

LOCATION AND CHARACTERIZATION OF DEPOSITS AND FORMER QANATS SUPPLY TO THE CORDOBA CITY FROM SIERRA MORENA (SPAIN)

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In this paper they are characterized, describe and locate water deposits and traces of old pipes that have historically fed the city of Cordoba from the area located north of the city or southern elevations of Sierra Morena.

Since Roman times and later in emiral and caliphate times the exploitation of these natural seeps is started and the wells in this sector. They are constructed made several aqueducts in Roman times that are subsequently reused in improving and expanding not only the number of deposits (*qanats*, mines, filtering wells, etc.) but also the pipelines and distribution systems or storage. This system is reinforced in modern times and held until the first third of the twentieth century when the dam built on the river Guadalquivir, becomes the main reservoir supplies water for the city. From this moment, together with the creation of private enterprise drinking water, an abandonment of the system of deposits and traditional water distribution, which is entering a phase of gradual deterioration and destruction that lasts to this day occurs.

They have been located and mapped thirty two water points and georeferenced different types of deposits, qanats, water mines, falsework and wells, as well as the constructive elements needed for distribution (culverts, athanors, delivery), storage and distribution of water (pools, *alcubillas*, *cauchiles*, *arqueta*) that they have allowed the supply of the city of Cordoba almost to the present.

It has collected and analyzed information available to both those elements that currently still in use, and for those other bad or missing, while have identified new structures that no record be had, evidencing the existence of a historical heritage of the first order.

This supply system has historically been based on the exploitation of aquifers present in the paleozoic limestones of Santa Maria de Trassierra and miocene calcarenites located immediately in the termination of the Sierra Morena sector. Water points studied were positioned in relation to the different lithologies mapped by IGME (1973), and located in the rururban space in relation to the network of streams and main communication routes. Have represented those brought in modern times occurred in some of these waters to supply the city, except three who believe muslim executed in the period as Don Marcos Huerta, Huerta del Alcázar and Huerta de La Reina.

More specifically it has been raised on the basis of Google Earth 2007 trace of the four branches of the *qanat* of El Duende or Huerta de la Reina given their special dimensions and development. In connection with this it has been possible to locate a fourth branch already outlined above located at heights of 140 m in contact with the miocene calcarenite, being a gallery with eight ports that are attached to the main line between wells 31 and 35 once connected the branches 2 and 3 with this addition the total number of ports identified for the system finally amounts to 94.

Described the existing gallery in the current Huertas Unidas, it would be for us one of the initial deposits of this qanat. This gallery shows very similar to other existing in the vicinity aspect. It has a length of 191-223 m, a height of 31 m, a height of 2 to 4 m and 2 m average width, and has three ports with constructive and aeration purposes. The first is located 32 meters from the entrance, the second at 37 m further inland, and a third at the end of an annex to the completion of the same branch.

The existence of the travertine platform Huerta Los Arcos (Baena et al., 1993) in its vicinity is a clear indicator of the existence of water with potential for uptake and utilization in this sector, which is also confirmed by Cid (1906) investigation who estimated the flow supplied by this uptake in 200 l/m.

They have represented the hydraulic elements currently associated with this collection, composed of a set of terraces, pools, culverts and now other lines in use that do not justify in any way the magnitude of current flow or the works carried out, and would support the hypothesis maintained.

It found some difficulty in locating the driver carrying the water from the mine Huerta Los Arcos (branch 1), to be superior to 20 meters deep, and found very urbanized area through which it flows. The documentation studied in the City Historical Archive and the location of any of its s has guided the trace from the origin to the union with the other branches of qanat Huerta La Reina.

Same problem has arisen in the branch 2 qanat but to a lesser extent, to elapse east by the valley of the Moro water stream, the survival of some ports, the lack of buildings in its path and direct access itself done on the ground. For its top, the consulted documentation has been useful to put this sector in connection with the intermediate and binding to other branches.

The trace of the branch 3 currently runs under the asphalt of an urban road where their ports covered by manhole covers of the local water company of Córdoba (EMACSA) persist. His stroke coincided with the edge of a country road still exists today, which has its preservation as well as facilitating access.

The branch 4 is developed under the basement of a residential area and has been a need to access their ports by acting as a private well for one of the owners. A collapse at the end of the trace, probably motivated by the weight of buildings, has hampered full study.

The existence of terracing associated with these mines uptake by the distribution of water through channels, was common throughout this area termination of Sierra Morena, particularly in the Huerta Los Arcos, it acts as a reference and model to retain much of all this old agricultural structure, despite the urban development occurred.

On the other hand it refined the design and Díaz Pego (1879) on the sharing of waters and existing in the Huerta del Hierro infrastructure. They have identified the point of attachment of the springs of Santa Maria and waters of the Huerta del Hierro themselves, and drawn seven *alcubillas* comprising this complex water distribution consists primarily of two almost parallel gallery and a third perpendicular serving as draining gallery. Currently the water that captures poured into a nearby stream.

It has identified a new *qanat* called Aguas de Huerta Don Marcos, unknown until now, whose gallery southwesterly crosses the alluvial terrace of the Guadalquivir, with presence of 19 ports and an average depth of around 16 m. Has made an elevational view of the gallery where the different heights of its ports and of these, which are currently in contact with the outside are appreciated and shown in Google Earth projection thereof on the surrounding territory where they appreciate the ports and two existing secondary branches and its drain a pool.

The possibility arises whether this *qanat* redialing waters Huerta Don Marcos could belong to one of the initial deposits of one of the branches of the Roman aqueduct of *Aqua Nova Domitiana Augusta*.

For driving Santa Clara, initially charted by Alonso Gutierrez in 1908, and discussed in recent works like Pizarro Berenjena (2014), it has been profiled in field your driving, mapping its plan and identified its union with the springs of Torrecilla -Antas and Los Morales. Also, it has been localizing the supply that from this current orchards to San Pablo, Jardinito and Maestre Escuela (Gamero Gutiérrez, 2015) was made.

To conduct the waters of the wellspring of Huerta La Reina has been studied a sketch made around the year 1836, redesigned its layout on the current mapping, using as references the ancient sites and place names indicated. His extensive legend has allowed collecting data on its route and approximate measurements of the distance between the lights at that time were still recognizable.

On the ground he was locating the lights that remained on the surface. Allowing understand their spatial arrangement and operation of its wells as water sinks sensors.

Therefore this characterization study and location system catchments and *qanats* constitutes an important new contribution to knowledge and appreciation of the rich historical and cultural heritage that has the city of Cordoba, providing an overview of the status of this important hydraulic heritage, and making advances in knowledge and characterization of this underground system is beyond the scope of the general public.

