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Sillyon Antik Kenti Su Sistemi Üzerine Bir Değerlendirme

An Assessment on the Water Supply System of Sillyon Ancient City

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Abstract: Sillyon, an important settlement in the region of Pamphylia, displays an urban development as per topography; its water supply system constitutes the scope of the present study. The quintessential element of life, as a fundamental supply and different from other natural resources, water has been exploited for political and social targets, apart from its economic value in the past and today. Based on this opinion, the water sources and structures of ancient Sillyon have been explored with an interdisciplinary approach within the frame of archaeology and hydrological engineering. The water structures attested in the city have been studied thoroughly and their approximate capacities have been calculated. Precipitation, temperature and humidity data of the city have been scrutinized and flooding occasions of the basin have been evaluated. Based on these data, various proposals have been made regarding the urbanistic fabric and city population of the city. It has been understood that the water structures at Sillyon were utilized in accordance with the continuing urban tradition, which had become traditional through the ages, that the morphological fabric of the territory was followed in the basis of the water supply system, and that a functional system was preferred rather than a regular planning. Nevertheless, an implementation not attested in other cities emerges at Sillyon, as that most of the water demand of the city was supplied from sources flowing at a certain altitude. It has been noted that these sources dictated the locations and volumes of important facilities such as Roman Bath, Nymphaeum A, Aquaeductus and Ottoman Fountain.

Keywords: Sillyon, Water Supply System, Water Structures, Urbanization, Ancient Sources

Öz: Pamphylia Bölgesi'nin önemli yerleşimlerinden olan ve kentsel gelişimi topografyaya göre yön bulan Sillyon antik kentinin "Su Sistemi" bu makalenin konusunu oluşturmaktadır. Yaşamın ana unsuru olan su, en temel ihtiyaç maddesi olması bakımından, diğer doğal kaynaklardan farklı olarak, ekonomik değerinin dışında, geçmişte ve günümüzde sosyal ve politik amaçlar doğrultusunda kullanılmıştır. Bu düşünceden hareketle, sunulan çalışma kapsamında Arkeoloji ve Hidroloji Mühendisliği disiplinleri çerçevesinde Sillyon antik kentinin su kaynakları ve su yapıları *disiplinlerarası* bir yaklaşımla araştırılmıştır. Kentte bulunan su yapıları tüm detaylarıyla çalışılmış ve yaklaşık kapasiteleri hesaplanmıştır. Kentin yağış, sıcaklık, nem verileri incelenmiş; havzanın taşkın durumu değerlendirilmiştir. Bu verilerden yararlanarak Sillyon'un urbanistik yapısı ve kent nüfusu hakkında çeşitli öneriler sunulmuştur. Sillyon'da tüm dönemlerde geleneksel hale gelen şehirciliğinde, su yapılarının da süregelen kent geleneği çerçevesinde kullanıldığı; su sisteminin temelinde arazinin morfolojik yapısına uyulduğu ve düzenli bir planlama yerine daha çok fonksiyonel bir sistemin tercih edildiği anlaşılmaktadır. Bununla birlikte Sillyon'da diğer kentlerde pek rastlanılmayan bir uygulama da ön plana çıkmaktadır. Şöyle ki, kentin su ihtiyacının büyük bir kısmı belli kot seviyesinde akan su kaynaklarından sağlanmaktadır. Bu kaynakların Roma Hamamı, Nymphaeum A, *Aquaedukt* ve Osmanlı Çeşmesi gibi önemli tesislerin konumunu ve hacmini belirlediği anlaşılmaktadır.

***Anahtar sözcükler*:** Sillyon Antik Kenti, Su Sistemi, Su Yapıları, Kentleşme, Antik Kaynaklar

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Introduction

The ancient city of Sillyon is located in the Kocagözler area of Yanköy Mahallesi, Serik district of Antalya province. The city is located on a 235 m high rocky hill. The city, surrounded by Aspendos in the east and Perge in the west, is located approximately 13 km away from the Mediterranean. Sillyon, one of the important cities of the ancient Pamphylia Region, is surrounded by the Tauros Mountains. It stands out as the most fortified city of the Pamphylia Plain. Sillyon, one of the connected settlements to the land, was packed into a very narrow area. The upper part of the natural rocky hill in which the city is located (acropolis) and southwest, west and south parts forming the lower city were available for settlement. Due to its characteristic terrain, Sillyon's urban planning has a unique implementation (Taşkıran 2021a, 314). It has been understood that the settlement developed towards the western slope and this area was the new social area of Sillyon during the Roman Empire period (Fig. 1). It has been observed that the city was pulled inward again and it was moved to the acropolis after the VIII8th century in late antiquity (Taşkıran 2021b, 31-32). It has been seen that the water system and buildings, which are the subject of this article, were directly affected by zoning policies in the city.

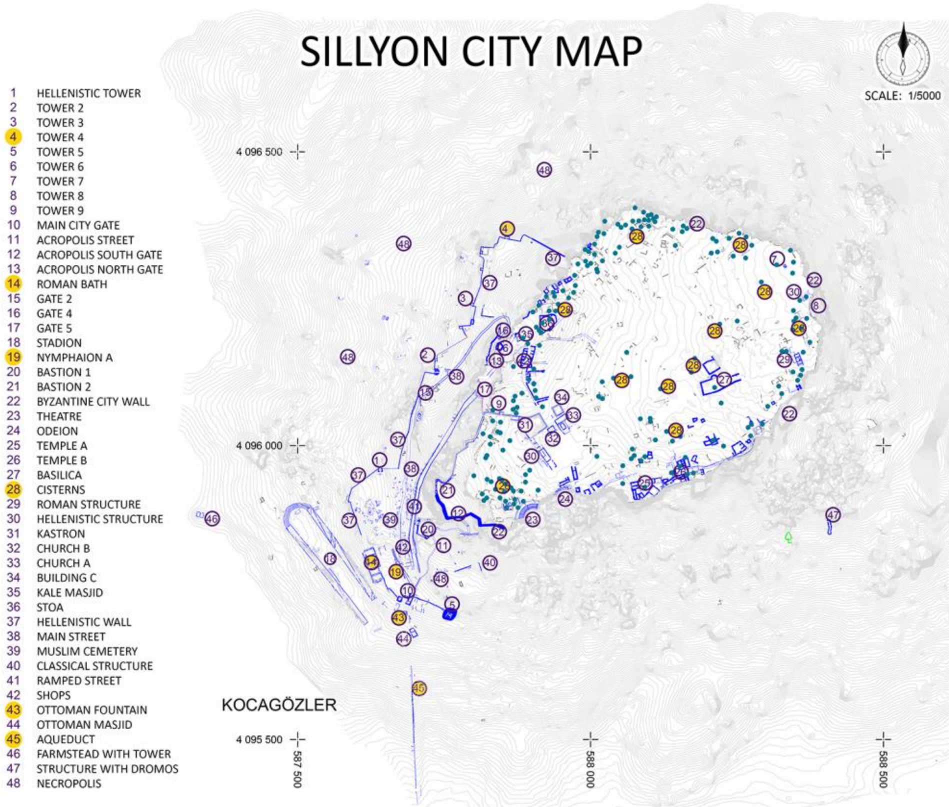


Fig. 1. Sillyon city map and the location of water structures in city map

It would be appropriate to briefly touch on the chronological history of the city in order to deal with the subject in a historical perspective (*longue durée*) and to explain that the periods of water structures are guided by politics and political developments. In the light of current research, it has been understood that Sillyon was inhabited continuously from the beginning of the Iron Age to the Turkish-Islamic period (Taşkıran 2020, 1-31). It is commonly accepted that the origin of the city is based on the Hittites, that the name Sillyon derives from Šalluša in the

Hittite texts, and that it is not a Greek name (Forlanini 1999, 237; Tekoğlu 2000, 49. Also, for recent research, see Taşkıran 2020, 1-31). However, the earliest archaeological data in the city are geometrically ornamented ceramics which were found during the surveys and they are dated back to the VIIIth and VIIth centuries BC. (Bilgin *et al.* 2020, 34-38, dwgs. 1-2). Apart from the political developments of the period, there is not much data about Sillyon dating to the Archaic and Classical periods. The Archaic period oil lamp (Küpper 1996, 265; Küpper 1997, 453) dated to the Vth century BC and IVth, black slipped ceramic fragments dated to the Vth century BC (Bilgin *et al.* 2020, 36-38, dwg. 3) and a red-figured crater fragment dated to the Vth century BC (Özer & Taşkıran 2010, 283, fig. 10, dwg. 2; Bilgin *et al.* 2020, 36-38, fig. 4. 22) can be evaluated as evidence that the city existed in the Classical Age. It has been understood from both the diversity of the findings and the narratives of ancient writers that the archaeological data about the city intensified during the Hellenistic period and that Sillyon has gradually assumed the character of a city. Inscriptions, coins and ceramic findings stand out as important data on the Hellenistic period of the city (For inscriptions from this period of the city, see Brixhe 1976, 165. The dates of 221/220 BC are seen as Era on the coins of Alexander the Great seen in Pamphylia. For this see Morkholm 1978, 70. For Hellenistic coin evaluations, see Köker 2020, 234-236, fig. 2. For ceramics of this period, see Bilgin *et al*. 2020, 38-42, figs. 4-5. Alkaç *et al.* 2020, 83 -86). It is also possible to reach various narratives about Sillyon in the passages of many ancient authors (Scyl. *Per.* 101. 1; Liv. *perioch.* XXXVIII; XV.4-12; Arr. *anab.* I. 26. 5). On the other hand, it has also been understood from the dense defense-oriented construction dating to the Hellenistic period that Sillyon was a self-sufficient city in this period (Taşkıran 2021a, 315).

It can be said that Sillyon expanded and became a large-scale city with *Pax Romana* during the Roman Empire period (For periodic comments, see Kolb 1984, 117; Nollé 1993, 297-317). It has been understood that the urbanization process with its architectural fabric and monumental public buildings was completed in the Roman Empire period (IInd and IIIrd centuries AD). It has been seen that many existing buildings from the Hellenistic period in Sillyon were renovated and some were built as in many Anatolian cities (Quaß 1993, 210; Tüner-Önen 2008, 176) during this period (For evaluations, see Taşkıran 2021a, 315-316). In addition to the urban developments, the inscriptions of the period provide important information. The inscriptions of the benevolent *philanthropist* Menodora and her family, found in Sillyon and dated to the IInd century AD, are important in terms of showing the social and economic situation of the city during this period (Debord 1982, 73; Bremen 1994, 43; Adak 2020, 48-49). It can be said that Sillyon developed in terms of urbanization in the IInd and IIIrd centuries AD and many public and religious buildings have been built especially with the support of Menodora and her family. Although the use of buildings dating to the Imperial period continued in Late Antiquity, it can be said that the city was slowly pulled inward and the city defense system came to the forefront again, as in the Hellenistic period. In this period, it has been observed that new buildings such as Nymphaion A and shops were built on the western slope of the city and the old city center was changed/reduced. This process should be considered as the first step of movement of the city towards the acropolis in the following periods.

Despite many events that took place in both the Byzantine and Turkish-Islamic Periods, Sillyon became one of the most powerful cities in the region with its sheltered natural structure, strategic location and strong fortification. The fact that the city was a bishopric center during the Byzantine period and that it maintained this status for a long time is the enormous periodical output of this position (Ruggieri & Nethercott 1986, 133; Hellenkemper & Hild 2004, 397; Taşkıran 2020, 15-21; İşler 2020, 146-150, Taşkıran 2021b, 6-8). Similarly, it preserved its importance in the Anatolian Seljuk and principalities period and was at the forefront among the regional settlements as "Karahisar-ı Teke", one of the important centers of Teke province in the Turkish-Islamic period (Taşkıran 2020, 21; Mıynat 2020, 197-200, Taşkıran 2021b, 8-9). In the light of recent studies, it has been revealed that the city was inhabited until the last periods of the Ottoman Empire. Architectural structures such as the masjids, fountain, residences and barn, especially seen on the western slope of the city, should be considered as concrete data of the mentioned period.

The structures and water resources of Sillyon began to be studied as part of the survey project conducted with an interdisciplinary approach in 2018, and detailed studies have been pursued under the title of "Sillyon Water System Project" in subsequent years. Since the main subject of this project is related to archeology/art history and hydrological engineering, its method has also been shaped by the methodology of the aforementioned disciplines. In general terms, the hydrography of the ancient city of Sillyon has been researched with an interdisciplinary approach within the framework of archeology and hydrological engineering disciplines. The water structures of the city were studied in detail and their capacities were calculated. Precipitation, temperature and humidity data of the city were examined. The flood status of the basin was evaluated and various suggestions were presented about the urbanistic structure of Sillyon and its population by use of this data. In the urbanism that has become traditional in all periods in Sillyon, water structures are also used within the framework of the ongoing urban tradition. It has been determined that the morphological structure of the land was followed based on the water system and a more functional system was preferred instead of a regular planning. However, an implementation that is not seen in other cities comes to the fore in Sillyon. Namely, a large part of the city's water need was provided from water sources that boil at a certain level. It has been understood that these sources determined the location and volume of important facilities such as the Roman Bath, Nymphaion A, Aquaeductus and Ottoman Fountain, as will be explained in detail below.

To this date, no comprehensive study of the water system has been conducted in Sillyon. However, individual publications of some water structures have been completed or some structures have been briefly introduced. The Roman Bath, located on the western slope of the city, was published by M. Taşkıran in 2021 (See Taşkıran 2021a). The Nymphaion A/Late Antique Fountain, located just above the bath and fed from the same source, was studied and published by G. Işık in 2020 (See Işık 2020). The Aquaeduct / *Aquaeductus* extending in the south direction along the southwest of the city was researched in detail and made ready for publication by M. Taşkıran (See Taşkıran 2022). Brief evaluations of the Ottoman Fountain and other water systems are included in the Sillyon Book II prepared by M. Taşkıran (For these evaluations, see Taşkıran 2021b, 84-86). Accordingly, all the elements that make up the Water System will be discussed and the results will be presented within the scope of the recent surveys and excavations in the city in this study.

1. Field of Study and Data

Considering the studies carried out so far and the areas ruled by the neighboring cities, the area of sovereignty of Sillyon can be roughly described. The territory of the city can be limited to the Cestrus (Aksu) River to the west and the Mediterranean Sea to the south, starting from the foot of the Taurus Mountains bordering to the north. Thus, the city and its area of sovereignty provide a pattern that is both rugged and flat, and connected to the sea and allows for thinking about different settlements (Taşkıran 2021b, 23). Large and small streams and steamlets draw attention in the mentioned area. Although the flow rates of these creeks, that originate at the foot of the Taurus Mountains and curve and flow into the Mediterranean at the borders of Kadriye and Belek Districts, vary according to the seasonal precipitation, it appears that they form a uniquely fertile basin (Fig. 2). According to the studies carried out in the city territory, it can be said that the settlements connected to Sillyon were also located according to these water resources. The most important example is a coastal settlement called *Kynosarion* (Κυνοσάϱιον), that belongs to the *khora* of the city, reached by the Sillyon Creek, that flows just west of Sillyon.

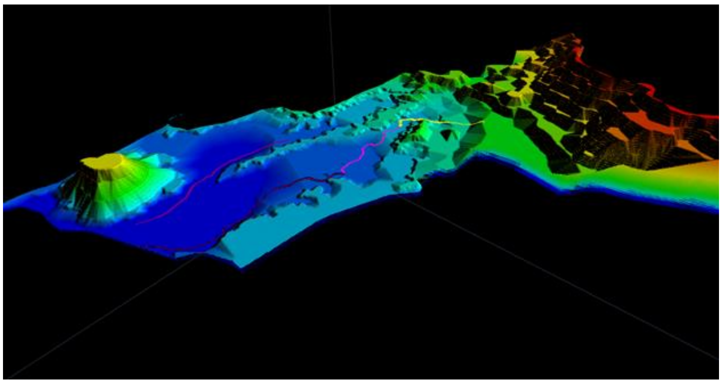


Fig. 2. 3D model of the Sillyon basin

It has been thought that the *Kynosarion* Settlement, located in Taşlı Burun, within the boundaries of Belek District, may also be the port of Sillyon. In fact, it was very easy to reach the shore, i.e Kynosarion, via the Sillyon Creek (Koducak) with small boats or rafts. Examples of cisterns attract attention in most of the settlements connected to Sillyon. The presence of cisterns highlights in the Kepez Settlement in the north of the city and in the small agricultural settlements between Sillyon and the Mediterranean. Apart from the cisterns here, well samples have also been encountered since the ground water level is close. Almost all the mentioned settlements must belong to the Roman Empire period and later. It has been known that rural settlements increased around Sillyon due to the increase in population growth and security after the IInd century AD (Taşkıran 2020, 2; Atalay *et al.* 2020, 168-169; Taşkıran 2021b, 23-24).

Sillyon ancient city, located in the Antalya basin, is close to the airport and Serik meteorology station. These data have been evaluated for Sillyon. The average annual rainfall is 1073.5 mm in Serik. According to the average of Serik station, 17 % (182.5 mm) of the annual precipitation is in spring, 1.4 % (14.9 mm) is in summer, 20.7% (222.7 mm) is in autumn, 60 % .9 (653.4 mm) falls during the winter months. The average annual precipitation is 1119.39 mm at the airport (Table 1). According to the airport station average, 18 % (198.4 mm) of the average annual rainfall is in spring, 1 % (13.14 mm) is in summer, 22 % (248.4 mm) is in autumn, 59 % (659,5 mm) of it is in winter (Table 2).

Table 1. Annual Rains Data at Antalya Airport Station

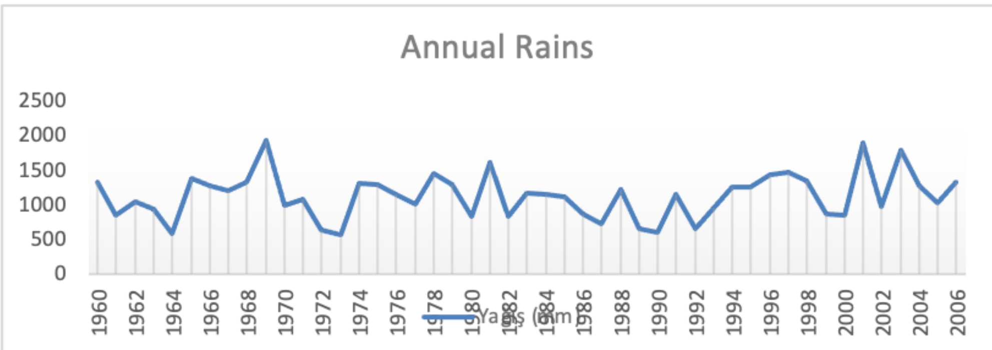
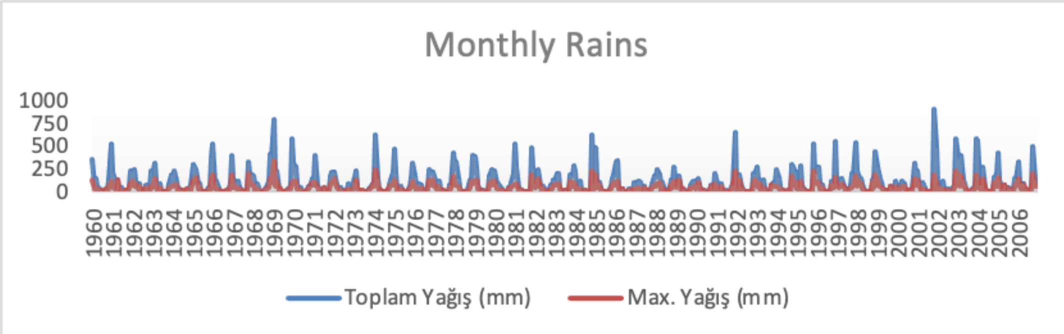


Table 2. Monthly Total and Maximum Rains Data at Antalya Airport Station



The basin that forms our subject, i.e., namely the city and its surroundings, has an area of approximately 22,500 m^2 (Fig. 2). As observed from stations close to the city of Sillyon, the basin is exposed to excessive precipitation, especially in winter. The ancient city of Sillyon and its surroundings are heavily affected by these rainfalls. In the study conducted according to the criteria of health, environment, cultural heritage, economic risk criteria and severity of the flood and its recurrence interval by the Ministry of Forestry and Water Affairs, Antalya-Serik is among the regions with a high level of risk (O.S.İ.B. 2016).

2. Water Structures and Sources

It would be appropriate to evaluate the Sillyon Water System under two different headings, namely the Acropolis and the Lower City. The need for water in the acropolis area, where the city first emerged, relies entirely on the storage system built over cisterns. So much so that the cistern discovered in the Kale Masjid, excavated in 2020, is the only structure that meets the water needs of the mosque, which is the most important data supporting our thoughts (Taşkıran – Palali 2021, 42-44, fig. 21). No water source was found during the intensive surveys in this area. Moreover, the water obtained by the accumulation of rainwater was used in civil and public buildings.

However, a different situation emerges on the western and southern slopes, where the city developed and important public buildings were built during and after the Hellenistic period. Although there are no cisterns or water reservoirs in the mentioned areas contrary to the acropolis, there are water sources at an elevation range of approximately 110-120 m. The formation adventures and flow conditions of these resources have been determined and have been investigated in detail in the geology and geophysics studies carried out within the scope of the Water System Project (For these studies, see Kumsar *et al.* 2019, 898-899, fig. 11; Kumsar 2020, 293-294). There are many cracks, fractures and melt gaps in the limestone unit of the ancient city area of Sillyon, which was established on a hilly area on Gebiz limestone. Therefore, it can store precipitation and surface waters in its body and contains groundwater (Taşkıran 2021a, 327-328). The Karpuzçay formation, located at the base of the limestone unit, is generally impermeable and partially permeable as it consists of fine-medium-thick bedded, gray, dirty yellow, green, beige, cream-colored sandstone, claystone and siltstones. Therefore, the groundwater stored in the Gebiz limestone unit, wound on the Karpuzçay formation, discharges at several points on the slope as a source from the contact of these two units at the bottom (Kumsar 2020, 294-299). Consequently, these water source points were evaluated for the city plan and used in many buildings in parallel with the urbanization of Sillyon. In the western part of the city, on the water source points in the lower city, a Roman Bath was built in the Roman Empire period, the Nymphaion A/Late Antique Fountain in the Late Antiquity and a fountain in the Ottoman period were built. In fact, the water source here was transferred to the plain for agriculture by means of the Aquaeduct/ *Aquaeductus* after being collected in a water reservoir during the Byzantine period. Finally, a line was drawn and transferred to the Kocagözler Fountain, which was built in the village in the early Turkish Republic period. It has been seen that the water resources at the same elevation in the southern and northern parts have been used in certain ways apart from the zoning activities developed because of the spring on the south-west slope. For example, Structure with Dromos, considered a cult building and located on the southern slope of the city, was built on a water source (For this structure, see Taşkıran & Bilgin 2019). Today, the water outlets used by locals to water their animals are located in the north side of the city. As can be seen, the geological structure of the city determined the water system and the city planning was guided accordingly in most places. The Sillyon water structures are described under the following headings (Fig. 1).

2.1 Cisterns

Since there is no water source in the Sillyon acropolis, the daily water needs of the people were obtained by collecting rainwater in cisterns, just as seen in many hill or hill skirt cities established with a defensive strategy (Fig. 3). In other words, the water system in the acropolis is based only on cisterns. In the ancient city of Sillyon, which was built on a steep cliff, many cisterns were built to store rainwater and reduce the effect of flooding. Rainwater, which was mostly collected from the roofs of the buildings, was collected in cisterns with special mechanisms, and water needs were met by these cisterns, especially in the summer months (Fig. 4). The number of detected cisterns and their features are given in Table 3. 220 cisterns identified in the studies carried out in the acropolis were evaluated under four types in total. Although their widths are different, their depths are in the range of 3, 4.5, 6 and 8 m, respectively. The 8 m-deep examples, which draw attention among all types and are called "public cisterns", were clustered in areas where public buildings were located. However, a rectangular cistern with a total of 15 columns, just south of Kastro, constitutes the prominent structure of the water system in the acropolis.

Table 3. Types of cisterns Found in the Ancient City of Sillyon

LOCATION	**TYP**	**RADIUS** (r) (cm)	**DEPTH** (h) (m)	**NUMBER**
Residental District	TYPE 1	25	3	70
Residental District	TYPE 2	50	4,5	70
Close to the Public Area	TYPE 3	80	6	70
Public Area	TYPE 4	80	8	10

There are houses in the northern and southern parts of the Sillyon acropolis. However, it is clear that the residential district of the city is the northern part of the acropolis. Here, in most places, we see examples of houses carved from the rock and designed in an adjacent order. In Sillyon, which exhibits a land-dependent housing pattern, there are cisterns, which we usually refer to as Type 1 and Type 2, inside the houses, in the courtyard, on the street or right next to it. In fact, the density of cisterns was followed in these regions. Type 3 and Type 4 cisterns were identified in public areas such as temples and theaters. Three connected Type 3 cisterns were found at the central point, south of Kastron, in the southwest of Temple B. 1 of Type 4 was found next to Temple A. There are two Type 4 units near the theater (Fig. 5).

The reservoir part of the cisterns is largely covered by soil and rubble. For this reason, only a fraction of the 220 identified cisterns could be evaluated. The cisterns schare common architectural features. The general geometric structure of the cisterns is bottle-shaped, pear-shaped and some examples are bell-shaped (Fig. 6-7). The upper width nearly triples at the base.

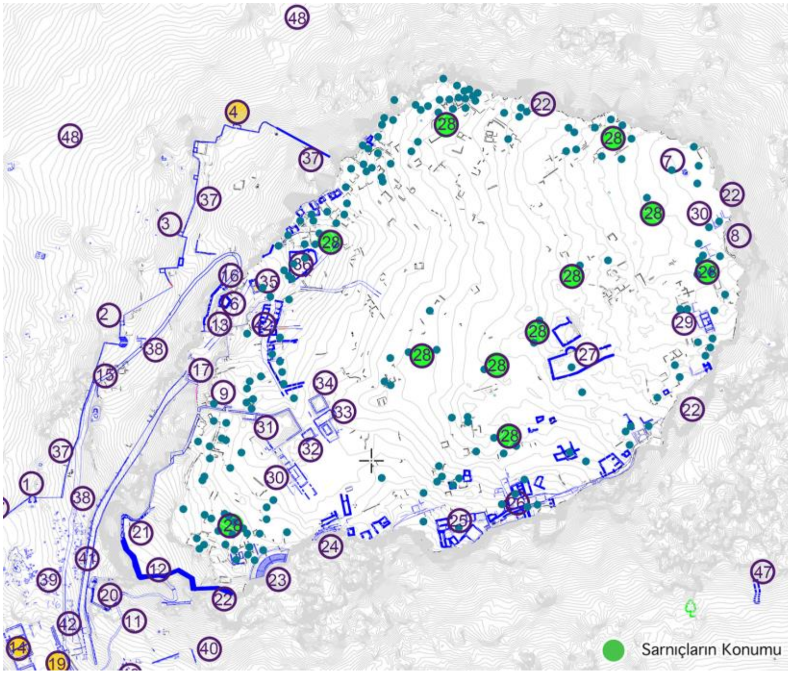


Fig. 3. Akropolis of Sillyon and cisterns on it

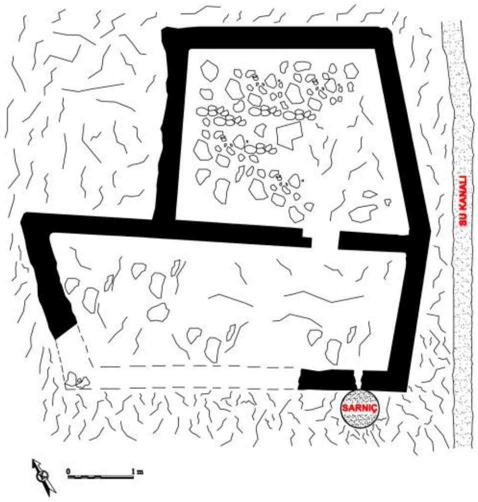


Fig. 4. Drawing of an example of a house, the location of the cistern and water canal in the acropolis

Fig. 5. 4 types of cisterns identified in Sillyon; a) Akropolis residential area type 1 and its lid, b) Akropolis residential area type 2 cistern, c) Akropolis residential area type 3 cistern, d) Type 4 or example of public space cistern (Temple Terrace)

Making the cisterns pear-bottle shaped preserves fresh air inside and prevents evaporation, as well as providing ease of covering (Kürkçü 2015a, 304). Therefore, the risk that people and animals accidentally falling into them and materials such as dust, soil, pollen etc., that can be blown by the wind was also avoided (Kürkçü 2015b, 124). It has been understood that the cisterns in the residential areas were located on the streets, in the gardens of the houses or right under the roof. Thus, it was planned to store water easily and to avoid wasting water. The placement of some cisterns in the interior floors of the spaces provided easier access to water, and at the same time, the water source was protected against negative external influences. At the central point of the cisterns, which were covered with limestone blocks, a plain, simple and monolithic well collar (*puteal*) was placed on the limestones. Traces of the pull rope of the bracelets of some cisterns have been observed. While most of the cistern bracelets have a simple cross-section, some are made in an "outer square and inner circle" scheme (For cistern bracelets, see İşler 2019, 23). All of the examples were carved from the rock, and these structures were obtained by cutting and leveling the rock ground above Sillyon. All of the samples we were able to evaluate were similar and on the walls was not preferred brick veneer (such as *tegula mammata* or *opus testaceum*), marble veneer or a similar weave pattern. In other words, the cisterns were made functional with easy-practical and on-site analysis as much as possible. In addition, in our research, it was observed that some cisterns have holes that allow excess water to drain away or collect groundwater in the cistern in order to prevent water from leaking out.

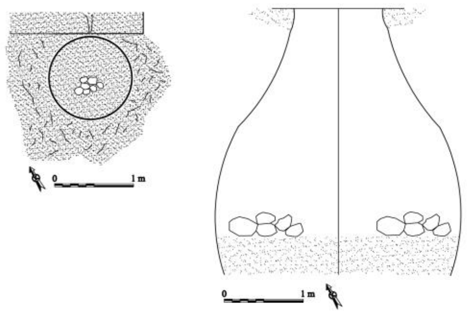


Fig. 6. Example of bell-shaped cistern, plan and section drawing

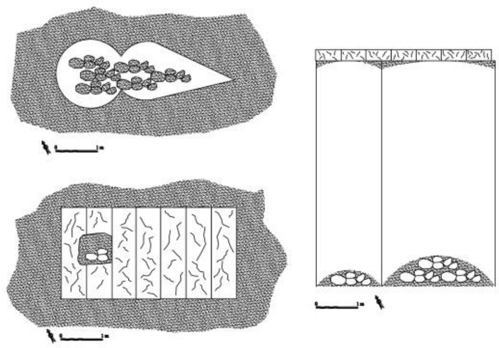


Fig. 7. Example of double-section cistern, plan and section drawing

Canals connected to cisterns were observed on some streets, oriented according to the slope of the hill and not too deep. It can be said that these water canals were built to transfer flood water along the streets and avenues to the lower elevations and even outside the city, in cases such as when the cisterns overflow after filling up rapidly in rainy weather (Fig. 8). In fact, during the work on the main street located just below the residential area in the 2021 excavation season, a water drainage canal, which is with a depth of 1.20 m and a width of 1.10 m and follows to the street and finds a downward direction. As a result of the investigations, it was thought that the water and floods collected in the residential area and other regions during heavy rainy seasons were transferred via this channel to the lower elevations or outside the city (Fig. 9). It was observed that all the canals in the streets are directed to the main street and merge with the large canal here. It was understood that with this system, which we see in the city plan of Termesos (Kürkçü 2016, 134) and Pergamon in the Philetairos period (Radt 2001, 45-46), it is not only to collect water, but also to evacuate the floods that will occur in this way.

As a result of the research in the acropolis, a 15-column cistern where rainwater was collected at a height of 222,847 m was identified in addition to the widespread cisterns, about 50 meters west of the Hellenistic Building and just southwest of Castrum, that is, i.e., at a central point where the public buildings are located. It was determined that this columnar cistern, which is different from other examples, was formed by carving into the rock and the structure was strengthened with four corner bearing columns. It was observed that the walls of the building were plastered with a thin waterproof mortar (Fig. 10). The dimensions of the cistern are 10.85*8.00*4.00 (3.65) m and reflect a rectangular plan. Column dimensions 0.45*0.45; column spacing was measured as 1.70 -1.35 m. The approximate volume of the cistern is 335.05 m3. We also see this rectangular cistern in Kremna similar to the one in Sillyon (Kürkçü 2015, 307-308, fig. 11). The Kremna example differs from Sillyon's in the presence of a pillar in the middle area, consisting of rectangular blocks stacked on top of each other with mortar.

Fig. 8. An example of Canal in residential area, from east

Fig. 9. The main water canal where the flood waters in the acropolis were directed, the view of it after the 2021 excavations campaign

Fig. 10. A view from the interior of the columnar cistern in the Acropolis

It is not easy to determine an exact date range for the building period of the cisterns at this stage. However, the fact that nearly all of the cisterns included in the evaluation have walls covered with pinkish and reddish hydraulic plaster (*opus signinum)* to provide waterproofing and that they are pear / bottle shaped may be considered a seasonal feature. In addition, the use of an almost standard construction technique in all cisterns makes a typochronological assessment difficult (for a Pamphylian example see Yurtsever 2021, 21-37). Undoubtedly, the major reason for this standardization is the morphological structure of Sillyon. Although examples of pear-shaped cisterns have been found in Lycia and other regional cities since the Classical period (for examples of Pergamon in Hellenistic period, see Radt 2002, 145; for Assos, see Yerli 2019, 19, for examples of Kekova Island Tersane Bay, see Aslan 2014, 342-343, dwg. 3), it can be said that it is almost a necessity to prefer this type of plan in order to store water and use it for a long time while avoiding evaporation. The four types of cisterns identified in Sillyon should also be considered in this context and it should be imagined that these structures may have been in use from at least the Hellenistic period to the times when the city was abandoned. In fact, it has been determined that the cistern in an early house (Küpper 1996, 262-263; Küpper 1997, 453, Fig. 9A) is similar to the examples in the houses just west of Castrum, which are thought to be dated to the Byzantine period. It can be said that the cisterns were overhauled over time, continued their functions and had beeb used for centuries. When we look at the hydraulic mortar components, the fact that they have more Roman Empire period features supports our thoughts (Thanks to Lecturer Ali Yaşar for this evaluation). However, the way the cisterns were closed or the well bracelets can be useful for dating. "Square from the outside and circle from the inside" or simple circular shapes mostly indicate Roman-Byzantine periods (See Tölle-Kastenbein 1990, 106-114) However, the large-capacity cisterns call as "Public Cisterns" (See Table 3) dated to the Hellenistic period, is close proximity to structures such as the Temple Terrace, the Theatre, the Hellenistic Building (For the dating of these structures, see Taşkıran 2021b, 58-60), indicates that these examples may have been built in the Hellenistic period along with the aforementioned public buildings.

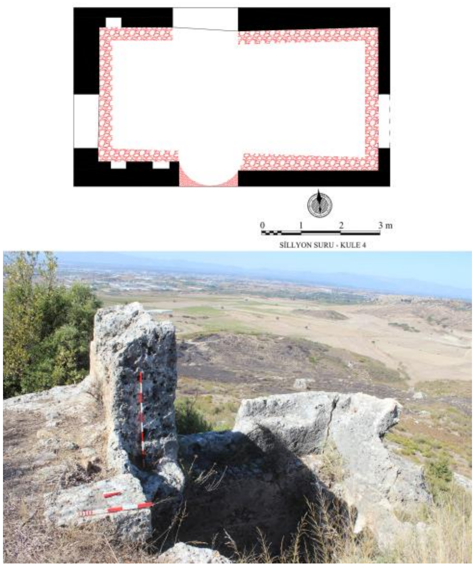


Fig. 11. Tower 4- Cistern, plan and a general view from east)

Fig. 12. Roman Bath, an attempt of 3D model, a general view from southeast

2.2 Tower 4-Cistern

The building, which has been considered as Tower 4 or Tower Cistern, is located on the Hellenistic fortification and continues from the northwest slope of the city towards the acropolis. This place was evaluated as a part of the defense of the city by M. Taşkıran in his doctoral thesis, the defensive aspect of the building was emphasized and it was dated to the middle of the Hellenistic period (For detailed evaluations, see Taşkıran 2017, 145-147). The building has two floors and the upper floor was used as a defense tower and the lower floor was used as a water tank. Tower 4 was measured as 8.05 m x 4.54 m and has a rectangular plan. Thickness of the wall varies between 0.33 m and 0.65 m as it was carved from the rock. Lower floors's walls, carved from the bedrock, are surrounded by an additional interior wall with a thickness of 0.33 m. It has been seen that there are traces of impermeable mortar on the wall built with small stones and bricks (Fig. 11).

The importance of this building in terms of our subject is that its lower floor was separated as a cistern/water tank. So much so that on the south wall of the building there is a half-round cistern mouth 1.50 m wide. It has been seen that the cistern with a half-round section was plastered with a thin and pinkish mortar and was designed together with the lower floor. It has been seen that the plaster on the cistern opening continuing towards the lower floor of the tower and the plaster on the 0.33 m wide wall surrounding the lower floor are the same. As a result, it was determined that the lower floor of the tower was a water tank and the half-round part on the south wall was the mouth of this cistern/water tank. It has been understood that the beam slots placed opposite each other on the northern and southern walls of the space belong to the floor/ceiling separating the water tank/cistern and the tower on the first floor.

The example of Sillyon is a manifestation of the land-dependent city plan and the city's defense policy. Here, beyond a tactical defense understanding pointed out by Aeneas Tacticus, it has been revealed that the ground floor of a defense structure was designed as a water tank in order to supply the water needs of the soldiers or law enforcement officers in charge of the city defense. Moreover, the water resources in the city are on the south and south-west slopes of the hill, and Tower 4 is far from these areas. Examples of water tanks and cisterns in defense structures in antiquity appear in many places (Taşkıran 2017, 147). The two most vivid examples of making some of the towers into cisterns in Anatolia can be found in Rough Cilicia. One of them is the building known as Dibisulu Tower, which dates back to the Hellenistic period in Rough Cilicia. Here, the lower part of the tower was designed as a cistern (Durugönül 1998, 77-78, 91, 122, Abb. 51, Taf. 48-49.) Another example is the Demirciören tower located in the north of Korykos. Although a large cistern is right next to the tower, it is not clear that it formed the lower part of the tower, as in Dibisulu (Durugönül 1998, 78-79, 91, 122, Abb. 52, Taf. 50, 1-3). In the Lycian Region, another example can be seen in the Ision-Beymelek complex. It has been emphasized that the first floor of the building, which is described as Tower 1 here, was carved out of the rock and made into a cistern, as in the Sillyon example (McNicoll - Winikoff 1983, 317). In addition, there were cisterns in the towers of the Orontes Antioch, which were repaired during the Justinian period (527-565 AD) (Lawrence 1979, 230).

2.3 Roman Baths

The Roman Bath is located on a leveled terrace on the western slope of the city, where public buildings from the Roman Empire period were clustered. There is the the Main City Gate in the 40 m northwest of the building, located on the upper terrace of the stadium, and there is the Nymphaion A /Late Antique Fountain in 26 m east of the building (Fig. 12). The area where the building is located was the busiest point of the city together with the imperial period and was a point where all social areas were clustered. Roman Bath was published by M. Taşkıran in 2021 under the title of "Roman Bath in the Light of Recent Studies" (For this, see Taşkıran 2021a). For this reason, in order to ensure the integrity of the subject, only brief information about the building will be included and the location of the city in the water system will be evaluated.

Covering an area of approximately 1140 m^2, the Roman Bath was placed in the city plan in a north-south orientation. The bath was oriented according to the terrain and was placed directly on a rocky and solid ground. The building has a rectangular plan, with a short front of 21.80 m and a long side of 60.87 m. It has been understood that the Sillyon bath consists of five halls in order according to the existing plan scheme. However, it has been determined that the building has two basic construction phases in the light of new researches. Although the first three rooms of the bath (Halls I-III) are of the same size, the other two rooms (Halls IV-V) were started at 4.25 m east. In other words, Halls I, II and III (21.80 m) were placed longer than Halls IV and V (16.55 m). It has been understood that this structural difference between the halls was due to the repairs made in the bath. In particular, there are significant differences between the construction technique of the walls of the first three halls and the construction technique of Halls IV and V and its corridor. However, the absence of seams and the separation of walls at the junction of Hall IV with Hall III is another indication that these spaces were added later. Thus, it has been thought that the building was a facility with three halls in the first construction phase, and that the building was transformed into a more complex facility by adding halls IV and V and a corridor in the second construction phase. It has been understood that the western façade was surrounded by a corridor which was 43.40 m long and 2.65 m wide. This corridor, which starts from Hall I of the building, continues until Hall IV. From the north side, where Hall I (*apodyterium*) is located, an entrance was made to the corridor, in other words to the building, and by continuing along this corridor, Halls I, II, III and IV were reached, respectively (For evaluations, see Taşkıran 2021a, 318-321, fig. 3-9; Taşkıran 2021b, 65-67, fig. 56-57).

Sillyon Bath has two basic construction phases. The bath, which consisted of three sequential halls in the first construction phase, was transformed into a complex structure by adding two halls and corridors in the second phase. This transformation did not change the basic plan of the building, and the sequential order was developed and continued to be used. At the first stage, we thought that this facility had consisted of *frigidarium* (*apodyterium* (?)), *tepidarium* and *caldarium,* and later Halls IV and V were added to give new functions to the spaces. In this new scheme, the arrangement of the halls of the bath is as follows from north to south; *apodyterium* (Hall I), *frigidarium* (Hall II), *tepidarium* (Hall III), *caldarium* I (Hall IV), and at the southernmost end caldarium II (Hall V). Sillyon Roman Bath should be evaluated as an architectural activity for the monumentality of the IInd and IIIrd centuries. The building remained in use until the Late Antiquity (Taşkıran 2021a, 335-337).

In terms of our subject, the most important aspect of the building is the water supply. As mentioned above in the water resources, the spring on the western slope of the city constitutes the main water source of the bath. It turns out that this source, which was almost the most important geographical feature of the lower city, was sufficient for a large facility such as a bath. This has also been supported by the studies we have done in and around the building. As a matter of fact, it has been revealed by geophysical studies that the clean water entrance to the Sillyon Roman Bath has been provided from the east, where the source is located, through the pipe openings opened to the façade wall. With the geophysical studies carried out between the bath and Nymphaion A, an anomaly was detected starting from the central axis of Nymphaion A and continuing towards the bath on the western axis, and this anomaly was evaluated as a water channel. In the scanning, it was seen that the area where the water channel enters the space is the central point of the eastern wall of Hall III, that is, the *tepidarium*. However, it has been seen that after the period when the bath lost its basic function or was converted into a small facility, two vaulted water tanks were added to Hall III/t*epidarium*. These two structures, in addition to the water distribution system within the facility, act as a water tank or *castellum aquae* and store water from an upper level, namely the area where Nymphaion A is located. It is very difficult to explain what this stored water was used for at this stage. This will be evident with the planned excavations.

Nymphaion A / a Fountain of Late Antiquity

Nymphaion A/Late Antique Fountain is located on a north-south axis, approximately 50 m northwest of the Main City Gate, approximately in the 25 m east of the Roman Bath, and just west of the Main Street. It is located in the center of the area where the most intense architectural remains are observed in the lower city, together with the buildings in its immediate vicinity (Fig. 13). The first results about the structure studied during the surveys carried out in the city between 2018-2019 were published by G. Işık in the book "Sillyonian Studies I" (See Işık 2020). Within the scope of our study, the building has been handled within the integrity of the subject and its place in the water system has been evaluated.

This monumental fountain was placed on a north-south axis and faces west. The building, which is 18.80 m long in total, has a height of 6.20 m in the best-preserved place, and a wall thickness of around 1.10 m. Although the building has been perceived as rectangular due to the terrace wall to which it is attached and the scattered filling cover, it has been thought to have a "U" plan in its original form. It consists of three barrel-vaulted units of equal shape and size on the long side, an arch or vault on the short sides, and a raised rear wall with a reservoir at the top. The vaults on both sides on the front façade were completely closed due to the filling soil. The vault of the southern unit collapsed, and only one row of the double-row arch of the northern unit was preserved. The unit forming the northern short side is almost completely underground. One wing of the arch opening on the south short side, which has been understood to be multi-phase, has survived to the present day. A reservoir extends over the vaulted units along the long side. The western wall of the reservoir, which was vaulted and can be seen from the traces on both walls forming its wings, continues until the beginning of the northern short edge of the fountain. The high retained wall that forms the other wing of the reservoir and the rear of the fountain, which is approximately half intact, also assumed the function of retaining the Acropolis, the Main Street (Işık 2020, 133; Taşkıran 2021b. 67-69, fig. 58-59). It has been foreseen that the flat area or courtyard between the building and the Roman Bath may have a setup such as an outdoor pool or park that contributes to the city's landscape.

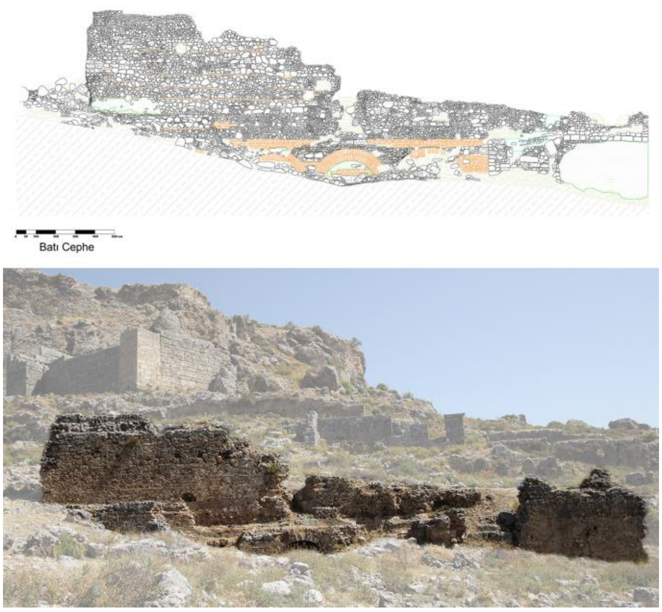


Fig. 13. Nymphaion A / Fountain of Late Antiquity, drawing of facade and a general view from west

Fig. 14. Aqueduct / *Aqueduktus*, a general view from southwest

Fig. 15. Ottoman Fountain, a general view from west

Two different water channels fed from the same source, a reservoir whose function has not yet been determined on the long side, and a high retaining rear façade show that the structure has a functional architectural setup aimed at meeting the specific needs of the settlement. Based on its architectural setup, material/technical features and its location in the settlement, it can be said that it was built in Late Antiquity after the Roman Bath, located just west of it, lost its function. The water of the spring feeding the bath was transferred to Nymphaion A during this period (Taşkıran 2021a, 28-29). The water flowing from the fountain was groundwater stored in limestone (Kumsar *et al.* 2019). It has been foreseen that the underground water collection structure - gallery was compiled and given from the fountain. As a result, the history, architectural setup and location of the building show that Sillyon had an important place in the urbanization adventure. It is obvious that the source in the area, which had always been important for the city, was presented to the use of the city residents with a fountain with visual richness. The Nymphaion A / Fountain of Late Antiquity and the near future excavations in its immediate front area will reveal all the details.

2.5 Aquaeduct / *Aquaeductus*

The Aquaeduct / *Aquaeductus*, which starts from the area where the Main City Gate is located, continues for 313 m in the southwest direction and can be watched in all details, approximately 180 m long, has been studied in detail for the "100th Anniversary Book of the Antalya Museum". This article written by Murat Taşkıran will be published soon. For this reason, only brief information about the building will be included in order to ensure the integrity of the subject (Fig. 14).

While the elevation, the Aquaeduct starts at, is 122 m, it is 62 m at the point where it ends. There is an elevation difference of approximately 60 m and accordingly a slope of 19.8 %. The shape of the land was complied with in the construction of the north-south oriented structure. The walls of the aquaeduct were built using local limestone, polygonal dry rubble stones, spolia blocks, and lime mortar with brick and tile additives. For the buttresses supporting the building, neatly cut square blocks were preferred. In addition, mixed applications have been seen in the structure. No traces of clamps, clamps or wooden usage has not been found. The first detail that catches the eye is that the blocks used in spolia are rectangular and properly cut materials. The wall of the aquaeduct is 60 cm thick, 4 m high in the most preserved place, and it was supported by buttresses at certain intervals. The buttresses are 60 m wide and 60 m deep. 5 of the buttresses placed on the western façade of the wall at regular intervals have survived and their heights vary between 2 and 4 m. There are wooden pier slots placed at a certain height in the middle of the buttresses. It has been understood that a rectangular-shaped collection pool was built at the point where the aquaeduct ends, just east of it. Its width is 7 m and its total length is 17.5 m. Above the arch, the area where the terracotta (*tubuli fictiles*) pipes used for water transfer sit is chosen and it has been understood that these pipes are fixed with coarse mortar.

After Nymphaion A had lost its function -probably in the VIth and VIIth centuries- it was transferred to the plain with the help of the square-planned water partition structure built just to the east of the east tower of the Main City Gate and the Aquaeduct. It has been also thought that it may be possible that the distribution depot of this place, Castellum divisorium (For this, see Vitruv. *de Arch*. VIII. 6.1-2; May 2010, 121-122; Hodge 2002, 279-296 and 320-321), which also provided water delivery to different networks of a city. (See Taşkıran 2022). The water carried from this point by terracotta pipes was stored in the pool at the end of the aquaeduct and was probably used for irrigated agriculture. The source from which the water came out first met the water needs of the Roman Baths and right after the Nymphaion A in Late Antiquity. After Nymphaion A had lost its function probably in the Byzantine period, the aquaeduct was built and the spring water was transferred for agricultural organization (Taşkıran 2021b, 73-74, fig. 63). In other words, the construction technique and analogical comparisons of the Aquaeduct indicates that the building dates just after VIth century and it may used during the Middle Ages. The chronological development and political developments of the city support this date range.

2.6 Late Fountains

Fountains, which are the last point where the water that is distributed reaches the city from the source, is an important document reflecting the changing architectural and technological level in the historical process. Fountains are a cross between water engineering and culture (Bacanlı *et al.* 2018). In the ancient city of Sillyon, there are two fountain structures are still in use today. One of them is the Ottoman Fountain located in the southwest of the city, and the other is the Kocagözler Fountain in the village. It has been determined that the water of both fountains was the source that was located at approximately 120 elevations on the western slope of the city and fed structures such as the Roman Bath first, then Nymphaion A, Aquaeduct, respectively.

The Ottoman Fountain is located at the center of the public buildings on the southwestern slope of the city, between the Main City Gate and the Lower Mescit, at an elevation of 119,551 m. The back part of the fountain, which was built on an area with a slope in the east-west direction, leans on the slope of the land. The western side of the fountain overlooks a partially flat area where the main road from the city bends (Fig. 15). A perimeter wall without mortar was built on the north and south of the fountain with spolia large and smooth cut stones. The fountain, which was built entirely of large and small cut stones, has a round arch resting on an unworked capital on the legs on the sides and expanding upwards. The fountain, which does not have a water reservoir, was directly connected to the waterway. In the arched niche, at the lowest part, there is a slightly protruding stone gutter through which the spring water flows. There is a small rectangular bowl niche just above this groove. There is a trough carved from a single piece of stone extending in an east-west direction in front of the fountain. The fountain, which has a single arch and a façade, does not have any ornamental elements (Taşkıran 2021b, 85, fig. 76). The fountain structure is largely intact and has continued to function today. As a result of our observations, it has been documented that the flow rate changes according to the seasons, but the flow rate drops down to 0.2 lt/sec -12 l/min in the summer months. The building, which does not have a construction inscription, is similar to the Ottoman Masjid in terms of materials and techniques. At the same time, it can be stated that it resembles the single-arched neighborhood fountains built in the Ottoman period as an architectural form. Therefore, in the same period as the Ottoman Masjid, that is, it has been thought that it may have been built after the 15th century (Stone 2021b, 86).

In the Ottoman period, water was given by measuring with the unit of measurement and adjusting the amount in distribution or gathering places, starting from the water source. They used to make a spillway on one of the vertical sides of the pool to keep the level of the water taken into small pools called measuring chests or piping bowls constant. Starting from the fixed water level, pipes of different diameters were placed with their axes 96 mm below to ensure that the water was taken. If the diameter of this pipe was 26 mm, the water it gave was called a nozzle (52 m^3/day). The sub-units of the nozzle and the amount of water they give; 1 nozzle 52 m^3/day; 1 reed (1/4 tress) 13 m^3/day; 1 tube (1/8 nozzle) 6.5 m^3/day, 1 bag (1/32 nozzle) 1.625 m^3/day; 1 crescent (1/64 tress) is 0.813 m^3/day (For calculations, see Abay – Baykan 2010, 64-76). The outer diameter of the hole where the pipes of the Ottoman Fountain was placed and where the water is also flowing now, was measured as 15 cm. Considering that it expands a little more with the destruction over time, the diameter of the pipe placed in the past period must have been approximately 100 mm. According to the Ottoman period measurement unit calculation, it was 8-9 ringlets. This corresponds to a flow rate of 288 – 324 l/min. As a result, it turns out that the water flowing in the fountain has decreased considerably today.

Another example, Kocagözler Fountain, is located at an elevation of 90 m in Kocagözler Mahallesi, which begins where the hill of Sillyon ends. There is a larger trough in front of the fountain, which has an architecture like the Ottoman Fountain (Fig. 16). However, it has two water troughs, and both troughs flow effectively in all four seasons. As a result of our investigations, even though it drops to 0.588 lt/sec in the summer months, it continues to flow uninterruptedly. In fact, it has been still being used as drinking water by the people of the village with an average daily flow of 50,803 m^3. The trough in front of Çeşme also creates a water source for the village animals; The remaining water from here is transferred to the gardens of the neighborhood. It has been noted by the local people that the pipes carrying water to this structure, whose flow rate is higher than the Ottoman Fountain, are cleaned at regular intervals. It has been understood that the building, which does not have a construction inscription, was built in the 1950s by drawing a line from the above-mentioned source to the west of the city, as a result of the oral information received from the local people. Nowadays, it has been seen that not only Kocagözler District people; but also, people from the surrounding villages and settlements visit this place to get drinking water, and even sometimes congestions occur forms in the village due to the density.

Fig. 16. Kocagözler Fountain, a general view from west

Fig. 17. A view of a cistern that broke off after a rockfall and landslide in the Acropolis, from northwest

3. Evaluation and Conclusion

In order to understand the Sillyon Water System in all its details and to make a chronological evaluation, our studies were carried out with an interdisciplinary approach especially in archeology and hydrological engineering. To comprehend the urban development of an ancient city, it is necessary to consider the clues provided by the geological principles that determine topography, geomorphology, soil structure and the existence of the materials used in the buildings, as well as the water resources (Crouch 2000, 48). The collection of water through cisterns in the acropolis, which we encounter in the Sillyon Water System, and the presence of natural water resources in the lower city should be considered as the main factors affecting the development of the city. The acropolis section that forms the upper part of the Sillyon hill (*masa dağ-tafelberg*) is completely rocky and there is no water source here. In the acropolis, where urbanization was intensely observed during the Hellenistic, Byzantine and Turkish-Islamic periods, the first collection of water by means of cisterns and then its use was based on topographical and geomorphological reasons. On the other hand, the water source and the factors constituting the source, which were actively used in the lower city every period, especially on the western slope, are also related to the structure and geological condition of the land, as mentioned above. We would like to express clearly that the natural water source that comes out here constitutes the triangulation point of the lower city, where especially the city's defense system was shaped and important public buildings such as the Stadion and the Roman Bath were built during the Roman Empire period. If we list this source chronologically based on available data, and future excavations may indicate the existence of some early period structures or structures related to this source. It did not only provide functionality for the structures such as the Roman Bath, Nymphaion A / Late Antique Fountain, Aquaeduct / *Aquaeductus,* Ottoman Fountain, Kocagözler Fountain and Stadion, but it also determined their locations.

It is understood that the Sillyon Water System has been closely tied to the topographical and geological structure of the city, as well as being intertwined with the city’s political history. So much so that Sillyon has never been able to be captured at any time in history, thanks to its strong defense system, insurmountable terrain and resilient people. It was called the *castle-city* and had own name written in letters of gold in history just for this reason (see Taşkıran 2020, 1-31; Taşkıran 2021b, 1-9). Aristotle says, “*Water, and especially spring water, should be plentiful and, if possible, immediately contained during war; if this is not possible, a way must be found to collect the rainwater in large and numerous boats so that they have enough water to* *keep the defenders of war from going far*” (Aristotle. *pol.* 7.11) also emphasizes the importance of controlling water sources during an envelopement or war. In Sillyon, an exemplary situation presents itself exactly as he describes it. Both the cistern system in the acropolis and the natural resources mentioned in the lower city remain in the city periphery and within the defense system. Moreover, Sillyon's naturally sheltered terrain provides insurmountable resistance. In fact, at the beginning of the Hellenistic period, units affiliated with Alexander the Great (Arr. *anab.* I. 26. 5, Taşkıran 2020, 9-10) and whether it was besieged by the Arabs in the VIIIth century (For a general evaluation, see Taşkıran 2020, 18-19) are examples of phenomena that explain this situation. Moreover, historical sources indicate that there was no struggle during these sieges. On the contrary, it has been written that its natural structure, strong defense system and the determination of the people deter the enemies and bring peace.

In our study, we tried to predict how much water can be stored in the cisterns by evaluating today's monthly precipitation data. After the study on the map of the region in the basin evaluation of the ancient city of Sillyon, the settlement plans of the drainage area were determined as 225000 m^2 as a result of the calculations made on the 1/25.000 maps of that region. The flow coefficient was taken as 0.20 for grass-covered areas. Using the data from the Airport Meteorology Station, the required reservoir volume was determined as 20 677 m^3 from the appended volumes graph. From the graph of the added volumes, Vx = 50 400 (m^3/year) was calculated (Tables 4-5).

Table 4. Additive Volumes Curve of Sillyon

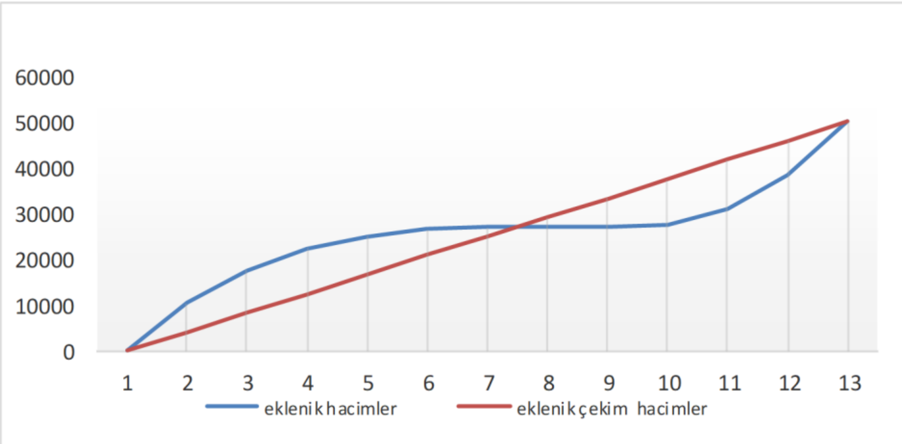


Table 5. Amount of water collected the ancient city of Sillyon by precipitation VAS (m3/month)

1	2	3	4	5	6	7	8	9	10	11	12
10599	7247	4825	2631	1471	366	137	88	523	3490	7163	11831

During our research, we tried to make a ratio between the water capacity of the city and the population, based on the potential of water resources. In Iller Bank's instruction no. III, the average daily water consumption of a person was determined according to the population of the residential area. As a result, the daily per capita consumption varies between 60-170 l/day according to population values. In the Turkish study conducted in 2008, the per capita water consumption in ancient cities was taken as minimum qenk=20 l/N/day, maximum qenb=100 l/day, and average qort=50 l/N/day (Türk 2008, 56). It was determined that the population of ancient city of Sillyon lived only on the hill; as per capita water consumption qenk= 20 l/day Nenb = 7000 persons, per capita water consumption qenk= 50 l Nort = 2800 persons, per capita water consumption qenk= 100 l Nnk = 1400 persons.

Finally, according to studies, the groundwater level was measured as approximately 129-130 m. This depth coincides with the level of the underground springs in the ancient city. As a result of the first evaluations, the underground level was thought cause the alteration of the ancient city. In the following processes, the underground water table will continue to be measured in an area between approximately 210 m and 120-130 m elevations, in a comprehensive but periodic manner, and thus the water variability of the city will be observed. The study in the city will also be directed in parallel with the results, because all the studies in Sillyon are directly related to the soil structure and morphological structure of the city. In this sense, water and formations related to the water system will be a situation that we will constantly encounter in every research. So much so that the geological structure of the city consists of cracks, karstic voids and porous limestone. Under the influence of its geological structure, cracks and rockfalls were formed in the ancient city. It has been observed that cracks and collapses are more frequent especially in the parts of the cisterns (Fig. 17). In other words, the presence of cisterns accelerated the landslide process in the city and caused rock cracks especially here. At the same time, the cisterns served as flood protection structures in the region where heavy rains were occurred. This situation continues today, and excessive precipitation falling on the acropolis, especially in winter, has been kept under control by this method.

As part of this study, the water resources and water structures of the ancient city of Sillyon were investigated using an interdisciplinary approach within the disciplines of archeology and hydrological engineering disciplines. When the Sillyon Water System is examined in detail, it it is seen to be an extremely rational city and water system that can still be taken as an example in terms of water supply, water storage, leakage losses and urban flood control. More detailed data will emerge throuht planned upcoming excavations.

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