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## THE LATE ROMAN MILITARY BATHS OF THE WADI ARABAH: A SURVEY OF RECENT ARCHAEOLOGICAL WORK

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**Résumé** – Les recherches archéologiques entreprises depuis une vingtaine d'années sur les sites militaires romains du Wadi Arabah ont mis au jour un corpus de bains qui partagent une même architecture régionale. Construits à la fin du III<sup>e</sup> s. - début du IV<sup>e</sup> s. apr. J.-C. lors d'une période de reprise économique et de redynamisation du commerce régional, ces petits bains militaires romains apportent beaucoup à notre compréhension du contexte socio-économique et historique de l'*Arabia/Palaestina* à la fin de l'Antiquité. L'article passe en revue les récents travaux sur les bains militaires romains du Wadi Arabah et offre de nouvelles analyses en termes de planification urbaine et architecturale.

**Mots-clés** – Bains, époque romaine tardive, militaire, *Arabia Palaestina*, Wadi Arabah, caravansérail, 'Ain Hosob, Bir Madhkour, 'Ain Gharandal, 'Ain Ghadian

**Abstract** – Archaeological investigation over the past two decades at several Late Roman military sites in the Wadi Arabah has revealed a corpus of bathhouses that share a geographically distinct architectural design. Constructed in the late 3rd – early 4th cent. CE during a short-lived period of economic resurgence and revitalization of regional trade, these small Roman military baths can add much to our understanding of the broader socio-economic and historical contexts of *Arabia/Palaestina* in Late Antiquity. This paper reviews recent work on the Late Roman military baths of the Wadi Arabah and offers new analyses regarding their placement and architectural planning.

**Keywords** – Baths, Roman, military, *Arabia Palaestina*, Wadi Arabah, caravanserai, 'Ayn Hosob, Bir Madhkour, 'Ayn Gharandal, 'Ayn Ghadian

**ملخص** – أظهرت الاكتشافات الأثرية وعلى مدى العقدين الماضيين في عدة مواقع عسكرية تعود للعصر الروماني المتأخر في منطقة وادي عربة على عدد من الحمامات التي تشترك في المنطقة الجغرافية والتصميم المعماري، والتي شيدت في أواخر القرن الثالث وبداية القرن الرابع الميلادي خلال الفترة القصيرة من الأزدهار الاقتصادي والتجارة الإقليمية النشطة في المنطقة. ويمكن لهذه الحمامات العسكرية الرومانية الصغيرة أن تضيف لنا الكثير من المعلومات حول السياقات الاجتماعية والاقتصادية والتاريخية للولاية العربية – فلسطين في الفترات القديمة. وستلقي هذه الورقة الضوء على الأعمال التي أجريت مؤخراً بالحمامات العسكرية الرومانية في منطقة وادي عربة وتقدم لنا خليلاً جديداً فيما يتعلق بموقعها وتخطيطها وطرازها المعماري.

**كلمات محورية** – حمامات، الرومان، عسكري، المقاطعة العربية، مقاطعة فلسطين الثالثة، وادي عربة، عين حوسب، بير مذكور، عين غرنديل، عين غديان

While the Nabataean incense trade from Petra drastically declined following Roman annexation, all but disappearing by the first quarter of the 3rd cent. CE, a revitalization of the old trade routes through the Wadi Arabah occurred at the end of the 3rd cent. CE and beginning of the 4th cent. CE (**fig. 1**)<sup>1</sup>. It is presumably within this chronological framework and economic renaissance that the Late Roman military bathhouses discussed in this article were constructed. Archaeological evidence from the Wadi Arabah indicates that a flourishing of bath construction by Rome's army took place during the early 4th cent. in *provincia Arabia/Palaestina* featuring new forms and distinctive regional adaptations. More, the architectural similarities discernible in the military *balnea* at the four sites examined below suggest a shared bath design may have been circulated between the Roman military units occupying these newly constructed fortifications protecting the rejuvenated trade routes through the Wadi Arabah at the beginning of the 4th cent. The following examination highlights recent archaeological work at these sites focusing in particular on their bathing complexes.

### ʿEN ḤAZEVA/ʿAYN HOSOB (TAMARA)

#### *Location and History*

Situated at an oasis along the northwestern edge of the Wadi Arabah, ʿEn Ḥazeva stands at the confluence of two important ancient trade routes (**fig. 1**). Its strategic position at this junction assisted in controlling commercial traffic traveling along the western edge of the Dead Sea only 20 km to the N. More importantly, by the beginning of the 4th cent. CE, ʿEn Ḥazeva commanded access to the nearby Maʿale Tsafir, also known as the Scorpion's Ascent.<sup>2</sup> This narrow switch-back linked Gaza and the Mediterranean with both the copper mines at Phaeno and the Red Sea port at Aila (Aqaba) via a newly constructed Tetrarchic road through the Wadi Arabah.<sup>3</sup>

#### *Previous Research*

The ruins of ʿEn Ḥazeva received moderate attention from scholars at the beginning of the 20th cent. after Alois Musil recorded the remains of a large Late Roman fort and a nearby bath complex in 1902.<sup>4</sup> The site was subsequently visited by A. Alt, F. Frank, and N. Glueck.<sup>5</sup> Glueck's early photograph of the bath's ruins provides a hint of the structure's once vaulted superstructure that disappeared by the second half of the 20th cent. (**fig. 2**).<sup>6</sup> Y. Aharoni was the first to suggest that ʿEn Ḥazeva be identified, based upon its location and material remains, with the ancient city of *Tamara* mentioned by Eusebius (*Onom.* 6. 17-19), which also appears on both the 6th cent. Madaba mosaic map and the *Tabula Peutingeriana*, a 10th cent. map thought to be derived from a 4th cent. cartographic model.<sup>7</sup>

#### *Topographic Placement/Directional Alignment*

The bathhouse and adjoining caravanserai at ʿEn Ḥazeva lie ca. 60 m SE of the fort and follows its orientation along the cardinal points. A minor shifting of the structure's alignment a few degrees off axis to the NE was likely done in order to construct the caravanserai and bathhouse on a more level area. The location of the bathhouse utilized the natural slope of the terrain to receive its water from the nearby spring via a stone-lined conduit.

1. ERICKSON-GINI 2004 ; ERICKSON-GINI 2010.
2. ERICKSON-GINI 2004, p. 272.
3. ROLL 2007, p. 125-127.
4. MUSIL 1907, p. 207-208.
5. See FRANK 1934, p. 254; ALT 1935, p. 6; GLUECK 1935, p. 17-20, 115.
6. Cf. MUSIL 1907, p. 206, fig. 144.
7. AHARONI 1963, p. 31.









Figure 2. Photo showing the no longer extant ruins of the Late Roman military bathhouse at 'En Hazeva (after GLUECK 1935, 19, fig. 7).

### *Architectural Plan*

The bathhouse at 'En Hazeva was comprised of seven rooms set around a paved courtyard/*apodyterium*, a *piscina* or cold-plunge bath, a *latrina* with urinal, a *latrina* featuring stone bench toilet seats, *frigidarium*, two adjoining heated rooms, the *tepidarium* and *caldarium*, and a *praefurnium* enclosure or furnace room (fig. 3). The plan of the bathhouse conforms generally to both the “angular row” and the so-called “southern” type featuring both an off-set *frigidarium* and a paved, entry court.<sup>8</sup>

The bathhouse, like the *castellum*, experienced two primary phases of use before and after the earthquake of May 19<sup>th</sup>, 363 CE, which likely caused significant damage to parts of the bath as it did to the other buildings at the site and towns in the region.<sup>9</sup> While the fort and caravanserai were almost entirely demolished by the earthquake, the extent of the damage to the bath is less clear. However, repairs to its superstructure were observed by the excavators.<sup>10</sup> Despite this evidence, the damage suffered by the bathhouse may have been substantially less than that of the neighbouring structures

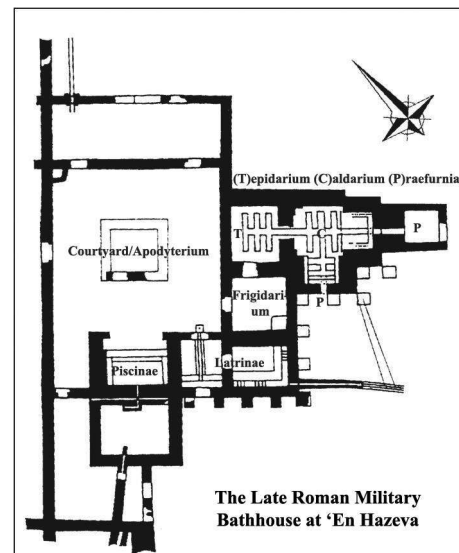


Figure 3. Plan of the bathhouse at 'En Hazeva (after COHEN & ISRAEL 1996).

8. For the angular-row type see NIELSEN 1993 II, p. 51, fig. 1; For the so-called “southern-type” in *Palaestina* see GICHON 1978; Also HOSS 2005.
9. ERICKSON-GINI 2007, p. 274.
10. ERICKSON-GINI 2007, p. 273.

due to the advanced construction techniques and materials used in its construction.<sup>11</sup> It does not appear that substantial alterations were made to the plan of the bath in the period immediately following the earthquake in 363 CE. Rather, the integrity of the primary bathing block and subsidiary rooms was largely maintained. There is some evidence, however, suggesting that the courtyard/*apodyterium* underwent minor reconfigurations, perhaps the result of its roof collapsing, but this remains speculative.

In its initial configuration, the bathhouse was entered from the adjoining caravanserai via a central doorway in the NW wall opening onto a large square paved courtyard containing a small square pool at its center. In a later reconfiguration the courtyard was partitioned into a space approximately half its original size by the insertion of two walls which form the bathing suites. A low bench ran the length of the NW partition wall above which was a row of rectangular niches built into the wall that served as storage cubicles for patrons' clothing indicating use of the room as an *apodyterium* (fig. 4).<sup>12</sup> It is possible that NE partition wall also featured a bench and lockers. In this later phase, the courtyard/*apodyterium* featured four stone piers at its center which probably supported a roof to provide shade from the sun's intense rays. However, it is possible that they were not architectural features at all, but instead decorative in nature.



Figure 4. View of the courtyard/*apodyterium* with bench and storage lockers © R. Darby.

The courtyard/*apodyterium* also featured a large, rectangular *piscina* or cold plunge bath on its southwestern side. The *piscina* was raised slightly higher than the paved courtyard and accessed by a stone step. It was further lined with a stone bench for immersion in the bath. The deep, plastered tub received its water directly from a large settling basin located on the bathhouse's W exterior. *In situ* voussoirs suggest it may have been partially roofed by a vault.

11. See SHERESHEVSKI 1991, who notes that, in the Negev baths, with their use of concrete, were the most highly advanced architectural forms built during the Late Roman and Byzantine periods.
12. See De VRIES & LAIN 2006, p. 214, fig. 7.1, pl. 7.1; The presence of storage niches and benches in the courtyard area compares well to those found in the legionary bathhouse at Lejjun.



Adjacent to the piscina on the S were two rooms that served as the *latrinae* of the bathhouse. The *latrinae* were accessed from the *apodyterium*/courtyard by a doorway in the SW corner. This doorway first entered a small, square room with an open channel for the waste water of the neighboring plunge bath running along its SE wall. A secondary drain, presumably from the courtyard pool, bi-sects the room and empties into the primary channel.<sup>13</sup> The open water channel suggests that the room might have served as a urinal since the adjoining room to the S assuredly served a similar purpose.

One entered the second *latrina*, a small rectangular room, from the first *latrina* by a doorway in the S wall.<sup>14</sup> A continuation of the water-channel from room lined the SE and SW walls forming an “L” shaped latrine with a bench of stone toilet seats of which three remain.

From the courtyard/*apodyterium* one entered the main bathing block through a doorway in the SE corner opening into the *frigidarium*. This room was not directly connected to the hypocaust, and, as such, was only heated by excess thermal transfer through a doorway in its northeast wall adjoining the *tepidarium*. In fact, the location of the jambs in the two doorways indicates that both doors swung inward. It was, therefore, possible to control the temperature of the *frigidarium* by closing or opening the doors connecting it to both the courtyard/*apodyterium* outside and the *tepidarium*. There is no evidence that the *frigidarium* itself contained a bath suggesting that it was likely served by the nearby *piscina* or a *labrum*.

The *tepidarium* was entered from the SW by the door exiting the *frigidarium*. The floor of the *tepidarium* was paved with rectangular flagstones set in *opus signinum* that covered the hypocaust below. Portions of flagstone floor and its *opus signinum* matrix remain *in situ* along the edges of the room. Based on the fact that it contained neither alcoves for tubs, nor any connection to the hydraulic system of the bathhouse, the *tepidarium* likely functioned much like a *sudatorium* or sauna. The remains of a possible bench along its NW and NE walls would seem to support this interpretation. The *tepidarium* was connected to the *caldarium* via a doorway in the SE wall which, like those in the *frigidarium*, contained a jamb that would have allowed for the opening and closing of the door between the two rooms to control heat distribution.

The *caldarium* itself consisted of a central square room (ca. 3.44 x 3.44 m) and two rectangular alcoves (ca. 2.5 x 1.87 m) containing *alvea* or hot plunge baths. The SE *alveus* was built directly over the main *praefurnium* channel, while the SW *alveus* sat over an extension of the hypocaust system specifically constructed to heat its bath. Inaccessible from the *caldarium* was the *praefurnium* enclosure that stands just outside its SE wall.

The *praefurnium* enclosure could only be accessed from outside the bath complex proper as it controlled direct access to the *praefurnium* and the hypocaust system. An entryway near the S corner of the structure permitted entry inside the small service room. The surrounding enclosure walls protected the *praefurnium* from wind. It is, however, unlikely that the room was roofed given the presence of the furnace. The thick NW wall of the enclosure abutting the SE exterior wall of the *caldarium* contained the *praefurnium* itself.

While the *praefurnium* enclosure was, as noted, probably left unroofed, evidence indicates that the *caldarium*, *tepidarium*, and possibly, the *frigidarium*, were either barrel vaulted or domed using a combination of finely cut ashlar *voissoirs* and *opus caementicium*. How the remaining rooms of the bathhouse were roofed is less certain.

13. The excavators interpreted an opening in the SW wall of the *latrina* as a door. This cannot have been the case as it would have been blocked by the raised aqueduct along the exterior face of the SW wall. The reason for the lacuna on this portion of the wall might more plausibly be related to the location of a window providing ventilation and light for the *latrina*.

14. Cf. Hoss 2005, p. 147, who places the entrance to the *latrina* via the *frigidarium*.

## BIR MADHKUR (MOA?)

### *Location and History*

The site of Bir Madhkur is situated among the barren desert foothills of the Edomite Mountains on the eastern edge of the Wadi Arabah roughly at the midway point between the Dead Sea and the Gulf of Aqaba (**fig. 1**). Of utmost importance in regards to the site's location is Bir Madhkur's close proximity (ca. 10 km SE) to the *metropolis* of Petra. Its commanding position helped control mercantile access along an important E-W trade route across the Wadi Arabah, but there is little doubt that it also monitored caravan traffic traversing N-S along the valley as well. The modern Arabic name for the site denotes the presence of a well (*bir*) indicating the important water resources that the site also contains. Numerous deep-water wells and a nearby spring supply the otherwise arid site with water today as they did in Antiquity.

The identification of Bir Madhkur's place name during the Late Roman and Byzantine periods is unknown. Various proposals have been put forth by scholars seeking to associate its ruins with named locations in the surviving historical sources. Perhaps the most tenable of these hypotheses associates Bir Madhkur with *Moa*, an ancient caravan station and settlement along the so-called Incense Road connecting Petra and Gaza.<sup>15</sup> Listed in the Be'er Sheeba Edicts (ca. 6th cent.), *Moa*'s taxation burden of 15 gold coins *per annum* suggests that it maintained at least a moderate level of economic prosperity.<sup>16</sup> Its depiction among the other towns of the Negev on the Madaba mosaic map further indicates its regional significance by the Byzantine period. Others have, however, plausibly suggested that Bir Madhkur instead be identified with *Calamona* listed in the *Noticia Dignitatum* (ca. 400 CE).<sup>17</sup> Despite the enigma of Bir Madhkur's name in the ancient sources, its substantial archaeological remains, which include a Late Roman *castellum* and a presumed caravanserai with an adjoining bath complex, leave little doubt of its role as both a satellite community of Petra and another fortified way-station in the N-S chain of forts extending the length of the Wadi Arabah.

### *Previous Research*

Exploration of Bir Madhkur and its ruins by modern scholars did not initiate until just before the middle of the last century.<sup>18</sup> Visits to the site by Fritz Frank (1934) and Nelson Glueck (1935), both of whom incorporated their findings into broader regional surveys, marked the earliest field-work conducted at Bir Madhkur.<sup>19</sup> Renewed interest in the site occurred only in the last quarter of the 20th cent. with several different archaeological survey projects visiting the site. The first of these was led by David McCreery (1979), followed by Andrew Smith, Michele Stevens, and Tina Niemi (1994) under the auspices of the Roman Aqaba Project directed by S. Thomas Parker.<sup>20</sup> Smith's work at the site continued in 1997 as the Bir Madhkur Excavation and Survey Project which would later become the Bir Madhkur Project (BMP), a currently ongoing long-term archaeological investigation of Bir Madhkur and its surroundings.<sup>21</sup>

The identification of a Late Roman military bathhouse at Bir Madhkur is a recent one.<sup>22</sup> Earlier visitors to the site such as Glueck took note of the large rectangular structure near the ruins of the fort but believed it to be the ruins of a *birkeh*.<sup>23</sup> Further confusing its function was an extensive ash dump

15. ALT 1935; ERICKSON-GINI 2004, p. 15; SMITH 2010, p. 144.

16. SMITH 2010, p. 145.

17. ROTHENBERG 1971, p. 217; SMITH 2010, p. 145.

18. SMITH 2010, p. 145.

19. FRANK 1934; GLUECK 1935.

20. For McCreery see SMITH 2005, p. 61, 75; SMITH, STEVENS & NIEMI 1997.

21. SMITH 2005; SMITH 2010.

22. See SMITH 2005 who first proposes the presence of a military bath at the site. Cf. GLUECK 1935 and FRANK 1934 who both hypothesized a ceramic production center.

23. GLUECK 1935, p. 36.



stretching the entirety of the structure's S face. Both Frank and Glueck believed the ash lens to be associated with possible kilns and ceramic production.<sup>24</sup> Smith, however, noting a lack of slag or wasters and an abundance of hypocaust tile fragments postulated it originated from a bath complex associated with the Roman and Byzantine military occupation at the site.<sup>25</sup> Further, Smith has convincingly argued that the adjoining structure was not in fact a water reservoir as Glueck proposed but rather something more substantial as it clearly featured rows of rooms set around a central space.<sup>26</sup> The first attempt to identify specific architectural elements of the bath complex through stratigraphic excavation was undertaken in 2008 by the BMP.<sup>27</sup>

### *Topographic Placement/Directional Alignment*

The bathhouse and adjoining complex, most likely a caravanserai, lie along the edge of a small wadi ca. 35 m SE of the *castellum* (fig. 5).<sup>28</sup> Although the bath complex and presumed caravanserai are still under investigation and a detailed plan of their rooms has yet to be published, the remains of the structures are visible on the surface to the degree that allows the naked eye, as well as aerial and satellite photography, to see the clear association of the fort and bath/caravanserai.

The two structures are in parallel alignment despite the fact that the bath complex stands at a noticeably higher elevation than the *castellum*. More, the fort and bath were both constructed on axis with the cardinal compass points, which clearly differentiates them from other ancient structures at the site, in particular those in the large ruin field immediately W of the fort, and the complex of modern buildings to the NW. Even without additional archaeological data connecting the two it would be difficult to imagine their construction as anything but contemporaneous. It is thus not surprising that preliminary interpretation of the archaeological materials recovered at the site by the Bir Madhkur Project in 2008 confirm the architectural relationship between the bathhouse/caravanserai and *castellum*.<sup>29</sup>

### *Architectural Plan*

At present, little can be said regarding the architectural plan of the bathhouse due to its incomplete state of excavation. This lacuna will hopefully be clarified in the near future through the ongoing work at the site by the BMP. Nevertheless, despite our lack of knowledge regarding the individual rooms of the bathhouse, a general overview of the bath/caravanserai's plan can be ascertained.

To date, two (possibly three) rooms of the bath/caravanserai have been published.<sup>30</sup> The function of only one room is ostensibly lucid, that being a small, rectangular room in the SW of the complex identified as a *latrina*. The presence of a latrine in close proximity to the bathing facilities is paralleled at numerous other Roman military baths across the empire and was, of course, a common feature of urban baths as well. Moreover, the design and location of the *latrina* within the larger architectural plan of the complex is extremely similar to those at the nearby presumably contemporary sites of 'En Hāzeva and 'Ayn Gharandal.<sup>31</sup> Additionally, based upon the apparent similarities with those neighbouring sites it is possible to hypothesize about the location of the latrine at Bir Madhkur in relation to the primary bathing block of the bath complex.

24. FRANK 1934, p. 228; GLUECK 1935, p. 36.

25. SMITH 2005, p. 58.

26. SMITH 2005, p. 58.

27. See SMITH 2010, p. 147-148.

28. SMITH 2010, p. 147.

29. SMITH 2010.

30. See SMITH 2010, p. 147-148; Excavation of Trenches B.1 and B.3 were supervised by the author in 2008 as a member of the Bir Madhkur Project.

31. See COHEN & ISRAEL 1996, fig. 1, for 'En Hāzeva; See DARBY & DARBY 2012a, p. 742, for 'Ayn Gharandal.

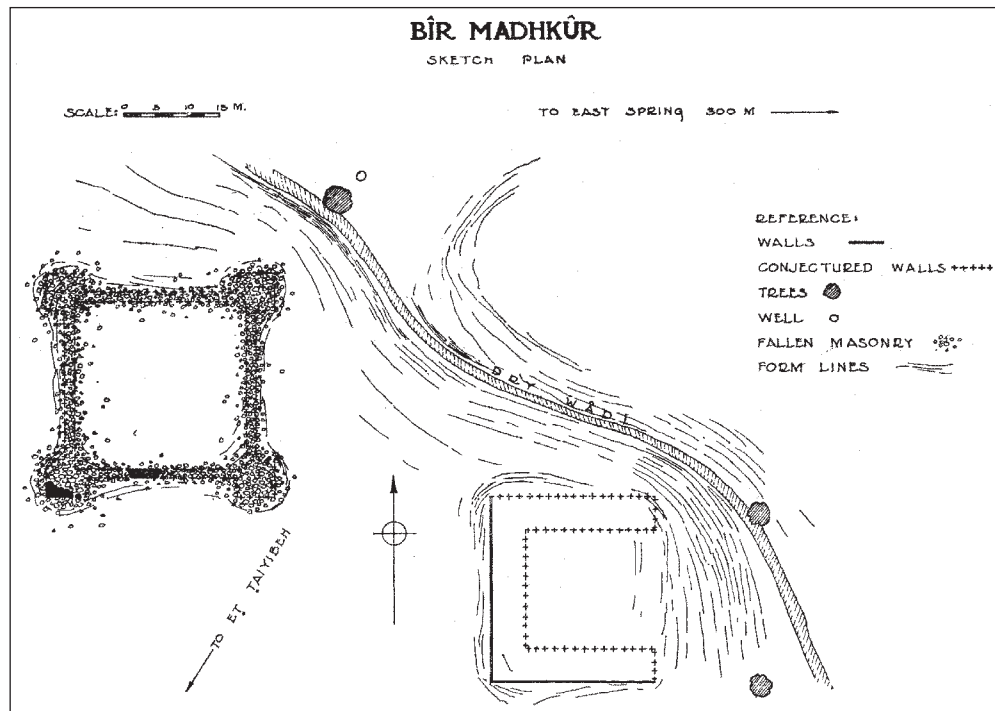


Figure 5. The late Roman *castellum* and bath/caravanserai at Bir Madhkur (after GLUECK 1935, 168, pl. 6).

The bathhouse and adjoining caravanserai (ca. 20 x 25 m)<sup>32</sup> appear to be comprised primarily of a large, square open courtyard surrounded by stone-built walls on all four sides which presumably contained rooms. A gap in the center of the W wall of the structure may indicate a gate accessing the courtyard. Also clear in aerial photographs of the structure and visible on the surface are numerous additional wall lines incorporated into the building's southern quadrant. There is little doubt that amongst these toppled stones are the bathing suites. The enormous ash deposit lying just S of the ruined structure is the most telling evidence for the heated rooms of the bath that surely must be nearby.

The aforementioned *latrina* stands along the W wall of the structure and, perhaps more importantly, is slightly downhill from the probable location of the bathing suites along the S wall. The placement of the latrine near the end of the bathhouse's water system follows the standard arrangement seen at other military baths in the region. Based upon such comparanda it is likely that the *frigidarium* is located close to the latrine amongst the collapse and debris adjacent on its eastern side.

Given the close comparison (and proximity) of the Bir Madhkur latrine with that at 'En Ḥazeva and 'Ayn Gharandal, it is feasible, although uncertain, that the *frigidarium* occupied the immediately adjacent room as it does at the other sites. While hypothetical, this arrangement would suggest that the plan of the bathhouse follows an arrangement typical to other auxiliary military baths in the Wadi Arabah featuring an "L" shaped design of the angular-row type.<sup>33</sup> Furthermore, the apparent incorporation of the bathhouse within the caravanserai again finds a close regional parallel with the bath/caravanserai complex at 'En Ḥazeva and other sites.<sup>34</sup>

This architectural arrangement carried certain obvious advantages for whoever made use of the way-station, be it civilian or soldier. More, the regularity in which this architectural fusion occurs within the

32. This measurement for the bath/caravanserai is derived from aerial and satellite photos of the site and comparing it to the known dimensions of the *castellum* (ca. 30 x 30 m).

33. NIELSEN 1993, II, p. 51, fig. 1; Present at 'Ayn Gharandal, 'En Ḥazeva, and Yotvata.

34. See e.g. C. Durand in this volume on the bath/caravanserai at Khirbet edh-Dharih.

relatively limited geographic confines of the Wadi Arabah hints at more than mere coincidence in the repetition of the general design of these bath buildings.<sup>35</sup>

### ‘AYN GHARANDAL (*ARIEDELA*)

#### *Location and History*

The site of ‘Ayn Gharandal is located ca. 70 km N of the gulf of Aqaba and some 40 km SW of Petra on the eastern edge of the Wadi Arabah (**fig. 1**). The presence of an artesian spring in the mouth of the nearby Wadi Gharandal presumably served as the primary reason for occupation at the site during Antiquity as it does today. During the Nabataean and Roman periods ‘Ayn Gharandal commanded an important pass through the Edomite mountains to Zodocatha (modern Sadaqa) in the Shera‘a highlands ca. 25 km NE as well as overland routes to Hauarra (Humayma) and Petra.<sup>36</sup> More, in the Late Roman period it occupied a strategic position in the line of fortifications guarding the trade route connecting the Red Sea port at Aila (Aqaba) to the Mediterranean at Gaza.

#### *Previous Research*

‘Ayn Gharandal and its surroundings were visited by many of the early 20th cent. explorers to the region.<sup>37</sup> Alois Musil was the first to record the ruins of a Roman *castellum* at ‘Ayn Gharandal in 1902.<sup>38</sup> Musil’s description of the site also includes at least two additional structures near the fort, as well as miscellaneous walls, towers, and a basin in the vicinity of the spring. T. E. Lawrence also passed through ‘Ayn Gharandal in 1914 as part of the Palestine (Wilderness of Zin) Survey.

Investigation of the site by the ‘Ayn Gharandal Archaeological Project (AGAP) in 2009 revealed that two rooms of a bath complex associated with the nearby remains of a Late Roman *castellum* had fallen victim to illegal digging.<sup>39</sup> As a result, a portion of the building’s architectural remains were unearthed, including several well-preserved and heavily plastered walls, exposing them to the extreme environmental conditions of the Wadi Arabah. Following the completion of the 2009 survey the AGAP carried out two seasons of excavations in 2010 and 2011.<sup>40</sup> The 2010 season focused on the presumed Late Roman *castellum* and the nearby *auxiliary* bathhouse situated ca. 60 m E of the fort.

#### *Topographic Placement/Directional Alignment*

The *castellum* and bathhouse stand in an alluvial plain ca. 200 m W of the mouth of Wadi Gharandal (**fig. 6**). The importance of the site as a fortified caravan station along the trade corridor in the Wadi Arabah during the Late Roman and Early Byzantine periods is likely in part due to several natural and topographical advantages in spite of the extreme environmental conditions posed by its location in the desert. Abundant water resources, control over trade and travel, and the site’s relatively close proximity to both the metropolis of Petra and the Red Sea port at Aila (Aqaba) are presumably the reasons the site was fortified in the Late Roman period.

There is little reason to doubt the bathhouse and fort are contemporaneous, and preliminary assessment of the ceramic finds from both structures appears to support this conclusion.<sup>41</sup> In addition,

35. See DARBY & DARBY 2012b.

36. KENNEDY 2004, p. 210.

37. MUSIL 1907, p. 193-97; WOOLEY & LAWRENCE 1914, p. 14-15; FRANK 1934, p. 231-232; GLUECK 1935, p. 39-40.

38. MUSIL 1907, p. 193-197; fig. 142.

39. DARBY & DARBY 2010, 2013; DARBY, DARBY & SHELTON 2010.

40. DARBY & DARBY 2012a; DARBY & DARBY, 2012b.

41. DARBY & DARBY 2012a; DARBY & DARBY, 2012b.



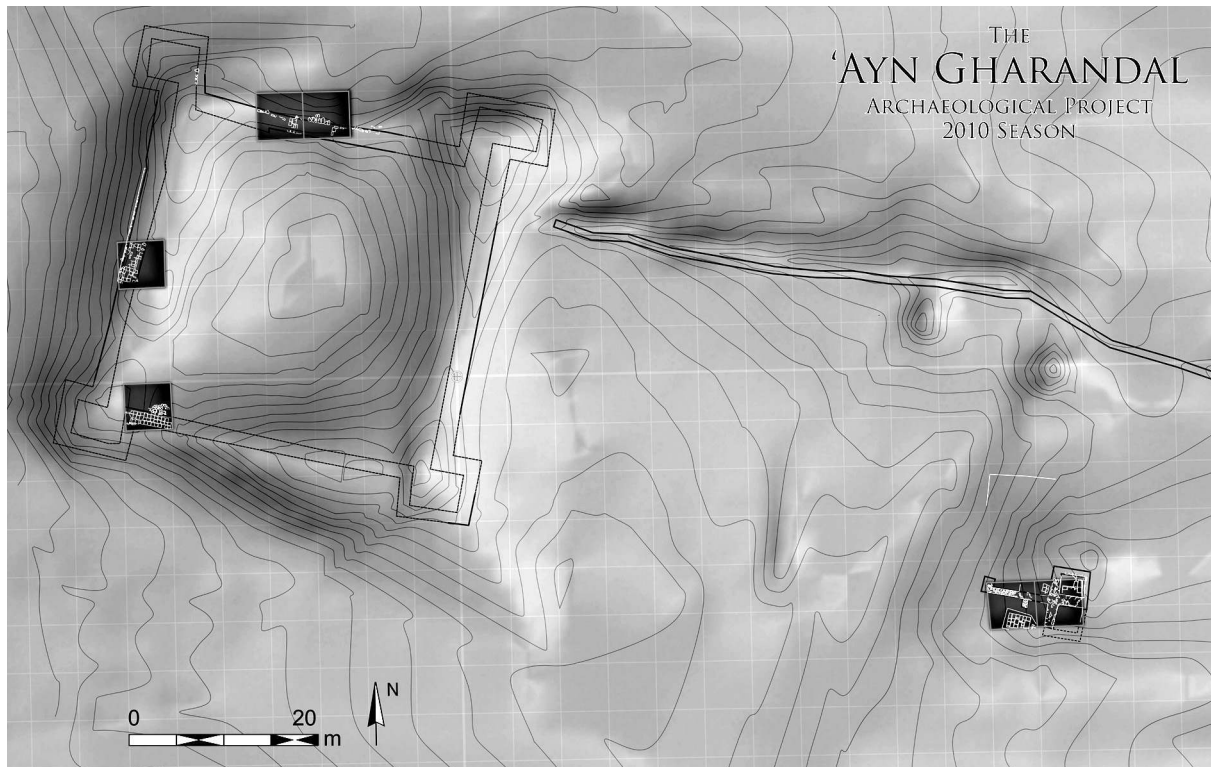


Figure 6. 3-D topographical plan of 'Ayn Gharandal showing the Late Roman *castellum* and bathhouse  
© 'Ayn Gharandal Archaeological Project.

recent fieldwork by the AGAP has shown that the bathhouse and *castellum* share the same directional alignment of their walls.<sup>42</sup> This discovery further substantiates the presumed association of the two structures and clarifies a perplexing error in Musil's early plan of the site.

Musil's 1907 plan orients the bath structure due N in contrast to the fort, which he orients to the NE. The rectified plan now shows that the bathhouse is clearly oriented in parallel alignment with the fort towards (cardinal or magnetic) North, as is the case in a number of other Roman army camps and bathhouses throughout the region.<sup>43</sup>

### *Architectural Plan*

Excavation in 2010 revealed two heated rooms of the bathhouse that had been partially exposed by looters. Recorded in the 2009 survey as the South and North Rooms, they are now securely identified as the *caldarium* and *tepidarium*. In addition, a third room was discovered adjacent to the North Room and probably served as the *frigidarium* (fig. 7).

Investigation of the *caldarium* revealed that the recessed heating pipes (*tubuli*) were still intact in its E and N walls. In addition, a large concrete fragment from the E wall containing at least two partial lines of Greek text and a *graffito* of a seated camel was discovered in the course of excavations. Two additional *in situ* Greek *graffiti* were found adorning the E and W walls of the *caldarium*. The delicate nature of these finds indicated that the South Room had not been exposed to the elements by looting as was previously thought.<sup>44</sup>

42. DARBY, DARBY & SHELTON 2010, p. 199; DARBY & DARBY 2010, p. 534-535.

43. See e.g. Bir Madhkur, 'En Hazeva, and Yotvata.

44. DARBY & DARBY 2012a, p. 742.



Figure 7. The bathhouse at 'Ayn Gharandal with the *tepidarium* in the foreground  
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Clearing the *tepidarium* of the bath complex confirmed that it had been looted to the level of its finely paved floor, a fact made apparent by the discovery of a large hole ripped through to the sub-floor hypocaust system as well as several modern objects found at floor level, including a juice box, a rusted road sign, and a large metal pipe. Despite the looting, the majority of the *tepidarium* remains remarkably intact. All four of its walls are still partially covered by their original plaster and contain numerous *in situ* heating pipes (*tubuli*). The walls (ca. 1 m wide) are constructed of roughly hewn blocks bonded with concrete and survive to ca. 3 m in height. In addition, the E and W walls are topped with two courses of finely cut ashlar from which once sprang a barrel vault.

Moreover, the 2010 excavations also brought to light the full extent of two doorways in the *tepidarium* that had previously been recorded at the level of their lintel stones.<sup>45</sup> One leads to the *frigidarium* on the W and the other connects the *tepidarium* and *caldarium*. The presence of a door jamb in each of the doorways indicates the *tepidarium* could be closed off from the other two rooms, presumably to control the temperature of each. Only a small segment of the adjoining *frigidarium* was uncovered in the 2010 season. The identification of this room as the *frigidarium* is confirmed by the absence of *tubuli* in the walls and the presence of heavy paving stones that differentiate its floor from the suspended floor of the *tepidarium*.<sup>46</sup>

In addition, a series of contiguous plastered mud brick and stone walls forming the N, E, and W walls of a rectangular shaped room that stands immediately SW of the heated rooms of the bathhouse were uncovered in 2010 (**fig. 8**). The room featured an exceptionally well-preserved paved stone floor surrounded on the N and W by a channel, 0.75 m in depth and 0.50 m in width, with a drain on either end. The form follows the typical plan of a Roman *latrina*. More, the *in situ* plaster lining the N and W walls appears to have extended to a uniform level, ca. 0.50 m above the drainage channel, suggesting that a wooden installation, perhaps a multi-seat toilet bench, once adorned the room. The location of the

45. DARBY & DARBY 2012a, p. 742; DARBY & DARBY 2012b.

46. The floor of the *caldarium* has yet to be exposed.



Figure 8. *Latrina* serving the 'Ayn Gharandal bathhouse  
© 'Ayn Gharandal Archaeological Project.

latrine adjacent to the *balneum* probably allowed the latrine to make secondary use of water exiting the baths. Additional walls of the bath complex were also revealed immediately N of the latrine; these walls comprise at least two more rooms whose functions are, as yet, unknown.

#### YOTVATA/ AYN GHADIAN (*OSIA/COSTIA*)

##### *Location and History*

Yotvata/ Ayn Ghadian lies on the NW edge of the Tabah Sabkha, an expansive saline marsh, located in the southern Wadi Arabah ca. 40 km N of the Gulf of Aqaba and the ancient port of Aila (**fig. 1**). The abundance of water, both from the main spring, as well as numerous watering holes on the desert surface undoubtedly attracted human occupation at the site long before the arrival of the Romans and continued to do so after their departure.

The remains of the Roman fort and bathhouse are ca. 350 m W of the main spring near the foot of a steep limestone escarpment and stand very near to the modern paved highway to Eilat. The modern road presumably follows a similar N-S track to an ancient one that traversed the Wadi Arabah in the late 3rd- early 4th cent.<sup>47</sup> The gentle terrain along the western edge of the valley, as opposed to the steep alluvial embankments on its eastern side, likely contributed to its use as a caravan route especially in the later Roman period. Thus, Yotvata's advantageous position controlling both water access and caravan traffic presumably made it an ideal location for a military way-station to monitor and police those using the oasis and the desert road.

47. See ROLL 2007, p. 119-130.



### *Previous Research*

Exploration of the Yotvata/Ayn Ghadian oasis by western scholars commenced with Alois Musil's brief visit in 1898.<sup>48</sup> Musil noted three stone-lined wells and described the main spring enclosure but made no mention of any substantial architectural ruins. T. E. Lawrence passed through in 1914 and was the first to interpret the low square mound W of the oasis concealing the remains of the Roman fort as an ancient building, which he postulated was a late Classical or Byzantine police post guarding the water source.<sup>49</sup> He makes no mention of the outlying bathhouse to the N. as his focus, however, like Musil's before him, centered on Yotvata/Ayn Ghadian's springs and wells about which he offered the following lucid description, "Ghadian today is not attractive: there are eight smelly pits in which water collects a few feet down, and the land about is a bush-covered, salty, sandy waste, fit for camels."<sup>50</sup>

It was Ze'ev Meshel who first noted the exposed remains of the bathhouse ca. 50 m N of the *castellum*.<sup>51</sup> Their omission in all of the previous surveys suggests that they had, prior to Meshel's work at the site in the 1970's, remained more or less buried from view.<sup>52</sup> Two excavation seasons were carried out by Meshel on behalf of the Institute of Archaeology at Tel Aviv University in 1975 and 1976.<sup>53</sup> While much of the focus was directed at the *castellum*, "trial excavations" were also conducted in the bath complex revealing a significant portion of its two heated rooms or what remained of them.<sup>54</sup> The relatively poor state of preservation in which the bathhouse was initially found, having suffered from exposure to the harsh elements of the Wadi Arabah as well as damage from later Bedouin burials and the cutting of the oil pipeline trench along its eastern side, led Meshel to conclude that there was little left of the structure to be found.<sup>55</sup> For the next 30 years, it remained partially exposed and in a state of decay.

New excavations of the bathhouse were supervised by the author in 2006 and 2007 under the auspices of the Yotvata Roman Fort Project, co-directed by Jodi Magness and Gwyn Davies.<sup>56</sup> These renewed investigations in many cases confirmed Meshel's hypotheses regarding the baths' architectural plan, its relationship to the fort, and its destruction. However, substantial amounts of new data were also collected that, along with many surprising new discoveries, cast doubt upon some of Meshel's suggestions and contradict others. The final excavation report was recently published.<sup>57</sup> Since the conclusion of the Yotvata Roman Fort Project in 2007 conservation work on the bathhouse has been ongoing in an effort to preserve it for public display.<sup>58</sup>

### *Topographical Placement/Directional Alignment*

The ruins of the bathhouse lie ca. 50 m N of the *castellum* near the edge of a small wadi emanating from the steep scarp to the W (**fig. 9**). The bath structure was built on a parallel axis with the nearby fort whose corner towers are aligned to the cardinal compass points. Thus, the bathhouse was oriented at a 45° angle NW by SW in alignment with the NE wall of the *castellum*. This close parallel arrangement of the two structures suggests that they were built in conjunction with one another.<sup>59</sup>

48. MUSIL 1907, p. 253-254.

49. WOOLEY & LAWRENCE 1914, p. 13-14.

50. WOOLEY & LAWRENCE 1914, p. 14.

51. MESHEL 1989, p. 234.

52. It is also possible that they were periodically exposed and then reburied by spring flooding of the adjacent wadi.

53. MESHEL 1989, p. 229.

54. MESHEL 1989, p. 235.

55. MESHEL 1989, p. 234-235.

56. DAVIES & MAGNESS 2007; AVNER, DAVIES & MAGNESS 2004.

57. DAVIES & MAGNESS 2015.

58. The conservation work at the site is being done by the Israel Antiquities Authority and the Eilat Regional Council.

59. See MESHEL 1989, who believed the two structures to be contemporary. Cf. DAVIES & MAGNESS 2011, p. 474.

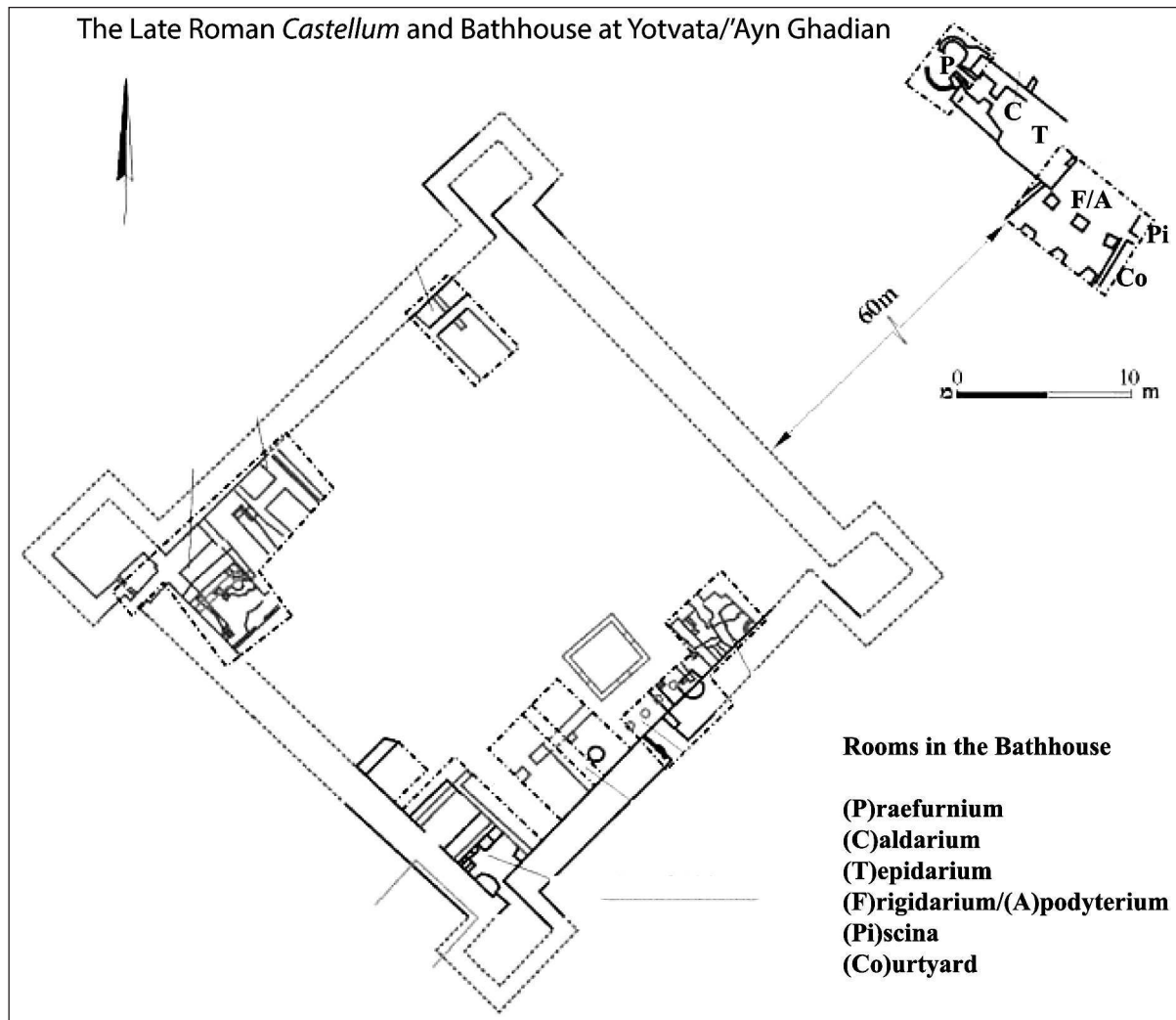


Figure 9. The late Roman *castellum* and bathhouse at Yotvata/Ayn Ghadian (after DAVIES & MAGNESS 2007).

### Architectural Plan

While a portion of the bath complex remains unexcavated, the majority of its rooms and installations have been exposed and identified (fig. 9). In its current state six rooms of the bathhouse are visible: a paved courtyard, a *piscina* or cold-plunge pool, a large *apodyterium/frigidarium*, a *tepidarium*, a *caldarium*, and a *praefurnium* enclosure. Additional rooms may yet lay buried to the NE, as indicated by the remnants of other walls extending from the exterior of the *tepidarium* and the presence of toppled architectural materials in that area. Additional rooms could also remain to the S of the *apodyterium/frigidarium* where they may have lined the courtyard.<sup>60</sup>

The various rooms and bathing installations of the bathhouse were built around an open courtyard that provided direct access to the main heated bathing block as well as the *apodyterium/frigidarium* and *piscina*. A low row of finely tooled stone blocks borders the courtyard on the W and N demarcating it from the bathing facilities.<sup>61</sup> Facing onto the courtyard on its NE side is a large rectangular *piscina* ca. 1 m in depth containing four stone steps in its NW corner. The plunge bath is ca. 1.50 m across; its full

60. See MESHEL 1989.

61. See DAVIES & MAGNESS 2011, p. 474, who only note the blocks in relation to the *apodyterium/frigidarium*.

dimensions were, however, unable to be recorded due to the overhanging acacia trees and surrounding brushes. The careful placement of the steps in the corner of the tub nearest to the adjoining room to the W, the *apodyterium/frigidarium*, is a clear indication that the *piscina* functioned as a cold plunge bath serving the *frigidarium*. Its propinquity near the entrance to the heated bathing suites meant it could serve as an initial immersion or a final rinse in the bathing sequence. Further, its proximity to both the courtyard and *apodyterium* conveniently allowed a visitor to the baths relatively quick access to bathing without having to enter the heated rooms.<sup>62</sup> More, a close parallel can be drawn with the *piscina* at 'En Hāzeva which also faces directly onto a courtyard in close proximity to the *apodyterium* and *frigidarium*.

On the W side of the courtyard is a large rectangular room (ca. 9 x 11 m) that likely served a dual function as both *apodyterium* and *frigidarium*. Six piers (ca. 1 x 1 m) arranged in two parallel rows divided the interior space of the room into three approximately equal spaces; a central aisle and two flanking galleries on either side. The N and S galleries probably served as changing areas, while the W end of the room may once have contained a plastered tub.<sup>63</sup> More, the room features long plastered benches along its N and S wall, further indicating the room's use as an *apodyterium*, while its proximity to the *piscina* and *tepidarium* indicates it also functioned as the bath's *frigidarium*. The northern bench contained a plastered step in its center that most likely led to another adjacent unexcavated room or bathing installation. In the NW corner of the room a single projecting step granted access to the *tepidarium*. All remnants of the door that must have once separated the two rooms are now lost. However, two long flagstones that presumably served as a threshold for the *tepidarium* remain *in situ*.

The majority of the *tepidarium* was recorded by Meshel, particularly its northern half.<sup>64</sup> Details of its southern half were not clarified until 2006.<sup>65</sup> The superstructure of the small *tepidarium* is preserved only to the level of its suspended floor surmounting the hypocaust below. Large pieces of collapsed concrete vaulting litter the surface nearby and presumably once roofed both the *tepidarium* and *caldarium*.<sup>66</sup> A short cross-wall divided the *tepidarium* from the *caldarium* with a doorway connecting the two rooms. Only the foundation for the cross-wall between the *tepidarium* and *caldarium* now remains.

The *caldarium* was entered from the E. Its poor state of preservation was noted by Meshel with only a small portion of the plastered floor, minus its paver stones, remaining in place.<sup>67</sup> However, based upon the design of the *caldarium*'s hypocaust system and *suspensura* its plan and function are discernible. The small rectangular room was divided, with the western one-third being used as an *alveus* or hot tub, while the remaining eastern two thirds functioned as a sauna.<sup>68</sup> The *caldarium* was covered by a concrete vault the remains of which can still be seen lying next to the structure.<sup>69</sup> The *praefurnium* flue entered the *caldarium* in the center of the W wall.

A small external room lies to the West of *caldarium* and served as the *praefurnium* enclosure. Centered on the opening of the furnace, the room contains a sloping floor made of hard-packed clay or mortar surrounded by two semi-circular walls with a central entry. The two walls extended W from a plastered rectangular platform that sat directly above the furnace. The platform would have once held a water tank. Yotvata's bathhouse, like its counterparts in the Wadi Arabah, also conforms to the angular row type.<sup>70</sup>

62. Musil notes that the temperature of the water flowing from the main spring at Yotvata was only 22°C, which helped to counter its unpleasant sulphuric smell when drinking MUSIL 1907, p. 254.

63. DAVIES & MAGNESS 2011, p. 474.

64. MESHEL 1989, p. 235.

65. DAVIES & MAGNESS 2007.

66. DAVIES & MAGNESS 2011, p. 474.

67. MESHEL 1989, p. 235.

68. See MESHEL 1989, p. 235, who notes the wall dividing the *caldarium*'s hypocaust basement and assumed that it was only for supporting the floor above. He, however, failed to note the significant differences in the hypocaust system between the two spaces.

69. DAVIES & MAGNESS 2011, p. 245.

70. See e.g. NIELSEN 1993, p. 51, fig. 1, II.