EARLY CHANNELS AND LANDSCAPE DEVELOPMENT AROUND ABU SALABIKH, A PRELIMINARY REPORT

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Introduction

Although topographically simple, the landscape of the lower Mesopotamian plain masks a complex of sedimentary environments: old river channels, levees, flood basins, artificial channels, aeolian dunes, ancient irrigated soils and archaeological sites (both buried and at ground level). Many of these features owe their origin, either directly or indirectly, to the hand of man. In order to study early channel systems, the prime objective of the fieldwork, it was necessary to examine both the landscape and the sub-surface features beneath in order to produce a three-dimensional view of the area.

Fieldwork was conducted over some ten weeks in the springs of 1988 and 1989 as part of the Abu Salkabikh project, directed by J. N. Postgate. The immediate objective was to determine if an early branch of the Euphrates ran through the site, and if so, to attempt to trace its course. The presence of such an early course is implied in the name Buranuna (Akkadian Purattu from which the word for Euphrates is derived) and which is thought to have flowed through Sippar, Kish, Abu Salabikh, Nippur, Shuruppak, Uruk and Ur (Adams 1981, 159 and fig. 27; also Gibson 1972, fig. 69). It has been assumed that such a channel probably ran north-south between the Main and West Mounds of Abu Salabikh, and its presence must have determined or limited the growth and shape of the Uruk and Early Dynastic towns. A more general aim of the fieldwork was to determine how the settlement pattern may have evolved as a result of changes in the systems of channels or canals.

Fieldwork

Although the main objective of the project was to determine what lay beneath the ground surface, it was felt that the study would be more beneficial archaeologically, if a programme of augering was placed within a more general landscape context. Consequently, field work was divided into:

(*a*) A general programme which entailed the compilation of maps of sedimentary deposits, archaeological sites, visible water courses (both ancient and recent) as well as more general artifact scatters. This was aided by the presence of a network of modern drains 4–5 m deep, the upcast from which hinted at the nature of underlying deposits or buried archaeological sites. Data was plotted on 1:20,000 planimetric maps showing the modern drains and, in 1989, on SPOT satellite images.

(*b*) Augering, usually at set intervals along transects, to a maximum depth of 5·4 m. This produced sections through successive stages of floodplain accumulation, and also indicated the presence of ancient canals.

(*c*) The collection of pottery from sites within the immediate catchment of Abu Salabikh (within *c.* 3 km radius) in order to determine their main phases of occupation. In turn, alignments of dated sites could be used to suggest the routes of early water systems (cf. Adams 1981, 27–8).

Sedimentary stratigraphy and ancient channel systems

Abu Salabikh lies within the upper part of the Euphrates delta plain (Buringh 1960, fig. 47) where the main Euphrates channel has, in the past, split into a number of distributary branches.

In general, floodplain sediments can be classified according to grain size and in turn by the energy of the current flow that transported them. Characteristic suites of sediment accumulate within specific positions within the floodplain. Thus river channels, levees, and

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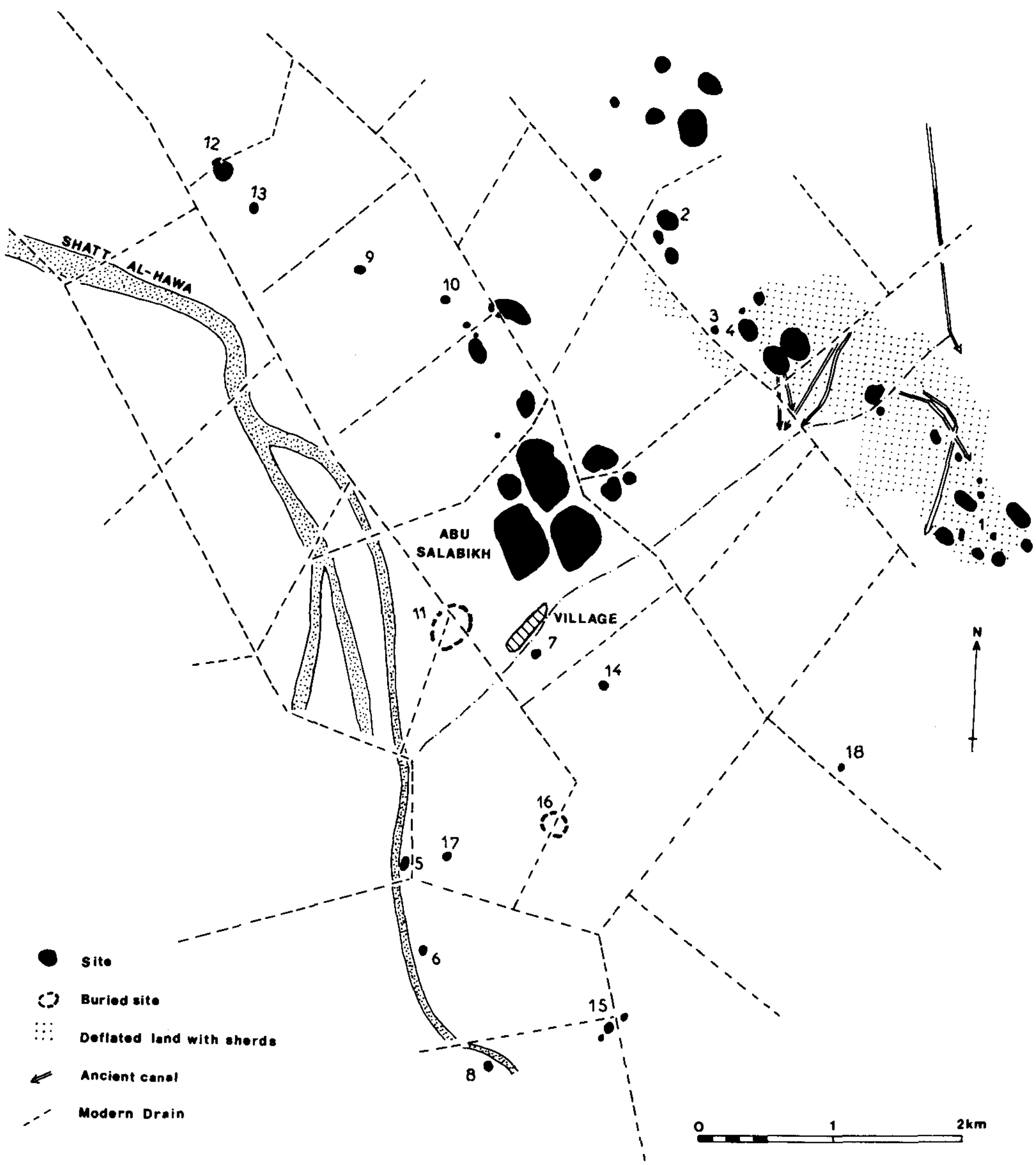

Fig. 1. The area of Abu Salabikh showing archaeological sites, relict canals, sherd scatters, and modern drains.

flood basins each have their own distinctive suite of sediments, respectively: sand/fine sand; fine sand/silt, and silty clay or clay. Artificial channels can result in the deposition of similar ranges of sediment: main canals with deposits of fine-medium sand; sandy silt and silt accumulate in moderate energy flows in smaller channels as well as on irrigation levees nearby; finally, silt and clay will accumulate towards the sluggish end of canals and within fields.

Expressed on the basis of field textures alone, the field results would be uninformative or misleading. It was therefore necessary to add supplementary diagnostic criteria in order to express more subtle variations in the sedimentary enviroment. At Abu Salabikh the following supplementary features were noted: presence/absence and species of molluscs, pottery and archaeological materials, mottles resulting from oxidation/reduction of the deposits, the presence of gypsum concentrations and the nature of sedimentary boundaries. In addition, a number of thin sections were made by Wendy Matthews to see if sediment

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Table 1. Periods of occupation of outlying sites shown on Fig. 1.

Site 1	Sasanian.
Site 2	Probably 1st millennium BC.
Site 3	Early 1st millennium BC—Seleucid.
Site 4	Parthian.
Site 5	Cassite.
Site 6	Islamic.
Site 7	Later 3rd/early 2nd millennium BC.
Site 8	Seleucid/Parthian.
Site 9	Mid-late 2nd millennium BC.
Site 10	Mid-late 2nd millennium BC.
Site 11	Early Dynastic—Ur III.
Site 12	2nd millennium.
Site 13	Parthian and Islamic.
Site 14	Mid 2nd to early 1st millennium BC.
Site 15	Uruk and Seleucid/Parthian + other undated occupation.
Site 16	Uruk and Cassite.
Site 17	Islamic.
Site 18	?Islamic.

micro-fabric studies could be used to interpret sediments that had their fabric disrupted by augering.

Augering, using a simple screw-type auger, enabled sub-surface layers, channel deposits and the pre-occupation floodplain surface to be traced to a depth of 5·4 m. Although more sophisticated augers are available, the advantage of the screw auger lay in its lack of moving parts and its robustness that enabled it to crunch and break through potsherds and other archaeological impediments that would have deterred more sophisticated sampling augers.

Auger holes were mainly placed along transects laid out at right angles to the supposed courses of ancient canals. All elevations are expressed with respect to the Abu Salabikh arbitrary site datum in metres above sea level. Outlying holes were positioned in order to solve specific problems, such as to determine the presence of buried sites. Such holes, because of their distance from bench marks, were not levelled.

Figures 3–5 show the sub-surface sediments as determined by augering; Figs 3 and 4 give a detailed and objective record of sediment types present, whereas Fig. 5 presents a more subjective interpretation of the general sedimentary environments present. Here, only those results directly relevant to the text are illustrated; these are from transects D and J. Results from transects A, B, C, E, F, G, H, and I (indicated in plan on Fig. 2) are either summarised on Fig. 5 (B, D, and I) or are given in the 1988 preliminary report (A, B, C, E, F and G).

The sediments can be classified as follows, (Figs 3 to 5):

1. Sediments of the original Euphrates floodplain. A firm yellowish-brown (10YR 5/6) clay or silty clay containing secondary gypsum crystals over olive or olive brown (2·5Y 4/4) silty fine sand. The upper levels of the original floodplain (indicated as buried soil on Fig. 3) were exposed by excavation in area E (Postgate and Moorey 1975, fig. 5) some 6 m below the summit of the main mound and 3 m below the adjacent plain level.

2. Occupation deposits exposed in holes D80 and D100 (Fig. 3). In both holes, brown to yellowish brown silts including common potsherds occurred down to 5·4 m below plain level, that is to more than 2 m below the original plain level. Other occupation debris present included fired clay, bone and charcoal. Holes augered to 5·4 m depth to north and south of D100 (i.e. transect J, Fig. 4) intercepted the original Euphrates flood plain at depths of 3·80 and 3·20 m below plain level, and it seems that the occupation deposits (2) are infilling a large depression 2 m or more in depth. Freshwater molluscs are entirely absent from this deposit.

3. Firm, mainly greyish brown clay or clay loam with occasional shells of *Bulinus, Planorbis* and *Melanopsis* (preliminary identifications by the author) freshwater molluscs, common fragments thereof and rather less common fragments of freshwater mussel (*Unio*). Olive mottles occur as a result of waterlogging. Gypsum concentrations are present and pottery occurs as either sherds or small flecks of red disintegrated pottery. The predominant mollusc species together with the fine grain size of the sediment suggests a low-energy environment of deposition, perhaps either a sluggish canal or even within fields irrigated by mud-lined canals. The top of this stratum is approximately horizontal at elevations of 2·75–3·25 m, Abu Salabikh datum, that is 1–2 m below present plain level. Close to the west edge of the Main Mound, pottery became very common at depth within unit 3 and continued down to *c.* 5 m depth.

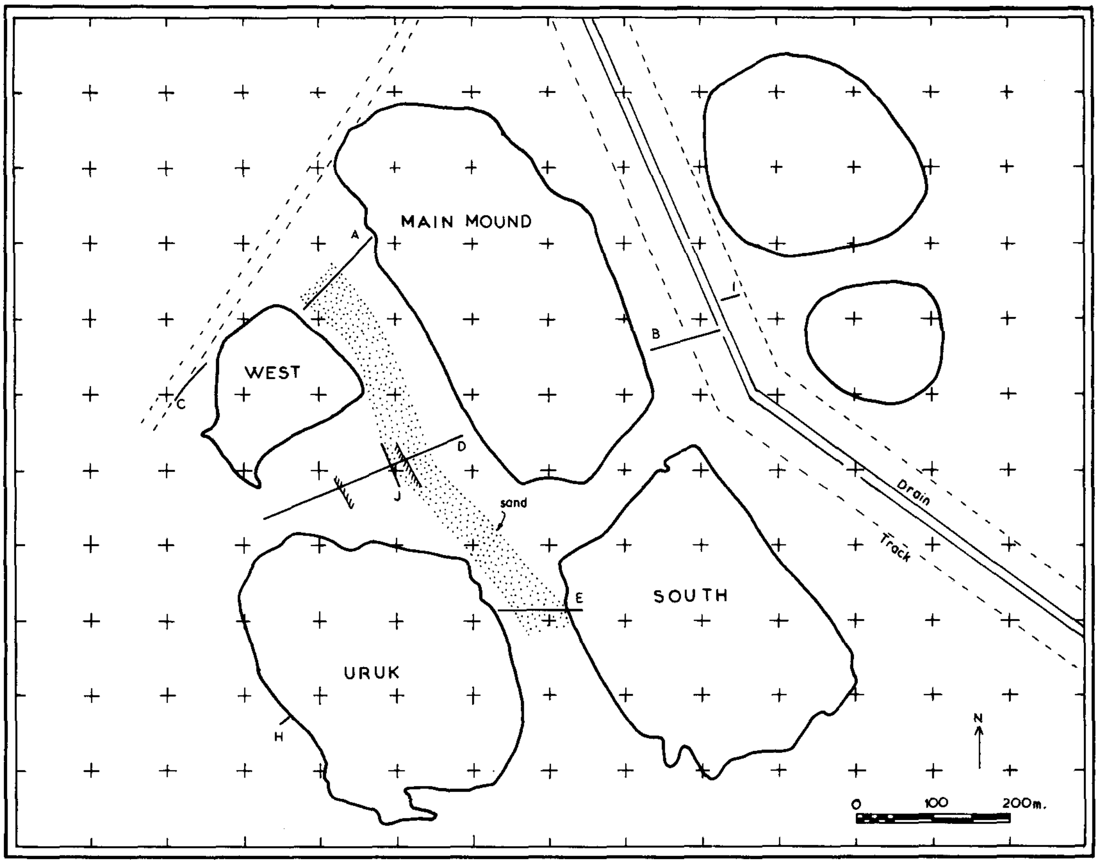

Fig. 2. The Abu Salabikh mounds showing locations of the augered transects.

4. Mainly yellowish-brown silty clay loam which forms a large body of sediment between the Uruk and West Mounds. Shells of freshwater molluscs are absent. The presence of occasional sherds, other artifacts and one or two cultural horizons, suggests that this is either an *in situ* archaeological deposit or has been washed from the adjacent Uruk and West Mounds.

5. Silts and clays of indeterminate origin.

6. Olive brown sands, sometimes silty, of Euphrates/Tigris type, and containing common shells or fragments of *Bulinus, Planorbis* and *Melanopsis*. Deposition occurred in a current of moderate flow energy, probably within small–medium size canals. Unit 6 sediments are within the upper part of unit 3, or are stratigraphically above it.

7. Colluvial deposits flanking the mounds and filling the low areas between them. These comprise two related sediment types: brown sandy deposits containing common flecks of red, disintegrated pottery and silty clays which include occasional aggregates of silt/clay (*'parna'*). The pottery flecks, which occur in both sediment sub-types, appear to result from the disintegration of non-vitrified pottery by salt-weathering. Weathering takes place on the mound surface and the resultant by-products are swept along gullies to be eventually deposited as alluvial fans on the surrounding plain. Finer sediments, silt, clay and silt/clay aggregates, with fewer sherd flecks, accumulate in the depressions between the alluvial fans and form the bulk of sedimentary unit 7.

8. Archaeological deposits immediately adjacent to the mounds. These are most obvious in D 15E (Fig. 3), where the deposits comprise dark greyish brown silty clays with common sherds and charcoal flecks, as well as rare-occasional shell fragments. These are related to unit 3, but because of their proximity to the mound, they contain abundant artifacts.

9. Olive or olive brown sands and loamy sands present in the upper layers of transects A, D and E within the north-south central depression (Fig. 2). Although originally of Euphrates/Tigris provenance, these sands lack molluscs and show no signs of having accumulated in water. They form a sinuous, elongate feature that *rises* slightly to the south. Apart from their sandy texture, there is nothing to indicate that these deposits are waterlaid.

10. Olive green silts or silty clays occurring to the east of the main mound (saline/?marsh silt on Fig. 5). and also reached within the auger holes made on sites 11 and 16 to the SW of Abu Salabikh. This deposit is devoid of molluscs, but the distinctive colour suggests prolonged waterlogging. Buringh has noted that mottles of a similar hue are characterstic of the deeper layers of saline soils, both in the Mesopotamian lowlands and in the coastal Netherlands (Buringh 1960, 98). Similar soil horizons occurring within the marsh areas of southern Iraq are

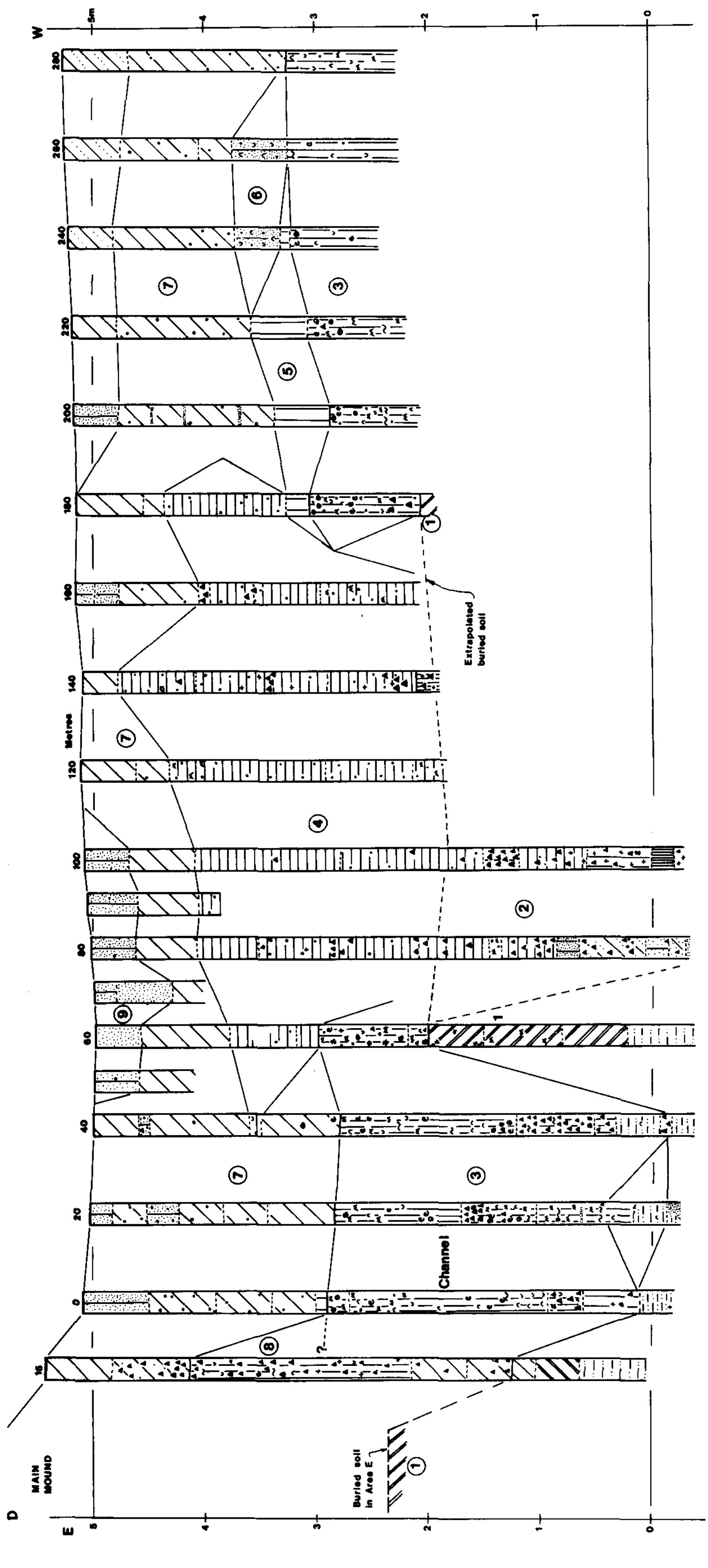

Fig. 3. Transect D: details of auger holes. Note that the buried soil in Area E is extrapolated.

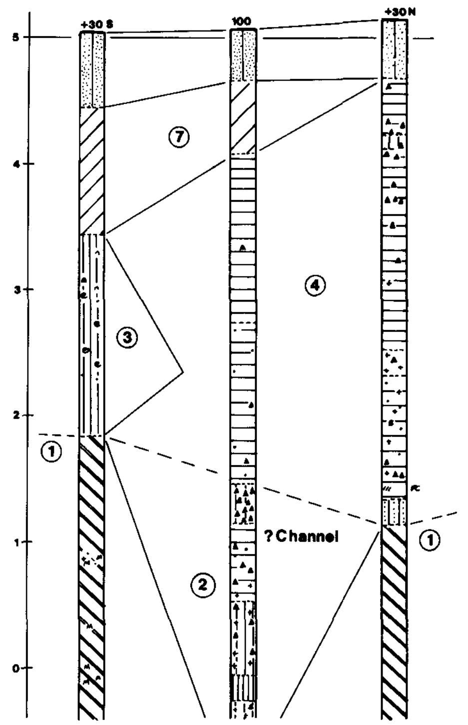

Fig. 4. Transect J at right angles to D at D100 m.

considered to result from prolonged saline and anaerobic conditions (Buringh 1960, 186). If the deposits at Abu Salabikh represent marsh conditions, the absence of freshwater molluscs might suggest that they were too saline for such molluscs to survive. However, until more evidence is available, the depositional environment of these silts must remain open to question.

11. Topsoils: Mainly clays deposited in virtually enclosed basins or sandy clays which include some aeolian sand.

Figure 5 shows the main features recorded by augering along a composite east-west transect approximately 800 m long. The original ground surface is interpreted from the 1975 excavations in Area E (Main Mound; Postgate and Moorey 1976, Fig. 5) and four auger holes. Deposits of moderate energy flow, (shelly sands of unit 6), indicate the presence of two small, late channels, one to the east of the main mound and the second near the Uruk mound. The main channel detected, however, that positioned against the western edge of the main mound, could not be distinguished by deposits alone. Its fill (unit 3) was deposited in a tranquil flow regime, and the channel was only recognizable by the form of the boundary between units 3 and 1.

The base of the inferred channel was at least 3 m below the original ground surface and the channel width of 50–70 m could be deduced from the geometry of the unit 3/1 boundary. The sluggish flow regime suggests perhaps the downstream end of a canal system or one that had ceased to flow altogether. Although fine sands, indicating moderate flow energy, were present in the channel base, during most of the recorded history the channel aggraded with silt and clay. The anomalously high deposit with shells (U on Fig. 5) to the east and west of this channel may be the remains of silts cleaned out of the channel, but the evidence on this point is meagre.

The existence of a second canal is suggested by transect J and the associate fill: unit 2). Auger holes D80 and D100 (Fig. 3) penetrated occupation deposits to depths of 5·4 m, whereas auger holes 30 m to the north and south, intercepted the original floodplain at significantly higher levels (3·8 m and 3·2 m below plain level). Sherds retrieved from

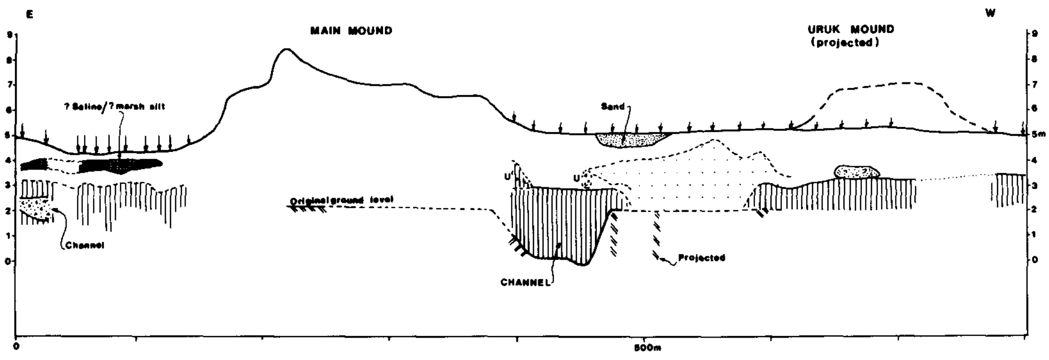

Fig. 5. Composite E–W transect through the Abu Salabikh mounds. For location of transects see Fig. 2.

3·6–4·0 m below plain level (total: 15) and 4·5–5·0 m (total: 5), were diagnosed to be of predominantly Uruk fabric (Sarah Collins pers. comm). Again a canal can only be inferred by the form of the sedimentary boundaries. The depression, whatever its interpretation, was at least 2 m deep and eventually became filled with Uruk occupation deposits that were either dumped into it directly, or were washed in over a long period.

Of the later deposits, the olive green silts may have been deposited within a (?saline) marsh (see 10, above). This deposit may have accumulated within the feature indicated on the map of Collingwood (1861) which roughly corresponds in position to an enclosed depression at 19·5 m above sea level shown on map 1F of Gibson (1972).

The upper olive sands (unit 9) are interpreted as being the remains of a system of linear dunes that formed when the area was uncultivated and was presumably desert. Dunes in this region can draw their supplies of sand from either the Euphrates or its branches or as silt/clay aggregates ('*parna*') blown from desiccated canal levees and abandoned cultivated areas. Although no individual *parna* dunes were recognised, some basin colluvium samples (unit 7) were shown by soil micromorphology to include clay aggregates of possibly wind-blown origin (soil micrographs made by Wendy Matthews). In general, the 1–2 m depth of colluvial deposits adjacent to the mounds confirms that large quantities of archaeological deposits have been removed by erosion from the Abu Salabikh mounds and deposited in the adjacent basins.

The landscape

During fieldwork it became clear that the sedimentary overburden covering the canal systems within the site area might also have obscured canals in the areas beyond. To complement the time-consuming augering programme, archaeological sites were mapped and the resultant alignments were used to suggest possible early canal systems. Diagnostic sherds were collected, then sketched, and the appropriate periods of occupation are given on Table 1. Two main site alignments are evident on Fig. 1:

(*a*) An arc-shaped group of sites, mainly of the 4th–2nd millennium BC, centred on Abu Salabikh. Upcast thrown up from recently dug drains as well as selective augering suggests that parts of the Abu Salabikh mounds are buried, therefore the sub-surface archaeology may be considerably more complex than the surface patterning suggests. The unreliability of the surface record is further supported by the lack of any surface expression for Sites 11 and 16. The depth of burial of these sites was confirmed by augering, Site 11 being buried by a mere 40–70 cm of overburden, whereas Site 16 was overlaid by *c*. 1·7 m of later deposits. In both cases, these deposits included the olive green type 10 silts. A third possible buried site is Site 15 where both Uruk and Parthian sherds were common within the drain upcast, but the height of the mound was so slight as to suggest that the occupation extended some distance below ground.

No single ancient canal could have linked all sites in zone (*a*), but it seems likely that all could have drawn their water from a single canal system (that is including the branches) that developed and moved laterally through time. Any details of such a shift are beyond the currently available data.

(*b*) A straggling alignment of sites of significantly later date (post early 1st millennium BC) can be seen along the eastern boundary of Fig. 1. These sites are close to the desert margin and parts of the surrounding plain are still uncultivated today. As a result, archaeological features between sites are more visible. The most striking features are moisture marks or alignments of saline soil that cross the landscape from north to south or from north-west to south-east. In most cases, the fills of these canals or drains are moisture-retentive silts and clays, whereas the channels are cut into loamy field soils that dry out more readily. These canals, which together with their fringing spoil banks, have been planed off by deflation to the present level, appear to represent many, but undated, phases of activity.

Littering the surface over many hectares are scatters of pottery and baked brick fragments. Although some may remain from wind-eroded outlying buildings, the bulk of these scatters seems to form a veneer across the level surfaces that stretch between the sites. Indeed, they can be followed almost continuously to the major Sasanian and early Islamic site of Zibliyat, some 3 km to the east of zone (*b*). These scatters closely resemble 'field scatters' that littered many sq km of former cultivated land around the Abbasid city of Sohar in Oman. At that site the scatters have been interpreted as being the remains of intensively cultivated land that was manured with the settlement-derived refuse when the site was in its hey-day (Costa and Wilkinson 1987, 79–92).

Discussion

The two archaeological zones (*a*) and (*b*) provide a marked contrast. Although zone (*a*) includes a sprinkling of later sites, most were pre-early 1st millennium BC in date. In other words, as is evident on Table 1, they were occupied just until the time of occupation of the zone (*b*) sites. Those sites in zone (*a*) that were later (Sites 13 and 17), lay close to the Shatt al-Hawa, an undated, but apparently quite recent relict water course, still mentioned by name by many of the local inhabitants (Fig. 1). The land surface within zone (*a*) appears to mask a complex buried topography in what appears to be an area of long-continued sedimentation. This process ultimately led to the burial of a number of archaeological sites. Zone (*b*), in contrast, comprises later sites, and the original ground surface shows signs of having been lowered by deflation to expose the skeletal veneer of potsherds and planed off canals. It is not known whether any early sites remain buried within zone (*b*), but if they are, they have left no visible trace, either on the surface or within the upcast of the modern drains.

The results of the landscape survey would seem to support the work of Adams (1981) that shows Abu Salabikh to be situated on a 3rd millennium BC channel oriented NW–SE (zone *a*), that was, by the Sasanian period replaced by a more N–S system which included numerous distributaries (zone b; Adams 1981, figs 27, 30 and 45). The field evidence gathered in 1988 and 1989 does however, suggest a number of refinements to that outlined by Adams. The earlier system (*a*) may have been in operation as early as Uruk times (no Ubaid sites are known from the area), and continued probably until Cassite times. There was then a change in the channel system with new canals being developed from the north that nurtured the development of the eastern group of settlements (*b*).

As a final word of caution, it should be emphasised that there is no evidence to show that the large channel immediately west of the Main Mound carried a vigorously-flowing channel. The evidence of the sluggish fill would suggest that the most active channel for at least part of the 3rd millennium may have been somewhere else, perhaps to the east of the Main Mound, where augering only penetrated to some 3 m depth.

Acknowledgements

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