ARCHAEOLOGICAL EXPLORATIONS ON THE ROMAN FRONTIER IN NORTH EAST JORDAN: SOME FURTHER NOTES

by
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Introduction

In the course of a ten day stay at Azraq Druze in July 1982 to carry out a pilot study of the ancient environment, the opportunity was taken to revisit some of the sites discussed by the first author in his recent publication.[1] The results of the former work are to be published separately,[2] the present note offers some additional information specifically relevant to the earlier explorations together with a contribution by the second author on the results of thin-sectioning of a sample of pottery collected by Kennedy from several sites in 1978. Sections 1-4 are by Kennedy; section 6 by Cowie. The work in the field was carried out by Kennedy, Dr. D.D. Gilbertson and Mr. D.A. Wilson; the figures are the work of Ms. Carolyn Hanman, B.A., and Ms. Gillian Woolrich, B.A. Special thanks are due to Dr. P. J. Cattermole of the Department of Geology at Sheffield University for checking the thin-sectioning results. Funds were provided by the British Academy, the Craven Committee, Meyerstein Fund, University of Sheffield Research Fund, and Mr. Wilson. Permission for the work was kindly granted by Dr. Adnan Hadidi and support was provided by the British Institute at Amman for Archaeology and History.

Sites

1. Qasr Ain es-Sol[3]

To the plan of the main structure prepared in 1978 may now be added those of foundation walls on the south and west, (Fig. 2). The relatively poor state of preservation is probably to be attributed to those structures having been of a much more flimsy construction: there were no significant traces of collapsed material and it was not evident that it had been removed for inclusion in the few modern buildings in the vicinity.

The internal arrangements are no more than provisional: excavation would certainly reveal more dividing walls, especially in the long-building to the north-east of the *qasr.*

The buildings on the north and the east lie on the remaining raised ground beside the *qasr* together forming a courtyard outside its entrance. The function of the buildings is unknown: storebuildings and for stabling are the obvious possibilities.

The north and east ranges of rooms were clearly broadly contemporary; equally, the southwards extension of the north range abuts the *qasr* and, consequently, is of a later date. No clear date was obtained for any part. I remain of the opinion, however, that the structures around the *qasr* are the remains of an early Islamic development of an abandoned Roman fortlet at a roadside spring.

The low lines of stones on the west and south are apparently part of the water-harvesting activities of the inhabitants.[4] I envisage the land between these walls and the *qasr* forming

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[1] D.L. Kennedy, *Archaeological Explorations on the Roman Frontier in North-East Jordan, BAR.*, Oxford, 1982.

[2] D.D. Gilbertson and D.L. Kennedy, an archaeological reconnaissance of water harvesting structures and wadi walls in the Jordan desert north of Azraq Oasis, *ADAJ,* forthcoming.

[3] Kennedy, *ibid.,* p. 128-132.

[4] Gilbertson and Kennedy, *ibid.*

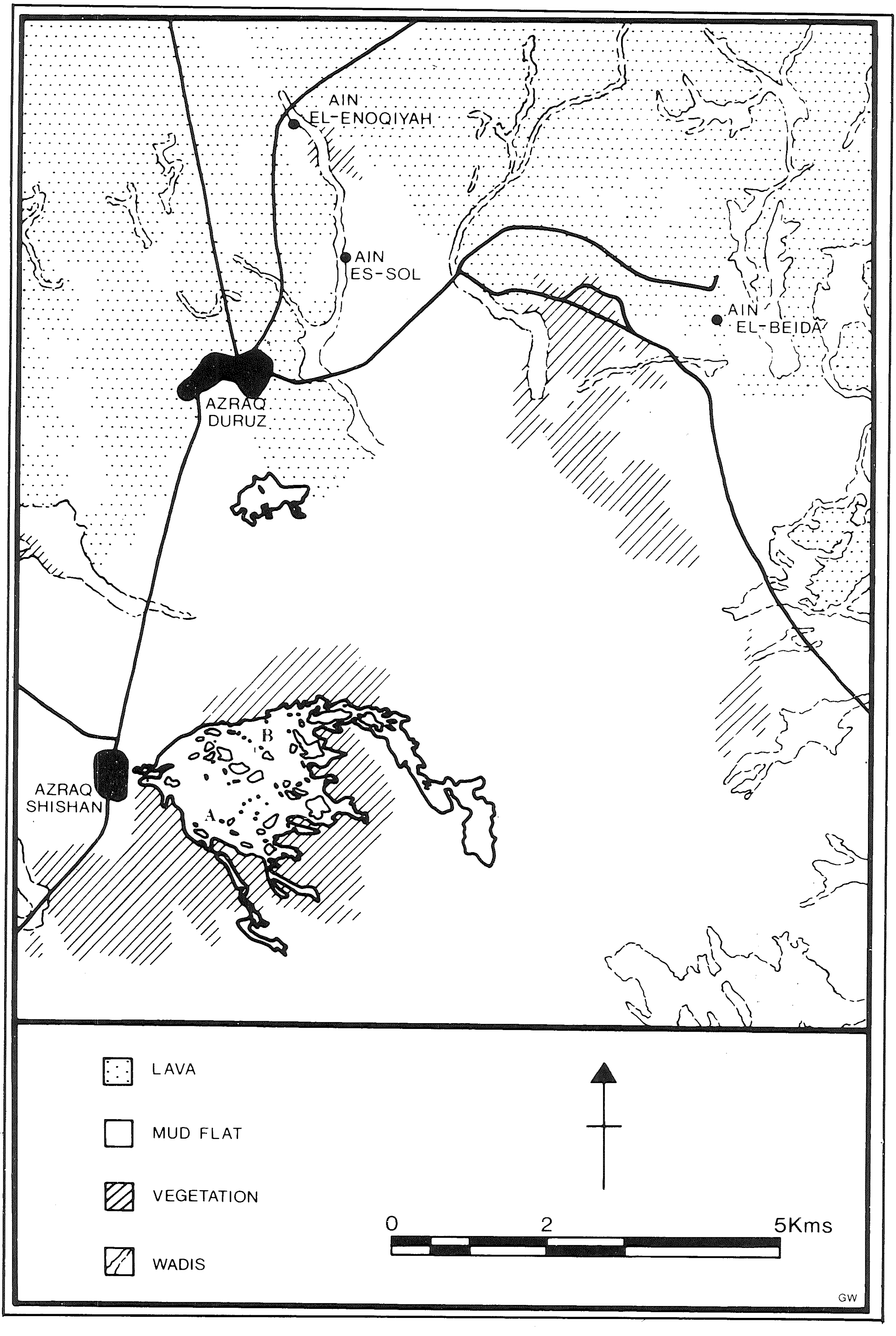
AIN
EL-ENOQIYAH
AIN
ES-SOL
AIN
EL-BEIDA
AZRAQ
DURUZ
B
A
AZRAQ
SHISHAN
LAVA
MUD FLAT
VEGETATION
WADIS
0
2
5Kms
GW

Fig. 1

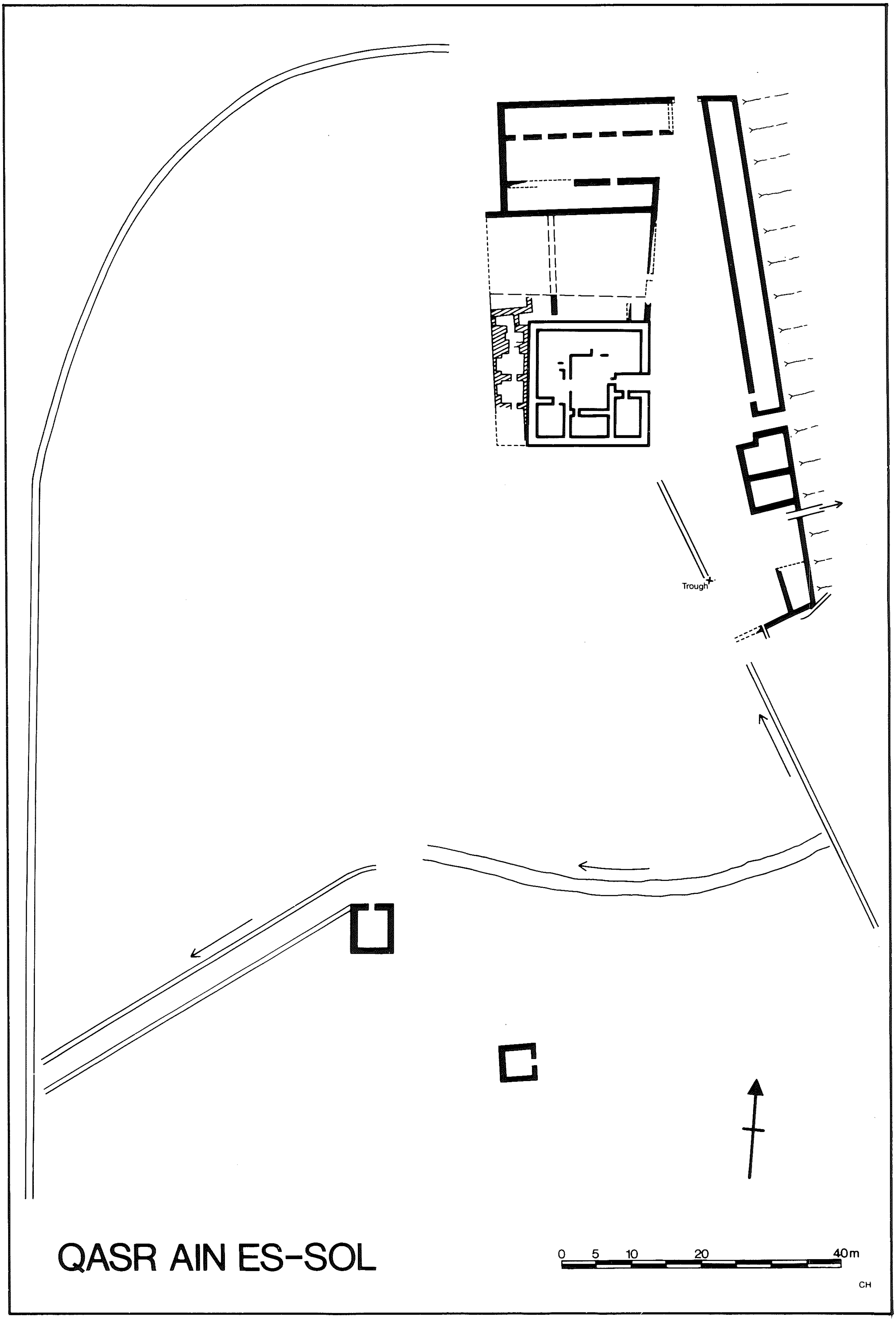

Fig. 2: Qasr Ain Es-Sol

an irrigated garden with water from the wadi on the west.

2. Roman road north from Azraq Druze[5]
While re-examining a stretch of this road several miles beyond Ain el-Enoqiyah, Mr. David Wilson observed the base of a Roman milestone on the right side of the road at a point approximately 5 kms. north of Rujm Mudawer (Pl. LXIII: 1). The squared base and part of the cylindrical drum of the black basalt stone were all that survived and there were no traces of lettering. The overall height including the base was 0.49 m.; the circumference of the drum *ca.* 0.63 m. The inscribed part of the drum may well be amongst those recorded in Azraq fort and patently removed from this road.[6]
About 500 m. beyond the milestone base was found half of a basalt quern lying in the roadway (Pl. LXIII: 2). No associated structures were noted in the vicinitv of the road at either point.

3. Wadi el-Baida grafitti
During a brief visit to Qasr Ain el-Beida,[7] a group of bedouin offered to show us some grafitti. At a spot in a recessed bay of the Wadi el-Beida (CRO13317) we photographed both ancient and modern drawings and lettering on a number of rocks. Some others, fainter, were shown to us nearby. The ancient texts have been identified as Safaitic by Mr. Michael MacDonald who is to include them in his corpus of the Safaitic inscriptions of Jordan.

4. Wadi el-Beida causeway
At the lower end of the wadi, to the north east of the *qasr,*[8] the foundation course of a causeway curves across the wadi bed linking tracks over the high ground on either side (Pl. LXIII: 3). Age could not be determined, it could be quite recent though the surface was rutted.

Analysis of twenty sherds of "Roman" coarse ware

From several hundred sherds collected at random from sites in north-east Jordan in 1978[9] were selected for detailed macroscopic and thin-section analyses. These analyses were undertaken with the intention of gaining further information about the ceramic technology used in North-East Jordan during the Roman period, and the provenance of the sherds in question. The latter was regarded as especially interesting in view of Kennedy's[10] suggestion that every-day coarse wares were likely to have been the produce of a highly local pottery industry"., He supports this statement with the observation that at one site, Aseikhin, the pottery has a "purplish tinge" similar to that of the local volcanic rock, basalt. It is interesting to note that similar observations have been made concerning fine Nabataean pottery from Petra, which has a red-pinkish colour "strikingly reminiscent of the geology of the Petra district."[11]

The sample and its chronology
The sample of Roman coarse ware consisted of: eight sherds from Qasr el-Uweinid, eight sherds from Qasr el-Aseikhin and four sherds from Azraq Druze. At present the dating of this pottery remains uncertain.[12] Therefore the dates given for the sample in Table 1 must be considered only as provisional. Kennedy[13] has questioned the reliability of the current typological chronology of ceramics in this area, pointing out, for example, that while the probable single period fort at Uweinid is dated by two inscriptions

[5] *Ibid.*
[6] Kennedy, *ibid,* p. 170.
[7] *Ibid.,* p. 186.
[8] *Ibid.*
[9] *Ibid,* p. 313-25.
[10] *Ibid.,* p. 325.
[11] Khairy, N.I. Technical aspects of fine Nabataean Pottery *Bulletin of the American Schools of Oriental Research,* No. 250, 17-40.
[12] Kennedy, Personal communication.
[13] Kennedy, *Ibid.,* p. 313-314.

to the early third century (201 and 200/2 respectively) paradoxically all dateable pottery from the site has been assigned to the Late Roman IV period (A.D. 284-324).[14]

Macroscopic analysis

In this study macroscopic analysis is regarded as a preliminary stage to record such attributes of pottery that will not be observed during thin-section analysis such as hardness and colour, and if possible to obtain a preview of some of the fabrics inclusions. These attributes can provide useful information about ceramic technology, and methods of production (Table 1).

Each sherd was inspected in the hand, assisted by a hand lens (magnification x 8), and the presence of any visible voids and non-plastic inclusions in the fabrics was noted. When possible, inclusions were quantified using four categories: present (one or two inclusions only), sparse, moderate, and common. These terms are only used to express relative quantities. All sherds in the sample have relatively fine fabrics. Most mineral and rock inclusions observed in the sherds are less than 1.0 mm. in diameter. Similarly grog (crushed pottery), which occurs in six sherds, and voids are generally less than 1.0 mm. in diameter. The sample demonstrates that the use of the term coarse ware for lower quality, utilitarian pottery can sometimes be misleading.

Hardness may be defined as various things, but for the purpose of this analysis I have taken it to mean the resistance of a pottery fabric to penetration and abrasion. To test their hardness the sherds were scratched with a set of graded minerals and their hardness recorded according to Mohs' scale. It should be stressed that this is a rough test, for there is no uniformity in the pressure applied in making the scratch. The sherds display considerable variation in their hardness, ranging from those which are fairly soft with a hardness of 3 in Mohs' scale to very hard pottery with a hardness of 7. This attribute is dependant on the properties of the potting clay (principally its composition), and firing temperature. The variation of hardness, even between sherds that have similar pastes when viewed in the hand and through a microscope (for example sherds UW 1 and UW 7) suggests that the pottery was fired in a wide range of temperatures, and that the hardest sherds in the sample were probably fired at a temperature higher than the rest.

Because the colour of pottery is largely dependent on the technological processes involved in its manufacture, and the composition of the paste used, an examination of this attribute may often provide useful information about methods of pottery production. In the case of each sherd, a complete cross-section of pot wall was examined (cross-sections were conveniently created by the preparation of thin-sections), and the colours of the surfaces and core were matched to corresponding colours in a Munsell Soil Colour Chart. This information, presented in Table 1, was then converted into a numerical code (Table 2). The code represents the colour of the sherds, and the firing conditions that these may indicate.

Most sherds (UW 5, UW 8, AS 1, AS 3, AS 6, AS 7, AS 8, AZ 2, AZ 4) have reddish yellow to brown walls, indicating oxidation throughout, although there are slight colour differences between the outer areas and cores in some cases. Three sherds (UW 1, UW 3 and UW 7) have walls that are brownish to pinkish grey throughout, which may indicate partial oxidation. Several sherds (UW 2, UW 4, AS 2, AS 4, AS 5, and AZ 3) have grey non-oxidized cores, with lighter outer areas which are mainly reddish yellow to reddish brown resulting from varying degrees of oxidation. Most of these sherds display some oxidation to a depth of at least 1.0 mm. from the surface. The borders between the residual carbon in the dark core, and the lighter coloured oxidized outer zones are fairly well defined.

[14] S.J. Parker, archaeological survey of the limes Arabicus: a preliminary report, *ADAJ,* XXI (1976), p. 19-31.

Table 1: Results of Macroscopic Analysis

RD	*Site*	*Chronology (of sample)*	*Composition (Measurements in mm.)*	*Hardness (Mohs' scale)*	*Wall Thickness (mm.)*	*Colour Thickness of areas in brackets (mm.)*	*Remarks*
1.	Qasr el-Uweinid (1978)	3rd Century	Moderate limestone and grog <1.0 Moderate-common voids ≤2.0	7	2-3 Up to 6 at rim	Light brownish grey 10 YR 6/2 throughout, dark grey 10 YR 4/1 patches on interior surface.	Rim sherd. Ribbed exterior surface.
2	,,	,,	Moderate quartz, limestone and grog <1.0, sparse-moderate voids mostly <1.0	7	5	Pinkish grey 7.5 YR 6/2 exterior and interior areas (1.0), but reddish yellow 5 YR 6/6 at surface, grey 10 YR 6/1 core.	Rim sherd. 2 shallow incised bands parallel to rim on exterior surface.
3	,,	,,	Sparse inclusions <1.0 including grog, moderate voids ≤2.0 mainly in ext. surface.	4	3 up to 6 at rim	Pinkish grey 7.5 YR 6/2 throughout.	Rim sherd.
4.	,,	,,	Moderate limestone <0.5, moderate common voids ≤1.0 mainly in surfaces.	4	4	Light red 2.5 YR 6/6 exterior (1.0) and interior (superficial) areas, grey 10 YR 6/1 core.	Rim sherd.
5.	,,	,,	Sparse basalt ≤1.0	3	19-23	Reddish yellow 5 YR 6/8 throughout	Handle
6	,,	,,	Sparse quartz, limestone, and grog ≤1.0, moderate voids ≤1.0 in surfaces.	5	5	Dark grey 7.5 YR 6/0 throughout.	Ribbed exterior surface.
7.	,,	,,	Moderate-common lime-stone, and grog <1.0 sparse voids ≤1.0	3	5	Pinkish grey 7.5 YR 6/2 throughout.	Ribbed exterior surface.
8.	,,	,,	Basalt present c. 1.0, sparse voids <0.5 in core.	5	4-6	Red 2.5 YR 5/6 throughout.	

1.	Qasr el-Aseikhin (1978)	2nd-3rd Century	Sparse quartz? and basalt <1.0 Sparse voids <1.0	4	4-5	Reddish brown 2.5 YR 4/4 exterior (1.0) and interior (1.5) areas reddish brown 5YR 5/3 core.	
2.	,,	,,	Moderate basalt <0.5, moderate voids <1.0 in core.	3	6-8	Yellowish red 5 YR 5/6 exterior (2.0) and interior (1.5) areas, grey 5 YR 5/1 core.	
3.	,,	,,	Limestone, and grog <0.5 present, sparse voids mainly <1.0	3	6-8 Up to 10 at rim	Pink 7.5 YR 7/4 throughout.	Rim sherd.
4.	,,	,,	Moderate quartz <0.5, sparse limestone <0.5, moderate voids <0.5.	5	8-9	Reddish yellow 7.5 YR 6/6 exterior area (0.5) light brown 7.5 YR 6/4 interior area (superficial), light grey 10 YR 7/1 core.	
5.	,,	,,	Sparse basalt ≤1.0, sparse voids <1.0 in core.	5	6-9	Yellowish red 5 YR 5/8 exterior (1.5-2.0), and interior (1.0) areas, grey 7.5 YR 6/0 core.	
6.	,,	,,	Sparse voids <1.0.	3	5-7	Yellowish red 5 YR 5/6 throughout.	
7.	,,	,,	Sparse basalt ≤1.0, sparse voids <0.5.	4	5-6	Light red 2.5 YR 6/6 exterior (2.0) and interior (≤1.0) areas, brown 7.5 YR 5/4 core.	
8.	,,	,,	Sparse basalt ≤1.0	3	6	Reddish yellow 5 YR 6/8 throughout.	
1.	Azraq Druz (1978)	2nd-4th century	Sparse quartz/quartzite ≤1.0	6	4-5	Grey 7.5 YR 6/0 exterior area (2.0) grey 10 YR 5/1 interior area (3.0).	
2.	,,	,,	Common limestone ≤1.0 (concentrated in exterior area), common voids ≤1.0 (mainly in interior area).	3	7-9	Red 2.5 YR 5/6 exterior area (3.0) brown 10 YR 5/3 interior area (3.0-6.0).	
3.	,,	,,	Sparse basalt <1.0	3	4-6	Dark reddish brown 2.5 YR 3/4 exterior area (1.0-2.0), red 2.5 YR 4/6 interior area (1.0-2.0), grey 5 YR 5/1 core.	
4.	,,	,,	Moderate quartz ≤0.5, moderate-common limestone <0.5.	3	8-10	Brown 7.5 YR 5/4 exterior (2.0), and interior (3.0) areas, reddish brown 5 YR 5/4 core.	

Table 2: The degree of oxidation (as indicated by colour)

Sherd No.	*Group*[1]	*Colour* *Exterior area*	*Core*	*Interior area*
UW1	A	4	4	4
UW2	—	4[2]	2	4[2]
UW3	A	4	4	4
UW4	A	.7	2	7
UW5	B	7	7	7
UW6	A	2	2	2
UW7	A	4	4	4
UW8	B	7	7	7
AS1	B	5	5	5
AS2	B	7	1	7
AS3	—	6	6	6
AS4	—	7	2	6
AS5	B	7	2	7
AS6	B	7	7	7
AS7	B	7	5	7
AS8	B	7	7	7
AZ1	—	2	1	1
AZ2	—	7	5	5
AZ3	B	5	1	7
AZ4	A	5	5	5

Colour:
1 = Dark non oxidized
2 = Light non oxidized
3 = Dark uncertain
4 = Light uncertain
5 = Dark partly-fully oxidized
6 = Light partly - fully oxidized
7 = Oxidized

(Colours based on the Munsell System
Dark = Values 2-5
Light = Values 6-8
Non oxidized = Chroma 1
Uncertain = Chroma 2
Partly - fully oxidized = Chroma 3-5
Oxidized = Chroma 6-8
Hue yellower than 2.5 YR

[1] Groups defined during thin-section analysis
[2] 7 at surface

Two sherds (AZ 1, and UW 6) have entirely grey non-oxidized walls, suggesting that they may have been fired in a reducing atmosphere.

Many sherds have slightly darker, dirtier colouring at their surfaces and old fractures than that observed at the freshly made cross-sections. When such differences are apparent, the colouring of the surfaces and old fractures are attributed to post depositional processes, and are therefore, generally ignored. However, it is interesting to note that many of the sherds in group B (sherds that thin-section analysis showed to contain basalt fragments and/or basalt derived minerals]) weather to the 'purplish' colour described by Kennedy.

The fine parallel striations present on the exterior and interior surfaces of many of the sherds were probably created while the vessels were thrown on the wheel.

Thin-section analysis

Thin-sections were prepared from each sherd in the sample, and were then viewed through a petrological (polarizing) microscope at a magnification of X 15 and

X 50. The inclusions observed in the pastes were identified and then quantified by visual comparison of the thin-sections, and placed into four categories: present, sparse, moderate, and common (see Table 3). A graticule was used to measure the diameter of inclusions, and quartz grains (the most frequent type of inclusion) were divided into size categories. The analysis results allowed two fabric groups to be defined within the sample. These groups were given the code letters A and B.

The sherds of group A have a yellowish to greyish brown clay matrix with moderate inclusions of quartz less than 0.05 mm. in diameter, sparse to moderate quartz grains of 0.05 to 0.1 mm., and present to moderate quartz grains greater than 0.1 mm. While the quartz grains vary from angular to sub-rounded most are sub-angular. The sherds also contain moderate to common limestone fragments that are mainly 0.2 mm. or less, although fragments up to 2.0 mm. can be seen in some thin-sections. Apart from a few grains of hematite (an iron oxide) most sherds contain little iron. The exception is sherd AZ 4 which has a brown clay matrix that is relatively rich in iron. Therefore, although AZ 4 is similar to the sherds of group A in other respects, strictly speaking it should be regarded separately. Four group A sherds contain sparse to moderate grog, mainly with a diameter of 1.0 mm. or

Table 3: Results of thin-section analysis

Sherd No.	*Group*	*Quartz (mm.)* *<0.05*	 *0.05-0.1*	 *>0.1*	*Quartzite/ Strained Quartz*	*Feldspar*	*Olivine*	*Pyroxene*	*Basalt Frag-ments*	*Carbonate (Lime-stone)*	*Grog*
UW 1	A	M	S	X	—	—	—	—	—	C	M
UW 2	—	M	M	M	X	X	—	—	X?	S	M
UW 3	A	M	S	—	—	—	—	—	—	C	S
UW 4	A	M	S	—	—	—	—	—	—	C	—
UW 5	B	C	S	—	—	—	S	—	M	—	—
UW 6	A	M	M	M	X	—	—	—	—	C	M
UW 7	A	M	S	S	—	—	—	—	—	M	M
UW 8	B	C	S	—	—	—	X	—	X	—	—
AS 1	B	C	S	—	—	S	X	—	S	—	—
AS 2	B	C	S	—	—	S	S	—	S	—	—
AS 3	—	S	X	—	—	—	—	—	—	X	X
AS 4	—	M	M	M	S	—	—	—	—	S	S
AS 5	B	C	S	—	—	S	S	—	S	—	—
AS 6	B	C	S	X	—	S	X	—	—	—	—
AS 7	B	C	S	—	—	S	S	S	S	—	—
AS 8	B	C	S	X	—	S	—	S	S	—	—
AZ 1	—	M	M	S	S	—	—	—	—	—	S
AZ 2	—	C	S	—	—	S	S?	—	—	C	—
AZ 3	B	C	S	—	S	S	S?	S	X	—	—
AZ 4	A	M	M	M	—	—	—	—	—	C	—

? = Identification uncertain
X = Present (one or two grains only)
S = Sparse
M = Moderate
C = Common

less.

The sherds of group B have a reddish brown clay matrix, with common quartz grains less than 0.05 mm. and sparse quartz grains of 0.05 to 0.1 mm. So in granulometric terms the quartz is fine and well sorted, that is to say the grains are fairly uniform in size, mostly silt (particles less than 0.06 mm.). As in group A most quartz grains are sub-angular. Group B sherds also contain sparse basalt fragments and/or basalt derived minerals, namely feldspar, olivine, and pyroxene. These inclusions are the most distinctive feature of group B. The basalt fragments, which are rarely larger than 1.0 mm., consist of olivine phenocrysts in a ground mass of plagioclase feldspar, and pyroxene, although olivine is absent from some of the smaller fragments. However, the groundmass of the basalt inclusions in sherds UW 5 and UW 8 is isotropic and vesicular. Basalt derived minerals also occur separately in the clay matrix as individual grains. Cracks can be seen clearly on some olivine phenocrysts, which are marked by networks of iron oxide where alteration has occurred. Group B sherds are relatively rich in iron oxide. It occurs as distinct grains, and as part of the matrix giving the clay a reddish tinge. Iron-ores almost certainly make a significant contribution to the distinctive purplish colour of both basalt and pottery containing basaltic inclusions.

In addition, thin-sections were prepared from a basalt fragment from Qasr el-/Aseikhin, and a basalt quern found at Hallabat for comparison with the basalt inclusions observed in group B sherds. The rock from Aseikhin is composed of dark, very altered olivine phenocrysts in a vitrified isotropic groundmass, with some feldspar laths, which is similar to the basalt inclusions observed in sherds UW 5 and UW 8. The quern from Hallabat is composed of olivine phenocrysts in a groundmass of plagioclase feldspar, and pyroxene. Grains of magnetite (iron) are also present. Indeed much of the iron in group B sherds probably has a basaltic origin. Magnetite fired in an oxidising atmosphere will be converted to hematite. Similarly, magnetite may sometimes be converted to hematite under naturally occurring oxidising conditions which may occur, for example, close to the vesicles found in basalt, or as the rock weathers.

Ceramic technology

In his survey of pottery and other artefacts from Pella, in the Jordan Valley, Smith[15] implies that the late Roman provincial pottery of Jordan is "well levigated usually to the extent that it shows no inclusions to the naked eye". Similarly, all twenty sherds in the sample from North-East Jordan have fine fabrics. There is, however, no evidence to suggest that they were made from clays refined by elutriation (levigation), a process which removes the larger, heavier particles from clay. Thin-section analysis shows that the pottery,fine as it is, contains rock and mineral particles that are a little too coarse and frequent for levigated clays. Therefore the potters probably used naturally occurring fine clays to produce this pottery.

Among the inclusions observed in the pottery grog is the only material that could be positively identified as a filler (temper). Several sherds contain crushed pottery, including four in Group A. However, grog is absent from sherds in Group B. It is possible that some of the mineral inclusions observed in the sherds are also additives introduced to the clays by the potters. Nevertheless, it seems likely that most mineral inclusions in the pottery are natural constituents of the clays rather than fillers.

The regularity and evenness of the sherd walls, together with the presence of fine parallel striations on the interior and exterior surfaces of many of the sherds, suggest that the pottery is wheel-made.

With the exception of an oven found in the fort at Azraq, Kennedy[16] has discovered no evidence of ovens or kilns during

[15] R.H. Smith, *Pella of the Decapolis*, Ohio, 1971, p. 217.

[16] Kennedy, personal communication.

his fieldwork in North-East Jordan. Nevertheless, the attributes of the sherds themselves provide useful information about the conditions in which they were fired. The hardness and colour of the sherds show that the firing temperature, duration, and atmosphere, the pastes were subjected to, varied considerably, although it seems that most sherds -were fired in an oxidizing atmosphere. Ten sherds were well fired in an oxidizing atmosphere so that the entire thickness of their walls is oxidized. Six sherds have grey non-oxidized cores with lighter oxidized outer areas. The presence of a dark core indicates incomplete combustion of carbonaceous matter in the paste, which in turn suggests that either the firing temperature was too low, and/or the firing duration was too brief to burn out all the carbon.[17] The hardness of sherds UW 2, AS 4 and AS 5 makes the low temperature explanation unlikely, so that their non-oxidized cores are probably due to rapid firing.

Provenance

Thin-section analysis of the sample was undertaken principally for the purpose of pottery characterization. By matching the mineral suite observed in a paste to regional geology it is possible to establish the source of the raw material used to make the pottery, which may in turn lead to the identification of the production source itself. The precision of characterization depends on the geology of the area in which the pottery is produced.[18] For example, if pottery is made in a region where the geology is similar over a wide area its provenance cannot be defined by thin-section analysis within that area. To a certain extent this is the situation with which we are faced in North-East Jordan. The sites from which the sample was taken, Qasr el-Uweinid, Qasr el-Aseikhin, and Azraq Druze, are located in the Azraq depression. Large volcanic fields of basalt cover the northern part of the depression, while the southern and western parts are mainly limestone desert. Aseikhin, and Azraq lie on the edge of the main basalt field. Uweinid, less than fifteen kilometres south-east of Azraq, has to its north an area of basalt, /and to the south, east, and west, areas of limestone, and fluviatile deposits.[19] The mineral suites in the sherds reflect the geology described above. Unfortunately, from thin-section analysis alone we can say little more about the provenance of sherds in groups A and B than that the former were probably made in or near a limestone area, while the latter were probably made in or near a basalt field. In order to increase the precision of characterization by thin-section analysis, it is also necessary to analyse the composition of the ceramic assemblages of sites in North-East Jordan, and establish distribution patterns for coarse ware fabric groups. For example, most of the ceramic assemblage at Qasr el-Aseikhin appears to consist of purplish pottery,[20] an observation that alone suggests local production. Furthermore, the fact that thin-section analysis has shown purplish sherds to contain basaltic inclusions, together with Aseikhin's position on the edge of a large basalt field, lends further support to the view that the purplish pottery at this site was produced locally, however, it must be said that the assessment of the composition of Aseikhin's pottery assemblage was based on the casual observation of scatters, rather than on the analysis of a representative sample from the site. Indeed, at present distribution patterns of coarse ware fabric groups in North-East Jordan, based on the analysis of representative pottery samples, are urgently required.

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[17] F.R. Matson, some aspects of ceramic technology, *Science in archaeology,* London, 1963, p. 595; A.O. Shepard. *Ceramics for the archaeologist,* Washington, 1956, p. 104.

[18] D.P.S. Peacock, the scientific analysis of ancient ceramics, a review, World archaeology, I (1970) p. 375-386.

[19] Kennedy, *ibid.,* p. 70.

[20] Kennedy, personal communications.

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