PRELIMINARY REPORT ON THE UNIVERSITY OF SYDNEY'S EIGHTEENTH AND NINETEENTH SEASONS OF EXCAVATIONS AT PELLA (ṬABAQAT FAḤL) IN 1996/97[1]

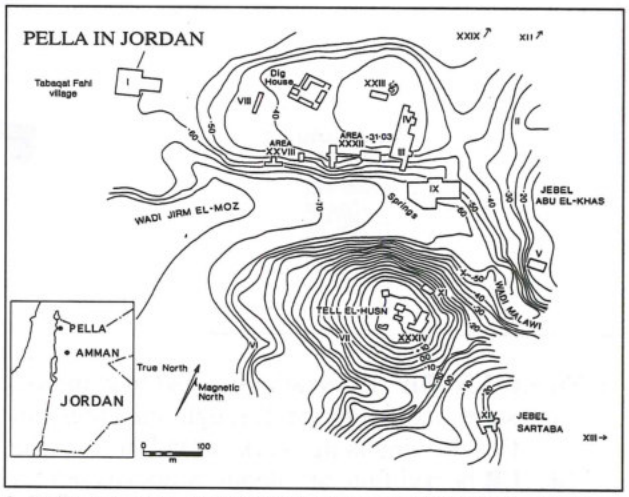
Stephen Bourke, Rachael Sparks, Bruce McLaren, Karin Sowada, Lachlan Mairs, John Meadows, Thomas Hikade and Wendy Reade

Introduction (Figs. 1-2)

The eighteenth season of excavations at Pella in Jordan took place between 8 November and 18 December 1996. The team numbered between 34 and 39, with a workforce of 50 local labourers. The nineteenth season took place between 17 February and 27 March 1997. The team numbered between 34 and 36, with a workforce of 55 local labourers.[2]

Over the course of the two field seasons, there were seven main areas of excavation:

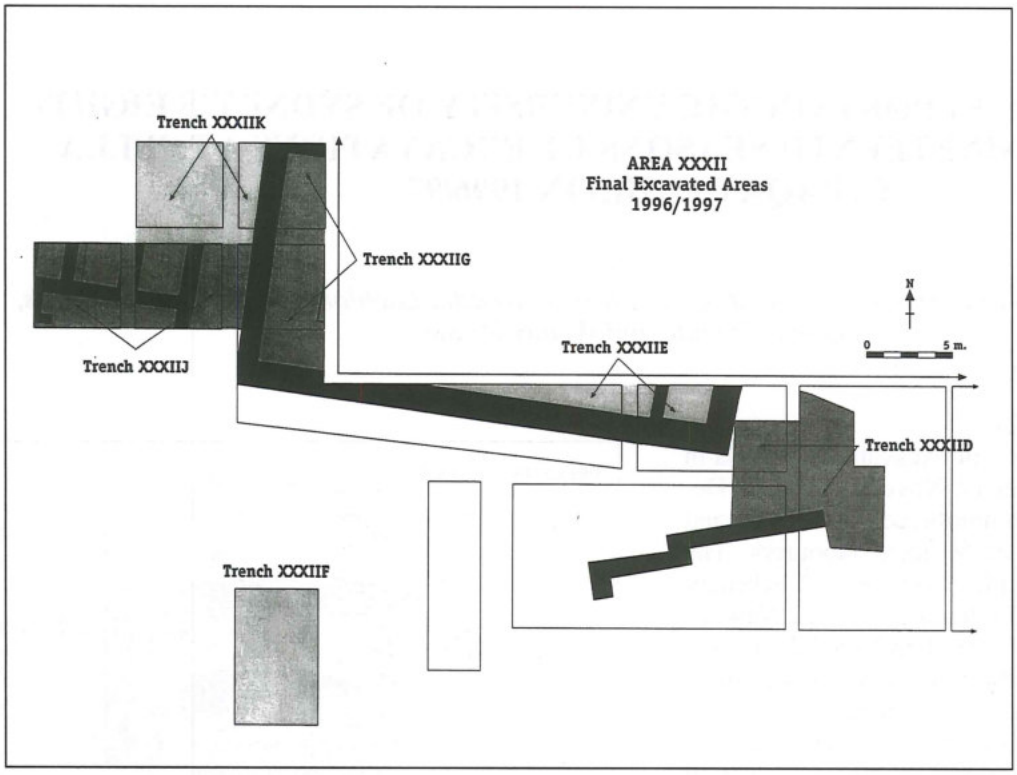
1. Trench XXXIID. Excavations concentrated in and around the enigmatic Chalcolithic period platform structure discovered in 1995 (Bourke *et al.* 1998: 180-183).
2. Trench XXVIIIC. Work here expanded excavations in the area of the western complex of Middle Bronze Age fortifications first detected in 1995 (Bourke *et al.* 1998: 189-194).



1. Pella site plan. Area XXVIII (West fortifications) and Area XXXII (Temple precinct) featured in 1996/97.

1. The 1996/7 field seasons were directed by Dr. Stephen Bourke (ARC Australian Research Fellow in Archaeology, University of Sydney). Major funding bodies were the Pella Volunteer Scheme, in association with the Near Eastern Archaeology Foundation (University of Sydney), the Australian Department of Foreign Affairs and Trade (Cultural Resources Section), the Australian Research Council, the Australian Institute of Archaeology (Melbourne), and the University of Sydney. We would like to thank H.E. Mr. Mohammed Adwan, then Minister for Tourism and Antiquities; Dr. Ghazi Bisheh, then Director of the Department of Antiquities; Mr Wajeeh Karasneh, then Inspector of the Umm Qays Office, Dept. of Antiquities Representative in 1996/97; for their considerable interest and support. Equally appreciated were the enthusiasm, interest and assistance provided by H. E. Ms Merry Wickes, then Australia's Ambassador to Jordan, and her staff. We also thank Ms. Alison McQuitty, then Director of the British Institute at 'Ammān, and Mr. George Findlater, then Assistant Director of the Institute, for much logistical support and equipment hire. Finally, we thank the people of Ṭabaqat Faḥl village for continued hospitality.
2. Core staff members for the 1996 season were Stephen Bourke (director), Wajeeh Karasneh (DoA representative, Area IX), Bruce McLaren (XXVIIIC), Ruth Ward (XXXIID), Peter Woodley (XXXIIE), Samantha Eames (XXXIIF), Kathryn Swan (XXXIIG), Samantha Gibbins (XXXIIH), Penelope Middleton (XXXIIJ), Phillip Karsgaard (XXXIIK), John Meadows (XXXIIL), Ben Churcher (XXXIIH and photographer), Catherine Macarthur, Jesse McNicoll, Tamara Winnikof and Angus Browne (draftspersons), Holly Parton (registrar), Maree Browne (volunteer co-ordinator), Abu Issa (foreman), Abu Sami (chief cook), Aladdin Madi (cook's assistant), 30 Australian volunteers and a local workforce of up to fifty.

   Core staff members for the 1997 season were Stephen Bourke (director), Kate da Costa (co-director, Area XXXV), Wajeeth Karasneh (DoA representative, Area IX), Bruce McLaren (XXVIIIC), Phillip Habgood (XXXIID), David Thomas (XXXIIE), Samantha Eames (XXXIIF), Kathryn Swan (XXXIIG), Penelope Middleton (XXXIIJ), Phillip Karsgaard (XXXIIK), Amanda Parrish (XXXVA), Natalie Franklin (XXXVB), Anna Parker (XXXVC and draftsperson), Lisa Hopkins (XXXVD), Georgia Brittan (photographer), Holly Parton (registrar), Jo Atkinson (conservator), Lachlan Mairs (archaeozoologist), John Meadows (archaeobotanist), George Findlater (surveyor), Karen Hendrix (volunteer co-ordinator), Abu Issa (foreman), Abu Sami (chief cook), Aladdin Madi (cook's assistant), 30 Australian volunteers and a local workforce of up to fifty-five.

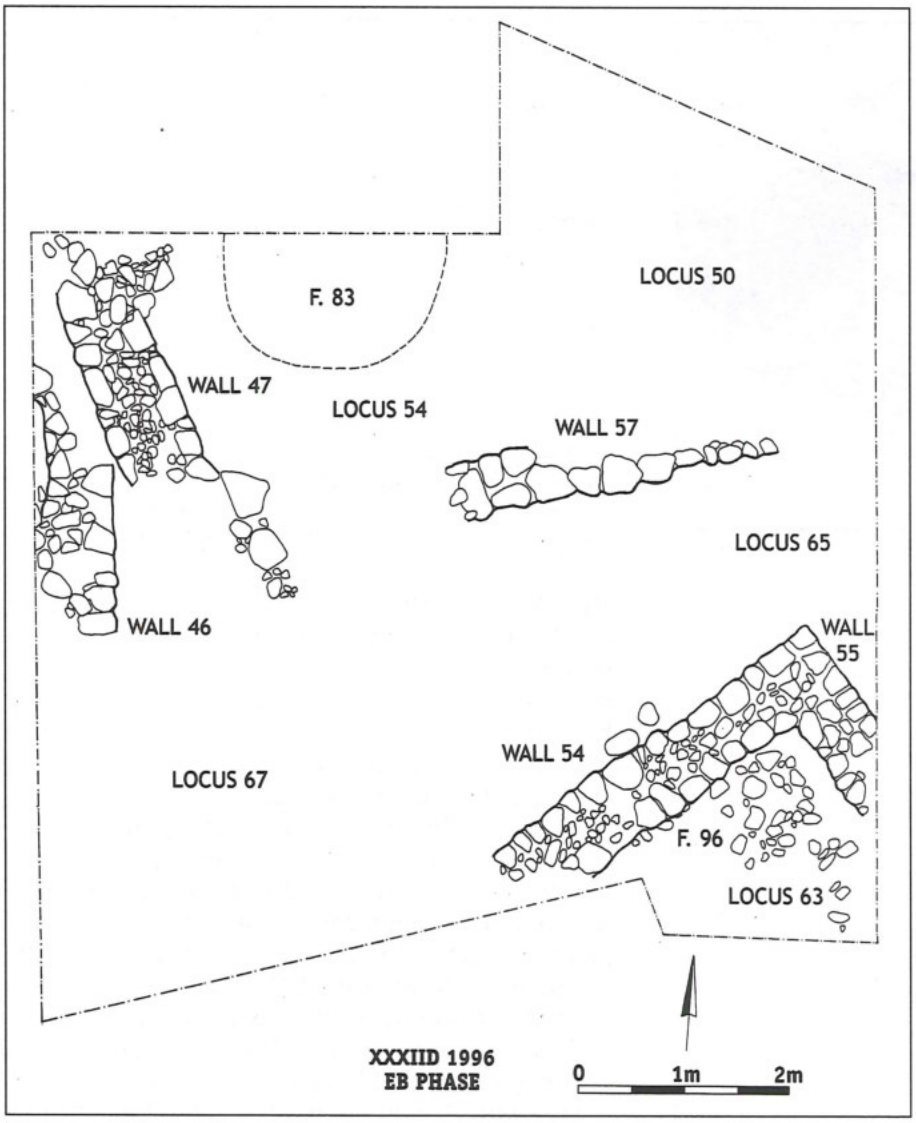


2. Area XXXII. Actual trench areas excavated 1996/97.

3. Trench XXXIIF. Excavations aimed to complete this stratigraphic probe through the southern tell, first by finalising work in and around the MB/LB period funerary deposits discovered towards the end of the 1995 season (Bourke *et al.* 1998: 194-198), and then by exploring the EBA through Neolithic sequence below these deposits.
4. Trenches XXXIIE and XXXIIG. Excavations here concentrated on the delineation of the southern wall (XXXIIE) and the excavation of the southwestern corner (XXXIIG) of the large Fortress Temple first detected in 1994/5.
5. Trenches XXXIIJ-K. Work in these newly instituted trenches aimed to explore the area immediately west of the Fortress Temple, particularly in and around an exceptionally well-preserved Iron Age mud-brick building complex five metres west of the Fortress Temple.
6. Trenches XXXVA-D. Work in this newly instituted Area begins the exploration of the northern streetscape of the Late Roman-Late Antique city, in the area between the Wooster Civic Complex excavations (Area IX) and the modern site fence line.
7. Trenches IX Z7-Z9. Dept. of Antiquities excavations in the Civic Complex continued during both field seasons, with much effort given over to the full excavation of the southern half of the cella of the cathedral church, completed by the end of the 1997 field season.

3. Trench XXXIID. Early Bronze Age Architecture. Locus 65 room.

Due to size constraints, only pre-Classical operations (1-5 above) will be presented in this report. Late Roman through Late Antique operations will be dealt with separately. Detailed reports on pre-Classical field activities appears below, following a rough chronological order according to the dom-



4. Trench XXXIID. Composite plan. Early Bronze Age I-II Architecture.

inant archaeological period present in each area of excavation.[3]

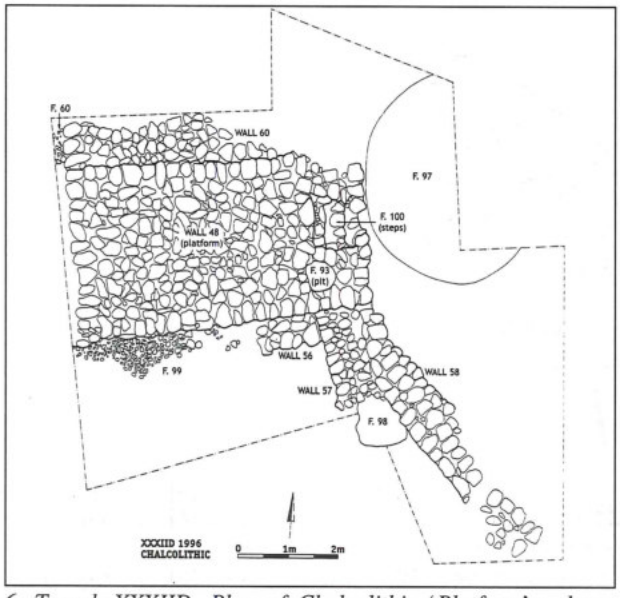
1. Trench XXXIID: The Chalcolithic Platform (ca. 4700 BC). Architecture and Associated Deposits (Figs. 3-8)

Excavations in the 4 x 4m expansion of trench XXXIID in 1995 uncovered four metres of three metre wide mud-brick and stone platform, at the base of the Area XXXII sequence (Bourke *et al.* 1998: 180-181). The three metre width of the structure coupled with very shallow foundations (without any parallel at Pella) suggested a function as something other than a wall.

In 1996 excavations were expanded 4 x 6m to the north and east, in an attempt to recover further of the structure's plan and context. Initially, two phases of scrappy EB IB-II (ca. 3300-2700BC) domestic architecture were uncovered, similar in phase to EBA deposits excavated in 1994/5

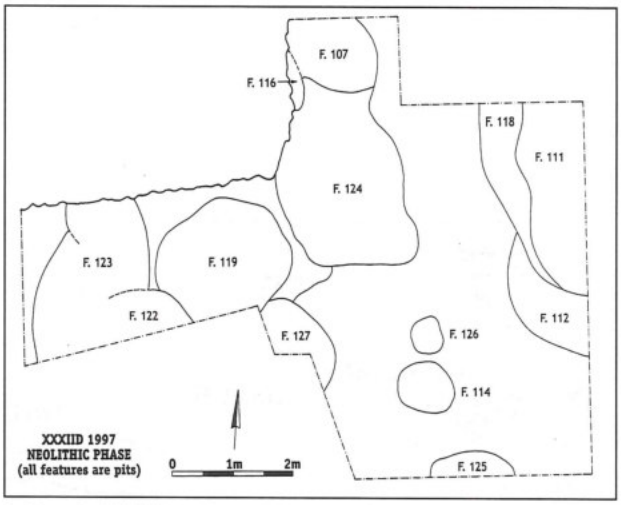
3. Bourke contributed most stratigraphic and ceramic summaries, the radiometric dating report, and edited the article. Sparks contributed all notes on small finds, excepting the violin figurine, which was analysed by Bourke, and the two scarabs, which were analysed by Sowada. McLaren contributed notes on Area XXVIIIC stratigraphy and related pottery, Mairs the archaeozoological report, Meadows the archaebotanical report, Hikade the lithics report, and Reade the glass analysis. Most ceramic and object illustrations were by project draftspersons (listed above), with some additional work by Cameron Petrie, Lisa Mullin, Catriona Bonfiglioli and Franz Reidel. Lithics were illustrated by Thomas Hikade. All sections and plans were inked by Rachel Jackson, with layout by Ben Churcher. All finds plates, and most tables and graphs were laid out by David Thomas. Photographs were taken by Georgia Brittan and printed by Russell Workman. Due to size restrictions, Roman and Late Antique materials excavated during the 1996/97 field seasons are the subject of a separate report, edited by K.A. da Costa.

5. Trench XXXIID. Chalcolithic 'Platform' and earlier pits.



6. Trench XXXIID. Plan of Chalcolithic 'Platform' and associated structures.

7. Trench XXXIID. Close-up view of steps F.100 at east end of Chalcolithic 'Platform'.



8. Trench XXXIID. Plan of Ceramic Neolithic 'Pit Phase' features.

(Bourke *et al.* 1998: 181-183), before the level of the Chalcolithic 'platform' was reached. Earliest (EBIB) of the two EB phases consisted of fragments of two structures (loci 54 and 65), separated by a street/alleyway (locus 65). One structure (Wall 47 and associated surfaces) was badly disturbed by subsequent (and less substantial) EBII constructions (Walls 46 and 57), and MBA pitting (F.83). The second structure, located in the SE area of excavations (Walls 54-55 and installation F.96), preserved a small fragment of a well-built house, apparently destroyed in the construction of the southern fortification Wall 16.

With the removal of the EBA remains, the Chalcolithic platform structure (Wall 48) was found to continue for one additional metre east of the previous limit of excavation. The total exposed e/w length is now approximately five metres. At the middle of the eastern end of the structure, a neat three-step staircase (F.100) led up to the centre of what can now be seen to be a slightly raised (perhaps 30-40 centimetres) platform, consisting of a single course of medium fieldstone foundations capped by two courses of flattened brown mudbricks. A pebble and gravel roadway (F.99) ran along the south side of the platform, preserved in patches (between later pits) up to a metre wide. A far more substantial flat stone pavement (Wall 60) ran along the inner northern face of the platform. A fragmentary curved stone wall over five metres in length (Wall 58) ran up to the southeastern corner of the platform, and seems to delimit an open courtyard stretching east from the stairs, although the exact relationship of Wall 58 to the platform Wall 48 is complicated by foundation trenches of later walls (Walls 56-57) and pits (F. 93 and F. 98).

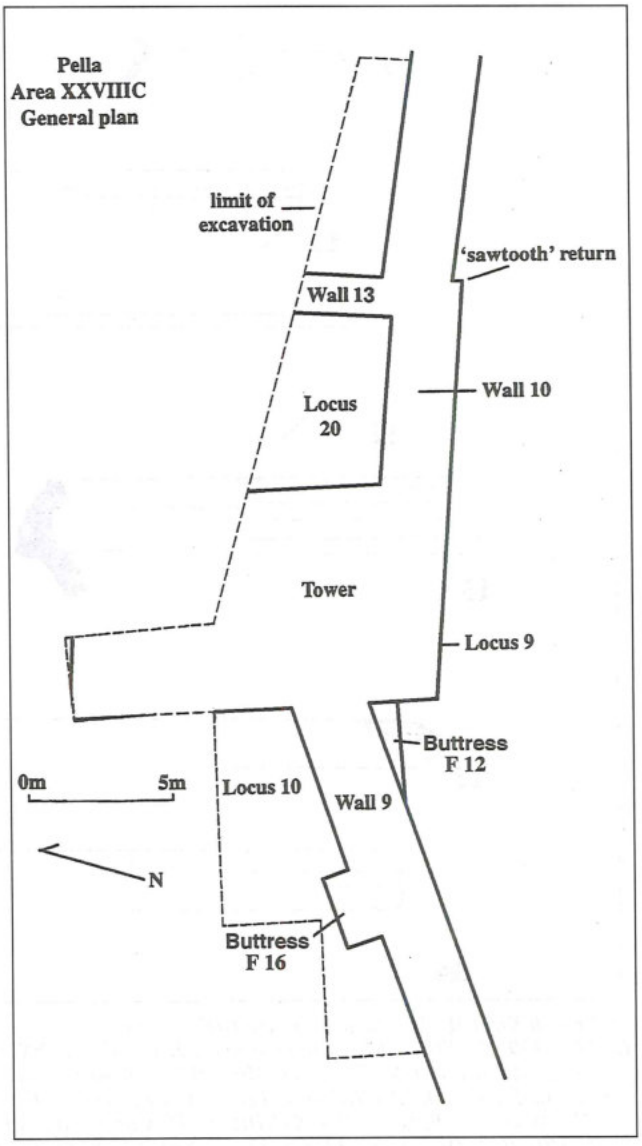
In 1997 excavations were further expanded an

additional 5 x 5m south and east of the platform. The eastern half of this extension had been cut through by a large two metre deep n/s wash gully (F.111-112 and F.118), removing all pre-Iron Age deposits from the eastern trench. In the western half of the extension patches of thickly burnt courtyard surfaces were traced from the top of the platform (XXXIID 80.3) across a 3 x 5m area. The courtyard and platform surfaces were closely related, and extensive deposits of a burnt sifted wheat product (99% pure) were recovered from the surfaces (see Archaeobotanical Report, below). It now seems likely that the platform formed part of the raised foundations of a large wheat storage facility, and is related to the complex of large wheat storage silos excavated between 1992-94 (Bourke *et al.* 1994: 85-86; 1998: 180-181) some four metres to the west of the small area of the platform currently exposed. However, it is probable that the platform continues further to the west, and is to be directly associated with the silos.

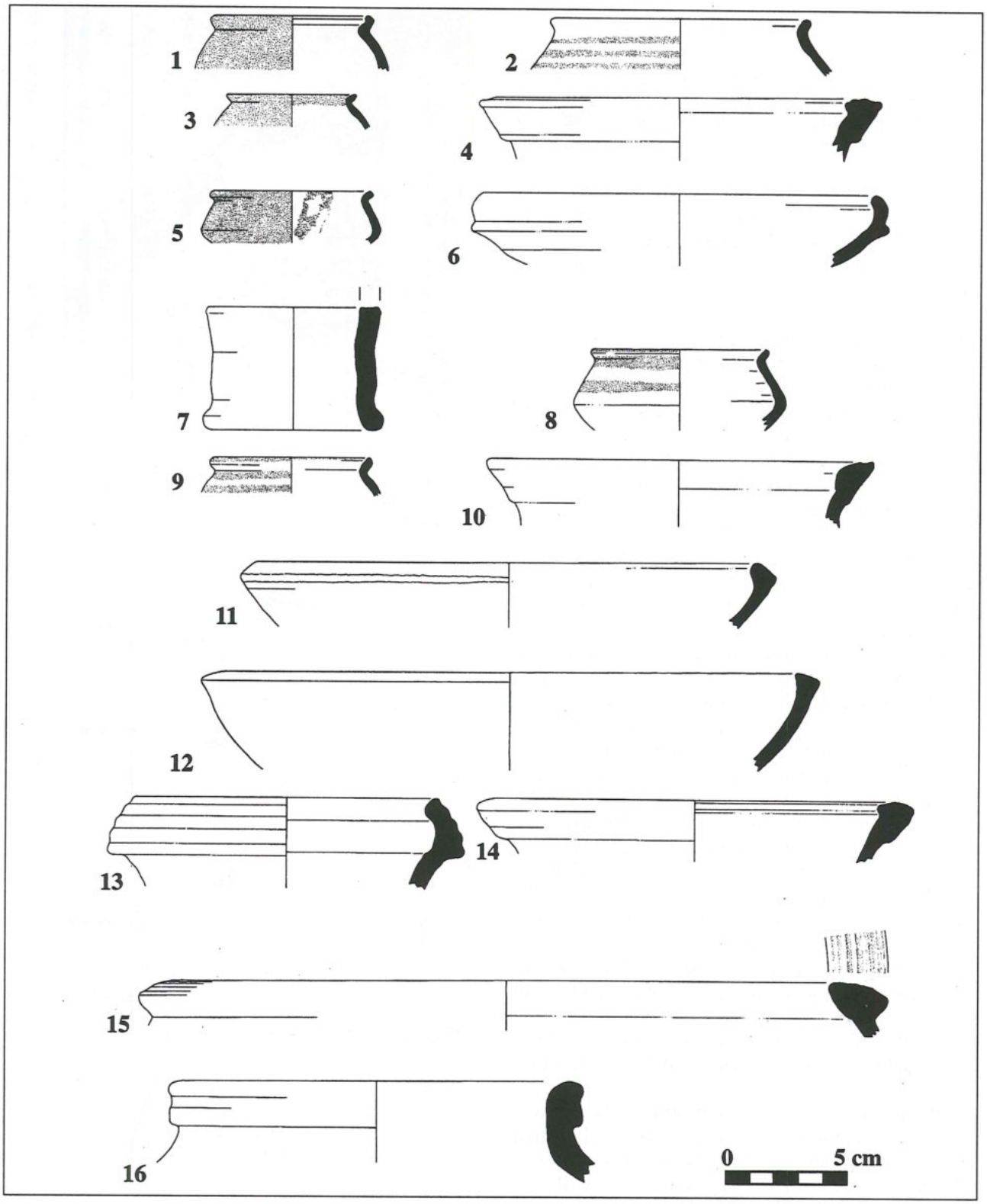
The Area XXXIID Chalcolithic ceramic assemblages were of a different form to those recovered in Hanbury-Tenison's excavations on Jabal Sarṭaba (Area XIV) in the 80s (McNicoll *et al.* 1992: 21-23; Lovell 2000: 70). Even so, the radiometric dates drawn from silo and platform surfaces are identical and surprisingly early, at around 4600-4500 CalBC (see Radiometric Report, below). If the complex is correctly interpreted as a central grain storage facility, its early date has potentially revolutionary implications for the timing of the development of social complexity in the north Jordan Valley (Bourke 2001: 125-127). One intriguing architectural parallel lies with the EBIII Khirbat al-Karak grain storage complex, widely assumed to evidence an introduced life way from the northern Levant. However, if the functional parallel with the Pella 'Platform Complex' is valid, then it might well be that the Khirbat al-Karak structure need not be viewed as an artefact of an introduced system, but may simply be the sophisticated (and much larger) successor to a very long (2000 years) indigenous cultural development.

Below the Chalcolithic platform levels, excavations continued down to sterile red stony clays that lay roughly twenty centimetres below. Fragments of earlier shallow pit deposits (F.107, F.114, F.116, F.119 and F.122-127), often intercut, partly truncated and sealed by later constructions, were traced to the south and east of the platform. These dated variously from the early Chalcolithic (ca. 4700-4500BC) and the late Neolithic (ca. 5200-4900BC). Several thin patches of associated oc-

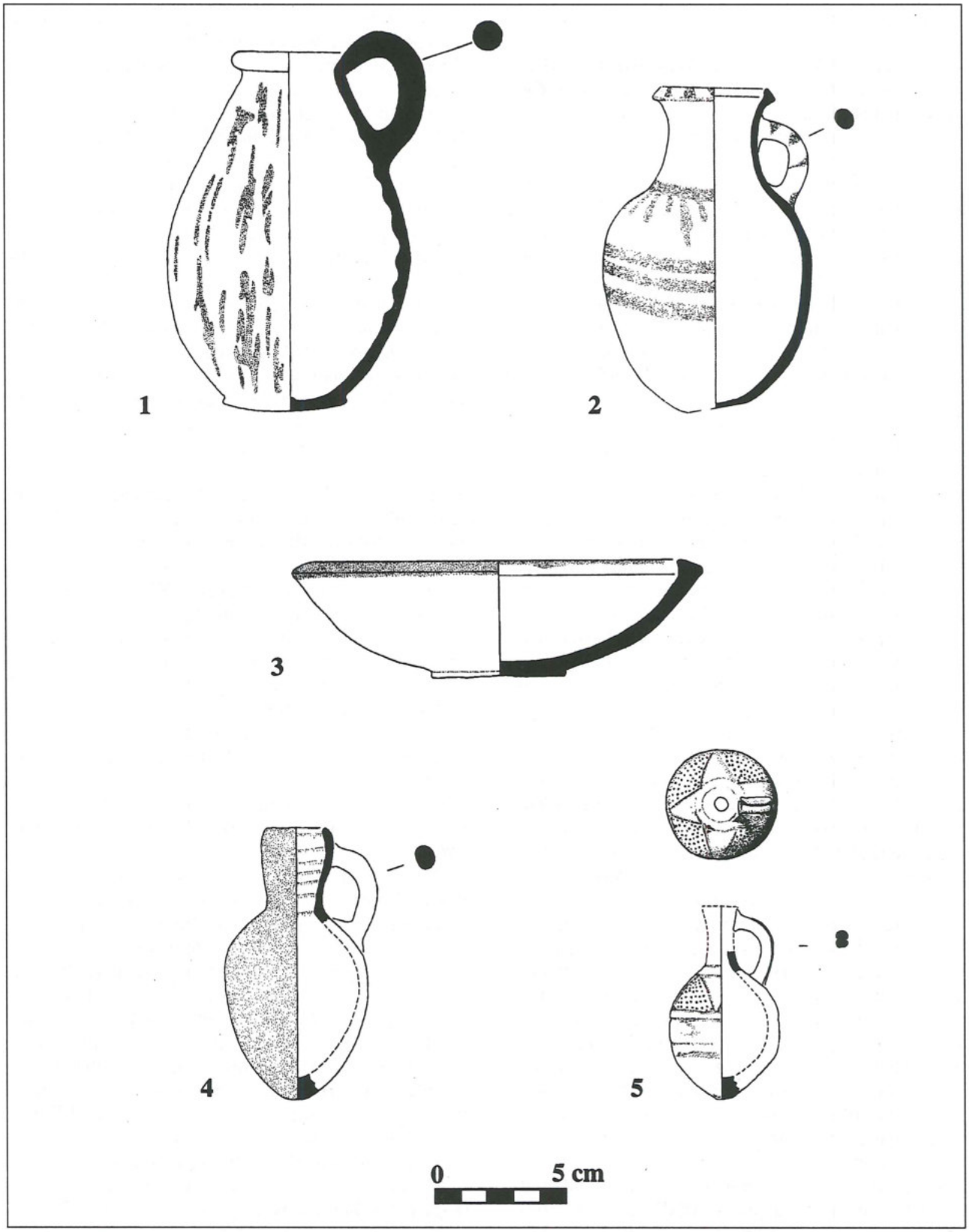
9. Trench XXVIIIC. MBA city walls. Wall 9 and Tower 1.View from the west.



10. Trench XXVIIIC. Schematic plan of fortification complex.



11. Trench XXVIIIC. Middle Bronze Age I-III Pottery.
1. *CN 17159, XXVIIIC 10.2. Carinated bowl.* ***2.*** *CN 17161, XXVIIIC 10.2. Short necked (S/N) Jar.* ***3.*** *CN 17158, XXVIIIC 10.2. Carinated bowl.* ***4.*** *CN 17138, XXVIIIC 10.1. Tall narrow necked (TNN) storage jar.* ***5.*** *CN 17144, XXVIIIC 10.3. Carinated bowl.* ***6.*** *CN 17129, XXVIIIC 10.1. Ledge rimmed bowl.* ***7.*** *CN 17134, XXVIIIC 10.1. Ring stand.* ***8.*** *CN 17127, XXVIIIC 10.1. TNN storage jar.* ***9.*** *CN 17189, XXVIIIC 10.15. Carinated bowl.* ***10.*** *CN 17188, XXVIIIC 10.15. Carinated bowl.* ***11.*** *CN 17165, XXVIIIC 10.2. Deep bowl.* ***12.*** *CN 17192, XXVIIIC 10.15. Deep bowl.* ***13.*** *CN 17163, XXVIIIC 10.2. TNN jar.* ***14.*** *CN 17160, XXVIIIC 10.2. TNN storage jar.* ***15.*** *CN 17213, XXVIIIC 10.18. S/N jar.* ***16.*** *CN 17262, XXVIIIC 10.45. TNN storage jar.*



12. Trench XXVIIIC. MB I (1-3) and MB II/III (4-5) Pottery. 1. CN 17279, XXVIIIC 10.60. Jug. 2. CN 17281, XXVIIIC 10.60. Jug. 3. CN 17280, XXVIIIC 10.60. Bowl. 4. CN 17254, XXVIIIC 30.6. Dipper juglet. 5. CN 17255, XXVIIIC 30.7. Tall al Yahṣdyah Juglet.

cupational debris were also detected.

2. Trench XXVIIIC: The Western Fortifications (ca. 1800-1600BC). *Architecture and Ceramics* (Figs. 9-12)

Initial probes in trench XXVIIIC in 1995 excavated a narrow three metre section through a massive mud-brick and stone tower, and cleaned the exterior face of the associated mud-brick city wall along some fifteen metres of its extent (Bourke *et al.* 1998: 189-194). However, the restricted size of the probe (15 x 3m) did not allow for a clear delineation of the dimensions of the tower, and the surface cleaning along the southern face of the wall had not provided sufficient constructional fill material to secure the date of construction.

Excavations in trench XXVIIIC in 1996 were expanded to 35m e/w along the wall line and between four and five metres n/s inside the wall line (loci 10 and 20). The massive solid mud-brick tower (Tower 1), some 8 x 12m in plan, was largely uncovered. It was eroded heavily from north to south, being preserved some five metres and 43 mud-brick courses high at its maximal northern height, and eroded down to the stone substructure on its southern edge. The tower was also eroded (but less severely) from west to east, being preserved to a height of 23 courses in the west, down to 13 courses in the east.

The western curtain wall (Wall 9) was explored over 11m of its length. It was found to vary between 2.5 and 3m in width, and was attached to the tower at an oblique angle, set back some 1.5m from the southwest corner of the tower. A metre thick triangular stone buttress (F.12) joined Wall 9 to the tower. Five metres west of the tower, an internal buttress (F.16) supported the wall course. The eastern curtain wall (Wall 10) was explored over 16m of its length. Wall 10 was between 2.5 and 3m wide, and attached flush with the southern edge of the tower. About seven metres east of the tower, a short stretch of heavily eroded 1.5m wide wall (Wall 15) joined Wall 10 perpendicularly. At this point Wall 10 steps back some 70cm, creating a 'sawtooth' in the southern wall face. It is suggested that this constructional technique favours the existence of an original casemate double-wall configuration.

Extensive constructional fill deposits recovered in 1996 confirmed an early MBII (ca. 1800BC) date for the walling (**Figs. 12: 1-3**). Four distinct phases of MBA and MB/LB assemblages were associated with the life of the western fortification complex (**Fig. 11: 1-16;** and **12: 4-5**), which seems to have fallen out of use during the MB/LB period, as was the case with the eastern city wall complex. Specific constructional features, such as the large internal tower, triangular external buttress, and 'sawtooth' wall alignment, find parallels at Tall Bayt Mirsīm F (Albright 1938: 18), Megiddo XIII (Loud 1948: 7) and Shiloh Stratum VII (Finkelstein *et al.* 1993: 17) respectively. However, the most comprehensive parallels for the Pella west fortification complex as a whole are found at Hazor, in the lower city gate Area K (Yadin *et al.* 1989: 279-283).

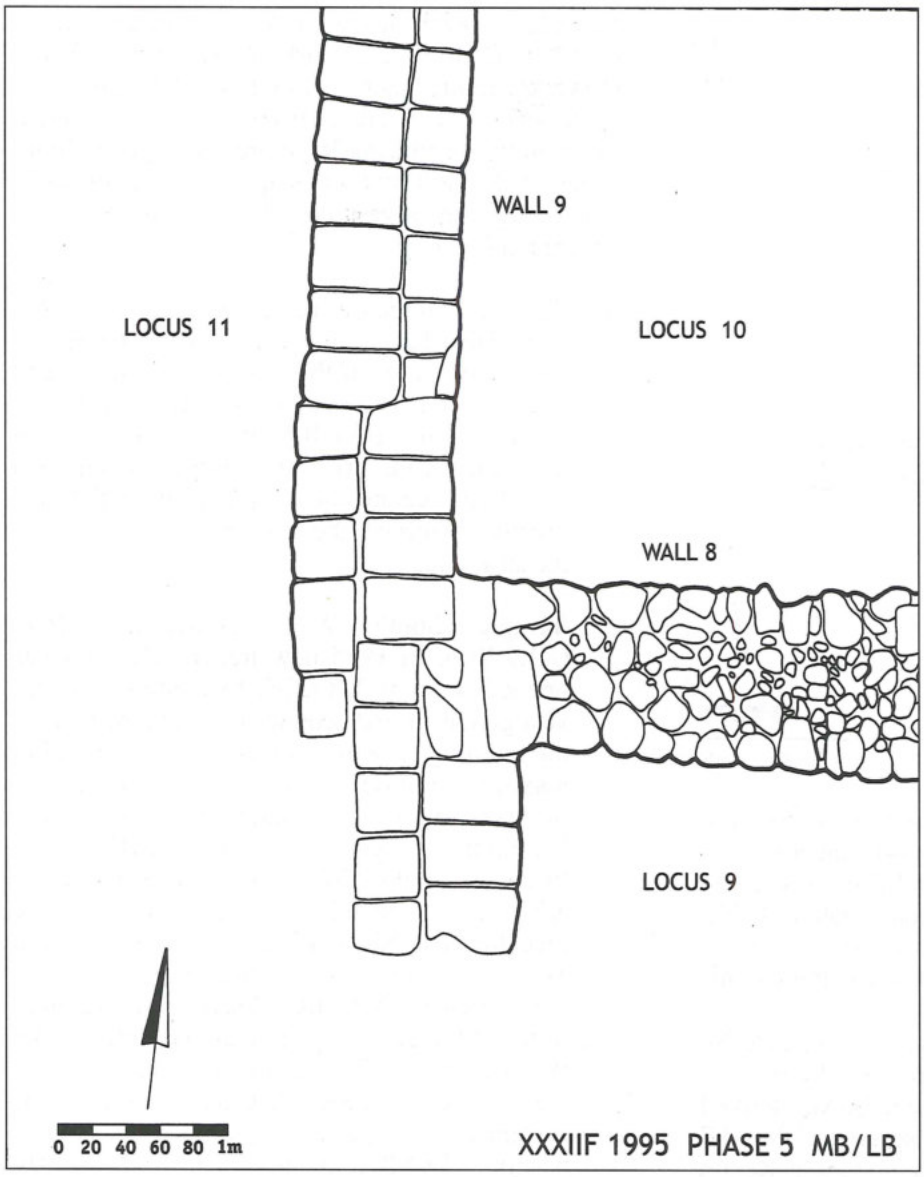
During the early part of the 1997 field season, an area approximately 5 x 3m in extent west of the tower and north of Wall 9 was taken down to sterile deposits. In this probe, a small patch of EBII walling (Wall 22), two large irregular pits of EBIB date (F.11) and several large pit cuts (F.10) of early Chalcolithic date were uncovered.

3. Trench XXXIIF: MB/LB Funerary Deposits (ca. 1600BC) and Neo-EBA Occupational Deposits (5000-2700BC). Architecture and Ceramics (Figs. 13-21).

Initial excavations in trench XXXIIF in 1995 explored a series of Iron II through LB II period deposits (XXXIIF Phases 1-4), before uncovered two phases (XXXIIF Phases 5-6) of a well-constructed mud-brick building, containing three plaster lined and plaster sealed bins (Features 26, 28 and 29) built against the east wall (Wall 11) of the westernmost room (locus 11) excavated. From these three bins, a series of complete ceramic funnels, flasks, small bowls and a unique gypsum bowl were recovered in 1995 (Bourke *et al.* 1998: 194-196).

In 1996 the remainder of the building and all three plastered bins were completely excavated. Additional large and small funnels, bottles and bowls were recovered (**Fig. 16: 1-16**). As well, an exquisite Egyptian alabaster jar (see **Fig. 39: 4**), several red and black burnished cylindrical and piriform juglets, and a number of carinated bowls and painted jugs were added to the repertoire of what is likely to be a de-commissioned funerary libation assemblage (Bourke *et al.* 1998: 194). Best parallels for the material suggest a date in the MB/LB period, around 1600BC.

Excavations in 1997 explored some three metres of earlier material beneath the funerary deposits (**Fig. 19: 1-11**), recovering two phases of EBIB-II domestic architecture (XXXIIF Phases 7-8), patches of at least three sub-phases of Early Chalcolithic period occupation (XXXIIF Phase 9), and at the base of the sequence, two Late Neolithic plaster-



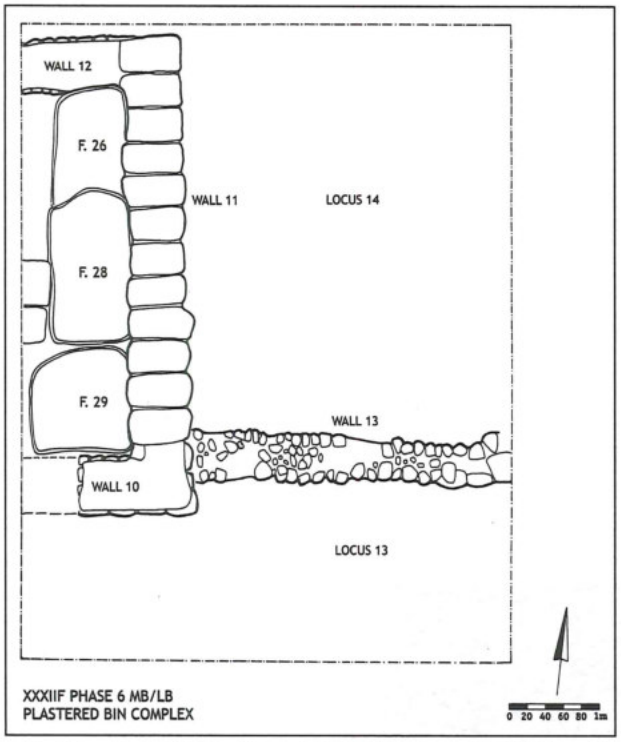
13. Trench XXXIIF. Plan of MB/LB phase 5 architecture.

14. Trench XXXIIF. Phase 6 plastered 'Bin' features 26 and 28-29.

lined pit-houses (XXXIIF Phase 10) and associated pit deposits.

EBA deposits consisted of two main phases of fragmentary EBIB-II domestic structures (Walls 19-20 and 16-17 respectively), badly disturbed by silo F. 39 and pits (F. 42 and 44-45). The Chalcolithic period deposits consist of the corner of a neatly constructed mud-brick room (Wall 18), associated plaster-lined pits (F. 38 and F. 40) and several plaster floor and posthole fragments. Both the EBIB-II and Chalcolithic phase material is identical in date to that recovered in trench XXXIID (ca. 4700-2700BC).

Below the Early Chalcolithic levels, a series of Late Neolithic domestic and courtyard deposits were unearthed. Latest phased Late Neolithic material consisted on two wall stubs (Walls 21 and



15. Trench XXXIIF. Plan of MB/LB phase 6 'Bin' architecture.

22) and an associated plaster-lined pit (F. 51). Earlier phased Late Neolithic deposits include large shallow pits (F. 50 and 59), small deep pits (F. 54-56), one plaster-lined (F. 60), and a patch of thick yellowish plastered floor (F. 57). Sterile deposits were reached in the western half of the trench only, at the end of the 1997 season.

The cultural affiliations of the XXXIIF Late Neolithic assemblages are not clear-cut. Some links are evident with Banning's 'Wadi Rabah-derived' Ziqlab Neolithic assemblages (Banning 1998: 197-198). Radiometric dates (see Radiocarbon Report, below) suggest that the XXXIIF Late Neolithic occupation is best placed towards the end of the 'Ziqlab Neolithic', perhaps when earlier Late Neolithic modes of 'dispersed settlement' in small farmsteads were beginning to give way to renewed settlement in larger communities.

4. Trenches XXXIIE and G: The Late Bronze and Iron Age Fortress Temple (ca. 1600-800BC). Architecture and Ceramics (Figs. 22-32).

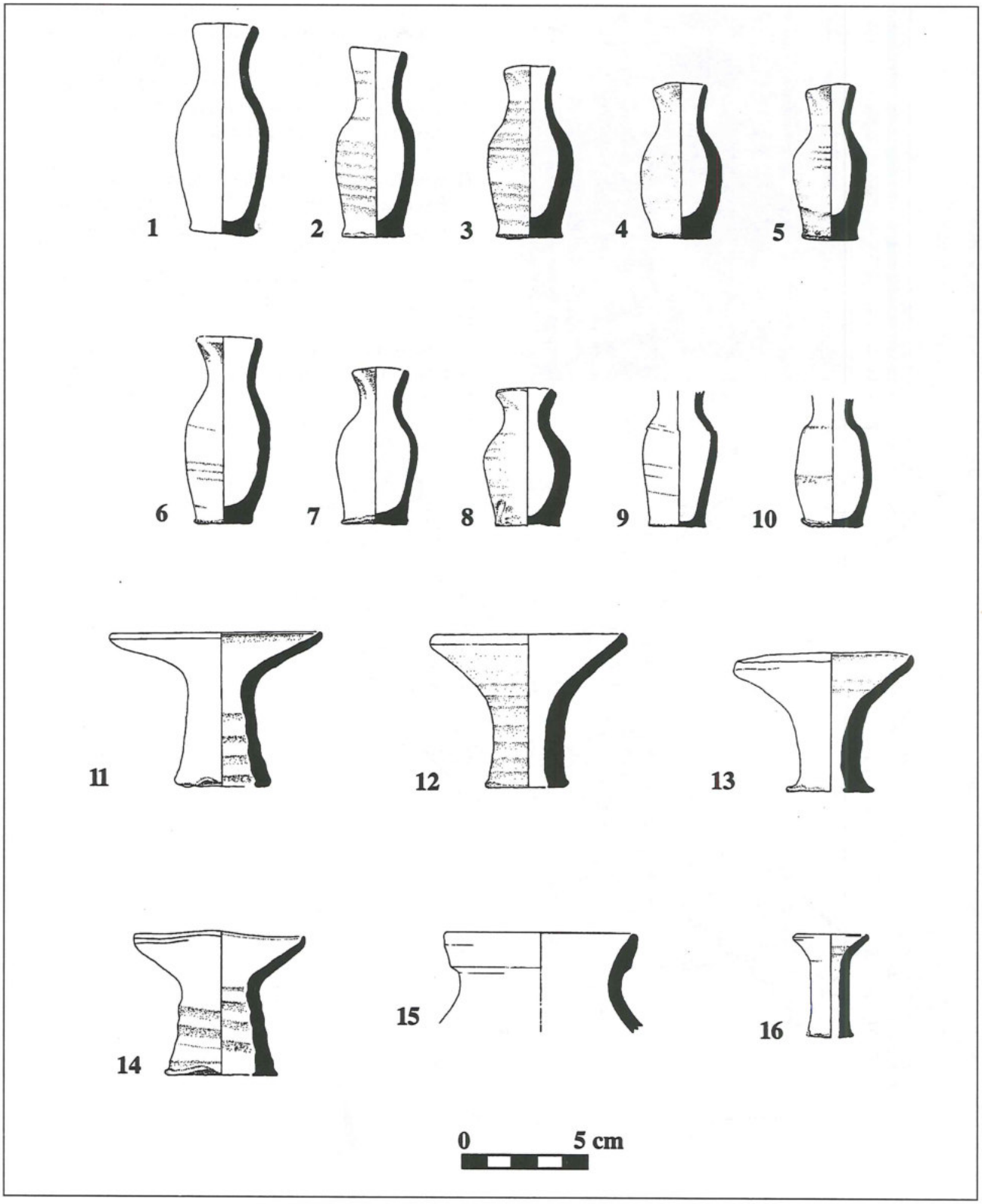
Temple Excavations 1994/95: Discovery and Initial Exploration

A new 10 x 5m trench (XXXIIE) was commenced immediately north of trench XXXIID in 1994. The original aim was to recover an enlarged sample of EBA domestic architecture and associated material north of the EBA city wall discovered in XXXIID in 1992 (Bourke *et al.* 1994: 83-86). However, immediately below topsoil the corner of a massive stone walled structure was uncovered. The building, featuring large roughly squared limestone blocks built into walls up to two metres thick, is certainly the largest pre-Classical structure discovered at Pella.

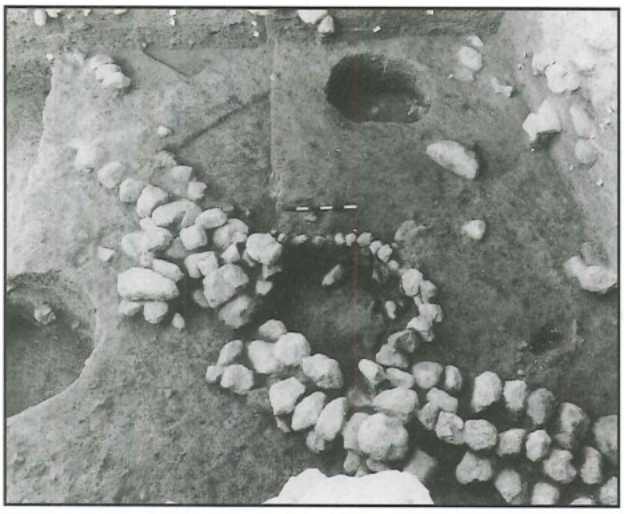
A. Temple Southeast Tower Excavations 1994 (XXXIIE): Excavations in 1994 uncovered the southeast corner of the structure (Tower 1 and Wall 3), and removed one significant phase of modifications (Iron IIA) within and immediately east of the original building, as well as a very large number of Iron Age pits which had greatly disturbed the internal stratigraphy of the structure.

B. Temple South Wall Excavations 1995 (XXXIIG): In 1995 new trench XXXIIG was opened west of XXXIIE, to continue the investigation in and around the southern wall of the building. The new trench was 'L' shaped to maximise exposure in a region circumscribed by the twin hazards of modern cemetery fencing immediately north of the XXXIIE baulk line and the 1983 Wooster South Probe (Area XXV) approximately five metres south of the fenceline (McNicoll *et al.* 1992: 19-20). The 1995 area consisted of a narrow 13 x 4m e/w 'strip trench') XXXIIG locus 50), running south of the cemetery fencing and north of the Wooster probe. This acted to join the southwest corner of trench XXXIIE to the southeastern corner of a more orthodox 8 x 5m exposure (XXXIIG locus 1-10), immediately west of the modern cemetery fence line. Work in the 8 x 5m exposure west of the modern cemetery (XXXIIG locus 1-10) produced thick Late Antique, Hellenistic and Late Iron Age debris layers, all post-dating the main structure. Towards the end of the 1995 season Iron IIA occupation and pit deposits probably relating to the structure were reached in the far south-eastern edge of the trench.

Work in XXXIIG locus 50 in 1995 exposed 13m of the outer face of the southern wall (Wall 10). When added to the eight metres exposed in XXXIIE in 1994 (Wall 3), this stretch of the southern wall totaled 21m in exposed length. The latest deposits associated with the exterior face of Wall 10 date to the Iron IIA. A series of deep Iron II pits cut through the exterior deposits south of the wall line, much dis-



16. Trench XXXIIF. MB/LB pottery from 'Bin' funerary deposits. 1. CN 17265, XXXIIF 11.12. Bottle. 2. CN 17204, XXXIIF 11.2. Bottle. 3. CN 17203, XXXIIF 11.12. Bottle. 4. CN 17205, XXXIIF 11.12. Bottle. 5. CN 17208, XXXIIF 11.12. Bottle. 6. CN 17261, XXXIIF 11.9. Bottle. 7. CN 17257, XXXIIF 11.12. Bottle. 8. CN 17206, XXXIIF 11.12. Squat bottle. 9. CN 17258, XXXIIF 11.12. Bottle (-Neck). 10. CN 17259, XXXIIF 11.12. Bottle (-Neck). 11. CN 17202, XXXIIF 11.2. Funnel. 12. CN 17201, XXXIIF 11.12. Funnel. 13. CN 17260, XXXIIF 11.12. Funnel. 14. CN 17256, XXXIIF 11.12. Squat funnel. 15. CN 17115, XXXIIF 11.5. TNN Jar. 16. CN 17207, XXXIIF 11.12. Small funnel.



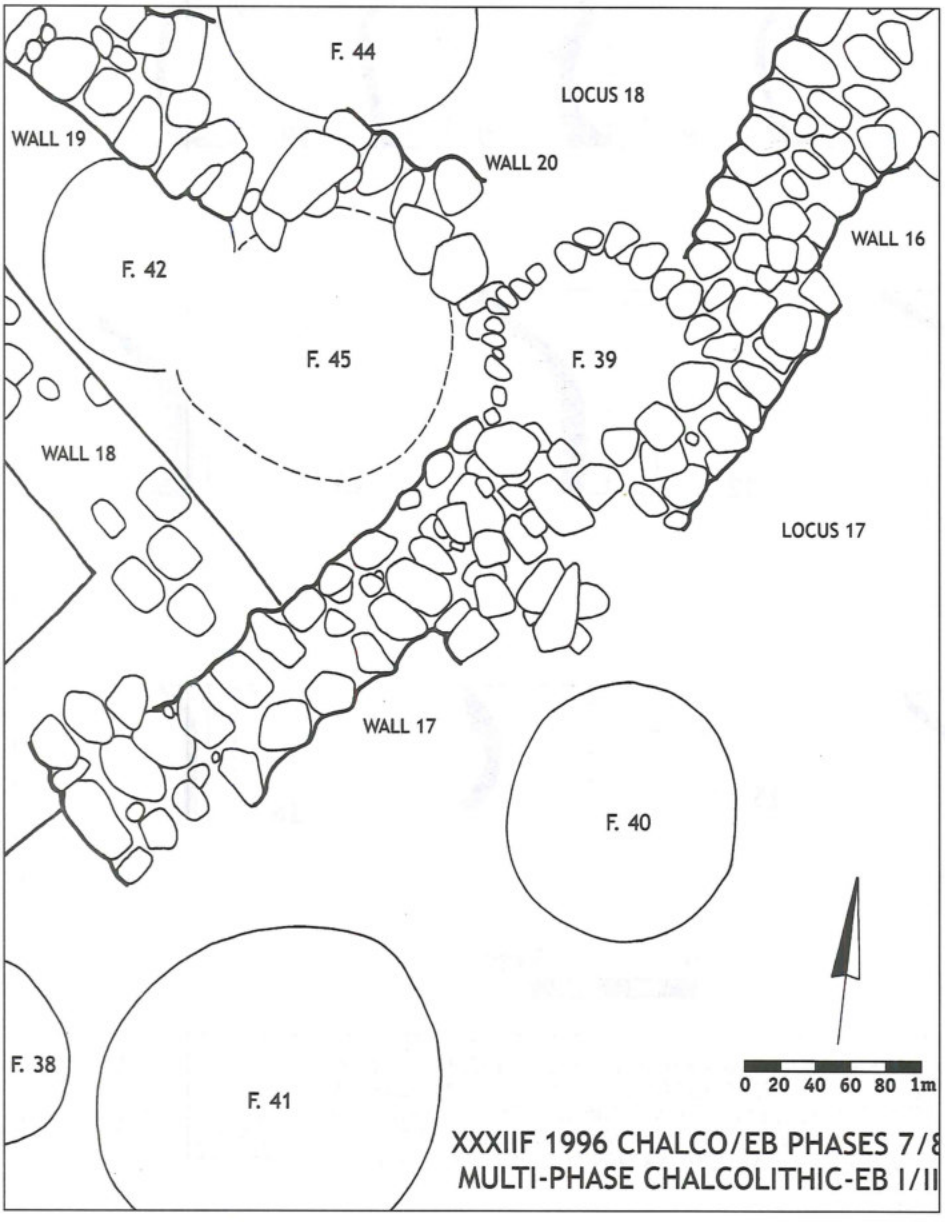
17. Trench XXXIIF. Chalcolithic and EB I-II architecture.

turbing the stratigraphy. Towards the end of the 1995 season LB/EI deposits (surfaces and pits) had been reached in the western end of the strip trench. Ceramics from debris layers and several pits mended into typical elements of Iron I-IIA assemblages (**Fig. 23: 1-6**).

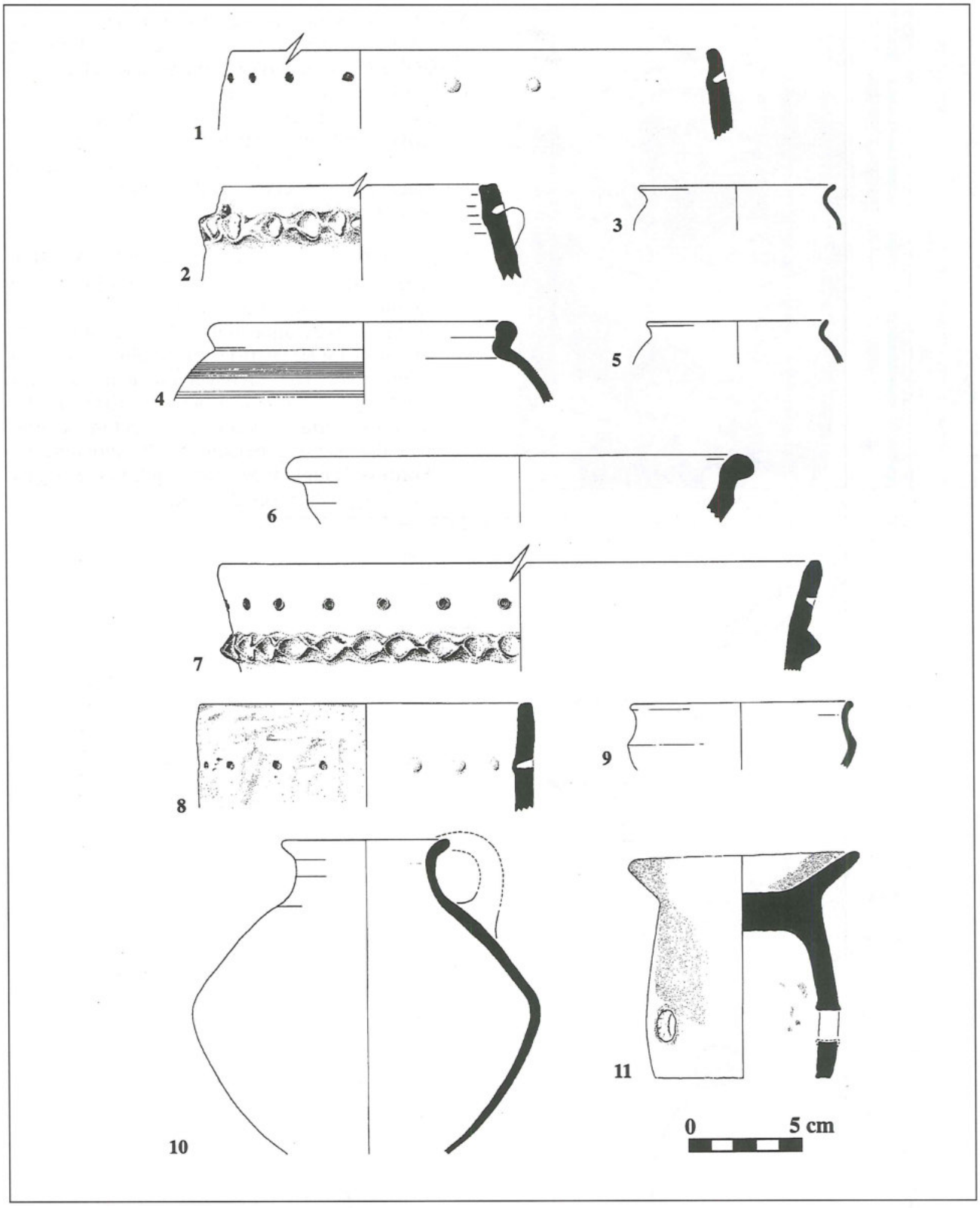
Temple Excavations 1996/97: Introduction

Excavations in 1996/7 concentrated on exploring the western end of the structure (ultimately 15 x 5m trench XXXIIG Locus 100). In addition work resumed in the southeast corner of the building (ultimately 20 x 5m trench XXXIIE Locus 10-15).

The trench XXXIIG exposure was situated over and within the southwestern corner of what has proved to be a very large Fortress Temple. Trench



18. Trench XXXIIF. Composite Plan of Chalco/ EBA Phase 7-9 architecture.

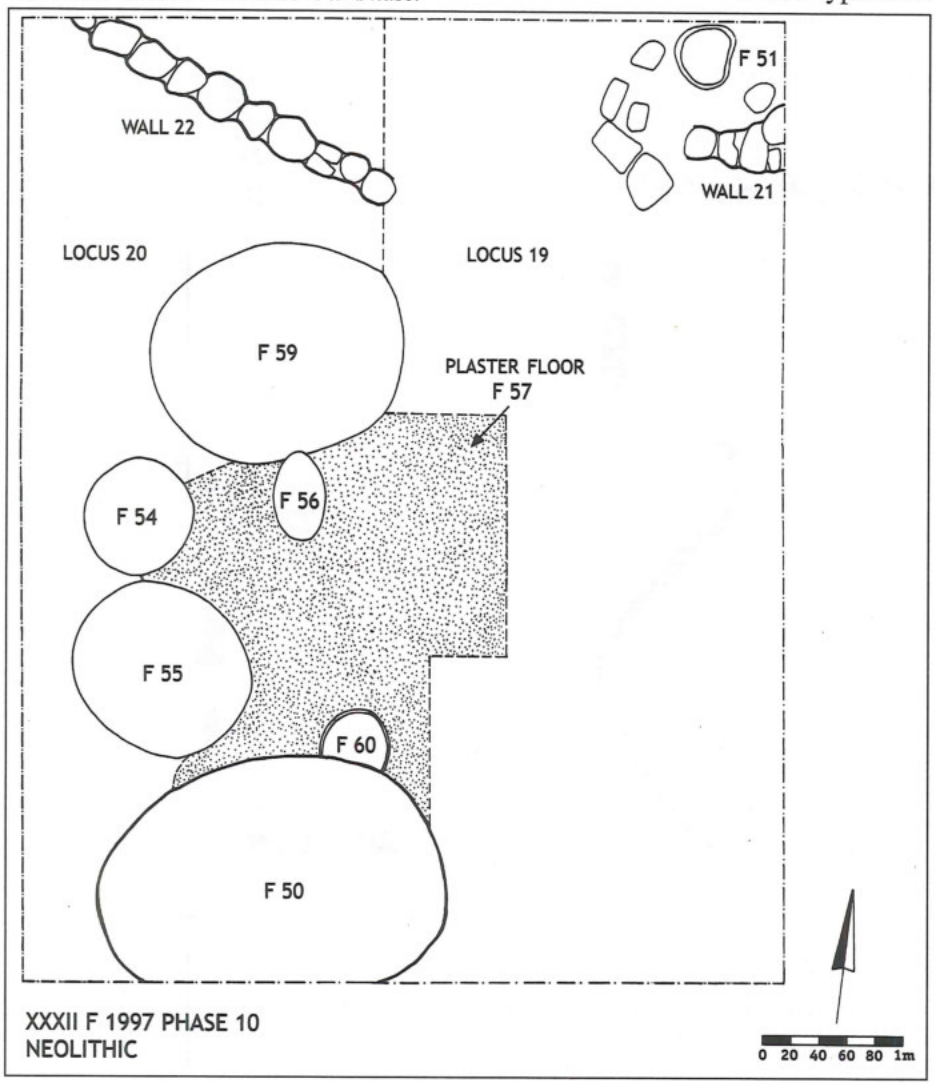


19. Trench XXXIIF. MB I-II (1-11) and EB I-II (12-13) Pottery. 1. CN 17151, XXXIIF 12.4. Cooking Pot-Early MBA. 2. CN 17166, XXXIIF 12.8. Cooking Pot-Early MBA. 3. CN 17117, XXXIIF 8.10. Carinated Bowl-Early MBA. 4. CN 17147, XXXIIF 12.6. S/N Jar-Early MBA. 5. CN 17118, XXXIIF 9.3. Carinated Bowl-Early MBA. 6. CN 17172, XXXIIF 12.7. Large Bowl-Early MBA. 7. CN 17193, XXXIIF 14.3. Cooking Pot-Early MBA. 8. CN 17224, XXXIIF 11.21. Cooking Pot-Early MBA. 9. CN 17223, XXXIIF 11.21. Carinated Bowl-Early MBA. 10. CN 17237, XXXIIF 13.7. Jug-EBA. 11. CN 17238, XXXIIF 13.10. Fenestrated Stand-EBA.

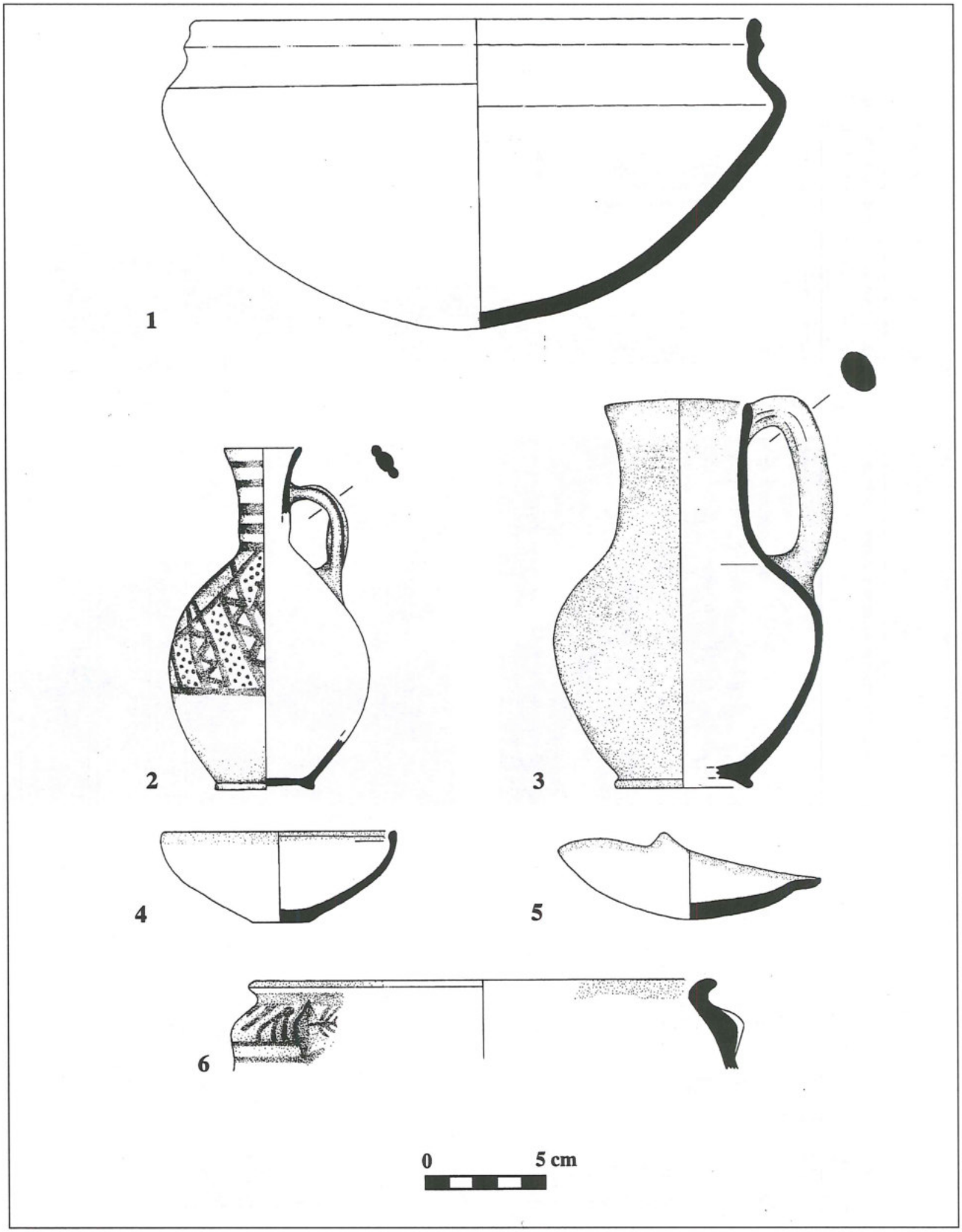
20. Trench XXXIIF. Neolithic 'Pit' Phase.

XXXIIE excavations came to expose approximately half the southern tower and a very small portion of the southeastern corner of the temple cella. What follows below are descriptions of excavations in the southwestern interior of the temple (trench XXXIIG), and the southeastern tower and cella (trench XXXIIE). These two excavated areas are separated by intervening land unavailable for excavation in 1996/97.

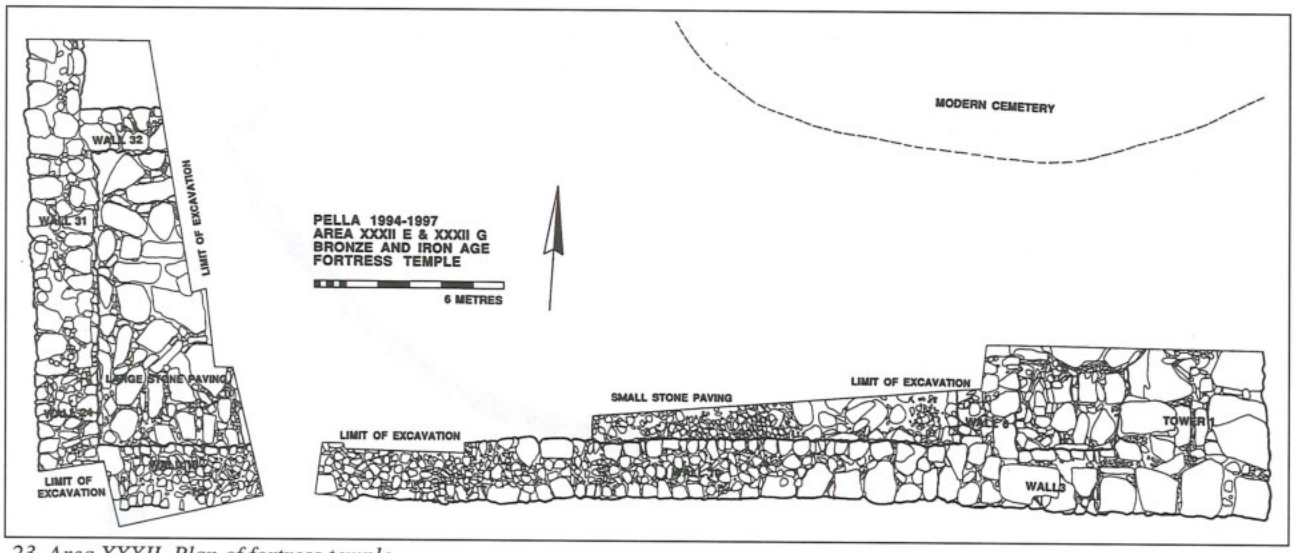
C. West Temple Excavations 1996/97 (XXXIIG): The western return wall (Wall 24/31) to the temple was discovered eight metres west of previous excavation limits. In total the southern wall (Wall 3/10/18), is slightly less than 32m long. The architectural plan and assemblages recovered from a variety of destruction surfaces within the structure suggest that the building belongs to the monumental Fortress Temple type, and is indeed the largest of this type discovered to date.



21. Trench XXXIIF. Plan of Phase 10 Neolithic Pits.

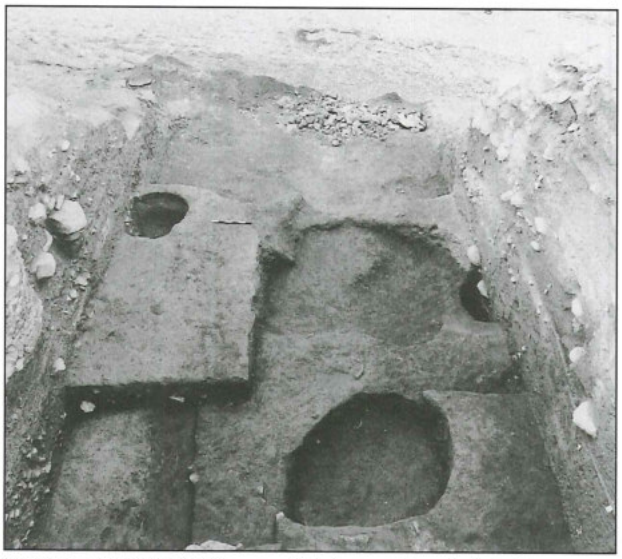


22. Various Trenches. Iron Age Pottery from outside temple south wall. 1. CN 15974, XXXIIG 5.4. Cooking pot. Iron IIA. 2. CN 15954, XXXIIG 4.9. Painted buff jug. Iron I. 3. CN 15953, XXXIIA 13.6. Red slip jug. Iron IIA. 4. CN 17013, XXXIIG 6.5. Bowl. LB/EI. 5. CN 15337, XXXIID 28.2. Lamp. Iron I/II. 6. CN 15503, XXVIIIB 19.2. Bar-handled bowl. Iron I/II.

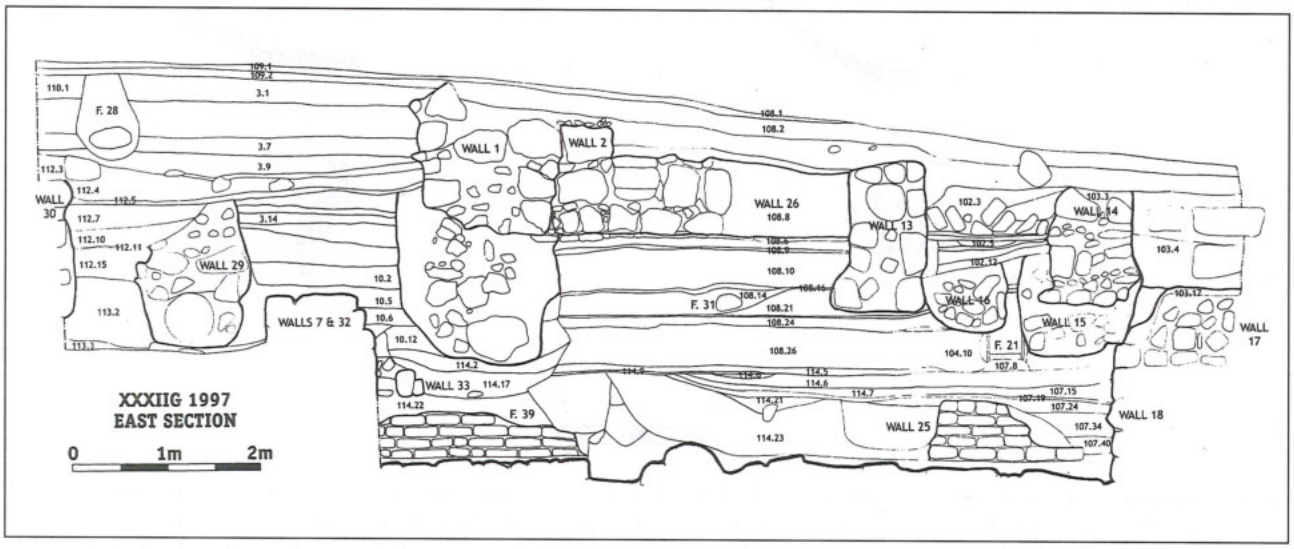


23. Area XXXII. Plan of fortress temple.

24. Area XXXII. View east along temple south wall.

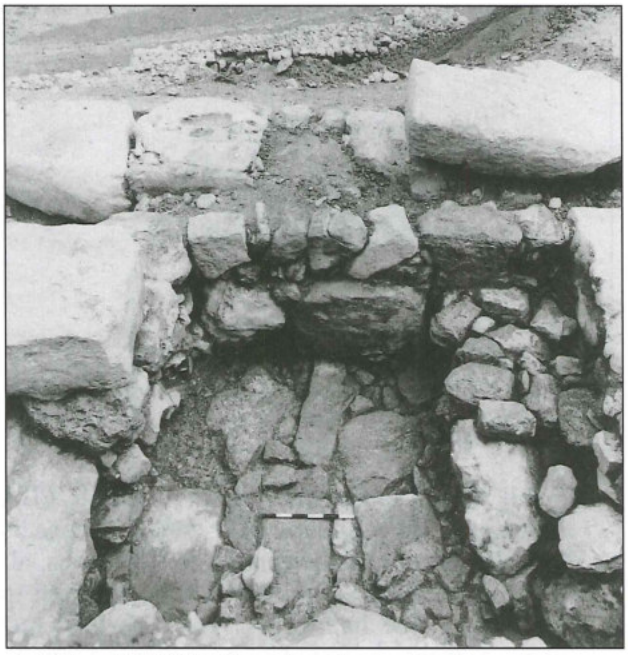


26. Trench XXXIIG. View north into west temple interior.



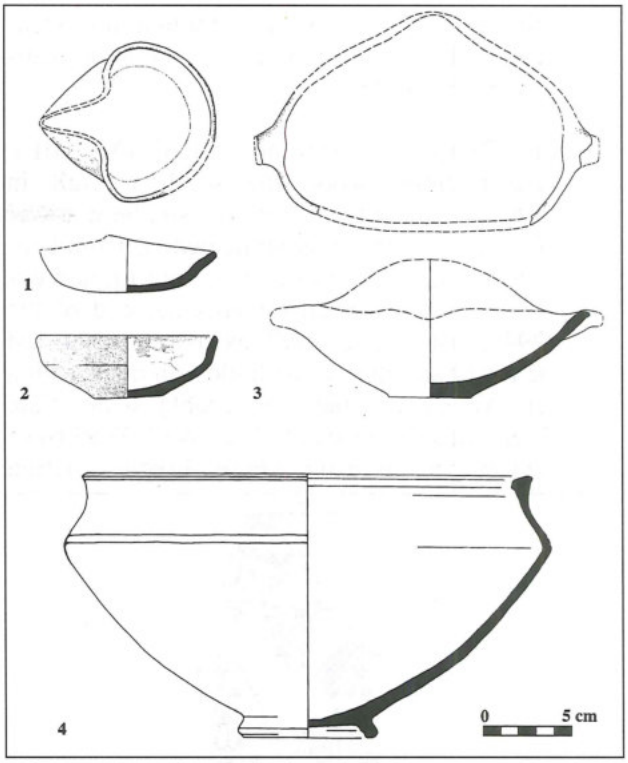
25. Trench XXXIIG. East section.

27. Trench XXXIIE. View west along tower and south wall.

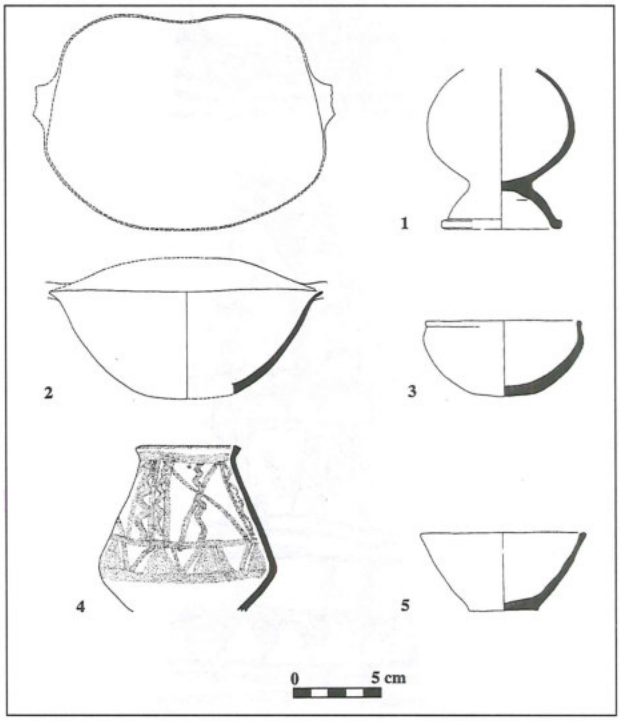


28. Trench XXXIIE. View of south tower interior.

The structure was probably built in the MB/LB period, although primary constructional deposits had not been reached in XXXIIG by the end of the 1997 season, due to the presence of a massive stone-paved floor across the base of the sequence. The structure underwent a series of internal modifications over the course of the Late Bronze Age, and was completely rebuilt at some stage during the Iron I/IIA transitional period, where new external walls (Walls 17 and 31) and a new north wall (Wall 32) were



29. Trench XXXIIG. Iron II through LB II pottery. 1. CN 17288, XXXIIG 113.1. Lamp. Iron II. 2. CN 17239, XXXIIG 107.9. Carinated bowl. LB/EI. 3. CN 17287, XXXIIE 15.7. Assymetrical bowl. LBII. 4. CN 17304, XXXIIG 114.9. Krater. LBII.

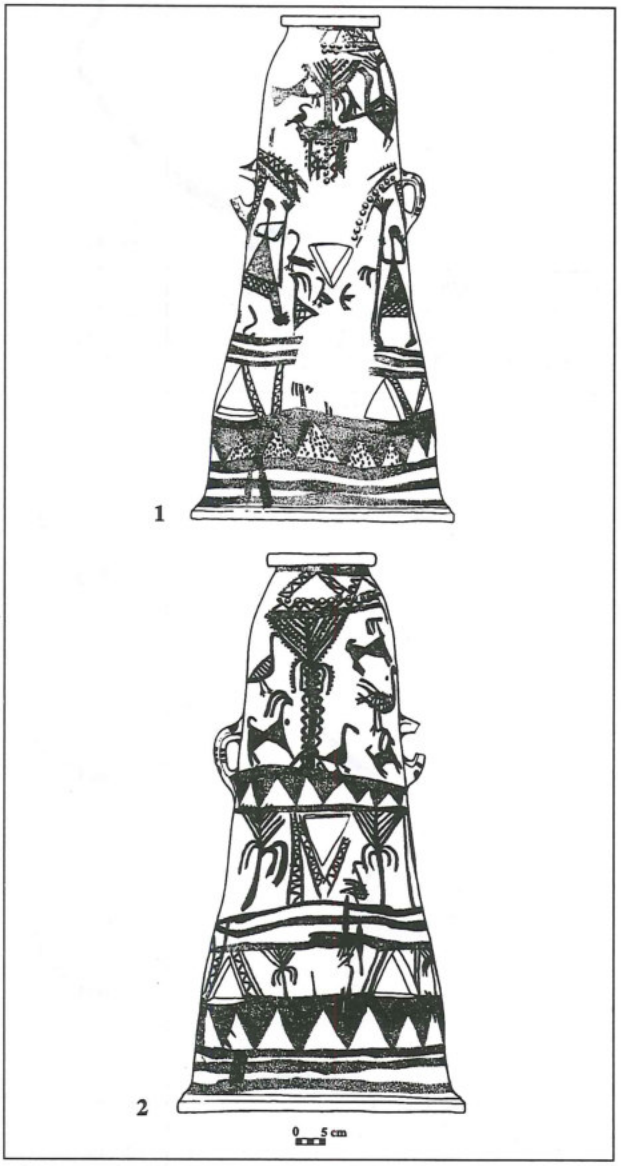


30. Trench XXXIIG. LB II pottery. 1. CN 17299, XXXIIG 114.23. Assymetrical bowl. LB II. 2. CN 17300 XXXIIG 114.23 Chalice. LB II. 3. CN 17301 XXXIIG 114.9 Hemispherical bowl. LB II. 4. CN 17302 XXXIIG 114.22 Painted carinated jar. LB II. 5. CN 17303 XXXIIG 114.21 Straight-Sided bowl. LB II.

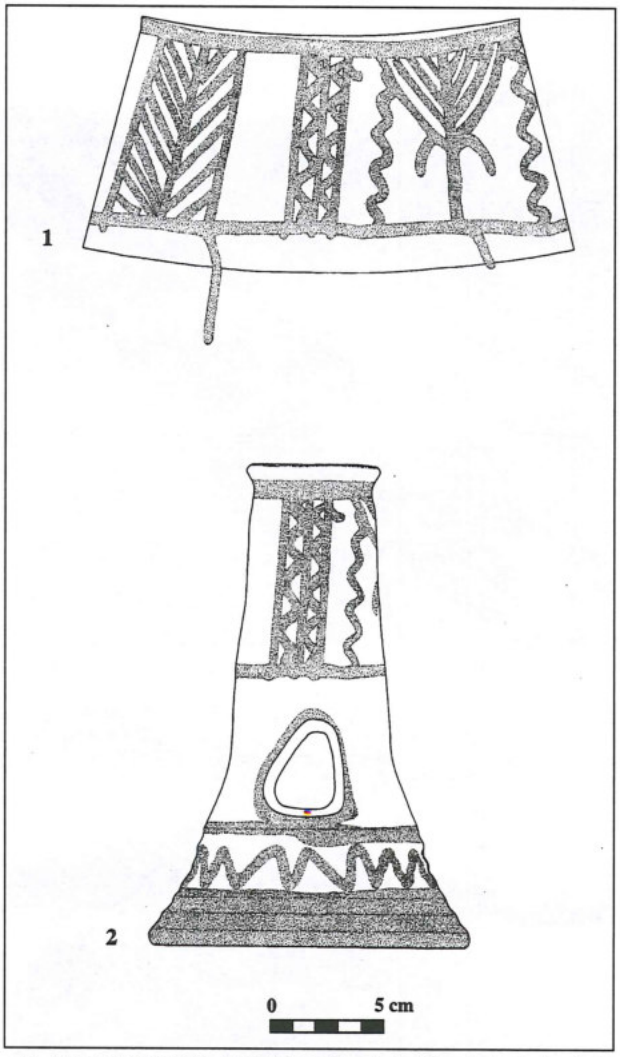
constructed on virtually (although not identically) the same alignment as previous walls (Walls 18 and 24).

D. East Temple Excavations 1996/97 (XXXIIE): Investigations inside the southern wall in 1996/97 concentrated on the southern tower (Tower 1), where a complicated structural sequence had been evident from the limited explorations undertaken towards the end of the 1994 season. The 1997 excavations showed the tower structure to be hollow in plan, with a massive eastern face, noticeably wider than other walls. The western back wall (Wall 6) of the tower had a second phase of reconstruction (Wall 8), at some time within the Iron I/IIA transition. The southern wall (Wall 3) appears to be the latest of two separate constructions, although earlier phases have not been exposed to any depth. The interior of Walls 3 and 6 rest upon a massive foundation, which seems to have a noticable 'straight edge' within its matrix, perhaps hinting at earlier structural phases below. Although traces of at least one thick yellow plaster floor were detected within the tower interior, interpretation was much complicated by several large Iron II pits, which removed much of the original interior deposits.

Excavations in the interior of the cella (north of Wall 10 and west of Wall 6) shrank to a mere sliver after ten metres, as the south wall runs slightly north of west out of the narrow margins of the strip trench. Even so, these excavations



31. Trench XXXIIG. LB II painted fenestrated stand. 1. CN 17297, XXXIIG 114.23. Painted buff conical fenestrated stand. LB II. Highly fragmented. Max. Ht. 950mm x Max. Dia. 480mm.



32. Trench XXVIIIB. LB/EI small painted feestrated stand. 1-2. CN 15996, XXVIIIB 22.4. Painted buff conical fenestrated stand. LB II. Near complete. Max. Ht. 218mm x Max. Dia. 146mm.

exposed patches of mud-brick paving overlying both small stone paving, and (where pits removed upper deposits) larger foundational stonework. Although the area excavated was small, it produced both cymbals and balance pans (**Fig. 40: 1-4**), and the 'Kassite bucket' (**Fig. 39: 3**), all in LB II deposits.

Although the Iron Age phases of the temple are much disturbed by extensive Late Byzantine foundation trenches (**Fig. 25**), a clear sequence from Iron I through Iron IIA was evident (**Fig. 29: 1-2**). Below the Iron Age, Late Bronze Age deposits were far preserved (**Fig. 29: 3-4 and 30: 1-5**).

A notable discovery from a deep late LB II pit was a badly fragmented but largely reconstructable painted conical fenestrated stand (**Fig. 31**). The painted decoration is both rich and obscure. If iconography can be related to the temple function, then worship of a male deity (Baal, or perhaps El) is possibly indicated by the prominent male figure holding either a thyrsus or perhaps a palm-spear. There may be some indication of a female consort (Astarte, or perhaps Asherah), if the garlanded altar supporting a date palm and grazing caprines is correctly interpreted.

A similar (if smaller) fenestrated stand was recovered from an LB/EI pit in trench XXVIIIB, some 30m west of the temple (**Fig. 32**). This may indicate that a significant area to the west of the main temple was involved in the support of the cult and its servitors.

Temple Summary: Phasing and Parallels

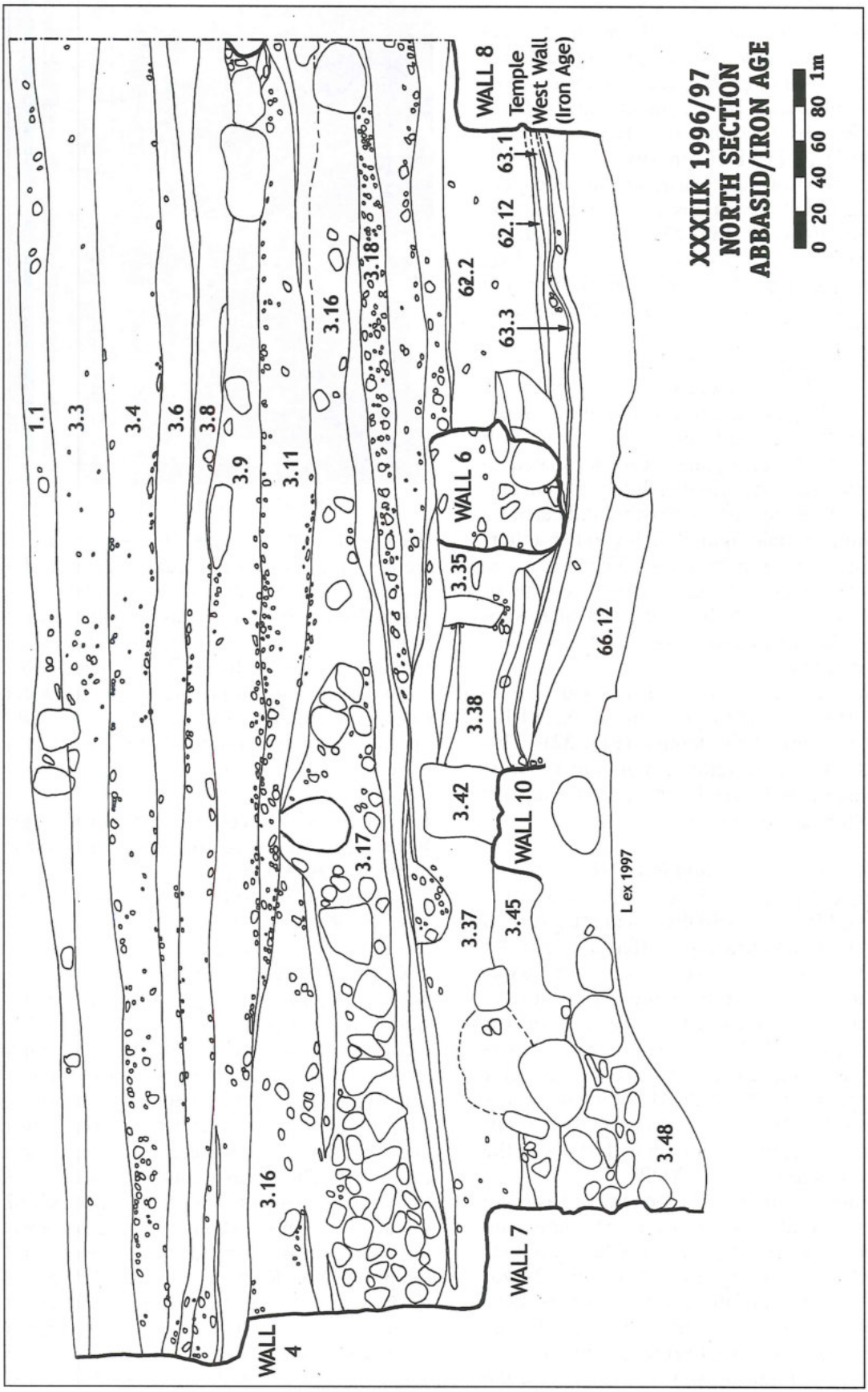
The temple was probably constructed towards the end of the MBA (ca. 1600BC), and after several intervening floor re-surfacing, suffered significant damage in what appears to be a major earthquake, probably early in the LB II period (ca. 1350BC). The structure was destroyed at the end of the Bronze Age (ca. 1150BC), and poorly restored during the Iron I period (ca. 1050BC), before a major rebuilding episode in the Iron I/IIA transitional period (ca. 950BC). The final destruction, which apparently brought temple use to an end, dates to the Iron IIA/B transition (ca. 850-800BC).

The original ground-plan of the temple has close parallels with similar structures at Shechem and Megiddo, and also with the much smaller structures at Tall Kittān and nearby Tall al-Ḥayyāt (Mazar 1992: 163-169). Most of these structures were constructed towards the end of the MBA (al-Ḥayyāt being the notable and still puzzling exception), and enjoyed long occupational histories throughout the LBA and well into the Iron Age, where several were rebuilt along significantly different lines (for Shechem, see Stager 1999). The Pella temple is particularly close in original design and occupational circumstance to that excavated at Shechem (for which see Bull 1960; Fowler 1986; Stager 1999), perhaps unsurprising given the documented links between the royal houses in the LBA. It is probable that the religious circumstances at both sites were similarly linked.

33. Trench XXXIIJ/K. View west from temple west wall (Wall 24).

5. Trenches XXXIIJ-K: The Iron Age Civic Building (ca. 1150-850BC). Architecture and Ceramics (Figs. 33-38)

As part of the exploration of the west temple region in 1996/97, a number of new 5 x 5m trenches were opened west and north of 1995 trench XXXIIG. Dense Late Antique domestic constructions (Byzantine through Abbasid), and several fragments of Late Roman and Middle Hellenistic architecture (heavily disturbed by Byzantine constructions) were encountered across the excavated area. Much of the 1996 season was taken up in the excavation of these structures, and only towards the end of that season were Iron Age layers encountered. The excavations continued in 1997, in two main exposures. The first, trench XXXIIK, ultimately 5 x 6m in extent, explored deposits against the outer northwestern face of the west wall of the temple (XXXIIK Wall 8/XXXIIG Wall 31). Immediately south of this exposure, trench XXXIIJ (ultimately 10 x 3 to 4m in extent), explored deposits against the outer southwestern face of the west wall of the temple (XXXIIJ Wall 13/XXXIIG



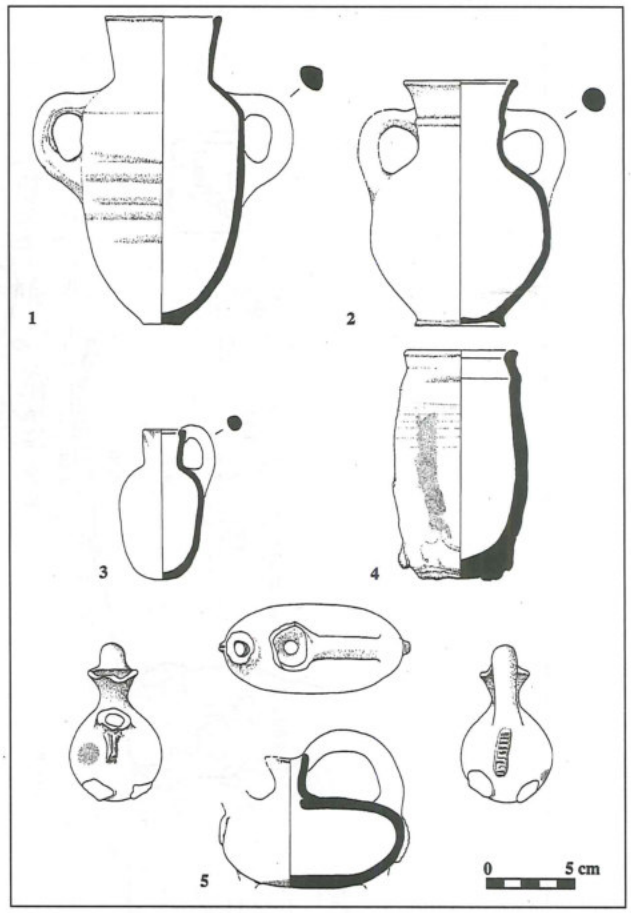
34. Trench XXXIIK. North section.

36. Trench XXXIIJ Loci 22 and 24. View east across mud-brick building.

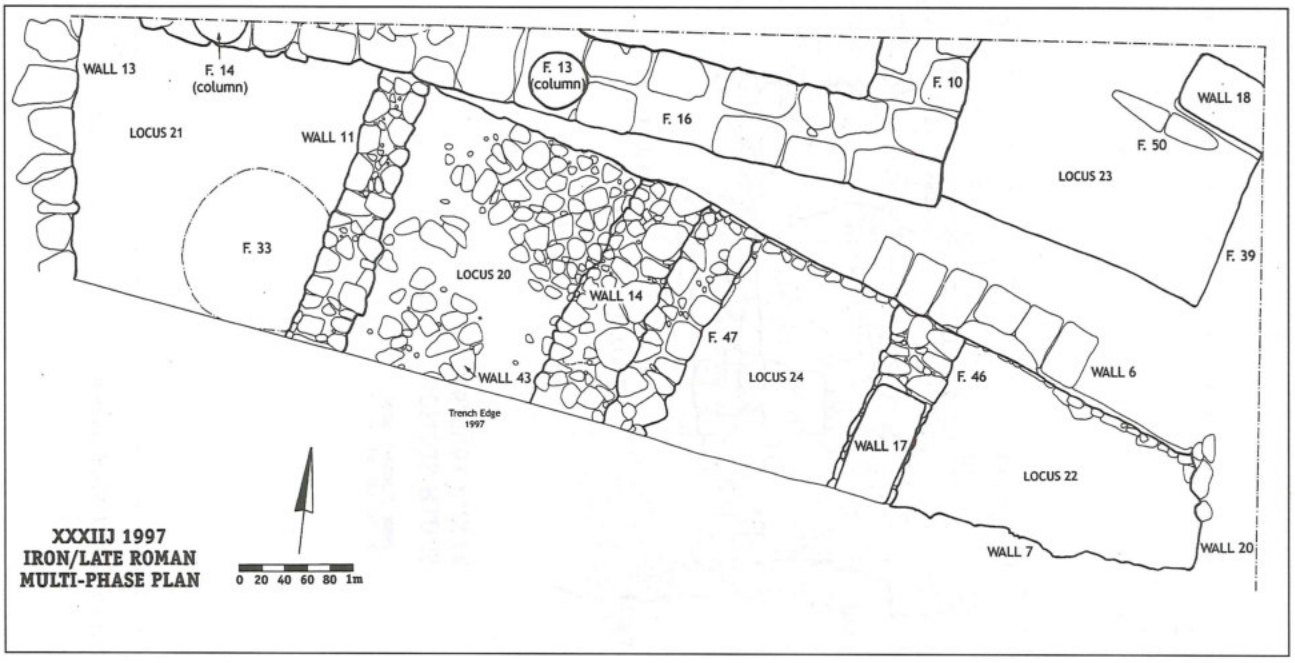
Wall 24).

In trench XXXIIK, thick deposits of Late Antique material and much baulk removal slowed excavations in 1997, such that Iron II levels were only reached towards the end of the season. Even so, a series of Iron II occupation deposits (XXXIIJ 3.30-48) and at least one architectural phase (Walls 7 and 10) were securely associated with the last phase of occupation in the temple.

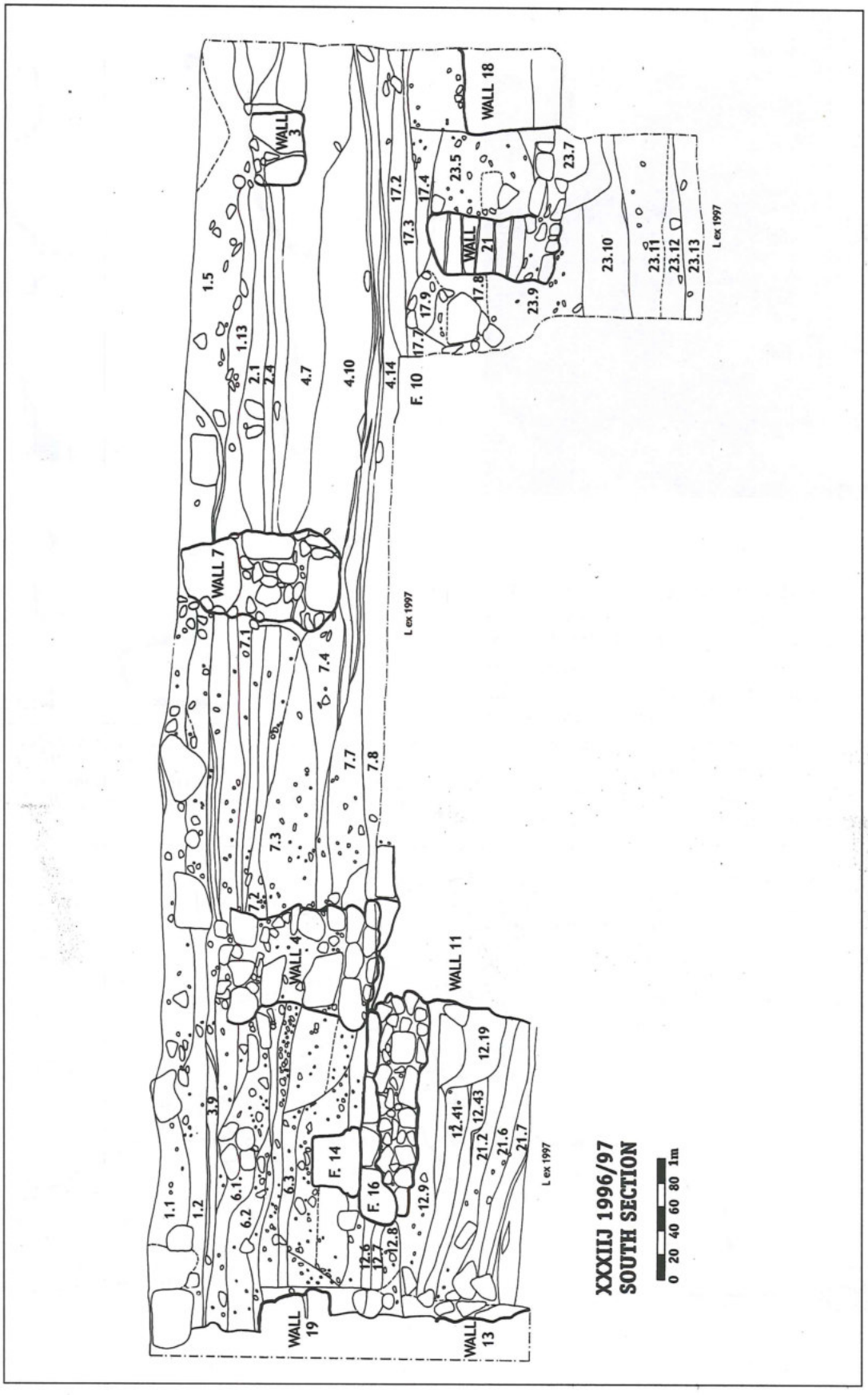
In trench XXXIIJ, extensive Late Antique constructions (Features 10, 13 and 16) restricted ex-



38. Trench XXXIIJ. Iron II pottery. 1. CN 17282, XXXIIJ 19.11. Amphoriskos. 2. CN 17283, XXXIIJ 19.8. Amphoriskos. 3. CN 17285, XXXIIJ 23.3. Dipper. 4. CN 17284, XXXIIJ 20.1. Beer jar. 5. CN 17286, XXXIIJ 20.2. Zoomorphic vessel.



37. Trench XXXIIJ. Plan of mud-brick building.



35. Trench XXXIIJ. South section.

posure to a relatively narrow 10 x 3m in places. Even so, excavations in 1997 quickly exposed several substantial mud-brick walls of a well-preserved building, sealed by thick layers of destruction debris.

Excavation within the building uncovered parts of five rooms (XXXIIJ Loci 20-24) of a large and well preserved mud-brick building. Considerable portions of yellow plastered red-brown and black mud-brick walls are preserved to a height of between three and four metres across the excavated area. Several phases of reconstruction and refurbishment are already evident, although the date of construction is yet to be determined. Several limited probes below destruction surfaces suggested an Iron I/IIA date for these last floors. The entire structure was destroyed in a major conflagration at some stage within the Iron IIA, probably that which finally destroyed the nearby Fortress temple. The presence of food preparation and serving vessels in some rooms and storage jars in others suggests a multi-function complex.

Many reconstructable vessels have been recovered from extensive destruction debris layers. Most are vessels used in the storage, preparation and consumption of food and drink, and all date to the Iron II period (**Fig. 38: 1-5**).

6. Chalcolithic, Bronze and Iron Age Small Finds (Figs. 39-42)

A. Stone Figurine

A1. Greenstone 'violin' Figurine (**Fig. 39: 1**). RN 200024, XXXIIF 20.52. Chalcolithic. Opaque fine grained pale apple coloured greenstone. L. 64mm x W. 44mm x Th. 5.2mm.

Violin figurines are among the most distinctive products of the Chalcolithic period. They are made predominantly of ground and polished limestone, although a variety of stone types, including calcite, marble, greenstone and sandstone have been recorded (Levy and Golden 1996: 153-156). Violin figurines are known from al-Ghassūl (Lee 1973: 278, LB 72) and Abū Ḥāmid (Dollfus and Kafafi 1995: 454-455). Miniature violin pendants in ivory and bone are known from al-Ghassūl (Lee 1973: 279, e-f; Bourke *et al.* 2000: 74) and in greenstone from Abū Ḥāmid (Dollfus and Kafafi 1988: 49, fig. 80). The extreme stylisation of most violin figurines is in contrast with more naturalistic, but much rarer basalt (Shiqmim) and ivory (Abū Maṭar/Ṣafad) figurines from the northern Negev (Levy and Golden 1996: 154-155).

The majority of violin-figurine find contexts west of the Jordan have been interpreted as cultic (Perrot 1959; Alon and Levy 1989; Levy and Golden 1996). The sheer concentration (fifty-nine) of such figurines at Gilat would seem to support such a contention (Levy and Golden 1996: 155). Whilst no Jordanian violin figurine comes from an explicitly cultic context, the Pella findspot does lie directly below later (MB/LB) cultic establishments associated with the Fortress Temple. However, the presence of violin figurines in Jordan Valley assemblages are best viewed as items of exchange rather than indigenous products (Alon and Levy 1989: 209; Dollfus and Kafafi 1995: 455), perhaps indicating some form of cult association between a Gilat central place and Jordan Valley peripheries.

B. Stone Vessels

B1. Calcite cylindrical jar (**Fig. 39: 4**). RN 190061, XXXIIF 11.12. MB/LB. RDia. 33mm x Base Dia. 33.5mm.

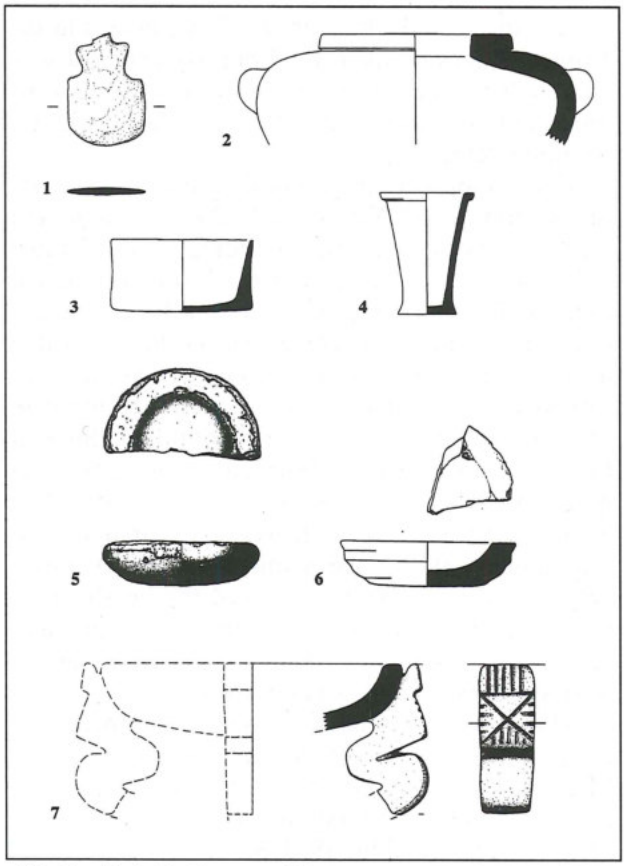
This vessel is an Egyptian import, of a form that was very popular in Egypt as a container for funerary oils, and for use in foundation deposits, often in miniature form. They are not common in the Levant, where they appear primarily in funerary deposits. Parallels date largely from the MBIIB-LBI periods, and include examples from Jericho (Kenyon 1965: figs 100.3, 154.12; Garstang 1933: pl. XVII.7), Khirbat Kufin (Smith 1962: pl. XVII.34, 36) and Tall al-'Ajūl (Petrie 1931: pl. XXV.5). The example from Pella is the first to appear in a cultic deposit.

B2. Diorite bowl fragment (**Fig. 39: 2**). RN 200012, XXXIIG 114.7. LB/EI. RDia. 160mm Pres. Ht. 95mm.

The shape has its best parallels with Egyptian hard stone vessels dating back to the Early Dynastic period (Aston 1994: Type 108, Dynasties 1-5). The use of diorite also points to this dating for the piece, as this material was rarely used for stone vessels after the Fourth dynasty (Aston 1994: 15, fig. 21). Our vessel would therefore seem to predate its depositional context by a considerable period. One probable explanation for this phenomenon is that the object had re-entered circulation through the looting of Early Dynastic tombs in Egypt. This phenomenon is not unknown, with bowls of similar form from Late Bronze and early Iron Age contexts at sites such as 'Ayn

Shams (Grant 1938: pl. LIV.65), Bayt Shan (Rowe 1940: pl. LIIA.6), Kamid al-Lawz (Lilyquist 1996: pl. 28.1-3 and 29.1-2) and Rās Shamrā (Caubet 1991: 242, pl. I.1-2).

B3. Stone Tripod Bowl (**Fig. 39: 7**). RN 180038, XXXIIG 5.4. Iron IIA. Ht. 87mm x RDia. 165mm x Th. 10mm. Munsel 7.5 YR 5/0 'grey', with variegated whitish streaks, 10 YR 7/2 'light grey' .Mohs 3.5-4.0.
This fragment belongs to a tripod bowl, a popular Iron Age type that is more usually found in basalt. The use of a dark-coloured crystalline stone for this example may seek to imitate basalt versions. The execution is extremely fine, with a degree of care in the shaping, decoration and finish not seen on many basalt vessels. The shape, with its elaborately carved feet, is in itself unusual, although a general similarity can be detected to 'gate-leg' tripod bowls found at sites such as Hazor (Yadin 1959: pl. LXX.26, LXXI.28 and pl. CLIV.1; Yadin *et al.* 1960: pl. LXXVII.1), Hurvat Rosh Zayit (Gal 1994: figs. 1-2), Megiddo (Lamon and Shipton 1939: pl. 112.13, 15 and 17) and Tall Bayt Mirsīm (Albright 1943: pl. 29.16-16a and 30.7). These usually feature sculpted feet with raised knobs on the outer face near the base and closer to the top of the bowl. Some of the feet feature incised linear designs on the outer face. The feet are usually linked at the bottom by cross-bars extending from each foot to join a central column from the base of the bowl.



39. Small finds. Stone and faience vessels. 1. RN 200024, XXXIIF 20.52. Greenstone violin figurine. 2. RN 200012, XXXIIG 114.7. Diorite Early Dynastic Egyptian Bowl. 3. RN 190068, XXXIIE 10.113. Faience bowl fragment. 4. RN 190061, XXXIIF 11.12. Calcite cylindrical jar. 5. RN 170071, XXVIIIB 11.3. Iron IIA/B. Faience palette fragment. 6. RN 170072, XXVIIIB 11.2. Limestone palette fragment. 7. RN 180038, XXXIIG 5.4. Crystalline stone tripod bowl.

C. Stone and Faience Palettes

C1. Faience palette (**Fig. 39: 5**). RN 170071, XXVIIIB 11.3. Iron IIA/B. Ht. 18mm x Dia. 87mm. Faded glaze, Munsel 7.5 GY 7/1 'light greenish grey' .Mohs 2.0. C2. Limestone Palette fragment (**Fig. 39: 6**). RN 170072, XXVIIIB 11.2. Iron IIA/B. Ht. 24mm x Dia. 90mm. Munsel 5Y 7/1 'light grey' (top) - 5Y 6/1 'Yellowish grey' (base). Mohs 3.5-4.0.
Small, solid mortars of this kind with thick walls and limited capacity are usually known as cosmetic palettes, probably because they would be suitable for mixing or grinding cosmetic, although few examples show either the residues or pigment staining inside the bowl that might be expected to indicate such activities (Crowfoot *et al.* 1957: 464; Barag 1982: 14). Another possibility is that they were used for grinding small quantities of non-cosmetic goods, such as medicines or spices (Thompson 1971: 61 n.1). At Hazor, a palette of this type was found near a pestle made of the same material; they were probably intended as a set (Thompson 1971: 64).
Palettes have been found in contexts ranging from the eighth to the early sixth centuries BC, although the majority has some kind of incised geometric decoration around the rim. Limestone was the most popular material, but glass and faience could also be used. Two examples of the latter were found in Megiddo Stratum II (Watzinger 1929: fig. 19; Lamon and Shipton 1939: pl. 108.12). According to Barag neither faience nor glass was produced in Palestine at this period, which suggests that the example from Pella is an import, perhaps from Phoenicia (Barag 1982: 16). The origin of the limestone example is less certain, as current distribution patterns of this class of material would tend to favour an origin in northern Palestine (Albright

1943: 81; Barag 1982: 16; Thompson 1971: 61-62).

D. Faience Vessel

D1. Faience bowl fragment (**Fig. 39: 3**). RN 190068, XXXIIE 10.113. LBII. Glaze originally dark blue, now hydrated to yellowish white. Ht. 41mm. x Dia. 74mm. x Th. 3-7mm; RDia. 80mm, Base Dia. 81mm.

A similar bowl fragment was found in the Late Bronze Age sanctuary at Dayr 'Allā Franken 1992: fig. 3-9.11), with a further two examples coming from Megiddo (Guy and Engberg 1938: pl. 168.1, fig. 185.2; Loud 1948: fig. 409, pl. 191.8). This type of object is sometimes referred to as a Kassite 'bucket', with complete examples usually having two raised lug handles above the rim. It is a type that originates in Babylonia during the late 14th century BC with examples being traded further abroad, to sites such as Mari, Emar, Ugarit and Enkomi (Clayden 1998: 55, fig. 1). These vessels appear primarily in funerary deposits, and depictions of similar objects on seals and relief's suggest strong ritual associations. It is not known whether such associations were preserved when vessels were traded elsewhere, although the discovery of two examples in Canaanite cultic areas at Pella and Dayr 'Allāmay favour the suggestion.

E. Metal Objects

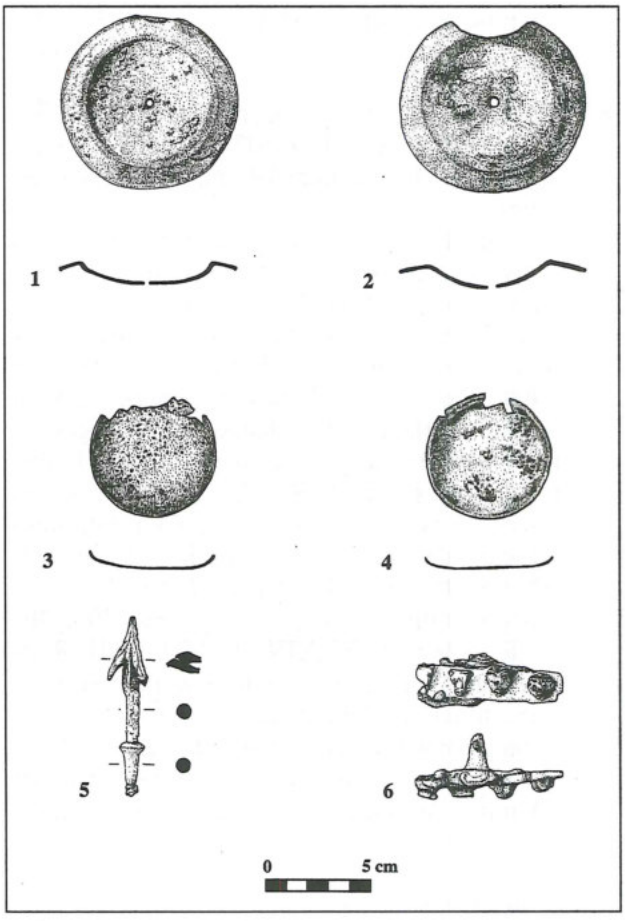
E1. Copper/copper alloy cymbal (**Fig. 40: 1**). RN 200015, XXXIIE 15.4. LBII. Dia. 125mm x Th. 2mm; Central hole Dia. 4mm

E2. Copper/copper alloy cymbal (**Fig. 40: 2**). RN 200016, XXXIIE 15.4. LBII. Dia 131mm x Th. 2.5-3mm; Central hole Dia 5mm.

The hole at the centre of each cymbal would have been used to attach a small finger loop, either of bronze, or more perishable material such as leather or cloth. Comparable cymbals are known from various LBII and Iron I deposits such as the Ulu Burun shipwreck (Bass 1986: fig. 28), the Level VII destruction at Tall Batash (Kelm and Mazar 1995: fig. C12 top right), Megiddo Stratum VIII-VI (Loud 1948: pl. 185.4-7), and the Stratum X temple at Tall Mevorakh (Stern 1984: 18, 23, fig. 3.2, pl. 31.2-3).

E3. Copper/copper alloy balance pan (**Fig. 40: 3**). RN 200013, XXXIIE 15.4. LBII. Dia 88mm. x Th. 1.5mm.

E4. Copper/copper alloy balance pan (**Fig. 40: 4**).



40. Small finds. Metal objects. 1. RN 200015, XXXIIE 15.4. Bronze cymbal. 2. RN 200016, XXXIIE 15.4. Bronze cymbal. 3. RN 200013, XXXIIE 15.4. Bronze pan scale. 4. RN 200014, XXXIIE 15.4. Bronze pan scale. 5. RN 190074, XXXIIG 107.24. Bronze spearhead/harpoon. 6. RN 190073, XXXIIG 107.20. Bronze inlay of animal heads.

RN 200014, XXXIIE 15.4. LBII. Dia 88mm x Th. 1.5-2mm.

Objects of this kind usually had four holes around the outer edge, which was used to suspend them from a balance arm. Similar objects are known from sites such as Tall al-'Amārna in Egypt (Doll 1982: 60, cat. 31), while Egyptian tomb scenes of the New Kingdom depict small balances in use, including a famous scene showing the docking of a Canaanite merchant ship (Doll 1982: figs. 23-24). Bronze scale pans are also known from contexts ranging in date from the Late Bronze through to the Persian periods at sites such as Megiddo (Guy and Engberg 1938: pls. 125.6-9, 167.3), Ashdod (Dothan and Porath 1982: fig. 12.3) and Tall Michal (Herzog *et al.* 1989: fig. 25.15.310). The accompanying balances were probably made from more perishable materials, such as wood, although examples in bone and ivory

have occasionally survived (Barkay 1996: 75, 77).

E5. Copper/copper alloy spearhead (**Fig. 40: 5**). RN 190074, XXXIIG 107.24. LBII. Length 130mm x Dia. (collar) 19mm; Width of head 13mm.
This small spearhead may have belonged to a votive or cult statue, with the attributes of a warrior god such as Reshef or El. It has some resemblance to a barbed 'harpoon' discovered in a LBA hoard at Tall Munbaqa (Werner 1998: fig. 113), and may also hark back to larger spearheads with flanged 'stop ridges' at the top of the tang, as known from MBI contexts at sites such as Rās Shamrā, Byblos and Carchemish in the Northern Levant, although these predate the Pella example considerably (Philip 1989: Spearhead Type 2, 70-71).

E6. Narrow copper or copper alloy strap (**Fig. 40: 6**). RN 190073, XXXIIG 107.20. LBII. Rectangular section, tapering to a straight edge at one end and broken at the other. There is a tapering point projecting from the underside of the strap, which is square in section. Length 104mm x Width (tapering bar) 36mm; Height with projecting point 38mm.

F. Faience Cylinder Seals

F1. Faience cylinder seal (**Fig. 41: 1**). RN 190075, XXXIIG 107.17. LB II. Pierced through length. Traces of blue-green glaze ext. The surface is divided into two metopes, framed by vertical bands of oblique hatching in opposing directions on either side, with a single horizontal line as frame at the top and bottom of the scene. The first metope contains a horned quadruped, looking back over its shoulder; the second, an uncertain repeated motif, perhaps 3 stylised heads, placed sideways in the field. Length 31mm. x Dia. 12.5mm; Dia. (hole) 5mm.

F2. Faience cylinder seal (**Fig. 41: 3**). RN 190076, XXXIIG 107.37. LB I/II. Pierced through length. Faint traces of blue glaze ext. Decorated with two figures wearing fringed mantles, looking in the same direction, standing either side of a bouquet tree with five branches and cross bars across two areas of the trunk. The pattern then splits into three horizontal registers, with a running foliate design at the top, two quadrupeds with crossed horns in the centre, positioned sideways in the field, then a guilloche pattern across the bottom. The whole scene is framed by horizontal lines above and below. Length 28mm x Width 12mm. x Th. 11mm, Dia. (hole) 3mm.
Both seals belong to the Mitannian Common Style, a class that was popular in the Levant throughout the Late Bronze Age, and which may have been manufactured in a number of workshops across the region. A close parallel for RN 190075 was found in Bayt Shan Level X (Parker 1949: pl. VI.40), with more generic parallels for individual elements and style found at Atchana (Collon 1982: 67, cat. 38), Megiddo (Lamon and Shipton 1939: pl. 66.4) and Rās Shamrā (Schaeffer-Forrer 1983: RS 8.349, RS 25.381). Parallels for RN 190076 include seals from Gezer (Parker 1949: pls. V.34, XV.94), Bayt Shan Levels IX and VII (Parker 1949: pls. VI.45, XIV.90; James and McGovern 1993: pl. 58e), and Atchana Levels III-IV (Collon 1987: cat. 257). The form of the bouquet tree depicted here seems to be an earlier version of this motif.
An association between cylinder seals and temple deposits is not unique to Pella. At Bayt Shan, the majority of cylinder seals found in Levels VIII and VII came from the temple precinct, where it has been suggested that they were used as foundation deposits or votive offerings (James and McGovern 1993: 230-1). At Tall Mevorakh, a similar association was seen, with two faience seals discovered on the temple platform (Stern 1984: 25).

G. Glass Cylinder Seal Blanks

G1. Blue-green glass cylinder seal blank (**Fig. 41: 2**). RN 190077, XXXIIH 10.15. LB/EI. Pierced through length. The surface is blank, except for a single circular depression near one edge. Length 32mm x Dia. 15mm; Dia. (hole) 5mm.

G2. Blue-green glass cylinder seal blank (**Fig. 41: 4**). RN 190081, XXXIIG 107.7. LB/EI. Pierced through length with small hole. Blank surface. Length 53mm x Dia. 20mm; Dia. (hole) 4mm.
A similar object was published from Tall Mevorakh Stratum X, where it was described as a bead with the 'form of a cylinder seal') Stern 1984: 26, fig. 4.27). However glass seal blanks are known in the Near East from the Late Bronze Age (Barag 1985: 30, 36). Comparable examples were also found in the palace, temple and housing at Tall Brāq, which the excavators also interpreted as probable seal blanks (Oates *et al.* 1997: 27, 34, 58).

Glass was less popular for cylinder seals than materials such as faience, or hard stones such as hematite, rock crystal and jasper. However, like the latter, glass seals could be imported as ready-to-carve blanks, and even finished seals could be ground down and recut (Barag 1985: fig. 2.24). This is in keeping with the way many Bronze Age craftsmen appear to have treated glass — as a stone rather than a silicate — leading to use of drills and abrasives in shaping vessels and objects rather than casts and moulds (Barag 1985: 32; 1993: 115-6). Whether these blanks were imported from Syro-Mesopotamia or manufactured locally, their appearance inside the temple suggests that they may have been deposited as votive offerings, either for the intrinsic value of their material or as objects representative of more finished products.

H. Glass Objects

H1. A large piece of cobalt blue glass (**Fig. 41: 5**). RN 190083, XXXIIG 107.9. LB/EI. Pale sky blue to greyish-white at surfaces with patches of tan brown patina; sky blue to dark cobalt blue interior, darkest towards the centre; it features a flat upper surface sloping down to three flattened sides with a flat underside; roughly triangular in plan view. Probably a piece of raw material, perhaps originally from a larger ingot. Length 100mm x Width 67mm x Th. 42mm; Weight 220 grams.

A similar irregular piece of raw glass was found at Bayt Shan in Level VIII locus 1304, and in addition a solid glass sphere was found below the altar steps in the Level VII temple. Both probably represent refuse or unused raw material from local industry (James and McGovern 1993: 151-2). The position of the latter might suggest that this was deliberately included as a votive offering, rather than being an industrial discard. Another glass ingot fragment was found in Ashdod Stratum XII (Dothan and Porath 1993: fig. 38.8). Glass ingots have also been found at Nuzi (Barag 1970: 140, fig. 16), and in the Late Bronze Age palace at Tall Brāq (Oates *et al.* 1997: 85, 89, fig. 124). Bun-shaped glass ingots, including several cobalt blue examples, were also part of the cargo of the Ulu Burun shipwreck, while moulds for this type of ingot are known from Tall al-'Amārna, in association with cobalt blue glass residues (Nicholson *et al.* 1997: 145). While the issue of where the Pella ingot was originally manufactured must remain open for the present, its presence in the region is in keeping with textual evidence that shows Palestinian courts acting as agents in the glass ingot trade (Moran 1992: EA 323, 327, 331).

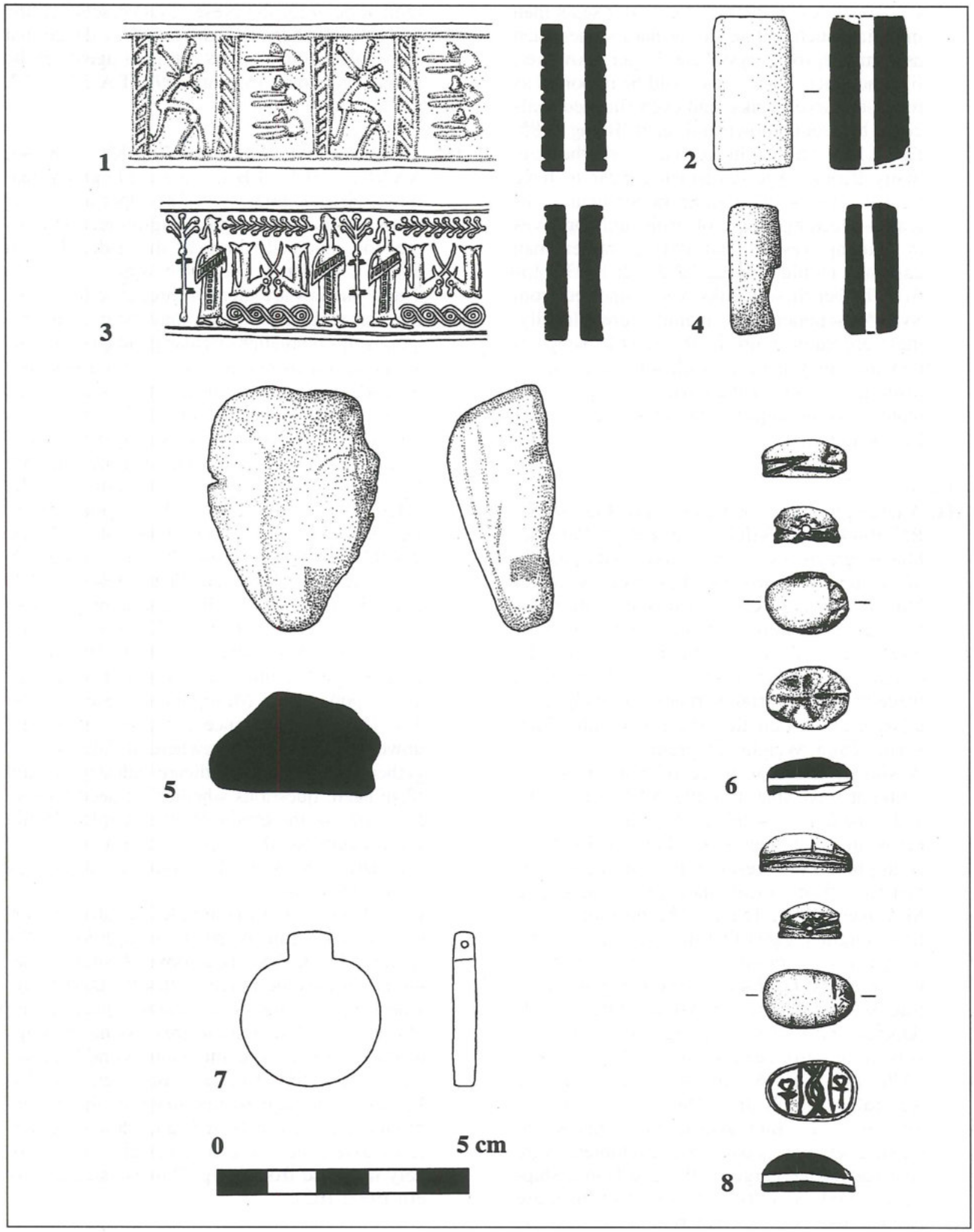
H2. Glass plaque (**Fig. 41: 7**). RN 190048, XXXIIG 107.17, LB II. Pale apple green, featuring circular body with flat upper and lower surfaces, and a rectangular lug projecting from the top, pierced through the side. Length 64mm x Th. 8mm; Dia. (hole) 4mm.

These plaques are pierced through a lug at the top for suspension, and may bear some relationship to smaller circular pendants worn as amulets, sometimes decorated with a star motif, and thus linked to metal amulets connected to the cult of Ishtar (Barag 1970: 140, 189). Similar objects have been found in primarily cultic contexts ranging from LB I into the Iron I period, at sites such as Bayt Shan Level IX (McGovern 1985: cat. 305), Megiddo Strata IX, VII and VI (Loud 1948: pls. 210.41, 214.92, 216.119 respectively), the Stratum X temple at Tall Mevorakh (Stern 1984: fig. 4.1-2, pl. 32.3-4), in the palace and temple at Tall Brāq (Oates *et al.* 1997: fig. 222.83-4), as well as at Nuzi (Starr 1937: pl. 120WW). It has been suggested that the Palestinian examples are imports from Mesopotamia (Stern 1984: 26). However, evidence for glass ingots and unworked fragments elsewhere in Palestine, together with signs of a silicate industry at Bayt Shan itself, questions whether we need look so far north for the origin of all examples. While the concept for this type of object may have originated in Syro-Mesopotamia, these examples need not.

Finds from within the temple included numerous glass and faience beads, in addition to the silicate objects described above. A similar phenomenon may be noted at nearby Bayt Shan, where silicate beads, pendants, spacers, and plaques were found in the area around the steps leading to the temple altar (James and McGovern 1993: 155). Compositional analysis led McGovern to suggest that many of these were produced locally at Bayt Shan, while other object classes, such as faience vessels, were probably imported from Egypt (James and McGovern 1993: 162).

I. Scarabs

I1. Steatite scarab (**Fig. 41: 8**). RN 170131, XXXIVF 17.7. Off-white to beige in colour,



41. Small finds. Seals and scarabs. 1. RN 190075, XXXIIG 107.17. Faience cylinder seal. LBII. 2. RN 190077, XXXIIH 10.15. Glass cylinder seal blank. LB/EI. 3. RN 190076, XXXIIG 107.37. Faience cylinder seal. LB I/II. 4. RN 190081, XXXIIG 107.7. Glass cylinder seal blank. LB/EI. 5. RN 190083, XXXIIG 107.9. Glass ingot. LB/EI. 6. RN 170173, XXIIIB 15.1. Faience scarab. LB/EI. 7. RN 190048, XXXIIG 107.17. Glass plaque. LB II. 8. RN 170131, XXXIVF 17.7. Faience scarab. MB/LB.

pierced longitudinally for suspension. Lightly polish surface. Damaged near the perforation at the head. Chip missing from edge. The plain schematically modeled back bears an oblique line delineating the head from the thorax, with two small nicks at the edge defining the thorax from the wing case. The head and clypeus tend towards 'hourglass' shape, and are separated by two tiny diagonal nicks. The scarab body is separated from the base by two horizontally incised lines from threading hole to rear. An incised oval border frames a tripartite design along the length of the scarab. The design consists of a "knotted rope" flanked by a single incised line and an *ankh* sign on each side. L. 18mm x W. 12.5mm x Th. 7.5mm.

This object belongs to Tufnell's group with 'coiled and woven patterns, encompassed with a central twist') Design Class 6C2). It also features flat, plainly carved sides (Type E11) and back (Type O), with little detail. This class is best known from Tall al-'Ajūl where it would appear to be associated with deposits dating to the MBIIB/C and MBIIC period (Tufnell 1984: 126). From Tomb 3175 at Megiddo, a scarab with very plain sides and flat back has two *ankh* signs within oval frames, flanking a twisted rope (Tufnell 1984: 312-313). At Tall al-Yahūdiyah, a related type without *ankh* signs was found associated with Tall al-Yahūdiyah ware juglets, probably dated to the 17th century (Tufnell 1978: fig. 2:23). A date within the second half of the seventeenth century is consistent with parallels.

I2. Faience Scarab (**Fig. 41: 6**). RN 170173, XXIIIB 15.1. LB/EI. The scarab is glazed opaque pale blue on grey-white faience and pierced longitudinally for suspension. It is mould made, with very indistinct details. It has a rough and grainy surface finish, and is missing part of the base. The back is plain, with a single line dividing the head from the thorax. The simple trapezoidal head and clypeus create 'hourglass' shape. On the sides, a single horizontal incision and oblique line defines the back legs. The base design is indistinct. A long thin concave shape across the length of the scarab is flanked on one side by two smaller ovals, the design perhaps a schematic floral motif. The glaze is friable. L. 16mm x W. 12.5mm x Th. 7.5mm.

Mould-made faience scarabs do not occur in Egypt before the reign of Tuthmosis III, after which time they become common (Nicholson 1993: 32). However, dating this scarab typologically poses a particular difficulty because the moulding is very coarse. The sides and back could be placed anywhere after the mid-fifteenth century BC. The base design can be interpreted as a variation on the floral motif in the form of a cross with space-fillers, and a scarab impression bearing a related design with a patterned border from Tell Keisan is dated to the Iron IB period (Keel *et al.* 1990: 245 taf. x. 28). The Pella scarab was found in deposits dating to the LB/EI period, which probably suggests an LB/EI floruit for the type, although it remains possible that the piece may be an heirloom.

J. Ivory and Bone Items

J1. Ivory inlay fragment (**Fig. 42: 1**). RN 190053, XXXIIG 107.17. LBII. Flat upper and lower surfaces. Cut in the shape of a profiled head, with hair, ear and part of one eye preserved. The hair is decorated with a lightly incised pattern, featuring groups of alternating large and small v-shaped incisions running obliquely across upper hair, and vertically down the sides. Length 38.5mm x Width 26.5mm x Thickness 2.8mm.

Although there is a strong Canaanite tradition in bone and ivory inlays dating back to the Middle Bronze Age, human figures were rarely depicted, with inlays tending to incorporate geometric shapes, linear and circular patterns, and the occasional zoomorphic element such as birds and snakes (Liebowitz 1977). This tradition began to change as a more international style of ivory carving developed. Early Egyptian features are seen on the Middle Bronze Age ivories from al-Jisr (Amiran 1977) and Palace P at Ebla (Scandone Matthiae 1990). In the Late Bronze Age a wider range of elements of Egyptian iconography were incorporated into Canaanite repertoires, and it can become difficult to isolate purely Egyptian work from that of Levantine artisans working under Egyptian influence. Our piece probably belongs to this phase of development as the style has a strongly Egyptianising feel. The use of ivory, rather than bone, points to a comparatively prestigious item, reminiscent of the ivory inlays found some years ago in the Governor's Residence complex at Pella (Potts 1987).

J2. Bone inlay (**Fig. 42: 2**). RN 190054, XXXIIG

107.14. LB II. Flat upper and lower surfaces, and part of one corner preserved, with straight, slightly uneven edges. Polished upper surface with shallow incised linear decoration featuring what may be a floral or plant motif. The underside has a shallow circular depression in the centre. Thickness 4-5mm.
The depression on the back of this fragment was probably intended to help fit the inlay onto a larger, composite object. Decoration in a comparable style may be seen on two ivory pyxis fragments from Rās Shamrā (Gachet 1987: pls. 2.22, 6.53).

J3. Bone pendant (**Fig. 42: 3**). RN 170125, XXVIIIB 17.1. Iron II. Slightly pointed base, sides tapering to a flat top. Pierced near apex, and oval in section. Decorated on four sides with vertical row of incised and black inlaid dotted circles. Complete, with polished exterior. L. 51mm x W. 8mm x Th. 7mm.
Ivory and bone pendants of this kind were popular during the Iron Age, and probably served as simple jewellery (Platt 1978). The dot-circle motif was the most commonly used, although linear designs are also known. Examples with similar decoration have been excavated at numerous sites, including Hazor (Yadin *et al.* 1961: pl. CLXXIX. 29), Tall al-Fār'ah (Chambon 1984: pl. 73: 1-3) and Lachish (Tufnell 1958: pls. 37.7 and 55. 23). An undecorated pendant of similar shape (RN 70111, IIIN 33.1) was found at Pella in an Iron I/IIA context in 1985.

K. Metal Sheet Inlays and Fittings

K1. Fragment of gold sheet metal (**Fig. 42: 4**). RN 190063, XXXIIG 107.14. LBII. Narrow rectangular body with a raised ridge running along the centre. Bent and slightly twisted. Length 46mm x Width 2mm x Thickness 0.5mm.
This thin strip was probably originally used as an overlay on another object, perhaps folded or glued in place, as no holes for attachment are visible. Sheet overlay of this kind is known from contemporary deposits at Bayt Shan Level VIII-VII (James and McGovern 1993: 182, figs 106.6-7), Lachish (Tufnell *et al.* 1940: pl. XXVI.28), Kamid al-Laws (Miron 1990: pl. 6), and the Tall Brāq palace (Oates *et al.* 1997: fig. 236.71-3).

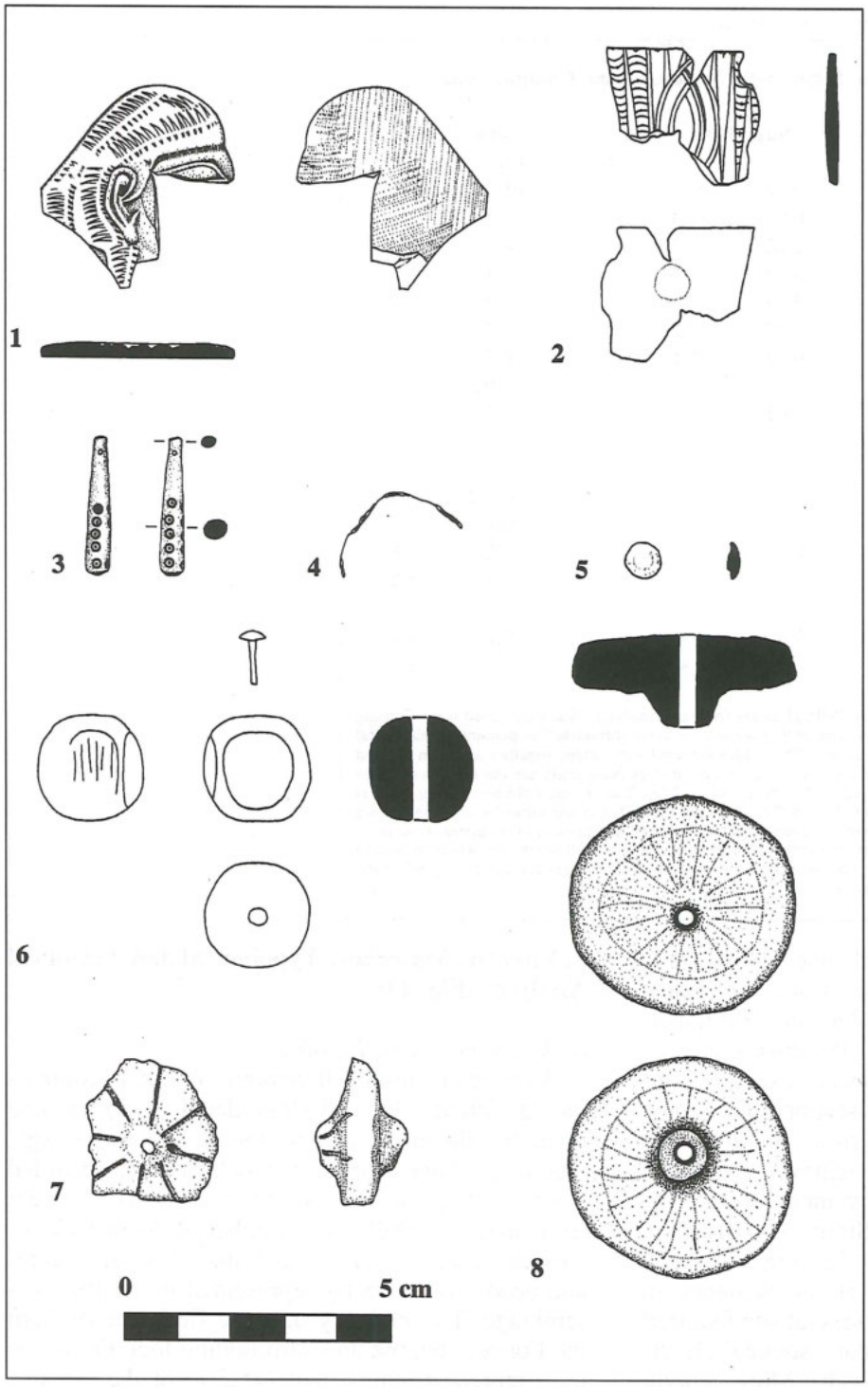
K2. Copper/copper alloy stud overlaid with gold foil (**Fig. 42: 5**). RN 190064, XXVIIIC 10.16. MB/LB. Hemispherical head with edges folded over onto the underside. Dia. Head 4.5mm x Th. 2mm; Length 6.5mm.
Studs of this kind were probably used to decorate furniture and boxes, with only the visible elements covered in gold leaf or foil. Similar examples are known from Tall al-'Ajūl deposit 1504 (Petrie 1932: 7, pls. IIIC, IV), Bayt Shan VIII (James and McGovern 1993: 207, fig. 153.5), Tall Abū Ḥawwam Stratum V (Hamilton 1935: 60, cat. 371), the Fosse Temple at Lachish (Tufnell *et al.* 1940: pl. XXVI.23-7), the 'Schatzhaus' at Kamid al-Lawz (Miron 1990: pl. 9.1-8), and the palace at Tall Brāq (Oates *et al.* 1997: fig. 233.41, 236.70).

L. Jewellery

L1. Spherical lapis lazuli bead, found with small gold pin/rivet with hemispherical head (**Fig. 42: 6**). RN 200006, XXXIIG 114.15. LB II. Incised circle on one side, and more oval shaped area adjacent to it, with traces of an illegible inscription inside. Bead Dia. 19.75mm x Ht 19.75mm; Pin Head Dia. 5mm x Length 10mm; Shaft Dia. 1-1.5mm.
The incised oval on its outer face suggests that the lapis bead may have originally carried an Egyptian royal name inscription, of the kind seen on carnelian beads from earlier contexts at Rās Shamrā)Schaeffer 1962: fig. 20) and Tall al-'Ajūl (Petrie 1931: 7, pl. XIII.43). However, it is impossible to identify the script, far less the royal name. The small gold pin fits within the thread hole of the bead, but is too short to have functioned as a fastener for it. It seems likely therefore that the association is accidental, and that this pin was originally used to decorate another object. Both the pin and the lapis lazuli bead represent luxury materials, and were probably part of larger composite objects, which served as prestigious votive offerings.

M. Ceramic Model Wheels

M1.Ceramic model wheel fragment (**Fig. 42: 7**). RN 200028, XXXIIJ 20.1. Iron IIA. Fabric has a few small white lime inclusions, fired grey at core and red at surfaces. Originally circular with flat upper and lower faces, and raised hub projecting from either side, pierced through centre. Broken on all edges. Decorated with rough incised spokes radiating out from the central hub on one side, with traces of a dark red painted band around the hub on the other. Length 50.6mm x Width 51.5mm x Thickness



42. Small finds. Ivory, Bone, Jewellery, Gold and Ceramics. 1. RN 190053, XXXIIG 107.17. Ivory inlay (Head). LBII. 2. RN 190054, XXXIIG 107.14. Incised wood furniture inlay. LB II. 3. RN 170125. XXVIIIB 17.1. Bone pendant. iron IIA. 4. RN 190063, XXXIIG 107.14. Strip of gold sheet. LB II. 5. RN 190064, XXVIIIC 10.16. Copper stud covered with gold foil. MB/LB. 6. RN 200006, XXXIIG 114.15. Lapis bead with associated gold pin. LB II. 7. RN 200028, XXXIIJ 20.1. Ceramic wheel fragment. Iron IIA. 8. RN 190069, XXXIIJ 12.30. Ceramic wheel. Iron IIA.

31.4 mm. Munsell 10 R 6/6 (surface), 10 R 5/4 (paint). Mohs 3-3.5.

M2. Ceramic model wheel (**Fig. 42: 8**). RN 190069, XXXIIJ 12.30. Iron IIA. Fabric has many medium and large white lime inclusions, fired red int. and buff at surfaces, and covered with a greyish buff slip on one side. Circular in plan view, with flat inner and outer surfaces and slightly convex outer edge. Pierced through centre, and with a moulded raised hub around the hole on one side only. Decorated on both sides with rough, irregularly incised spokes radiating out from the central hole, and framed by an outer circle. Length 80mm x Width 82mm x Thickness 16mm. Munsell 5YR 6/4 (fabric), 2.5Y 7/2 (slip). Mohs 3.5.

43. Chemical analysis of glass ingot with comparisons.

Table 1. Analysis of Pella Glass Ingot with Nuzi/Amarna Comparisons

Oxide	Pella Ingot	Nuzi Glass		Amarna Glass	
				Cu	Co
SiO_2	74.93	69.95	68.4	65.9	64.1
Al_2O_3	0.38	0.62	0.7	1.1	2.4
CaO	3.69	3.22	7.7	8.5	7.8
MgO	2.14	6.11	4.5	3.8	3.7
Na_2O	12.89	15.08	15.5	15.2	19.2
K_2O	3.04	2.32	2.8	2.7	1.1
Fe_2O_3	0.34	0.35	0.5	0.7	0.5
CoO	0.03	-	-	0.02	0.17
CuO	2.23	1.63	-	1.54	0.19
P_2O_5	0.00	-	-	0.2	0.1
MnO	0.02	-	-	0.04	0.22
PbO	0.04	0-0.1	-	0-0.2	0-0.1
SnO_2	0.0	-	-	0.1	0-0.1
Sb_2O_3	0.0	0.0	-	0.2	0.33
SO_3	0.14	-	-	0.3	0.2
ZnO	0.04	-	-	-	-
TiO_2	0.04	0.0	-	0.1	0.1
SrO	0.03	-	-	-	-

Notes to Table 1: The results achieved for the Pella glass are from one analysis. Standards used were Corning Glass Standard B, NBS 278 and NBS 1633a. The components have been normalised as percentage elemental oxides to allow comparison with different glasses. The oxides detected were added together and then divided through to normalise the sum to 100%. The figures in the first column of Nuzi glass are the translucent blue glass M79/1 analysed five times and averaged by Vandiver (1983, 243). The second column of Nuzi glass is from Brill's analyses (Lilyquist & Brill 1995, 41). SiO2 values are estimated in the latter by difference from 100%. Nine Amarna copper blue glasses were analysed by Shortland. The averaged results appear in Amarna column one. Shortland also analysed ten Amarna cobalt blue glasses, the averaged results for which appear in Amarna column two (2000, 144). Opacity or translucency was not indicated. Ranges are given only when the average would have been zero. A dash indicates no results given.

Ceramic model wheels with one or two hubs appear in contexts dating from the Early Bronze Age through to the Persian period, usually as part of larger composite objects such as cart or chariot models. 'Spoked' examples are comparatively rare. The closest parallel is provided by a model wheel from Ashdod, and here the spokes have been achieved by pinching the clay, rather than by incision (Dothan and Porath 1993: fig. 18, Stratum XIIIB, Iron IA). Another example from Tall Jemmeh has a combination of linear and floral elements on the surface, while others from that site featured serrated edges for a similar 'spoked' effect (Petrie 1928: pl. LXI.99 e-f, h). More generic contemporary parallels include examples from Jerusalem Cave II (Eshel and Prag 1995: fig. 8.21) and in a variety of Iron II to Persian contexts at Tall Jemmeh (Petrie 1928: pl. LXI.99 k, 99 p). Each of the two wheels from Pella has distinct styles and shapes, and they probably came from two separate model vehicles. This class of object has been interpreted variously as either a toy or votive offering.

7. Vitreous Materials: Typological and Technical Analyses (Fig. 43)

A. Assemblage and Typology

Vitreous materials discovered in temple contexts include faience, frit and glass, dated by context and form for the most part to the Late Bronze Age. Faience, frit and glazed objects have been recorded from much earlier times, but glass objects appear from around 1500BC in a number of distinct forms. Vessels, cylinder seals and blanks, ingots, plaques and beads are currently represented in the Pella assemblage. The majority of these finds derive from the Fortress temple and surrounding loci. Glass objects represent almost half (45.5%) of the vitreous assemblage, and outnumber faience (34%) and frit (20.5%) by a wide margin.

Although Assyrian glass-making texts (Oppenheim 1970) give recipes for the production of blue and red glasses, only the former is present in the Pella assemblage. The plaques, cylinders and the majority of beads were made from plain undecorated blue glass. Blue glass, both dark translucent blue and turquoise-coloured opaque blue,

dominate the assemblage.

Beads are by far the most numerous object type in the assemblage, comprising 77% of the total vitreous assemblage, which is representative of bead percentages within the overall collection. Bead types include spherical and flattened spherical, cylindrical, disc and barrel types. The disc beads are made of turquoise glazed faience, the barrel and cylindrical beads are pale blue frit, and the spherical and flattened spherical beads are made of glass, suggesting that shapes may well be material specific.

B. Chemical Analysis[4]

The vitreous materials from Bronze Age Pella are in the process of being analysed for elemental composition by scanning electron microscope with energy dispersive x-ray analysis (SEM-EDS), and proton-induced x-ray and gamma-ray emissions (PIXE-PIGE). Early Near Eastern glasses were of a soda-lime-silica composition. Silica is the network former, while sodium or potassium compounds act as a flux to lower the high melting temperature of the silica from 1700 to less than 1000 degrees C. This glass is stabilised to some extent by the addition of calcium as lime, which increases its durability by lessening its solubility in water (Freestone 1991: 39-40). Nevertheless, early glasses tend to be in poor condition when found.

To make blue glass, the basic glass mixture is coloured by the addition of copper and/or cobalt containing minerals, which impart a clear translucent blue colour. To create opaque turquoise-coloured glass, and indeed the white and yellow opaque glasses used for decorative purposes, an opacifying agent, such as calcium antimonite or lead antimonite, was added.

Compositional analyses of the Pella glasses will reveal the nature of the colourants and opacifiers used to produce these vitreous objects. The first PIXE-PIGE analysis concentrated on determining the composition of the translucent blue glass ingot (RN 190083).

C. Discussion

While the silica level for the ingot is a little higher than the range cited for the 'Amarna glasses, it falls within two standard deviations of Brill's average for Nuzi glass, as does the ingot sodium level. The sodium level is lower than the range given for 'Amarna cobalt glasses but falls within the range of 'Amarna copper glasses. The cobalt 'Amarna glasses have higher proportions of aluminum, sodium, manganese and tin. Elevated levels of aluminum and manganese may be related to the addition of cobalt (Shortland 2000: 142, 147). The levels of cobalt and copper in the Pella ingot are slightly higher than the range for these oxides in the copper blue 'Amarna glasses. Cobalt levels in the Nuzi glasses were not measured, and only one reading is given for copper, which was lower. Tin was not present in the Pella glass, while some was present in the 'Amarna glasses, it was not measured in the Nuzi glasses. Low levels of potassium and high sodium levels in the cobalt 'Amarna glasses may be related to the use of natron instead of plant ashes as the alkali source. The potassium result for the Pella glass falls within the ranges given for both Brill's analyses of Nuzi glasses and the copper 'Amarna glasses.

Preliminary results, therefore, indicate that the ingot composition is comparable to that of the Nuzi and copper blue 'Amarna glasses, with some variations that require further investigation. Future analyses will provide compositional information for other classes of object, including beads, cylinders and plaques. Comparisons will then be made between object types and between vitreous materials from sites in Mesopotamia, Egypt and Syro-Palestine to determine similarities and differences in composition. This forms part of the on-going effort to analyse and place the vitreous material from Pella within a wider and more meaningful context.

8. Archaeozoology: Neolithic, Chalcolithic and Early Bronze Age (Figs. 44-49)

Introduction

Between 1992 and 1997, 33476 elements from the Neolithic through Iron Age levels have been processed. Of these, 12651 were identifiable to species level for the main food production or traction animals — an overall identification rate of 37.8%. However, due to size restrictions, this report will concentrate on the Neolithic through EBA assemblages only. From these levels more than 3000 elements were identifiable to species level (Fig. 44: **Table 2**). The more specialised use of Tall al-Ḥuṣn during the Early Bronze Age (EBA) has been discussed previously (Bourke *et al.* 1998: 204), so the current discussion will be limited to the material

4. The SEM analyses are being performed at the Australian Key Centre for Microscopy and Microanalysis at the University of Sydney, and the PIXE-PIGE analyses are provided by the Australian Nuclear Science and Technology Organisation (ANSTO) at Lucas Heights, with the assistance of grants from the Australian Institute for Nuclear Science and Engineering (AINSE).

44. Archaeozoology. Summary statistics for main food production and traction animals.

Table 2. NISP values for the main food production and traction animals.

	Early Neolithic	Late Neolithic	Early Chalcolithic	Late Chalcolithic	Early Bronze Age
Ovicapridae	79	73	173	248	466
Bos	16	47	51	202	266
Sus	17	22	53	114	57
Cervidae	1	2	8	12	22
Gazella			2	5	1
Equid			0	0	1
Total	113	144	287	581	813

Table 3. MNI values for the main food production and traction animals.

	Early Neolithic	Late Neolithic	Early Chalcolithic	Late Chalcolithic	Early Bronze Age
Ovicapridae	22	15	50	77	135
Bos	11	12	23	64	78
Sus	7	7	25	29	30
Cervidae	1	1	7	4	9
Gazella	0	0	1	1	1
Equid	0	0	0	0	1
Total	41	35	106	175	254

Table 4. SGE values for the main food production and traction animals.

	Early Neolithic	Late Neolithic	Early Chalcolithic	Late Chalcolithic	Early Bronze Age
Ovicapridae	22	15	50	77	135
Bos	132	144	276	768	936
Sus	10.5	10.5	37.5	43.5	45
Cervidae	4	4	28	16	36
Gazella	0	0	0.75	0.75	0.75
Equid	0	0	0	0	4
Total	168.5	173.5	392.25	905.25	1156.75

45. Archaeozoology. Summary statistics for neolithic food production and traction animals.

Table 5. Trench XXXIID – Early Neolithic (PNA)

	NISP	MNI	SGE	%SGE
Ovicapridae	79	22	22	13.1
Bos	16	11	132	78.3
Sus	17	7	10.5	6.2
Cervidae	1	1	4	2.4
Bird	1	1		
Total	114	42	168.5	100

Table 6. Trench XXXIIF – Late Neolithic ('Wadi Rabah Derived')

	NISP	MNI	SGE	%SGE
Ovicapridae	73	15	15	8.6
Bos	47	12	144	83
Sus	22	7	10.5	6.1
Cervidae	2	1	4	2.3
Totai	144	35	173.5	100

46. Archaeozoology. Summary statistics for chalcolithic food production and traction animals.

Table 7. Early Chalcolithic Trench XXXIIF

	NISP	MNI	SGE	%SGE
Ovicapridae	173	50	50	12.7
Bos	51	23	276	70.4
Sus	53	25	37.5	9.6
Cervidae	8	7	28	7.1
Gazella	2	1	0.75	0.2
Total	287	106	392.25	100

Table 8. Early Chalcolithic Trench XXXIID

	NISP	MNI	SGE	%SGE
Ovicapridae	248	77	77	8.5
Bos	202	64	768	84.8
Sus	114	29	43.5	4.8
Cervidae	12	4	16	1.8
Gazella	5	1	0.75	0.1
Total	581	175	905.25	100

47. Archaeozoology. Summary statistics for early bronze age food production and traction animals.

Table 9. Early Bronze Age Trench XXXIID 1992-94

	NISP	MNI	SGE	%SGE
Ovicapridae	69	28	28	11.8
Bos	40	16	192	80.8
Sus	16	9	13.5	5.7
Cervidae	4	1	4	1.7
Gazella				
Equid				
Total	129	54	237.5	100

Table 10. Early Bronze Age Trench XXVIIIA 1995

	NISP	MNI	SGE	%SGE
Ovicapridae	285	76	76	11
Bos	199	49	588	85.3
Sus	24	14	21	3
Cervidae	1	1	4	0.6
Gazella	1	1	0.75	0.1
Equid				
Total	510	141	689.75	100

Table 11. Early Bronze Age Trench XXXIIF 1996-97

	NISP	MNI	SGE	%SGE
Ovicapridae	108	28	28	13.8
Bos	24	11	132	65.2
Sus	17	7	10.5	5.2
Cervidae	17	7	28	13.8
Gazella				
Equid	1	1	4	2
Total	167	54	202.5	100

from the main tell. Also we have separated both the Neolithic and the Chalcolithic into earlier and later phases (**Figs. 45-46**), which has enabled us to refine understanding of animal husbandry practices at Pella during these periods.

Methodology

Methodology has been discussed previously (Bourke *et al.* 1994: 121-123). Analysis of the data utilises the Number of Individual Specimens (NISP), the Minimum Number of Individuals (MNI) calculated by the maximum distinction method, and Sheep/Goat Equivalents (SGE), this a relative meat value based on twentieth century live weight-at-slaughter patterns (Hammond 1974). Bone percentages (i.e. relative proportions of each bone), which part of the bone (proximal, midshaft or distal), relative age, handedness, evidence for burning, butchery and gnawing, were all recorded as standard practice.

The NISP and MNI values are given for comparison with other sites. When looking at the site as a whole and when comparing different major time periods, meat equivalent values (SGE) are emphasised as these give the reader a more realistic idea of dietary preference and animal use. Difficulties exist with all analytical regimes, so a variety of descriptive indices are presented for maximum utility. Statistical analysis has been based on NISP and MNI values where appropriate.

Discussion

A. Neolithic: pottery neolithic levels have been excavated in two separate areas, trenches XXXIID and XXXIIF. Faunal remains from these two trenches add significantly to the previously small Neolithic samples recovered from trenches IVE and XXXIID in 1994. We have now recovered 263 specimens identifiable to species level for this period. This sample is sufficiently large to represent as indicative of an early domestic economy. More speculatively, we have broken the samples into earlier (XXXIID) and later (XXXIIF) Neolithic assemblages, in line with radiometric data (see Radiocarbon Report, below). There is a highly significant statistical variation ($p = 0.000162$ on NISP values) between the XXXIID Early Neolithic (PNA), and the XXXIIF Late Neolithic (Rabah-derived) assemblages. Whilst pigs are represented in the same proportion in both periods, fewer sheep and goat and more cattle are represented in the later Neolithic (**Fig. 49: 1-2**). Numerically there are more sheep and goat represented than any other species throughout the Neolithic, but cattle provided the bulk of the meat protein. Some deer were hunted but numbers were very low.
Apart from the variation in the relative numbers of domesticates, other animal husbandry changes occur between the early and later phases of the Neolithic. Although the metrical data has not been presented because different elements are generally represented in the two trenches, cattle remains from XXXIIF were significantly larger than those from XXXIID. There has been an argument that size reduction of animals equates simply with domestication (O'Connor 2000: 150-152). If this were invariably so, then the Pella samples might seem to indicate a reversal of the domestication process, but this seems unlikely. From the age-at-death ratios (**Fig. 49: 1-**

48. Archaeozoology. Comparative statistics for chalco/EB Pella and Tall ash-Shūna *North.*

Table 12. NISP/NISP % values: Tell es-Shuna North and Pella Early Chalcolithic

	Shuna NISP	Pella NISP	Shuna %NISP	Pella %NISP
Ovicapridae	121	173	38.7	60.3
Bos	47	51	15	17.8
Sus	145	53	46.3	18.4
Cervidae		8		2.8
Gazella		2		0.7
Equid				
Total	313	287	100	100

Table 13. NISP/NISP % values: Tell es-Shuna North (later EB I) and Pella (EB IB-II)

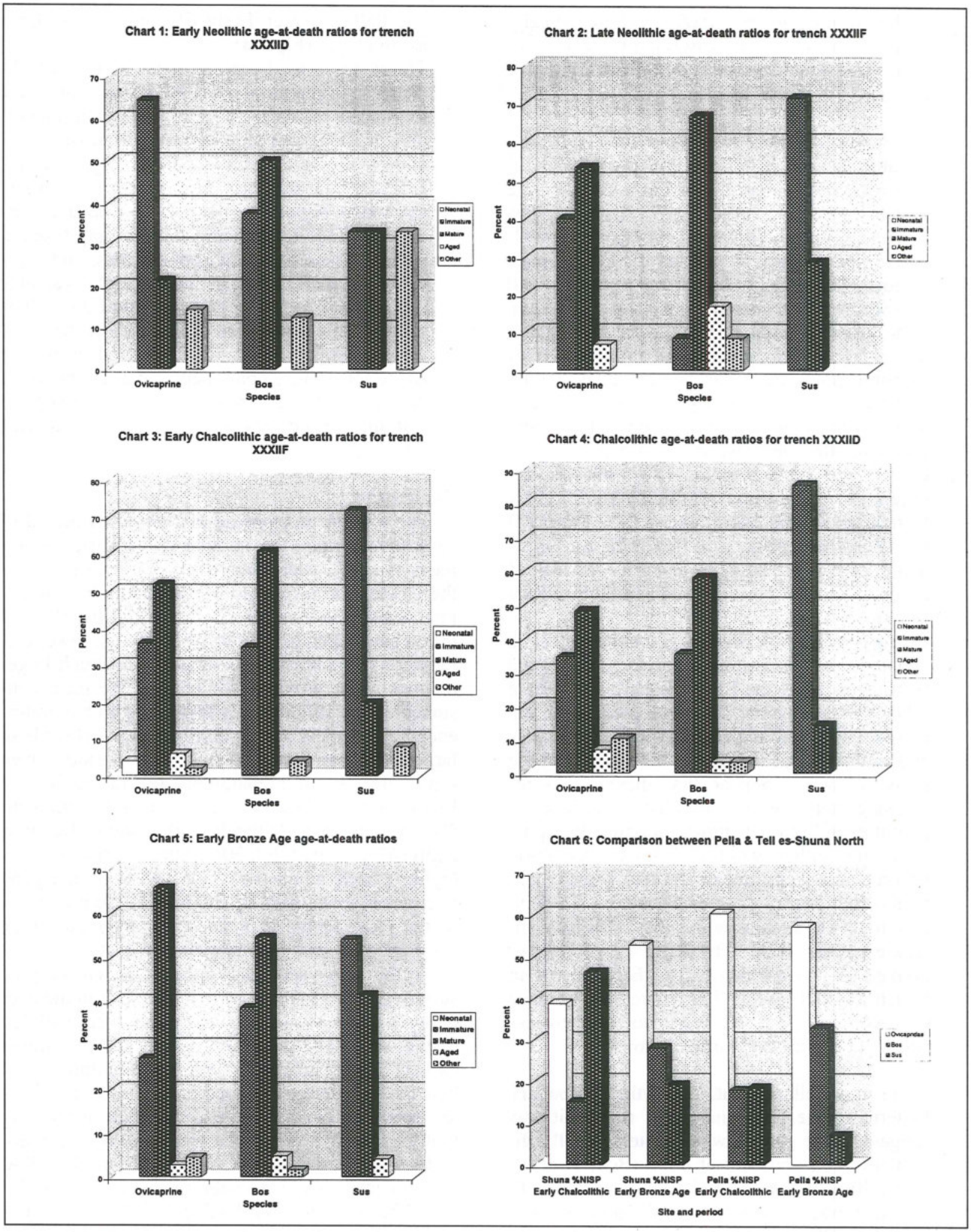
	Shuna NISP	Pella NISP	Shuna NISP%	Pella NISP%
Ovicapridae	177	466	52.8	57.3
Bos	94	266	28.1	32.7
Sus	64	57	19.1	7.1
Cervidae	0	22	0	2.7
Gazella	0	1	0	0.1
Equid	0	1	0	0.1
Total	335	813	100	100

2), more cattle are kept into maturity and old age in the later Neolithic, and although statistically this variation would appear to be insignificant (p = 0.313628), perhaps this is the simple answer to the question of size variation. Of similar interest is the statistically significant (p = 0.036368) variation between the age-at-death ratios for the ovicaprids. As with the cattle, more sheep and goat are kept into maturity and old age during the later Neolithic.

It is obvious from these variations that different animal husbandry practices are being tried and tested during the Neolithic. It would seem that there is an increasing awareness of breeding potential with the added possibility that animals are being kept for longer because of their usefulness with regard to secondary products such as wool and milk.

B. Chalcolithic: compared with Neolithic samples, there are more than three times the number of identifiable fragments (901) from Chalcolithic levels in trenches XXXIID and XXXIIF. As with the Neolithic, Chalcolithic samples from both trenches are analysed separately, to explore patterns of spatial variation in what seem noticably different functional zones. Interestingly, the earlier Chalcolithic assemblage from trench XXXIIF is comparable in form to the Chalcolithic assemblage from Tall ash-Shūna North. Statistically, the variation between the later Neolithic and the early Chalcolithic assemblages in trench XXXIIF is highly significant (p = 7.70474E-05), as is the functional (?) variation between contemporary assemblages in XXXIIF and XXXIID (p = 2.81457E-09).

Wild animal (gazelle and deer) exploitation is at its highest during the Early Chalcolithic. Reliance on ovicaprids starts to increase again. More pigs are used than at any other time, making up nearly 24% of the total animal numbers on the site, but cattle are used at some of the lowest levels (less than 22%) recorded for the periods under discussion. Husbandry practices reflected in the age-at-death ratios (**Fig. 49: 3-4**) do not alter significantly for sheep, goat or pigs from the late Neolithic through to the Early Chalcolithic. The statistical variation between the late Neolithic and Early Chalcolithic with regard to cattle age-at-death ratios, however, is



49. Archaeozoology. Histograms of comparative husbandry patterns. 1. Early Neolithic age-at death ratios for trench XXXIID. 2. Late Neolithic age-at death ratios for trench XXXIIF. 3. Early Chalcolithic age-at death ratios for trench XXXIIF. 4. Chalcolithic age-at death ratios for trench XXXIID. 5. Early Bronze Age at death ratios (Khirbat Faḥl). *6. Pella and Tall ash Sh*ṣ*na North: Comparative zoological assemblages in the Chalcolithic and Early Bronze Ages.*

highly significant (p = 0.000186). Statistically there is no variation between the two Chalcolithic assemblages in age-at-death ratios for any of the domestic species.

C. Early Bronze Age: during the 1996-1997 excavation season material from trench XXXIIIF was added to the corpus of Early Bronze Age data from the main tell (**Fig. 47**). Earlier studies of the Chalcolithic/EBA assemblages from Pella had failed to reveal the very distinct changes to husbandry techniques attested at nearby Tall ash-Shūna North (Baird *et al.* 1994: 130-131). With more material to work with statistically, the variation between the Chalcolithic and EBA assemblages at Pella can be seen to be highly significant (p = 8.30438E-24 on NISP values). There is a rise in the use of sheep and goat and a concomitant decrease in the use of pigs and cattle. Age-at-death ratios (**Fig. 49: 5**) for sheep, goats and pigs vary highly significantly from Chalcolithic assemblages (p = 0.001573 for sheep and goat; p = 0.001526 for pigs). More animals are kept into maturity for each of sheep, goats and pigs, although cattle husbandry remains static.
Changes in EBA husbandry practices may echo apparent changes in the larger socio-economic landscape during the EBA (Richard 1987; Esse 1991: 176). General archaeological data are consistent with an increase in social complexity and economic specialization at Pella during the EBA. It would appear that there is an increasing emphasis on specialised breeding capabilities of both ovicaprids and pigs. It is possible that either wool and milk production become more prominent, or that younger animals are being transported elsewhere. Trade in commodities (such as wool) may well have increased in the EBA, with the first evidence for donkey (E. asinus) detected in EBIB levels in trench XXXIIIF. As well, an increasing reliance on sheep and goats has been noted elsewhere and will be discussed further below.

D. Pella and Tall ash-Shūna North: Husbandry Patterns in the EBA: in earlier reports it was suggested that gazelle were hunted at Tall ash-Shūna North, and deer at Pella (Bourke *et al.* 1998: 202). However, it is now clear that both deer and gazelle (albeit in small numbers) were hunted at Pella. Notwithstanding differing environments, there is a highly significant alteration in animal use at both Tall ash-Shūna North and Pella between Early Chalcolithic and EBA assemblages (**Fig. 48**).
The increase in sheep and goats along with the decrease in pig numbers (**Fig. 49: 6**) would tend to indicate either a drying of both environments or a shift to commercial production of a secondary product that is easily transported (i.e. wool). While this may be indicative of a more integrated regional economy, this need not be the case. Individual centres may simply take advantage of new trading opportunities, and a developing market in an increasingly valuable commodity. In Mesopotamia central authorities were mainly concerned with sheep in terms of wool (Postgate 1994: 159-163), and by the Ur III period state employment schemes involving thousands of workers were in place to support institutionalised textile production (Postgate 1994: 235).

Conclusion

For a death assemblage that covers a period of several millennia, the number of identified specimens is small, especially when one considers that the Drehem archive from Mesopotamia lists an animal account over a 60 months period for 384,344 individuals! (Postgate 1994: 161). Whilst fewer cattle were killed than sheep or goats, as much larger animals cattle provided the bulk of the meat consumed on the site, strongly indicating both a preference for this meat and an ability to support cattle in larger numbers than today. In later periods, oxen figure heavily in preparations for the arrival of Egyptian troops in various cities in the Levant, with 500 oxen given by Subandu to the king of Egypt as a gift (Moran 1992: EA 301). Cattle were obviously highly prized in the Levant as well as in Egypt. Sheep and goats made up the bulk of the remainder of the meat source at Pella, and numerically they were the most common animals at the site.

At this stage, secondary product use can only be surmised. The evidence for a major shift in the age-at-death ratios between the early and later Neolithic (cattle, sheep and goats kept longer and pigs killed earlier) points strongly to an understanding of the benefits of breeding for specific purposes in the latter period. It indicates a major change in the way that the inhabitants of Pella managed their animals, and was a trend that carried through into the EBA. This, together with the major intra-site variation detected between Khirbat Faḥl and Tall al-Ḥuṣn during the EBA (Bourke *et al.* 1998: 204), gives us a glimpse of the increasing socio-economic complexity at Pella. However, whether control of pro-

duction and trade can be centralised in the EBA or at any time (Redding 1992: 99-107) remains an open question.

9. Archaeobotanical Report (Figs. 50-51)

Introduction

Intensified archaeobotanical research at Pella began in 1994. Thirty-four samples from the 1994-95 seasons were ultimately selected for study by Chantelle Hoppé (Hoppé 1996). Another sixty samples were processed during the 1996-97 seasons. Many of these were very poor, and only fourteen were selected for analysis. These were samples from secure contexts, with an estimated sample size of over 100 identifiable plant remains (Meadows 1998). The primary aim during 1996-97 was to describe changes in the plant economy over the course of the Neolithic through Early Bronze Ages. To this end all occupation deposits from these phases were sampled. In later phased excavations (MBA through Iron Age), only obvious concentrations of plant remains were sampled. These latter include five Iron Age samples from the final destruction of the Fortress Temple and associated buildings to the west.

Method and Results

All the archaeological plant remains had been carbonised by exposure to fire. Uncharred plant remains were considered modern contaminants, and ignored. The samples were sorted under medium magnification (X6-X40) at the University of Sydney, and again at La Trobe University. The coarse flots (light fractions from flotation greater than 1.0mm in diameter) were initially sorted without magnification, in order to extract potentially identifiable plant remains, which were then identified under the microscope at the University of Sydney (Meadows 1998). An experiment demonstrated that the initial stage of sorting was inadequate, and all Neolithic-Early Bronze samples were subsequently re-sorted in full at La Trobe. Figures 50 and 51 summarise the results, which are discussed below.

Food plants

A. Glume wheat (probably all emmer, *Triticum turgidum* var. *dicoccum*). Well-preserved glume wheat grains could generally be assigned to emmer, the most common wheat variety in Mediterranean prehistory. Fragmentary grains with glume impressions or very marked dorsal ridges were classed as indeterminate glume wheat, a category that would include einkorn (*T. monococcum*), although no convincing examples of einkorn were found. The large Chalcolithic grain store (XXXIID 80.3) seems to have been exclusively emmer. Emmer remained an important crop after the Chalcolithic, but durum wheat appears to have overtaken it in importance during the Bronze Age.

B. Free-threshing wheat (*Triticum* sp.). The rounded wheat grains at Pella tend to be longer than those identified by Kislev as *T. parvicoccum* (Kislev 1979). In the Bronze Age, they probably represent another tetraploid, *T. turgidum* var. *durum*, or durum wheat. It is almost completely absent from the Chalcolithic samples, although reasonably plentiful in one of the Early Bronze Age levels. The five grains of free-threshing wheat from the Neolithic samples are closer to the *T. parvicoccum* type. This free-threshing wheat variety may have disappeared during the Chalcolithic. Durum-type wheat appears to have been introduced in the Early Bronze Age.

C. Barley (*Hordeum* sp.). There was a small quantity of wild barley (*Hordeum vulgare* var. *spontaneum*) in two of the Late Bronze Age samples, probably representing a crop weed. Domestic barley was neither very abundant nor very well preserved, and there were no obviously straight (symmetric) or twisted (asymmetric) grains. Barley rachis internodes were found in only three samples. None was sufficiently well preserved to identify as two-row or six-row barley.

D. Lentil (*Lens culinaris*). Small numbers of cultivated lentils (mostly about 3mm in diameter) were found in every sample (other than XXXIID 80.3) from the Neolithic to the Early Bronze Age. None was found in the Late Bronze Age samples. Lentils were a staple food from the Neolithic onwards.

E. Other pulses (recorded as indeterminate large legumes). Two angular pulses, consistent with chickpea (*Cicer arietinum*) were recovered, one in the Neolithic and one in the Early Bronze Age. Four fragments of probable fava beans (*Vicia faba*) were found in three samples (two Chalcolithic and one Early Bronze Age). Vetches (*Vicia* spp.), sub-rounded to sub-angular legumes 4-5mm in diameter, appear in small numbers in most Chalcolithic and Early Bronze samples. Bitter vetch (*V. ervilia*) is generally regarded as a fodder crop, and common vetch (*V. sativa*) as more palatable, but both may have

50. Archaeobotany. Neolithic-Early Bronze samples. Coarse and fine flot data. (Sorted at La Trobe University).

Table 14. Neolithic-Early Bronze samples (Sorted at La Trobe). Coarse and Fine flot data.

provenance	F20.42	F20.45	D 87.1	D 88.1	F20.37	F20.19	F20.39	F 17.3	F 17.9	F17.18	F 20.3	F20.11	F20.16	D 72.1
phase	LN	LN	EC	EC	EC	EC	EC	LC	LC	LC	LC	LC	LC	EB
glume wheat grain	136	70	.	.	7	26	10	100	40	39	32	1	47	12
wheat spikelet fork	25	26	.	.	2	2	2	.	.	2	8	.	.	1
terminal sp.fork	2	6	.	.	.	.	2	.	.	4	6	.	4	.
wheat glume base	174	264	2	1	45	94	161	45	10	108	270	1	98	.
free-threshing wheat	1	4	.	.	.	1	.	.	.	.	.	.	.	1
wheat grain indet.	85	123	.	.	.	15	2	15	11	13	27	.	28	19
wild/cult.barley grain	23	5	.	.	.	3	.	7	6	1	1	.	7	5
cult. barley grain	84	26	.	.	2	6	4	19	8	18	9	.	16	47
barley grain indet.	3	.	.	.	.	.	.	.	1	.	2	.	1	7
cult.barley rachis	5	.	.	.	.	.	.	.	.	.	.	.	.	6
cereal grain indet.	82	85	3	3	6	14	9	33	40	19	18	2	24	14
cereal culm node/base	2	1	.	.	.	.	.	.	.	.	.	.	.	.
lentil	40	15	.	1	28	17	9	2	8	8	1	2	3	1
large legume indet.	4	7	1	.	4	4	3	.	6	8	.	.	2	.
Linum (linseed/flax)	.	.	.	.	.	.	.	.	.	.	.	.	.	4
cf. flax pod frag.	.	.	.	.	.	.	.	.	.	.	.	.	2	.
Pistacia nutshell	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Ficus (fig) seed	2	3	.	1	4	.	.	2	2	.	.	.	.	1
Olea (olive) stone	16	5	1	.	.	1	.	1	5	3	2	.	.	2
Vitis (grape) pip	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Celtis (hackberry)	.	.	.	.	.	.	.	.	.	.	.	.	.	12
Aizoon hispanicum	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Apiaceae	1	27	.	.	.	2	.	.	.	.	.	.	.	1
Anthemis sp.	.	1	.	.	.	2	4	.	.	.	2	.	.	.
Asteraceae indet.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Heliotropium sp.	3	.	.	.	.	.	.	.	.	.	.	.	.	.
Boraginaceae	1	3	.	.	1	.	1	.	.	.	.	.	.	2
Brassicaceae	.	2	.	.	.	.	.	.	1	.	.	.	2	.
Brassica/Chenopodiaceae	15	85	.	.	.	58	8	8	3	66	62	.	36	2
Caryophyllaceae	1	3	.	.	.	.	.	.	.	4	.	.	.	.
Chenopodiaceae	1	.	.	.	.	.	.	1	.	.	2	.	2	1
Carex sp.	10	12	.	.	.	.	.	4	2	.	.	.	.	.
Fimbristylis sp.	38	90	.	.	.	2	.	8	3	2	10	.	.	.
Cyperaceae indet.	2	6	.	.	1	4	1	.	3	2	4	.	.	4
Scorpiurus type	.	.	.	.	.	2	.	.	.	.	.	.	.	.
Medicago type	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Astragalus type	.	4	.	.	.	.	.	.	.	6	.	.	.	.
cf. *Trigonella astroites*	6	11	.	.	.	.	.	4	2	10	24	.	10	1
Trigonella sp. type	.	.	.	.	.	.	2	.	.	.	20	.	8	.
Hippocrepis sp.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Melilotus/Trifolium type	.	3	.	.	.	.	.	.	.	.	.	.	.	1
Fabaceae indet.	62	154	2	4	1	323	37	10	37	111	30	1	46	12
Fumaria sp.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
Teucrium/Ajuga	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Bellevalia type	2	5	.	.	.	.	1	.	.	.	.	.	1	1
Ornithogalum type	6	32	.	.	.	.	2	.	1	.	.	.	.	.
Liliaceae indet.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Malva sp.	1	6	.	.	.	2	.	.	1	.	.	.	2	5
Papaveraceae	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Avena sp.	3	1	.	.	.	2	.	.	1	2	.	.	.	1
spiral awn frag.	2	.	.	.	.	2	.	.	.	6	16	.	4	.
Bromus sp.	8	6	.	.	.	2	2	.	.	.	2	1	2	.
small grass type	14	15	.	.	.	.	2	.	.	10	16	.	.	.
Lolium sp.	133	351	.	.	12	56	24	6	.	15	33	.	25	25
Phalaris sp.	.	11	.	.	.	2	.	.	.	4	.	.	.	1
Panicum/Setaria	1	.	.	.	.	.	.	.	.	.	.	.	.	1
Poaceae indet.	8	10	2	.	3	7	20	.	15	17	3	2	2	36
Polygonaceae	2	34	.	.	.	.	.	.	.	2	.	.	.	.
Galium type	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Rubiaceae	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Valerianella sp.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
Verbena sp.	.	10	.	.	.	4	.	.	.	.	2	.	.	.
Not identifiable	33	24	.	2	1	41	17	28	4	30	11	.	19	17
Total count (a)	1043	1547	11	12	117	696	325	293	210	514	615	10	393	247
Volume (L) (b)	52	51	13	55	54	10	35	29	44	50	53.5	3	50	19
Density (a/b)	20.1	30.3	0.8	0.2	2.2	69.6	9.3	10.1	4.8	10.3	11.5	3.3	7.9	13.0

51. Archaeobotany. Neolithic-Early Bronze samples. Coarse flot data only. (Sorted at Sydney University).

Table 15. Neolithic-Early Bronze samples (Sorted at Sydney University). Coarse flot data only.

sample	F 20.26	D 80.3	D 65.14	F 16.2	G 108.16	G 113.1	G 113.3	J 22.5	J 24.1
phase	EC	EC	EB	EB	IA	IA	IA	IA	IA
context description	pit	stored product	occupation surface	occupation surface	stored product	stored product	stored product	burnt area	burnt area
glume wheat grain	67	229†	2	53	.	3	.	8	99
wheat glume base	14	6	.	36	.	.	.	.	.
free-threshing wheat	.	.	50	1	.	1285	740	.	44
wheat grain indet.	55	.	46	30	1	.	.	6	54
wild barley grain	.	.	.	.	.	.	.	3	17
wild/cult.barley grain	8	.	16	3	.	1	.	44	65
cult. barley grain	28	.	37	46	.	10	9	29	23
barley grain indet.	6	.	9	5	.	.	.	4	9
barley rachis indet.	.	.	.	.	.	.	.	.	10
cereal grain indet.	46	.	60	28	.	.	.	4	81
cereal culm node/base	1	.	.	.	.	.	.	2	21
lentil	10	.	8	21	.	.	.	.	.
large legume indet.	23	1	33	4	1526	217	.	1293	47
Linum (linseed/flax)	.	.	.	.	.	4	1	20	24
Ficus (fig) seed	.	.	16	1	.	.	.	.	.
Olea (olive) stone	3	.	.	3	.	.	.	.	.
Vitis (grape) pip	.	.	1	1	.	.	.	.	.
Boraginaceae	.	.	10	4	.	.	.	.	.
Chenopodiaceae	.	1	1	.	.	.	.	.	.
Fabaceae indet.	103	.	2	97	.	.	.	5	10
Fumaria sp.	.	.	2	1	3	.	.	1	.
Bellevalia type	2	.	.	2	.	.	.	.	.
Ornithogalum type	4	.	.	.	.	.	.	.	.
Malva sp.	2	.	2	.	1	.	.	.	3
cf. *Plantago*	.	.	.	.	.	.	.	.	2
Bromus sp.	1	.	.	3	.	.	.	.	.
Lolium sp.	539	.	39	48	.	.	.	27	374
Panicum/Setaria	.	.	.	.	.	.	.	.	2
Phalaris sp.	.	.	.	.	.	.	.	.	38
Poaceae indet.	11	.	2	3	2	1	.	3	90
Polygonaceae	.	.	.	4	.	.	.	.	2
Ranunculaceae	.	.	.	.	1	.	.	.	.
Galium type	.	.	4	.	5	.	.	4	.
Not identifiable	7	.	8	4	4	8	2	6	29
Total count (a)	932	237	372	402	1543	1529	752	1459	1046
Volume (L) (b)	58	10	97	131.5	0.2	4	0.2	19	53.5
Fraction sorted (c)	1	0.25	1	1	1	0.125	0.5	0.5	1
Density (=a/[b*c])	16	95	3.8	3.1	7715	3058	7520	154	20

†whole grains only; fragments not counted.

LN = Late Neolithic

EC = Early Chalcolithic

LC = Late Chalcolithic

EB = Early Bronze Age

IA = Iron Age (the 9th century BC destruction of the temple)

been used as food. The stored product in XXXIIG 108.16 appears to have been bitter vetch. Spherical legumes in the same size range as the vetches were attributed to pea (*Pisum sativum*). Peas can also be rather angular, necessitating a pea/vetch category. Pea or pea/vetch were found in small numbers in the four earliest samples. Like lentils, chickpeas, peas, beans and vetches are part of the suite of Neolithic founder crops.

F. Linseed (cf. *Linum usitatissimum*). With one possible exception, linseed, or flax, was found only in Bronze Age samples. This is somewhat surprising, as cultivated linseeds have been found as far back as the Neolithic (van Zeist and Bakker-Heeres 1975). Forty-four of the fifty-three seeds occurred in the Iron Age burnt area samples in trench XXXIIJ. Two pod fragments in a Chalcolithic sample (XXXIIF 20.16) appear to be flax.

G. Pistachio (*Pistacia* sp.). A nutshell fragment in XXXIIF 20.19 was consistent with finds of Pistacia sp. at other Jordanian sites (Edwards 2001). A wild terebinth such as *P. atlantica* is probably represented, rather than the domesticate *P. vera*.

H. Fig (*Ficus* sp.). The total number of fig seeds recovered is a fraction of the number found in a single fruit. Most came from one of the Early Bronze surfaces, XXXIID 65.14. By that stage, domestic fig (*Ficus carica*) may have been cultivated, but fig seeds were also found in the Neolithic and Chalcolithic samples, and occur at many prehistoric sites (Neef 1997). These are probably from a wild species, *F. pseudosycamorus*. No fig seeds were found in the stored products.

I. Olive (*Olea europea*). Olive stones, or fragments of olive stones, were found in most of the early samples. The remains in the Late Neolithic samples are some of the earliest evidence of olive exploitation. A large deposit of olive stones at the Chalcolithic site on Jabal Sartaba (Area XIV) was described by Wilcox (1992).

J. Grape (*Vitis vinifera/sylvestris*). Three grape pips were recovered, one from each of the Early Bronze samples. The absence of grape in the Late Bronze stored products is unremarkable, but the fact that no grapes were found in the Chalcolithic and Neolithic pit samples is significant. Grapes were frequent at Early Bronze Wādī Fīdān (Meadows 2001) and Bāb adh-Dhrā' McCreery 1979), but have not been found in the Levantine Chalcolithic.

K. Hackberry (cf. *Celtis tournefortii*). Twelve stones were found in one Early Bronze sample from XXXIID 72.1.

Discussion

The small number of samples analysed, considering the length of occupation involved, precludes any definitive statements, but a few observations can be made. The preservation of ancient plant remains at Pella is extremely variable, with some contexts yielding practically no identifiable remains and other deposits consisting of little else. Between these extremes are the samples from a series of Neolithic and Chalcolithic pits in trench XXXIIF and from Early Bronze occupation surfaces in trenches XXXIID and XXXIIF. In terms of site formation processes, these are secondary contexts. They contain a wider range of plant types than the stored product samples, and thus have greater interpretative potential.

A. *Late Neolithic and Chalcolithic Samples:* the plant assemblage in the pits is comparable to that in the Early Chalcolithic at Tulaylāt al-Glassūl (Bourke *et al.* 2000). Emmer wheat and hulled barley, lentils, olives and occasional free-threshing wheat are the main food plants, with *Lolium*, small-seeded legumes and glume bases as the main by-products of crop processing. Wheat is more abundant at Pella, and barley more common at al-Ghassūl, probably reflecting Pella's higher rainfall. The composition of these samples is remarkably consistent, considering the passage of time involved. Other than the absence of free-threshing wheat in the Chalcolithic, the plant economy appears to have changed little. The pit samples range in density from 2 to 70 items per litre. The presence or absence of any taxon appears to be a function of sample size.

The Chalcolithic grain store sample from XXXIID 80.3 was the 'cleanest' sample in the study. Most grains were badly fragmented, and only whole grains caught in a 2mm sieve were recorded. The number of grains was therefore severely underestimated. The remainder of the sample was sorted for anything other than broken emmer grains. The 5-10cm thick deposit covered an area of at least $2m^2$, equivalent to about 150 litres of grain. Emmer is traditionally stored

in spikelet form, so it may be incorrect to describe this material as a stored product, given the near-absence of glume bases and spikelet forks.

B. *Early Bronze Age Samples:* samples were analysed from three occupation surfaces, XXXIIF 16.2 and XXXIID 65.14 and XXXIID 72.1. The first of these differs only slightly from the Chalcolithic samples, containing a single grape pip and a single grain of free-threshing wheat in addition to the traditional combination of emmer, barley, lentil and olive. The XXXIID samples, however, show a significant change underway: the wheat is mostly durum, not emmer, and the pulses mainly vetches, not lentils. Grape occurs in all three samples, olive in two samples, and hackberry and linseed in XXXIID 72.1. Barley is as common as wheat. Wheat was more abundant than barley in all Neolithic and Chalcolithic samples. This need not mean that there was an increase in barley cultivation, however. It may simply reflect the change in wheat variety, because free-threshing wheat require less crop processing and are thus less likely to be exposed to fire.

C. *Iron Age Samples:* three samples (XXXIIG 108.16, 113.1 and 113.3), came from destruction levels inside the last Iron Age phase of the temple, which was destroyed around 850-800 BC. One sample, XXXIIG 108.16, from a niche/bin in a storage room at the north end of the Iron Age structure, consists almost entirely of bitter vetch (and perhaps other pulses), with a few weeds. Two samples come from the storeroom floor deposit (XXXIIG 113.1) and the storeroom floor (XXXIIG 113.3) respectively, and consist mainly of durum wheat. The former also contains some pulses, and both include some barley grains and weeds. The latter sample is a tiny subsample of a layer of burnt grain comparable to that from Chalcolithic XXXIID 80.3; about 50 litres of this material remain in storage in Jordan. The grain was probably stored on a mat or in a rush basket, judging by impressions on the ground surface immediately below it.

Two samples (XXXIIJ 22.5 and 24.1), derive from a large multi-room complex five metres west of the temple, destroyed at the same time (ca. 850-800 BC). Sample XXXIIJ 22.5 (154 items/L) includes a concentration of pulses, probably burnt *in situ*, and a mixture of cereals and weeds. It is not as rich or as pure as the stored products inside the temple, but it appears to be in a primary context. The other sample, XXXIIJ 24.1 (20 items/L) is poorer and more mixed. Both samples contain a significant number of linseeds, while neither includes any fruit or lentils. Both samples contain glume wheat, in contrast to the samples from inside the temple, and XXXIIJ 24.1 also contains free-threshing wheat. It is also the only sample with many culm nodes or barley rachis internodes, which are by-products of threshing and winnowing.

Summary: 1996-97

Neolithic and Chalcolithic agriculture was based on the cultivation of emmer, barley and lentils, and the exploitation of wild or domestic olive. Fig and pulses other than lentil were probably minor components of diet. In the Bronze Age, durum wheat was at least as important as emmer, and lentils may have been partially replaced by other pulses. Linseed was also cultivated. Olive and fig were still exploited, together with grape and hackberry. The main transition in the plant economy appears to have taken place during the Early Bronze Age, if we assume that XXXIIF 16.2 is earlier than XXXIID 65.14. In some respects, the composition of XXXIID 72.1 falls between these two samples. The three Early Bronze samples are comparable with each other and with the Neolithic and Chalcolithic samples, as all are from mixed secondary contexts. The Iron Age samples, however, are from *de facto* and primary contexts, and do not give a representative view of the plant economy.

Comparison Between 1996-97 and 1994-95 Results

Hoppè (1996) analysed thirty-four samples ranging in date from the Late Neolithic to the Early Bronze Age. Ten Neolithic samples were analysed. Every sample contained glume wheat and barley grains. Some samples had many lentils, but some had none. Those with lentils also tended to contain olive stone fragments. The other pulses (bean, pea, vetch and chickpea) were each found in at least one sample. There was one fig seed but no grape, and no free-threshing wheat. There was no straw or barley chaff, and very few glume bases.

There were fifteen Chalcolithic samples. Every sample contained glume wheat grains, two-row barley grains and lentils. All but one sample contained olives. All other pulses except beans were found in at least one sample. There were no grapes or figs, and no straw elements. There was only one barley rachis internode, and very few glume bases. One sample, XXXIID 42.43, was dominated by wheat grain. The others were fairly mixed.

There were nine Early Bronze Age samples. Of the 1043 identifications, 535 were in one sample. Most samples contained glume wheat and two-row barley grains, lentils and olives. There were no beans or chickpeas, but vetch and peas were found. One fig seed was recovered, and ten grape pips were split between three samples. Again, there was no straw, no barley chaff and very few glume bases. There was no free-threshing wheat. The crops are those the Neolithic and Chalcolithic, with the addition of grapes and loss of beans and chickpeas. The same gaps in crop processing are still evident.

The 1996-97 samples are probably less representative of the site than those from 1994-95, but the Neolithic-Early Bronze samples are reasonably mixed. Similarities between the seasons include:

1. The wheat to barley grain ratio is usually between 2:1 and 3:1.
2. Straw and chaff are virtually absent.
3. Grapes appear in the Early Bronze Age.

On the other hand, free-threshing wheat was not found at all in 1994-95. There is no sign of an increase in the abundance or diversity of cultivated legumes in the 1994-95 Early Bronze samples, if anything, the reverse. These apparent contradictions could be resolved if the 1994/95 EBA samples were as early as 1996/97 XXXIIF 16.2, and earlier than 1996/97 XXXIID 65.14, as seems likely.

Conclusion

Data analysis is still ongoing, but already consistent patterns are emerging. The areas excavated at Pella consistently lack evidence of threshing and winnowing, and there is less evidence of the later stages of crop processing than at comparable sites. This is the case in each phase, and probably reflects the spatial organisation of the site. The plant economy was apparently unchanged throughout the Late Neolithic and Chalcolithic. Emmer, barley, pulses and olives were the basis of subsistence. This strategy continued into the Early Bronze Age, with the addition of grapes. At some point in the EBA, durum wheat was introduced, and it apparently displaced emmer as the main wheat crop.

10. Lithic Analysis: Neolithic and Chalcolithic Assemblages (Figs. 52-56).

Introduction

This study is based on material from trench XXXIID. The earliest levels in the trench date to the Ceramic Neolithic, with the ceramic assemblage similar to the PNA assemblage at Jericho (Bourke 1997: 98-99). Much material is to be dated to the Chalcolithic period, with broad ceramic parallels to the 'Northern Chalcolithic' assemblage at sites such as Neve Ur, Tall al Far'ah North and Tall ash-Shūna North (Bourke 2001: 125-127).

The present report studies the lithic assemblages from both Neolithic and Chalcolithic strata excavated in 1994 (Bourke *et al.* 1998: 180-181). The Neolithic assemblage comprises 365 pieces, and the Chalcolithic 1585 objects. The following report gives an initial overview of the primary and secondary production and illustrates major tool types.

A. *Raw material* (**Fig. 52: Table 16**): the local flint in the Pella region is a greyish-brown, heterogenous variety. Remains of cortex are usually chalky-white indicating mined material. There are, however, three other varieties represented that presumably had been brought to the site. The first is a very light brown material, the second a mid-brown (caramel or honey-like) flint, and the third a dark-brown dense material. All three varieties were mined. Although the raw material frequencies (**Fig. 52: Table 16**) should be seen as reflective of a trend rather than absolute figures, the raw percentages suggest no major change in the strategy of raw material supply over the course of the Neolithic and Chalcolithic periods.

B. *Dorsal cortex* (**Fig. 52: Table 17**): in order to classify the artefacts into primary (100% covered), secondary (50 to 100%) and tertiary (less than 50% covered) blanks or artefacts they were classified by the percentage of cortex remaining on the dorsal face. In both inventories the vast majority displays no cortex, with only a very small percentage attributed to the first stage of a reduction sequence. It seems clear that in both Neolithic and Chalcolithic periods there was no area of production in or near trench XXXIID. The interpretation of the Chalcolithic complex as an agricultural storage facility is therefore broadly consistent with the lithic assemblage.

C. *Primary production* (**Fig. 53**): in order to analyse primary production major categories have been separated. The grouping can be divided roughly into core remnants and the products of core preparation, such as crested blades or rejuvenation pieces, a large percentage of debitage proper (chips, shatter or amorphic pieces) and blanks. In both assemblages nodules and core fragments are very rare. Leftovers from core preparation are almost non-existent. In the Neo-

52. Lithic Analysis. Trench XXXIID. Neolithic and Chalcolithic Periods. Raw material and cortex percentages.

Table 16. Lithic Analysis. Trench XXXIID 1992-94: Raw material distribution (%)

	Neolithic	Chalcolithic
Local greyish-brown flint	72.9	67.1
Light-brown flint	2.0	2.3
Mid-brown flint	14.9	15.8
Dark-brown flint	10.2	14.8
Total	100 (295 objects)	100 (1211 objects)

Table 17. Lithic Analysis. Trench XXXIID 1992-94: Dorsal cortex amount (%)

	Neolithic	Chalcolithic
Primary blade/flake	0.5	1.1
Secondary blade/flake	6.0	2.3
Tertiary blade/flake	14.8	15.8
Cortex absent	78.7	80.8
Total	100 (365 objects)	100 (1585 objects)

lithic (53.9%) and in the Chalcolithic (63.6%) a large portion of the material consists of debitage, and in both inventories flakes outnumber blades (Neolithic 26 to 15 %, Chalcolithic 19 to 14 %). Worth mentioning is the amount of bifacial thinning flakes that most likely stem from the reshaping and resharpening of tools.

D. Secondary production (**Fig. 54**): tools have so far been classified into 24 different types. The most common tool for both the Neolithic (44 %) and Chalcolithic (37 %) assemblages is a tool on a flake or blade that shows a simple retouch on dorsal, ventral or on both aspects. Comparisons between other tool percentages, such as serrated blades/flakes (8.8 compared with 9.4%), side scrapers (13 to 13.2%), burins (4.3 to 4.7%) and borers (4.3 to 4.2%), suggest little differentiation between the Neolithic and Chalcolithic assemblages.

Discussion

Elements of note within the assemblage include a fragment of a Byblos point (**Fig. 55: 1**) with a missing tip. A second complete specimen of the same type comes from a later (EBA) level (**Fig. 55: 2**).

The type of the broad sickle blade backed and truncated at both ends is represented by three complete artefacts (**Fig. 55: 5-7**). The working edge is the denticulated margin that bears sickle sheen on all three objects. One sickle blade (**Fig. 55: 3**) comes from a Neolithic layer and two from Chalcolithic contexts. Two of them were manufactured on the same greyish-brown, coarse raw material. This kind of sickle blade resembles the harvesting tools known from the Rabah complex (Gopher 1995: 212, fig. 3). However, most of the sickle blades belong to a smaller variety (Fig. 56: 2), often segmented, backed and serrated.

Altogether sickle sheen could be observed on 21 blades or blade fragments (five from Neolithic contexts, 16 from Chalcolithic layers). In one case this kind of use wear was found on a simple blade that was only retouched on the dorsal surface, and in another it was on a serrated blade (**Fig. 56: 3-4**). Given the technique of segmenting larger blades, all specimens give evidence that they once were inserted into a sickle bow. One object can be attrib-

53. Lithic Analysis. Trench XXXIID. Neolithic and Chalcolithic Periods. Primary production percentages.

Table 18. Lithic Analysis. Trench XXXIID 1992-94: Lithic primary production percentages.

	Neolithic	Chalcolithic
Fragments of nodule	3.2	0.7
Fragments of tabular flint	0.3	0.0
Core fragments	1.5	0.7
Caps of core	0.3	0.2
Plunging flakes	0.0	0.1
Crested blades	0.3	0.3
Core rejuvenation pieces	0.3	0.5
Amorphic pieces	3.0	2.2
Chips	34.4	33.8
Debitage shatter	16.5	27.6
Burin spalls	0.0	0.3
Flakes	24.2	17.4
Bifacial thinning flakes	1.5	1.8
Bladelets	3.3	3.1
Blades	8.2	7.7
Large blades	3.0	3.5
Core tools	0.0	0.1
Total	100	100
	(365 objects)	(1585 objects)

uted to the so-called 'Canaanean sickle' classification (**Fig. 56: 5**). It is a fragment (49.9 x 27.7 x 16.8mm) of a large regular blade of local material. The right margin of both the dorsal and ventral aspect was slightly invasively retouched. No remains of sickle sheen are visible.

Most scrapers were ad hoc tools and lack a definite standardisation. There are, however, two examples made on local material that stand out. They were produced on large blades and were truncated at the basal end. The terminal ends of these Chalcolithic end scrapers (**Fig. 55: 3-4**) were both distinctively worn, clearly indicating the working edge.

Most tools described seem to have had a purely domestic/industrial function. This probably does not apply to the fragment of a perforated disc or holed tool (**Fig. 56: 6**). It is made on a flat flake of dark brown flint and was invasively retouched on both sides. It still shows the remains of the pecked hole. Complete examples have a rounded or semi-circular shape and measure more than 100mm in diameter. Although the function of this Chalcolithic implement remains unknown, it has been suggested that they could have been used either as cutting tools (Epstein and Noy 1988: 133-144), or perhaps served some symbolic/display purpose (Rosen 1997: 84-85).

Summary

Ad hoc or expedient tools characterise both inventories. Primary production further indicates that flakes dominate over blades. Remains of a reduction sequence are scarce, suggesting production

54. Lithic Analysis. Trench XXXIID. Neolithic and Chalcolithic Periods. Tool Percentages.

Table 19. Lithic Analysis. Trench XXXIID 1992-94: Tool percentages

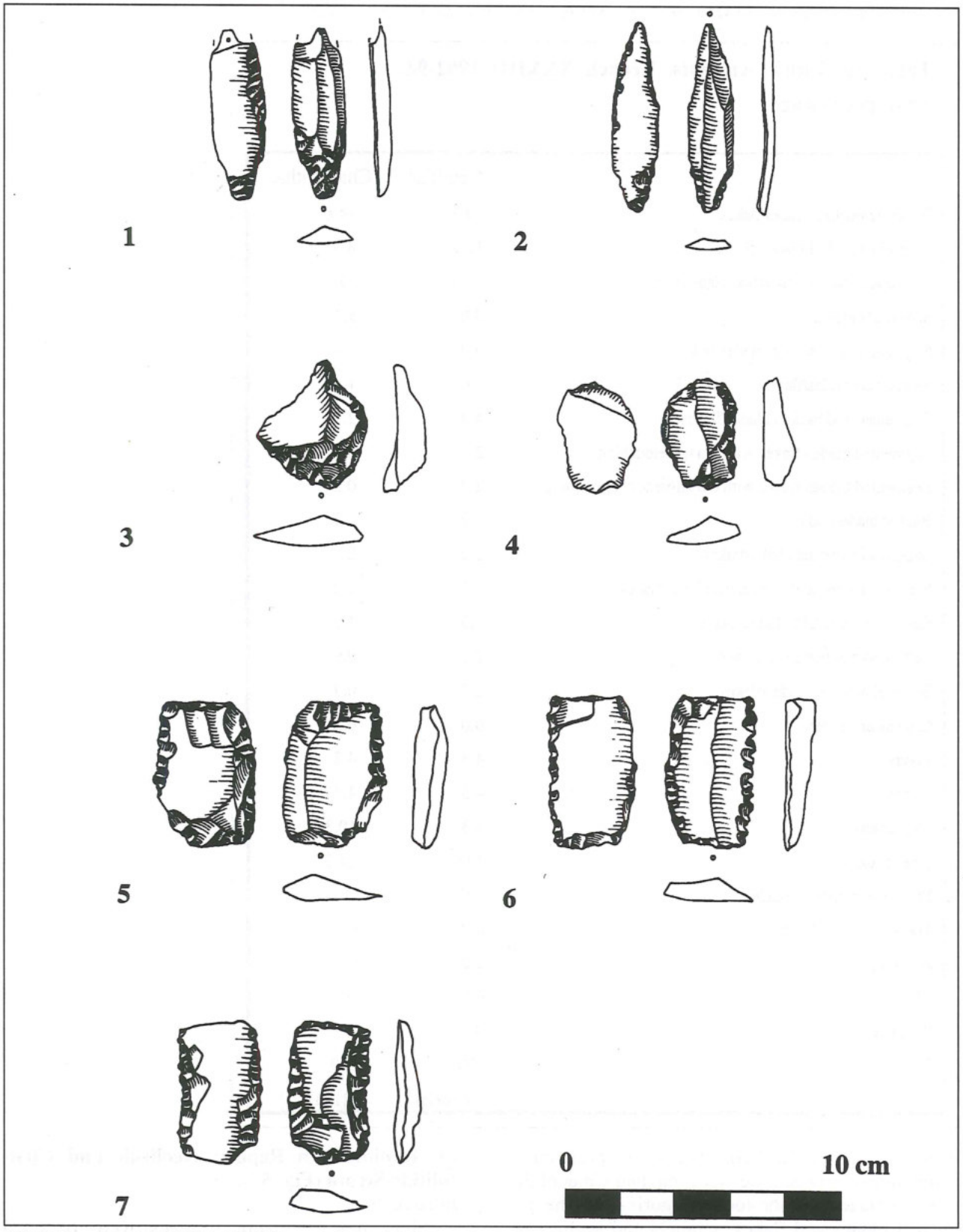
	Neolithic	Chalcolithic
Dorsal retouched blades/flakes	19.6	14.6
Ventral retouched blades/flakes	10.9	8.9
Dorsal and ventral retouched blades/flakes	13.0	12.7
Serrated blades/flakes	8.8	9.4
Segmented and serrated blades/flakes	0.0	1.4
Segmented blades/flakes	0.0	1.4
Segmented and backed blades/flakes	4.3	2.3
Segmented blades/flakes with dorsal retouching	2.2	0.9
Segmented blades/flakes with dorsal/ventral retouching	2.2	0.5
Backed blades/flakes	2.2	3.3
Backed and serrated blades/flakes	0.0	2.0
Backed, serrated and segmented blades/flakes	4.3	2.0
Right sided notched blades/flakes	0.0	1.5
Left sided notched blades/flakes	2.2	0.9
Bilateral notched blades/flakes	2.2	0.9
Canaanean blades	0.0	0.5
Borers	4.3	4.2
Burins	4.3	4.7
End scrapers	4.3	10.3
Side scrapers	13.0	14.2
Projectile points on blade	0.0	1.5
Transverse arrowheads	0.0	0.5
Byblos points	2.2	0.0
Chisels	0.0	0.9
Perforated discs	0.0	0.5
Total	100	100
	(46 tools)	(212 tools)

away from trench XXXIID. Secondary production differs rarely between the Neolithic and Chalcolithic assemblages. Major tool categories are the retouched blades and flakes, scrapers and segmented sickle blades. The latter is considered to be a hallmark of the Chalcolithic period in Jordan. Arrowheads play no important role in either tool kit.

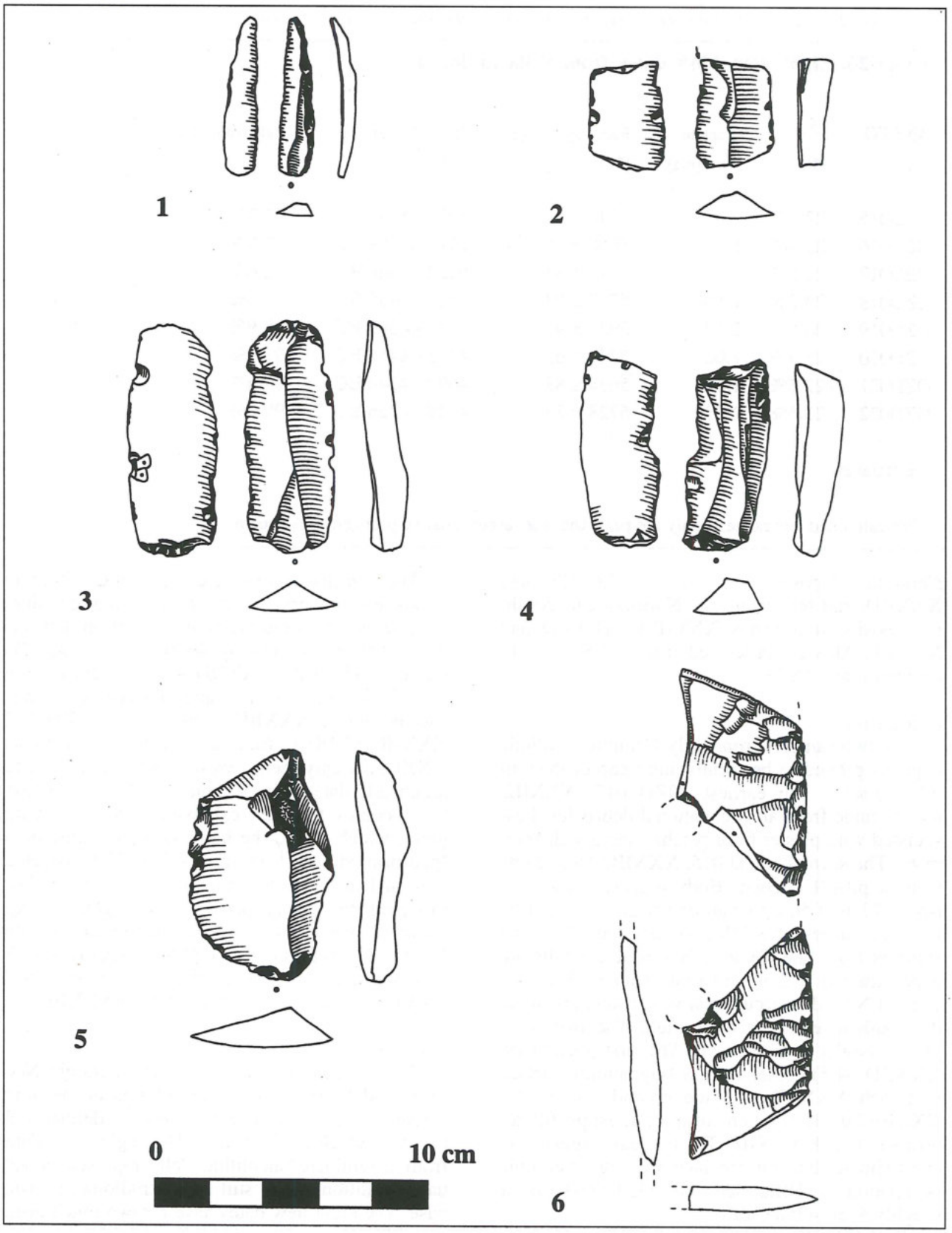
11. Radiocarbon Report: Neolithic and Chalcolithic Strata (Fig. 57).

Introduction

Eight new short-life samples were obtained from Ceramic Neolithic and Early Chalcolithic strata, two from the Pottery Neolithic A levels in trench XXXIID, two from 'Wadi Rabah-derived'



55. Lithics. Trench XXXIID. Neolithic and Chalcolithic Periods. 1. FN 940001F, XXXIID 44.21. Byblos point. 2. FN 940002F, XXXIID 39.12. Byblos point. 3. FN 940003F, XXXIID 44.10. End scraper. 4. FN 940004F, XXXIID 44.13. End scraper. 5. FN 940005F, XXXIID 44.26. Truncated sickle blade. 6. FN 940006F, XXXIID 44.6. Truncated sickle blade. 7. FN 940007F, XXXIID 44.6. Truncated sickle blade.



56. Lithics. Trench XXXIID. Chalcolithic and Early Bronze Ages. 1. FN 940008F, XXXIID 18.36. Bladelet. 2. FN 940009F, XXXIID 18.38. Segmented sickle blade. 3. FN 940010F, XXXIID 42.15. Blade. 4. FN 940011F, XXXIID 42.15. Blade. 5. FN 940012F, XXXIID 42.24 'Canaanean' sickle fragment. 6. FN 940013F, XXXIID 42.14. Perforated disc tool.

57. Radiocarbon analysis. AMS dates from Neolithic and Chalcolithic Periods. Various Trenches.

Table 20. Eight new AMS dates from Pella in Jordan

ANSTO Code	$d^{13}C$ [PDB]	Graphite Mass [mg]	Radiocarbon Age [BP]	2s Calibrated Age [BC]	Relative Probablity
OZD015	-22.9%	1.95	7040 ± 70	6020 - 5766 BC	97.7%
OZD016	-22.1%	1.37	5868 ± 163	5079 - 4359 BC	97.9%
OZD017	-22.2%	2.29	7217 ± 83	6232 - 5968 BC	92.6%
OZD018	-23.2%*	1.60	5727 ± 83	4725 - 4439 BC	91.0%
OZD019	-24.5%	2.19	5933 ± 93	5042 - 4580 BC	98.9%
OZD020	-25.7%	1.06	5747 ± 65	4723 - 4456 BC	97.3%
OZD021	-22.5%	1.87	5654 ± 88	4692 - 4340 BC	99.6%
OZD022	-23.5%	2.03	5728 ± 86	4728 - 4436 BC	90.2%

* estimated

With calibrated age ranges , only the peak with the largest relative probability is shown.

Neolithic deposits in trenches XXXIIF and XXXIID, and four from the 'Northern Chalcolithic' deposits in trenches XXVIIIA, XXXIID and XXXIIF. All were processed at the ANSTO AMS Centre in late 1997.[5]

Discussion

The two samples from early Ceramic Neolithic deposits proved to be significantly earlier than all other assays. The earliest (OZD 017, XXXIID 44.27) came from an occupational debris level associated with plaster floor patches and a wall fragment. The second (OZD 015, XXXIID 46.7) came from a pit-fill deposit. Both suggest a date between 7220-7050 bp or around 6120-5950 CalBC for this earliest Neolithic occupation. The two samples from late Ceramic Neolithic deposits are approximately a thousand years later in date, and suggest Neolithic occupation was discontinuous in the southern environs of the tell. The two dates give a similar overall result. The first (OZD 019, XXXIID 44.6) comes from a fragmentary surface in trench XXXIID, and the second (OZD 016, XXXIIF 20.45), from one of the earliest pit-fill deposits in trench XXXIIF. The two dates suggest an approximate date for the later Ceramic Neolithic occupation at Pella between 5950-5850 bp or roughly 4850-4750 CalBC.

The four dates from the earliest Chalcolithic horizons at Pella form a tight group spanning perhaps as little as a hundred years of occupation, between 5750-5650 bp or roughly 4600-4500 CalBC. The earliest (OZD 020, XXXIID 42.37) is drawn from the contents of a ceramic and plaster-lined storage silo in trench XXXIID. The second (OZD 022, XXXIIF 17.18) is from a floor deposit in trench XXXIIF, twenty metres west of XXXIID. The near identically dated third sample (OZD 018, XXXIID 80.3) comes from an extensive deposit of burnt grain, which sealed the large stone and mud-brick 'platform' structure in trench XXXIID. Together with at least six large ceramic-lined storage silos, this platform formed part of a large grain storage complex, one of the earliest known in the southern Levant. The fourth date (OZD 021, XXVIIIA 44.7) comes from a small pit-fill deposit in trench XXVIIIA, forty metres west of trench XXXIIF.

Conclusion

The various subdivisions of the Ceramic Neolithic and Early Chalcolithic cultures in the north Jordan Valley have long been poorly defined culturally and chronologically. The eight new dates from Neolithic/Chalcolithic Pella represent a valuable addition to the still sparce radiometric database. The eight new dates have thrown much need-

5. The eight new AMS dates were processed under AINSE Grant 97/021. We thank AINSE for this grant, and Drs. Ewan Lawson, Quan Hua and Ugo Zoppi of the AMS dating facility at ANSTO (Lucas Heights, Sydney) for their assistence in the preparation of the new dates.

ed light on the little understood period of earliest settlement at Pella, and in so doing, assist in defining both the origins and developmental pathways of one of the longest lived settlements in the ancient Near East.

12. Summary and General Conclusions

Over the course of the last two field seasons, investigations have continued into the early occupational horizons on the south side of the main tell (trenches XXXIID and XXXIIF), whilst further exploring the major MBA fortification system on the western side of the site (trench XXVIIIC), and the massive LB/IA Fortress Temple (trenches XXXIIE and G) and associated outbuildings (XXXIIJ).

The presence of two distinct phases of Ceramic Neolithic occupation in trenches XXXIID and XXXIIF was unexpected, while further exploration of the Chalcolithic 'platform' area produced significant botanical discoveries bearing on function. Additional Early Bronze Age discoveries were limited to several patches of domestic architecture.

The expanded investigation of the MBA city fortifications along its western margins (trench XXVIIIC) adds much further data on the early constructional date (late MBIIA) and extended circuit of this massive mud-brick fortification system, underlining both the strength and early date of the MBA occupational episode.

The discovery and partial excavation of the massive Fortress Temple (trenches XXXIIE and G) is certainly the highlight of recent work in the Late Bronze and Early Iron ages. The realisation that the Bronze Age temple and many associated buildings (XXXIIJ) remained in use throughout the Iron I-IIA periods has changed significantly our view of the strength and importance of the latest Bronze and earlier Iron Age polity. Consistent thick destruction horizons across the site dating from around 850-800BC suggest a conflagration of great severity, which served to diminish all subsequent Iron Age settlement in and around the main mound of Khirbat Faḥl.

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