13 Naukratis, 'Mistress of ships', in context

Ross Thomas

Naukratis was an important hub for trade and cross-cultural exchange long before the foundation of Alexandria. Established in the late seventh century BC as a base for Greek and eastern Mediterranean traders, Naukratis also functioned as the port of the royal pharaonic city of Saïs.[1] Previous fieldwork by Petrie and Gardner (1884–1886), Hogarth (1899–1903) and Coulson and Leonard (1970s–1980s) concentrated particularly on the central areas of the town. Recent investigations were undertaken by the Supreme Council of Antiquities within the surrounding villages of Rashwan, Abu Mishfa, Gebril Abbas, Hassan Kasim and El Baradany, directed by Mohammed Aly Hakim. The early excavations were pioneering for their time, revealing a wealth of information, but left many questions unanswered; their significance and their effect on scholarship have been discussed in recent publications by the British Museum's Naukratis Project.[2]

In October 2012 and April 2013 two brief seasons of new fieldwork at the site were carried out by members of the Naukratis Project in collaboration with the Egyptian Supreme Council of Antiquities (SCA).[3] The key incentive was to gain new and additional contextual information about Naukratis as part of the on-going reassessment the site, and to assess the potential of the site for a possible larger-scale fieldwork project. Specifically, our primary objectives were to undertake preliminary investigations of the full extent of the city and its development, its urban structures, palaeo-landscape and position in the system of waterways in the Nile Delta—pressing research questions that could not be answered solely through our on-going reassessment of the nineteenth century fieldwork at the site.[4]

The programme of work included topographical (RTK GPS) survey, geophysical (fluxgate gradiometer) prospection, a targeted programme of geological investigation (auger drilling) and limited excavation, complemented by surface pottery collection and architectural survey (in the limited places where extant). In spite of the short time spent on site, important new results emerged from the work. We faced a great challenge mapping the series of earlier excavations and surveys onto the current landscape, though succeeded in reconciling, as close as is practicable with the accuracy of the methods of the time, Petrie's, Hogarth's and Coulson's maps with each other and with the current lay of the land, utilising ArcGIS and archived satellite and aerial photography following our 2012 season.[5] This article will summarise the major findings of the 2012 and 2013 seasons and, for the purposes of clarity, will use the same terminology for areas as of our recent article on the 2012 season,[6] in which a more extensive account of the methodologies employed and the research background can be found. We hope future fieldwork will allow us to resolve further questions raised by this preliminary work, not least completing our geophysical prospection to better understand the layout and development of the settlement (Figure 13.1), the function and phasing of newly-discovered features.

Topography

The ancient site of Naukratis has a complicated topography that has confused archaeologists for the last 130 years. Today, the ancient harbour town is encircled, and in places covered, by the modern villages of Rashwan,

1 Cf. Fabre, this volume, Chapter 9.

2 Thomas and Villing 2013; Villing 2013a.

3 The Naukratis fieldwork team consisted of Alexandra Villing (British Museum), Penny Wilson (Egyptologist, Durham University), Marianne Bergeron (British Museum), Ben Pennington (Geologist) and field director Ross Thomas (British Museum), assisted by archaeologist Entesar El Sayed Ashour, Eptisam Nabeel Mahmoud Elbahiye, Doaa Ferieg Ali, Emad Hamdy Mohamed Abou Esmail, Tarik Sayed Ahmed Abdellah, and Hani Farouk Abd El-Azeez Shalash of the Beheira section of the SCA, Damanhur, Egypt, who were trained in all aspects of the fieldwork. The October 2012 season was funded by the British Museum, the April 2013 by a British Academy Small Research Grant, Reckitt Fund. The Honor Frost Foundation and the British Museum have contributed funding towards a future fieldwork season.

4 The British Museum's Naukratis Project, led by Alexandra Villing, is publishing an Online Research Catalogue of over 17,000 objects known from the early excavations at Naukratis distributed over 70 institutions worldwide (Villing et al. 2013). It is funded by the Leverhulme Trust (Project Grant number F/00 052/E), the Shelby White-Leon Levy Program for Archaeological Publications, Christian Levett and the Mougins Museum of Classical Art, the Institute of Classical Studies, London, and the British Museum. Fieldwork revisiting Naukratis has provided new contextual information that enables a better understanding of the distribution of artefacts retrieved during all archaeological investigations at Naukratis. This enables us to better understand ritual offering practices in sanctuaries as well as domestic, industrial and trade activities taking place at this ancient port, discussed in other Naukratis Project publications.

5 Thomas and Villing 2013: 86–8, fig. 8.

6 Ibid.

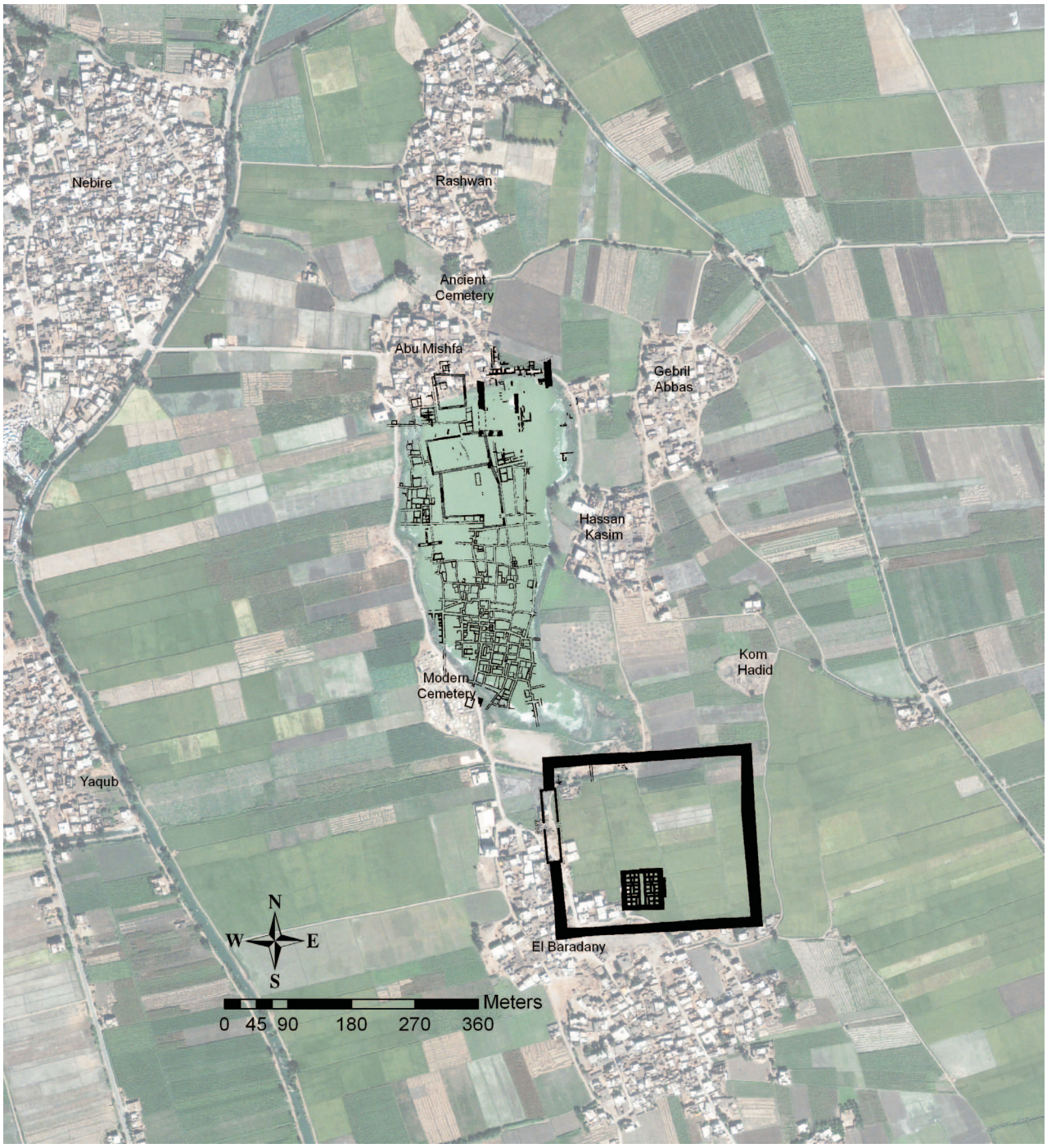


Figure 13.1 Composite plan of Naukratis/ Kom Geif. Satellite image and excavation plans.

Abu Mishfa, Gebril Abbas, Hassan Kasim, El Baradany and their fields, collectively known as Kom Geif. A large portion of the northwestern quarter of the ancient settlement is currently a large pit, until recently a lake, left by the excavations of the *sebbakhin* and archaeologists.[7] Our topographical survey of the ancient settlement and its immediate landscape covered 182 ha. It was started in 2012 and completed in 2013, using two RTK GPS units, a Leica GX1230 as a reference station, and another Leica GX1230 as a rover unit.[8] This made it possible to accurately locate modern and ancient features of the site and to incorporate this data into a composite map of Petrie's, Gardner's, Hogarth's, Coulson's and Leonard's and Hakim's plans, sections and photographs

7 Bailey 1999: 218; Leclère 2008: 140.

8 The programme used GPS technology, deemed the most time and cost efficient method for the level of accuracy required, to locate all extant architectural and archaeological features, surface survey finds, auger holes, magnetometry grids, and archaeological trenches (both from our work and from earlier work by Mohamed Aly Hakim of the SCA in 2009 and 2011) as well as a topographic survey. Areas of archaeological interest and topographic complexity were covered in greater detail (5 m traverse intervals, every metre and 0.1 m height change) than the outlying fields. This placed the whole survey in real-world co-ordinates with an accuracy of 3.7 cm (see Thomas and Villing 2013).

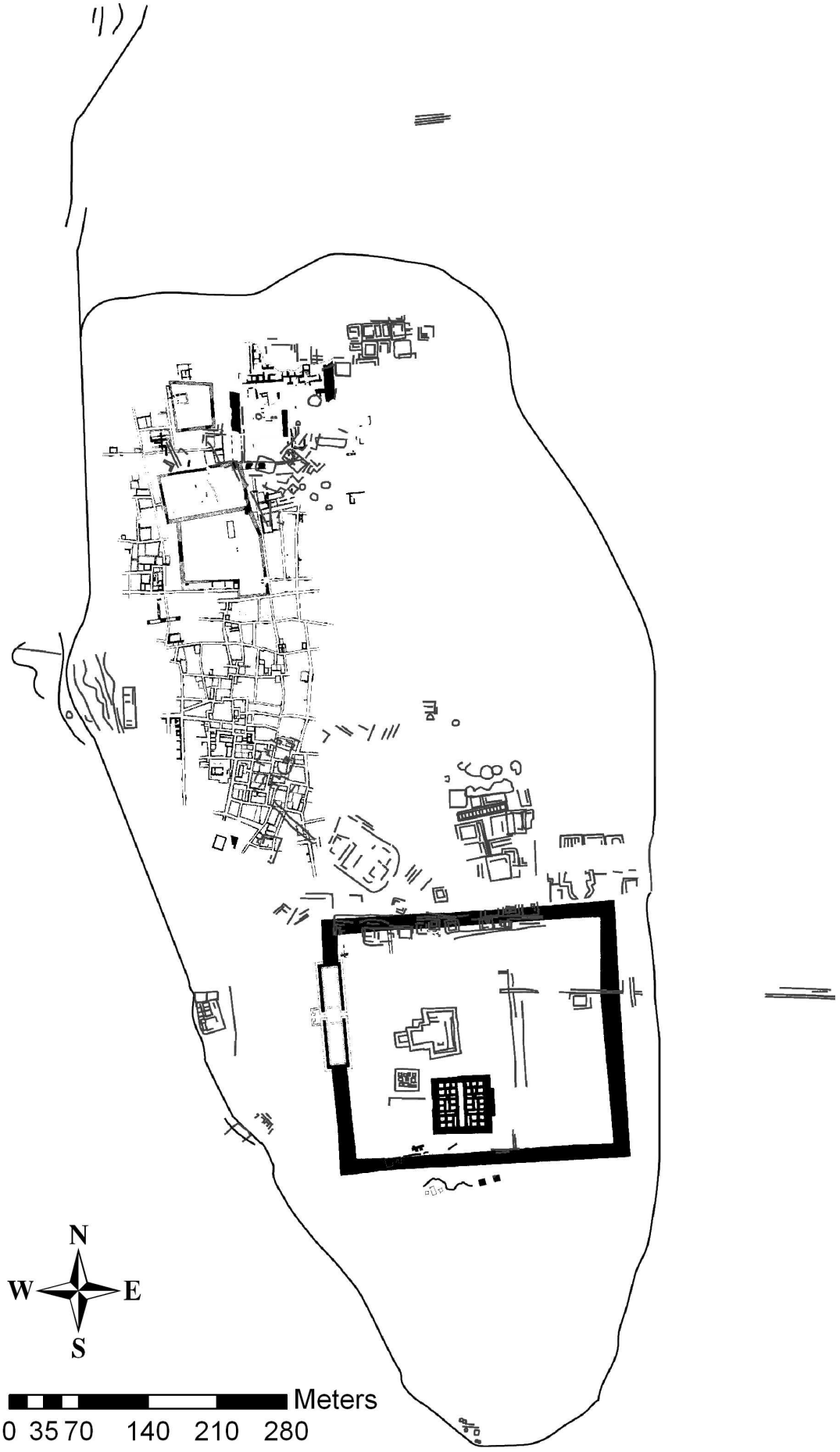


Figure 13.2 Interpretation of magnetometry results with excavation plans and location of excavations.

Figure 13.3 Magnetometry results.

alongside aerial photography and satellite images taken in 2011, 2009, 2007, 2004 and 2002 (Figures 13.2–3). It also enabled us to correct errors in subsequent interpretation, notably in the work of the American mission to Naukratis of the 1970s and 80s,[9] as well as to build a topographic model in ArcGIS (Figure 13.4). During the survey, abundant pottery was observed on the surface[10] and a small sample was collected, dating

9 Thomas and Villing 2013: 87, fig. 8.

10 Each object was located using the RTK GPS. We were also able to record in the same manner the still visible SCA trenches of 2009 and 2011 excavated by Mohamed Aly Hakim. Our ArcGIS plan enabled us to rubber sheet and geo-correct the errors in Coulson's survey (based on somewhat distorted aerial photography) and Leonard's excavation plans of the site. We were then able to compare our surface survey results with Coulson's in real-world coordinates.

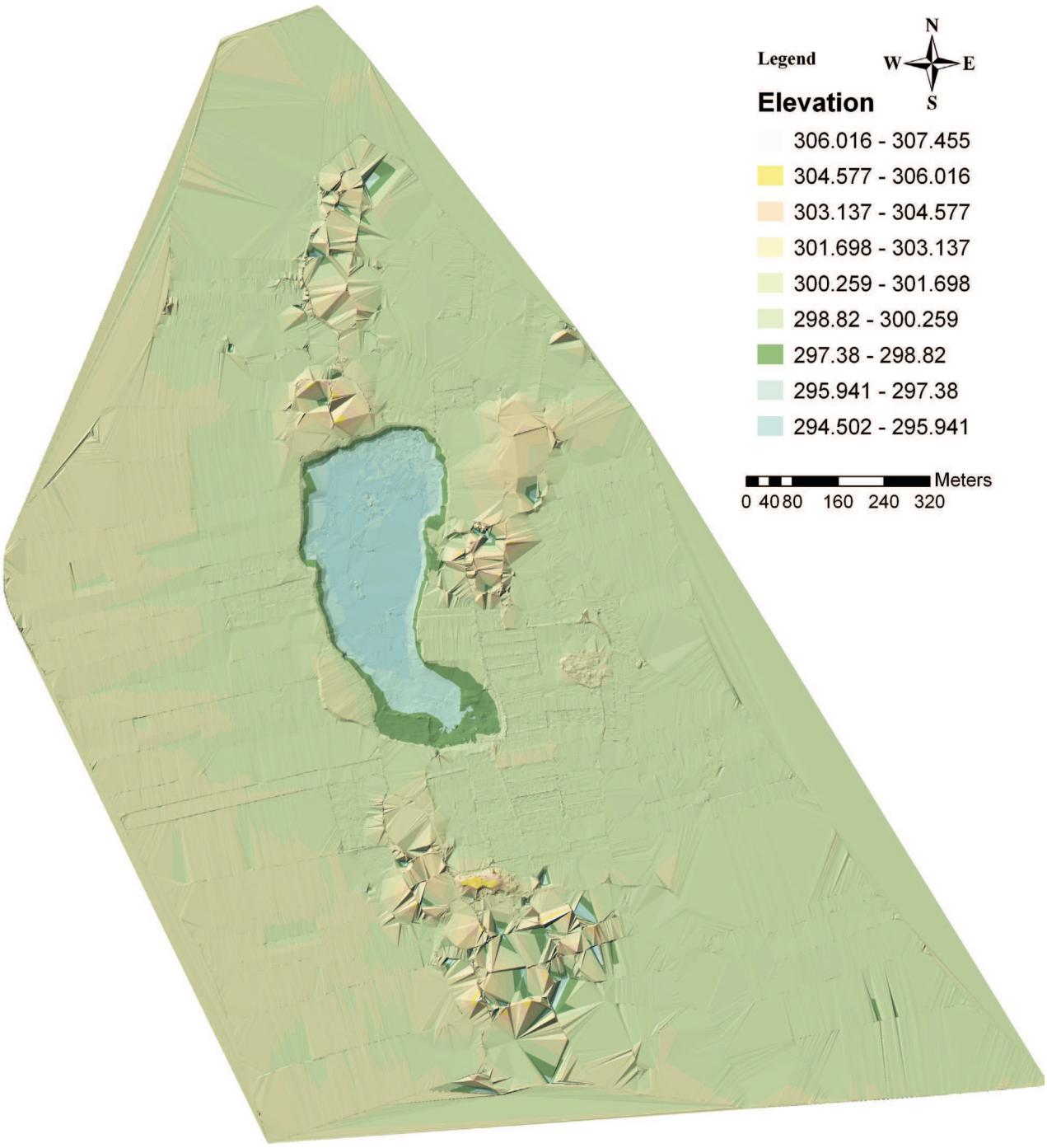


Figure 13.4 Topographic plan of Naukratis.

from the late seventh century BC to at least the seventh century AD, agreeing with the date range attested by the artefacts found by Petrie, Gardner, Hogarth, Coulson and Leonard.[11] In 2013, artefacts were also recovered in excavations and auger drill cores, providing dates for geological and archaeological phases.[12]

Geophysical prospection was undertaken using a Bartington Grad601-2 Dual Array Twin Fluxgate Gradiometer[13] (henceforth magnetometer). Magnetometry has now been completed for 26 ha of the 30 ha still accessible of the ancient settlement that we now know reached over 52 ha at its full extent. The magnetometry revealed numerous previously unknown structures, interpreted below as over 70 houses, sections of temenos walls and other religious structures, magazines, and industrial features, as well as the riverfront.

11 Villing et al. 2013 and forthcoming.

12 All finds were washed, photographed, bagged with labels, boxed, and stored in Kom Firin magazine for future study and publication.

13 Known to detect man-made sub-surface structures effectively in the sedimentary geology of Nile Delta. For technical details see Thomas and Villing 2013: 85. All data has been processed in Geoplot 3.0 by Kristian Strutt from the Archaeological Prospection Service of Southampton, http://www.southampton.ac.uk/archaeology/apss/), who will also work with this author on the final report of the magnetometry results.

The Nile, harbour and canals

West of the dried up lake and Abu Mishfa-El Baradany road as far as the modern Abu-Diab canal, concealed under fields, lies the Canopic branch river harbour of Naukratis. Long the subject of controversy,[14] magnetometry undertaken in 2012 and 2013 provided an indication of where the ancient river bank/shore line was, a hypothesis subsequently confirmed by the results of geologist Ben Pennington. The magnetometry revealed a 'neutral' zone to the west, consistent with river sediments (i.e., the location of the Canopic branch),[15] next to a series of magnetic linear features (henceforth 'river bank') that we suspected represents harbour terraces retaining surfaces made up of magnetic man-made material on which magazine-like structures were built, aligned north–south following the course of the now dried-up river.[16] A series of hard surfaces containing Ptolemaic pottery built over a high energy Late Period shore deposits were confirmed in 2013 by auger cores[17] drilled through this anomaly and dated using the abundant pottery contained within the cores. This 'river bank' anomaly was visible in magnetometry grids in three areas to the northwest, west of Rashwan, and continues all the way to the southwest tip of El Baradany, where the 'neutral' river sediment signature bends towards the southeast marking the southern limit of the settlement. A long 40 m × 11 m building divided into square cells was identified in 2012 next to the riverbank in the west and was interpreted as a magazine. This structure is of the same size and alignment as nearby 'Ptolemaic' structures excavated by Petrie in 1885.[18] Pottery found on the surface of this area includes material representing the full range of Naukratis chronology, from the seventh century BC to seventh century AD, but Ptolemaic and Roman to Byzantine finds were most common there. Transport amphorae of the fifth to early seventh centuries AD are particularly well-represented, suggesting that this part of the settlement was used until the cities decline in the seventh century AD.[19] The thriving harbour of Naukratis is represented by maritime artefacts found in previous excavations at the site. Most were found in this western area of the settlement by the river during Petrie's excavations.[20] These include fishing hooks and weights, ballast stones, fragments of lead hull sheathing, copper hull tacks and brail rings (Figure 13.5).

Whilst Petrie had correctly identified the location of the maritime access to the site,[21] we can now confirm that this was the wide navigable Canopic river branch, not a narrow canal as he had suggested. Hogarth[22] and Coulson's less convincing alternative suggestions[23] for the location of the ancient Nile branch, to the east or running through the settlement, can now be discounted. A programme of auger drill coring was conducted by geologist Ben Pennington, concentrating on the western river channel and its interface with the settlement, to test our hypothesis for the western location of the Canopic branch and the site's harbours.[24] We also wanted to understand how deep and wide the river was, whether it was navigable, when it moved, silted up and in what direction. Using an Eijkelkamp hand auger,[25] nine cores were drilled at points surveyed using RTK GPS. A variety of palaeo-landscapes and archaeological deposits were identified, including mud-brick structures and domestic activity, putative ditch or canal cuts and deposits, river channel and river adjacent environments as well as periods of hiatus and/or farming activity. A preliminary interpretation of the data suggests the presence of a deep (average *c.* 3 m) and wide (*c.* 250 m) river channel immediately to the west of the urban quarters,[26] flowing south to north and laterally migrating from east to west over time. This is most likely the Canopic branch of the Nile. The levels of the geological sequence and a number of datable sherds contained within the auger drill cores confirmed that this was contemporary with the ancient site. Full publication of the 2013 Naukratis auger programme and re-interpretation of previous auger cores[27] drilled at the site will form part of on-going research on this dynamic landscape.[28] A similar methodology combining magnetometry and auger drill cores undertaken at Tell el-Dab'a revealed a broad early Pelusiac branch channel that once served the ancient settlement and has subsequently silted up.[29] Judging from the results obtained so far, it seems likely that the Canopic branch of the Nile was deep enough and navigable, likely all year round, for sea-going ships such as the *Kyrenia*.[30]

Questions remain concerning the east of the settlement. Scholars have argued for the location of

14 Petrie 1886: 2–4, 10; Bernand 1970: 618–23; Möller 2000: 115–16.
15 They are neutral because they are laterally more homogenous than anthropogenically derived sediments.
16 Thomas and Villing 2013: 91.
17 Pennington forthcoming: cores A04 and A07, complemented by further 2014 auger cores.
18 Petrie 1886: pl. 41, labelled 'Ptolemaic houses'; Petrie 1886 Notebook 6: 17, points 130–2. Objects from this area appear to confirm Petrie's dating, however in many parts of the site, other 'Ptolemaic' houses are known to have contained Late Period or Roman artefacts. Many Roman artefacts have also subsequently been identified as Ptolemaic production (Bailey 2008).
19 Thomas and Villing 2013: fig. 7, table 1.
20 Petrie 1886: 10; Thomas and Villing 2013: 92.
21 Petrie 1886: 10.
22 Hogarth, Lorimer and Edgar 1905: 122–3.
23 See Villas 1996: 177–90.
24 Thomas and Villing 2013: 91–2.
25 Cores were brought up in 20 cm chunks. The sediment was recorded in terms of grain size, clast percentage and composition, organic content and form, as well as sorting, rounding and mineralogy where appropriate.
26 Pennington forthcoming: cores A01–3, A06–7.
27 Gifford in Coulson, Leonard and Wilkie 1982: 75; Leonard 1997: 28 with note 67; Villas 1996: 177–90; Shaaban El-Awady 2009; Wilson 2010: 116–18, fig. 9.3.
28 Pennington forthcoming.
29 Forstner-Müller et al. 2012: 4, fig. 6.
30 An early fourth century BC ship that sank off Cyprus in the early third century BC: see Parker 1992: 231; Casson 1994, 109; Steffy 1985.

Figure 13.5 Artefacts from excavation and survey.

the main river channel,[31] a minor branch, or a canal leading to the Saïte capital Saïs to the east, during part or all of the life of the site.[32] Though pottery has been found to the northeast of the settlement,[33] magnetometry did not pick up any magnetic signal that would be consistent with buildings. Instead there is a 'neutral' zone, consistent with river sediments as found to the west of the site. This 'neutral' zone was also found in other areas to the east and southeast of the settlement, which revealed little other than modern and old field systems (Figure 13.3). A *c.* 37 m long section of a *c.* 6 m wide east-west aligned linear feature was identified in the northeast. Its magnetic signature and dimensions suggest it was a canal or ditch. It is of unknown date and could potentially be a relatively recent irrigation canal branching off the modern canal that passes by to the east. A second linear east-west feature was found to the southeast. A *c.* 330 m long section of this *c.* 8.5–10 m wide feature of two parallel lines was seen in the geophysics. It penetrates well into the northeast quarter of the Great Temenos, where it meets a perpendicular north-south aligned wall. It appears to be covered by the Great Temenos wall, and respected by an adjacent *c.* 13 m square mud-brick building to the south, within

31 Hogarth, Lorimer and Edgar 1905: 122–3.
32 Thiers 2007; Thomas and Villing 2013: 93.
33 Coulson 1996: 8, 132–5, fig. 5, fields S–2, S–15.

the Great Temenos area, consistent with the dimensions and materials of the tower houses described below. The precise archaeological relationships between these features needs to be clarified in future seasons. If this linear feature is indeed ancient, then the 'neutral' zone to the east of the settlement must have been dry land before these linear features were cut or built, confirmed by our fieldwork in 2014. Thus the 'neutral' zone to the east was dry land when Naukratis was occupied, albeit over much older (geologically) river deposits. Though tantalising, fieldwork in 2014 confirmed this cannot be an east-west canal linking Naukratis and Saïs, the existence of which has been argued by some scholars,[34] and may yet be found in another part of the settlement. It was in fact two parallel ditches, both too narrow and shallow for a canal, so could perhaps have been used for farming?[35]

Naukratis town

The settlement at Naukratis is larger than previously thought.[36] Magnetometry and the recent excavations by the SCA in 2009 and 2011 have significantly increased our understanding of the limits and layout of the ancient settlement. The magnetometry revealed previously unknown areas of the settlement, including mud-brick square houses to the northeast, east of a structure at the southwestern limit of modern El Baradany associated with Ptolemaic to early Roman pottery. The western and southern limits of the settlement were constrained by the river. Parts of the eastern limits of the settlement are obscured by modern Gebril Abbas and Hassan Kasim, where ancient material was found during SCA excavations in these areas. The areas east of the Great Temenos and Kom Hadid are clear of structures, with magnetometry indicating old field systems and canals. The northern limit of the settlement is not yet defined, but was constrained by the cemetery excavated by Gardner[37] on a small mound between Rashwan and Abu Mishfa.[38] Our better understanding of the limits of Naukratis forces us to reconsider its size, which must have exceeded 60 ha during the heyday of the city. New features have emerged concerning the layout and architecture of Naukratis. What does the layout of Naukratis mean for the status and function of the settlement?

Herodotus describes Naukratis as both a *polis* and an *emporion*,[39] though the appropriateness of applying the term *polis* to Naukratis prior to the Macedonian conquest has been called into question.[40] Naukratis was never an entirely independent city state, though the religious architecture and written evidence confirms the existence of religious and administrative features consistent with a Greek city and *emporion* during the Saïte and Persian Periods. Still, the settlement cannot be considered a Greek colony, as the population was diverse, including a significant Egyptian element.[41] Greek geographers[42] tend to refer to barbarian cities as *poleis* if they were 'nucleated settlements of a certain size', with a population over 5,000,[43] which Naukratis certainly exceeded during its height. However, is such terminology useful if a settlement, such as Naukratis, is known to have had elements common with Egyptian settlement? Public buildings are generally poorly represented in the archaeology of Naukratis. It is likely that a trade market existed next to the river harbour, discussed above, but the epigraphically attested *palaistra*[44] and the *prytaneion*, mentioned in later texts, remain undiscovered. An *agora*, essential to any Greek city, is currently absent from the archaeological record of Naukratis, indeed many scholars accept that it is unlikely that an *agora* existed there.[45] On the whole, however, Naukratis has a rather organic look about its construction. It has no *dromos*, no orthogonal Hippodamic-style street layout, as seen in Alexandria with its insulae of peristyle-houses, or indeed Philadelphia, which featured Egyptian tower houses.[46] Indeed, its highly irregular non-orthogonal layout, dominated by large *temene*, seems to resemble other (and older) Egyptian delta towns, such as Saïs, more than it does a Greek city newly-founded in the seventh century BC.[47] It is interesting to note, moreover, that the location of the workshops and industry integrated within the settlement in the north, including kilns in the east and a scarab workshop in the town,[48] did not respect the prevailing northerly winds that were taken into account at organised foundations, such as Macedonian settlement at Athribis.[49] Of course, even in Egypt orthogonal street grids were known from the Middle Kingdom to the Roman Period, but they were rare and confined to specific cases relating to expressions of dynastic and/

34 Thiers 2007; Wilson 2010: 116–8, fig. 9.3.
35 The major Nile-Red Sea canal was described as being 30–69 m wide by different authors at different periods of its history: Cooper 2009: 204; Herodotus *Historia* 2.158; Strabo *Geographica* 17.1.26; Pliny *Naturalis Historia* 6.333.165–6. A canal channel discovered in Karnak was 16 m wide, see Graham et al. 2012: 25.
36 Wilson 2011: 186; see table 1. Wilson calculated a population of 5920, based upon a density of 185 people per ha, within a 32 ha site.
37 Gardner 1888: 21–30.
38 Thomas and Villing 2013: 90–1, fig. 14.
39 Herodotus *Historia* 2.178–9.
40 Austin 2004: 1238; Möller 2006: 184–94; see Hansen 2004: 87.
41 Yoyotte 1983: 129–36; Leclère 2008: 117–38; Spencer 2011: 35–41; Villing 2013b.
42 Specifically in the case of Naukratis, see Strabo *Geographica* 17.1.18; Herodotus *Historia* 2.178–9.
43 Petrie 1886: 35; Möller 2006: 71–4, 118; Müller 2010: 220, 225; see also Bresson 2005: 152.
44 Petrie 1886: 35; see Redon 2012.
45 Müller 2010: 233.
46 Ibid.: 227, 230, 234.
47 For Egyptian settlements layout, see Müller 2010: 225; Leclère 2008. For Greek colonies and settlement layout see Mertens 2006; Lang 1996. Note the preserved layout of Archaic Smyrna is also organic and irregular.
48 Petrie 1886: 36; Villing 2013b; Möller 2000: 152–4.
49 Müller 2010: 234; Szymańska 2005: 22–37.

or military power,[50] whereas organic, irregular, street layouts were more common. We cannot exclude the possibility, however, that an initial orthogonal layout may have been superseded, or overgrown by later building activity, when Naukratis expanded, as occurred at other Egyptian sites, such as at Dionysias.[51]

Domestic architecture

The Naukratis Project's 2012 and 2013 programme of magnetometry revealed over 70 previously unknown 12–16 m square or near-square mud-brick structures with substantial walls or footings/foundations; they are densely packed (*c.* 38 per ha), filling all the space not occupied by religious, public, trade, and industrial zones of the settlement. These buildings have a clear magnetic signature and are occasionally seen on the surface. Internal divisions are often visible, dividing the building into a tripartite plan with a number of cells or rooms. Though square, they often overlap and abut other houses or parts of the Great Temenos wall, suggesting that future excavators should expect complicated stratigraphic phasing. As the magnetometry and excavations revealed structures from different periods and at different levels, the plan we have of Naukratis today likely represents various phases, making it difficult to calculate the density and extent of the settlement for the different periods of the site. In sites where tower houses were excavated or augered, they were often found to be well-preserved to some depth. Their wide walls, substantial footings and foundation platforms are features which are typical for mud-brick Egyptian 'tower house' architecture of the Late Period to Roman Period.[52] Such features are, however, inconsistent with the plan of the settlement published by Petrie[53] in the northwest quarter of Naukratis. Here Petrie mapped a range of flimsy irregular mud-brick terraced insula, an architectural style known also from Egypt[54] that is often found alongside tower houses. Is this difference real, and if so what does that mean for the layout and demography of Naukratis and what do we know about the architecture from the subsequent excavations by Hogarth, Leonard and ourselves?

Figure 13.6 Model of a tower house.

Naukratis' 'tower houses' are large,[55] but fit within the standard 9–16 m width for this architectural tradition of building on a 'casemate' platform.[56] Documentary, model and architectural evidence of tower houses confirms they were commonly three to four and possibly even reaching six stories high.[57] Late Period and Ptolemaic models of such tower houses were also found at Naukratis (see Figure 13.6).[58] There are numerous examples of Late Period Nile Delta settlements populated by tower houses,[59] where the *verticalisation* of the architecture occurred in response to limited space in the Delta.[60] This was also the case in the constricted fortified garrison towns of Elephantine[61] and Aswan.[62] Tower houses were built on a larger scale during the early Ptolemaic Period, in response to the rapidly growing population, at Karnak, Edfu, and particularly the Fayum.[63] This architectural style continued to be used through the Roman[64] and into the Islamic Period,[65] making them difficult to date on the basis of the magnetometry results alone. There is only relatively little help from pottery: auger cores, excavations (by Leonard[66] and in 2013) and surface survey collection produced Roman, Ptolemaic and Late Period pottery at Naukratis. The Ptolemaic material was best represented and the Late Period pottery was rare, being covered by subsequent building and occupation deposits. Roman pottery was found in the excavations of

50 Müller 2010: 240.
51 Ibid.
52 Marouard 2012; Arnold 2003.
53 Petrie 1886: pl. 41.
54 Müller 2010: 250.
55 The Naukratis tower houses are slightly larger than normal, however the magnetometry parallels cited by Marouard were also larger than excavated examples. This may represent the wider footing platform over which these houses were built, thus explaining the exceptionally narrow, or absent, space between tower houses.
56 Marourard 2012: 124–5; Spencer 2008: 6–10; 2013: 171–3; Arnold 2003: 174 table 14. If one excludes Islamic Period examples, the tower houses tabulated by Arnold range from *c.* 9 m × 11 m to 17 m × 18.5 m.
57 Arnold 2003: 166–9; Müller forthcoming; Husson 1990: 127; Marouard 2012: 126; Spencer 2013: 173.
58 Petrie 1886: 40, pl. 18.1 and see 18.3; British Museum EA 68816 (1886,0401.1397); Cairo JE28784 and see TR19/3/24/6.
59 At Mendes, Tell el-Nebeshe, Toukh el-Qaramous, Tell el-Moqdam, Kom Firin, Tell Tebilla, Tell Dab'a, Buto, Tell Basta, Tanis and Tell el-Balamun; see Brissaud 2000: 25–6; Forstner-Müller et al. 2011: 4–5, fig. 5; Marouard 2012: 127; Spencer 2008; 2014: 171–4; Spencer 2009: 105, fig.11.1.
60 Marouard 2012: 131.
61 Arnold 2003: 166–9.
62 Müller 2010: 244–5; forthcoming.
63 Tebtynis, Karanis, Philadelphia, Bakchias, and Soknopaiou Nesos. See Hadji-Minaglou 2007: 166–7, figs 2–4; Marouard 2012: 131–2; Müller 2010: 227, 230, 234.
64 Marouard 2012: 131–2.
65 Müller forthcoming; Arnold 2003: 176, table 14.
66 Leonard 1997; 2001.

the 'South Mound' and in the east of Naukratis. Roman deposits across the site may have been erased by modern building and farming practices, as at Tell el-Dab'a.[67] Alternatively, there may have been a reduction in activity during the Roman Period at Naukratis. The tower house plans at Naukratis closely resemble both Saïte-Persian types found at Buto and later Ptolemaic types from various sites,[68] which are square and organised better than the 'organic' misaligned rectangular examples excavated at the Saïte 'Citadel area' at Kom Firin, that were built over and modified earlier structures.[69] The tower houses at Naukratis was not aligned with an organized orthogonal street plan as found at Philadelphia.[70] Instead, they seem to have grown in a piecemeal fashion, each house roughly respecting the alignment of its neighbours, using all space economically.

Northwest town

The flimsy irregular mud-brick terraced structures published by Petrie in his plan of the 'town',[71] which was accepted uncritically by subsequent researchers, provides us with a different architectural style and layout. The plan was largely the product of a triangulation survey undertaken by Petrie in 1884–5 of the surviving walls revealed to him by the activities of the *sebbakhin* on the site, which were, by his own admission, difficult to interpret.[72] Though some 'Ptolemaic' houses were identified, the plan, Petrie claims, essentially represents the town of the 'time of Herodotus'.[73] Petrie himself excavated only few houses and failed to describe in any detail,[74] other than in his journal: 'The Greeks undoubtedly borrowed a great deal necessarily from the native ways. The mud-brick houses and *peribolus* for instance are Egyptian in manner'.[75] Gardner carried out his own attempt to excavate 'various private houses', concluding that the 'arrangement of the houses remained conjecture … (though) … the best example produced a plan [unpublished and apparently lost], without doors, suggesting cellars'.[76] Nevertheless, no tower houses were planned, mentioned or recognised in this area. Magnetometry undertaken in 2013 in the lake depression revealed a number of features also visible on Petrie's plan,[77] and Hogarth's plans,[78] as well as some apparently mis-aligned new features, and other new features possibly representing different or multiple phases of buildings. However, the area seems disturbed, littered with large magnetic spoil heaps from the excavations rich in pottery. There were no traces in the magnetometry results for tower houses in this 'town' area. It is possible that further excavation may explain this difference, as the magnetometry results offer the geophysics specialist a similarly difficult terrain to interpret as that seen by Petrie in 1884.

The south and east

Hogarth mentioned that there were grand to modest fired brick and limestone buildings dated to Roman and Byzantine Periods in the east of the site towards Kom Hadid,[79] though he failed to investigate them. Small excavations undertaken by Leonard revealed a 1.8 m-wide 10 m section of wall in Kom Hadid, associated with Ptolemaic pottery that may have come from a house.[80] The magnetometry of 2012 revealed a large apsidal structure, aligned north-south just south of Kom Hadid, though the remaining area to the east appears to be populated with the type of 'tower houses' discussed above. Hogarth recognised to the south of the site 'on three sides of the … Great Temenos … an aggregate of house remains, piled up round'[81] the north, west, and southern walls of the temenos. Despite Hogarth's and Leonard's claim that Petrie confused these aggregated mud-brick houses with the remains of a temenos wall,[82] it is clear that Petrie set his colleague Griffith to excavate a series of these houses, just inside and outside of the northern Temenos wall, as sketched and explained in their notebooks.[83] Some of the structures were drawn in his plan of the Great Temenos.[84] The notebooks record Saïte jars, torpedo jars and figurines of Late Period and early Ptolemaic dates,[85] though specific stratigraphic details remain unclear. These domestic structures built over (or under?) and/or against the Great Temenos wall are represented in the 2013 magnetometry, which revealed square mud-brick structures consistent with tower houses. Some of the mud-brick walls of these structures, present in the magnetometry, were also visible on the surface of a bare earth road in 2013.

The 'South Mound', in El Baradany, is another complicated area of Petrie's Great Temenos wall obscured by numerous mud-brick structures. Here the ground is too uneven to allow for magnetometry, except in a small area largely obscured by litter and modern construction. Excavations were undertaken by Leonard in the 1980s, who chose to focus on the 'South Mound',

67 Forstner-Müller et al. 2011: 4.
68 Marouard 2012: figs 1 and 4.
69 Spencer 2013: 171–3, fig. 108.
70 Müller 2010: 227, 230, 234.
71 Petrie 1886: pl. 41.
72 Ibid.: 35.
73 Ibid.: pl. 41;'pre-Ptolemaic' Petrie Notebook April 1885, 183A.
74 Petrie 1886: 35.
75 Petrie Journal 1884–5: 73–4, EES XVII.d.47.
76 Gardner 1888: 16.
77 Petrie 1886: pl. 41.
78 Hogarth et al. 1898–9: pls 1–2.
79 Ibid.: 1898–9: 41, pl. 2, grids 7b, 8b, and 9b.
80 Leonard 2001: 7, fig. 1.5.
81 Hogarth et al. 1905: 111.
82 Ibid.: 111; Leonard 1997: 29–30.
83 Griffith Notebook 150, 10–11, areas 13 and 24.
84 Petrie 1886: pl. 42.
85 Griffith in Petrie Notebook 150: 10–11, areas 13 and 24; Thomas 2013: 118, figs 115–7.

revealing a flimsy two-course wide mud-brick structure crossing Areas 1, 2, 482, 490–2 and 502, and part of a more sturdy mud-brick structure in Areas 315 and 316.[86] Leonard also revealed two areas of massive mud-brick wall in Areas 12 and 15, to be discussed below. Targeted small-scale excavation in three trenches and the cleaning of two exposed mud-brick sections were carried out in 2013 by Penny Wilson at the 'South Mound' (Figure 13.4). The northwest side of the 'South Mound' revealed stratigraphic sequences and wall sections, cut (then refilled) in Leonard's Area 1, 2, 482, 490–2 and 502 excavations of 1980–1981 in the west. Excavations on the south side of the 'South Mound' were undertaken in a bay in the side of the mound. Trench 1 (3 m × 3 m) revealed a solid sequence of mud-bricks aligned east-west with limited Late Period to Ptolemaic pottery within the bricks, reminiscent of the massive mud-brick wall sections published by Leonard in Areas 12 and 15.[87] Trench 2 (7 m × 3 m) revealed a north-south aligned wall built over a rubble layer and pit dating to the Ptolemaic-Roman Period. Shallow Trench 3 (2 m × 2 m) traced the continuation of the later wall running north-south from Trench 2. Our excavations revealed a Ptolemaic (or, less likely, earlier) east-west wall, intersected by late Ptolemaic to Roman north-south aligned wall built over a pit and rubble. A full report of the work so far by Penny Wilson will follow in future publications. We hope to undertake future excavations in this relatively undisturbed area of the site, to understand better the relationship between various phases of domestic structures and the putative Temenos wall first recognised by Petrie.[88] It seems that some of the structures observed in the excavations by Leonard and Wilson may represent tower houses, whilst some phases exposed by Leonard in the 'South Mound' are more flimsy terraced insula structures.

In conclusion, the excavations around the Great Temenos by Petrie, Gardner, Hogarth, Leonard and Wilson have revealed similar architecture to that shown by the magnetometry in much of the site, namely tower houses, with some flimsy terraced structures also. The presence of these structures against, over, and potentially under sections of the Great Temenos wall should not be a surprise as there are numerous parallels from across Egypt, for example at Syene and Karanis, where temene were absorbed by the regular settlement following the decline of the Egyptian temples during the Roman Period.[89] This is likely to have followed on from complicated processes of domestic house encroachment, temenos wall rebuilding phases, later robbing, and reuse. This is well represented at other Egyptian sites.[90] The huge area covered by the Great Temenos, the firm foundation and ready-made mud-bricks, would have made the wall areas an inevitable choice for prospective builders once it was no longer protected.

The domestic architecture of western Naukratis is distinct from that to the east and south (Figure 13.7). Petrie's 'town of the time of Herodotus,'[91] seems to have consisted of rather flimsily-built insula terraces, whilst the areas to the east and south, surrounding the Temenos, feature tower houses, occasionally interspaced with more flimsy structures. Tower houses are a well-known Egyptian architectural style used in the Nile Delta during all periods of Naukratis' occupation. The western town seems different, even if it is difficult here too, to identify Greek domestic architecture, grand or humble.[92] Instead, Petrie's plan may represent the organic growth of irregular structures including potentially (unidentified) tower houses as well as terraced insulae, courtyards, pigeon towers, workshops, kilns, and silos as found at other Egyptian sites such as Kom Firin,[93] Aswan,[94] Karanis,[95] Tell el-Herr,[96] Soknopaiou Nesos[97] and Tebtynis,[98] representing a number of phases of a frequently remodelled cityscape. Put simply, the difference between the western, eastern, and southern parts of the site could be explained by Petrie confusing and conflating different structures and phases; or it might represent a different, but still Egyptian style of architecture; or be an earlier phase. Quite probably all three factors were at play. The western town, being closest to the river harbour, with the oldest attested structures—the Greek sanctuaries of Apollo, Aphrodite and Hera—was likely the oldest part of town, regularly rebuilt and remodelled, but constrained by public, religious structures and the organic, irregular unplanned growth of its early success. Houses to the east and south were built without constraints, into open, sometimes, as in the case of the Great Temenos, newly-available land.

Industry and trades

Industry and crafts were carried out within and adjacent to the terraces and tower houses of Naukratis. Archaeological and documentary evidence for industrial practices taking place within tower houses and their courtyards in Aswan[99] Kom Firin[100] and Buto[101] include small-scale craft production and industry utilising kilns.

86 Leonard 1997: 36–84, 116–35.
87 Ibid.: 24.
88 Petrie 1886: 23–4.
89 Müller 2010: 251.
90 Spencer 2009: fig. 11.1; 2010: 150–1, fig. 4; 2011: fig. 13.
91 Petrie Journal 1886: 131.
92 Rider 1965: 210–67, see fig. 51; Lang 1996; Hoepfner and Schwandner 1986.
93 Spencer 2013: 172.
94 Moller 2010: 245–50.
95 Arnold 2003: 180, fig. 113.
96 Valbelle 2007.
97 De Maria et al. 2006: 29–30, figs 9–10.
98 Hadji-Minaglou 2007: 166–7, figs 2–4.
99 Husson 1990: 135–6; Müller forthcoming.
100 Spencer 2013: 172.
101 Marouard 2012: fig. 4.

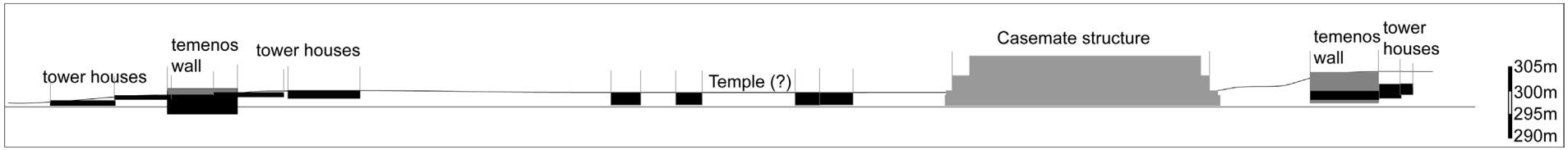
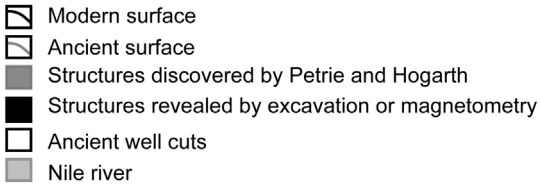


Figure 13.7 Schematic section of west Naukratis.

Figure 13.8 Schematic section of the Hellenion.

Figure 13.9 Schematic section of the Great Temenos.



Magnetometry in northeast Naukratis, near the ancient terracottas workshop,[102] produced a number of highly magnetic irregular anomalies. These could represent ancient industrial kiln waster spoil heaps, or spoil heaps from archaeological excavations (Figure 13.4).

The east of Naukratis, the area around the towns and fields of Gebal Abbas and Hassan Kasim and the unoccupied hill Kom Hadid, produced clear evidence of industrial activities. Kiln wasters, fired brick and circular patches of burnt earth were frequently observed in the recently harvested fields in October 2012. They occurred alongside a dense concentration of pottery dating to the Late Period, Ptolemaic, and Roman to Byzantine Periods. Magnetometry revealed a number of highly magnetic features in the northeast, some of which were circular, possibly kilns, whilst others were irregular, possibly waster spoil heaps, in the immediate vicinity of the wasters and burnt ground described above. Immediately to the south of these industrial activities was a narrow highly magnetic rectangular *c.* 51 m × *c.* 11 m east-west aligned structure divided into small cells. This appears too long and narrow for domestic use, and is very different to the tower houses or terraced insulae attested elsewhere at the site. The magnetic signal, and the association with kiln wasters and putative kilns, suggests the structures might have served as storerooms for workshops in the area. It should also be noted that kiln wasters were found amongst high-energy river shore deposits discovered in auger cores from the southwest of Naukratis. It has not been possible to determine the precise location of the origin of this industrial activity, although Petrie's western 'slag heap'[103] under the modern cemetery is a possible source. Certainly any industrial activity directly to the west of the Great Temenos seems unlikely to have occurred during the use of the pylon, as it would have obscured the processional way to the Temple of Amun-Re. The wasters were found in association with small generic Nile silt body sherds, at a depth consistent with Late Period and Ptolemaic river shore and bank deposits found in the west.

Demography

Trade and industry attracted a significant population and varied demographic to Naukratis. The population of Naukratis at any given time is difficult to calculate, not least because of our poor understanding of the limits of the site during different periods. Judging by our current state of knowledge, the full limit of the settlement at its peak was at least 52 ha, excluding cemetery and canals. The peak of the settlement appears to have been the early to mid-Ptolemaic Period, based on excavations and survey finds, though there is significant evidence also for other periods of activity. Late Period levels were reached in the northwest town, and excavated in parts of the 'South Mound'.[104] Late Period pottery was found in the east.[105] Our minimum estimate of the settlement area of 52 ha,[106] combined with conservative estimates of population density based on documentary evidence of 245 people per ha, suggest that the city centre could have accommodated a population of *c.* 12,800 people during its Ptolemaic peak (Table 13.1).[107]

Most demographic models offer only a general population density for the whole settlement area (including public space), they do not take into account the variability between settlements for the different proportions of space taken up by public buildings. Naukratis had large areas of the town occupied by temple precincts, leaving maybe only 35 ha for domestic settlement.[108] An alternative method to blanket population densities by area is to calculate population by house. The tower houses at Naukratis were large, but densely packed, at *c.* 38 per ha, in a slightly irregular fashion, as those discovered at Buto.[109] If this density of domestic construction extended over all domestic areas of Naukratis, the settlement could have accommodated 1,330 multi-story tower houses. If the previous demographic density models used are indeed correct, then each tower house would accommodate 10 people, not unrealistic, but greater than most scholars estimates for 'housefuls' of 5.66–8.04[110] for Ptolemaic and

102 Bailey 2008: 5, concerning 'site 95'; Petrie 1886: 45; Petrie Journal 1884–5: 200; Hogarth, Edgar and Gutch 1898-9: 41 site 38.

103 Petrie 1886: pl. 40. However, this is located 200 m downstream of where the auger core was drilled.

104 Spencer 2011: 39; Thomas and Villing 2013: 100.

105 Coulson 1996: 8, 131, fig. 5, field E-E2; Thomas and Villing 2013: 106, table 1.

106 Since presenting this paper, our 2014 season has revealed an extension of the settlement to the northeast in areas previously inaccessible, that means we should revise the area of the settlement to 60 ha. Also auger work in 2014 revealed archaeological remains (but not necessarily structures) at depths beyond the functional limit of magnetometry, suggesting the site may well exceed this. As this paper is based upon the results of the first two seasons and as we do not know whether the full area was simultaneously occupied throughout the settlements history the author has decided to stick with the original discussion of population with the added warning that this this likely a conservative, underestimate of the full population of Naukratis at its peak.

107 245 people per ha is a reasonable estimation for settlements of Ptolemaic to Roman Egypt, based upon documentary and archaeological evidence. Wilson 2011; Bagnall and Frier 1994; Rathbone 1990. The high density of 514 people per ha suggested by Wilson for Alexandria seems excessive when compared to eighteenth and nineteenth century AD Edinburgh and Rome: see Chandler 1987; Barioch 1988. The same density applied to Naukratis would suggest a population of 26,728, or over 20 people per house based on the house density calculated above. Note that Müller is sceptical about a similar excessively high 500 people per ha population density used by Arnold for Aswan: Arnold 2003: 17–18. Instead, Müller prefers a much smaller density, with a population of 1,000–2,000 people for the 12–13 ha site. Müller 2010a: 221–2, 243; forthcoming.

108 A conservative estimate that assumes the temenos was respected during the settlement's peak. The archaeological evidence suggests that this was certainly no longer the case at some point in the Roman Period.

109 Hartung et al. 2007: pl. 20; Marouard 2012: fig. 4.

110 Number of people per house, rather than number of people per family or household. Rathbone 1990: 120; Alston 2002: 70–5; Müller 2010: 223.

Table 13.1 Population estimates based upon different population density models.

Source	Calculation notes	People per ha	Hectares	Population
Wilson 2011		185	32[1]	5920
Population of Naukratis based on population density estimates for other Egyptian sites				
Müller forthcoming		77–167	52	4004–8684
Bagnall and Frier 1994[2]	5.3 per household	232–247	52	11,832–12,844
Rathbone 1990	6 per house	237–267	52	12,324–13,884
Arnold 2003		500	52	26,000
Wilson 2011[3]		514	52	26,728
Population of Naukratis based on 'housefuls'				
Alston 2002[4]	6 per house 38 houses per ha	228	35	7980
Alston 2002[5]	8 per house	304	35	10,640

1 Wilson 2011: 186 table 7.10. Wilson's conservative estimate for the size of Naukratis, of 32 ha, was based on the information available at the time, whilst acknowledging that the site could be as large as 55 ha.
2 Based on a multiplier of 5.3 per household—note households are distinct from housefuls; see also Alston 2002.
3 Population density of Alexandria. Wilson follows Bowman's (2011) suggestion that this high estimate is conceivable given the likelihood of multi-story apartment blocks in the capital.
4 Six per house followed by Wilson 2011 for AD 170s Thmuis. Rathbone 1990.
5 Taking into account that the 3–6 storey structures may contain more than one family or household unit.

Roman Egypt. An estimate based on such 'housefuls' suggests a more modest population of *c.* 8,000–10,600, though as Table 13.1 illustrates, the demographic models applied to various Ptolemaic and Roman settlements in Egypt vary considerably.

Sanctuaries, public buildings and the cemetery

The modern villages of Rashwan, Abu Mishfa and their fields cover the northern part of Naukratis, including the town, cemetery, administrative structures, and the sanctuaries of the Hellenion and temple of the Dioscuri. Archival research confirms that the ancient cemetery excavated by Petrie and Gardner was between modern Rashwan and Abu Mishfa,[111] which also marked the northern limit for the settlement. This area was surveyed and planned, but no plans were published or are preserved in any of the known surviving notebooks by the excavators.[112] We cannot rule out the possibility that other, as yet unidentified, cemeteries serving Naukratis may have existed near the site, as the area excavated by Gardner was both small and predominantly contained early Ptolemaic graves.

The Hellenion, identified and partially excavated by Hogarth in 1899 and 1903,[113] is located under the fields and road east of Abu Mishfa,[114] with its southern limits largely removed in the northeastern part of the lake depression by archaeological and *sebbakhin* activity. Magnetometry results from 2012 and 2013 suggest that parts of the Hellenion structure survive north of Hogarth's excavations, abutted by at least 14 'tower houses' (Figures 13.3–4). Classical Greek, Hellenistic and Ptolemaic pottery was observed on the surface of this area, reflecting the main periods of activity for the Hellenion, as observed by Hogarth during his excavations,[115] and for the adjacent domestic structures. Roman pottery is scarce in this area today, possibly suggesting a decline at this time. However, Hogarth recognised poorly preserved heavily disturbed Roman levels in this area that suggests that the Roman levels were removed by subsequent construction, possibly the building of the modern road. The ground was levelled and the lake depression bank secured by a concrete revetment when the modern tarmac road that encircles the depression was constructed. This northern area is 4 m higher than the bottom of the lake depression, which marks the bottom of the first phase of the Hellenion structure. This means that beneath the fields of Abu Mishfa 4 m of archaeological deposit must still be preserved, likely encompassing all three major phases of the Hellenion as investigated by Hogarth in 1899 (Figure 13.8). Within the drained lake depression the area was disturbed, with large spoil heaps from the excavations clear on the surface and obscuring the magnetometry. The magnetometry did reveal, however, what might be the continuation of a large mud-brick temenos wall from the earliest phase of the Hellenion, including its southwest corner, though part of this feature is obscured by the spoil heaps. No temenos wall could be made out in the southeast corner, but instead a number of irregular structures at a different alignment, perhaps representing phases of overbuilding. The earliest phase of the 'Hellenion', with its huge

111 Gardner 1888: 11, 21–30; Thomas and Villing 2013: 91.
112 Gardner decided not to publish the plan as he did not believe it important (Gardner 1888: 26). Petrie stated 'I have made the survey of the cemetery' while Griffith was excavating the Aphrodite temple (Petrie Journal 1885–6: 98; see also Petrie Notebook 74).
113 Hogarth, Edgar and Gutch 1898–9; Hogarth, Lorimer and Edgar 1905.
114 Thomas and Villing 2013: 90–1.
115 Hogarth et al. 1898–9: 38.

mud brick temenos wall, appears to have been built at a slightly different alignment to the subsequent two phases. We should perhaps be cautious before assuming that this poorly understood phase, with only shallow and potentially disturbed deposits,[116] held the same function as the subsequent two phases. All in all, the area of Naukratis covered by known Greek sanctuaries is a significant 3 ha. This is probably an underrepresentation. However, even if there are new discoveries, the area of Greek sanctuaries are never likely to match the huge 8 ha area covered by Egyptian religious space, which occupied the aptly named Great Temenos to the south.

Magnetometry in the southern lake depression revealed irregular structures and spoil heaps left by the excavators within the heavily disturbed town (described above). A significant magnetic feature could be observed here, 150 m long, aligned northeast to southwest, with a semi-circular southern end and what appears to be a parallel return, obscured by the banks of the lake depression, which would make this large feature *c.* 59 m wide. This feature appears to be an earthwork, but whether it is recent (spoil heap?) or ancient is unclear. The northern section was once covered by what appear to be domestic structures mapped by Petrie,[117] now lost or concealed, and part of the middle section is obscured by structures. It is tempting to interpret this as a long earthwork, judging from its scale and form, built against a hill or tell to the northeast, perhaps a stadium or hippodrome. Such structures are known from Memphis and Alexandria.[118] Any such interpretation has to be very tentative, as this could equally be an exceptionally well-organised 150 m long spoil heap left by the *sebbakhin* and excavators, with a semi-circular end. Only archaeological investigation could resolve the question of identification, and also explain the stratigraphic relationship between this feature and the mud-brick houses in this area. The question remains, where in the settlement were the games held that are attested at Naukratis in the third century AD?[119]

The Great Temenos

The south of Naukratis, under the town and fields of El Baradany, was dominated by the massive 298 m × 259 m 'Great Temenos,'[120] an Egyptian temple precinct dedicated to Amun-Re and associated deities.[121] This was enclosed within a massive mud-brick walled temenos and accessed through a monumental 107 m × 24 m pylon built during the reign of Ptolemy II.[122] Houses built over and/or against the Great Temenos wall are clearly represented in the magnetometry and archaeological investigations in the north, west, and south, as set out above. The precise location of the temenos has been the subject of debate, due to the obfuscation caused by subsequent construction.[123] It is often assumed that the survey methods of Petrie, the son of a surveyor, were sound, not least given his highly respected survey of the pyramids at Gizeh.[124] A closer look at his work at Naukratis, recorded in substantial detail in his notebooks, however,[125] suggest his plan may require some revision, as certain inconsistencies and errors can be recognised in his use of levelling,[126] triangulation, tacheometry and offsets.[127] Indeed, Petrie seems to have regularly corrected triangulation measurements of features when he found his own methods unsatisfactory.[128]

The date and layout of the temple precinct of Amun-Re has been the subject of much debate, though Egyptian epigraphic and archaeological evidence, supported by our own results, confirm that a sanctuary must have existed here from at least the sixth century BC.[129] Its precise form and phasing remains elusive, though recent magnetometry and excavation results have greatly improved the information available to us. The picture we now have is of a complicated plan that represents a sequence of phases and a variety of functions. Some suggestions can be made at this stage.

The Ptolemaic temenos can be best described as a rectangular area encircled by a mud-brick wall with a monumental gateway pylon. The area today is represented by a rectangle of fields flanked on all sides by paths, roads and buildings, with most traces of the walls levelled already over 130 years ago. The area covers nearly 8 ha of the site, a significant portion of the settlement. Though no longer immediately visible above ground, archival work on Petrie's excavations and our own auger cores suggest that 4–5 m of archaeological deposits must be preserved below the fields (Figure 13.9). Ancient structures within the Great Temenos are today partly obscured by a row of ancient or modern (archaeological?) pits, electricity pylons, paths, and irrigation ditches and in some places ancient or at least earlier (Ottoman?) field systems visible in the magnetometry results. However, different phases of temene walls can perhaps be seen

116 Ibid.: 31.
117 Petrie 1886: pl. 41.
118 Humphreys 1986: 2, 442.
119 Lobel and Roberts 1954: *P.Oxyrhynchus* 2338.
120 Petrie 1886: 23–34; Hogarth et al. 1905: 110–12.
121 Muhs 1994; Leclère 2008: 118, 120, 128–38; Spencer 2011: 40.
122 Petrie 1886: 23–34.
123 Spencer 2011; Thomas and Villing 2013.
124 Petrie 1883.
125 Thomas and Villing 2013: 97.
126 Petrie 1884–5 Notebooks 6: 73–4.
127 Ibid. Petrie's survey methods at Naukratis, including levelling, tacheometry, and triangulation will be the subject of future studies. Preliminary observations have highlighted inconsistences and unexplained errors in both triangulation and tacheometry calculations that may have influenced the accuracy of his survey. It seems Petrie was not quite as thorough in his survey methods at Naukratis as he was with his previous, much acclaimed survey at Giza.
128 Ibid.
129 Yoyotte 1983: 129–36; Leclère 2008: 117; Thomas and Villing 2013: 97.

in the magnetometry. Of the large rectangular temenos planned by Petrie, there is a small section of the east wall that seems to be revealed by the magnetometry, with an unclear relationship to a canal feature that crosses it at right angles (see above). A long east-west section of the north wall appears to have been overbuilt and/or abutted by tower houses. The results appear slightly misaligned with that of Petrie's survey (as explained above), though the complicated phases of reconstruction, modification, reuse, overbuilding and destruction are likely to have confused the picture somewhat. Magnetometry moreover appears to detect walls from a smaller (*c.* 4 ha) and potentially irregular shaped temenos within the larger temenos, which presumably precedes it.

Within the temenos area, magnetometry revealed three new structures that were likely a part of the ritual landscape. They include at least two phases of a mud-brick and limestone 'temple'[130] approximately in the area where we would expected to find the temple of Amun-Re: a rectangular feature measuring 47 m × 35 m within a 'T'-shaped structure 51 m × 64 m in size. Though the magnetometry suggests significant modifications of the layout of the sacred space, it is not possible at present to speculate in what order these occurred. This structure appears misaligned with the Ptolemy II pylon,[131] which may be an argument for it being earlier than the pylon (or it would have been aligned with the pylon). Late Period pottery was found in this area.

A smaller 21 m square casemate structure was identified just south of the 'temple'. Such structures were used during the Late Period as chapels or barque-station,[132] though its phasing and precise architectural relationship with the other structures of the Great Temenos remains unclear, so interpretations of its role remain tentative, as other functions have also been suggested for such structures.[133] South of this is a 46 m long wall section of a third mud-brick structure, largely obscured by recent building activity undertaken since Leonard and Coulson's work in the 1980s. Immediately to the south and east of these three structures was the large 59 m × 64 m casemate building excavated and planned in detail by Petrie, which has good Saïte parallels from Egyptian temple precincts at Tell Dafana and Tell el-Balamun.[134] Within the Great Temenos area, pottery was rarely observed on the surface, as it had been displaced.[135] Material originating from the Temenos area largely dated from the sixth century BC to the Ptolemaic Period, with only a few Roman pieces. More Roman material is preserved within the 3 m tall 'South Mound' excavated by Penny Wilson and previously by Leonard.

Finally, it must be noted that an important discovery was made by SCA inspector Sabri Choucri during the recent construction of a new school building in El Baradany, a large north-south running stone wall.[136] Sabri Choucri exposed a 13 m long, 4 m deep and over 1 m high section of quay, probably part of the monumental quay that functioned as the Nile access to the processional way to the temple of Amun-Re.[137] It was found to the west, and in alignment with, the pylon and traces of a processional way flanked by rams and sphinxes.[138]

Conclusions

Two field seasons at Naukratis, comprising survey, archaeological, geophysical and geological investigations, have shed new light on this important ancient site, its development, and its role in the interconnected landscape of the Egyptian Nile Delta. Their outcome is twofold: we have been able to reassess old fieldwork and provide new data. On the one hand, they have allowed us to revisit and reassess earlier work on the site over the past 130 years in ways previously impossible. A topographical map was created, incorporating all visible archaeological features of the site and integrating in real-world co-ordinates all previous fieldwork by Petrie, Gardner, Hogarth, Coulson, Leonard and Hakim as well as new discoveries. This has made it possible to reassess central aspects of the work of Petrie and Hogarth at Naukratis. Particularly significant are the implications this has for our understanding of the existence, placement and dating of Petrie's 'Great Temenos', long debated in scholarship. It is now beginning to take shape as a busy, complex and multi-period structure that underwent some considerable change in its long history from the Late Period onwards.[139]

On the other hand, a significant amount of new data on the site is emerging. This includes a number of new archaeological features identified through magnetometry in all areas of the site, including densely packed houses, industrial, public and religious architecture, old field systems, canals, and the river bank with its harbour facilities and magazines. It was also possible to assess

130 The identification of the magnetometry signature as likely mud-brick and limestone walls is supported by a disturbed limestone block found in the immediate vicinity (Thomas and Villing 2013: 85, 99, 103).

131 Even if the location of Petrie's plan is incorrect, it is impossible to see, without significant survey errors in Petrie's plan, how this pylon could have ever been aligned with the temple.

132 Spencer 1979.

133 For parallels from Dafana and Karnak, see Leclère 2008: 512–5; Masson forthcoming.

134 Petrie 1886: 24, pl. 42; Spencer 1996: 55; Spencer 2011: 36; Petrie 1888: 52; Leclère 2008: 134–7.

135 Much had been cleared from the fields and redeposited to the north by a well pump. Thomas and Villing 2013: 99 table 1; see also Coulson 1996: fields G-S1 and G-S2.

136 As reported to us by the local SCA site guard and archaeologists from the SCA office in Damanhour.

137 Thomas and Villing 2013: 93; see parallel in Boraik 2010. The presence of a grand quay was predicted by Yoyotte 1983: 129–36; Leclère 2008: 117.

138 Excavated in December 1885. Petrie 1886: vii; Gardner 1888: 13–14; Spencer 2011: 35–8, Fig. 11; Thomas and Villing 2013: 92; Petrie Journal 1885–86, Griffith Institute: 18–19.

139 Thomas and Villing 2013: 86, 102–3.

the minimum extent of the site at its peak and its relation to the river. As is now clear, the settlement extended well beyond the areas excavated 130 years ago, and was skirted on its western flank by the Canopic branch of the Nile, the location of which is now securely identified through magnetometry and geological core drillings. The latter also suggest that the river was navigable for sea-going ships. We can also now propose a likely location for of the river harbour area and the magazines that enabled Naukratis to operate as a major international port. The ritual Nile harbour that was linked via the processional way with the sanctuary of Amun-Re (the 'Great Temenos') is likely to have been located in the area of recently-built school in the village of El Baradany.

The improved understanding of the site's topography, archaeology, extent, geomorphology and architecture finally allows us to begin to consider the settlement's urban layout and development over time. It appears that the site was densely occupied with traditional Egyptian architecture, tall tower houses and irregular terraced building. Naukratis clearly housed a significant population in the Ptolemaic Period. We cannot exclude the possibility that the site was already densely populated in the Late Period, as excavations and surface survey have revealed late seventh to fifth century BC material in many areas. By the Roman Period, the densely packed domestic housing had crept into the Great Temenos area. Here our magnetometry survey revealed substantial structures from different phases, presenting a complicated and changing layout. Further archaeological work may help clarify the relationship between these structures, their date and function. Similarly in and around the area of the Hellenion, only partially excavated by Hogarth, new features were revealed. Here as elsewhere, the existence of rich, untouched archaeological remains below the fields of Naukratis could be confirmed. It is now clear that previous assumptions that Naukratis was archaeologically 'exhausted' were wrong. A significant depth of archaeology is preserved and future fieldwork is likely to make significant new discoveries at this important ancient site.

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