and palaces, it was still used to line hydraulic infrastructure.

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<sup>27</sup> Miguel Alba (pers. comm.), similarly discussed in Alba Calzado 2004: 255 and Alba and Mateos 2008: 268. See above, section 3.4.3.2.

<sup>28</sup> Cf. Martínez Jiménez 2012: 35-6. It would anyway be unwise to start a project if either (or both) resources or skills were lacking.

At first sight the aqueduct of Reccopolis, which was built *ex novo*, might suggest the survival in Iberia of considerable technical expertise. The context, however, is unique – Reccopolis, as a royal foundation, could have access to a proper engineer. The whole construction of Reccopolis is a feat of Visigothic construction, but the presence of the aqueduct raises the issue of who built and designed it. The construction techniques and the materials are clearly local in nature, but, in the complete absence of similar works in Iberia, the person responsible for the design and construction is unlikely to have been local – he may rather have been Byzantine. After all, Liuvigild was building his city in the year of his *decennalia*, and at a time in which hostilities against the Byzantine province had ceased.<sup>29</sup> This would mean that Roman engineers could have collaborated or even been sent to Liuvigild by the imperial administration.

Engineers and architects are known to have been sent at request to foreign rulers (including potential enemies) by the emperors. Even itinerant specialised masons are known for Merovingian Gaul.<sup>30</sup> In the late sixth century, Bayan I, the Avar khagan (king), requested builders from Constantinople who would build him *a palace and a bath* (which they did), although he then forced them to build a bridge over the Danube.<sup>31</sup> Similarly, and perhaps more closely related to the Reccopolis example, early in the seventh century Pope Gregory requested from the imperial authorities for the *vir clarissimus* Augustus (presumably with his team of workers), to be appointed as manager of the aqueducts, as he was the most capable man available in Ravenna<sup>32</sup> – perhaps indicating that in Rome able men who could manage water supply were rare, for the aqueducts were then almost collapsing:

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<sup>29</sup> John of Biclar, s.a. 570.2, 571.3; *HistGoth* 49.

<sup>30</sup> Lebecq 1996: 298-9.

<sup>31</sup> John of Ephesus VI.24; cf. Menander Protector XXV.1 and footnotes 174, 296 and 316 in the Blockley edition.

<sup>32</sup> Augustus, *vir clarissimus*, worked for the byzantine urban magistrates of Ravenna (Gregory, *Epist.* IX.4)

*Praeterea ante aliquantum temporis experientiae tuae praeceperamus ut apud filium eminentissimum nostrum praefectum [paraetorium] ageret, quatenus cura formarum committi Augusto viro clarissimo debuisset, pro eo quod omnino sollicitus atque strenuus est. (...) Nam sic despiciuntur atque negleguntur formae ipsae, ut, nisi maior sollicitudo fuerit intra paucum tempus omnino depereant.*

“Furthermore, some time ago we ordered your Experience to take action before our most eminent son the [Praetorian] Prefect, so that care of the aqueducts (*cura formarum*) might be entrusted to the *vir clarissimus* Augustus, since he is a man of real concern and energy. (...) For the aqueducts themselves are so despised and neglected that, unless great concern is shown over them, they may shortly be totally destroyed.”<sup>33</sup>

A century earlier, Theoderic could still muster enough resources and skilled men to preserve and repair the aqueducts of Rome and Ravenna – but even then, as evidenced from one of Cassiodorus’ letters, a water expert had to come from North Africa at one point.<sup>34</sup> These examples do not demonstrate that Byzantine engineers were sent to Liuvigild, but they show that these skilled builders moved around the Mediterranean with some ease, so making their way to Reccopolis would not have been that difficult.

The plausible presence of foreign engineers in Spain would have only affected the construction of the Reccopolis aqueduct (unless they were also responsible for the failed attempts in Mérida), so should be considered as an exception rather than as the norm. These highly skilled craftsmen, even if they were common and abundant in the

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<sup>33</sup> Gregory, *Epist.* XII.6.71-81 (=XII.24 of the *Patrologia Latina* edition), dated to AD 602.

<sup>34</sup> Cassiodorus, *Variae* III.53, although not an aqueduct expert.

provinces in the first century AD, were too specialised and too focused on their own trade to adapt and survive throughout the fifth and sixth centuries.<sup>35</sup> This, in turn had, a negative effect on aqueducts, which very occasionally needed a thorough repair, because even if there were funds, then there was nobody around who could fix them.

## 5.2 URBANISM AND AQUEDUCT CONTINUITY IN LATE ANTIQUITY AND THE EARLY MIDDLE AGES

The relationship between aqueducts and Roman urbanism has been stressed and discussed at length in various publications<sup>36</sup>. After several centuries of coexistence, the fate of aqueducts and Roman townscapes surely must have been very closely knitted together, and it is worth exploring this further into detail. To what extent did towns depend on aqueducts for their water supply? What impact (if any) did the breakdown of aqueducts have on towns? Did old Roman distribution patterns continue unaltered into Late Antiquity?

### 5.2.1 The persistence of a public water supply

There is very limited evidence of the continued presence of public fountains fed by piped water in late antique Spain such as had characterised Roman cities, with their fountains set in the street or in public squares. Perhaps the most interesting one is that with a fifth-century inscription from Tarragona, which I have claimed above belongs to a fountain.<sup>37</sup> Similarly, the *nymphaeum* of Valencia was kept in use and accessible. One last example could be the fountain at the bus station in Córdoba, if we admit Ángel

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<sup>35</sup> As Trajan said, *Nulla provincia est, quae non peritos et ingeniosos homines habeat* ("There is no province which lacks skilled and clever men") Pliny, *Epist.* X.40.

<sup>36</sup> Wilson 2012 –for a recent example.

<sup>37</sup> Section 3.5.3.1; *CIL* II 4109.

Ventura's interpretation of the Arabic name *'ayn funt awrya* as indeed deriving from the Latin for "golden fountain" or *\*fons aurea*, indicating the presence of a fountain and not referring to the bronze outlets of the *castellum aquarum*.<sup>38</sup> All of these were in use into various stages of Late Antiquity. Besides these examples of functioning fountains, we have a less certain example in the various fountains of Mérida, which went through two phases of transformation in Late Antiquity. They first were stripped of their marble decorations while they were still functioning, and only once the aqueducts were out of use were the lead pipes finally removed.<sup>39</sup>

A short note on *new* public fountains should be included, especially for the Islamic period, because there are a few instances of new ones being built. Firstly, the street public cistern of Reccopolis should be mentioned, because it fulfilled the function of a public fountain, similar to the Roman *laci* from Ostia. As has been explained above, the large covered vat found on the main street of Reccopolis is considered to have been a public cistern (fig. 3.60), although no indication on how it was filled is given in the literature.<sup>40</sup> Considering its position (at a lower level than the palace complex), it is possible that the cistern was filled by aqueduct water, especially because it is not adjacent to any roofed surface big enough to have secured some water (see fig. 3.59). This is a system parallel to that suggested for Tarragona, but functioning in a way similar to the large public cisterns located at El Tolmo (although these were clearly fed from roof water). In the Islamic period, and especially in Córdoba, several new fountains were built, especially at the Mosque, but also outside the alcázar. The alcázar fountain (the so-called "fountain of the pipe" in the *Chronicle of a-Nasir*) was fed by the Alcázar aqueduct, and is mentioned as existing in the tenth century, though we do

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<sup>38</sup> Section 3.3.3.1.

<sup>39</sup> Alba Calzado 2007: 163; Mateos et al. 2002: 77. By the seventh century the fountains had been completely demolished to foundation levels, lest they would obstruct traffic through the (narrowing) streets of Mérida.

<sup>40</sup> Olmo Enciso 2006: 94.

not know when it was built; it seems to have been fed by the overflow (the unused) water of the alcázar itself.<sup>41</sup> Lastly, the mosque fountains built in the 960s were (and are still) fed by the new conduit which tapped the water away from the Western aqueduct, rendering the former useless. Despite their obvious public nature, the mosque fountains have an essential ritual and sacred meaning, and it is doubtful that these were used as public sources of drinking or domestic water – similar to the ritual use of water in Christian complexes, such as the fountain at the church of Saint Acisclus, also in Córdoba, where the Visigothic soldiers took refuge in AD 711.

Overall, the preservation of the public fountains can be seen as an indicator of a continuing care (if not active acts of preservation) towards the public hydraulic infrastructure. This can be interpreted either as showing public concern (i.e., administrative) consciousness towards the water supply system, from either the local elites, the state or the Church. This contrasts sharply with some instances of aqueducts being dismantled or quarried away whilst still functioning from outside Spain; this as it happened in Nîmes and Italy.<sup>42</sup>

### 5.2.2 Private consumption and domestic architecture

The evidence for the continuity of private water supply is even scantier than that for public supply, and does not persist beyond the sixth century. In fact, only Mérida, Seville, and Barcelona offer documented excavated examples of private houses with hydraulic infrastructure.

On the one hand, we know of the continuity of various baths in urban *domus* of Barcelona, including those of Bisbe Caçador and Pati Llimona, in use into the sixth

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<sup>41</sup> See section 3.3.3.3 and Ventura Villanueva 2002: 126.

<sup>42</sup> Fabre et al. 1991b; *Variae* II.7.

century, and seemingly part of large single-family houses.<sup>43</sup> On the other, we have the houses of Mérida, like those excavated at the site of Morería, which in their fifth-century phase lacked piped water and were fed by a single well, and ended up being subdivided into several dwellings. The House of Cantaber, in Conimbriga, was a large urban *domus* supplied by pipes, and up to the very last moments of its life (early in the fifth century), the pipes were running. In fact, it is possible to tell that the house was abandoned because the hydraulic system failed and flooded the house at one point, never to be repaired.<sup>44</sup> In Seville we have seen the houses at the Plaza de la Encarnación site, which had a lead pipe still in the fifth century.<sup>45</sup>

However, the very same elite *domus* of Barcelona which preserved their baths and their status during the sixth century, and that were building their own private sewers in the fifth, eventually went through a process parallel to those houses of Morería. The sixth century phases of the *domus* of Carrer Bisbe Caçador and Carrer San Honorat show not only an abandonment of the bathing structures, but also a subdivision of the house into multi-family dwellings.<sup>46</sup> This chronological coincidence implies a direct causal relationship between the existence of private luxury *domus* and private baths. This is a wider phenomenon, as evidenced in the towns of the Byzantine province, which show no traces of elite urban housing whatsoever for the Byzantine (post AD 555) period.<sup>47</sup>

In fact, just as the houses of Morería in Mérida focus around the communal well, in the theatre of Cartagena, which had been turned into a dwelling area in the course of the sixth century, a communal well also appears.<sup>48</sup> There is no information about the

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<sup>43</sup> Section 3.2.1.2.

<sup>44</sup> García-Entero 2005: 567.

<sup>45</sup> See above, section 3.8.2.2.

<sup>46</sup> Beltrán de Heredia 2008: 282-3.

<sup>47</sup> Vizcaíno Sánchez 2009: 387-92.

<sup>48</sup> Vizcaíno Sánchez 2009: 400.

*domus* of Barcelona, because the house could not be excavated in open area, but the hydraulic infrastructure of the baths may have turned into a communal fountain, parallel to Mérida or Cartagena, taking advantage of the pipe. The early abandonment of Conimbriga may be the one reason behind the lack of subdivision and communalisation of its water supply evident there. Of Seville not much else is known.

Lastly, the end of public water supply to private individuals may also be behind the appearance of domestic cesspits, a development which is parallel to the decline of public sewer systems. Cesspits are known in dwelling areas in Cartagena (at the theatre) and in Mérida already in the fifth, but mostly during the sixth century<sup>49</sup>. In Reccopolis cesspits appear in the Islamic period, although before that there does not seem to have been any proper covered sewer system.<sup>50</sup>

### 5.2.3 Settlement reorganisation

The availability of drinking water has always been one of the key factors which determined the creation of settlements. The presence of springs, or of a river and a high water table, was normally required from an area on which a settlement could be established, although this was not an imperative.<sup>51</sup> Aqueducts were normally built long after a city had been founded, but when built, enabled its further development and growth.<sup>52</sup> This is especially true for Rome, which built its first aqueducts in the republican period in order to bring drinking water for the population, though later

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<sup>49</sup> There are at least 12 marble sewer lids of late antique date (according their decorations) in the Visigothic Museum of Mérida, which I was able to record thanks to the help and permission of Dr. Rafael Sabio, curator of the National Museum of Roman Art (MNAR). These must relate to small domestic drains (perhaps leading to cesspits?) rather than to main sewers, which we know were largely out of use.

<sup>50</sup> Sanz Paratcha 2008. Only open drains are known.

<sup>51</sup> Especially because the Romans' mastery over aqueduct construction enabled them to settle wherever they thought it suitable, without the need of an immediate water source; Ward-Perkins 1974: 30-4.

<sup>52</sup> Hodge 1989: 128-9.

aqueducts can be linked to the construction of large bath complexes or the *naumachia*.<sup>53</sup> Similarly, Constantinople needed its aqueducts because local sources could not sustain such a large population.<sup>54</sup> In Rome, once the aqueducts ceased to function many of the hills were abandoned, because water was more readily available in the Campus Martius, the heart of Medieval Rome. On the Janiculum, during the fifth and sixth centuries, the inhabitants had to rely on illegal stealing of water from an underground aqueduct in order to have a reliable supply, but after the Gothic Wars this was not an option.<sup>55</sup>

But are the large cities of Rome and Constantinople fair comparisons? How much did small provincial towns, like our Spanish case studies, really need piped water? Recent studies on the evolution of settlement patterns in Crete indicate that in at least three cases (Polyrhennia, Cnossus, and the provincial capital, Gortyna) the main settlement shifted to a lower location once they got an aqueduct, indicating that piped water became essential for the new urban development.<sup>56</sup> Similarly, the answer for the question in Spain would be ‘possibly in only a few cases’. However cases like Rome, where the absence of piped water caused a shift of the inhabited area, are more common. The spread of settlement patterns in a context in which the lack of aqueduct supply meant that dense settlement was not as easy or healthy may thus respond to a need to maximise the water resources.

#### 5.2.3.1 Settlement polarisation: Tarragona and Segovia

Two of the clearest examples of this reorganisation of the inhabited area can be seen in Tarragona and in Segovia. Tarragona had a very particular urban tripartite distribution (upper city, lower city and harbour suburb; fig. 3.43) in the Classical period,

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<sup>53</sup> Hodge 2002a: 46-7; Stambaugh 1988: 130-1; cf. Frontinus *De Aquis* I.5-10 (republican conduits) and 11-13 (early imperial).

<sup>54</sup> Crow et al. 2008: 9.

<sup>55</sup> Martínez Jiménez 2012; Wilson 2000.

<sup>56</sup> Kelly 2006.

which then changed dramatically in Late Antiquity.<sup>57</sup> The archaeological record shows population decline and the abandonment of large areas of the city during the Visigothic period. These changes were largely the result of underlying political and economic decline, but the details of how they affected the topography of Tarragona were probably influenced by the survival of one of its aqueducts.

The upper town had been the centre of provincial administration and the focus of political life in the Roman period, with a large forum and a temple complex for the imperial cult. This forum area seems to have kept its public function throughout the fifth century (Tarragona was the last Roman town to be lost to the Visigoths in AD 475), but soon thereafter it was encroached upon, losing its public function. However, during the sixth century there is evidence to suggest that the episcopal complex was moved here from the Francolí suburb to this area; the principal reasons for this move were probably because the new site was located inside the walled enclosure, because it was built into the old centre of Roman power (claiming continuity of authority), and because it was close to several large walls and other impressive structures (including large cisterns) that have been excavated close-by.<sup>58</sup> However, I believe that the presence of a functioning aqueduct feeding this area was also an important factor: the aqueduct was an extra element of prestige for this area, if compared to the rest of the city which aqueducts did not any longer supply at this time.

The aqueduct in the upper town was not only adding ‘extra points’ to the attractiveness of the area, but it was also, to a large extent, enabling settlement there (until a network of cisterns was built). The upper town is too high above the water table to enable wells to be dug, so only aqueducts and rain water cisterns could supply water to this area. In fact, as explained above, the aqueduct and some of the cisterns worked

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<sup>57</sup> Macias Solé 2008: 296.

<sup>58</sup> Bosch et al. 2005.

perfectly together as part of a single water supply system, rather than two independent ones, although inevitably cisterns ended up being the main water source beyond the late Visigothic period.

These two elements (water availability and an element of prestige) may also be behind the development of the harbour suburb. The harbour suburb, which expanded from the mouth of the Francolí river and the Christian complex to the extra-mural harbour, was constantly inhabited in this period, albeit not very densely. In this area wells are very numerous, and it is here where the fountain at Carrer Pere Martell is located.<sup>59</sup> This area, however, was outside the walled enclosure of the city. In fact, the lower city, fed by the *cuniculus* (out of use by the 4<sup>th</sup> c.) and by the Gaià aqueduct, seems to have been mostly abandoned.<sup>60</sup>

This situation had a long-term impact on the urbanism of Tarragona, because after the seventh-century abandonment of the harbour suburb, the town of Tarragona was limited to the upper town, which was easily defensible throughout the Middle Ages and the modern period.<sup>61</sup> There was always a minor settlement at the harbour, but it lacked the entity of a proper suburb. This is confirmed by the sixteenth-century star-shaped fortifications built around the old Roman upper city, which limited the town to the perimeter of these walls, and it was not until after the Peninsular War (1808-1814), in the mid-nineteenth century (figs. 5.4a-b), that the old lower town, between the harbour and the upper town was again inhabited.

As for Segovia, its aqueduct seems to have been in use throughout the Middle Ages. However, there is little known archaeologically about the upper town in this period, but the proliferation of nearby necropoleis of Visigothic date, together with the existence of a bishopric, may indicate some sort of settlement continuity in the old

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<sup>59</sup> Above, section 3.5.2.4.

<sup>60</sup> Burés et al. 2000: 79.

<sup>61</sup> It became a largely semi-rural area outside Tarragona: Macias Solé 2008: 296.

upper city.<sup>62</sup> The settlement seems to have been reduced to that area, due to the continuing water supply and the natural fortifications of the enclave. When describing the city in the thirteenth century, archbishop Ximénez de Rada still mentions it as a high-ground settlement, indicating where the main settlement focus was, despite the already existing suburbs originated around the new Romanesque (12<sup>th</sup> c.) churches of Saint Martin, Saint Michael and Saint Andrew.<sup>63</sup> As opposed to Reccopolis (but similar to Tarragona), in Segovia the main focus remained unchanged from the Roman into the Medieval period, which means that the settlement has continued on the same spot. However, the aqueduct of Segovia was still in use during all the Middle Ages, and in this case, the aqueduct was a main reason linked to the development of Segovia's urbanism: the city grew along the lower reaches of the aqueduct from which they could tap water out of the conduit. This is still reflected in modern street names adjacent to the aqueduct: Calle de [los] Cañuelos ("Water-pipe Street") and Calle de los Batanes ("Fullers' Street"), which date at least from the late Medieval period (fig. 5.5).<sup>64</sup>

### 5.2.3.2 Relocation?: Toledo

Toledo, built on a granitic dome on a bend of the Tagus river in central Spain, was a rather small and unimportant settlement in the Roman period, which seems to have gained importance as the centuries passed. The city had an aqueduct, which brought water from quite a considerable distance (almost 75km) from a dam south of the river, and on reaching the city, crossed the Tagus on a siphon bridge, a considerable feat of

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<sup>62</sup> Tejerizo García 2011.

<sup>63</sup> *History of Segovia*, as presented by the Segovia City Council: <http://www.segovia.es/pe/002ai%20memorias/historia%20y%20arqueolog%C3%ADa/HISTORIA%20DE%20SEGOVIA.pdf>

<sup>64</sup> This practice of stealing water is recorded even by Somorrostro (1861), as recorded in Fernández Casado 2008 (1972): 114.

engineering.<sup>65</sup> It became the capital of the Visigothic kingdom at some point during the mid-sixth century, but by this stage, the old aqueduct had ceased to function, as the fourth-century abandonment layers of the terminal cisterns, known as “the caves of Hercules” (including the minor ones at Delegación de Hacienda and Calle Tornerías), and one of the upper town baths seem to indicate.<sup>66</sup> This means that by this stage the upper city could only rely on rain water cisterns for its supply, although we know from the Islamic period onwards of the existence of the *assaqqá* (“azacán” in modern Spanish) – watermen who carried jars of water from the river up to the city on donkeys<sup>67</sup> - and of wells which did not provide drinking water.<sup>68</sup>

Having said this, the archaeology of the old upper city of Toledo is largely unknown, as it has been constantly inhabited ever since it was first settled, but the area immediately outside the city, the *vega baja* (“lower meadow”) has not been touched by modern building. In fact, it has been a field ever since the ninth century, and despite being so close to the monumental centre of Toledo, the construction in the eighteenth century of the Royal Weapons Factory protected the area from any urban development until 2006. It was then that the emergency excavations prior to the construction of an important department store uncovered the remains of a large suburb dated to the Visigothic period.<sup>69</sup>

This suburb, which not only has an organised street grid, but residential and industrial quarters as well, is over 70ha in extension. There recent excavations have revealed that there were also some very important buildings built in ashlar blocks, floors

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<sup>65</sup> Aranda et al. 1997: 137-64, 323-30; Bestué and González 2006; Fernández Casado 2008 (1972). Although recent surveys seem to have identified a second Roman conduit approaching Toledo (the Pozuela conduit), it is not known where it went to (Arenillas and Barahona 2008).

<sup>66</sup> Aranda et al. 1997: 69, 73-4, 77, 336.

<sup>67</sup> Fernández Casado 2008 (1972): 210.

<sup>68</sup> In AD 1605 three public wells are recorded in Toledo, at Barrionuevo, San Salvador and Pozo Amargo (literally, “bitter well”), and all of them are mentioned to have *aguas salobres* (“salty water”); Francisco de Pisa 1605, book I, chap. VI, fol 15, vto., as quoted in Porres Martín-Cleto 1991: 113.

<sup>69</sup> Olmo Enciso 2009.

paved in *opus signinum*, and other elements which have linked this site with the *praetorium suburbanum*, the Visigothic palace complex and its churches mentioned in the sources.<sup>70</sup> This suburban development can be archaeologically dated to the second half of the sixth century, and was built on top of a series of loosely connected Roman suburban villas; it was finally abandoned in the ninth century, after the conquest of the city by Abd al-Rahman II during the muwallad revolts.

The choice of the Tagus meadow to establish the new centre of Visigothic power has been explained on various grounds, including its vicinity to the old circus, the possibility of displaying the power of the new regime in the open fields (as opposed to the allegedly crowded upper city) and the presence of the suburban churches.<sup>71</sup> Nobody has as yet considered the possibility of direct access to water, something impossible in the upper city. Several wells and cisterns are known from the excavations, which are located very close to the river (fig. 5.6). If there was an imitation of the imperial court ritual and display in the court of Toledo, then water surely must have played an important role in this palatine complex (baths?); something which could not be easily done in the upper city. The choice of the lower city and the availability of water can be further linked by the events which followed the Islamic conquest. The Umayyads established a fortress in the upper city, and soon they built a complicated system of concatenated lifting wheels which fed water from the Tagus directly into the alcázar. This system was later preserved and maintained in the Castilian and Habsburg periods (fig. 5.7) but it only fed the fortress, and not the city.<sup>72</sup> It does not seem to be a coincidence that the only historical period in which there was not a direct water supply

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<sup>70</sup> Fuentes Domínguez 2006; Olmo Enciso 2009:74-83. One of the churches has been positively identified underneath the small chapel dedicated to 'Christ of the Meadow' ("Cristo de la Vega").

<sup>71</sup> Fuentes Domínguez 2006; Olmo Enciso 2009.

<sup>72</sup> These water wheels are already mentioned by Idrisi in the twelfth century (Aranda et al. 1997: 138-9), and were later expanded (or repaired, or substituted) in the sixteenth century by the famous "Artificio de Juanelo", named after Philip II's engineer Gianello ("Juanelo") Turriano. They were finally abandoned partially because the town council refused to pay for the maintenance of a water supply which only benefited the Royal palace.

to the upper town (the Visigothic period) is the period in which the centre of power is moved away from the upper city and its natural defences.

It is difficult to assess the impact this new suburb had on the upper town, because nothing is really known about it, but there was certainly a new settlement pattern in the town in order to accommodate the incoming population linked to the Visigothic royal administration.

### 5.2.3.3 Urban necessity: Reccopolis

Perhaps closer to the example of Tarragona, Reccopolis is a case study in which it can be argued that the presence of an aqueduct was actually vital for the location of the settlement. Reccopolis had a brand new functioning aqueduct in this period, which supplied water to the main settlement, located on a hilltop, at which there is no other evident source of water (similar to Segovia and Tarragona).<sup>73</sup> This is, however, a proposal based on the limited archaeological evidence.

For Reccopolis, it could be argued that the aqueduct was built as a necessary infrastructure for the city, as the ex-novo settlement on a hilltop is too high up from the water table. The public cistern excavated on the main street leading to the Palace complex, indicates that its houses and the palace relied on a public supply system which, as mentioned above, is believed to have been fed by the aqueduct.

Arguing *a posteriori*, the strong correlation between the settlement of Reccopolis on the hill and the presence of the aqueduct can be further inferred from the evolution of the settlement in the area. Whereas in Tarragona the centre of power was the upper town even after the end of the aqueduct supply, in Reccopolis the centre of power was moved to a nearby location, where the modern village of Zorita de los Canes is located. This

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<sup>73</sup> See above, sections 3.6 and 3.7.

relocation took place during the eighth and ninth centuries, as the Umayyad administration centred the territorial administration of the district (*kura*) of Reccopolis (*Racubel*) on a new settlement (“Zurita”, a *jund*, or administrative military garrison), located on a hill opposite the Visigothic town (fig. 5.8).<sup>74</sup> There are large cisterns to supply the garrison in the fortress, but the actual population settled on the hillside and next to the Tagus river. The growth of Zorita paralleled the constant decline of Reccopolis, which at a given point was reduced to the Palace complex (now itself turned into a fortress), and by the mid-ninth century was already abandoned. It has been assumed that the aqueduct was out of use by this period.<sup>75</sup> A new administrative and political situation favoured settlement elsewhere, but it is reasonable to suggest that the readily-available water provided by wells and springs also favoured Zorita as a settlement location, as has remained until now (Zorita still exists as a village, Reccopolis is a ploughed field with ruins).

It would seem, overall, that the urban nature of Reccopolis (and its continuity as a settlement) was closely linked to its aqueduct, which in turn was dependant on the authority that built it. Once this authority disappeared, the town and its water supply vanished as well.

#### 5.2.3.4 Córdoba

In Córdoba we see both processes of relocation and suburbanisation, as suggested by the archaeological evidence. Despite knowing through archaeology of the presence of suburbs (*vici*) in Córdoba for the Roman period, the Latin sources are silent on them,

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<sup>74</sup> Sanz Paratcha 2008.

<sup>75</sup> Excavations were planned to take place in September 2013, but due to administrative problems, they did not take place.

except for the one mentioned in a Roman inscription.<sup>76</sup> Only very late, in the Islamic period, do we see several being mentioned: the suburb of *Saqunda* ([Corduba] *Secunda*) was perhaps one of the most important, located south of the river, which is where the Muslim troops first settled.<sup>77</sup> Other important suburbs of the Islamic period were those of the *Axerquía*, east of the city, which became the core of Caliphal Córdoba, and was as large as the *medina*, or old Roman city. But perhaps what characterised the hinterland of Córdoba in the Umayyad period were the Umayyad estates (*almunias*) and the city of Madinat al-Zahra (fig. 5.9). However, for our purposes, the most important suburb is that located north west of the city, where the Mozarabs (the Christians) settled.

The old Roman western *vicus*, located outside the city wall, was largely abandoned in the fourth century, and the Latin chronicles, in their brief mentions of this area of Córdoba, only talk about the church of Saint Acisclus, around which Agila stationed his troops during the siege of AD 550, and where the last Visigothic soldiers held their ground during the siege of AD 711.<sup>78</sup> Archaeologically speaking, the large late Roman complex of Cercadilla (which can be identified with Saint Acisclus' complex and probably the fifth-century episcopal complex) was located just north of the western *vicus*. Cercadilla was still active after the siege of Agila, when it became a centre for *ad sanctos* burials. This Cercadilla or north-western *vicus* would later develop into the Mozarabic suburb already mentioned.<sup>79</sup> The presence of large structures linked to the old Roman complex provided a wide area where to settle, but also important, almost certainly, were the still functioning Cercadilla and Western aqueducts. It can be argued that, despite the existence of many other attractive elements, available water was one of the key features of this suburb. Although the construction of the AVE (high-

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<sup>76</sup> *CIL* II<sup>2</sup> 7.274 mentions the *vicus forensis*, the “vicus of the forum”, although this seems to have been an intramuros neighbourhood.

<sup>77</sup> Manzano Moreno 2006: 125.

<sup>78</sup> *HistGoth* 45; Sánchez Ramos 2012: 13, 33; Section 3.3.3.2 above.

<sup>79</sup> Sánchez Ramos 2010: 37.

speed train) tracks in the early 1990s completely destroyed this archaeological area (which was badly excavated and hardly recorded) and prevents us from any sort of confirmation on this aspect, the lack of known late antique burials in this area (beyond the basilica) could mean that there was an inhabited nucleus already in the Visigothic period, in the same way that the presence of burials inside the walled enclosure suggest an abandoned upper town.<sup>80</sup> This contrasts with the decline of the eastern *vicus*, which was clearly out of use by the fourth century, perhaps because of the end of the Arroyo Pedroche aqueduct; and here no pre-existing suburb is mentioned in the Arabic sources.<sup>81</sup>

Regarding the *almunias* (“al-muniya”), these large rural vacation estates were generally built in the broad hinterland by the Umayyad elite, becoming one of the basic rural settlements. In Córdoba, some of the most famous of these estates were directly linked to aqueducts, the clearest example being that of Al Rusafa. Al Rusafa (currently known as Arruzafa, but originally deriving from the Arabic for “garden”, ر صافة) was built by Abd al-Rahman I in the eighth century, and in order to supply his estate, he diverted the Cercadilla aqueduct.<sup>82</sup> Several other later *almunias* are also linked to water conduits, although not to Roman ones, to supply their gardens and houses.

But perhaps the most important suburban development in Córdoba related to the availability of aqueducts was the foundation of Madinat al-Zahra, 8km away from the city. The settlement itself occupies 112ha inside its walled enclosure, of which only the palace has been thoroughly excavated, and what is known about the rest of the city derives from aerial photography. The foundation of Madinat al-Zahra responds more to propagandistic than to real population needs, as it was expected from the Caliph to found a city. This does not mean that the foundation was not functional, because it was

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<sup>80</sup> Burials were recorded, but structures (especially sixth-to-seventh century hovels) were not.

<sup>81</sup> This is also reflected in excavations, as it was all turned into a necropolis, Sánchez Ramos 2010: 33-4.

<sup>82</sup> Section 3.3.3.2.

the place where foreign ambassadors would have been received and it became, to all effects, the administrative capital of al-Andalus. Its links with the caliphs were so tight that once the Caliphate fell in 1010, the city was quickly abandoned.<sup>83</sup> As previously described, Abd al-Rahman III reused the Aqua Augusta to supply his palace (fig. 5.10), after repairing and diverting the old Roman conduit, which as it crossed the town served as a sewer.<sup>84</sup> It is difficult to assess the impact the foundation of the new city had on Córdoba itself, but considering its political importance, it would not be surprising if a number of inhabitants of Córdoba moved to the new capital. Certainly for them, the availability of water at the city was not the main concern, but for Abd al-Rahman III the presence of a Roman aqueduct was key in his decision.

Looking now at the relocation of the population, just as in Tarragona, the population of Córdoba slowly began to shift away from the upper (northern) city, on top of a hill (where the original settlement had been) towards the area closer to the river, the bridge, and ultimately, the Visigothic *palatium* (fig. 5.11). This is suggested by the increasing number of intramural burials in the north part of the city, which points to extensive abandonment in this part. Whereas the existence of the Christian cult areas outside the walls and the creation of the north-western suburb cannot be chronologically fixed, the gradual abandonment of the upper town predates the creation of the centre of power at the *palatium*. The forum had already ceased to function as such during the fourth century and throughout the fifth it was encroached upon and dismantled (including its fountain) by small houses, and finally turned into a series of dumps and small agricultural patches of land.<sup>85</sup> This reconfiguration of the upper town during the fifth century ended in the sixth with an overall abandonment, parallel perhaps to the development in the south-western corner of the lower city of the episcopal complex and

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<sup>83</sup> López Cuervo 1985; Vallejo Triano 2010.

<sup>84</sup> Section 3.3.2.1.

<sup>85</sup> Márquez and Ventura 2005: 438.

the Visigothic *palatium*.<sup>86</sup> This is further confirmed by intra-mural burials which only appear in the northern half of the city.<sup>87</sup> The population shift towards this area has been explained by the presence of the new centre of power in this area, but in fact it is here that the water table is readily accessible and where the theatre spring is located (and later, the Alcázar conduit), so in this case too water availability may have been a key factor in the relocation, before the construction of the palace and the cathedral.

Even if the first *oppidum* was built on the hilltop for defensive reasons, by Late Antiquity (and parallel to what happened in Rome) security was substituted by commodity (i.e., water) when it came to settlement. It was then only in the Islamic period that the upper town was reoccupied again as the population increased.

#### 5.2.3.5 Other examples: Spain and the West

As has been outlined, there is little we can say about the late antique urbanism of most Spanish cities, as they have been constantly occupied ever since, and rescue excavations only provide a very fragmentary mosaic of the past. However, from what is known from other towns with aqueducts, there does not seem to have been any major changes in the urban layout. For Barcelona, Seville or Ceuta, for instance, it appears that the city, even if going through a series of transformations, remained much the same, limited to the walled enclosure, although it is impossible to give a detailed evolution of the settlement inside the walls in the current state of our knowledge. In other cases, however, this area was reduced, as we know from Mérida and Valencia for the sixth and seventh centuries (if not earlier), but it would be difficult to link this solely to the evolution of aqueduct supply.<sup>88</sup>

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<sup>86</sup> Sánchez Ramos 2010: 36, 41-7.

<sup>87</sup> Sánchez Ramos 2010: 39.

<sup>88</sup> Alba and Mateos 2008; Manzano Moreno 2006: 245.

In Barcelona, the large episcopal complex was built exactly where the aqueduct entered the city, on top of an abandoned industrial area, during the fourth century, but it is not until the sixth that there seems to be a direct interest or control of the water supply (baptistery, baths). Similarly, for Valencia, the cathedral complex is built on a corner of the forum, respecting the pre-existing hydraulic infrastructure. We do not know enough of the rest of these cities to make any broader arguments about their development, but yet again the presence of the aqueduct may have been one of the several reasons which led to the establishment of these new centres of power (which were in turn foci of urban development). This would be perhaps parallel to the development of Ayasoluk at the site of the Justinianic Basilica of St. John in Ephesus, where a settlement developed not only because of the presence of the large complex, but also because there was an aqueduct there, without which no settlement would have been possible.<sup>89</sup>

Lastly, considering the evolution of settlement patterns and water availability, the foundation of Oviedo by king Alfonso II in the eighth century was based on a pre-existing monastic structure, later expanded into a royal palace complex, but there was a nearby spring that supplied water to the population, which was monumentalised during the ninth century: the Foncalada.<sup>90</sup>

It should be mentioned that these transformations are not unique to Spain. Processes of relocation and shrinking of the inhabited area are very common in the West in this period, and in some cases can be further linked to the presence (or absence) of an aqueduct supply. The Moroccan towns of Volubilis and Tangiers were both supplied by aqueducts, and both suffered a reorganisation of the urban area. The former was reduced in size already in the fourth century, when a new wall was built across the old city, leaving the aqueduct outside (fig. 5.12). The aqueduct had been by then repaired several

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<sup>89</sup> Foss 1979: 92, 183-4.

<sup>90</sup> Rías 1997; García de Castro 1995: 493-501.

times, so it was probably not fully functional by the fifth century, when the whole section of the town formerly fed by it was thoroughly quarried.<sup>91</sup> The latter (Tangiers) seems to have been reduced to a small area around the harbour (which was still functional) which included a set of baths. These were linked to an aqueduct which the sources mention as still functioning until the end of the Umayyad power prompted the creation of a new settlement on a hilltop.<sup>92</sup> In both cases it is noticeable how the new focus of the settlements (bridge and harbour) is closely paralleled to the continuity or not of the aqueduct.

Similarly, these patterns are also evident in neighbouring Gaul, where Simon Loseby has identified three main characteristics of post-Roman urbanism (fortification, reduction of the urban area, and Christianisation).<sup>93</sup> Although these transformations are explained in many different ways, an enquiry into the aqueduct evidence highlights that these transformations parallel those of Spain.

We have seen already how Narbonne still had an aqueduct (which had been repaired by the Prefect of Gaul) and baths when Sidonius Apollinaris wrote his poem XXIII.<sup>94</sup> Archaeology further contributes to this image by showing how the walled enclosure was reduced to a fifth of its original size, circling the area around the cathedral (as at Barcelona, Braga and Valencia) and facing the bridge (similar to Volubilis, Zaragoza and Córdoba), although its suburban areas continued to be inhabited.<sup>95</sup> The site of Clos de la Lombarde has revealed how an early imperial *insula* was left extra-muros after the reduction of the walls, and turned into a basilica after AD 420 (fig. 5.13). This rendered useless a hot bathing room, which belonged to the

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<sup>91</sup> In fact, as the Romans abandoned the province of Tingitania the hinterland of Volubilis (with its aqueduct) was probably very difficult to defend: Euzennat 1989; Makdoun 1996; Pons and Lagóstena 2010: 536; Thouvenot 1949.

<sup>92</sup> Gozalbes Cravioto 2000; Pons and Lagóstena 2010: 534; Siraj 1994, 1995.

<sup>93</sup> Loseby 2006.

<sup>94</sup> *CIL* XII 4355.

<sup>95</sup> Solier 1991; Gayraud 1981.

previous structure<sup>96</sup>. Later fifth century, the presence of wells in the immediate surroundings of this suburban basilica, together with the mention of baths by Sidonius in AD 466 would indicate that the aqueduct was repaired and preserved to supply the city centre, and not the suburbs.<sup>97</sup> This would be similar to what we see in Barcelona, Valencia, Seville, Lugo or Tarragona.

Lastly, we have described how the availability of water prompted the reorganisation of the urban layout. A final example to further argue for this is Arles, whose aqueduct was directly linked to the Baths of Constantine, which were in use until the fifth or even the sixth century (which would fit the archaeology of the aqueduct, on which late Roman repairs are identified).<sup>98</sup> The aqueduct fed only the lower town, as its level is not high enough to feed the upper suburbs, which were actually supplied by large cisterns, and from there it seems to have fed the suburb built beyond the Rhône, by means of an inverted siphon.<sup>99</sup> These suburbs were abandoned in the fourth century and the walls were reduced so as to enclose the lower town. Then, in the fifth century, Arles became an important administrative centre, which explains the further development and concentration of the population inside the walled area, but the population remained in this small section, inside the walls where the aqueduct still brought water, and not in the suburbs (fig. 5.14).<sup>100</sup>

#### **5.2.4 Transformations of the hydraulic infrastructure**

Beyond these general considerations in the transformation of post-Roman townscapes according to the availability of aqueduct water, it is useful to briefly have a

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<sup>96</sup> The basilica is dated due to the pottery of the foundations, which includes ARS Hayes forms 61, 67, 73 and 91; Solier 1991: 31-2; 83.

<sup>97</sup> Solier 1991: 15.

<sup>98</sup> Bouet 2003: 41-4; Droste 2003: 70-1; Heijmans 2004: 17-9, 131-2; Raffard et al. 2010.

<sup>99</sup> Heijmans 2004: 19.

<sup>100</sup> Guyon 2006: 111-3; Loseby1996b.

closer look at the secondary use given to the hydraulic infrastructures inside towns. Baths, aqueducts, and conduits were reused for secondary purposes not at all related with water supply once they were abandoned, as it happened with most public buildings that lost their main function in the post-Roman period.

#### 5.2.4.1 Baths and cisterns

As baths and cisterns went out of use, they became large empty buildings, which were reused in various different fashions. Even if most ended up being the site of dumps, some saw a secondary use as dwellings or cult buildings. However, it is important to stress that, in no case was there a conscious Christianisation of baths, or exorcisms as mentioned in eastern sources.<sup>101</sup>

In the Iberian Peninsula there are very few examples of such Christian reuse of hydraulic infrastructure (baths or cisterns), and in most cases, there is no hint to indicate a conscious Christianisation of a bathing space as opposed to the construction of a new building (which happens to be a Christian one) on an abandoned, formerly public, structure. The first example would be the conversion of a private cistern into a *domus-ecclesiae* in Mérida during the third or fourth century, but this is both very early for our study and limited to a domestic structure. The construction of the church of Saint Genesius (San Ginés) in Toledo on top of the aqueduct's terminal cistern mentioned above, cannot be seen as a deliberate act of Christianisation, and the cistern was surely already out of use when the church was built on top of it. Similarly, the conversion of one of the baths of Ampurias (in the province of Gerona) into a church during the Visigothic period seems to respond to this pattern of construction on an abandoned

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<sup>101</sup> As it is mentioned by Saradi (2006: 326-7, 336) and Jiménez and Sánchez (2004). Cf. Reis 2004: 45.

building – similar to the construction of a basilica on top of a set of baths at Clos de la Lombarde in Narbonne.<sup>102</sup>

In Seville, for instance, we have seen how the terminal cistern (or one of them), excavated at the Plaza de la Pescadería was turned during the Visigothic period into a dwelling area. The presence of various hearths and dividing walls indicate this (figs. 3.89-91). A similar process is seen at the terminal cistern of Cartagena, although in this case the reuse of the cistern as a dwelling in the Byzantine period took place after a period of abandonment, during which the cistern was filled with fourth-century rubbish.<sup>103</sup> The baths of Braga were also turned into a house during this period.<sup>104</sup>

As far as dumps are concerned, all Roman monuments would appear to have been turned into dumps during Late Antiquity. For hydraulic infrastructure this is very commonly the case, as they were large empty rooms usually underground, which were easy of fill, and usually very conveniently located next to domestic spaces, although it is also possible that these structures were filled on purpose in order to build something on top. The cases of Cartagena or Toledo have just been mentioned, but the *cuniculus* of Tarragona is another good example. The cisterns and conduits of several aqueducts such as those of Ebusus or Tiermes are filled with plenty of fourth century material, which is very useful for dating purposes.<sup>105</sup> Some were used for very specific purposes, as the distribution tank of the Western aqueduct of Córdoba, which was used by a glass workshop as a dump for its refuse.<sup>106</sup>

Lastly, the transformation of baths into burial areas can be mentioned. Baths were large public structures, which once they were out of use and collapsed, became relatively large areas of public land, which *technically* could be used by anyone. This

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<sup>102</sup> Marcet and Sanmartí 1990; Solier 1991.

<sup>103</sup> Aranda et al.1997: 332-3; Egea Vivancos 2002: 16-9; Vizcaíno Sánchez 2009: 363.

<sup>104</sup> López Quiroga 2004: 75.

<sup>105</sup> Argente and Díaz 1980, 1984; Castro and Roig 2009; Díaz and Argente 1984; Martínez 2007.

<sup>106</sup> Carmona et al. 2008.

may be the legal basis for the encroachment onto baths by private dwellings, as already mentioned. But this also meant that they could be turned into a burial area if no structure was built on top, as was the case in Pamplona, where the baths, abandoned during the fifth century were turned into an Islamic *maqbara* during the eighth.<sup>107</sup>

#### 5.2.4.2 Secondary use of conduits

Conduits themselves were perhaps more difficult to reuse, due to their very specific elongated shape. However, because of their almost identical proportions in terms of height and width, it is very common to see conduits reused for burial purposes. Burials inside the *specus* are common in large urban aqueducts, where a human body could be easily fitted without much difficulty. In Rome, at the Crypta Balbi, the conduit was used for burials during the Gothic Wars, and in Spain we see early Islamic burials inside the conduits in Mérida, at the site of Los Bodegones on the Cornalvo Aqueduct.<sup>108</sup>

The usurpation of the aqueducts in the countryside may be the most famous secondary use of aqueducts. Water stealing for private consumption was common in Antiquity, and as has been already pointed out, there was a large corpus of legislation against this. Despite these laws, aqueducts have been in constant use in many places as rural irrigation channels long after they ceased to supply towns. The aqueducts of Almuñécar, Valencia, Sagunto and Reccopolis are known to have been in use into the twentieth century as rural irrigation channels.<sup>109</sup> The aqueduct of Valdepuentes however, as it passed underneath Madinat al-Zahra, was used as the main sewer, not only because it was five metres below the street level, but also because it was still

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<sup>107</sup> Faro et al. 2007/2008: 238-40; Unzu et al. 2006: 432-3.

<sup>108</sup> Delgado Molina 2006, esp. 291. For Rome see Manacorda 2001: 42, 48-9.

<sup>109</sup> Those of Almuñécar or Sagunto are in fact still functioning in sections as irrigation channels, and they still belong to the *comunidad de regantes* (“irrigators’ community”) rather than to any sort of heritage bureau or department.

perfectly functional. Similarly, it is likely that the aqueduct of Casa Herrera in Mérida may have been used to supply the rural settlement which grew up around the basilica.<sup>110</sup>

### 5.3 THE END OF AQUEDUCTS AND THE END OF CLASSICAL URBANISM

Even if the towns of Antiquity had no aqueducts at their origin, and existed for centuries before acquiring one, it is evident that after the aqueduct madness of the first and second centuries AD, towns grew used to having them. The profound social, political and economic transformations of Late Antiquity were reflected in a constant transformation of urban layouts and townscapes. Aqueducts, as an integral aspect of urbanism, were affected by these changes.

#### 5.3.1 The emergence of new urban patterns

Roman urbanism cannot be seen as something static, as it was in constant change, just as our own modern cities are. However, the image of first- and second-century Roman towns is so powerful that it is difficult to see a Roman town in any other way. The fact is that from the fourth century onwards, towns entered a different dynamic, and from then on, their evolution responded to patterns unlike those which framed the early Roman town.

Perhaps, one of the most important transformations, which actually can be used to explain some of the issues proposed above, is the political reorganisation of town administration during Late Antiquity.<sup>111</sup> This readjustment substituted the old traditional magistracies and the curial administration by a centralised one, controlled by the *comes* (count), appointed by the central administration, and the bishop. This meant that

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<sup>110</sup> At least in its very early phase (Sastre and Martínez 2012; 2013).

<sup>111</sup> Liebeschuetz 1992.

traditional spaces of public politics, like fora, basilicas or *curiae*, ceased to fulfil an active function, and became redundant (which can explain why they were dismantled and encroached upon). The new political situation required a new public architecture, and this became increasingly true in the Visigothic state formation period. This is reflected in the renovation of walls, the construction of new palaces and new towns (Reccopolis and El Tolmo, for example, but Falperra, Victoriacum and Ologicus too), not only sponsored by the monarchy, but also by the new service elite.<sup>112</sup> This process of transformation continued during the Umayyad period, when a yet further political reorganisation prompted the creation of an utterly new architecture of power.<sup>113</sup>

Besides these political transformations, which affected the evolution of public architecture, a key factor to consider are religious transformations: from pagan to Christian and then to Islamic. The transformation of religious space did not only affect cult buildings, but also their environments. This is especially true for the evolution of Christian cult centres, which in the early stages of urban Christianisation were located outside the city walls, in the burial areas linked to a martyr's grave. These could in the end develop into a suburb, as in Tarragona, Córdoba, Metz and Tours.<sup>114</sup> Linked to the development of new architectures of power, the construction of episcopal complexes is one of the key developments in public monumentality, because these became the new, visible centres of political and religious power. They appear in Barcelona, Tarragona, and *Egara* (Terrasa, in Catalonia), and can be inferred in Valencia, Córdoba and Mérida. Furthermore, Christian constructions and other pious acts were the only possible niche in which old euergetic practices could be displayed.<sup>115</sup>

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<sup>112</sup> Fernández et al. 2013; Martínez Jiménez 2013; Olmo Enciso 2000, 2008.

<sup>113</sup> Martínez Jiménez 2013.

<sup>114</sup> Halsall 1996.

<sup>115</sup> One particularly late euergete is the *vir inlustris* Gudiliuva, who dedicated three churches in the early seventh century: *IHC* 115. This has been much more thoroughly studied for Italy and Merovingian

Lastly, and imposed by the historical context, the economic changes of Late Antiquity and the early Middle Ages should not be underestimated. As the Roman political world disintegrated, so did its economic sphere of influence. The interconnections between regions slowly faded, and the highly specialised systems of production which relied on long distance exchange collapsed to regional or local patterns.<sup>116</sup> In Spain this meant that gradually the different regions became increasingly isolated from each other. Of course, trade continued, and exceptional sites such as Toledo, Reccopolis or Mérida show signs of continuing long distance trade and production of goods, but this slowly faded through the sixth and seventh centuries. The final disintegration of the late Roman models, as continued by the Visigothic kingdom, occurred during the eighth century and under the Umayyad regime; the Umayyads reactivated trade and production, but on completely different grounds. These may have included Mediterranean links, but with different goods, routes and main trading nodes.

In this context of root and branch transformations of the late Roman world, which lasted for several centuries, the Roman townscape changed, attracted by the new foci: the new centres of power and religious complexes which developed especially during the sixth century. However, from the fifth century onwards there had been a trend to smaller towns and reduced wall enclosures, parallel to the development of suburbs around the functioning harbours or emerging religious centres. Paradoxically, towns were becoming smaller, but yet spreading over larger areas. These are processes which took place not only in Spain, but in Italy and Gaul too.<sup>117</sup> Perhaps spreading the population was another way of maximising the water resources.

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Francia, as discussed above: Beaujard 1996, esp. p. 143; Guyon 2006; Ward-Perkins 1984: 31. Cf. Loseby 2006: 67-71.

<sup>116</sup> Ward-Perkins 2005: ch. 6; Wickham 2005: ch. 11.

<sup>117</sup> Beyond the Spanish examples mentioned throughout the thesis, famous suburbs are the harbour suburb of Marseilles (Loseby 1992; 1996a) or the *vicus* of Saint Martin in Tours (Guyon 2006). As for reduced

As far as public monuments are concerned, such as theatres and amphitheatres, despite some dubious sixth-century mentions, these buildings had ceased to function.<sup>118</sup> Many had already been quarried away in the fourth century, as in Córdoba, or else turned to areas of Christian worship, as in Tarragona. These buildings were deeply rooted in earlier Roman cultural traditions and interlinked with old ideas on public munificence and obtaining political benefit from investing in public displays, something which had faded away by the end of the Roman Empire.<sup>119</sup>

The abandonment of fora, basilicas, and theatres implies a deep cultural change in town dwellers, probably derived from the social, economic, political and religious changes which characterised Late Antiquity. A new concept of town emerged as a result of these transformations, although it still was based on a symbolic, administrative and economic importance.<sup>120</sup> In the classical Roman world, baths and aqueducts were an inherent part of culture, so what can archaeology tell us about the relevance of both in this period of transformation and beyond?<sup>121</sup>

As has been stated, aqueducts were not originally an urban need (with only a few exceptions) and they were linked to the development in the provinces of Roman bathing culture.<sup>122</sup> Of course, the development of long-distance aqueduct supply enabled the settlement of areas which would have been discarded as not ideal in earlier periods. In fact, even if they were originally not a basic foundation stone of towns, aqueducts over the centuries became an integral part of urban settlements, permitting several areas to

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walled areas, Clermont is an extreme example of reduction to simply 2ha (Loseby 2006), but it also happened in Milan and Aquileia (Christie 2006: 203).

<sup>118</sup> Notorious are the mentions to Chilperic's amphitheatres (*DLH* V.17, whatever they may have been), the circus of Zaragoza (*Chronica CaesarAugustana* s.a. 504), or that of Arles (Loseby 1996b: 52-3).

<sup>119</sup> Ward-Perkins 1984: 4-10, 14-7.

<sup>120</sup> Again, cf. the Gaulish examples described by Simon Loseby (2006).

<sup>121</sup> There are many references in the classical authors to baths and the "Roman way of life", and almost as many on aqueducts; perhaps the most significant is *CIL* VI 15258: *Balnea, vina, Venus corrumpunt corpora nostra; sed vitam faciunt balnea, vina, Venus* – "Baths, wines and love corrupt our bodies, but baths, wines and love give [us] life".

<sup>122</sup> González Román 2010: 41; Laurence et al. 2011: 30, 95, 203-15.

further develop and to grow, which is evident only after these systems ceased to function, as I hope to have shown with the Spanish examples. As far as bathing is concerned, the changing attitude towards classical bathing as modified by the new Christian moralities and the decay of the infrastructure marked the end of Roman bath culture.

### 5.3.2 Were aqueducts necessary in the end?

It is very difficult to assess whether aqueducts were a truly urban need or simply an extravagant luxury inherited from the Roman past from our evidence. It would be anyway foolish to answer this question with a simple ‘yes’ or ‘no’, ‘black’ or ‘white’ answer, and perhaps it would be wiser to answer on a case-to-case basis. However, for the sake of a possible model, or pattern, some overall conclusions can be drawn from the archaeological evidence.

Aqueducts, as we have seen, enabled the development of areas which previously could not have been urbanised, and for a long time aqueducts were responsible for the cohesive nature of many urban nuclei. Aqueducts therefore acted as a key element in town planning and urban development, especially in the early imperial period. Furthermore, aqueducts prompted the construction of public bath complexes, and public fountains, and greatly contributed to the development of Roman *domus* in the provinces. The very close relationships between these developments, which are all roughly contemporary in their origins, and long-distance water supply systems, are really noticeable, paradoxically, once the latter ceased to function. After the end of aqueduct supplies we see a return to pre-Roman urban patterns, not only in terms of water supply (wells and cisterns), but also in terms of settlement location. The reorganisation of urban settlements according to the availability of water is one of the aspects which

characterises later medieval urbanism into smaller more concentrated areas (even leading to poli-nucleated settlements). It can also be argued that the decline of public water supply systems went hand in hand with a decline in the number of inhabitants which could live in a given town.

In this way, aqueducts were an active component of the “Roman way of life” in the provinces, especially with regards to public amenities. Ongoing aqueducts in Late Antiquity were then monuments which promoted or sustained traditional Roman urban life, especially at an elite level. After all, the old municipal elites had been responsible for the construction of this infrastructure, and were the ones that benefited most from it.<sup>123</sup> Aqueducts were, therefore, not only a vehicle for urban concentration in the Roman period, but also a means of expressing urban elite behaviour. In Late Antiquity, it was necessary for these elites to adapt to the new circumstances and to come up with alternative ways of displaying their status.

There is a symbolic meaning attached to aqueducts, beyond the purely materialistic and tangible benefits for urban development. This perhaps can further explain the continuity of some aqueducts, and the development of new urban patterns, and will be explored in the next chapter.

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<sup>123</sup> Fuentes Domínguez 2000: 138; García-Entero and Arribas 2000.

## **6. AQUEDUCTS AND THEIR SOCIO-POLITICAL IMPORTANCE IN LATE ANTIQUITY**

Beyond the architectural and archaeological impact aqueducts had, it is important to remember that they were built by and for town dwellers; throughout the Roman period the people co-inhabited with aqueducts and benefitted from their water. This was in many cases a very long-lasting relationship from a functional point of view, which greatly modified urban life. Nevertheless, aqueducts also had a very important symbolic meaning, as they were not only a source of pride for those who built them, but also for those benefitting from them many years later. Aqueducts were part of Roman urban pride, and this feeling went beyond the urban elites to the higher echelons of the state and the Church.

It has already been discussed how the continuity of aqueducts affected the urban landscape, and now we will focus on another other main aspect: the relation between town dwellers, urban elites and the state (both the Visigothic and the Umayyad) with aqueducts.

### **6.1 AQUEDUCTS AND THE URBAN ELITES**

For fourth-century urban dwellers, aqueducts may have seemed eternal. As opposed to walls (which were in many cases being built or remodelled in this period) or old fora (which were slowly but constantly going out of use and dismantled), aqueducts stood, had been standing seemingly for ever, and were still functioning. As has become obvious from previous chapters, soon this situation would change. The previous chapter has explored how this affected the development and evolution of urban areas in terms of

settlement location and spaces of power, but it is important to keep in mind that urban dwellers (and especially, the urban elite) were directly involved in the evolution of aqueduct supply systems.

### **6.1.1 An elite water supply system?**

Aqueducts were elite buildings, built by the elite as part of early Roman euergetic practices, and were closely linked to curial administration, as underlined above, so the fate of urban elites and urban aqueducts go hand in hand. In fact their evolution is so closely related that the origins and decline of one of them could be used as a perfect analogy to explain the transformations of the other. This comparison is most clearly exemplified by the chronological correlation between the decline of curial municipal administration and the beginning of the end of aqueducts (from the fourth to the sixth centuries), and firmly based on the nature of aqueduct maintenance and repairs (see table 2).<sup>1</sup>

This close correlation may also be the reason behind the continuity of certain aqueducts linked to certain towns of the Iberian Peninsula, and it is clear from the evidence put forward in this thesis that aqueducts continue mostly in those towns which preserve some degree of administrative and political importance. It would not be fair to claim that Roman water culture was exclusively an elite culture, but it was elite-led, as the members of the elite, following Vitruvian canons, received in terms of private domestic supply a third of the town's aqueduct water.<sup>2</sup> Most of this water was used for private baths and fountains.

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<sup>1</sup> Referring to Roman culture in general, J. Matthews mentions how “[y]et it was in the hands of such men [i.e., the elites], in their enterprise and willingness to play their part in the new conditions of the fifth century that the survival of Roman culture in the west resided” (1990 (1975): 328), which can be perfectly be applied to aqueducts.

<sup>2</sup> Vitruvius, *De Architectura* VIII.6.2: *Ita in medio ponentur fistulae in omnes lacus et salientes, ex altero in balneas vectigal quotannis populo praestent, ex quibus tertio in domus privatas, ne desit in publico –*

Urban aristocrats enjoyed bathing as much as the urban plebs, and many members of the elite had their own private baths. This was only possible after the development of aqueducts, and became an essential part of Roman water culture. In fact, the fourth century saw an increase in the number of private baths. However, in Late Antiquity the failing aqueducts threatened to put this practice to an end. In some instances, such as in Barcelona, the continuity of private baths into the fifth and sixth centuries (those of Pati Llimona or Bisbe Caçador) was possible due to the continuity of the aqueduct.<sup>3</sup> The private baths of Seville dated up to the fifth/sixth centuries at Cuesta del Rosario and the Palacio Arzobispal excavations are further examples of this.<sup>4</sup> Seville and Barcelona are two good examples of towns with administrative or commercial importance and a strong elite, in which aqueducts and private baths continue into this period.

However, there are instances of similarly important towns where aqueduct supply was not reliable (or completely gone), as in Tarragona and Mérida. There, the members of the elite looked for alternatives that would allow them to preserve their aristocratic domestic baths, despite the end of aqueduct supply. As has been shown in section 4.3 above, the end of aqueducts meant that wells became the main source of water: the various late baths of the harbour and Christian suburbs in Tarragona (the fifth-century baths at the Parc Central and the fourth-to-seventh century houses of PERI-2) were all supplied by underground water.<sup>5</sup> The late suburban private baths of Mérida (Calle Nerja excavations, and Resti suburb) were also fed by water from wells, sometimes linked to water-wheels.<sup>6</sup> Note that baths fed by wells were not late antique innovations, as pre-

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“[In the castellum] from the middle receptacle pipes will be taken to all pools and fountains; from the second receptacle to the baths, in order to furnish a public revenue; to avoid a deficiency in the public supply, private houses are to be supplied from the third”. As explained in section 3.4.3.1, Vitruvius’ tri-partite division is wrong, but the truth behind this is that private consumers, after paying a fee, were entitled to a private connection to the main water distribution network.

<sup>3</sup> Section 3.2.1.2 above.

<sup>4</sup> Section 3.8.2.2.

<sup>5</sup> Section 3.5.3.3.

<sup>6</sup> Section 3.4.3.2.

aqueduct baths at Pompeii were fed by similar mechanisms. Neither were they particular to Spain, as the Byzantine baths of Androna in Syria were similarly fed by a well. However, this extra effort and search for water was not always possible, and Mérida offers further examples of this process of adaptation. For instance, at the site of Morería the subdivision of the *domus* into various tenant houses meant that the old *balneum* was also turned into a dwelling area.<sup>7</sup>

The large corpus of evidence for private late antique baths available for the Iberian Peninsula (compiled by Virginia García-Entero in her PhD thesis)<sup>8</sup> confirms that this latter process (abandonment rather than adaptation) is far more common than the continuity outlined above.

### 6.1.2 Elite implications and the new munificence patterns

Aqueducts were perhaps elements of the elite Roman culture, but they were also fulfilling a public service, although in Late Antiquity it is difficult to assess the extent to which elites were willing to preserve them. Table 2 shows very graphically how these elites in many cases ceased to preserve aqueducts.

The transformation of the urban administration and the increasing separation between the large landowning aristocracy, the urban elites, and the central government meant that traditional euergetic practices were increasingly abandoned from the fourth century onwards, and especially after the fifth century.<sup>9</sup> For the landowning aristocracy, it was more beneficial and attractive to engage with the new Germanic states than to bother with local politics, because this let them play much more important roles than those previously available to them as simple provincial aristocrats; it seems clear that

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<sup>7</sup> Section 4.3.

<sup>8</sup> García-Entero 2005.

<sup>9</sup> Cf. With the situation in fifth-century Gaul – Matthews 1990 (1975): 348-9. For Italy and the fourth century, see Ward-Perkins 1984: ch. 2.

urban munificence did not matter much for these issues. Similarly, the urban elites had no incentives to take part in public life now that influence and power was concentrated in fewer, non-curial hands (counts and bishops). Lastly, as we shall see later, the Visigothic monarchy did not have any incentives to promote public buildings either. Added to this, the Church (bishops in particular) stepped forward as the true heir to urban munificence, but from a Christian perspective.

The preservation of Roman town life by urban elites in a few chosen sites is evident, and the preservation of aqueducts, or the attempts to keep them running, is one sign of this. There is some evidence to suggest that these attempts were not simply done for the sake of the elite's own private *balnea*, but with a public purpose in mind, which would indicate a late continuity of euergetic practices. The construction of a new set of public baths behind the theatre in Mérida is very interesting in this respect, which could be paralleled to the obscure mention to "circus" games in Zaragoza in the sixth century, but on a much more solid archaeological basis.<sup>10</sup> These baths (fig. 3.40) were fed by a well, but their size and location do not suggest a private structure. This could perhaps indicate an attempt to continue with traditional euergetic practices, despite the lack of an aqueduct.<sup>11</sup> This seems to be a rather isolated example: traditional Roman munificence practices had declined amongst urban aristocrats, who now chose to show their power and wealth by building churches or private houses, a clear reflection of the rupture between Classical and late antique practices.<sup>12</sup> Besides those of Mérida and those of Barcelona (further discussed below), there are no other known public baths functioning in this period, not to mention newly-built ones. Even so, by the seventh century, church

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<sup>10</sup> *Caesaraugustae circus spectatus est.*

<sup>11</sup> Section 3.4.3.2.

<sup>12</sup> Cf. Kulikowski 2004: 70.

donations by a layman, such as those of *vir illustris* Gudiliuva, were already equally rare.<sup>13</sup>

As far as aqueducts and water supply are concerned, if imperial law (in particular *CTheod XV.2.1 = CJust XI.xliii.1.1*) is a reflection of provincial practices, then we have to assume that it was in the hands of private landowners to repair aqueducts once the municipal administrations had given up their maintenance.<sup>14</sup> Again, it is difficult to say up to what point landowners were willing to take over this responsibility in exchange for tax deductions, especially after the fifth century when the collection of taxes was certainly in radical decline. It was really up to their energetic disposition (or their private interest) to preserve aqueducts running.

### 6.1.3 Social and cultural redefinitions?

From our modern perspective, it seems inconceivable that the municipal authorities or the urban elites would be ready to let aqueducts fall to ruin, but considering the evidence presented, this could have been the case. Despite some very late and exceptional cases of public energeticism, by the fifth and sixth centuries urban elites lacked any incentive to continue with these anachronistic practices. The lack of technical capabilities greatly limited their ability to repair aqueducts, but also the decreasing power and impoverishment of municipal infrastructures meant that town councils had to rely on other patrons to preserve them. Normally these would have been provincial governors or the emperor himself, but after the fifth century this was no

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<sup>13</sup> Mentioned above in section 5.3.1; *IHC* 115 commemorates the construction of three churches, allegedly in rural contexts: [*In nomin]e d(e)i n(o)s(tr)i Ih(e)s(u) Chr(ist)i consecrata est [ec]clesia S(an)c(t)i Stefani primi martyris in locum Nativola ... ab inl(ustre) Gudiliu[va] cum operarios vernolos et sumptu proprio* – “In the name of God our Lord Jesus Christ, this church was consecrated at the site of Nativola to Saint Stephen, first martyr ... by [vir] illustris Gudiliuva with his own slave-workers and money”. Of course this may just be a decline in the epigraphic habit, and the lack of charters for this period prevents any further guesses on private church donation (cf. Italy: Ward-Perkins 1984: ch. II.4)

<sup>14</sup> See section 2.4.4 above.

longer an option.<sup>15</sup> Despite any urban pride and interest the elites may have had, some things were simply beyond their control.

Important towns enjoyed a longer period of aqueduct supply, although in most cases (Barcelona, Valencia, Tarragona, Reccopolis, and Córdoba) either the state or the Church took over the aqueducts.

But overall, it can be said that direct access to water was becoming increasingly a sign of higher and higher status, even more than in previous periods, due to its scarcity. The declining number of functioning aqueducts also prompted changes in more general (non-elite) water culture, even if it was simply because large public baths were no longer available, excepting clerical baths, which may have been of public access, as known for Italy.<sup>16</sup> Bathing was reduced to the domestic space, if preserved at all, or focused on the new Christian centres. The expansion of new Christian morals, which had a lot to say on Roman bathing, may be one of the reasons behind this, but we should not take the text of Christian moralists at face value, as bathing habits may have still been desirable.<sup>17</sup>

It was not simply that the infrastructure was declining, that the new Christian ambience seemed opposed to traditional bathing, or that the elites could not take care of the old baths; one of the key issues is that one of the results of the transformations of Late Antiquity is the transformation of the elites. From the fourth century onwards, they lacked any incentive to preserve traditional public munificence, as they were further and further away from the public municipal administration. During the period of a power vacuum of the fifth century, but especially through the process of state formation of the Visigothic kingdom, the elites had to accommodate to the new situation. As has been

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<sup>15</sup> As the mentioned repairs of the aqueduct of Narbonne by the Praetorian Prefect of Gaul: *CIL* XII 4355. Cf. section 5.2.3.5.

<sup>16</sup> Ward-Perkins 1984: 135-41.

<sup>17</sup> Miller 2000: 32.

said already, there was an almost total rupture between urban/local affairs and the state (excepting in those areas of direct control, such as El Tolmo, Reccopolis, or Toledo), and the only way the local elites had to achieve rank and position was to turn into a service aristocracy. Serving in the public administration (regardless of ethnicity or religion) was the way to obtain power, but this new administration was far removed from municipal issues: it had been the new way forward in the fourth century, and by the sixth century it became a must.<sup>18</sup>

This in turn gives another reason for the decreasing interest in preserving the aqueducts: the Visigothic state (the elites' model to follow?) itself did not take much care in aqueducts.

## **6.2 THE RELEVANCE OF AQUEDUCTS FOR THE VISIGOTHIC MONARCHY**

As far as the Visigothic monarchy was concerned, public monuments were largely a responsibility of the local administration. As opposed to what the Ostrogoths (Theoderic in particular) did in Rome, the Visigothic kings hardly cared for public services or monuments. This is perhaps not simply a matter of interest, but rather a consequence of the differences between late Roman Italy and late Roman Spain. Yet in this context we see the construction of a new aqueduct at Reccopolis.

### **6.2.1 Germanic monarchies and public works**

Cassiodorus in his *Variae* mentions how the old public monuments were an element of pride for the state, and how the pride of the Goths was to preserve the Roman way of life.<sup>19</sup> The concept of preserving the past, the Roman order, and the

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<sup>18</sup> Fernández et al. 2013; Ward-Perkins 1984: 14-9

<sup>19</sup> *Variae*, IX.14.18.

repair of old buildings served Theoderic as a way of presenting himself as a legitimate ruler of Italy, which in turn was sanctioned by the Ostrogothic legislation on this topic, also compiled in the *Variae*.<sup>20</sup> The corpus of repairs on monuments, especially in (but not limited to) Rome and Ravenna, and new constructions is vast, and it was linked to the continuous production of new bricks (fig. 6.1). This attempt to promote the image of the Ostrogothic monarchs as continuators of the Roman order was closely linked to the preservation of monuments, because in Italy the emperor had been much closer and much more involved in this type of works than in the provinces. The clearest way to show continuity and the lack of interruption between the imperial administration and the Ostrogothic kingdom was maintenance and constructions. Furthermore, in Italy all the imperial administrative infrastructure was still very present, so the transition did not imply great changes, as the formulae preserved in the *Variae* indicate.

In this aspect, Spain was very dissimilar to Italy, and not only because there is no corpus of letters similar to the *Variae*. By the time the Visigoths had firmly established and reorganised the kingdom (especially under Liuvigild and Reccared, in the last quarter of the sixth century) the Roman infrastructure had long disappeared. In fact, even if the Visigothic administration imitates late Roman practices, it had to be mostly reinvented. Looking back at the Roman past was a very useful legitimising argument used by the Visigoths, but the scope of their public constructions was much reduced, so

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<sup>20</sup> Many passages of Cassiodorus refer to Theoderic's policy as a righteous cause: *Variae*, I.25.1: *Nil prodest initia rei solidare, si valebit praesumptio ordinata destruere, ... de custoditis acquiritur laudata perfectio* – "It is not useful to build firmly from the beginning if lawlessness has the power to ruin what has been designed, ... from the things preserved the glory of completion is acquired"; III.30.1: *quid est enim dignius, quod tractare debeamus, quam eius reparationem exigere, quae ornatum constat nostrae rei publicae continere?* – "What indeed is worthier, than to maintain the repairs of that place [Rome] which clearly preserves the glory for our government?".

the process of state formation was based overall in less tangible things, like court ceremonial, law giving, and tax reorganisation.<sup>21</sup>

When it comes to aqueducts, the Ostrogoths again were much more involved in their maintenance. Much of the information we have comes from the creation of the Count of the Aqueducts of the City (*Comes Formarum Urbis*) in Rome, who was in charge of the maintenance of these structures, although as we have outlined earlier in chapter 2, Theoderic also restored the aqueduct in Ravenna.<sup>22</sup> The Visigoths, on the other hand, were only responsible for the construction of the aqueduct of Reccopolis. Perhaps the failed restorations of the aqueduct of Mérida (fig. 3.39) could be related to a royal project; after all, Mérida was for many years not only the capital of the kingdom, but also the most important city, and the Ostrogoths, who were keen on repairing aqueducts, must have been a model to follow. Furthermore, we know of other royal constructions through inscriptions found in Mérida, even if of dubious nature.<sup>23</sup> However this is only a supposition, as it is equally possible that the local elites or the bishops may have been responsible for this attempt.

### 6.2.2 Restoration of public works

The repairs carried out by the Visigothic monarchy are very few.<sup>24</sup> In fact, they are so few that the examples should be considered exceptions for various reasons. Perhaps the reconstruction of the bridge and walls of Mérida in the late fifth century (fig. 5.2) could be considered the first example, and even here, the intervention of king Euric is a pure formality, as the initiative derived from the bishop and the *dux*. After

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<sup>21</sup> Cf. *HistGoth* 51. In fact, all of this may be an imitation of the contemporaneous *Eastern* Empire rather than a revitalization of the old, long-gone, *Western* Empire. This is further discussed by M. R. Valverde Castro (2000: *passim*, esp. pp. 141-76, 182-94)

<sup>22</sup> *Variae* VII.6.2.

<sup>23</sup> Ripoll López 2000; the mysterious inscription by King Chindaswinth (*ICERV* 366: [*Chi*]ndasvintus rex pi[*issi*/mu]s in <i>mperio| [*Ch*]ndasvintus [...]), preserved with no context, is generally considered to have been linked to a building.

<sup>24</sup> This is, of course, ignoring church dedications.

these, the restorations of the walls of Itálica by Liuvigild, together with the repairs of the walls of Toledo later in the seventh century by Wamba, are perhaps the best known royally-sponsored reconstructions.<sup>25</sup> However, these are not restored public services but walls, which are very different in their nature, and it should be taken into account that the former were carried out during the rebellion of Hermengild, who was stationed in Seville, and the latter belong to the capital city. The inscription of Chindaswint in Mérida mentioned above and the inscription of Hermengild in Seville could also be related to (re)construction of buildings, but nothing is known about them.<sup>26</sup> Restoration of walls was a very important and symbolic thing to do, not only because city walls had become one of the most important urban symbols,<sup>27</sup> but also because they are very visible, and practical. It was a way to make strong statements about protecting a city.

This is how far the Visigothic monarchy went with regards to public services. There were other public buildings and civic constructions built in the Roman fashion by the monarchy (new palaces in Córdoba and Toledo; new urban foundations such as El Tolmo, Reccopolis, and Victoriacum) linked to the public administration, but these can hardly be considered to have provided public services; even if they were still necessary buildings for the new government.<sup>28</sup> This contrasts greatly with Ostrogothic Italy, but is perhaps close to what is known in Merovingian Francia. In Vandal Africa baths seem to have been repaired too, alongside other public buildings, but just as is the case with

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<sup>25</sup> John of Biclar s.a. 584.1 (Itálica); *Continuatio Hispanica* 35 includes a commemorative inscription, now lost, about the repairs of the walls of Toledo: *Erexit, fautore Deo, rex inclytus urbem/ Wamba, suae celebrem protendens gentis honorem./ Vos, sancti Domini, quorum hic praesentia fulget/ hanc urbem et plebem solito servate favore* - "With God as patron, the famous king Wamba erected the city to increase the honour (and) fame of his people. You, holy Masters (i.e. Saints), whose presence shines here serve this city and (its) people with your customary favour".

<sup>26</sup> *IHC* 76: (Chi-rho) *In nomine Domini ann[o] feliciter secundo regni Dom(i)ni nostri <H>erminigildi regis quem persequitur genitor/ su(u)s Dom(inus) Liuvigildus rex(.) in cibitate(m) <H>ispa(lim) ducti aione* - "In the name of the Lord, in the second year of the happy reign| of our lord King Hermengild, whom his father our lord King Liuvigild persecutes. Brought (=Hermengild) into the city of Sevilla for ever (*aione*)". Cf. Fernández and Gómez 2001: 647-9.

<sup>27</sup> In words of Isidore (*Etym* XV.ii.1): *urbs ipsa moenia sunt* - "a city itself is its walls".

<sup>28</sup> Ripoll López 2000: 374; Valverde Castro 2000: 182-3.

Ostrogothic Italy, the transition between the late Roman and the post-Roman administration was very short, and hardly suffered any disruption. Gaul and Spain, however, suffered periods of power vacuum which badly damaged the administration and its reach.<sup>29</sup>

Besides this, and as has been already highlighted earlier (see section 5.1), the lack of skilled engineers and the loss of vaulting techniques probably meant that by the late sixth century it was technologically impossible to repair most public buildings, regardless of the interest shown by the administration.<sup>30</sup> The reconstruction of walls requires only a basic knowledge of engineering and construction; repairing a set of vaulted baths or creating a levelled conduit for an aqueduct was not that easy. As for the construction of the large new royal projects (Reccopolis, the *praetorium suburbanum* of Toledo, etc.), specialised builders and engineers could have been mustered from abroad, as suggested earlier.

Overall, it would be misleading to take Ostrogothic Italy or Vandal Africa as a comparison with Visigothic Spain when it comes to the maintenance of public buildings and the importance given to aqueducts. It is perfectly understandable why the Visigoths might have wanted to promote hydraulic architecture and to preserve aqueduct supply systems, but various circumstances prevented this from happening.

### 6.2.3 The aqueduct of Reccopolis

In this context, the aqueduct of Reccopolis stands out as a unique exception. As explained above, my opinion is that it was the work of foreign engineers, brought with the purpose of building Reccopolis. Its importance as an element of prestige has been

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<sup>29</sup> For the Vandal examples, see the poem *De Thermis Alianarum* by Felix (*vir clarissimus*), which praises a reconstruction in particular by king Thrasamund (Chalon et al. 1995). More on repairs in Africa (Constantine and Carthage) in Wilson 1997: 99, 144. For Italy, see Ward-Perkins 1984: 128-31.

<sup>30</sup> On the end of vaulting, see Utrero 2006.

discussed in print already, but the fact that this is an aqueduct built in the late sixth century in the West deserves more than the usual four lines.<sup>31</sup>

The aqueduct was, from a landscape analysis, a very visible monumental building, and it was also a statement of the control the town exercised over its territory and the confidence of the builder that the surroundings were safe. It was a display of power over nature and a way of showing off the resources available to the monarchy, especially in a context where such monuments could not normally be built any more. But perhaps above all, to build an aqueduct was a way to refer back to Roman urban foundations imitating Roman imperial practices of public munificence; an aqueduct in Reccopolis, as part of the “ideal town”, was a must. The foundation of Justiniana Prima by Justinian in the Balkans is a good comparison, because just as Reccopolis, it has a new aqueduct.<sup>32</sup> The aqueduct of Justiniana Prima brought water from over 20km to the lower town (compare it to the 3/5km of the Reccopolis aqueduct), where the baths are located, whereas the upper town and the acropolis seem to have been supplied by cisterns. A new urban imperial foundation, despite its small size, required an aqueduct to be fully considered a city (figs. 6.2-3).<sup>33</sup>

Furthermore, aqueducts (as well as walls, which Reccopolis also had), still had a functional public purpose in late antique towns. It is perhaps because of this that the Ostrogoths and the Vandals took care of the maintenance of aqueducts: they were clearly visible, easily recognisable, and evidently useful – and not simply because it was another imperial practice they could imitate. Linking the ruler’s name to one of these structures was a great act of propaganda while still providing a public service (and one

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<sup>31</sup> E.g.: Ripoll López 2000: 393; Ripoll and Velázquez 2008: 217.

<sup>32</sup> The comparison between the two sites has been explored previously (Fernández Izquierdo 1982: 133; Claude 1965), although without specific references to the aqueduct.

<sup>33</sup> Ivanošević 2006; 2012.

which was still in demand), so it was a perfect investment. Aqueducts were, after all, standing wonders of engineering.<sup>34</sup>

The aqueduct of Reccopolis has to be considered in the context of the new urban foundation, a personal project of king Liuvigild, which drew large amounts of effort and resources. Even if preserving and restoring aqueducts in other towns (e.g. in Toledo, the capital) might have given Liuvigild popular recognition, the truth is that by this period Visigothic kings did not need popular support to legitimise their rule. By the late sixth century, Visigothic power was based on the emerging service elite, the mix of ecclesiastical, aristocratic landowning, and military elites (by then mixed Germanic and Roman in “ethnicity”), who earned their status by rank and not necessarily by birth.<sup>35</sup>

Even if it might have been possible for the monarchy to spend resources in restoring other aqueducts in the peninsula, to further legitimise its position, there was no demand for these repairs to be carried out. The resources and skilled workmen might have been temporarily available, but, all their efforts were focused on the two main royal projects (Reccopolis and the Vega Baja suburb in Toledo). This is parallel to the works of the Ostrogoths, who focused most of their efforts on aqueducts linked to their own royal residences, rather than on new projects. By the time of the Visigothic state formation, the dissociation between central administration and local monuments had reached a point of no return, and only when royal power had to be displayed was a new administrative building set up.

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<sup>34</sup> Famously phrased by Frontinus: *De aquis* I.16: *Tot aquarum tam multis necessariis molibus pyramidas videlicet otiosas compares aut cetera inertia sed fama celebrate opera Graecorum* – “With such an array of indispensable structures carrying so many waters, compare [them], if you will, [with] the idle Pyramids or the useless, though famous, works of the Greeks!”.

<sup>35</sup> Fernández et al. 2013.

#### **6.2.4 Water euergetism?**

Considering the repairs and constructions commissioned by the Visigothic monarchy (which are few) and the exceptional example of the aqueduct of Reccopolis (which should not be considered as water euergetism on its own, but rather part of an overall scheme), Visigothic water euergetism is famous for its absence. Clearly a reflection of historical and technical circumstances, it was impossible for the Visigothic central administration to carry on with traditional euergetic practices beyond walls and churches. In fact, the only other water-related dedication by the monarchy is also church-related: the medicinal water springs close to the church of San Juan de Baños mentioned earlier were monumentalised in a fountain.<sup>36</sup> Similarly, later on, in the ninth century the kings of Asturias would build an aedicule to hold a spring, a sort of public water supply in their newly-built capital of Oviedo (fig. 4.2), but this was far removed from Roman traditional practices, and perhaps it is not until the fifteenth century when the kings of Castile make laws to preserve the aqueduct of Segovia that we will see the state intervening again in a major way with urban water supply systems.

### **6.3 THE CHURCH AND URBAN WATER SUPPLY SYSTEMS**

The Church was one of the most important institutions in Late Antiquity, and its influence in towns and urban matters increased throughout the period: the influence of the Church in towns, channelled through the actions of bishops, grew from the fourth century onwards, so that by the sixth century, these men were largely in control of municipal issues. Similarly, Christianity and the Church had a very deep influence in the transformation of traditional Roman social values and attitudes to old Roman ways.

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<sup>36</sup> Section 4.1.

Baths, as major consumers of aqueduct water, are key to understanding the transformations of urban water supplies. These two things put together are important for this study, because the new Christian setting did not favour traditional Roman bathing habits or bath buildings, and bishops had the means and power to reformulate the priorities of water supply.

### **6.3.1 The new urban leaders**

The evolution of the bishops' power in the late antique town was a long process, which started with Constantine's concessions in the early fourth century.<sup>37</sup> Their growth in influence and importance was parallel to the decline of the power of the urban elites, so that by the sixth century, they had become the dominant leaders of local urban communities, and ecclesiastical sources such as the works of Gregory of Tours and the *Lives of the Holy Fathers of Mérida* present this. Similarly, the virtual disintegration of urban *curiae* and town councils left aqueducts and other public buildings unprotected. imperial legislation had these monuments preserved as public property (state property rather than municipal property), but at a town level, bishops, who were the only acting local power, might have put themselves forward as keepers of these monuments.

Archaeology reflects this transition, and the episcopal complexes of Barcelona, Valencia, Tarragona and Mérida have already been mentioned as examples of the new urban order. Episcopal complexes, usually referred to as *episcopia*, were the monumental reflection of the bishops' power in their cities. Originally an evolution of aristocratic houses, the *episcopium* was in itself by the sixth century a set of buildings, which included the cathedral basilica, a baptistery and residential quarters, which were also used for administrative and business purposes.<sup>38</sup>

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<sup>37</sup> Matthews 1990 (1975): 307.

<sup>38</sup> Miller 2000:13-20, 44.

When it comes to aqueducts, it seems clear from Italian examples that bishops became highly involved in the maintenance and preservation of aqueducts: in Nola, the local elites allowed the bishop early in the fifth century to build an aqueduct, which they later regretted, as the bishops ultimately monopolised the use and maintenance of this supply.<sup>39</sup> In Naples, the bishop had also monopolised the aqueduct, taking away the responsibility from the municipal authorities, as shown in a letter by Pope Gregory.<sup>40</sup> Water still used to show high standards of living, a sign of luxury, and a display of the power of the Church, much in the way old urban aristocrats had done with their private baths. Episcopal patronage over the water supply was usually linked to a new Christian charity, bringing water for the Church baths, fountains, and to ecclesiastical complexes.<sup>41</sup>

In Spain there is no direct evidence to suggest this, apart from the episcopal baths of Barcelona. Similarly, the conduit at Casa Herrera, currently under excavation, may have been for the general use of the (ecclesiastical) settlement. Besides this, what we find is that aqueduct supply was preserved in the immediate environments of episcopal complexes (Tarragona, Valencia, Barcelona, Seville, Córdoba),<sup>42</sup> although this cannot be truly linked to ecclesiastical maintenance due to the lack of written or epigraphic sources. Nonetheless, it would not be wise to assume that even after these consciously-located constructions bishops did not become much more actively involved with water supply systems. Christian charity and old traditional munificence did slightly overlap, and there may be some political intention behind the construction of episcopal complexes in the immediate environments of sources of water. Especially if, as shown,

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<sup>39</sup> “[B]ishops subordinated the requirements of their communities to those of their churches”; Squatriti 1998: 12-7 (quoted, p. 13); Ward-Perkins 1984:131, 132 (Naples).

<sup>40</sup> *Epistulae* IX.76. We know that it was out of use during the Gothic Wars (*BellGoth* I.9.10-8), so either it was repaired or the letter refers to a new conduit.

<sup>41</sup> Ward-Perkins 1984: 135-46.

<sup>42</sup> Martínez Jiménez 2012.

public water supplies were becoming less and less frequent. This would have helped bishops to reinforce their position within the community by controlling the distribution of water, and ideally, controlling its basic maintenance as well.

### **6.3.2 Baths and bishops**

The decline of Roman traditional bathing throughout this period may be one of the reasons behind the declining interest in preserving aqueducts. Baths were the main consumers of aqueduct water, and many conduits were built simply to supply sets of baths. With the spread of Christian morality traditional baths faded away and aqueducts lost one of their main consumers.

The position of the Church towards bathing was ambivalent, to say the least. While therapeutic bathing was certainly accepted by the Church Fathers, Roman social and luxurious bathing was against the ecclesiastical position regarding Christian spirituality and the negation of luxury. It should be noted too that despite this, the Church never forbade or publicly rejected bathing.<sup>43</sup> Even if the Church cannot be responsible for the closure of public baths (and discussed above),<sup>44</sup> it is true that Christian moralists promoted a new type of bathing which eventually led to the disappearance of Roman public baths. For Church moralists, bathing was to be encouraged mostly as a healing remedy, and always in individual tubs, something which could be done in small baths without large pools, and which could even be filled from wells or cisterns with buckets. Although no examples are known for Spain, this was commonplace in eighth and ninth century monasteries in Italy.<sup>45</sup> In Gaul this was the case as well, although (as mentioned) in Saint Denis a new water conduit was built from

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<sup>43</sup> Yegül 1992: 314-8.

<sup>44</sup> Section 5.2.4.1.

<sup>45</sup> Magnusson and Squatriti 2000:246.

the “holy spring” to bring water to the bathing area.<sup>46</sup> It is difficult, however, to assert whether the new Christian bathing culture was a result of the decreasing number of available public baths, or if the newly imposed morality was a trigger for the further abandonment of buildings which were already suffering from the lack of repairs.

Bishops themselves, however, were not necessarily moralists, and were in fact urban aristocrats, so baths were still appealing. The promotion and preservation of some baths by bishops could be behind this. It has even been suggested that bishops set up baths for public access, perhaps charging a fee, at least into the sixth century.<sup>47</sup> The scope of these baths was, however, limited, and not as wide-ranging as traditional Roman baths: the aim of these constructions was the urban poor and the needy, not the average citizen.<sup>48</sup> Here is where the rupture with traditional munificence begins.

This rupture, even if slight, marked a point of no return, which would be further marked in the Islamic period.

#### 6.4 THE Umayyad STATE AND THE ROMAN AQUEDUCTS

Whereas the Roman elites, the Gothic administration and the Church all had reasons to look back at the Roman past, and saw in aqueducts elements to bridge back to it, the Umayyad emirate did not have to do this. While those aqueducts still functioning offered an indubitable public benefit, the Umayyad emirs had their own agenda which led them to use and maintain these monuments in a parallel but yet different fashion. Despite the fact that the emirs and caliphs were in charge of preserving public services for the *umma(h)*, the Islamic community, this responsibility was not something which was required from their title or office. Furthermore, the

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<sup>46</sup> Benoit and Rouillard 2000: 167-8; Wyss 1996: 188-9, 303.

<sup>47</sup> Miller 2000: 31-2.

<sup>48</sup> Ward-Perkins 1984: 140.

concept of a “public service” does not seem to have existed in the Islamic world, beyond charitable endowments. This different attitude requires further explanation, and together with the lack of interest in the Roman past shown by the Umayyads (which offered them no legitimisation), helps explain the relationship between the Umayyad state and the Roman aqueducts, ultimately leading to the end of this public water supply system.

However, the vast majority of the positive evidence available comes from Córdoba, the capital of the Umayyad state, which may not be representative of the overall situation of the post-Visigothic period.

#### **6.4.1 The new legal status of the old water supply**

Perhaps one of the most important transitions that occurred in this period was the transformation from the Visigothic state, with its late Roman infrastructure, to the Umayyad emirate (and from AD 929, Caliphate), which worked on a completely different basis. This is perhaps better understood by explaining the transition between the classical concepts of “public” and the new Islamic concept of “*umma*”, which substituted the former. The *umma*, the Islamic community, is a difficult concept to explain. Brill’s *Encyclopaedia of Islam* defines it as follows:

“In the *Ḳur’ān*, *umma* usually refers to communities sharing a common religion, whereas in later history it almost always means the Muslim community as a whole while admitting of regional, essentially non-political expressions. ... Although other concepts relate to an understanding of *umma*—such as *dār al-Islām* vs. *dār al-Ḥarb* , *khilāfa* and *djamā’a* — throughout Islamic history the *umma* has usually been thought to possess

final authority (under God) with respect to overseeing the leadership of the Muslims.<sup>49</sup>

Thus the *umma* is the community of believers, and the emirs and caliphs are by definition the leaders of the *umma* both in a religious and political sense.<sup>50</sup> Put simply, with the Islamic conquest, the Iberian Peninsula was included in the larger *umma* so what remained “public” then was no longer “of the people”, but “of the *umma*”, and thus under the control of the Umayyad authorities.

By definition, and as explained earlier, aqueducts (as other public buildings) were, despite their public service, a private property of the town councils. However, this legal status did not exist in the Islamic world, so with the political transition, the legal status of this infrastructure changed.<sup>51</sup> During the Islamic conquest of the peninsula (AD 711-4), most towns surrendered to the Umayyad troops under the terms of treaties known as *sulh*, by which the locals were allowed to preserve their possessions and status in exchange for extra taxes.<sup>52</sup> Therefore, in the early years of Islamic rule, before the proclamation of the Emirate of Córdoba (AD 754), this meant that not much was done to the aqueducts or any other public buildings by the Umayyad state, excepting perhaps the repair of the bridge of Córdoba, as the distant rulers in Damascus had no direct interest in this remote province.<sup>53</sup>

However, from the 740s onwards, the Umayyads tried to deny and abolish these treaties, ultimately reinventing the conquest of Spain as a conquest by force, thus transferring the “conquered lands” to the *umma*, in other words, to the direct control of the Umayyad administration. This of course did not please the descendants of the

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<sup>49</sup> Bearman et al. 2013, *sub verbo* “umma”.

<sup>50</sup> Crone 2005 (2004): 3; Santillana 1926: 2.

<sup>51</sup> Especially as the municipality ceased to exist as a juridical entity: Santillana 1926: 134-6.

<sup>52</sup> Chalmeta Gendró 1994: 213-20; Clarke 2012: 42-4. Cf. Santillana 1926: 288-9.

<sup>53</sup> Arjona Castro 2001: 80.

conquerors who had settled in Spain, who saw their lands further taxed.<sup>54</sup> In this process, the public and (Visigothic) royal properties were fully transferred to the *umma* under the control of the state, the Umayyads. Under Islamic law, however, municipal buildings were not considered property in the Roman sense any more, and they were included in the “*waqf*”.<sup>55</sup> *Waqf* (or *wakf*) were a private charitable endowments, made by an individual (in this case, the Umayyads), which sponsored the upkeep and staffing of an institution with public functions as an act of piety and charity.<sup>56</sup> This meant in practice that they became part of the Umayyad patrimony (added to the fifth part of the lands they already had “legally” claimed from their right of conquest).<sup>57</sup> This soon took a further change when the Umayyads created a new state in the peninsula, which meant that they had direct control over the Iberian *waqf*, and it is then when repairs, new constructions and works carried out on aqueducts first happen.<sup>58</sup>

This is especially true in Córdoba, where the Cercadilla aqueduct was diverted at its head to feed a private estate, the Western aqueduct was diverted to supply the mosque, and the Valdepuentes aqueduct was restored to feed Madinat al-Zahra. The nature of these works is strikingly different from other works carried out on water works in earlier periods. By taking advantage of the fact that these were *waqf* (communal resources) of the *umma*, the Umayyad caliphs and emirs were in a position to do with them what they pleased, and in all instances, these works were done for their own private benefit. This came even at the expense of cutting or limiting public supply.

The diversion of the Cercadilla aqueduct to feed the estate at Arruzafa (al-Rusafa) is a clear example of this, even if the fountain at Cercadilla had ceased to function

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<sup>54</sup> Manzano Moreno 2006:39-40. This ultimately caused the Berber rebellion of the 740s.

<sup>55</sup> Santillana 1926: 322.

<sup>56</sup> Bearman et al. 2013, *sub verbo* “*wakf*”; van Leeuwen 1999: 11.

<sup>57</sup> Van Leeuwen 1999: 12, 68.

<sup>58</sup> Focused mainly on five towns: Córdoba, Sevilla, Mérida, Toledo and Zaragoza – Manzano Moreno 2006: 248-60.

allegedly by AD 711. The Alcázar conduit was built originally to supply the palace, although later Caliph Abd al-Rahman set up a fountain to turn the overflow of the private supply into public use. The reconstruction of the Valdepuentes aqueduct to supply water *only* to the palace can hardly be seen as an example of public urban munificence. This is all in essence very different from the dedication of a public fountain in Roman times (as those found in Córdoba itself). Even the construction of baths in Late Antiquity by the Church for the poor in Italy (and perhaps in Barcelona) had a wider and mainly public purpose. Later repairs and reconstruction of aqueducts, such as the tenth-century Almoina conduit feeding the alcázar of Valencia (fig. 3.84a-b) or the twelfth-century aqueduct of the alcázar of Seville (or indeed the large water-lifting device installed in Toledo), show an established practice in the Iberian Islamic world, by which water supply systems were mostly and primarily aimed at the ruling elite and their palatial complexes.

At first sight this story of “usurpation” or “privatisation” of the water supply is contradicted by the diversion of the Western aqueduct, which cut the water supply to the north-western suburb of Córdoba but in turn brought (and still brings) water to the mosque fountains. This conduit built in AD 967 by Al-Hakam II (figs. 3.22, 6.4) was an act of public piety which brought water to the most important Umayyad building: the mosque. Even if a first reading of this new conduit indicates public munificence, what we see is, in fact, not an act of public munificence in the Classical sense (expected as part of an administrative position), but rather a display of the caliph’s piety and goodwill, although given the centrality of ablutions to Muslim worship, it was definitely something that benefitted the entire congregation of the mosque. This is strikingly similar to the construction of fountains in the Vatican by Pope Symmachus early in the sixth century, when an urban aqueduct which was *meant to be* of public use was used

for a personal pious new purpose, in a church directly linked to the pope.<sup>59</sup> This is the key element which we see in the other works of the aqueducts in Umayyad Córdoba – piety and whim are not the same as munificence.

This attitude towards the aqueducts of Córdoba (usurpation or privatisation, but still with a slight public symbolic purpose) is perhaps a reflection of the Maliki doctrine which was common in al-Andalus. The Maliki doctrine was a school of law founded late in the eighth century by Malik ibn Anas, which proposed a set of doctrines, based on reports of what the Prophet had said and done, to be applied as laws; it was a way of applying Islamic law in practice, which became very popular amongst members of the Spanish Islamic elite. This set of religious and moral obligations was imposed on the emirs, who first welcomed these innovative legislative ideas during the ninth century, and then responded to the pressure of the growing Maliki faction. Up to this point, the Umayyad rulers had relied on a large network of clients of various origins (including Visigoths and other fellow exiled Syrians), but by this period the converted Visigothic elite (the so-called *muwallads* or *muladíes*) became an important proportion of the elite, and these became quickly interested in the Maliki theories.<sup>60</sup> The Maliki generated a very orthodox Sunni doctrine, preventing any innovation in cult or religious practices (even favouring archaising practices, which may have appealed to the recently converted *muwallads*), and became a very strong pressure group that the Umayyad rulers had to deal with. The Maliki faction would praise or criticise the Umayyads according to what they did, so emirs and caliphs had to be very careful, lest they found themselves with the opposition of the influential Maliki faction<sup>61</sup>. The relationship was one of mutual self-interest: the Umayyads gave preferential treatment to Malikis (e.g. appointing them to official positions), and the Malikis would advise the Umayyads on

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<sup>59</sup> *Liber Pontificalis* 53.6.

<sup>60</sup> Crone 1987: 22; Lévi-Provençal 1950: 70-1; Manzano Moreno 2006: 101-6.

<sup>61</sup> Lévi-Provençal 1950: 96-8; 1957: 293-8; Fierro 1991: 129-30.

policy. Maliki jurists could also act as go-betweens, mediating the relationship between the ordinary people (with whom the jurists came into regular contact, through things like drawing up marriage and sale contracts) and the state. Elsewhere in the Islamic world, multiple different law schools co-existed and competed with each other, but al-Andalus was unusual in that the Maliki school was the only one with any significant presence. All this conditioned the way the Umayyads faced the maintenance of old Roman public buildings, including aqueducts which were *waqf* for the *umma* but administered by the Umayyads. In this context, it was not adequate to take away the water supply from the *umma*, so from time to time (especially during the Caliphate) the Umayyads had to show their commitment towards the community.<sup>62</sup>

The Arruzafa conduit of Abd al-Rahman I (late eighth century, diverting from the Cercadilla aqueduct) pre-dates the arrival of the Maliki theories to al-Andalus, whereas the works of the caliphs (the fountain at the alcázar and those at the mosque) fit into the period of well-established Maliki practice.

#### 6.4.2 Looking back, looking East: Syria and the Iberian Umayyads

The development in al-Andalus of a new Umayyad state in two phases, the Emirate (AD 754-929) and the Caliphate (AD 929-1031), is linked to two periods of urban renewal, as the emerging power developed a new public architecture to make itself visible. This is very similar to the process which the Suevic and Visigothic kingdoms went through earlier, in the late sixth century.<sup>63</sup> However, and different from what we have seen for the Visigothic period, where the Roman past was an element of legitimisation, the Umayyads did not need to look back to the Romans or their

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<sup>62</sup> Santillana 1926: 16-7, 322.

<sup>63</sup> Martínez Jiménez 2013.

monuments to justify their rule. In fact, the Umayyads looked back at their own past as Caliphs in Damascus.<sup>64</sup>

Even if from a strategic point of view the Umayyads favoured as their principal nuclei those centres which had been major towns during the Visigothic and Roman periods (Zaragoza, Mérida, Toledo, Córdoba and Seville), they translated the infrastructure and administration from the East, from the Umayyad and Abbasid caliphates.<sup>65</sup> For them, the Roman towns and their monuments were not something to look at for inspiration or prestige.

The Great Mosque of Córdoba is the best example of this. Built late in the eighth century by Abd al-Rahman I, it became not only the main mosque of al-Andalus, but also a dynastic monument which all the Umayyads after him enlarged or repaired (fig. 6.5). The reuse of Roman and Visigothic columns and capitals was a way of indicating a transition between the 'old' and the 'new' regime, and an appropriation of that past giving it a complete new meaning.<sup>66</sup> The design of the mosque itself, despite some claims that the superimposed rows of arches imitate the aqueduct of Los Milagros in Mérida, indicates a Syrian tradition. This is clear not only in the arches (Syrian horse-shoe arches, and superimposed arcades as in the Mosque of Damascus), but also in the roofing technique (which imitates the al-Aqsa mosque at Jerusalem), the proportion of the aisles, and the use of alternating colours of masonry (the so-called *ablaq* technique).<sup>67</sup> All these architectural elements have Roman precedents, but the way in which they were used in al-Andalus was a fully Islamic one, which the Umayyads may have taken from Roman Syria, but which, by the time they had reached Spain, had lost any symbolic Roman meaning. The mosque had become such an important dynastic

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<sup>64</sup> Clarke 2012: 40-1; Fierro 2007.

<sup>65</sup> Chalmeta Gendró 1998: 26-8; Leví-Provençal 1957: 5; Souto Lasala 2001: 29.

<sup>66</sup> Cressier 2001: 319, 323. Cf. Van Leeuwen 1999: 8, 181.

<sup>67</sup> Clarke 2012: 40-1; Creswell 1940: 156-7; Souto Lasala 2001: 30; Torres Balbás 1957: 245-8 (although *caveat* pp. 364-5 on the "Visigothic" origin of the horse-shoe arch).

monument that when it was found out that the *qibla* wall was facing some 50° off true *qibla*, Hisham II decided to preserve the original orientation of Abd al-Rahman I.<sup>68</sup>

With these clear points of reference to legitimise their position (their own past as caliphs in Damascus, the Abbasids, and (during the Caliphate of Córdoba), Abd al-Rahman I himself), the Roman past seemed little else than a background noise. Aqueducts proved very useful, and, as has been shown, they were in fact preserved to an extent, but now these monuments had no symbolic importance whatsoever, and were solely kept for their inherent functionality. Those aqueducts which were not useful for the Umayyad agenda or were beyond repair were ignored. Those which were still standing but not flowing were left mostly unrepaired, and when they were restored (as in Seville and Valencia, perhaps in Mérida with the pipe through the aqueduct of Los Milagros) they were used privately for the local rulers, as mentioned above. Under this perspective, it is difficult to defend the “submission of the Arabs to Rome through its utilitarian works” proposed by Basilio Pavón.<sup>69</sup>

The importance of Roman aqueducts in Umayyad urbanism and town planning was very limited. It is certain that the means and knowledge to preserve and repair aqueducts were available in the Umayyad period, but with hardly any political interest in actively doing so, aqueducts had become purely functional structures. Furthermore, whereas bridges could rank together with aqueducts in terms of urban importance, the former (especially that of Córdoba) were thoroughly repaired, as they were much more useful in Umayyad schemes and ideas of urbanism than aqueducts.<sup>70</sup>

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<sup>68</sup> Manzano Moreno 2006: 315-8. This is, furthermore, the true *qibla* if you are in Damascus - Clarke 2012: 40-1.

<sup>69</sup> Pavón Maldonado 1988: 418 – “[la] sumisión de los árabes a Roma por la vía de las obras utilitarias”.

<sup>70</sup> Bridge repairs: Torres Balbás 1957: 339; Zozaya 2001: 55.

### 6.4.3 Umayyad urbanism and water supply systems up to the end of the Caliphate

Overall, the development of the Umayyad state(s) was linked to the emergence of its own new public architecture and its new urbanism.<sup>71</sup> This new urbanism broke with the previous (late Roman and Visigothic) trajectories of urban development and, either because of the long period of disrepair of the infrastructure or the attitude of the Umayyads towards the old aqueducts, Roman water supply systems did not play a major role in these new urban developments. In fact, public cisterns (*jubbs* or *aljibes* in modern Spanish) seem to have been far more common, together with professional water-carriers (*saqqaiun*) who delivered water from these sources door-to-door.<sup>72</sup>

The general consensus is that throughout the Umayyad period towns grew and developed around mosques and the main palaces, which were mostly built in the core of the previously existing towns, and were increasingly fortified. The street hierarchy was preserved, although the hierarchy was not reflected in width or straightness.<sup>73</sup> Therefore, there is a continuity of the principal foci of urban development in the main towns of the Iberian Peninsula.<sup>74</sup> What seems clear from the evolution of walled enclosures is that towns in the Umayyad period (especially after the ninth century) grew and expanded – not only the main settlement, but also its immediate suburbs (or *rabads*). This growth and these developments took place without a regular water supply in the Roman fashion. In fact, and looking back at the patterns of urban settlement outlined for the Visigothic period above, it is not surprising to see that the location of the Umayyad urban centres coincide with those of the Visigothic period, and not necessarily with those of the Roman one.

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<sup>71</sup> Martínez Jiménez 2013.

<sup>72</sup> Glick and Kirchner 2000: 303; Navarro and Jiménez 1995: 402.

<sup>73</sup> Almagro 1987; Canto 2001: 13; Gutiérrez Lloret 2012: 197; Lévi-Provençal 1957: 198-200. Many towns had their wall enclosures enlarged as well – Torres Balbás 1955.

<sup>74</sup> Almagro 1987.

The clearest example of this would be Córdoba, as the mosque and the alcázar are built on top of the cathedral and the Visigothic *palatium*, located by the bridge and where the water table is available. The same happened in Zaragoza, in Tarragona with the upper town, and in Valencia with the alcázar built on the episcopal area. At Reccopolis, the palace complex was turned into a fortified enclave during the emiral phase.<sup>75</sup> Even perhaps in Barcelona, where it has been suggested by the team of Luis Caballero that the “episcopal palace” could in fact be an early Umayyad building, if compared in size and plan to the Umayyad palaces excavated at Morería and the temple of Diana in Mérida (fig. 6.6).<sup>76</sup> In these examples there was continuity in the role and importance of given areas from the Visigothic into the Umayyad periods, and only in Tarragona (and maybe too in Valencia) these coincide with the centres of Roman urban power.<sup>77</sup> This is not only an indicator of the high degree of continuity between the Visigothic and Islamic periods (which accounts for the early settlement and administrative patterns of the Umayyads),<sup>78</sup> but also of the importance artificial water supply systems had in modifying the urban layout. Only in very limited examples did the Umayyads develop a brand new area during the ninth century, consciously trying to break the links with the Visigothic past: in Mérida and Toledo the Umayyad fortifications included a new fortress in a strategically located area to control the rebellious populations of these towns.<sup>79</sup> In the former, the alcazaba was built after the destruction of the walls on top of the Gate of the Bridge (fig. 6.7), which had been the symbol of the Roman colony since its foundation; in the latter, the alcázar was built on the highest point of the granitic dome of the old Roman town after the destruction of the

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<sup>75</sup> Olmo Enciso 2012.

<sup>76</sup> Luis Caballero and Isaac Sastre, pers. comm.; cf. the Islamic palaces of Mérida described in Alba Calzado 2001: 289-2.

<sup>77</sup> The case of Valencia is perhaps debatable, as the alcázar is already outside the old forum complex, adjacent to the old episcopal complex; but as this is now underneath the Gothic cathedral, it is very doubtful that any excavations will be carried out there.

<sup>78</sup> Manzano Moreno 2006: 248-60; Gutiérrez Lloret 2012: 197.

<sup>79</sup> The strong local aristocracies were responsible for continued rebellions.

suburban *praetorium* (the Vega Baja).<sup>80</sup> Curiously enough, in both instances, the deliberate location of the fortifications required the construction of new water supply systems, as they were located in areas without an obvious one. In Toledo, a set of water-lifting wheels was installed, as seen above (ch. 4). In Mérida a new “aljibe” or filtration cistern was built in the central area of the fortress, reusing Visigothic pilasters in its decoration (showing the power of the new rulers over the past) and conveniently orientated towards Mecca, so a mosque could be installed on top (figs. 6.8-11).<sup>81</sup>

In terms of domestic architecture, communal and private wells and cisterns were abundant in residential areas. Fountains were mostly found in mosques, and even these seem to have been linked to cisterns and wells. There were no more links with aqueduct water supplies, and towns fell back to pre-Roman patterns without much problem. In terms of sanitation, however, this caused some alterations: while conduits to evacuate domestic sewage were not common in al-Andalus, cesspits were pretty much everywhere. The only concerns the Islamic law-givers seem to have had, which may be a reflection of the simple drainage system, was that sewage and rain water should not flow on the same drains. That may be why open-air gutters to drain rainwater seem to have been the basic and most common type of sewer – and these did not rely on constantly-flowing water from an aqueduct.<sup>82</sup>

Considering the previous points, it is also noticeable in new urban foundations that there was a lack of overall public water supply systems. In Madinat al-Zahra we have seen how the aqueduct was used to feed the palatine complex, despite the fact that the residential areas were densely occupied.<sup>83</sup> The town of Jaén, re-founded in the

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<sup>80</sup> Mérida: Creswell 1940: 198; Alba Calzado 2001: 282-7. Toledo: Izquierdo Benito 2009.

<sup>81</sup> Creswell 1940: 202-3; Cressier 2001: 319.

<sup>82</sup> Rëklaitytë 2012; Vidal Castro 2000. There are a few notable exceptions, as Córdoba, Zaragoza or Mérida, where some Roman sewers were preserved or repaired, or Lérida and Murcia, two new urban foundations.

<sup>83</sup> Acién Almansa 1987: 12, 16-8.

Umayyad period, obtained its water from springs, which had been monumentalised in the Roman period, but the distribution conduits had long been abandoned, and were not restored in the Islamic period.<sup>84</sup> Similarly, Anjar in Lebanon was a new Umayyad urban foundation, settled in an area where the water table was easily accessible, but without a public infrastructure to distribute or administer it.<sup>85</sup>

Lastly, Islamic baths or *hammams* were very numerous in al-Andalus. Three hundred are mentioned in the sources in Córdoba alone, although archaeologically we only know two. There are still standing baths in Palma de Mallorca, Granada, Ronda, Málaga, and many other places. In recent years, a set of baths in Toledo has been identified, next to the mosque of Bab al-Mardum (now chapel of the Holy Cross). These baths all functioned with small quantities of water, as they lacked the large pools which characterised Roman baths. Cisterns or water wheels were the main water supply system for these baths, although the *hammam* of l'Almoína in Valencia might have been fed by the aqueduct, and the baths of Bab al-Mardum in Toledo were linked to an underground water filtration gallery.<sup>86</sup>

#### 6.4.4 An aqueduct-less society

Despite the fact that the techniques and the knowledge to build and maintain aqueducts were available in the Islamic world, these were never as common in the towns of al-Andalus as they were in the Roman period.<sup>87</sup> Water was still an urban need, and judges especially were very concerned with the availability of water in urban contexts, but this was rarely supplied by Roman aqueducts.<sup>88</sup> Old Roman aqueducts had been through a long period of disrepair after the fourth and especially the fifth century,

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<sup>84</sup> Salvatierra et al. 1998.

<sup>85</sup> Carver 1996: 189-90; Haase 1996: 167; Hillenbrand 1999: 66-7.

<sup>86</sup> Lévi-Provençal 1957: 279; Passini 2010.

<sup>87</sup> Hill 1993: 183-5.

<sup>88</sup> Navarro and Jiménez 1995: 402.

so in many instances it would have been necessary to re-establish the aqueduct supply at a high cost, which the new Islamic authorities could not afford, and which they did not care that much about. There was probably also no popular urge to put them back in service.

This fits the general trends of urban development in the early Islamic world, where the only true necessary and common elements in towns were fortifications, the mosque, and the palace.<sup>89</sup> All of these are known to have been quickly built in Spanish towns soon after the conquest.<sup>90</sup> *Hammams* and *suqs* or market areas would later develop through private initiative. The presence of other public infrastructure was mostly up to the interest of the ruling elite, as the lack of a municipal authority that encompassed most of the urban aristocrats prevented the construction of large public buildings, which as has been shown, were not truly public.<sup>91</sup> This return to pre-Roman modes of water supply should not be seen as a step back in urban development; after all, most Islamic towns grew far beyond the limits of their old Roman wall enclosures.<sup>92</sup>

Later in the Medieval period new long-distance water supply systems were built in Islamic towns in Spain, as in Palma de Mallorca, Madrid or Huelva, and in other instances, the rural irrigation conduits were diverted on a regular basis to fill domestic and public cisterns and baths, but these are usually much later in date (late tenth century at the earliest) and cannot be linked to Roman attitudes to public water supply.<sup>93</sup>

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<sup>89</sup> Canto 2001: 13; Hillenbrand 1999: 75; Kennedy 1998: 62.

<sup>90</sup> Zozaya 2001: 54-5.

<sup>91</sup> Cf. Salvatierra et al. 1998: 200.

<sup>92</sup> Torres Balbás 1955: 55-6.

<sup>93</sup> Usually called “qanats” in Spanish publications, although they did not function as proper qanats/foggaras (Hodge 2000b: 36). Retuerce Velasco 2004: 101-4; Pavón Maldonado 1990: 208; Valdés Fernández 1992: 158-61 and Solesio de la Presa 1992: 110-1 (Madrid). Riera Frau 1993: 33, 55; Glick and Kirchner 2000: 301 (Palma). Pavón Maldonado 1990: 204 (Huelva). Glick and Kirchner 2000: 303 (rural conduits feeding urban cisterns).

## **7. CONCLUSIONS**

Aqueducts went from being ever-present monuments that each Roman city worthy of the name wanted to have, to an established part of the urban infrastructure, and finally a derelict reminder of a past era. This was a general trend all over the empire, but perhaps it is in the west that these changes were most notable. The examples put together in this thesis for the Iberian Peninsula reflect these trends, while casting some light on the actual evidence. The most important conclusions that have been put forward are three. One, that aqueducts had a surprising degree of continuity into the Middle Ages (much more than could have been imagined). Two, that this degree of continuity was because of an equilibrium between the inherent usefulness and legitimising Roman appeal of aqueducts and the incapability (due to lack of resources, knowledge or skill) to keep them working. And three, that even if originally aqueducts had not been essential parts of towns, by this period they had an immense influence on urban layouts, so their abandonment was one key factor in the shaping of urban settlements.

### **7.1 A SURPRISING DEGREE OF CONTINUITY?**

One of the big questions that this thesis has tackled is the degree of continuity aqueducts had, a question that had not previously been addressed or answered, and was most usually just ignored. It is possible now to put forward figures on this continuity, as presented in chapter 3, and to claim that of the 61 aqueducts of the Iberian Peninsula, almost one in three (31%) were still in use by AD 400 and into the fifth century (Almuñécar, Barcelona, Ceuta, Conimbriga, Córdoba, Lugo, Mérida, Segovia, Seville, Tarragona, Valencia and Zaragoza). In some cases, as mentioned, the dating is quite

secure, as in Mérida, Seville or Córdoba, whereas in others the certainty is lesser (e.g., Almuñécar, Valencia, Ceuta), but they form a cohesive group of datable aqueducts. The number of functioning aqueducts declines steadily, but gradually, through the fifth and sixth centuries, with a steep fall into the seventh. This means that by the Islamic invasion only four of the old Roman aqueducts are in use, plus two other doubtful ones, and the new sixth-century aqueduct of Reccopolis.

Unsurprisingly, those aqueducts that show continuity are linked to the most important towns of the peninsula, those in which a powerful elite that could take care (or try to maintain) their water supply system was still present.

It would be very difficult to compare Spain to other regions, such as Gaul or Italy so as to assess if this ratio is a good indicator for the post-Roman west – although such a study would be extremely interesting. This is not only because there is no comparable corpus of data for either of these regions, but also because the local dynamics that ruled the years between AD 400 and 700 are very different. Italy had a much large number of urban aqueducts, and for the fifth and early sixth centuries, there was a much greater degree of Roman continuity in all aspects. But this all changed after the devastating wars of the mid-sixth century. As for Gaul, it is similar to Spain as it had a Mediterranean core which long preserved *Romanitas* (in fact, most of Mediterranean Gaul was ruled by the Visigoths) and a wide strip of northern and eastern territories which became increasingly de-urbanised. However, the geomorphology and climate of Gaul do not really make aqueducts essential parts of urban development, as water was much more easily accessed than in Spain.

One last key thing that can be inferred from the chronology and the data presented in this thesis, is that the approach to aqueducts was very different in the Roman period than its later Umayyad (and subsequent) equivalent. Aqueducts had been key in early

Roman urban culture, and were still present in the late Roman period, lingering through Late Antiquity, but after a period of abandonment, the reuse and reconstructions of the Islamic period did not follow the path marked by the Romans.

## 7.2 THE LONG SHADOW OF THE PAST

From the written sources of late antique Gaul and Italy we get the impression that preserving the Roman past was something very important for the local elites and the late imperial administration. The old Roman monuments represented a legitimising link to the past, which they wanted to take over. In Spain the lack of written sources prevent us from making strong claims on this aspect, but the attitude towards aqueducts may shed some light on it. It is mostly the urban elites in the important towns listed above that seemed to have enjoyed aqueduct supply, and in theory the ones who were responsible for its upkeep. Bishops seem to have also been involved up to a certain extent in these affairs, as they represented the new urban elites, as the possible episcopal baths of Barcelona or the episcopal buildings at the fora of Valencia and Tarragona suggest. The use given to the public water supply system had, however, started to shift into a more private sphere, and although some public fountains are still present and in use (e.g., Tarragona, Valencia), the aqueduct supply seems to have been preserved primarily as a private elite supply. This itself is not that different from the early Roman period, but the lack of public baths made aqueduct supply much more restricted, and therefore, much more elitist.

Despite this, aqueducts were still very useful and powerful symbols of *Romanitas*, so it is not surprising to see that a new royal urban foundation such as Reccopolis was equipped with a new aqueduct. This major construction has to be put in context, as an

aqueduct was part of the “ideal town”, it was one of the things that any important capital (especially in the context of Rome, Ravenna or Constantinople) should have, together with a church, a palace, and walls. The lack of any other major royal constructions in Visigothic Spain (beyond wall repairs) may account for why there were no other aqueducts built by the monarchy, but it does not explain why the monarchy was not responsible for the repair or maintenance of other urban aqueducts. Perhaps, and following late antique traditions, municipal infrastructure was increasingly left aside by the patronage of the central administration.

As seen in chapter 6, this approach towards aqueducts from the local elites and the local church (or from the central administration) came to an end with the Visigothic kingdom, as in the Umayyad period and beyond aqueducts became completely privatised. This privatisation included the rebuilding of aqueducts to supply private estates and palaces of the Umayyad ruler, even if this involved cutting the public supply. During the tenth century the Umayyad caliphs used aqueducts to supply water at the mosque of Córdoba, as a sign of the caliph’s piety and goodwill. But this was a gift to the mosque (which was an Umayyad dynastic monument), rather than a large-scale fountain distribution commissioned by the city council which had characterised the Roman period.

### **7.3 THE DECLINE AND FALL OF URBAN AQUEDUCTS**

The demise and ultimate abandonment and collapse of aqueduct is the main questions addressed in this work, and various answers have been put forward, especially in chapter 5. The transformations of the urban administration in the fourth century caused many of the transformations that are noticeable in the fifth century, including the

lack of investment in aqueduct maintenance. The lack of municipal funds and the lack of political incentives during the late fourth and fifth centuries are perhaps the main cause for aqueduct disrepair. Only basic maintenance was carried out in these centuries, if at all, so it is possible that as the demand for specialised and skilled engineers during this period declined, by the period of urban renewal of the late sixth century there were hardly any (if any) engineers who could repair major damage on aqueducts. This meant that these structures, which were mostly over four hundred years old, were impossible to repair and, as can perhaps be seen in Mérida, wherever they tried to repair aqueducts, they failed. In this context, the aqueduct of Reccopolis is even more striking, as it is built *ex novo* in a context in which this did not seem possible.

This abandonment of the water supply infrastructure did not, however, imply that towns were left without water. Some areas of towns were without running water, but water was still available (as it had been in the previous periods) from wells and cisterns. In some cases these become more numerous as the aqueducts cease to function, and in some other cases, due to the lack of aqueducts large public cisterns had to be built (as in the new urban foundation of El Tolmo).

Aqueducts had not originally been an urban need, but rather a way of showing allegiance to Rome and of presenting the locals as fully Romanised (the famous Monty Python's “—And what have they [the Romans] ever given us in return?!”). But as time passed and the benefits of piped water became more evident, urban populations grew more and more dependant on aqueduct supply, up to the point that in the late antique and post-Roman period the end of aqueducts prompted changes in urban layouts. We have seen through various examples of the main towns of the peninsula that townscapes and settlement location changed through this period, and even if there may be other reasons for this (the relocation of the centres of power, new economic foci, etc.), water

availability was certainly one of the most important. This is especially true in upper towns which were once fed by aqueducts, which may have become less welcoming without public fountains or domestic piped water.

This statement must be kept within perspective, as towns flourished before and after aqueducts were available: towns in the Islamic period and in the later Middle Ages grew beyond the Roman or late antique enclosures. Only in a very few cases were aqueducts a real urban need. The important thing to keep in mind is that in the post-Roman period town dwellers had to adapt to a situation they were not prepared for, in which water ceased to be a commodity and had to be acquired from wells or cisterns.

#### **7.4 FURTHER AFIELD?**

In conclusion, I hope this thesis has proved not only innovative in its results but also coherent and clear in its approach. And even if this thesis may be a useful contribution, there are still things that can be investigated and blurry areas that need further research. The most obvious thing, as already mentioned above, would be a similar study to assess the evidence for Gaul, Italy and North Africa: a general overview of the end of aqueducts in the west would be very useful to improve our understanding of the evolution of towns in the post imperial period. Similarly, with a larger body of comparanda, it will be possible to improve the results and refine the models proposed in this thesis.

Further research in absolute dating of aqueducts would also be extremely useful. ESR (*electron spin resonance*) and OSL (*optical stimulated luminescence*) dating can date the crystallisation of carbonate, and therefore, of sinter. With proper sampling *in situ*, it is possible to micro-sample crystals from the bottom and the top of the sinter

concretions, giving thus dates for the first and last flow of water in the conduit. This type of sampling and dating has not yet been applied to aqueducts, but it has been used to date enamel formation in Palaeolithic teeth.<sup>1</sup> The modern developments of micro-sampling would further allow us to date the formation of crystals from the top and the bottom of the sinter crust, giving us an absolute date between the last time sinter was removed and the date in which water ceased to flow.

From a more local point of view, a closer analysis of water-related material culture in post-Roman urban contexts (such as the analysis and volume of water vessels and jugs, or plotting well distribution in a single site) could provide a much more detailed account of the dairy uses of water. This could be compared across various sites of Roman, late antique and Islamic date. Much is yet to be learned from the many boxes of fine and common-wares excavated in recent years and stored in museums, which have not yet been studied.

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Overall, aqueducts in the towns of post-Roman Spain were mostly standing, but not necessarily in use, as silent reminders of a previous era. A considerable number of them were still functioning, especially in the most vibrant towns where urban elites still had enough resources and power, which is one of the most important conclusions for this thesis. But as the years passed and Roman rule became more of old men's memories, the local capability of preserving and repairing their water supply systems diminished. It is doubtful that aqueducts ceased to function overnight, and may have taken various years for an aqueduct to finally cease to function – but in that time the

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<sup>1</sup> Brothwell and Pollard (eds.) 2001: 55-6.

inhabitants may well have come to realise that they were living under new circumstances. The spell of aqueducts was so appealing that the Visigothic king's new town was equipped with one, and again – one just can wonder about what the reaction of those newly settled inhabitants was when they saw it. It would have to be the newly-arrived Umayyads, with their different attitude towards the Roman past, and their inherited and preserved knowledge of hydraulic engineering that brought many aqueducts back to use – but by then the population did not benefit from them, and probably they did not expect to either. But still, and as many of tourists these days, they would have looked at the centuries-old aqueducts which were still standing and wondered about these most impressive monuments.