QALAMOS
Heritage Studies
Vol. 1, Issue 1, pp. 1-18
Published: June 2025
ID : QALAMOS.1.1.6.2025.001

The Abuksa Reservoir
Past and present state of an ancient Reservoir in Fayoum, Egypt

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Abstract

For many years, the Abuksa water reservoir remained forgotten until we rediscovered it in Abuksa village in Fayoum after many years of neglect. This paper provides information on the condition of the reservoir in the past and present through using old maps, satellite images, local interviews and testimonials, doing site visits and other historical records. The study examines the remains of this hydraulic facility which is believed to have played an important role in the irrigation and water management systems in Fayoum. Field visits we undertook revealed and confirmed the existence of wall-remains of the reservoir which were built of red brick and covered with a layer of cement. The study questions the enigmatic date of this water reservoir and highlights the integration of community narratives with geography and archaeology.

Keywords

Reservoir;
Water Heritage;
Fayoum;
Water management;
Irrigation;
Geography.

Conflict of Interest: None declared
Funding: Not applicable
Author(s) Contributions:
Author 1. Matthias Rebentisch
Author 2. Mahmoud Kamel

Received: Feb. 3, 2025
Accepted: May 2, 2025
Published: June 30, 2025

1. Introduction

The Nile River was, and still is, a fundamental pillar of life in ancient and modern Egypt. If the river's floods failed, unrest and famine would occur, and the same thing would happen if high floods occurred, destroying villages and agricultural lands. All of this led to efforts to control and manage the river through the construction of water facilities. Throughout Egyptian history, Egyptian rulers paid particular attention to water facilities to maintain the country's strength and wealth. They focused on delivering water to agricultural lands, digging canals, constructing bridges and dams, and also building water reservoirs. (Nawar, 1999, pp. 7-8).

The oldest evidence of artificial irrigation is depicted on the Scorpion King's mace, which represents the king, one of the last kings of the pre-dynastic era, ceremonially cutting an irrigation canal. (Butzer, 1976, p. 36). Water storage facilities are considered one of the most important requirements for the population's drinking water needs as well as the needs for agricultural activities. This led to human innovation in ensuring a constant water supply, resulting in the invention of various water reservoirs – both natural and man-made, including cisterns, dams, and huge water reservoirs. (Nawar 1999, p.143).

Fayoum Oasis, famous for its fertile lands and diverse antiquities, is the site of one of the oldest water management projects in ancient Egypt. Unlike other Egyptian oases that receive irrigation water from wells and springs in groundwater aquifers, Fayoum receives water from the Nile River through the Hawara Gap, which connects to the river through an ancient natural branch now known as Bahr Yusuf. (Hassan & Hamdan 2007, pp. 113-114).

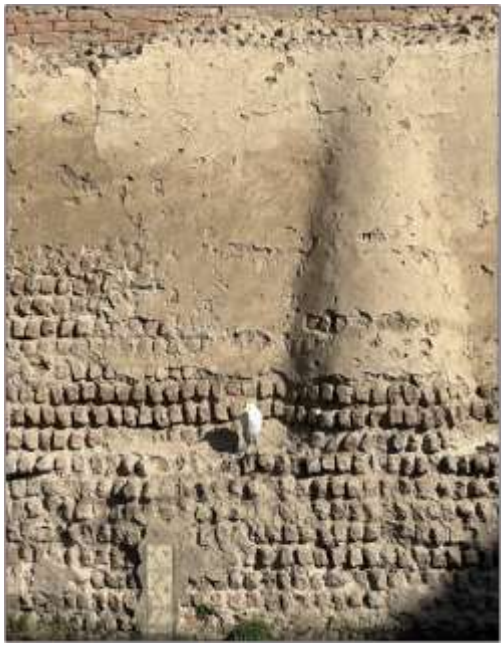


Figure 1: The Abuksa Wall, eastern section, with Marble 3. (Photo: © M. Kamel, Jan. 2024)

Building water reservoirs in the Fayoum is as old as The Middle Kingdom of Egypt as it witnessed an early attempt to harness the waters of the Nile in Fayoum depression. (Hassan, Hamdan, 2007, p127). This water management project was initiated by reviving Bahr Youssef waterway, building dams to regulate water, drying marshes, and creating an irrigation system. This transformed the area into a fertile province with about 1,000 km² of new farmland during the Middle Kingdom. (Hassan, Hamdan, 2007, p. 127)

Many classical writers, historians and geographers refer to large-scale hydraulic constructions' projects in relation to Fayoum. (Garbrecht 1986).

Garbrecht assumed that the artificial storage lake which the historian Herodotus described while visiting the Labyrinth could lie in the area between the Fayoum depression and the Gharak region specifically in between Itsa and Shidmoh, based on masonry walls, probably of Ptolemaic origin (Garbrecht, 1986, p. 156). This storage lake, named Hod el Tuyur (Basin of the Birds), was not a permanent lake like Lake Qaroun but a temporary transitional reservoir lake filled by the annual flooding of the Nile River in August and September. It served as a large reservoir until February or and supplied the stored water to the agricultural lands and Ptolemaic and Roman towns down to Qasr Qarun in the West. This Hod El Tuyur was the largest but not the only storage lake in the Fayoum region.

According to map_1844 of the Fayoum region, there were several water reservoirs scattered across the Fayoum area: among them the Al-Adwa, Matartaris, Ma'sara Edduda, Tamia, Hassan Bey, and Abu Kasah reservoirs. The latter – the focus of this paper - was first observed and described by E. Jomard in the Description de l'Egypte (Jomard 1818) and on Map 1826.

Jomard's report on his visit on 27. January 1799:

"Fourteen thousand metres north-west of Medynet el-Fayoum is the village of Abou-Keseh, where there is a very large water reservoir. It is square in shape, fifty metres long and fifty metres wide It was built in brick, using very hard cement. The brickwork is like that found in Egyptian buildings. Water from the Nile, when it overflows, is introduced into the reservoir, and it supplies the water needed for irrigation through openings made at different heights." This is commonly used to prioritize canals, lowest served first. If we take the scale given on Map 1826 seriously, the reservoir measured about 480 x 550 meters.

Figure 2: Map 1826, Abuksa on the map of the French Expedition.

By the end of the 19th century, due to the fundamental changes in the irrigation of the Nile Valley (Ibrahimia Canal, Old Aswan Dam, Assiut-Weir), the Bahr Yusuf now received full water supply throughout the year, and the need for water storage became obsolete. The reservoirs were abandoned, and the memory of their existence faded. For many years,

archaeologists who undertook archaeological surveys of the Fayoum couldn't reach the exact location of the reservoir. Even Dr. Cornelia Romer in her outstanding Fayum archaeological survey book (Römer 2019, p.315) reported about Abou-Ksa: "We did not see the basin anymore." That was our challenge.

The origin of the name Abouksah remains unidentified. Cornelia suggested that the site of Abouksah might correspond to the ancient city of Heraclea Ἡράκλεια (Römer 2019, p. 315). The Coptic name of the site is still unknown, and its current name is only attested in the writings of Muslim authors (Timm, 1991, pp. 45,46). In any case, Al-Nabulsi referred to it under two forms: Abi Ksa ابى كسا and Abou Ksa أبو كسا. He also mentioned the presence of a church within the site (Nabulsi, 1898, p. 22), which Timm proposed its date to a period earlier than the Ayyubid era. However, the exact dating of the church remains under study (Timm, 1991, p. 46).

Other transliterations are Abu Ksah (Google Earth), Abou Ksa "Father of Ksa" (Römer 2019) Abou Keceh (Map 1826 Jacotin), Abuksa (Map 1929), Abouquisse Map 1855 (Bellefonds), Abouksah (Map 1897 Audebeau), Abûksâh (Map 1914).

The Abuksa Reservoir on the maps.

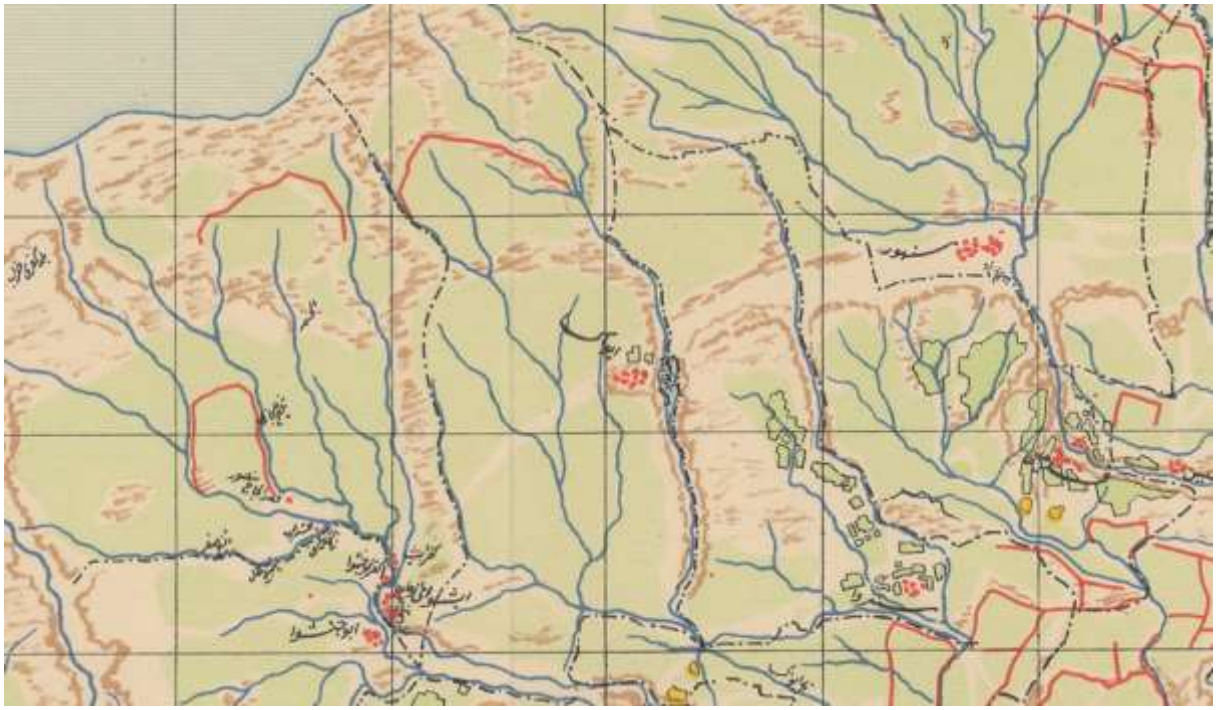


Figure 3: Map 1844, The Abuksa Reservoir is on the first detailed map of the Fayoum Settlement, "Kharabah sites", and irrigation. Scale 1:100.000. Surveyed 1843.

The first properly surveyed map of the Fayoum (map_1844) shows an elongated reservoir and just the Bahr Abuksa, no diversions. The Bahr marks the Markaz boundary. Measured on the original print (1:100 000), the reservoir is about 1 km long, 200m wide. It would have reached upstream the Bahr to the first bridge and mill-site (see Fig. 5). Google Earth elevation there is 2 to 3 metres above sea level. The survey for map_1844 was done in 1843 and revealed for the first time, that the level of Birket Qarun is below sea-level (today about -43 m below Sea Level). Before, it was believed that the level cannot be lower than sea-level.

Figure 4: Map 1854, The hydrographic map of Linant de Bellefonds, here as a reprint 1949, shows an elongated Abuksa Reservoir, the dam well pronounced (with two lines, unique on the map). There are no diversions. In the mid-19th century, the Nil and its flood still ran freely. scale 1: 250.000.

https://gallica.bnf.fr/ark:/12148/btv1b53021220r/f1.item.r=Carte%20Hydrographique%20de%20la%20Moyenne%20%C3%89gypte

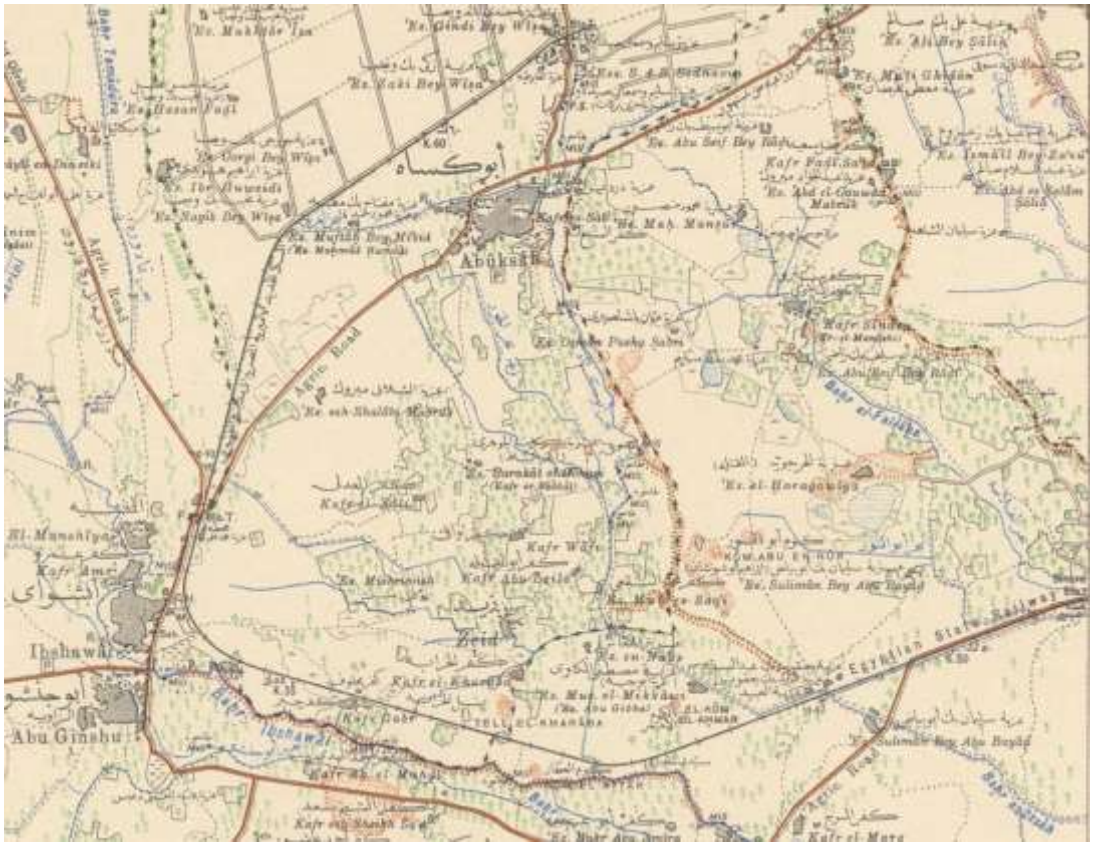


Figure 5: Map 1914, On the Atlas of Egypt, sheet 103 En Nazla, the Old Bahr Abuksa is visible as a dry trench, partly Markaz boundary; and the New Bahr Abuksa, irrigating the land south of Abuksa. The reservoir is empty, and there are three canals
https://davidrumsey.oldmapsonline.org/maps/5cc216d9-27b9-42d7-adb0-8cdb402c9355/view#

Figure 6: Map 1929. Abu Kasah on Mudiriyet El Faiyum map, which was first published in 1926 by the Survey of Egypt, and overprinted with contour lines in 1929. Scale 1:100.000. https://gallica.bnf.fr/ark:/12148/btv1b101042521/f1.item.r=Mudiriyet

The Story of the Rediscovery

In September 2023, we decided to search for the reservoir. We had identified two different locations for a possible reservoir: one near Ezbet Abboud, near Abu Kasah and another one inside Abu Kasah village itself. As we examined the first location, it yielded no visible remains of any ancient hydraulic constructions; however, we encountered two old farmers who were drinking tea nearby. We joined them, and when we showed them reference photos of the Shidmuh dam remains, they looked at the pictures carefully and smiled and said they knew of a place that has a similar structure, near the Boys school in Abou-Ksa, towards Maksam El Nasbah (a place where many weirs, water division points to distribute water are located. We rushed towards the site, hoping to find what we were looking for. Upon arrival at the school, the first view was underwhelming only a small Haddar (little waterfall) and a mysterious ditch lined with red brick. However, what we saw next was remarkable. Suddenly, the long-forgotten remains of the reservoir appeared from behind the Boys' school in the middle of a dense modern red brick construction. Hidden, but still standing tall as a witness to the long-gone great ancient hydraulic works built in Fayoum. We immediately started documenting the site, taking a series of pictures, and we acquired locally about the site. One of the old residents living opposite the reservoir told us it might be an old reservoir because in the old times this area was known as Ezbet El Khazan (the Hamlet of the reservoir). The area is now known as Ezbet Dardeer (the hamlet of Dardeer), probably the name of the family who occupied the area in the past. In January 2024, during Sada Shitwiya (winter water blockade), when all canals were at their lowest level, we had a second field visit to the site to gain more information.

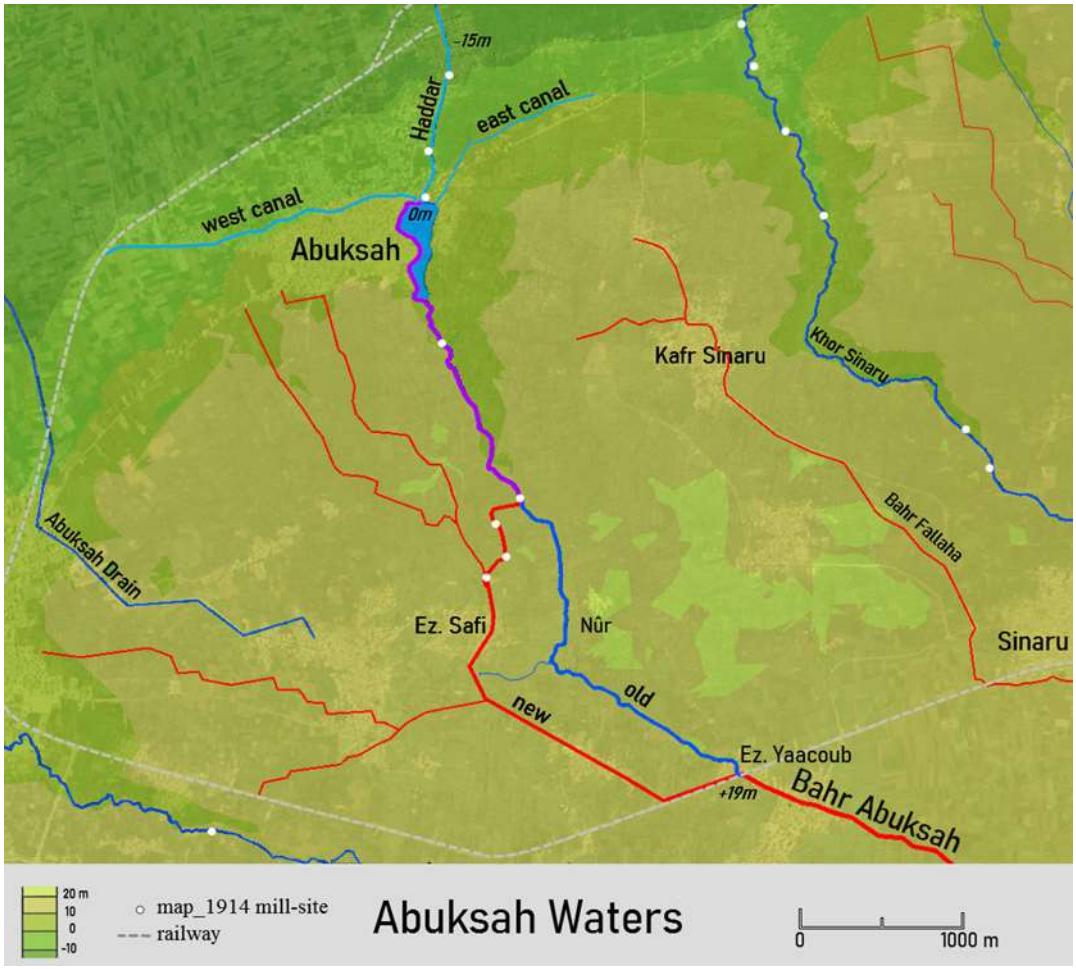


Figure 7: Abuksa Waters. (By © M. Rebentisch 2025. Maps and Google Earth)

The Bahr

The Bahr Abuksa has its source in the Bahr Yusef at Medinet Fayoum. The second twin-gate at the Final Distributor gives water to the Bahr Gharbi, which feeds the Bahr Ibshaway and the Bahr Abuksa. At Ezbet Farid Yaacoub +19m R.S.L. (Relative to Sea Level) the Bahr Abuksa used to continue for about 1 km in the same NW direction on high level. It followed the trench, still to be seen on map_1914. It turned around Kom Abu Nûr into the valley, leading to the Reservoir at Abuksah. About 1870 the railway to Abuksa Sugar-factory was built. The Egyptian State Railway in Fayoum was part of Khedive Ismail's cane-sugar project and connected the sugar factory at Abouksa with Medinet Fayoum and the Nile Valley (Bodenstein 2014). The new railway dike and the bridge over the Bahr Abuksa at Ez. Farid Yaacoub changed the previous course of the old Bahr Abuksah. The 2.5 km long channel around Kom Abu En Nur was abandoned and the Bahr Abuksah re-built up to a new Nasbah, 200 m north of Ezbet as Safi (+16 R.S.L.). This branch irrigates the agriculture to the Northwest, on higher ground – old land. The Bahr Abuksah that passes through the Reservoir originates from this new Nasbah. On its way down into the Old Ksah Valley, the water drops over the first 1 km by 10 m and drove several mills, the first mill was at the Nasbah. On Map 1929 both, the Old and the New Bahr Abuksah are shown active. The Bahr Abuksah at the Reservoir Wall happens to be round about at Mean Sea Level of the Mediterranean at Alexandria.

The lost Reservoir

The exact size of the reservoir, and its seasonal variation, is still to be established. The western boundary is probably the Bahr Abuksa but it could have extended, in its north-western part, to the road leading to the cemetery. To the east the reservoir is limited by the rising ground of the valley (see Figure 23).

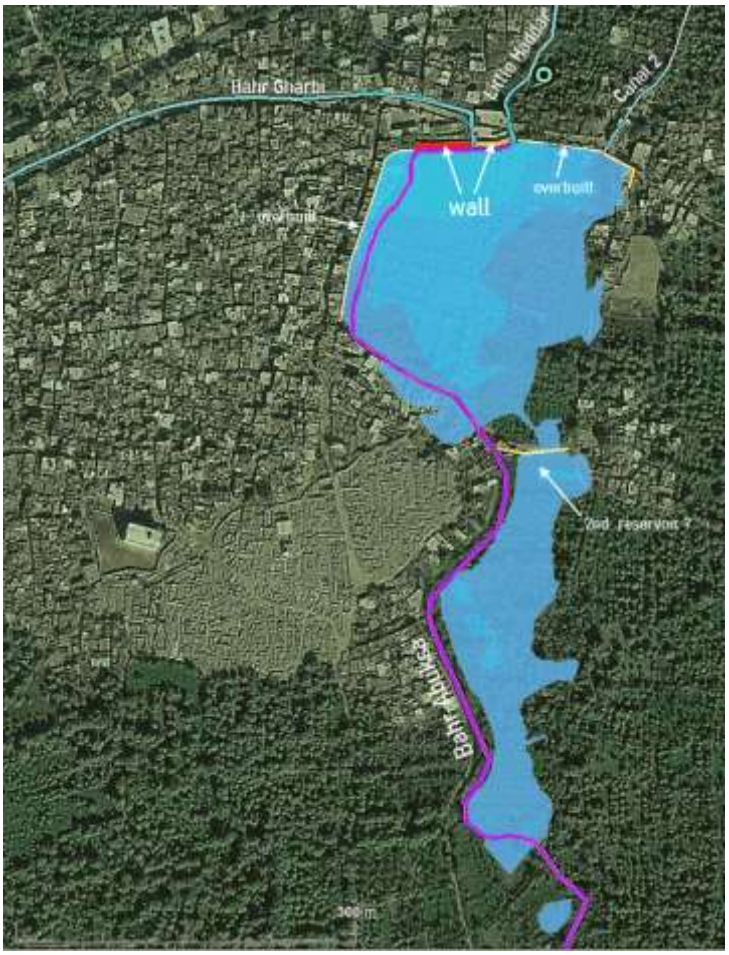


Figure 8: Reservoir simulated on Google Earth 12/2002 (By © M. Rebentisch)

The maximum extension of the reservoir is about 200 by 280 meters, not including a possible extension, south-east of the cemetery. Since the reservoir lost its purpose, the basin floor had been used for small, plotted garden-agriculture.

Since 2008 building started on the dike and on the lower the reservoir floor. A Telecom Mast was the first to be erected on the agriculture basin floor. That was between 2002 and 2007. This symbol of the outer “modern World” was a statement: The basin floor was declared a safe place to build on. Before, people's long-term memory of times of floods had kept them from doing so, despite the urgent need for housing. There had been buildings on and next to the

embankment-fill, like the school. But not yet on its eastern part and on the basin floor. From 2008 to 2010, we witnessed the walling of claims – former fields; and since 2010, at first a few, since 2012, a growing number of multi-story buildings. Between the buildings, fenced in with tall brick walls, there are still open spaces, gardens with trees.

Figure 9: Recent Changes: Newly built Ezbet Dardeer on Google Earth 2021. In 2002 the reservoir floor is still used for agriculture.

The Wall

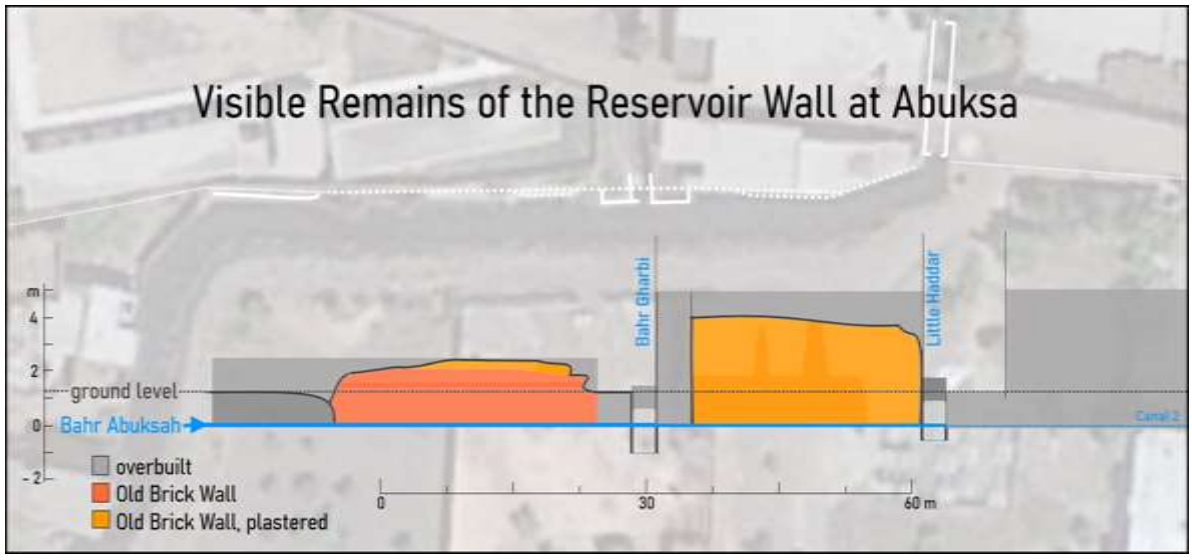


Figure 10: Visible remains of the reservoir wall. (By © M. Rebentisch with M. Kamel).

The parts of the wall that are still visible today stretch over 70 meters, of which about 30 meters are the Brick Wall, about 2.50 meters high, in front of the wall of the school grounds, and the Plastered Wall, almost as long, up to 4 meters high, and integrated into a modern brick building. Between is a gap, where there is now the Bahr Gharbi Weir. The old wall breaks off at the Little Haddar Bridge, the adjoining part to the east lies under the new buildings. All parts of the Old Wall were built with large red-bricks in Bull Header Bond.

Figure 11: Old plastered wall integrated into and topped by new buildings. (Photo ©M. Kamel, Sep. 2023). The corner-house (left) was last added and covers a section, fully visible till 2002.

Figure 12: Section of the reservoir wall (facing West) and brick culvert (Canal 1). (By © M. Rebentisch with M. Kamel)

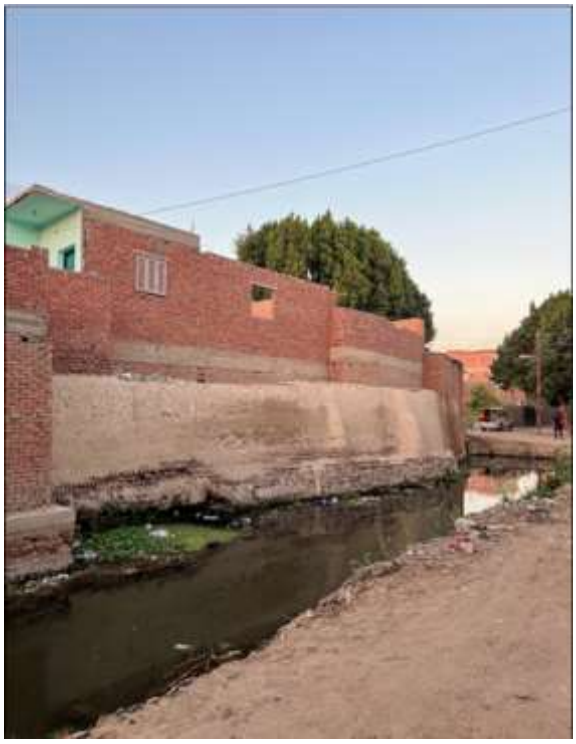


Figure 13 (Above left): The eastern, plastered part of the wall. View eastward. (Photo: © M. Kamel Sep. 2023).
Figure 14 (Above right): The western part of the wall. View eastward. (Photo: © M. Kamel Sep. 2023).

Figure 15: Bahr Abuksa running along the Wall. View downstream in Sept. 2023 (facing East).

The three canals leaving the Reservoir

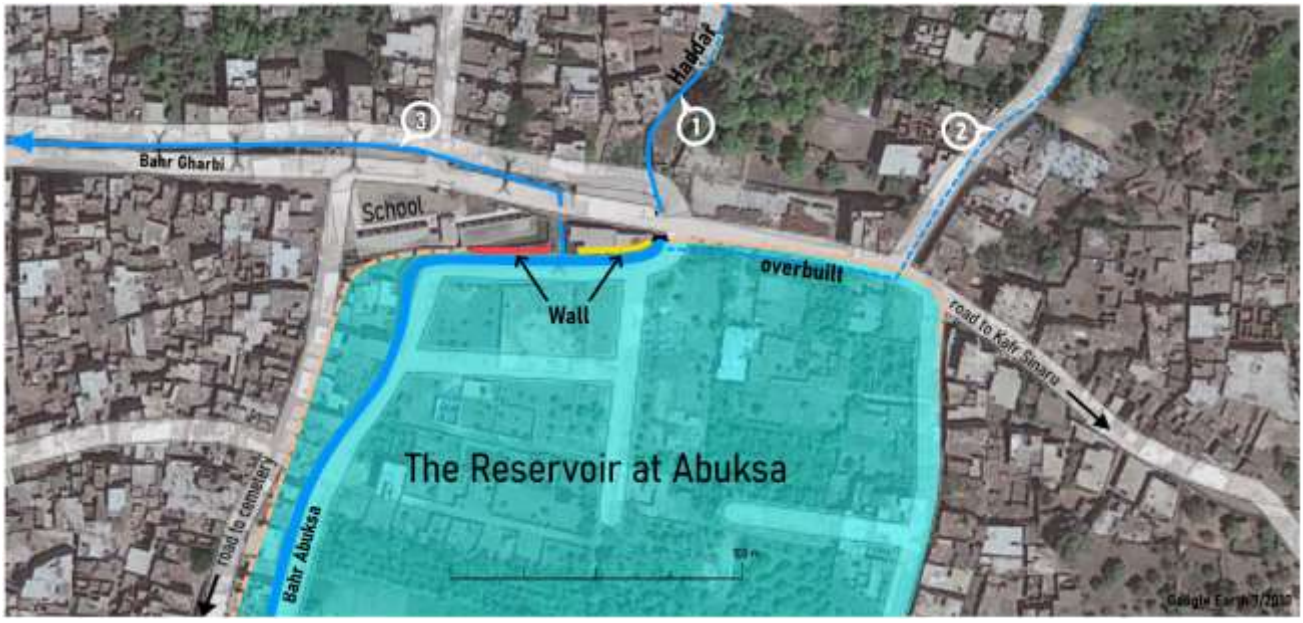


Figure 16: The Reservoir and Canals leaving. (By © M. Rebentisch on Google Earth 7/2010)

Canal 1 Not to be confused with the *Masraf* (drain canal) called Abûksâh Drain on Map 1914, 2.5 km west of the town of Abouksa, We therefore call the Canal 1 "Little Haddar (Weir)". The actual canal opening at the crest is less than one meter wide. Under the bridge the water falls over a step (~ 30 cm) into a culvert canal, about 15 meters long, 2 m wide with a slope of about 0.5 m. The culvert is bricked in Flemish Bond. Could be part of the mill-site, that is shown on map_1915. But there are no other remains or indications of a mill.

Figure 16 (Above left): North-side embankment-fill with younger red-brick fragments. (Photo: © M. Rebentisch Jan. 2024).
Figure 17 (Above right): Haddar Bridge and brick culvert. Brick-pavement with central gutter. (Photo: © M. Kamel Sep. 2023).

At the end of the culvert the water falls by more than one meter, cascading northward in a deeply cut, natural stream bed. There were two mills further down (map_1914). It crosses the road to Sanhur and continues north towards the train station terminal (sugar factory). Further course of canal 1: After the canalized culvert, the Haddar falls and after just 360 m., reaches the -5 m contour.

Figure 18 (above left): Cascading Little Haddar. (Photo: © M.Kamel Sep. 2023).
Figure 19 (above right) End of culvert (former mill-site ?). (Photo: © M. Kamel Sep. 2023).

Canal 2 (eastern canal) once ran along the now missing part of the embankment on which a row of houses has been built since 2008. All that is left is the latticed tube to the left of the Haddar-Bridge (see Figure 15).

Figure 20: (2023): Detail of Fig. 13: "Little Haddar" Bridge (left), limestone fragments and piped Canal 2 (right).?). (Photo: © M. Kamel Sep. 2023).

It probably crossed the wall and embankment (now the road to Kafr Sinouris) about 80 m east of the Haddar-Bridge (visible on Google Earth 7/2010). We could not find remains of Canal 2 between or behind the houses. The road to Kafr Sinours rises from this point. Here we turned left and followed the road. Canal 2 re-appears along the left side of this road, partly piped, partly as small open canalized watercourse. We followed it for 240 m to where this small Bahr crosses under the main road. It waters the area beyond as shown on map_1826 and on map_1914, running along the Markaz boundary, but the canal is no longer marked on map_1929. Further course of Canal 2: This irrigation canal is orientated along the contour-lines. It drops little and reaches the -3 m contour after about one kilometer.

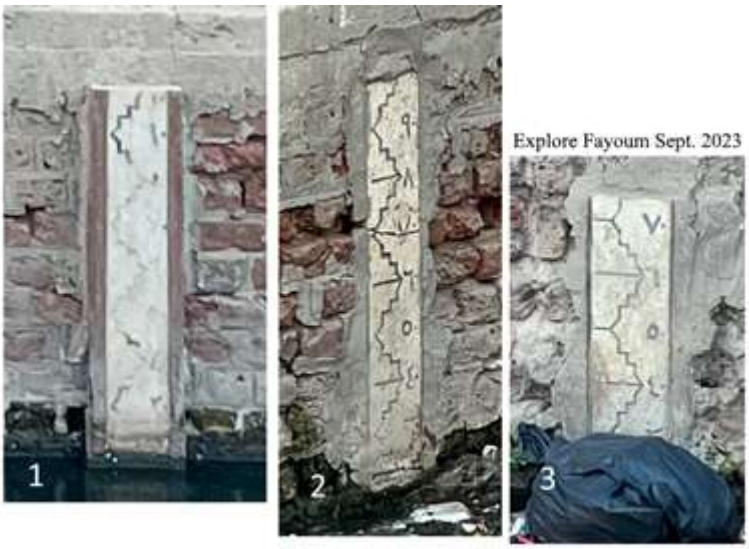
Canal 3 (western canal) El Bahr El Gharbi looks more recent. The Canal is 2,5 m wide, the actual opening at the crest is 1,3 meters. With a higher level (50 cm on marble 1) the crest opens to 1.7 m, thus taking more water. The canal and the weir are bricked in English Bond. This canal probably is as old as the school (on map_1914), little more than 100 years. The original embankment filling was removed here and levelled for the school ground. The canal is on map_1914 (like all three canals), and the most prominent on Map 1926.

Further course of canal 3: The intake is about 2 m in front of the Old Wall alignment, which could be an indication of a repaired breach. There is a fall of 1 meter and the canal descends quickly to – 3m contour within 20 m. There is a sharp bent to the west and the Bahr Gharbi continues contour-orientated. It reaches contour – 5 m after 1 km.

Figure 21: Patched photos (Photo: © M. Kamel 2023): Measures and levels at Canal 3, Bahr Gharbi Weir (Marble 1)

The Reservoir Marbles

There are three marbles in a row; they all show the same metric scale and the same water level. The first is right of the Gharbi Weir and, like the second marble attached to the weir's foundation.



Sep. 2023.

Jan. 2024.

Figure 22 (above, below): The Marble level plates at the Abuksa Reservoir Wall, as seen in Sept. 2023 (above) and Jan. 2024 (below).

The third marble is on the Old Wall. Their Zero is the same. Probably a coincidence, but if related to the Survey Grid Contours (since late 19th century), the upper edge of Marble 1 and 2 would represent the Mean Sea Level at Alexandria. The marble's Zero would therefore be at – 1 m below Sea Level.

The length of the marbles indicates that no higher water-level was expected: Marbles 1 and 2: max. 100, the older Marble 3: up to 75. The new marbles are an extension of the old, which probably reaches further down.

According to the marbles, the level of the Bahr was at about 20 above Zero in Mid-September 2023, and 05 above Zero three months later, during the annual Sada Shitwiya (Winter Water Blockade), and all canals were at their lowest level. At El-Falek / Wahbi Canal Bridge, the Bahr Yusuf stood at 22.50 m at the time of our visit. The gates at the Bahr Yusuf Final Distributor in Medinet were fully opened (above water level). Bahr Abuksah, therefore, was at a very low level; a drop of two fingers and the Bahr Gharbi would run dry.

With the help of the marbles, the visible size of the bricks can be estimated: the average bricklayers of the new building (stretchers) as well as those in English bond measure ~ 7,7 cm, while the layers of the old wall (bull headers) are ~ 15,8 cm (see Figure 21).

Figure 23: Ascending road to Kafr Sinaru; leaving the reservoir in the eastern direction. The houses to the right were built on the former reservoir wall.

Conclusion

At Abuksa we see one surviving remain of several “lost” reservoirs along the fridge of the high plateau. They all got their water from the Bahr Yusuf at Medinet Fayoum. Their purpose was to distribute water (during the flood) to the fields below, and to store water (for the dry months between April and July). Reservoirs have a limited lifespan. This has long since expired for the Abuksa reservoir, and the storage space below the lowest outflows has long since been filled with washed-in sediments.

The reservoir can only have been constructed after the level of the Lake Moeris had been permanently lowered by the Ptolemean (see Rebentisch 2020, pp. 187-193).

According to Butzer (Butzer 2012, p. 6), these hydraulic works were built during the early Islamic period in Egypt about 700 – 1000 AD.

Al-Nabulsi mentioned that, in the year 642 AH - 1244 AD, the number of water mills in operation was eight, in addition to a new mill that was built in a village known as Abuksa (Nabulsi, 1898, p.7).

Hydrologic conditions were different at the time of the construction of the wall, when the flood of the Nile was still affecting the Fayoum. Since 1900, this has changed, and the irrigation and draining systems have been adapted to the new conditions. At a level of 1 to 2 meters above Zero (Marbles Zero = river-bed = rim of Bahr Gharbi Weir, approximately 1m below sea level), the reservoir lake reached as far south as shown in Fig. 5. Using its full capacity of 4 meters above Zero the valley would be underwater as far as the first mill-site. The Aswan High Dam now guarantees a year-round water supply, and the reservoirs of the past have become superfluous.

Joining our local and distant expertise, we were able to trace and re-discover the remains of this reservoir and present it here as part of our ongoing explorations into Fayoum’s rich water heritage, hoping for archaeological excavations to begin in the future to reveal more of its secrets.

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