

1 The public water system of Barcino and its thousand-year history (First century BC – tenth century AD)

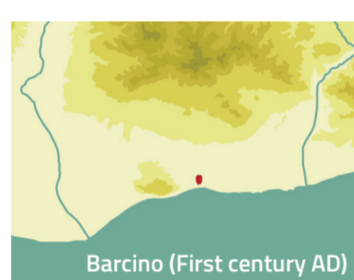
On the subject of the origin of cities, the industrial engineer Pere Garçia Fària, who inspired Barcelona's present sewer system, said that: "the settlement is born from the path". Recent research into the Roman founding of Barcelona, its territorial organisation and the early drinking water supply system would appear to support Fària's claim.

During the foundational period of Barcino, in the late-first century BC, an aqueduct was designed and built to bring water from the River Besòs to the newly established colony. Roman aqueducts were usually built mostly underground in order to save costs and ensure that the water remained clean, though, in places, certain stretches were elevated by arches spanning hilly areas or to turn their arrival at the city into a monumental entry. This was the case in Barcino. A recent hypothesis suggests that part of the course of this aqueduct ran alongside the road to the north from Barcino, passing through the gorge that leads into the Vallès territory. This great water supply system symbolised the thriving new colony established under the aegis of the Empire. The aqueduct comprised the first ambitious step in the historic process of bringing drinking water to Barcelona, and its impact lasted for centuries.

As in other parts of the Empire and even in Rome itself, the water brought in by the aqueduct was distributed through *castella aquae* (tanks) and was channelled, in the main, to fountains and spas, whilst the workshops and factories, such as those that can now be seen in the underground section of Plaça del Rei, obtained their water mainly from wells.

According to the archaeological evidence, the Besòs aqueduct remained in use for nearly one thousand years, until the tenth century AD. However, the work fell into disrepair after Rome ceased to hold public sway over the city. Only the wells and cisterns remained for local water supply. The ruins from the aqueduct, recovered in different archaeological and town planning interventions over the course of the twentieth century, comprise our most outstanding elements as regards water supply heritage from the aforementioned period. Particularly interesting are the arches in the final section, when the channel was elevated, and which are clearly visible in Plaça de Març, near Carrer Duran i Bas, as well as remains from the ground-level section, passing through what is now Sant Andreu district.

In the 1950s, a proposal was approved and implemented for the reconstruction of a whole arch from the aqueduct in Avinguda de la Catedral, at the point where the channel entered through the city walls. The original channel can be seen from Ca l'Andica. Other important remains, though not open to the public, include the waterway under Carrer de la Palma de Sant Just and the section of canal in Carrer del Coronel Monasterio.



2 Productive water. From the Barcelona of the year 1000 to modern-age "heritage stripping" (Eleventh century – 1866)

The expansion of Barcelona in around the year 1000 was accompanied by the introduction of far-reaching changes in water use and management. Water was a principal energy source throughout the Middle Ages, and a large number of mechanical inventions sprang up all over Europe – for example, mills using hydraulic power to grind grain, batten cloth or tan leather, amongst other activities. Control and collection of income from these mills helped to make the expansion of the city possible. To this end, perhaps towards the end of the eleventh century, the county authority embarked on a project to build the Rec Comtal, a large canal carrying water collected from a lock on the River Besòs that, despite conserving the Roman technological base as concerns conveying water by the force of gravity, was built in order to serve rather different social and economic purposes.

The new canal was used, basically, as an energy source and, secondarily, for agricultural irrigation. When the city subsequently began to expand, water from this source was also used for craft activities, particularly cloth and leather making. Its purpose was not to supply the city folk with drinking water, then, and from the eleventh century to the beginning of the fourteenth, the local population would continue to depend, above all, on water from wells, waterwheels and cisterns.

Entering the fourteenth century, when the demand and institutions began to demand running water, the Consell de Cent, or Council of One Hundred, acquired ownership of a water mine in Collserola. This was how Barcelona's first municipal water

supply system came into being, based on managing such mines and conveying water from them along a single channel that ran down what is now Passeig de Gràcia to enter the city. This canal was then diverted to the distributor in Plaça de Sant Jaume, from where it was conveyed variously through ceramic pipes, tanks, spiral pipes and other distributors to a series of fountains, such as those of Santa Anna, Sant Just and Santa Maria del Mar. This complex supply system was used without interruption or major alteration for centuries. Francesc Sociès, the "master of fountains" – a municipal post established in 1414, exclusively devoted to ensuring the conservation and operation of this system – made a detailed description of the system in 1650 in the *Libre de les fonts de la present ciutat de Barcelona*, or Book of Fountains, an exceptional manuscript that has as yet not been published.

The early eighteenth century was not an easy period for the municipal government with regard to managing water supply for the people of Barcelona. After 1714, when the absolutist Bourbon monarchy imposed a new administrative model, the water shortage problem became worse due to the lack of resources that the City Council devoted to improving and extending the system or even for the most indispensable repairs, if by the people of Barcelona did not receive a good water supply from fountains this was due less to a lack of bounty from the gods than to the parlous state of pipes, spiral pipes and distributors. Nonetheless, the energy generated over the previous century still sufficed to allow the completion of such projects as that to convey

water from the Rec canal to El Clot of to provide water for market gardens, convents and hospices in the Raval district. This infrastructure, whose construction began in 1703–1705, entered into service in 1714.

Industrial and manufacturing uses continued to depend on the Rec Comtal canal throughout the eighteenth century, and measures were taken to extend and intensify use of its flow in order to supply water to craft workshops and the burgeoning industries set up by Indians, wealthy people returned from the New World, as well as to serve for drainage in one particular area of the city.

The most important hydraulic work completed in the second half of the century was the construction, in 1786, of the Montcada mine, an underground source of groundwater from the River Besòs that was planned in an attempt to resolve supply difficulties to what were then a quickly-rising population and an expanding manufacturing sector.

After the Spanish War of Independence, the nineteenth century saw two outstanding new hydraulic works completed: first, the construction of the Canal de la Infanta, a canal on the Llobregat side of the city, in 1817; and secondly, nearly a decade later, in 1826, a canal on the River Besòs side, which became the city's principal source of water supply until the final quarter of the century.

An outstanding event in the history of water supply management in the city was the so-called stripping of water heritage, that is, the abolition of the traditional rights that the State held over water from the Rec Comtal

canal. This opened up the door to liberalisation, enabling privatisation on the part of individuals, companies, associations, etc. It made it possible, for example, for Reial Patrimoni ("Royal Heritage"), which had managed this canal of medieval origin, to be dislodged from its position of power and for the Association of Owners with an interest in managing the Comtal irrigation canal and water mines to be established in 1838. Although it formed part of this private ownership body, the municipal authority was just another member.

Despite the extensions to the Montcada mine, the repairs to the mine piping network and attempts to increase supply from the Besòs, Barcelona City Council was unable to resolve the chronic deficit in water supply to the city. Apart from economic insolvency, one of the main problems was that the traditional hydraulic technology used was not sufficient to provide a response to the changes demanded by an industrial society and the requirements for supply according to the Cercà Plan. Together, all these factors led to the gradual emergence of private companies that transformed the water management and supply situation in Barcelona.



3 A new market for water. Expansion, the hygienist movement, industrialisation and the absorption of townships (1867 -1928)

The introduction of a water system using pressure marked a turning-point in technical management and in access by a large part of the Barcelona population to regular and surplus drinking water supply. The introduction of this new model for urban water provision, which did not enter into general use until after the 1920s, and was linked to a new, capitalist production system based on industrial resources, signified the consignment to history of traditional, more limited and sustainable water supply. We cannot understand population growth in the city, urban development under the Cercà Plan or even industrial expansion (although many factories drew their water supplies directly from wells) without taking this paradigm change into account. We should remember that merely to ensure mobility of faecal matter in the sewage system – vital in those times to improve hygiene conditions – it was necessary to greatly increase water supply for this purpose. The local authorities tried hard to meet growing demand, but were faced by many difficulties. Partial solutions introduced, and which increased supply from the Baix aqueduct, included the extension to the Montcada water mine and fresh groundwater catchment from the Montcada Wells near the River Besòs (1879).

As for the Rec Comtal canal, the 1860s and 70s saw a bitter struggle between Barcelona City Council and the Board of the Society of Owners for control, particularly, of the water from Montcada. Moreover, the entire irrigation system was becoming ever more degraded, as regards not only water supply, but also the construction of new infrastructure

that affected it as urban expansion continued apace.

The modern water supply model, based on new pipe networks that worked using pressure through the elevation of the water by steam pumps, and the new systems of flow measurement gauges or meters, were developed through business initiatives resulting from liberal policy reform, which led to the privatisation of the water market. The private companies that were established included Palau, García i Cia. (1857), Empresa d'Aigües del Baix Vallès (1861), Associació de Propietaris d'Aigües de Sants (1879) and so on. These were, however, short-lived enterprises: within a few decades the most important companies were merged in Societat General d'Aigües de Barcelona (1882). The gradual consolidation of this company, funded by French capital, which took over from the earlier Companyia d'Aigües de Barcelona (1867), reflected the hegemonic position taken by private initiative in urban water management.

From 1895 on, Societat General d'Aigües de Barcelona became the main operator in a city unified politically after the absorption of surrounding townships in 1897. New infrastructure, such as the river collection and pumping stations, one at Sant Andreu, beside the Besòs (1897), the other in Cornellà, not far from the Llobregat (1909), which introduced the use of electricity and anti-bacteriological treatments, were added to that already built: the Dosrius aqueduct, the Baix Vallès aqueduct and the many groundwater catchment facilities in the city itself.

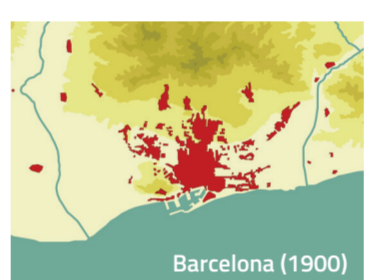
Moreover, sharply rising demand was already leading to an increase in wastewater generation, coupled with the impossibility of discharging domestic waste in cesspools and the lack of sufficient gradient in the old sewers led to constant leaking, with the subsequent contamination of drinking water supply and constant occurrence of epidemics of cholera, yellow fever and other diseases. Moreover, the change from the traditional production system in agriculture, with the use of chemical fertilisers, led to a rapid decrease in the flow of organic waste discharged to the farming areas around the city.

Whilst, during the first half of the nineteenth century, the solutions envisioned in Europe to combat pandemics were linked to miasma theory, over the closing decades of the century these were much more concerned with bacteriology. The Universal Exposition of 1888 provided a good chance for the City Council to tackle the problem of the absence of a good underground evacuation system. The engineer Pere Garçia Fària drew up a preliminary report that sought to finally solve the problem of sewage by introducing a modern sewer system similar to those in London and Paris, a kind of underground Eixample in the expanding Catalan capital. Although approved, the project did not finally get under way until the early-twentieth century.

The virulent typhus epidemic of 1914, which was linked to the Montcada aqueduct, triggered the reorganisation of municipal water services with the construction of the Trinitat Vella pumping station and

the two tanks in Trinitat Nova. The sewers were also modernised and public urinals were built. As regards water supply, however, the epidemic so badly damaged the prestige of the municipal systems that, despite these investments, private supply finally took over.

Uses of water not only increased, but also became more and more diversified. Whilst a new culture of the body helped to spread both hygienic practices and made bathing in the sea popular, fountains and other hydraulic systems for urban gardens also proliferated in the opening decades of the twentieth century. Particularly outstanding here are the works to urbanise and landscape the slopes of Mount Montjuïc in preparation for the International Exposition, which finally took place in 1929. A year before the Expo opened, the executive committee commissioned SGAB to manage all aspects relating to water supply. The result was the Magic Fountain, designed by Carles Buigas, which came to symbolise the role played by the great water and electricity companies in the modernisation of Barcelona.



4 "Metropolitan water". From the 1929 International Exposition to water from the River Ter (1929-1967)

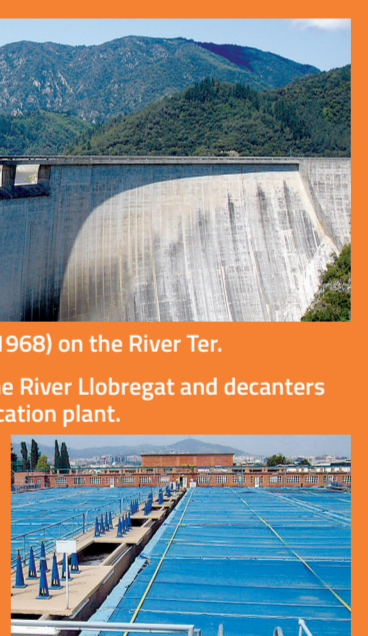
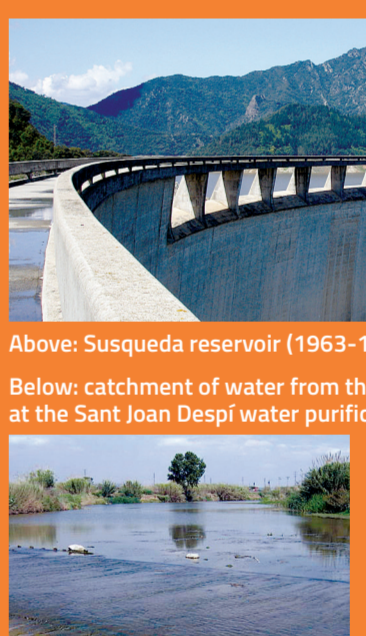
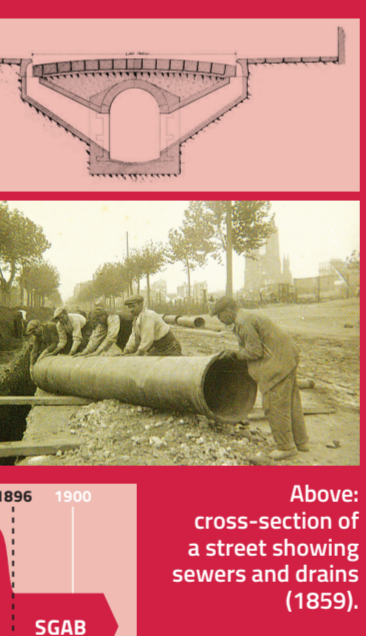
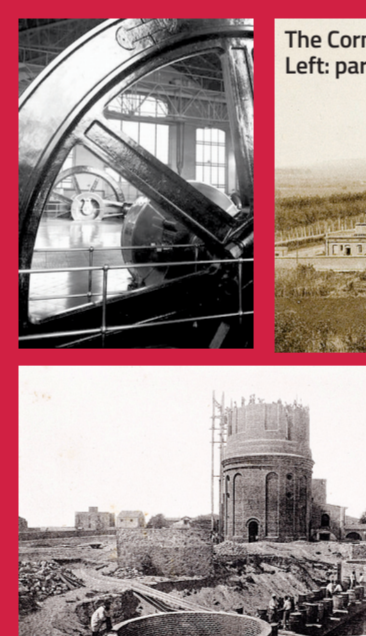
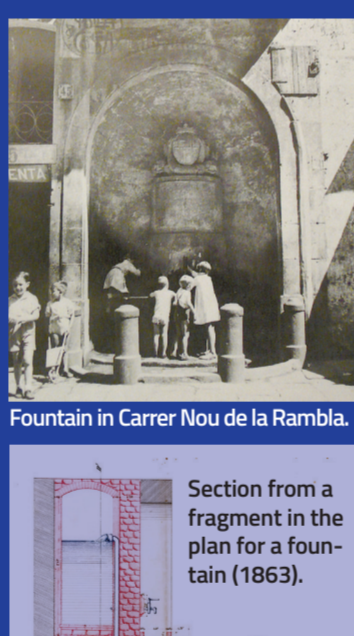
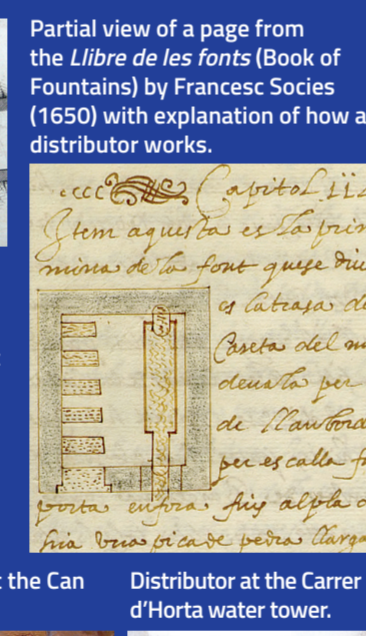
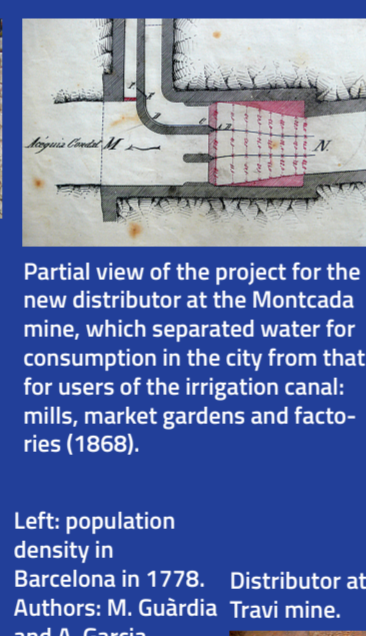
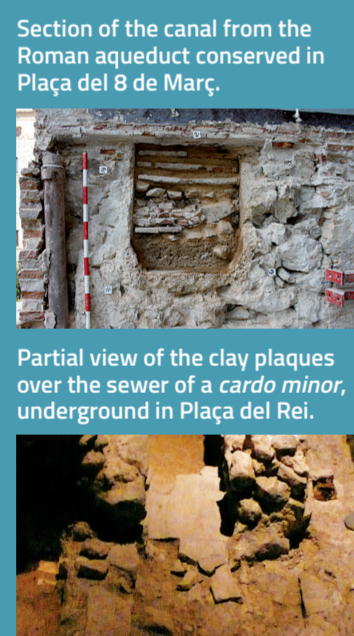
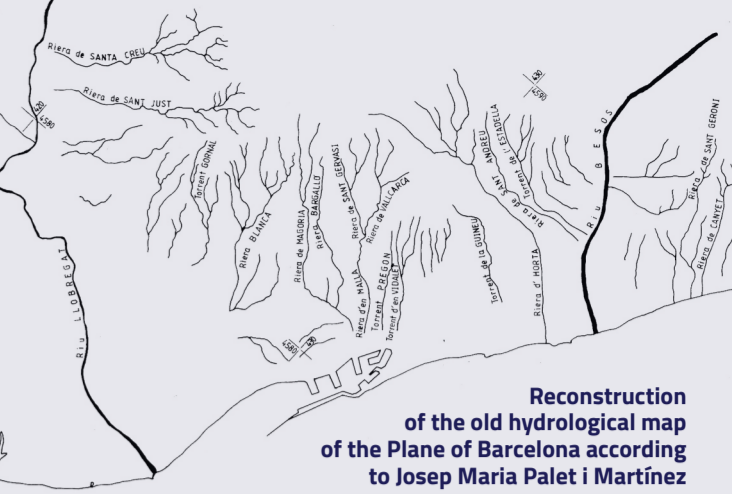
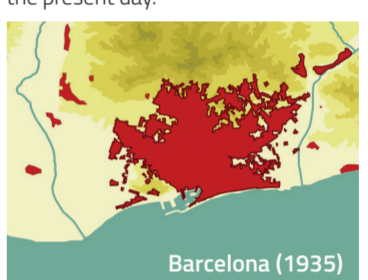
The new water distribution system and improvements to sanitation gradually transformed everyday life as the benefits spread through the city from the wealthier sectors to the poorer areas. As in the case of other technical networks, the private nature of the supply company led it to prioritise better-off customers in order to ensure a return on investment. Urbanisation and access to basic services were on a much lower level in the new working-class neighbourhoods that sprang up on the periphery of the city.

Expansion of the supply and consumption of running water was slowed down, not only by lack of infrastructure, but also because many homes did not have showers, and because latrines were still very common. The economic and social crisis that struck the country after the 1929 Expo and the brevity of the republican years, when awareness began to rise with regard to hygiene conditions in the home, prevented structural changes from taking root. After the Spanish Civil War, and the parenthesis formed by collectivisation (Barcelona's water company had been managed since 1936 by the Workers Committee for Confiscation), the SGAB recommenced its activities amid an autarchic political regime and a long period of droughts and electricity shortages, all of which complicated water supply.

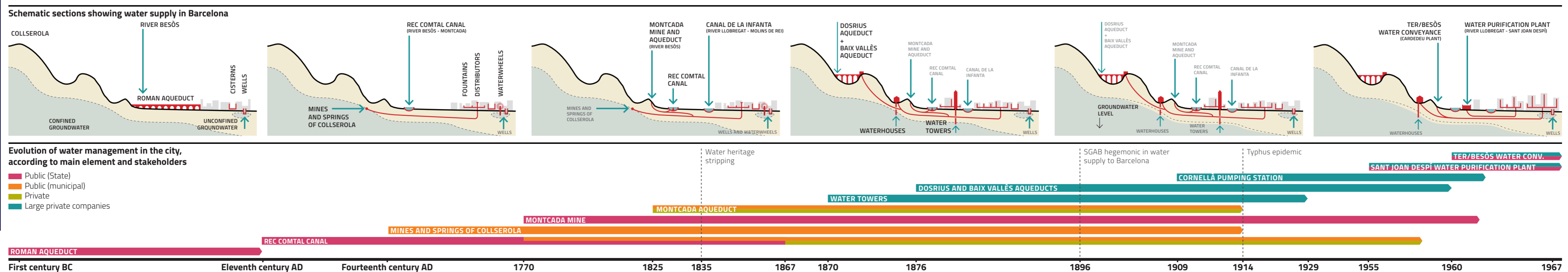
By the 1950s, a change in scale in the power of metropolitan supply could be put off no longer. Whilst the Hydrographic Confederation of the Eastern Pyrenees drew up, in accordance with a decree passed in 1950, a preliminary project to convey water from the River Ter to

the Besòs, water began to be taken directly from the Llobregat in order to compensate for falling supply from groundwater sources. The concession granted in 1953 to take 2.2 m³/s from the Llobregat was gradually increased until, by 1960, it covered nearly the peak consumption in the city. That same year, works were approved to convey water from the Ter, and by 1967 this system was also fully operational. The water was conveyed from the Pastoral reservoir along a 56-km-long underground canal to the Cardedeu purification station, from where it was finally distributed to Barcelona and other townships.

Although SGAB clearly and steadily increased consumption and subscriber numbers throughout the 1960s, the growth rate was still hampered by the aforementioned deficiencies in housing, as the use of water from fountains, public washing places and baths persisted in working-class neighbourhoods. The transition towards a new model of supply and consumption, what could be considered the "water revolution", which had begun almost a century before, was not completed until the 1970s. Thanks to improved housing and joint supply from both the Llobregat and Ter, a new age began, one that, in essence, has continued until the present day.



Reconstruction of the arches of the Roman aqueduct at the point where it joined the walls of Barcino (Avinguda de la Catedral).



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 - 10. SEAT 1950-65/BCN

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AUTHOR: Ignasi Mangue

PHOTOGRAPHS: Elisabet Badia, Mònica Blasco, Salvador Clarós, Tania Galán, Andrea Manenti, Ignasi Mangue, Vanesa Triay, Pere Vivàs

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CONCEPT AND DESIGN: Andrea Manenti

Water management has been a key factor in shaping the city since it was first founded, and has also had an effect on the inland reaches as a result of changing needs regarding water catchment. Over the years, a wide range of techniques has been used, not only to obtain, channel, store and distribute water in the urban space, but also to discharge it.

All the social formations that have succeeded one another since the times of ancient Barcino have been obliged to organise their hydraulic space. Over the two millennia from the period of the Roman colony to the industrial society that built the Eixample district, we can observe how, under public authority, whether state or local, Barcelona has maintained a continuist approach in the provision of running water systems using gravity, whilst adjusting the surface and underground water catchment area. To this supply from outside the city must also be added a resource that has varied in importance over the years: water from wells.

This technological stability was broken in the second half of the nineteenth century with the appearance of water pumping. The new technical paradigm, which should be seen as part of the wealth of changes brought in by the industrial revolution, became consolidated around the turn of the twentieth century, with huge transformations spurred by the incentive of increasing domestic consumption, partially in obedience to the need to provide sufficient water flow for the circulation of faecal matter in the new sewage system. Population growth and scientific and cultural changes, such as the appearance of hygienism, were important factors in influencing water policy, in which public initiative succumbed to a series of private initiatives that, over time, became integrated into a single large, hegemonic company.

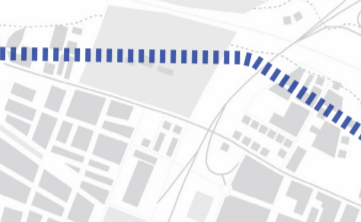
This list of aqueducts, springs, canals, mines, distributors, water towers, tanks and other elements is not exhaustive. However, it is representative of the two stages described here: that dominated by running water in a system that uses the force of gravity; and the more recent stage, the result of a veritable "water revolution", stretching from the mid-nineteenth century to the mid-twentieth century, revolving around the supply of water at pressure.



17. Eixample water tower (1870)
Carrer de Roger de Llúria, 56
An example of the many private initiatives launched by communities of owners in the Eixample district in order to secure the water supply necessary for their town planning projects. This tower with well, steam machine and elevated tank collected groundwater from the Torrent de l'Olla stream.



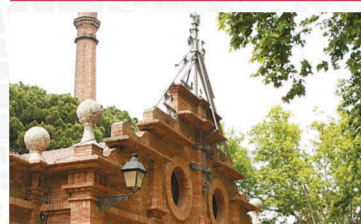
18. Dosrius aqueduct (1873)
Cami de la Font d'en Quintana, s/n
This was the first modern water-course built to bring water to of Barcelona from outside the city plains. Originally planned by the Palau, Garcia i Cia. water company in the mid-nineteenth century, it was finally built by the Companyia d'Aigües de Barcelona in 1871.



19. a. Water tank in the Casa de les Altures (de Dosrius) (1872)
b. Casa de les Altures (1890)
Ronda del Guinardó, 49-51



20. Baix Vallès aqueduct (1876)
Carrer de les Agudes, 222



21. Montcada wells. Pumping station (1879)
Av. de la Ribera (Montcada i Reixac)



22. Besòs water tower
Later incorporated into the Can Girona Factory (Macosa) (1880-1882).
Carrer Selva de Mar, 9-11



23. a. Water tank (1875-1888)
Carrer de Wellington
b. La Cascada fountain (Ciutadella Park) (1881)



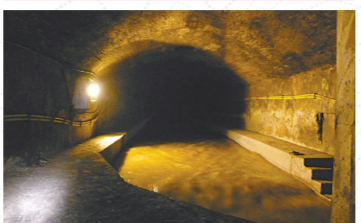
24. Les Altures water tank (1886)
Passatge del Dipòsit - c/ Pasteur



25. Besòs pumping station (1896)
River Besòs - Sant Andreu



26. Park Güell cistern (1900-1914)
Carrer d'Olot, 1-13
The cistern is in the Hypostyle Hall.



27. Sewer system (1900-1930)
Section between Passeig de Sant Joan and Avinguda Diagonal.



28. Tibidabo water tower (1905)
Avinguda de la Ribera



29. Catalana de Gas water tower (1906)
Barceloneta Park



30. Barcelona Swimming Club (Founded in 1907)
Pg. J. de Borbó, 93 - Pl. del Mar, 1



31. Sant Pere Màrtir water tank (1909)
Carretera de les aigües



32. Cornellà pumping and elevation station (1909)
Carretera de Sant Boi, 4-6 (Cornellà)
The Cornellà pumping and elevation station is one of the largest historic hydraulic sites in the Plain of Barcelona that operated using artesian water pressure technology. All the original machinery at this complex, built by the Societat General d'Aigües de Barcelona in 1909, is conserved.



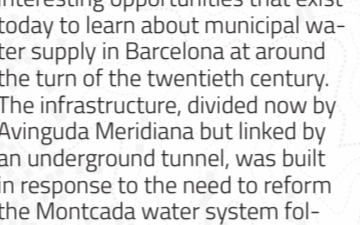
33. Casarramona Factory water tank towers (CaixaForum) (1910)
Avinguda de Francesc Ferrer i Guàrdia, 6-8



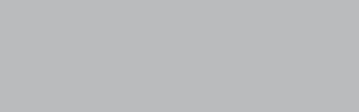
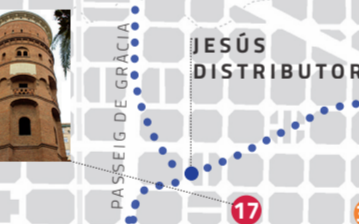
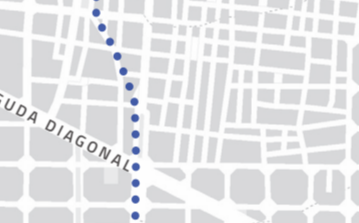
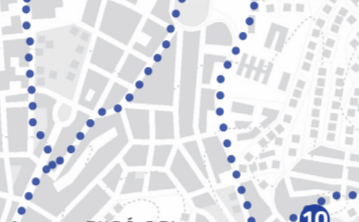
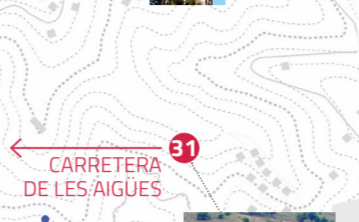
34. Distribution tower (1910)
Carrer del Llenguadoc, 95-97



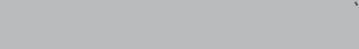
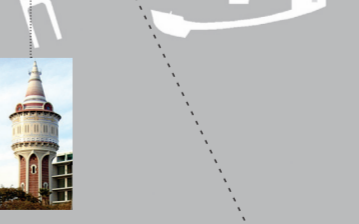
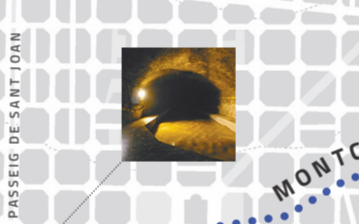
35. a. Trinitat Vella waterhouse
b. Trinitat Nova water tank (1917)
Parc de la Casa de les Aigües de Trinitat Vella
The Trinitat Vella and Trinitat Nova site provides one of the most interesting opportunities that exist today to learn about municipal water supply in Barcelona at around the turn of the twentieth century. The infrastructure, divided now by Avinguda Meridiana but linked by an underground tunnel, was built in response to the need to reform the Montcada water system following the 1914 typhus epidemic, and remained in service until the late-1980s.



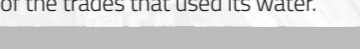
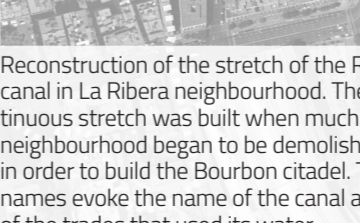
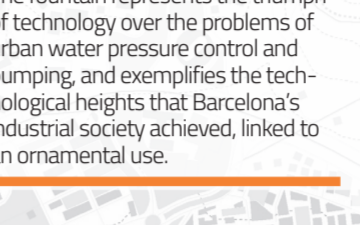
36. SGAB headquarters, 1920 to 2005
Passeig de Sant Joan, 39
In 1920, SGAB acquired the Palauet de Santa Isabel, a building completed by Josep Fontserè in 1887, from the Ricart family.



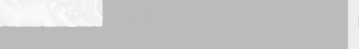
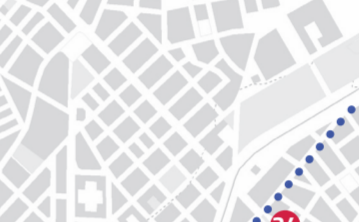
37. Montjuïc Magic Fountain and gardens (1923-1929)
Plaça de Carles Buigas
This monumental hydraulic work was planned for the 1929 Exposition by the engineer Carles Buigas. The fountain represents the triumph of technology over the problems of urban water pressure control and pumping, and exemplifies the technological heights that Barcelona's industrial society achieved, linked to an ornamental use.



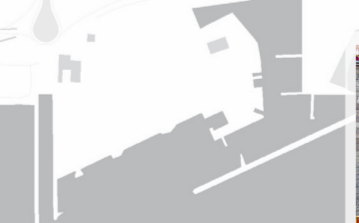
38. Llobregat filtration station (1955)
Sant Joan Despí



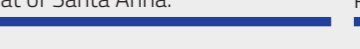
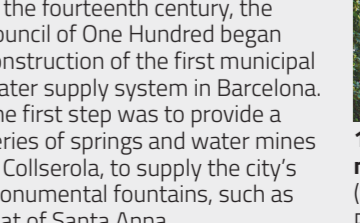
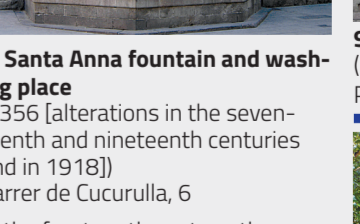
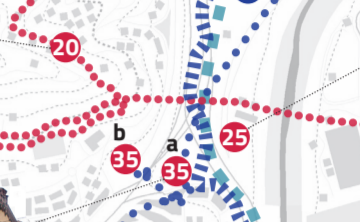
39. Turó de la Rovira water tank (1963)
Carrer de Marià Labèrnia



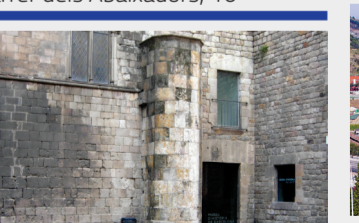
40. Ter filtration plant (1966)
Afores, s/n (Cardedeu)



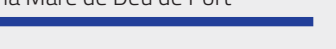
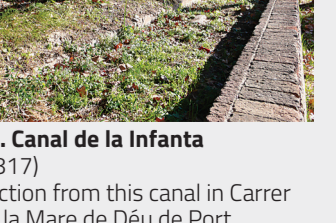
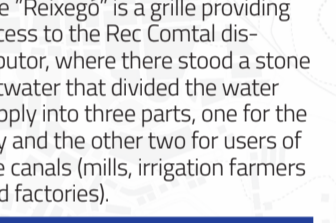
11. Montcada mine (1786)
Av. de la Unitat (Montcada i Reixac)
Designed by the architect and master builder Josep Mas i Vila, this underground canal brought groundwater from the bed of the River Besòs to the Rec Comtal. It was built in response to worsening water shortages suffered by users for irrigation throughout the eighteenth century.



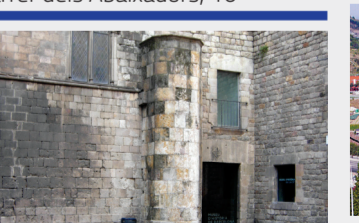
12. "Reixegó" grille (1868)
Av. de la Unitat (Montcada i Reixac)
The "Reixegó" is a grille providing access to the Rec Comtal distributor, where there stood a stone cutwater that divided the water supply into three parts, one for the city and the other two for users of the canals (mills, irrigation farmers and factories).



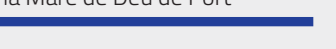
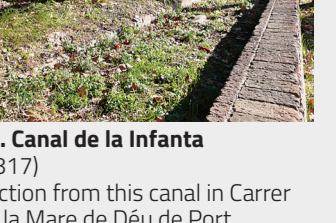
6. Sant Just (or Fivaller) fountain (1367)
Plaça de Sant Just



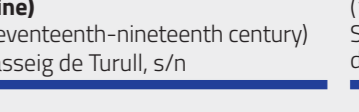
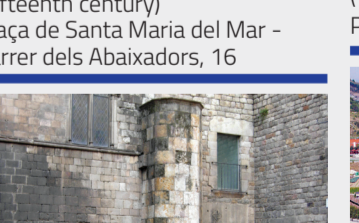
7. Well in the Palau Aguiar (Fourteenth-fifteenth century)
Carrer de Montcada, 15 (Picasso Museum)



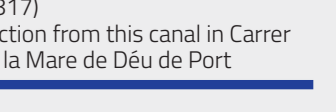
13. Baths in Carrer de l'Arc del Teatre (1814)
Carrer de l'Arc del Teatre - Carrer Santa Mònica



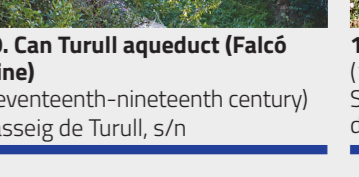
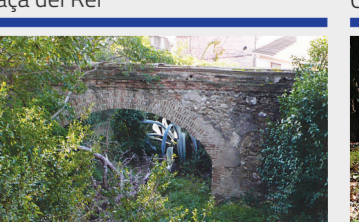
8. Santa Maria del Mar fountain and washing place ("Fountain of the Lords") (Fifteenth century)
Plaça de Santa Maria del Mar - Carrer dels Abaixadors, 16



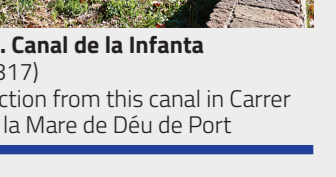
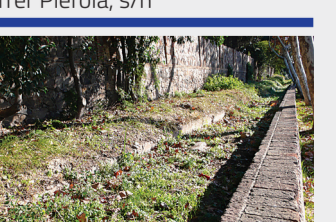
14. Fountain of Santa Eulàlia or the Lords (1826)
Plaça del Pedró



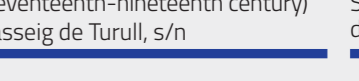
9. Distribution column (1644)
Plaça del Rei



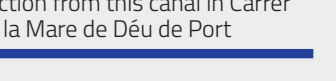
15. La Ponderosa market garden (Quadra Vallbona - Rec Comtal) (Nineteenth Century)
Carrer Pierola, s/n



10. Can Turull aqueduct (Falcó mine) (Seventeenth-nineteenth century)
Passeig de Turull, s/n



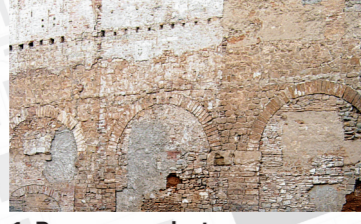
16. Canal de la Infanta (1817)
Section from this canal in Carrer de la Mare de Déu de Port



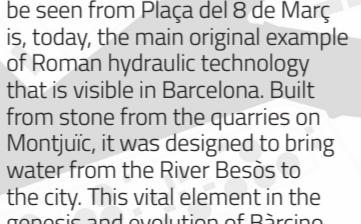
Legend
 Elements from first century BC to tenth century AD
 Elements from eleventh to early-nineteenth century
 Elements from 1867 to 1929
 Elements from 1929 to 1967

WATER / BCN
Forty water heritage elements

1. Roman aqueduct (First century BC to tenth century AD)
Plaça del 8 de març
The section of aqueduct that can



be seen from Plaça del 8 de Març is, today, the main original example of Roman hydraulic technology that is visible in Barcelona. Built from stone from the quarries on Montjuïc, it was designed to bring water from the River Besòs to the city. This vital element in the genesis and evolution of Bàrcino corresponds to the first known system of running water using gravity in the history of the city.



2. Sewer from a cardo minor (Fourth century AD)
MUHBA Plaça del Rei



3. Natatio from the frigidarium in the baths of a Roman house (Fifth-sixth century AD)
MUHBA Plaça del Rei



Reconstruction of the stretch of the Rec Comtal canal in La Ribera neighbourhood. The discontinuous stretch was built when much of this neighbourhood began to be demolished in 1714 in order to build the Bourbon citadel. The street names evoke the name of the canal and some of the trades that used its water.