Volume 2

Peshdar Plain Project Publications

Unearthing the Dinka Settlement Complex

The 2016 Season at Gird-i Bazar and Qalat-i Dinka

edited by

Karen Radner, F. Janoscha Kreppner and Andrea Squitieri

PeWe-Verlag

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Preface

Karen Radner & F. Janoscha Kreppner

To Wolfgang Röllig, in admiration

We are very pleased to present the results of the 2016 activities of the Peshdar Plain Project (PPP) in time for the start of the 2017 autumn campaign at Gird-i Bazar, which will bring the excavations in this part of the Dinka Settlement Complex to a close after three years.

The publication of this second volume of the series *Peshdar Plain Project Publications* (4P2) was made possible by the unstinting support and unfailing assistance of the General Directorate of Antiquities of the Autonomous Region of Kurdistan, the Sulaymaniyah Directorate of Antiquities and the new Raparin Directorate of Antiquities and their individual members, named in Chapter A; the sponsorship of the institutions who generously provided funding: above all, the Alexander von Humboldt Foundation and Ludwig-Maximilians-Universität München (LMU Munich), but also the Gerda Henkel Foundation and the Münchener Universitätsgesellschaft; and of course the personal commitment and great enthusiasm of all team members, a motley crew of experts of different fields from Austria, Canada, France, Germany, Iran, Iraq, Italy, the Kurdish Autonomous Region of Iraq, Romania, Syria, the UK and the USA, all individually named with their respective responsibilities in Chapter A.

In addition, we would like to express our deep gratitude to our cooperation partner Jessica Giraud, director of the *Mission archéologique française du Gouvernorat de Soulaimaniah* (MAFGS), for generously sharing not only data, contacts and logistical information but also MAFGS' entire kitchen equipment, a wealth of soft furnishings including cushions, bedding and curtains - merci beaucoup! We also want to thank several colleagues at LMU Munich: Petra Oppermann for overseeing the financial and logistical preparation and aftermath of the field and study campaigns and for her constant and manifold support of the project and especially the LMU project team; Henry Heitmann-Gordon for again assisting with the language editing of parts of this volume; and Jakob Riedl and Luise Tiemann for help in preparing some of the figures. Finally, a heartfelt thank you to Peter Werner, our publisher, colleague and friend, for his experience, knowhow and attention to detail.

As the first volume of the series *Peshdar Plain Project Publications* (4P1; Exploring the Neo-Assyrian Frontier with Western Iran: The 2015 Season at Gird-i Bazar and Qalat-i Dinka, edited by Karen Radner, F. Janoscha Kreppner and Andrea Squitieri, Gladbeck 2016; Open Access download: https://epub.ub.uni-muenchen.de/29236/), this book again is a "work in progress", representing our current state of knowledge; the results of future work may well lead to modifications in the interpretations presented in this book. But it is intended to be more than just a preliminary report, as we present every single stratigraphic unit of the 2016 excavations in Qalat-i Dinka and Gird-i Bazar, having completed the stratigraphic analysis for all areas excavated. The 2015 Gird-i Bazar results, published in 4P1, have been updated and merged with the 2016 findings. All further analyses of ceramics, small finds, archaeozoological and archaeobotanical remains, phytoliths etc. will be able to draw on this work.

We would like to dedicate this volume to Wolfgang Röllig, Professor emeritus of Assyriology at the University of Tübingen, whose interdisciplinary approach to the study of Ancient Near Eastern history has inspired us since starting out in the exciting field of Assyrian studies in the 1990s. Thank you, Wolfgang, for the happy days in Tell Sheikh Hamad and Deir ez-Zor, for sharing your knowledge and your vision and for generally making things happen!

Munich and Berlin, July 2017

A. Continuing the Peshdar Plain Project 2016 objectives

Karen Radner

The Peshdar Plain is located in the province of Sulaymaniyah in the Kurdish Autonomous Region of Iraq directly on the border with Iran (**Fig. A1**). The Peshdar Plain Project was inaugurated in 2015 in order to explore the history of this understudied region with a focus on the 9th to 7th century BC when the Neo-Assyrian Empire controlled the area, situated right at its eastern frontier (**Fig. A2**). The project brings together international experts in history, archaeology, bioarchaeology, landscape archeology, geography, geophysics, material science studies, GIS, photogrammetry and 3D modeling.

We are very grateful for the ongoing support and help of the General Directorate of Antiquities of the Kurdish Autonomous Region of Iraq, headed by Abu Bakr Othman, known as Mala Awad; the Sulaymaniyah Directorate of Antiquities, headed by Kamal Rasheed Raheem, under whose auspices the project is conducted; and the newly established Raparin Directorate of Antiquities headed by Barzan Baiz Ismail. We thank the people of the city of Qaladze, where the project's dig house is based, and of the village of Nureddin, where the excavations take place, for their hospitality and interest.

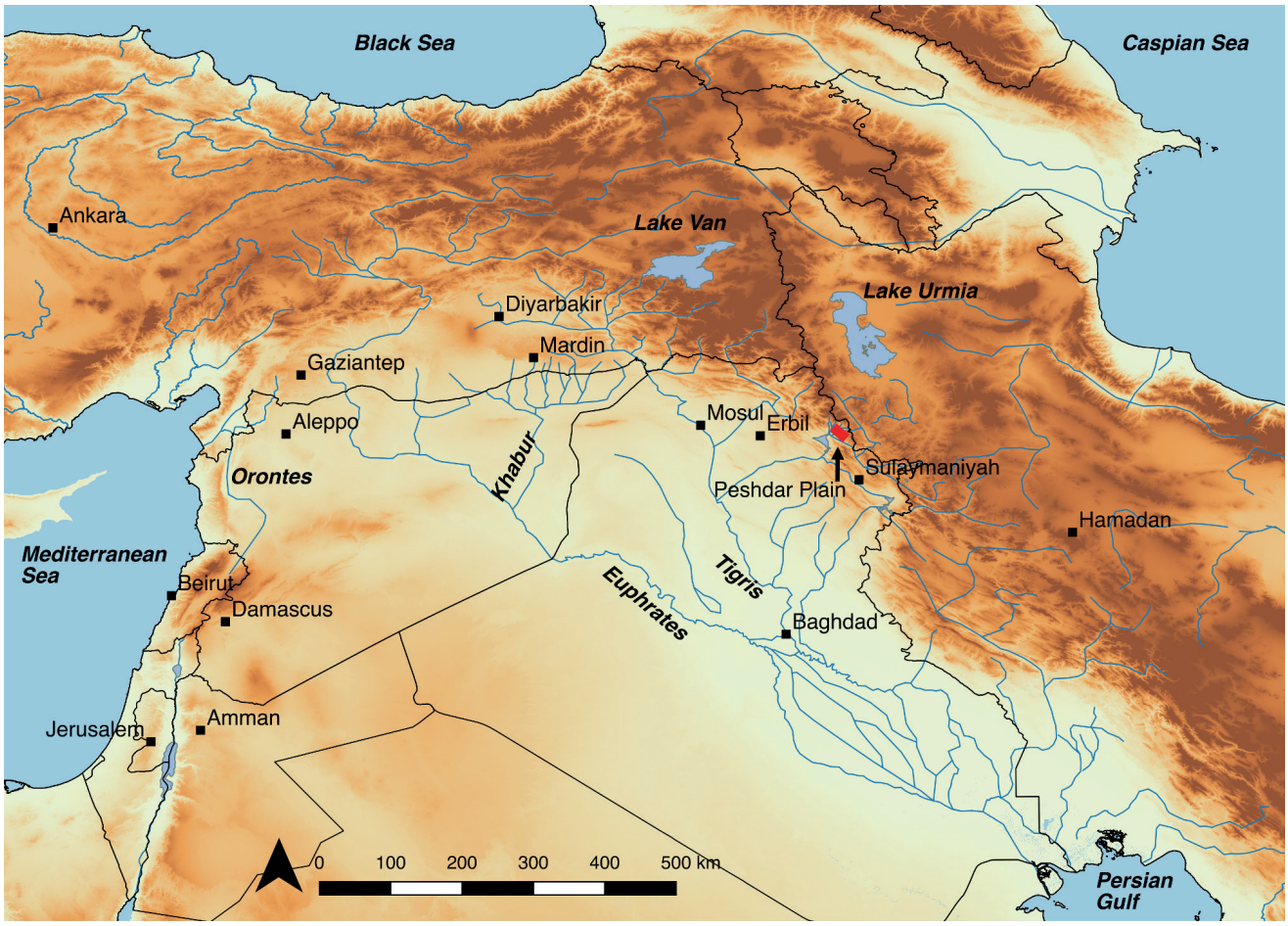


Fig. A1: The position of the Peshdar Plain in the modern Middle East, on the border of the Kurdish Autonomous Region of Iraq with Iran. Prepared by Andrea Squitieri.

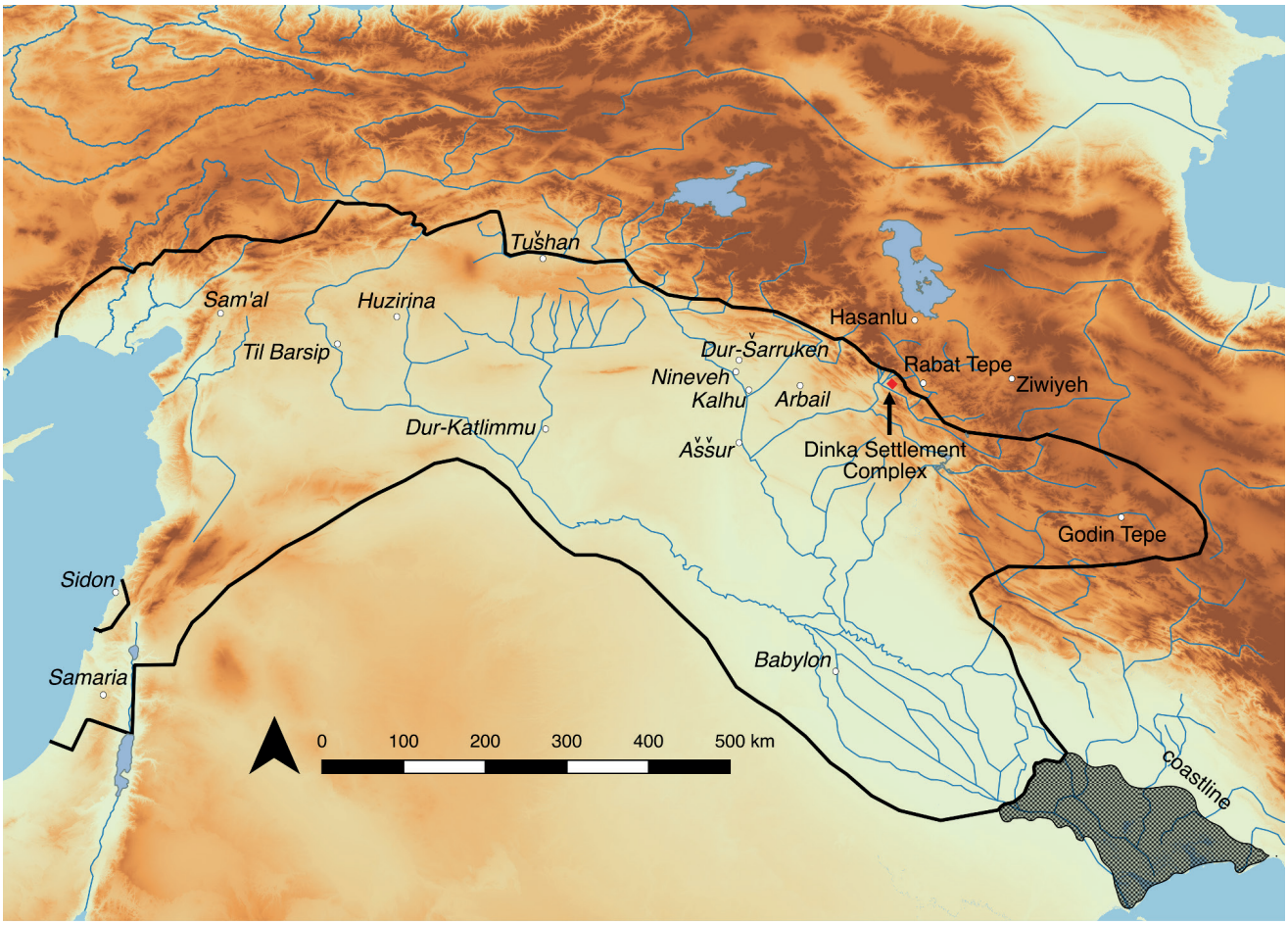


Fig. A2: The position of the Dinka Settlement Complex at the end of the 8th century BC, on the eastern frontier of the Neo-Assyrian Empire. Ancient place names in italics. Prepared by Andrea Squitieri.

We are equally grateful to our sponsors. In 2016, the activities of the Peshdar Plain Project received funding from Radner's Alexander von Humboldt Chair for the Ancient History of the Near and Middle East, which is financed by the Federal Ministry of Education and Research through the International Research Fund for Germany and by LMU Munich; from the Gerda Henkel Stiftung (for the development of the digital documentation system by Christoph Forster); and from the Münchener Universitätsgesellschaft (for the magnetometer survey headed by Jörg Fassbinder).

A1. Unearthing the Dinka Settlement Complex

The Peshdar Plain Project was initiated after Barzan Baiz Ismail and Ismail Muhammad Ali, then Sulaymaniyah Directorate of Antiquities and now Raparin Directorate of Antiquities, showed me, during a visit to Raniya in February 2015, a fragmentary cuneiform tablet that a farmer had discovered in 2013 at Qalat-i Dinka (UTM 511921.3 E, 3999115.1 N, altitude: 579 m; henceforth also Dinka), whose high mound looms at the end of a crescent shaped mountain range over the Lesser Zab (**Fig. C1**).

The autopsy of the tablet showed it to be a Neo-Assyrian legal document – only the second such text to come to light in the Kurdish Autonomous Region of Iraq after the discovery of a fragmentary contract during the 2010 rescue excavations at the settlement mound of Sitak[1], near Sulaymaniyah. The tablet from Dinka proved to be a slave sale contract of the year 725 BC with an intriguing mention of a servant of the Palace Herald[2]. This apparent clue to the Border March of the Palace Herald, a province under the command of one of the top officials of the Neo-Assyrian Empire charged with controlling and protecting access to the Assyrian heartland, prompted me to start the archaeological investigations, following also

1 Radner 2017.
2 Radner 2015; 2016a.

Fig. A3: The position of the excavations conducted so far at the Dinka Settlement Complex, from west to east: the T-shaped sounding at Qalat-i Dinka (spring 2016); GA 42, the intended "off-site" sounding (autumn 2015) that yielded evidence for Neo-Assyrian occupation, including a 14C date from a charcoal sample; the U-shaped sounding in "Dinka Lower Town 2" (spring 2017); the area in the enclosure of the chicken farm at Gird-i Bazar (autumn 2015 and autumn 2016) that turned out to be "Dinka Lower Town 1". Drone image created by ICONEM (Paris; http://iconem.com), courtesy of Un Film à la Patte (Strasbourg; http://www.unfilmalapatte.fr) and Jessica Giraud. Annotated by Andrea Squitieri.

a suggestion from Jessica Giraud, director of the *Mission archéologique française du Gouvernorat de Soulaimaniah* (MAFGS), whose 2013 surface survey had identified Neo-Assyrian pottery at Dinka and at the nearby shallow mound of Gird-i Bazar (UTM 512695.8 E, 3999301 N, altitude: 539 m; henceforth also Bazar).

First excavations in Bazar and magnetometer surveys in Dinka and Bazar took place in the autumn of 2015. During this period, Mark Altaweel opened three geoarchaeological trenches between Bazar and Dinka which, however, yielded evidence for the continuation of the Neo-Assyrian period occupation in the plain[3]. The results of these investigations, coupled with the results of Jessica Giraud's subsequent second surface survey in autumn 2015[4], pointed towards the existence of an extended site that included both Dinka and Bazar. The existence of this large settlement was conclusively proven by the results of the second magnetometer survey in autumn 2016 and first excavations in spring 2017. As its ancient name is presently unknown we call the site, which includes Gird-i Bazar and Qalat-i Dinka, the "Dinka Settlement Complex".

Exploring the Dinka Settlement Complex in its local environment within the framework of a wider study of the eastern frontier region of the Neo-Assyrian Empire is currently the main goal of the Peshdar Plain Project. **Fig. A3** shows the extent of the excavations so far, including the recent work undertaken in the new area called Dinka Lower Town 2.

3 Altaweel/Marsh 2016.

4 Giraud 2016.

A2. The 2016 activities of the Peshdar Plain Project

With three study and fieldwork campaigns, 2016 was a busy year for the project.

A2.1 Pottery study season in Sulaymaniyah in January 2016

The first excavation campaign in Gird-i Bazar in autumn 2015 had revealed many well-stratified ceramic collections from primary contexts that can be dated to the Neo-Assyrian period, including the floors of Buildings A and H and of Alleys 12 and 13 as well as from inside the pottery kiln in Open Area 8 and the drainage pit in Room 1 of Building A.

As the Gird-i Bazar ceramics differ markedly from the material known from the Neo-Assyrian sites in the Assyrian heartland along the Tigris, it was necessary to develop a pottery typology for the Gird-i Bazar assemblage. This was the goal of the study season at the Sulaymaniyah Museum between 19 to 28 January 2016 whose key results were already published in the 2015 report[5].

Team members:
- Jean-Jacques Herr, ÉPHÉ Paris, lead ceramicist and pottery processing,
- F. Janoscha Kreppner, LMU Munich & FU Berlin, Germany, pottery processing,
- Hero Salih Ahmed, Sulaymaniyah Directorate of Antiquities, representative, pottery processing and drawing,
- Andrea Squitieri, LMU Munich, pottery processing and photography.

A2.2 First excavation campaign to Qalat-i Dinka in spring 2016

To further investigate the settlement structures discovered by the geophysical prospection in the autumn of 2015[6], an archaeological excavation was conducted from 21 May to 7 June 2016 on the western slope of Qalat-i Dinka. The results are presented in **Chapter C**.

Team members (**Fig. A4**):
- F. Janoscha Kreppner, LMU Munich & FU Berlin, field director,
- Andrea Squitieri, LMU Munich, deputy field director, digital documentation and small finds processing,
- Hero Salih Ahmed, Sulaymaniyah Directorate of Antiquities, representative, trench supervisor and pottery processing,
- Awaz Jihad, Sulaymaniyah Directorate of Antiquities, representative, trench supervisor and pottery processing,
- Aziz Sharif, Sulaymaniyah Directorate of Antiquities, driver,
- Ibrahim Manla Issa, Erbil, cook,
- 8 workers from Qaladze and the village of Nureddin.

A2.3 Second prospecting and excavation campaign to Gird-i Bazar in autumn 2016

From 13 August to 6 September 2016 the second prospecting and excavation campaign in Gird-i Bazar was conducted with the participation of 23 specialists from 11 countries[7] and 19 local workers. The results are presented in **Chapters B1**, **B2** and **D**.

Team members (**Fig. A5**):
- Karen Radner, LMU Munich, project director, 13.8.-6.9.2016.

Representatives of the Sulaymaniyah Directorate of Antiquities:
- Hayman Noori, 20.8.-4.10.2016 (also pottery processing and pottery and small find photography),
- Hero Salih Ahmed, 13.8.-19.8.2016 (also pottery processing and drawing).

Logistics:
- Aziz Sharif, Sulaymaniyah Directorate of Antiquities, driver, 13.8.-4.10. 2016,
- Ibrahim Manla Issa, Erbil, cook, 15.8.-2.10.2016,
- Baiaz Ibrahim, Erbil, assistant cook (also pottery processing), 15.8.-2.10.2016.

Field team:
- F. Janoscha Kreppner, LMU Munich & FU Berlin, field director, 13.8.-4.10.2016,
- Silvia Amicone, University College London (now: University of Tübingen), pyrotechnology and kiln excavation, 26.8.-13.9.2016,

5 Herr 2016.

6 Fassbinder/Ašandulesei 2016.

7 One Austrian, Canadian, Iranian, Iraqi and Romanian each; two French, Syrians and US Americans each; four Germans, five Italians and six Kurds.

Fig. A4: The 2016 Qalat-i Dinka team with visitors from Sophia Cultural Club. Photo by Sophia Cultural Club, Qaladze.

Fig. A5: Most of the 2016 Gird-i Bazar team (5th September 2016). Photo by Jean-Jacques Herr (by automatic shutter release).

- Francesca Chelazzi, University of Glasgow, trench supervisor, 7.9.-4.10.2016,
- Vera Egbers, FU Berlin, trench supervisor, 13.8.-4.10.2016,
- Christoph Forster, Fa. Datalino, Berlin, digital documentation, 20.8.-6.9.2016,
- Zahra Hashemi, Université Paris 1, trench supervisor, 14.8.-4.10.2016,
- Alessio Palmisano, University College London, trench supervisor, 13.08.-13.9.2016,
- Andrea Squitieri, LMU Munich, deputy field director, digital documentation and small finds processing, 13.8.-4.10.2016,
- 19 workmen mainly from Nuruddin, 20.8.-27.9.2016.

Pottery team:
- Jean-Jacques Herr, LMU Munich, lead ceramicist and pottery processing, 13.8.-4.10.2016,
- Mohammad Aziz, Sulaymaniyah, pottery washing, 15.8.-2.10.2016,
- Abdullah Bakr Othman, ELTE Budapest & Salahaddin University Erbil, pottery registration and photography, 3.9.-2.10.2016,
- Zuhair Rajab Abdullah al-Samarraee, Baghdad, pottery drawing, 15.8.-2.10.2016,
- Bilind Shushe, Sulaymaniyah, pottery processing and photography, 15.8-30.8.2016.

Specialists:
- Mark Altaweel, University College London, geoarchaeology, 31.8.-6.9.2016,
- Andrei Ašandulesei, Alexandru Ioan Cuza University of Iași, Romania, geophysics, 10.9.-20.9.2016,
- Jörg Fassbinder, Bayerisches Landesamt für Denkmalpflege, Munich, geophysics, 10.9.-20.9.2016,
- Tina Greenfield, University of Manitoba, Winnipeg, Canada, archaeozoology, 2.9.-30.9.2016,
- Elsa Perruchini, University of Glasgow, residue analysis of pottery, 7.9.-22.9.2016,
- Melissa Rosenzweig, Miami University, Oxford, Ohio, archaeobotany, 3.9.-7.9.2016.

A3. The scope of this volume

After a first short summary in the journal *Ash-sharq: Bulletin of the Ancient Near East*[8], the present volume is a comprehensive report of the fieldwork of the Peshdar Plain project in 2016 and its results.

Section B consists of two chapters dedicated to the geophysical investigation of the Dinka Settlement Complex. As detailed in Chapter B1, Jörg Fassbinder and his team continued the magnetometer survey begun in 2015 and focused on the areas west and south of Gird-i Bazar towards Qalat-i Dinka. Examining an area of c. 400 × 400 m, they were able to demonstrate the existence of an extensive lower town linking up Gird-i Bazar and Qalat-i Dinka with quarters of different character. They discovered extended, densely settled neighbourhoods arranged along a planned street grid, a workshop area and a complex of larger buildings that is set apart from the other structures observed. The team also investigated nearby Gawr Miran where Neo-Assyrian pottery had been observed by Jessica Giraud and her MAFGS survey team.

In Chapter B2, Mark Altaweel presents the results of the electrical resistivity tomography (ERT) investigations conducted with a team from the University of Sulaymaniyah's Department of Geology, supervised by Professor Bakhtiar Qader Aziz, to further explore the subterranean *qanat* irrigation system observed in the Bora Plain[9]. So far, measurements were taken for 18 transects in autumn 2016 and spring 2017, beginning to reveal a complex network of tunnels that is very likely associated with the Neo-Assyrian period Dinka Settlement Complex.

In Section C, F. Janoscha Kreppner and Andrea Squitieri present the results of the excavation at the western slope of Qalat-i Dinka conducted in spring 2016. Here, the geophysical prospection of autumn 2015 had indicated the presence of structures that Jörg Fassbinder interpreted as the remains of burned buildings inside of an enclosure wall. In order to confirm this and assess the temporal and functional relationship to the settlement under excavation at Gird-i Bazar, a T-shaped test trench with a width of 1.5 m was dug whose two parts had a length of 20 m and 8.5 m, respectively. The excavation yielded substantial architecture with 1.10 m wide walls and a tiled floor with pottery of the same temporal horizon as Gird-i Bazar, that is the Neo-Assyrian period. On the minus side, the area is rather damaged by recent looting pits; but on the plus side, the building was encountered close to the surface and with no younger architecture on top. The chapter includes a discussion of the pottery (with Jean-Jacques Herr) and of the small finds.

Section D is devoted to the excavations at Gird-i Bazar in autumn 2016 where work continued in all areas investigated in 2015, resulting in a continuous excavated area of 625 m² by the end of the campaign. Alessio Palmisano, F. Janoscha Kreppner and Andrea Squitieri present their

8 Radner/Kreppner/Squitieri 2017.

9 Altaweel/Marsh 2016.

results from Building A (in the 2015 "Eastern Trench"). Francesca Chelazzi discusses Building D and Outdoor Area 8 (in the 2015 "Connecting Trench"), where pyrotechnology expert Silvia Amicone excavated and sampled the pottery kiln in the outdoor area. Work in the 2015 "Western Trench" continued under Vera Egbers who presents her results from Building D and E and Zahra Hashemi who discusses Building F. These buildings were used for living and working, and the existence of at least one pottery kiln shows that nearby Outdoor Area 8 was used for ceramic production. Contrary to our preliminary interpretation of last year, the buildings turned out not to be single-room houses. Instead, at least Building D, Building F and (probably) Building A consist of several rooms that are grouped around an inner courtyard, comfortably equipped with a well and a drainage system.

Section E consists of three chapters concerning pottery studies. In Chapter E1, Jean-Jacques Herr presents a selection of significant vessels from the 2016 excavations at Gird-i Bazar, an update to his typology of the Gird-i Bazar ceramics of 2015 and a first overview of the attested *chaînes opératoires*, based on the collaboration with Silvia Amicone who conducted thin section petrography analysis in order to refine the macroscopic fabric classification and also started investigating the clay sourcing (Chapter E2). Elsa Perruchini's Chapter E3 is dedicated to the first round of residue analysis on pottery from Gird-i Bazar and Qalat-i Dinka, with a special focus on her new on-site sampling methodology.

In Section F, Andrea Squitieri presents the small finds from Gird-i Bazar, arranged according to building context; as in 2015, the majority of the finds are stone tools although grinding stones, usually so typical for domestic contexts, continue to be absent in the material uncovered.

In Section G, Tina Greenfield presents the refined bioarchaeological sampling strategy at Gird-i Bazar, where close collaboration with Arlene Rosen (University of Texas at Austin) and Melissa Rosenzweig (Miami University, Oxford, Ohio) had led to improvements in the protocols for phytolith and palaeobotanical sampling. She presents preliminary results of her analysis of the animal bones and of Rosenzweig's palaeobotanical studies and discussed the graveyard on top of the ruins of the Neo-Assyrian occupation of Gird-i Bazar. 14C analysis of a tooth from one of the burials confirmed the dating to the Sasanian period that had already been suggested by the pottery found on the associated surface while Christoph Berthold (Competence Center Archaeometry Baden-Wuerttemberg (CCA-BW) of the University of Tübingen) showed by conducting μ-XRD analysis on beads from this same burial and another that they are made of carnelian.

The book closes with in Section H and Karen Radner's, F. Janoscha Kreppner's and Andrea Squitieri's conclusions drawn from the work conducted so far.

None of these studies would have been possible without the hard work, the enthusiasm and the unfailing support of our local colleagues. In particular, the substantial progress made in ceramic processing and analysis could only be achieved due to the wealth of experience and knowledge contributed to the project by Zuhair Rajab Abdullah al-Samarraee, Abdullah Bakr Othman, Hero Salih Ahmed and Hayman Noori.

B. Geophysical research in the Bora Plain

B.1 Magnetometer prospection at the Dinka Settlement Complex and Gawr Miran, 2016

Jörg W. E. Fassbinder, Andrei Ašandulesei & Marion Scheiblecker[10]

Magnetic prospection is among the methods most suitable for the large-scale prospection of archaeological sites. First applied by Aitken and Belshé in 1956[11], the method has since become a standard practice of archaeological geophysics[12] and proved very successful when first used at the Dinka Settlement Complex in 2015[13].

When we undertook the first magnetometer survey at Gird-i Bazar in August 2015, the area west and south of the chicken farm enclosure was roughly ploughed and not suitable for a high-resolution magnetometer survey. In the summer of 2016, however, the conditions of this area were perfect: almost all the intensively used fields around the chicken farm had been harvested already in June, and all the deep ploughing furrows of the last year had been levelled out and the surface was flat and even.

Our magnetometer prospection in September 2016 focused therefore on the area between the chicken farm at Gird-i Bazar and the elevation of Qalat-i Dinka, in the southwest of the lower town of the Dinka Settlement Complex (**Fig. B1.1**). We continued to use the caesium magnetometer Scintrex Smartmag SM4G-special in the so-called "duo-sensor configuration" which enables us to measure the highest possible signal of the archaeological features while minimising the noise to signal ratio (**Fig. B1.2**). Simultaneously, we can double the speed of the fieldwork. The magnetometer probes are fixed on a wooden frame and carried handheld in zigzag mode 30 cm above the ground. Since the magnetometer in this configuration is very tolerant in respect to the tilting of the probes, it is highly suitable for working in difficult, steep and uneven terrain and allows us to cover ditches and field boundaries (**Fig. B1.3**).

At the Dinka Settlement Complex, we surveyed an area of c. 400×400 m, covering the plain from the west and south of the chicken farm to the western road. The profiles were oriented preferably east-west or alternatively parallel to the direction of the plough furrows in order to minimise disturbance of the magnetometer probes. During September 2016, solar activity and the diurnal variation induced by the solar wind were comparatively low[14]. These conditions allowed us to reduce the diurnal variations to the mean value of all data for each 40×40 m grid[15]. The sampling density was 12.5×50 cm. To create discrete field values a re-sampling program designed by Fassbinder was used, which sets the data to 25×25 cm. Further data handling and processing followed the 2015 protocol[16].

As in 2015, in situ susceptibility measurements were undertaken with a handheld Kappa meter (SM-30, ZHinstruments, Brno, Czech Republic) which corresponded to last year's measurements[17]. The susceptibility contrast of the undisturbed topsoil and the archaeological layers is relatively low. Nevertheless, the habitual use of high magnetic rocks and gravels for the foundations of buildings at the Dinka Settlement Complex, as observed in the excavated areas, results in a high contrast magnetogram image. For the future, further mineral magnetic analysis is planned for a better understanding of the soil magnetic properties and the site formation processes.

In addition to the work at the Dinka Settlement Complex, test measurements in an area of c. 0.5 hectares were undertaken at the site of Gawr Miran, situated c. 3.5 km northeast from Qalat-i Dinka on top of a small plateau (**Fig. B1.4**). As Jessica Giraud's MAFGS team had found surface ceramic assemblages comparable to the Neo-Assyrian period pottery excavated at Gird-i Bazar at this site in 2015, a connection between Gawr Miran and the Dinka Settlement Complex seems likely[18].

10 Jörg Fassbinder and Andrei Ašandulesei conducted the magnetometer surveys while Marion Scheiblecker (LMU Munich) assisted in the evaluation of the results. The team is grateful for the generous financial support of the Münchener Universitätsgesellschaft for the geophysical prospection, awarded to Karen Radner.

11 Belshé 1957; Aitken 1958.

12 Aspinall/Gaffney/Schmidt 2008; Fassbinder 2016.

13 Fassbinder/Ašandulesei 2016.

14 http://www.ips.gov.au/Space_Weather.

15 Fassbinder/Gorka 2009.

16 Fassbinder/Ašandulesei 2016, 36.

17 Fassbinder/Ašandulesei 2016, 36-38.

18 Giraud 2016, 35.

Fig. B1.1: Panorama view of the Bora Plain, looking from Qalat-i Dinka in the west towards the plateau of Gawr Miran in the northeast. The chicken farm of Gird-i Bazar is visible in the centre. Photo by Jörg Fassbinder.

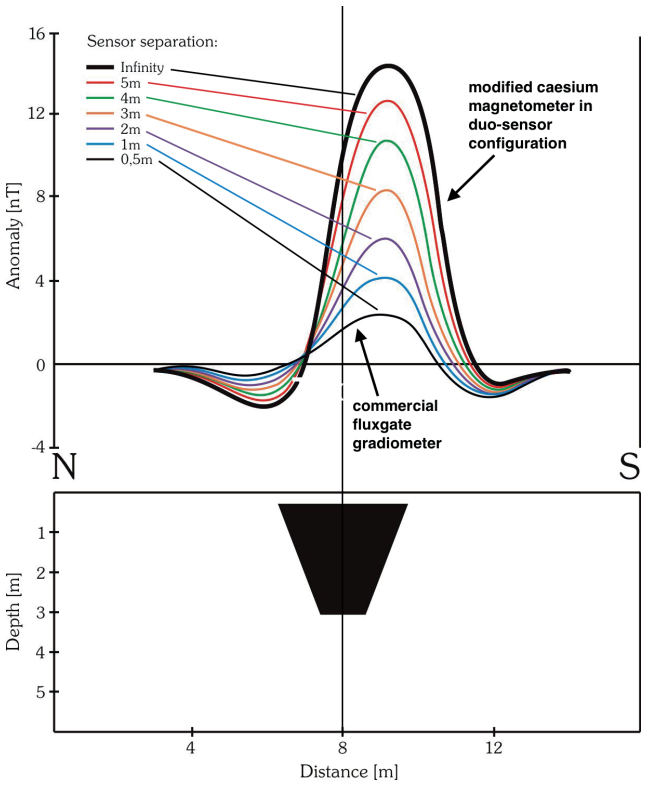


Fig. B1.2: Dependence of the intensity of a magnetic anomaly above a V-shaped body (ditch, c. 2.75 m deep and 3.5 m wide at the top) on the sensor / probe configuration of a magnetometer, calculated for an inclination of the Earth's magnetic field of 60° in the northern hemisphere. Prepared by Jörg Fassbinder.

Fig. B1.3: Andrei Ašandulesei surveying the lower town of the Dinka Settlement Complex with the handheld Caesium magnetometer in the duo-sensor configuration in September 2016. The large scale gravel extraction operations underway on the Lower Zab are visible in the background. Photo by Jörg Fassbinder.

Fig. B1.4: Satellite image of the Bora Plain showing the location of Qalat-i Dinka, Gird-i Bazar and Gawr Miran. Satellite image provided by Bing, accessed in July 2017. Elaborated in QGIS by Andrea Squitieri.

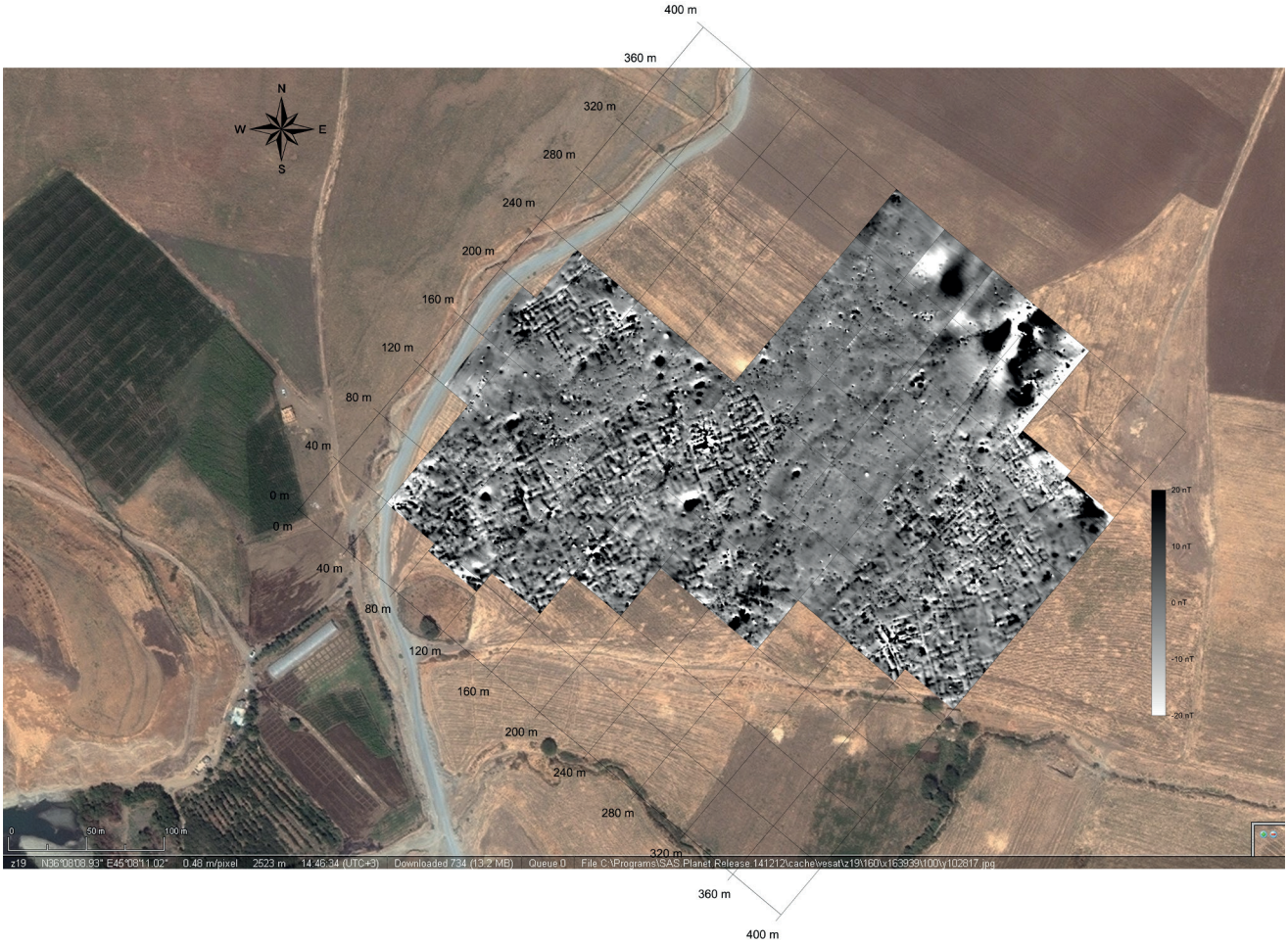


Fig. B1.5: Dinka Settlement Complex. Magnetogram of the survey area of c. 400×400 m between Gird-i Bazar and Qalat-i Dinka. Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics in 256 grey scales. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Satellite image provided by Bing, accessed in June 2017. Prepared by Jörg Fassbinder.

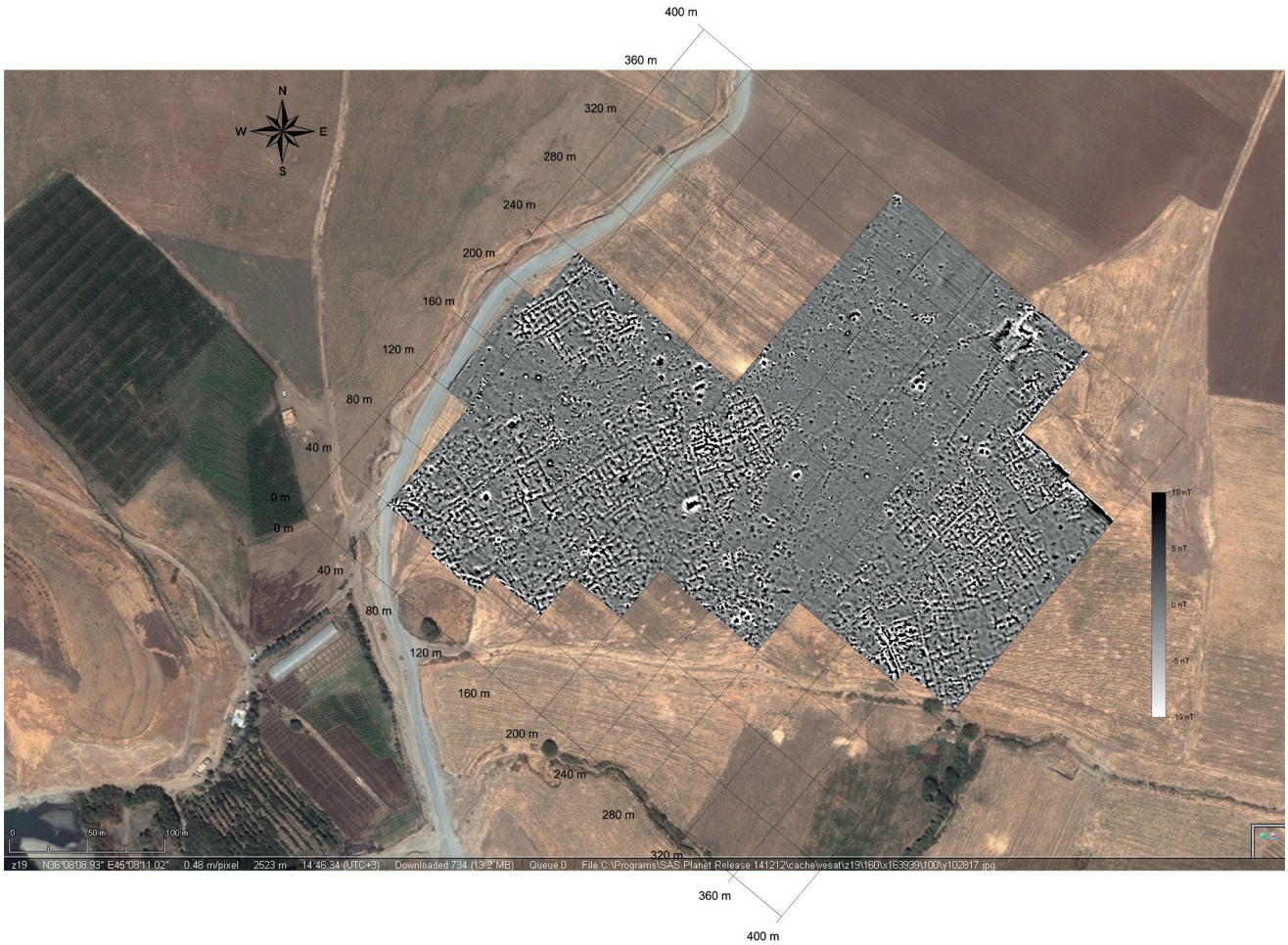


Fig. B1.6: Dinka Settlement Complex. Magnetogram of the survey area of c. 400×400 m between Gird-i Bazar and Qalat-i Dinka. Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics in 256 grey scales, fused by 10×10 high-pass filter. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Satellite image provided by Bing, accessed in June 2017. Prepared by Jörg Fassbinder.

B1.1 Prospecting the lower town of the Dinka Settlement Complex

The starting point for the 2016 survey (**Figs. B1.5-6**) was the site of Gird-i Bazar, partly destroyed by the modern chicken farm and partly excavated. An area of 40×80 m in the northeast of the enclosure, covering a slight elevation, had been surveyed in 2015 but no features except for some undefined pits were observed there[19]. In September 2016, we surveyed an area of c. 400×400 m to the south and the west of the chicken farm, starting at a distance of 10 m from the the fence around the chicken farm (**Fig. B1.7**).

The magnetometer survey results revealed an extremely clear, sharp and highly contrasting magnetic image underground. The archaeological features can be clearly distinguished from the adjacent soil and geological background, an aridisol developed on gravel and alluvium of the valley[20]. As detailed above, the surface conditions were excellent, with almost no disturbances in the topsoil. In addition, there are several further reasons for the outstanding results:

19 Fassbinder/Ašandulesei 2016, 36, 38.

20 According to the preliminary assessment of Eileen Eckmeier (Geography Department, LMU Munich) who took first samples for soil analyses in May 2017.

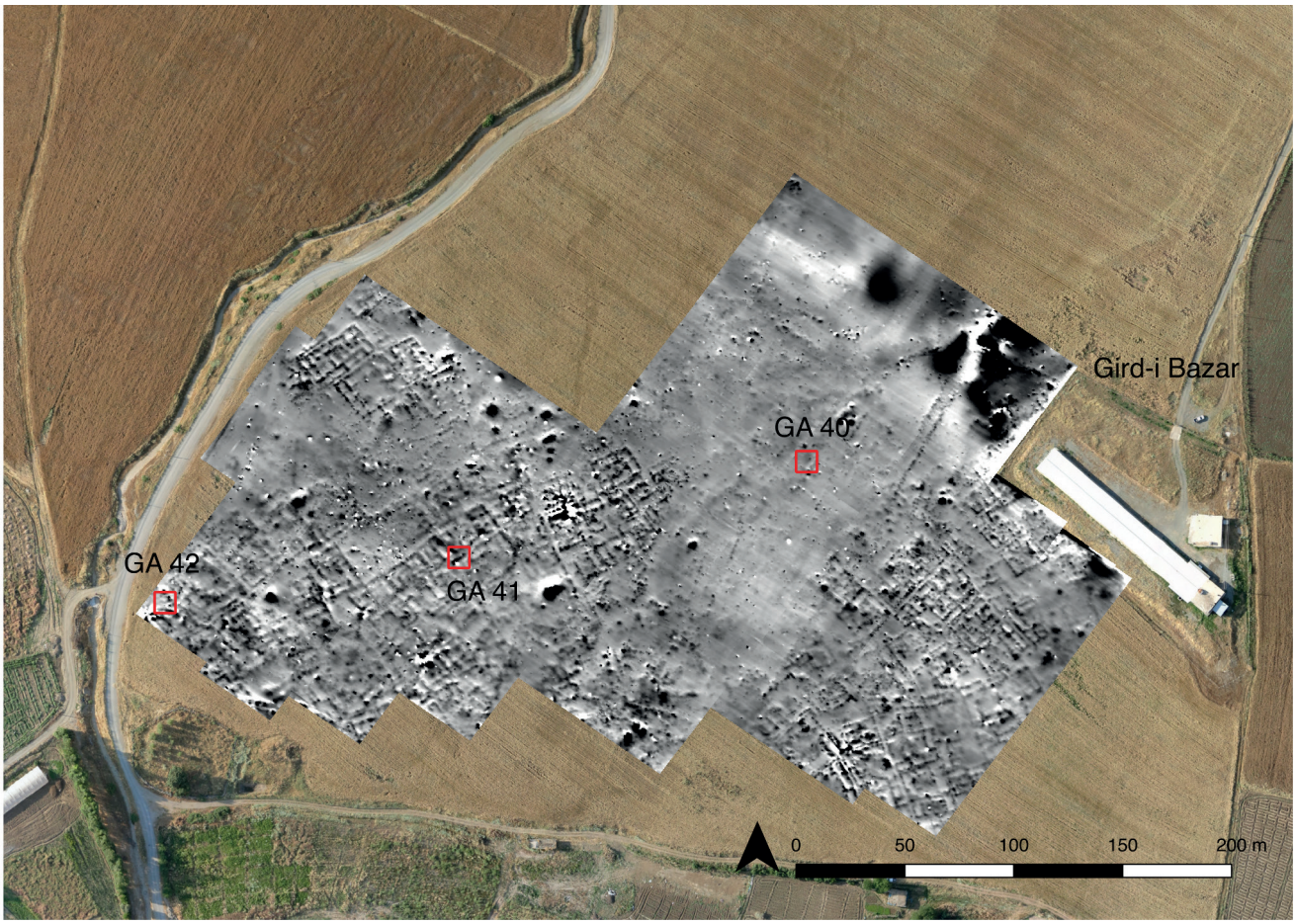


Fig. B1.7: Drone image showing the locations of the geoarchaeological trenches (red squares: GA 40-42) opened in 2015, superimposed on Jörg Fassbinder's magnetogram of the area between Gird-i Bazar and Qalat-i Dinka surveyed in September 2016. Drone photo created by ICONEM (Paris; http://iconem.com), courtesy of Un Film à la Patte (Strasbourg; http://www.unfilmalapatte.fr) and Jessica Giraud. Annotated by Andrea Squitieri.

Site conditions:

- The Dinka Settlement Complex is a single phase site with one archaeological layer.
- There is neither erosion nor destruction to the archaeological layer in the lower town (unlike at Qalat-i Dinka with its steep slope).
- The gravels and stones used to build the buildings' stone foundations display a high contrast to the magnetic susceptibility of the soil.
- The remanent magnetisation of the rocks contributes decisively to a very much higher intensity compared to the almost viscous remanent magnetisation of the adjacent soil.

Methodology:

- The caesium magnetometer used achieves measurements of a physical resolution that is 10× to 100× higher than that of commercial fluxgate magnetometer systems (**Fig. B1.2**).
- A special, well engineered sensor configuration of the field magnetometer.
- Precise data collection and high spatial resolution.
- Sophisticated data processing, fusing and visualisation as a grayscale image.

As in the 2015 survey, the magnetic field intensity data in a 40×40 m grid varies in the range of ±20 nT from the corrected mean value of the geomagnetic field. The stronger anomalies can be ascribed to burnt features such as kilns, lightning strikes or pieces of iron containing slag or iron waste. They are easily distinguishable by their different direction of magnetic dipole anomalies but also by their value of high intensities (> ±50 nT) (**Figs. B1.8-11**).

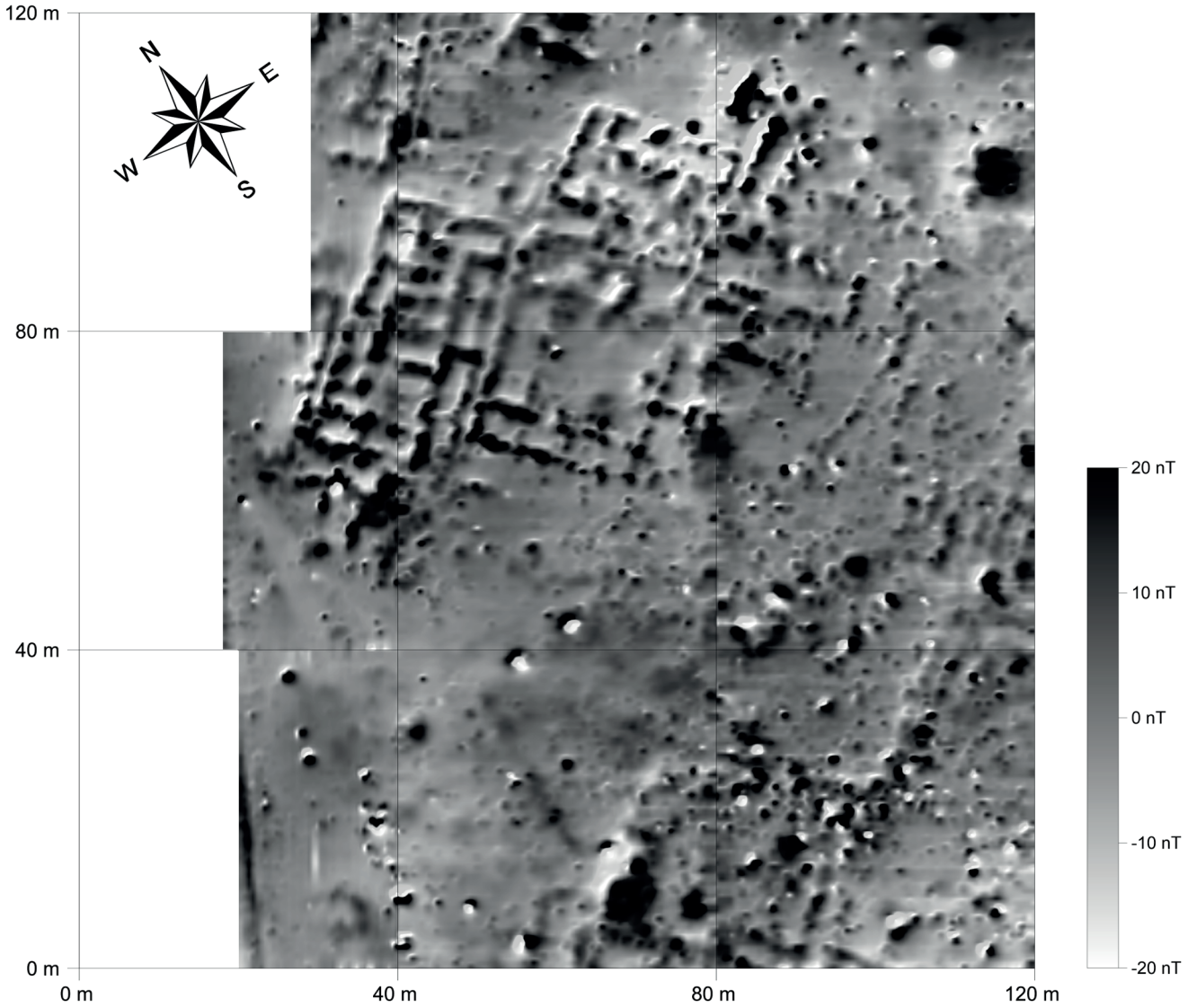


Fig. B1.8: Detail of the "large building complex" with three large buildings, seemingly free-standing. Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales, fused by 10×10 high-pass filter, displayed with hill-shading mode. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Prepared by Jörg Fassbinder.

For the integrated interpretation, we try to classify the findings:

1. by the shape and layout of the feature;
2. by the intensity of the magnetic anomaly;
3. by the direction and intensity of the remanent magnetisation;
4. by the induced magnetisation (volume magnetic susceptibility).

No. 1 is based on archaeological background knowledge. Nos. 2-4 are based on the supplementary measurements in the geophysics laboratory, such as magnetic volume susceptibility, on mineral magnetic studies of selected soil samples and on the theoretical background of applied geophysics and rock magnetism[21].

For a more detailed archaeological analysis of the results and a display in a lower scale, we divided the magnetogram into five subsections that will be discussed individually in the following.

21 Dunlop/Özdemir 1997; Fassbinder 2015; Jordanova 2017.

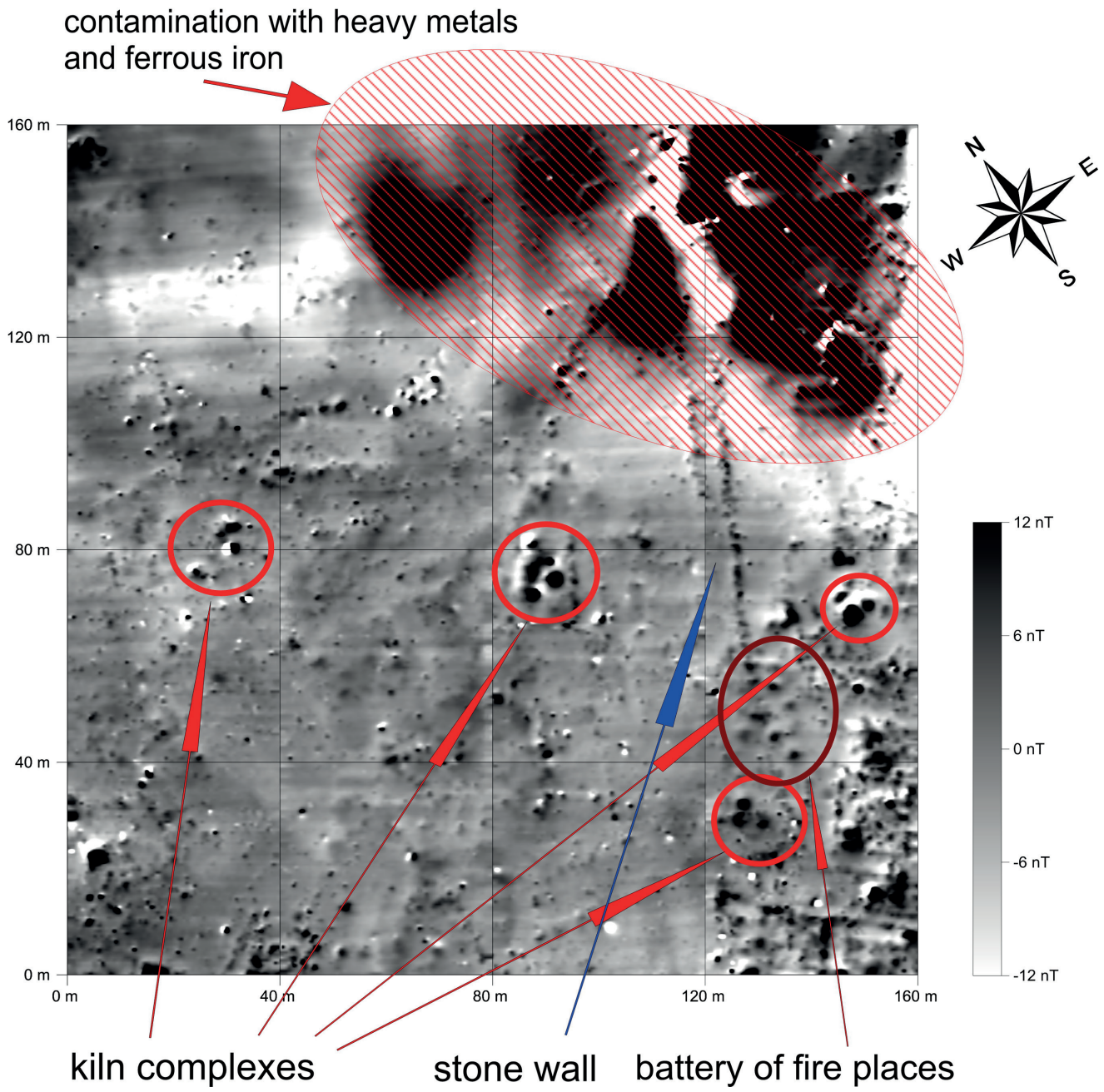


Fig. B1.9: Detail of the "workshop complex". Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Prepared by Jörg Fassbinder.

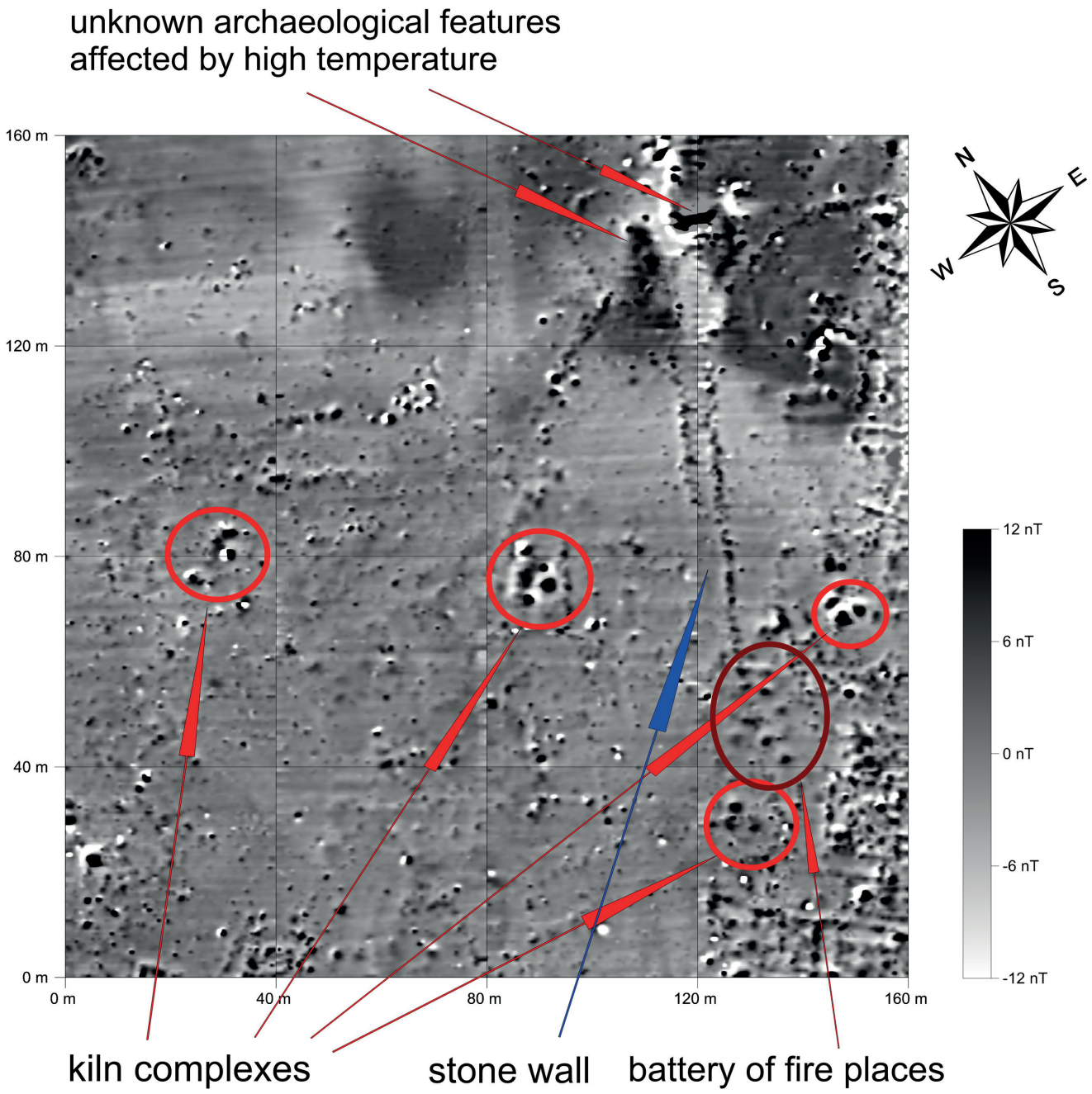


Fig. B1.10: Detail of the "workshop complex". Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales, partly overlayed by 10×10 high-pass filter. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Prepared by Jörg Fassbinder.

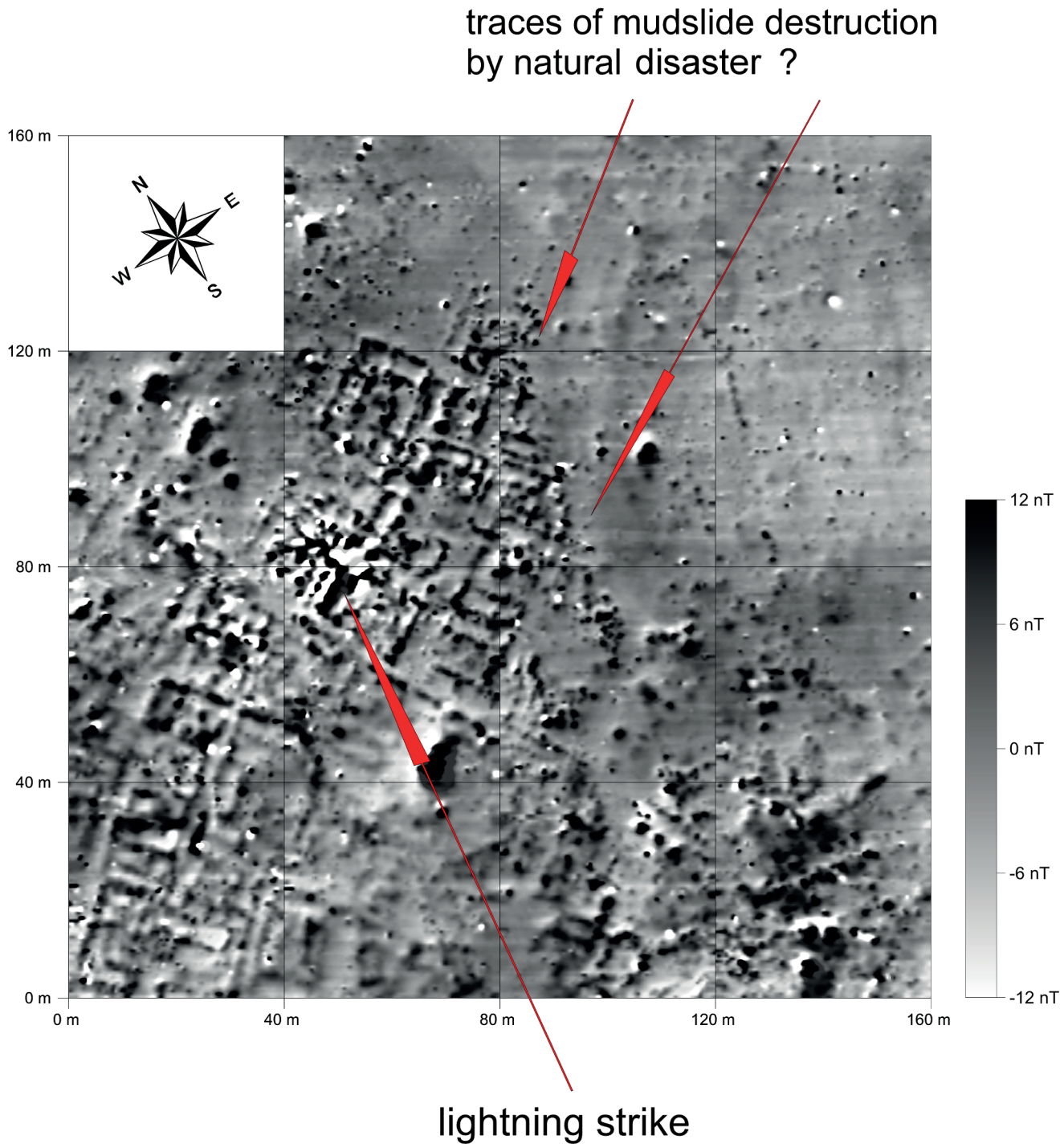


Fig. B1.11: Detail of the "neighbourhood in the centre". Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Prepared by Jörg Fassbinder.

B1.1.1 The large freestanding building complex

The magnetogram section of the "large building complex" (**Fig. B1.8**) reveals a complex of three freestanding buildings (as has been verified by excavation in spring 2017: Buildings K, L and M[22]). When looking closer at the magnetogram image one observes differences or irregularities in the composition and texture of the walls. While this could point towards a second building phase of repair works or reconstruction, it may also be due to the use of building material with different magnetic properties, as was observed during the 2015 excavation at Gird-i Bazar[23].

The magnetogram does not indicate any fireplaces, kilns or hearths inside the buildings. But one must emphasise that the absence of magnetic traces from fireplaces or kilns in the magnetic image does not exclude the possibility to find charcoal and / or fireplaces that were only in occasional or short-term use as short burning events with low firing temperatures do not lead to a noteworthy enhancement of magnetic minerals and may remain invisible even to sensitive magnetometers.

Some distinct dark (strong) remanent anomalies in Building L turned out to be large storage vessels during the 2017 spring excavations. In addition to their high magnetic susceptibility, they have a strong magnetic remanence which intensifies the anomaly at least twofold.

To the south of the buildings, kilns can be identified because of their round shape and by the intensity and remanence that was acquired in the direction of the Earth's magnetic field. An anomaly of this shape indicates that the kiln is still intact and not mechanically destroyed after the last use with fire.

In the southernmost part of the magnetogram section, we detected another building complex, with stone walls that are partly destroyed. Between this structure and the building complex in the north, there are further stone settings, a mudbrick wall and some more kilns. However, these features cannot easily be reconstructed as one building.

B1.1.2 The workshop area

Situated between the large freestanding building complex and Gird-i Bazar, the northeastern area stands out because of the extreme contamination of its topsoil with heavy minerals and ferromagnetic iron particles; in the first instance this obscures all other features in the northeastern part of the magnetogram (**Fig. B1.9**). Only by the application of a high-pass filter, we were able to observe features beneath this iron accumulation (**Fig. B1.10**). Tracing such large-scale (vertical) enhancement of magnetic minerals in the topsoil was possible thanks to the specific configuration of our magnetometer system; when using a commercial fluxgate gradiometer, such features would be removed by the subtraction of two sensors data and remain undetected.

However, while it is clear that the features observed were exposed to intensive fire they cannot be identified at present because they lack typical shapes and layouts and cannot be correlated with archaeologically known construction types.

Situated to the southwest of these features, we detected four groupings of large kilns, consisting of three, four and five kilns respectively in areas of c. 10×10 m. A battery of 9-10 fireplaces with lower fire intensity are located between the southern and the eastern groups of kilns. Further data processing and the application of a high-pass filter revealed a multitude of linear features and stone rows or adobe constructions. These features may be traces of temporarily used huts or workshops whose walls did not require solid stone foundations as observed for the other buildings. We therefore interpret this part of the Dinka Settlement Complex as a workshop area. Almost all features are quite clear in their layout and we therefore would expect a single phase occupation.

A long row of stones situated to the west of Gird-i Bazar and the modern chicken farm (**cf. Fig. B1.9**), interpreted to be a wall, bordered onto or enclosed that settlement quarter of the Dinka Settlement Complex. This wall can be identified in the surface topography as a visible slight depression that runs down to the Zab River.

B1.1.3 The neighbourhood in the centre

The area in the centre (**Fig. B1.11**) is dominated by a densely built-up neighbourhood. In addition to the buildings, there are fireplaces and kilns. On the eastern side of the neighbourhood, we observe traces of destruction to the building foundations which coincide with a slight depression in the topography, only just visible on the ground. It is possible, although not certain, that this destruction was caused by a natural disaster such as a mudslide occurring after heavy rainfalls (see **Chapter H**).

Furthermore, there is a clear indication for a lightning strike. The traces of the lightning strike follow in part the buildings' foundations. This could be interpreted as evidence for the existence of a higher building or something like a flagpole that attracted the lightning strike. It

22 See http://www.en.ag.geschichte.uni-muenchen.de/research/peshdar-plain-project/index.html for a preliminary report.

23 Fassbinder/Ašandulesei 2016, 38.

is clear that the event took place during the occupation of the site because it is unlikely that lightening would be attracted by a flat area such as the landscape looks today. A lightning strike or its traces cannot be excavated or even recognised by an enrichment of magnetic minerals. A lightning strike is revealed only by the extremely high remanent magnetisation, picked up by the field magnetometer or in evidence in affected rock or sediment samples analysed in a rock magnetic laboratory.

B1.1.4 The neighbourhood in the west

The western neighbourhood (**Fig. B1.12**) is another densely built-up area whose small, regular houses are separated by narrow alleyways. There is an open square with three large kilns, or possibly pits affected by high temperature fire. Furthermore, there is another clear indication for a lightning strike hitting a house.

B1.1.5 The neighbourhood in the southeast

The neighbourhood in the southeast of the Dinka Settlement Complex (**Fig. B1.13**) seems to be delineated by a wall to the northwest, towards the area of Gird-i Bazar, while in the northeast, there is a wide road. While the buildings of the neighbourhood are separated by narrow alleyways similar to those in the other quarters, the houses' layout and architecture differ considerably. There are also many small kilns and ovens inside the houses, indicating different patterns of usage and function.

Yet again, there is evidence for a lightning strike that hit a house complex in the southwestern part of the neighbourhood.

B1.2 Prospecting at Gawr Miran

The site of Gawr Miran is situated on a plateau c. 3.5 km northeast of the Dinka Settlement Complex. It offers a great view over the whole Bora Plain as well as the course of the Lower Zab from the modern border with Iran to the Sungasur gorge at Darband (also Darband-i Ramkan or Darband-i Raniyah)[24] and therefore has obvious strategic importance. The site came to our attention because the MAFGS team found a considerable concentration of pottery from the Neo-Assyrian period[25].

After a first visit in August 2016 to Gawr Miran led by Karen Radner and Janoscha Kreppner, it was decided to undertake a test magnetometer prospection on a ploughed field on top of the site. This area had been freshly ploughed, which brought numerous pottery sherds to the surface.

For the magnetometer test survey, a rectangular area adjacent to the top of the site was chosen. The resulting magnetogram revealed a dense settlement area with rectangular pits, probably cellars or basements. In contrast to the results in the different areas of the Dinka Settlement Complex, the foundations revealed their existence by negative (white) anomalies (**Fig. B1.14**). To facilitate the archaeological interpretation and to allow for a better comparison with the results at the Dinka Settlement Complex, we applied a high-pass filter, inverted the data and applied a slight hill shading to the image (**Fig. B1.15**).

The size and the layout of the buildings differ from those of the Dinka Settlement Complex. The use of different construction techniques can have various reasons but we can safely exclude that the occupation at Gawr Miran and the Dinka Settlement Complex date to different periods because of the matching pottery in evidence. Perhaps the explanation is the difference in the surface on which the buildings were erected. However, it may be the case that the buildings had a completely different function. A full prospection and test excavation would certainly help to answer this issue and to learn more about the functions of the buildings.

B1.3 Conclusions

The geophysical results discussed in this chapter reveal not only the existence of the lower town of the Dinka Settlement Complex but provide a very detailed and clear ground plan for hitherto unknown parts of the settlement, including several distinct neighbourhoods with residential quarters of differing building size and complexity as well as a workshop area. Subsequently, first excavations were undertaken in spring 2017 in the area with the freestanding complex of three large buildings and confirmed the magnetogram's accuracy.

Further research in the Dinka Settlement Complex will undoubtedly provide deeper insights into the structure and functional organisation of a large settlement of the Neo-Assyrian period on the Empire's border with Western Iran. Also the contemporaneous site of Gawr Miran, with its important strategic position, merits further study.

24 Radner 2016a, 11.

25 Giraud 2016, 35.

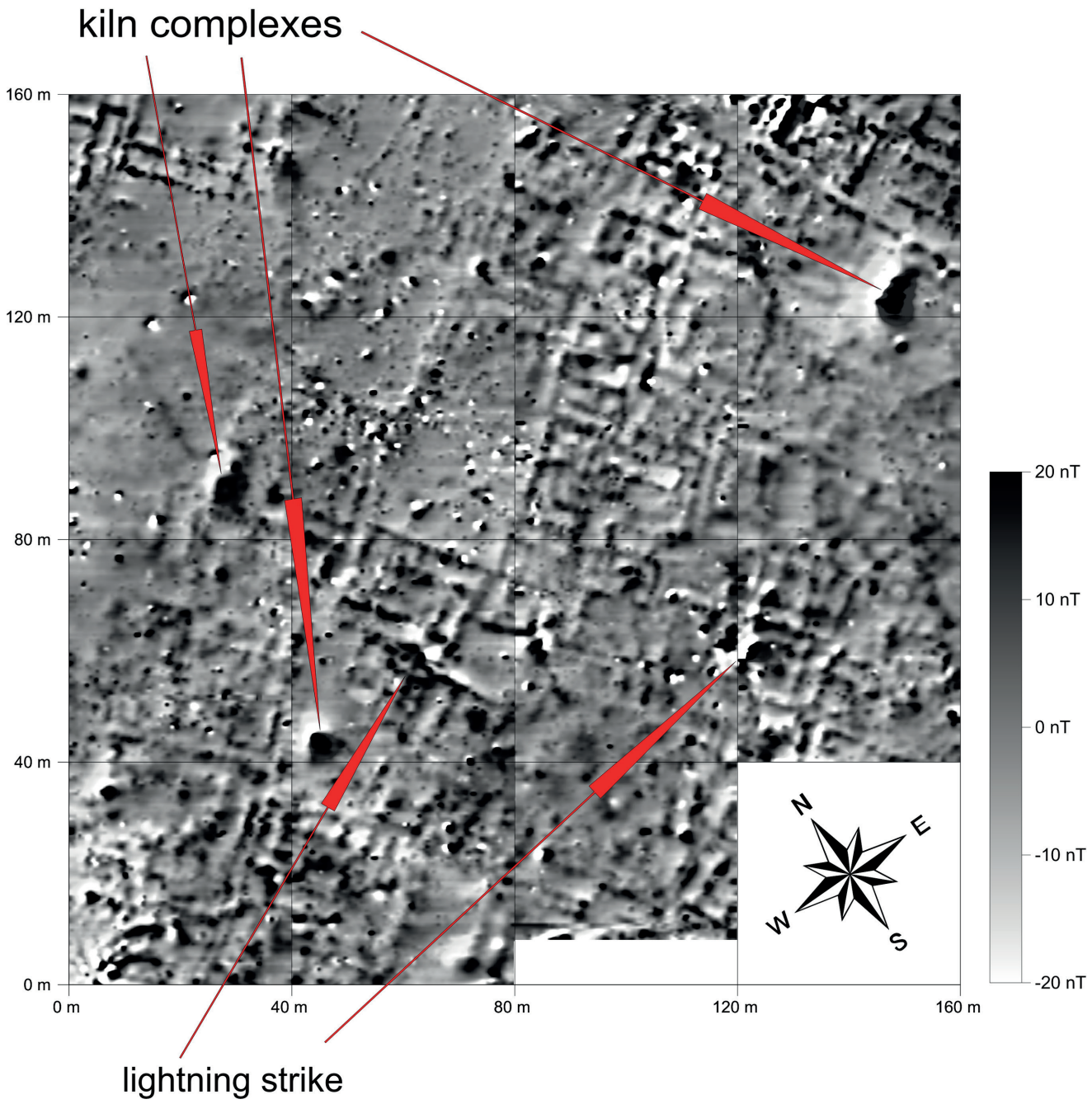


Fig. B1.12: Detail of the "neighbourhood in the west". Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Prepared by Jörg Fassbinder.

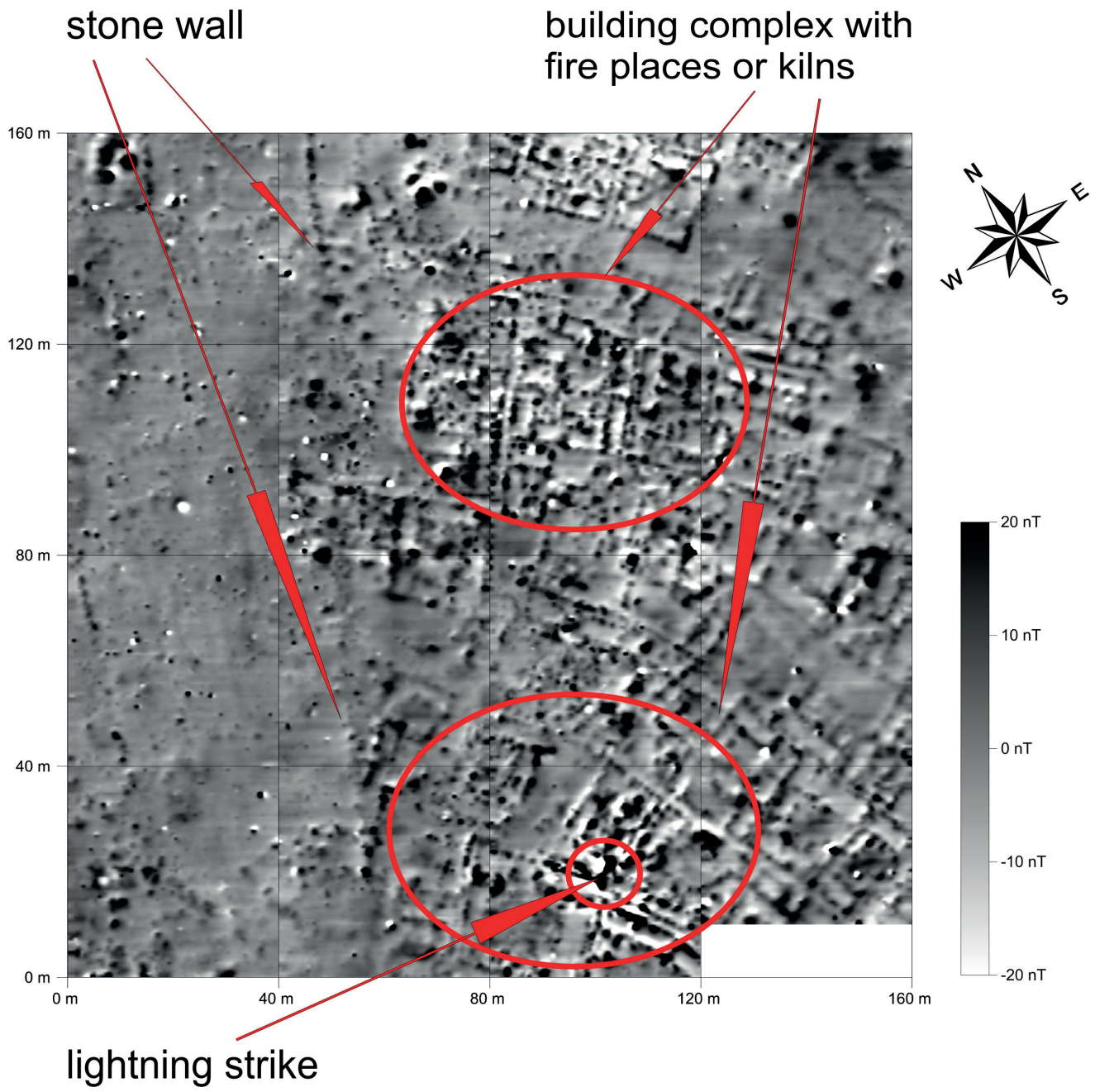


Fig. B1.13: Detail of the "neighbourhood in the southeast". Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 40×40 m grid, sampling density 25×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales. Intensity of total Earth's magnetic field at the site: 47,600 nT ±30 nT (September 2016). Prepared by Jörg Fassbinder.

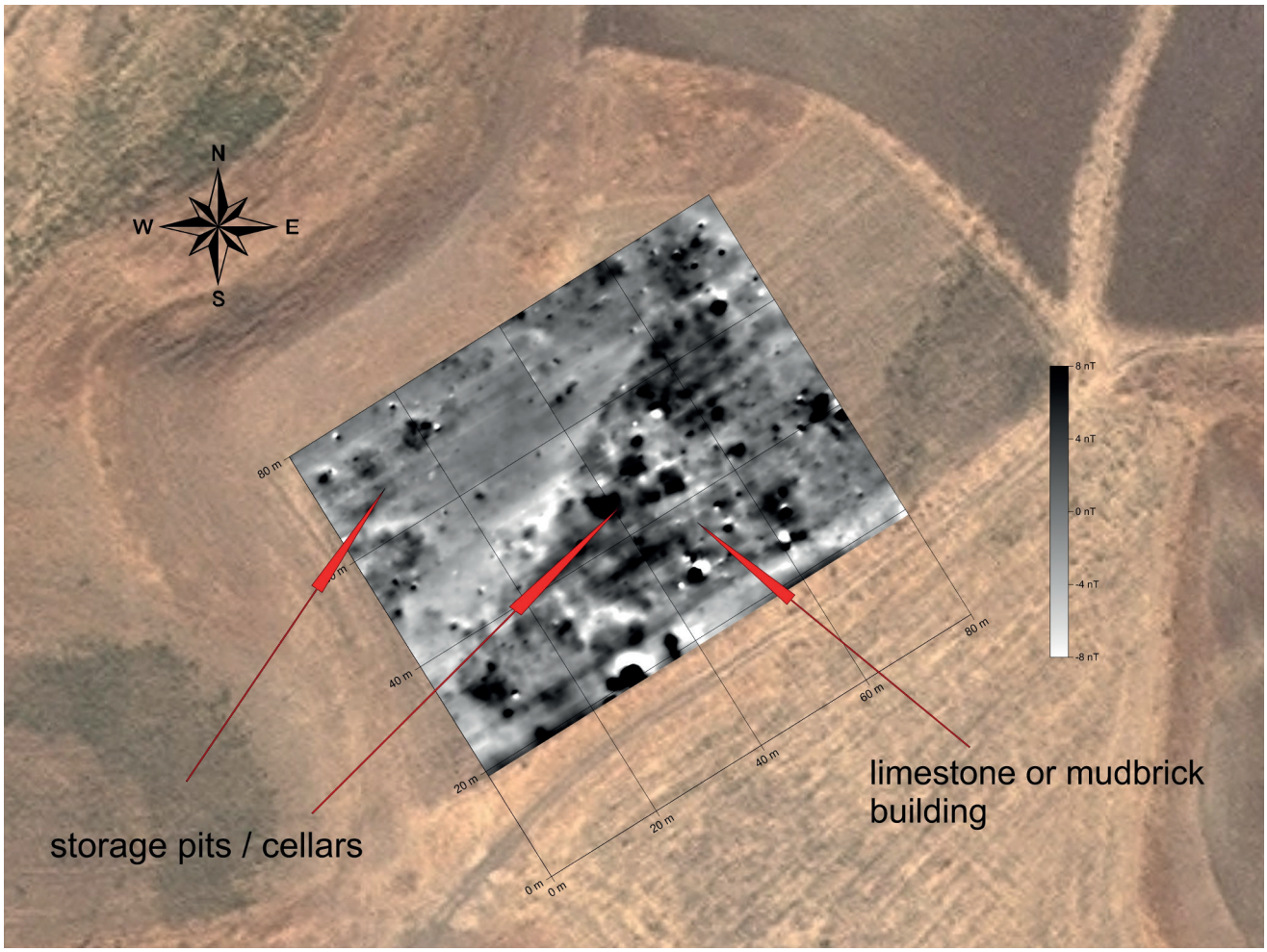


Fig. B1.14: Gawr Miran. Magnetogram of the survey area of 80×80 m near the top of the settlement mound. Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 20×20 m grid, sampling density 12,5×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales, fused by 10×10 high-pass filter. Intensity of total Earth's magnetic field at Gawr Miran: 47,620 nT ±20 nT (September 2016). Satellite image provided by Bing, accessed in June 2017. Prepared by Jörg Fassbinder.

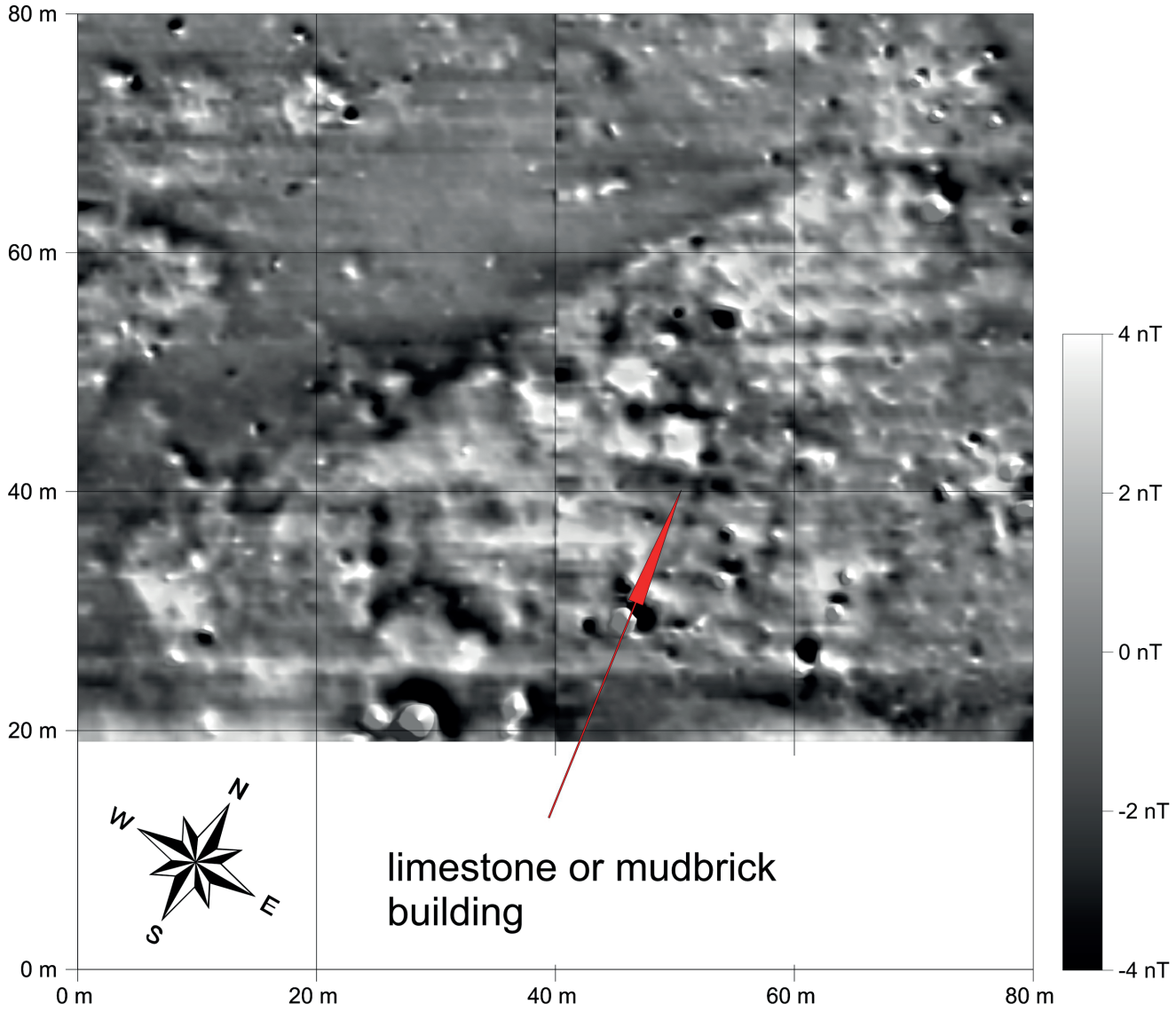


Fig. B1.15: Gawr Miran. Magnetometer survey conducted with a Scintrex Smartmag SM4G-Special caesium total field magnetometer (sensitivity ±10 pT) in a duo-sensor configuration. 20×20 m grid, sampling density 12,5×50 cm, interpolated to 25×25 cm, dynamics inverted in 256 grey scales, fused by 10×10 high-pass filter, displayed with hill-shading mode. Intensity of total Earth's magnetic field at Gawr Miran: 47,620 nT ±20 nT (September 2016). Prepared by Jörg Fassbinder.

B2. Electrical resistivity tomography investigations of the *qanat* system, 2016-2017

Mark Altaweel

In 2015, an irrigation system of the type called *qanat* in Arabic and *karez* in Farsi was identified about 1.3 km south of Girdi-i Bazar on the basis of the remains observable on the ground[26]. In autumn of 2016 and spring of 2017, a team of the University of Sulaymaniyah's Department of Geology, supervised by Professor Bakhtiar Qader Aziz, Dean of the College of Science, and funded by the Peshdar Plain Project headed by Karen Radner, was asked to undertake electrical resistivity tomography (ERT) and subsequent software analysis in order to further clarify our understanding of the *qanat* system in the Bora Plain. The Sulaymaniyah team completed Transects 1-9 during the 2016 autumn campaign and Transects 10-18 during the 2017 spring campaign.

The author of this chapter chose the location of these 18 transects. Firstly, the goal was to determine the likely water source of the *qanat* system and secondly, we wanted to learn more about its underground layout, especially how the tunnels are shaped and where the different branches observable on the ground connect. As the following discussion will show, some of these goals were accomplished. However, many questions remain, as not all ERT results were conclusive.

B2.1 *Qanats* in the Middle East and in the Bora Plain

Qanat features provide irrigation for agriculture and/or drinking water for humans and animals[27]. The general method for the construction of these features is well known: they are tunnelled from relatively higher elevation, either tapping underground aquifers or bringing water from a specific source. Using gravity flow, the tunnels transport this water to lower areas where the settlements and agricultural lands were situated. As a result, most of a *qanat* system is hidden underground, leaving visible on the surface only the access holes that were used in its construction and/or maintenance.

As the higher humidity underground keeps evaporation to lower levels, they can transport water with relatively low water loss, making them far more efficient than surface aqueducts or canals. This efficiency in water retention makes *qanats* very useful in dry regions throughout the Old World, where they are in use until today.

Qanat water features first appear in the Iron Age in the arid and more rugged regions of the Middle East, including Iran and northern Iraq[28]. *Qanats* have been extensively studied in Iran, but also on the Arabian Peninsula and in Central Asia[29]. Although it is clear that *qanats* have been historically important throughout northern Iraq, for example in regions around Erbil[30] and to the southeast of Mosul[31], they are far less thoroughly documented and studied than those of neighbouring Iran where some 50,000 *qanats* have been documented. Many of these were still in use at the beginning of the 20th century, and some of them are assumed to have been in near continual use since originating in the Iron Age[32].

The *qanat* system in the Bora Plain, which is at least in part still in use today, is likely to be such an example. **Fig. B2.1** shows its current appearance overground, based on satellite imagery from 2014. While its main axis runs from a southerly to a northerly direction towards Gird-i Bazar, one branch traverses in an east-to-west direction and appears to intersect or connect to the main north-south axis branch.

These observations lead to two important points. First, although the general axis of the main branch runs the raised bank of the Lower Zab towards the Dinka Settlement Complex, neither the origin nor the ultimate destination of the water transported by the system are clear at present. Furthermore, the presence of the east-west branch indicates a complex system with several contemporary branches or possibly multiple phases of construction, with the branches dating to different periods. At present, it seems more likely that the east-west branch simply joins the main channel going south-north.

The use of ERT has not been typical in the study of *qanat* systems. However, similar research to this has very recently been conducted in Iran, where *qanats* have been detected and mapped, although their study was not the primary focus, using a similar ERT method as that applied here.[33] In cases where ground penetrating radar (GPR) may not be of the correct frequency or shows possible limitations due to conditions, ERT could be a useful method for detecting *qanat* features and their dimensions, as demonstrated here.

26 Altaweel/Marsh 2016, 25.
27 Mostafaeipour 2010.
28 Ward 1968.
29 Hussein *et al.* 2008.
30 Ward 1968; Ur *et al.* 2013.
31 Altaweel 2008.
32 Kheirabadi 1991.
33 Amini/Ramazi 2016.

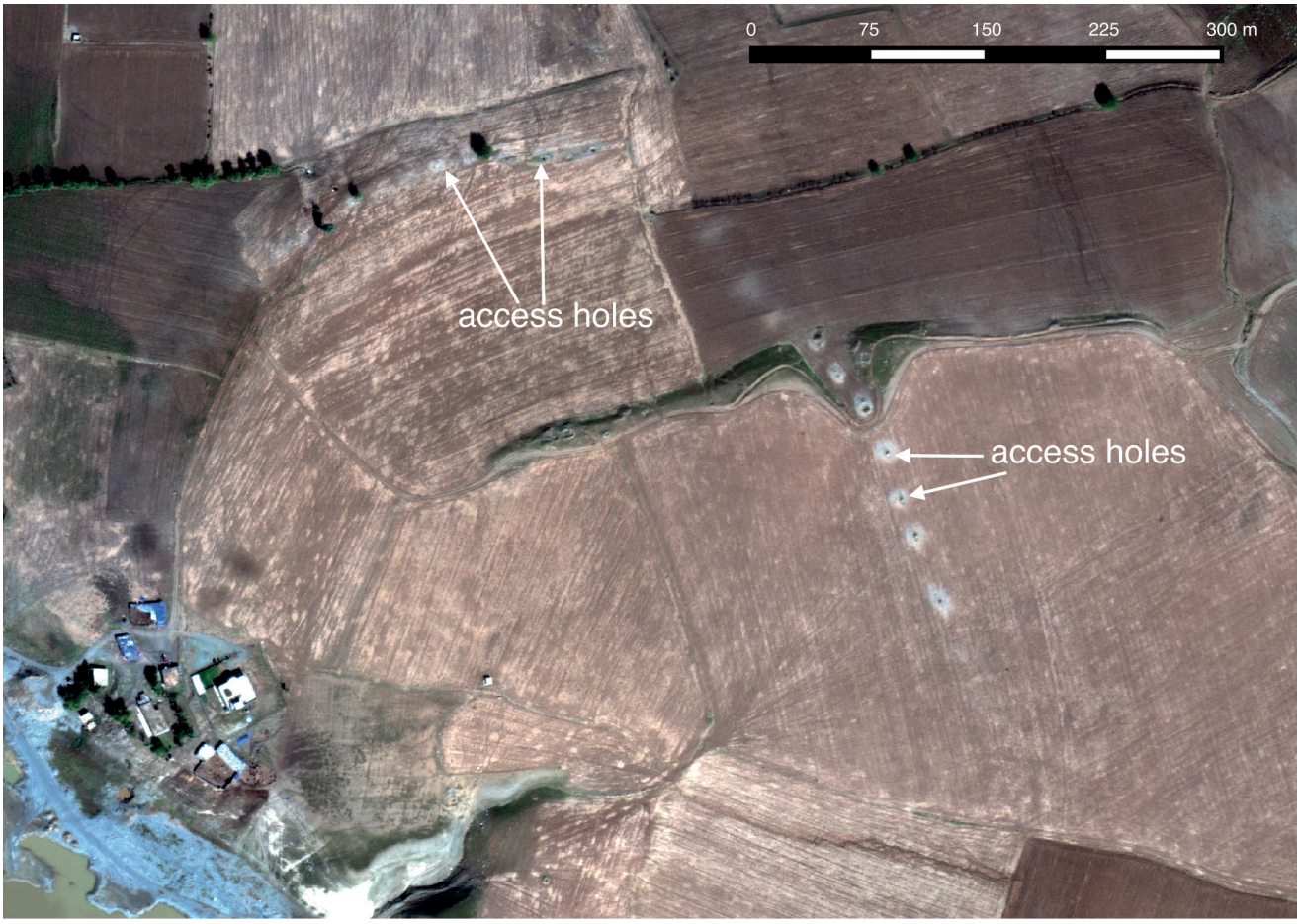


Fig. B2.1: *Qanat* access holes visible in the Bora Plain, east of the site of Gird-i Bazar, as visible on a QuickBird image of 24 October 2014. Annotated by M. Altaweel.

B2.2 Methodology of the ERT investigation

Electrical resistivity tomography (ERT) is a geophysical technique for imaging sub-surface structures from electrical resistivity measurements made at the surface. The first ERT investigation of the *qanat* system in the Bora Plain was carried out in September 2016. Ideally, conditions would have been better with wetter soils, but electrical resistivity demonstrated good soil conduction and the overall results were more positive than expected for a particularly dry time of year. A second round of investigations was undertaken in early May 2017.

The location and orientation of the transects were chosen by the author and based on two sets of considerations: we had to work in accessible areas while attempting to intersect areas that are likely to be traversed by a *qanat* tunnel. Some transects were also chosen so that the same feature could be observed multiple times, in order to confirm the presence of a given feature. As a consequence, a total of eighteen transects were undertaken (**Fig. B2.2**), each with a length of 142 m. Along each transect, 72 electrodes were positioned in a distance of 2 m from each other.

After the collection of the ERT field data, 2D images showing subsurface features were created. The currently available data do not allow the creation of 3D models. Professor Bakhtiar Qader Aziz (University of Sulaymaniyah) created the 2D images by exporting the field data to the software package RES2DINV (version 3.54.53), a 2D geophysical inversion software for resistivity and induced polarization data developed by Geotomo Software. This software applies a smoothness-constrained inversion to the resistivity data, using finite difference forward modelling and Quasi-Newton techniques[34]. Inconclusive or bad quality data points were removed from the dataset to avoid their effect in the inversion algorithm. To this end, filters were applied to remove abnormal results that re-

34 Loke/Dahlin 2002.

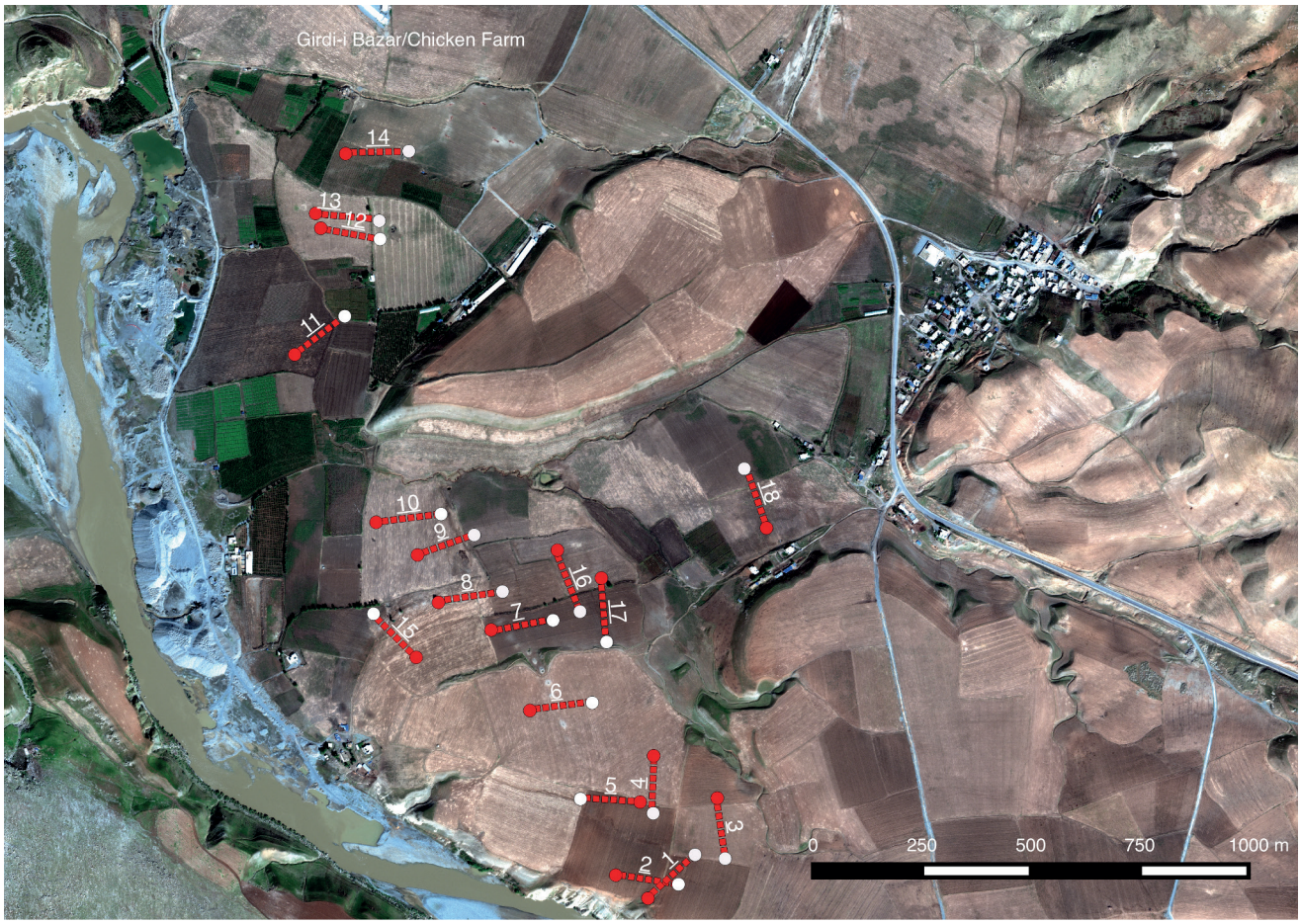


Fig. B2.2: Position of the 18 2016-2017 ERT transects (with numbers underlined). Red points indicate the first point (Electrode 1) in a transect and white is the second (Electrode 72); this is also the direction of the transects from left to right in subsequent figures. QuickBird image of 24 October 2014, annotated by M. Altaweel.

corded potential, resistivity, injection current, and standard deviations.

For each sounding, a drawing was made using the measured pseudo, calculated and inverse sections. In addition, the author's interpretation is based on his understanding of local hydrologic and sedimentary conditions based on fieldwork conducted in 2015 and general regional observations made since 2011.

B2.3 Discussion of the ERT results

For each transect, three images are shown: the top two images reflect the measurements and the third is the interpretative result. Colours applied in the figures indicate the ohm measurements according to the resistivity results, which help to map anomalies and subsurface features.

Transects 1-4

Transects 1-4 (**Fig. B2.3**) are situated at intervals south of a line of access holes that leads from the elevated bank of the Lower Zab in the direction of Gird-i Bazar and the modern chicken farm. These are intended to show the key water source for the feature.

Transect 1 showed two strong anomalies between Electrodes 23 and 34 (46-68 m length of transect) and 37 and 47 (74-94 m along the length of the transect) and at a depth close to 3-5 m. These represent some type of channel and the feature between electrodes 23 and 34 is more likely to be a tunnel of a *qanat*, as it lies within the trajectory expected for the *qanat* based on the visible access holes. Boulders and rocks are interpreted to be creating the high resistivity noticed in the 2D image of the features. Therefore, this signature could also represent collapse within the tunnel. The feature between 37 and 47 could represent a possibly bifurcation or second channel, although this is

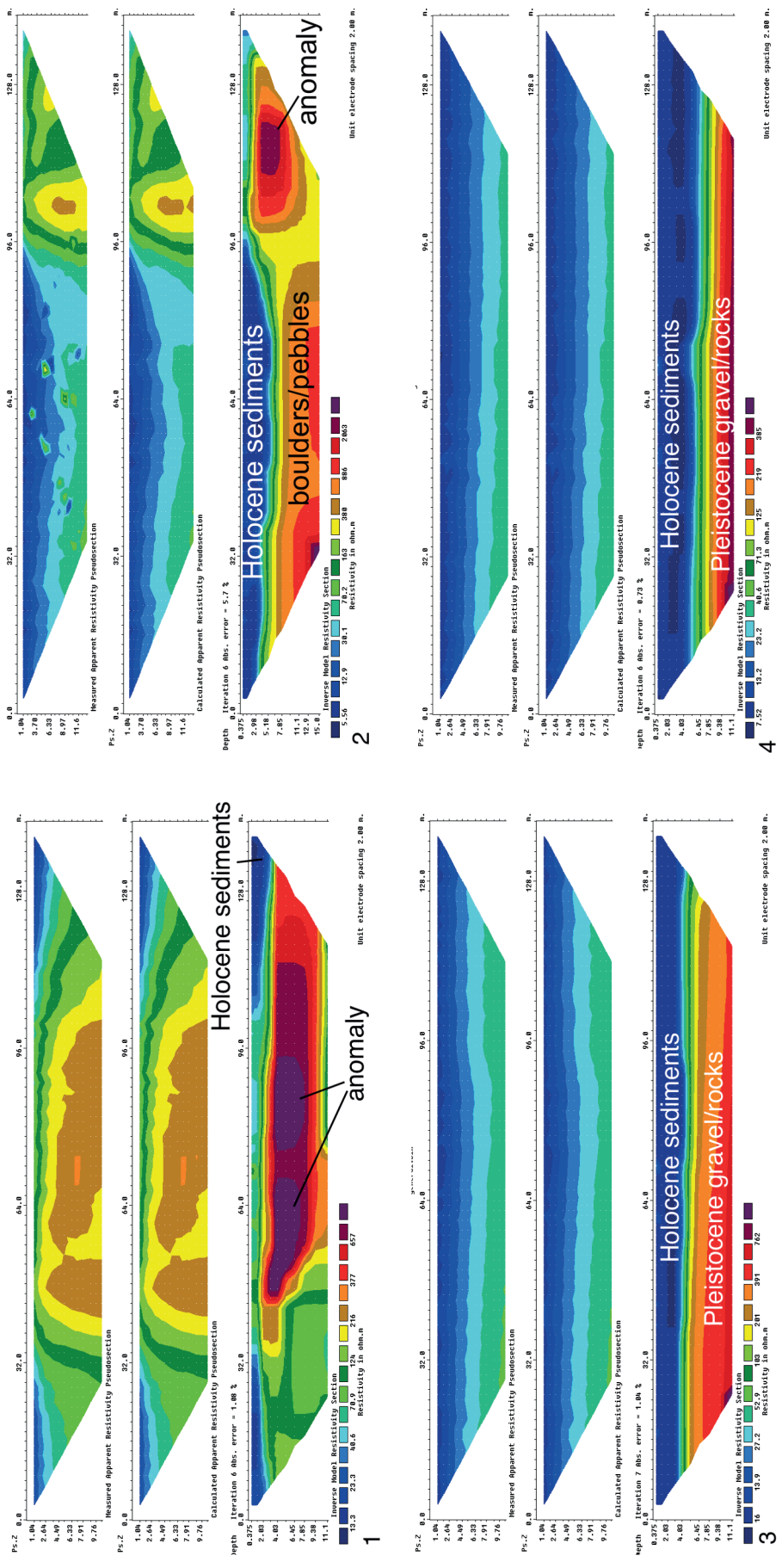


Fig. B2.3: Transects 1-4. 2D images created with RES2DINV by Bakhtiar Qader Aziz.

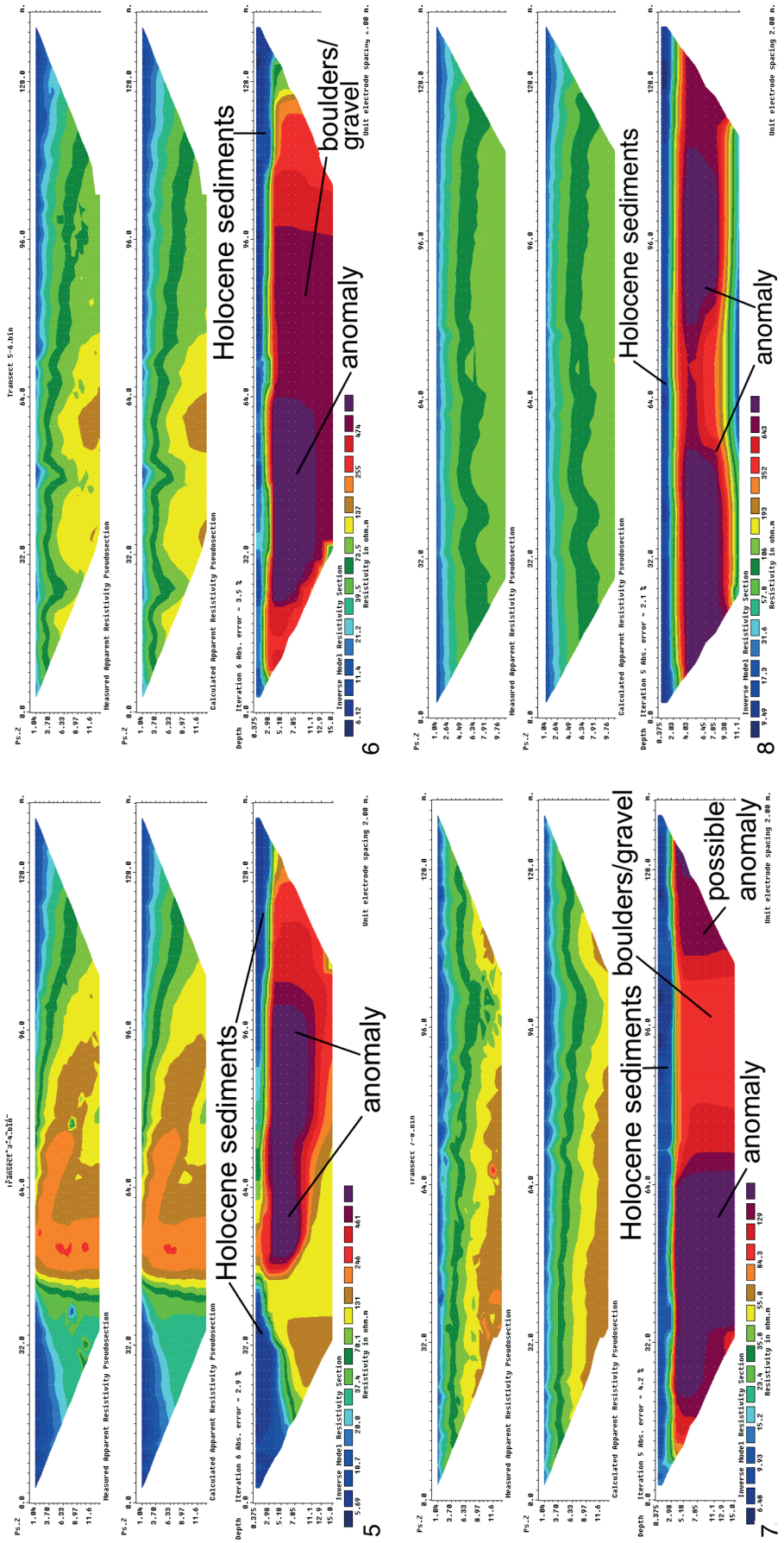


Fig. B2.4: Transects 5-8. 2D images created with RES2DINV by Bakhtiar Qader Aziz.

less clear. It is possible that an additional water source may be providing the main channel and, therefore, this second anomaly could be that second, branch channel.

Transect 2 intersects Transect 1 and part of the purpose of this transect is it can be used to certify the observation from Transect 1. In Transect 2, an anomaly is observable at a depth of 3 m beneath Electrodes 54 to 59, i.e., 108-118 m along the length of the transect. The transect makes it even more apparent that there is tunnelling in this location that follows in line with the feature (between electrodes 23 and 34) observed in Transect 1. According to the ERT results, the tunnel is 8 m wide and 5 m high in this position. One difference, however, is the tunnel seems to be not as deep as observed in Transect 1, although the alignment is as should be expected. In both transects, the feature observed maybe slightly deeper or shallower than the results observed, as the signal for it was strong, suggesting the *qanat* may actually be between 3-4 meters below the surface. Near Transect 15, an exposed access hole can be accessed and this allows us to observe that the tunnel was indeed located closer to 3 m below the surface, suggesting Transect 2's depth observation could be more accurate. The height and width of the tunnel near this access hole, however, are about 2 m and less than 1 m respectively. A comparison with the resistivity results from Transect 2 indicates that this is unlikely to represent the original width and height of the feature but that this area was affected by tunnelling, movement of debris and collapse, and lack of a high precision depth reading (due to the spacing of the electrodes). Other features detected in Transect 1 include the ancient river terrace made of boulders and pebbles, with Holocene clays and silts above this layer.

Transects 3 and 4 showed only natural sediments. Clays/silts are about 4-5 m in depth, which represent the Holocene sediments of the region. Below the clays are the likely Pleistocene rocks and gravels common to the region. The transects demonstrate that no branch *qanat* was evident in this area.

Transects 5-8

These transects **(Fig. B2.4)** were located just to the south and along the visible *qanat* access holes. The goal was to check whether the feature observed in the first four transects is, in fact, a *qanat* and not another feature, such as a natural palaeochannel.

Transect 5 showed another likely tunnel, or an anomaly, of the *qanat* system at a depth of nearly 3-5 m between Electrodes 23 and 71, i.e., 46-142 m along the length of the transect; the feature is c. 5 m high but this could be error due to electrode spacing or other possibilities. The results are not as clear as in Transect 2, possibly reflecting infilling or disturbance to the feature. Alternatively, the wider anomaly observed in Transect 5 in comparison to Transect 2 may indicate multiple construction phases of the feature or even evidence for tunnelling from an earlier phase. This could explain, additionally, the possible bifurcation suggested in Transect 1. While tunnelling and the *qanat* feature are evident, the large size of the anomaly is not easily explained.

Transects 6 shows that between Electrodes 14 to 32, i.e., 28-64 m along the length of the transect, an anomaly is visible; starting at a depth of about 3 m, an anomaly associated with the same *qanat* feature identified already in Transects 1 and 2 is evident. The depth of the feature was similar to Transect 2 and, similar to before, the tunnelling appears wider or larger than expected, which could be evidence of disturbance. The material inside the tunnel is likely to have a similar composition as the area tunnelled through, as the geological layer that the tunnel traverses consists of boulders and gravel. Above this, there is a layer of Holocene clays and silts of a height of about 2 m just below the surface.

Transect 7 shows the same feature as Transect 6 (at around Electrodes 14 to 32), but there is a second possible tunnel starting at Electrode 55, i.e., at 110 m along the length of the transect at about the same depth as the first feature in evidence in this transect. The possible presence of another tunnel branch in this area needs to be further investigated. The resistivity in this feature was not as strong as in the clearer *qanat* features in the earlier transects; however, other *qanat* features (discussed later) likely show similar resistivity as this feature.

Transect 8 appears to show anomalies at Electrodes 1 to 25 as well as beneath Electrodes 40 to 72. These anomalies are about 3-4 m below the surface, likely representing remains of the *qanat* as nearby surface holes are present in the area where this transect was conducted. In fact, the close proximity of the two anomalies indicates that the transect is likely cutting across near the juncture where the main north-south branch and the east-west branch of the *qanat* system meet. Furthermore, their elevations are nearly identical at this point, supporting the assumption that the two intersect. The resistivity reading for both anomalies corresponds to previous transects, indicating that the material of these features is similar or the same as in the previous features. There is a shallow layer of Holocene clays and silts to a depth of 2 m in this area.

Transects 9-12

In choosing transects in these locations (**Fig. B2.5**), the goal was to attempt to determine if the main *qanat* feature continues toward the Dinka Settlement Complex. If this were the case, the feature would very likely be contemporary with the site and may have provisioned water to the site rather than only to agricultural fields.

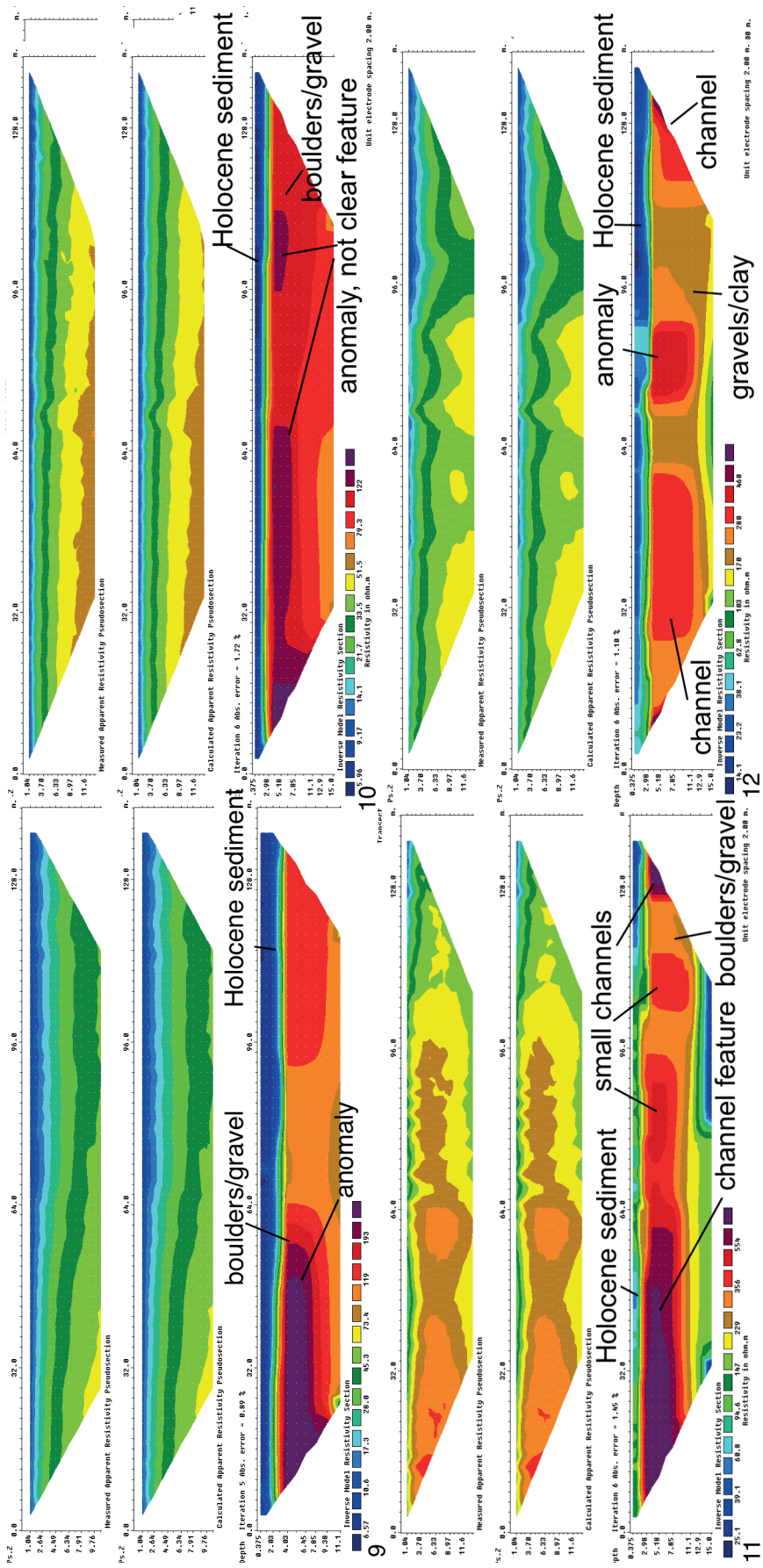


Fig. B2.5: Transects 9-12. 2D images created with RES2DINV by Bakhtiar Qader Aziz.

Transect 9 shows one anomaly between electrodes 1 and 26 (1-52 m in length). A faint anomaly is seen between electrodes 46 and the end of the transect. Both features could be evidence for channels or tunnels from a *qanat* system, although this is less clear as the morphology of the features is wide, which could mean that they are coming from an non-perpendicular angle relative to the transect. The fainter feature may be less likely to be a *qanat*, as the resistivity noticed could be more similar to palaeochannel or natural features.

Transect 10 again indicates the presence of a layer of Holocene clays and silts to a depth of about 2 m just below the surface, with a layer of boulders and gravels underneath, similar to evidence from previous transects. No clear *qanat* feature or anomaly similar to known *qanat* features is in evidence, with no obvious tunnel cut appearing in the resistivity measurements. At about 2.5 m below the surface, anomalies were detected between Electrodes 1-32, i.e., 2-64 m along the length of the transect, and again between Electrodes 48-55, i.e., 96-110 m along the transect. But these do not show clear patterns of an excavated tunnel, such as in height and expected shape, and may simply represent palaeochannels or buried wadis.

Transect 11 shows an anomaly, between 3-6 m below the surface, underneath a layer of Holocene clays and silts and between Electrodes 1-32, i.e., 2-64 m along the length of the transect. The anomaly shows resistivity and material consistent with other channels and it seems to be filled in with boulders and gravels. It is not entirely clear if the feature represents part of a *qanat* system, as the observed morphology is dissimilar to that of the better known features. The data seem most likely to point towards the presence of a natural, buried *wadi* channel. Alternatively, there is a *qanat* channel present but it is disturbed or transected at a non-perpendicular angle. Additional smaller channels are evident in the transect near Electrodes 41 and 65.

Transect 12 features a layer of 2-3 m of Holocene clays and silts underneath the surface. A clearer anomaly, and in similar dimensions as the previous readings of the *qanat* feature, is evident between Electrodes 38-43, i.e, 76-86 m along the length of the transect, at about 3-4 m below the surface. The dimension of this feature c. 10 x 8 m, although, as before the readings may not be accurate due to the spacing of the electrodes. The reading signal does not show the same resistivity as in the cases of the transects previously discussed where *qanat* features were mentioned, although this feature shows a shape and morphology that is consistent with *qanat* features. Furthermore, it shows a similar resistivity signature to a *qanat* feature in Transect 15. Other channels are present near the central feature in the transect. Otherwise, gravels and clay represent the main layer below a depth of 3 m.

Transects 13-16

These transects (**Fig. B2.6**) were undertaken in spring 2017 in order to determine the relationship of the *qanat* system with the Dinka Settlement Complex and to further elucidate the east-west branch of the *qanat* system.

Transect 13 shows several anomalies. The anomaly between Electrodes 41 and 53, i.e., 82-106 m along the transect, located about 4 m below the surface, follows the same trajectory as the feature identified in Transect 12 (Electrodes 38-34 in that transect). However, the feature in Transect 13 is not as deep and wide, perhaps indicating that it is natural. If the two transects show the same feature, as is most likely, this may suggest that it is not part of the *qanat* system.

Transect 14 has three anomalies that show relatively higher resistivity than the surrounding clay/silt and stone materials. In particular, the anomaly around Electrodes 44 and 51 could indicate a possible channel that follows the trajectory of the feature identified in Transects 12-13 (i.e., between Electrodes 41-53 in Transect 13). The course of the channel seems to follow the trajectory in a relatively straight manner, but the shape of the feature is again not consistent with a *qanat*. The anomalies at the two ends of the transect give resistivity readings that suggest a hard material. The dimensions and shape of the features do not suggest any possible *qanat* features. Natural sedimentation is evident in the rest of the transect, similar to other transects described.

Transect 15 did not show the thick layer of Holocene clays and silts underneath the surface that was observed elsewhere. However, a section near the middle of the transect showed deeper clay/silt infilling. Anomalies between Electrodes 1-22, i.e., 1-44 m along the length of the transect, represent likely channels; however, their morphology does not indicate a shape consistent with *qanat* tunneling. These anomalies are situated about 3-4 m below the surface. At around Electrode 33 (106 m), a square-shaped anomaly is evident about 3 m below the surface. This is very likely a *qanat* feature, as nearby access holes are visible on the surface. For this feature, the resistivity signature is consistent with gravels and boulders found in the area, although it is not as strong as some of the other *qanat* features observed.

Transect 16 shows a strong anomaly at about 3-4 m below the surface between Electrodes 1 and 24. Similar to the other *qanat* features and channels identified, the high resistivity measured is linked to the presence of a layer of gravel, boulders and pebbles. While the morphology of the anomaly is similar to other identified *qanat* features, it is not clear whether this feature is natural or a *qanat*. The other anomaly, from around Electrode 38 until the end of the transect, shows similar resistivity features as other anomalies that have been identified as *qanat* features;

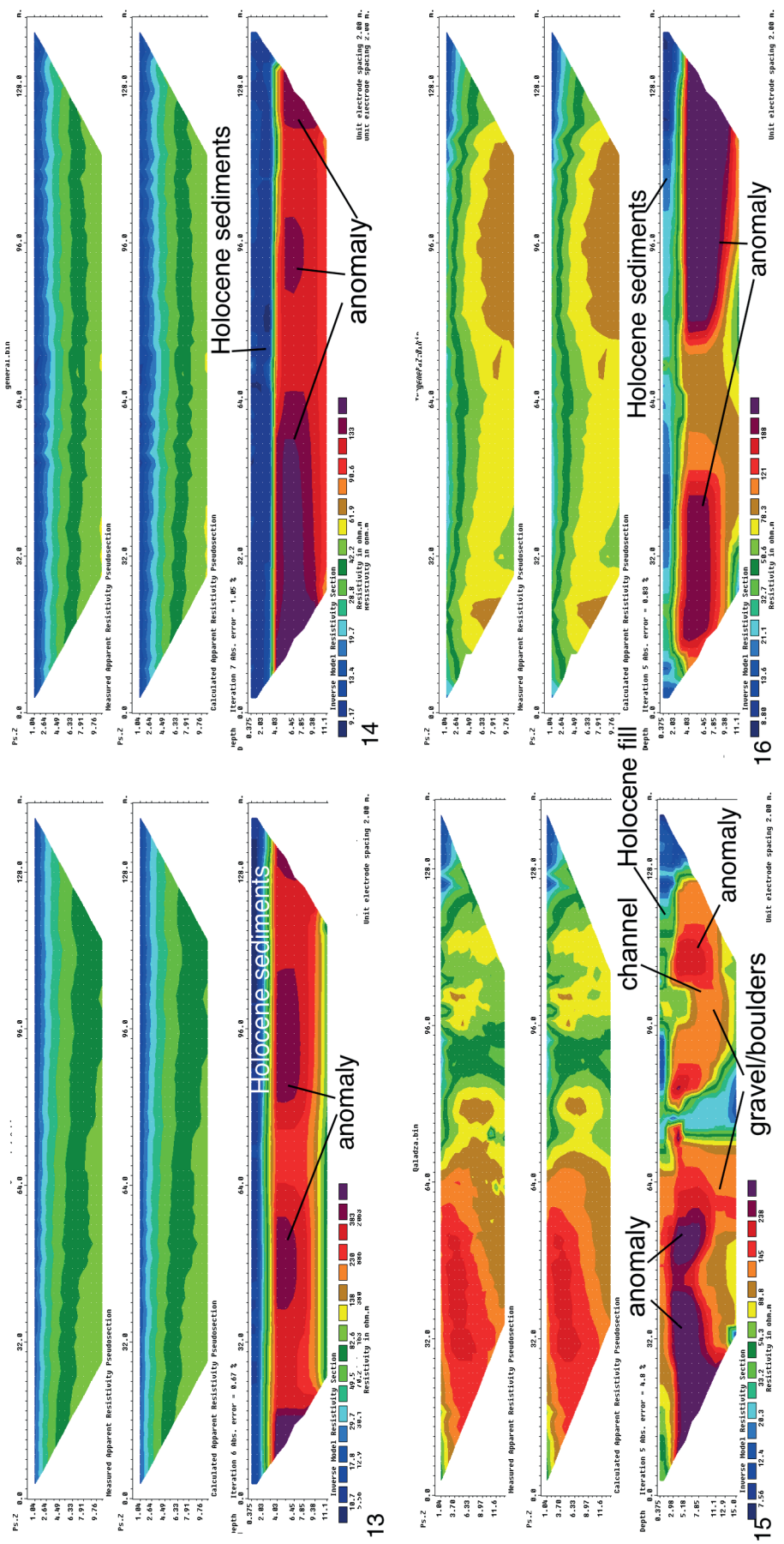


Fig. B2.6: Transects 13-16. 2D images created with RES2DINV by Bakhtiar Qader Aziz.

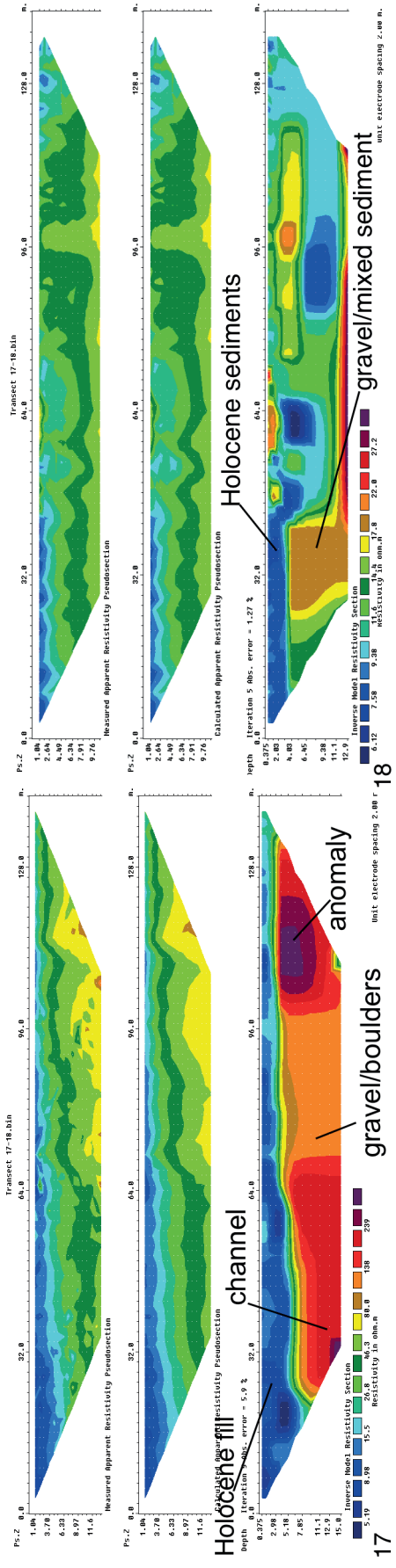


Fig. B2.7: Transects 17-18. 2D images created with RES2DINV by Bakhtiar Qader Aziz.

however, the morphology is not consistent given that the feature seems to be more irregular in shape.

Transects 17-18

These two transects **(Fig. B2.7)** are located to the east of the east-west branch and the north-south branch of the *qanat* system. The purpose of these two transects was to determine whether the *qanat* system accessed water sources to the east, such as the *wadis* from the highlands.

Compared to the other transects, Transect 17 shows a much thicker Holocene sediment layer of silts and clays, reaching a depth of up to 8 m. The greater infill is likely to be caused by the runoff from a nearby *wadi*. Again, the layer underneath is interpreted to consist mainly of boulders and gravel. About 3-4 m below the surface between Electrodes 53-58, i.e., 106-116 m along the length of the transect, there is an anomaly with a height of c. 5-7 m of a shape that suggests a *qanat* tunnel. As in the cases discussed before, the feature may be not quite as high as the ERT measurements indicate. We can also observe a channel at a depth of about 11 m below the surface, likely a natural palaeochannel.

Transect 18 shows deep clay and silt sedimentation and indications for Holocene channel formation. But there is no evidence for man-made *qanat* features, making it unlikely that water for the *qanat* system came from this more easterly direction.

B2.4 Preliminary conclusions and open questions

Many of the transects successfully document parts of the tunnel system or indicate the possibility of *qanat* tunnels, although the features are not always very clear. Damage to features and possible multiple phases of tunnelling could have affected the interpretation of the results. Additionally, limitations of a 2D method mean that it is sometimes difficult to know if a tunnel is, in fact, a tunnel unless the feature is captured at a more clear 90 degree angle in the transect. Transects 3, 4, and 18 definitely show no possibility of *qanat* features or any tunnelling.

The ERT investigations undertaken in 2016-17 confirm at least two extended stretches of the *qanat* system in the Bora Plain, which are likely connected, as suggested by Transect 8; the presence of the tunnels in two other areas is plausible but at the moment less certain. Transects 1-2 suggest a course toward the Lower Zab for the *qanat* tunnels; however, the source of the *qanat* is not likely to be this river since there is a large drop between the location of the *qanat* features and river below (about 20-30 m).

Fig. B2.8 indicates the main course of the *qanat* system, as it is presently understood. These results slightly expand our knowledge of the system beyond the areas

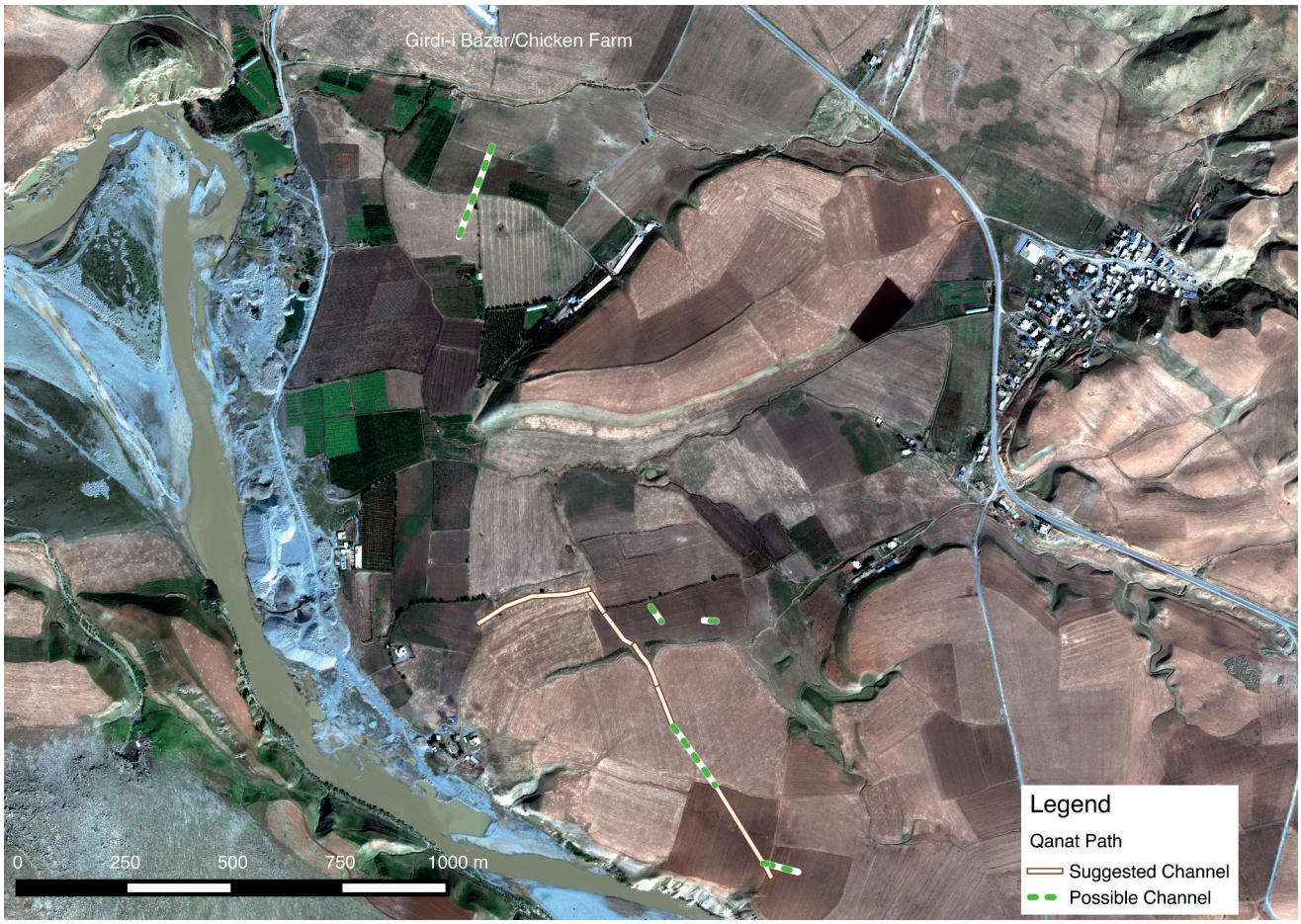


Fig. B2.8: *Qanat* tunnels as mapped and interpreted on the basis of ERT analysis and surface observations. Probable features as well as possible but less likely ones are indicated in the QuickBird image from 24 October 2014, annotated by M. Altaweel.

known from surface observation, particularly near the Lower Zab. But it is still unclear how the system connects to the Dinka Settlement Complex, if at all. The water source is likely to be somewhere in the highland regions to the east of the settlement, but given that the course of the *qanat* runs somewhat parallel with the Lower Zab, this suggests a possible source that is further to the south of the area investigated so far.

As suggested above, the *qanat* tunnels that run east-west seem to intersect and integrate with the main north-south features. The resistivity results from Transects 16-17 do not suggest any water source coming from areas east of the main north-south branch. This makes it likely that the east-west branch is a branch from the main north-south *qanat* system and that the main branch and east-west branch were contemporary in use.

After two seasons of ERT investigation, it appears possible that there were multiple construction phases and / or multiple water sources. The current results suggest that the *qanat* network could be much more extensive and complex than is evident from the surface features. This is also indicated by the fact that a number of modern water cisterns and artificial ponds in the area appear to be fed by ancient irrigation features, and these are likely related to the *qanat* discussed here. All this suggests an extensive and expansive system.

While our results so far continue to suggest a possible relationship between the *qanat* system and the Assyrian-period Dinka Settlement Complex, we do not at present possess any data that links them conclusively. In addition to determining the structural relationship of the irrigation system to the site, we must attempt to establish a date for the features identified. Ideally, dating of the features would be undertaken using the Optically Stimulated Luminescence (OSL) technique, but this requires the extraction of suitably sandy material from the tunnels. Although very little sand occurs in the Bora Plain, we will explore this option in future seasons using coring or excavation techniques. Furthermore, it is evident from our work so far that the water source of the *qanat* is more to the south and east than previously thought, indicating a need to explore those regions.

C. Excavating Qalat-i Dinka: the 2016 season

F. Janoscha Kreppner & Andrea Squitieri

This chapter presents the results of the first archaeological excavations at Qalat-i Dinka (hereafter Dinka) (**Fig. C1**), which took place between 24 May and 2 June 2016[35].

After it became known that a farmer had discovered a fragmentary and secondarily fired Neo-Assyrian clay tablet dated to 725 BC on the western slope of Dinka in 2013[36], Jörg Fassbinder and his team undertook a first geomagnetic survey in August 2015, surveying an area of c. 3 ha (**Fig. C2**)[37]. On the western plateau, all identifiable archaeological structures appeared to be limited to the upper part of the slope, delimited by a semi-circular feature of ca. 80 x 60 m, likely a fortification (**Fig. C3**). During the surface pottery collection survey conducted in February 2013 and October 2015 by the MAFGS team headed by Jessica Giraud[38], this same area yielded the highest concentration of Neo-Assyrian pottery observed on Dinka.

Because of Dinka's general geographical situation and the results of the geomagnetic survey, the working hypothesis is that Dinka may have housed a Neo-Assyrian fortress, guarding the passage towards the east[39]. The results of the surface pottery collection and the geomagnetic survey indicated that we should focus our archaeological investigations on the upper part of the western slope of Dinka. The aims of the first test trench opened in 2016 were as follows: to confirm the presence of Iron Age structures; to assess the depth of the Iron Age structures under the surface and the state of their preservation (as looting pits were observable in the area); to gain preliminary insight into the nature of the occupation; and to ascertain whether there was an occupation level contemporary with that of Gird-i Bazar. The investigation succeeded in completing all these objectives.

C1. Methodology

The excavation followed the protocol established for Gird-i Bazar in 2015, using a locus collection system and digital documentation with daily orthophotos[40].

The test trench on the western slope (**Figs. C4-C5**) was opened next to UTM-WGS84 511810 E / 3999090 N. Because of equipment issues it was impossible to create a UTM-based grid at the time. Therefore, a local grid was established, based on two fixed points located west of the excavation area on the north-south line. They were called "Zero", with coordinates X = 1000 / Y = 1000 / Z = 100, and "Fence", with coordinates X = 1000 / Y = 1034.15 (34.15 m being the distance between "Zero" and "Fence") / Z = 104.32 (4.32 m being the difference in height between "Zero" and "Fence"). The local grid allowed us to work with a total station in order to measure the loci (top points, outline and bottom points) as well as the positions of small finds and pottery collections. The square within which the test trench is located was given the square number 100000; this deliberately falls outside the numbering conventions of the system established for Gird-i Bazar. Consequently, the loci excavated at Dinka are identified with the square number 100000 plus a progressive locus number (e.g., Locus:100000:001). As established in the Gird-i Bazar system, locus groups are labelled LGR followed by a progressive number.

In August 2016, during the second field season at Gird-i Bazar (cf. Chapter D), absolute coordinates in the UTM-WGS84 reference system were established for "Zero" and "Fence", using a Leica Viva GS10 dGPS. This allowed us to transform all points taken in the local grid system into UTM-WGS84 coordinates. While this recalculation of the points in UTM coordinates facilitates better planning of future excavation work at Dinka, we decided not to rename all the loci excavated at Dinka in 2016, nor to

35 The 2016 team at Dinka: from LMU Munich, Janoscha Kreppner (field director) and Andrea Squitieri (documentation, small objects), from the Sulaymaniyah Directorate of Antiquities, Hero Salih Ahmed (trench supervisor, pottery processing), Awaz Jihad (trench supervisor, pottery processing) and Aziz Sharif (driver), with Ibrahim Manla Issa (cook) and six workmen from Qaladze and the village of Nureddin.

36 Radner 2015; Radner 2016a, 17-18.

37 Fassbinder/Ašandulesei 2016, 38, 40-42.

38 Giraud 2016, 29-35.

39 Radner 2016a, 21-22.

40 Kreppner/Forster/Squitieri 2016.

Fig. C1: View of Qalat-i Dinka from the north. The excavation area is visible on the western slope. Photo by Janoscha Kreppner.

Fig. C2: Magnetograms of Qalat-i Dinka superimposed on a Satellite image by Bing, accessed in June 2016, with the 2016 excavation trench indicated in red on the western slope. Magnetometer survey with a Smartmag SM4G-Special caesium-magnetometer, sensitivity ±10 picotesla, in variometer (duo-sensor) configuration. 40 × 40 m grid, spatial resolution 12.5 × 50 cm, interpolated to 25 × 25 cm, intensity of total Earth's magnetic field at the site: 47,290 nT ±30 nT. Prepared by Jörg Fassbinder and Andrea Squitieri.

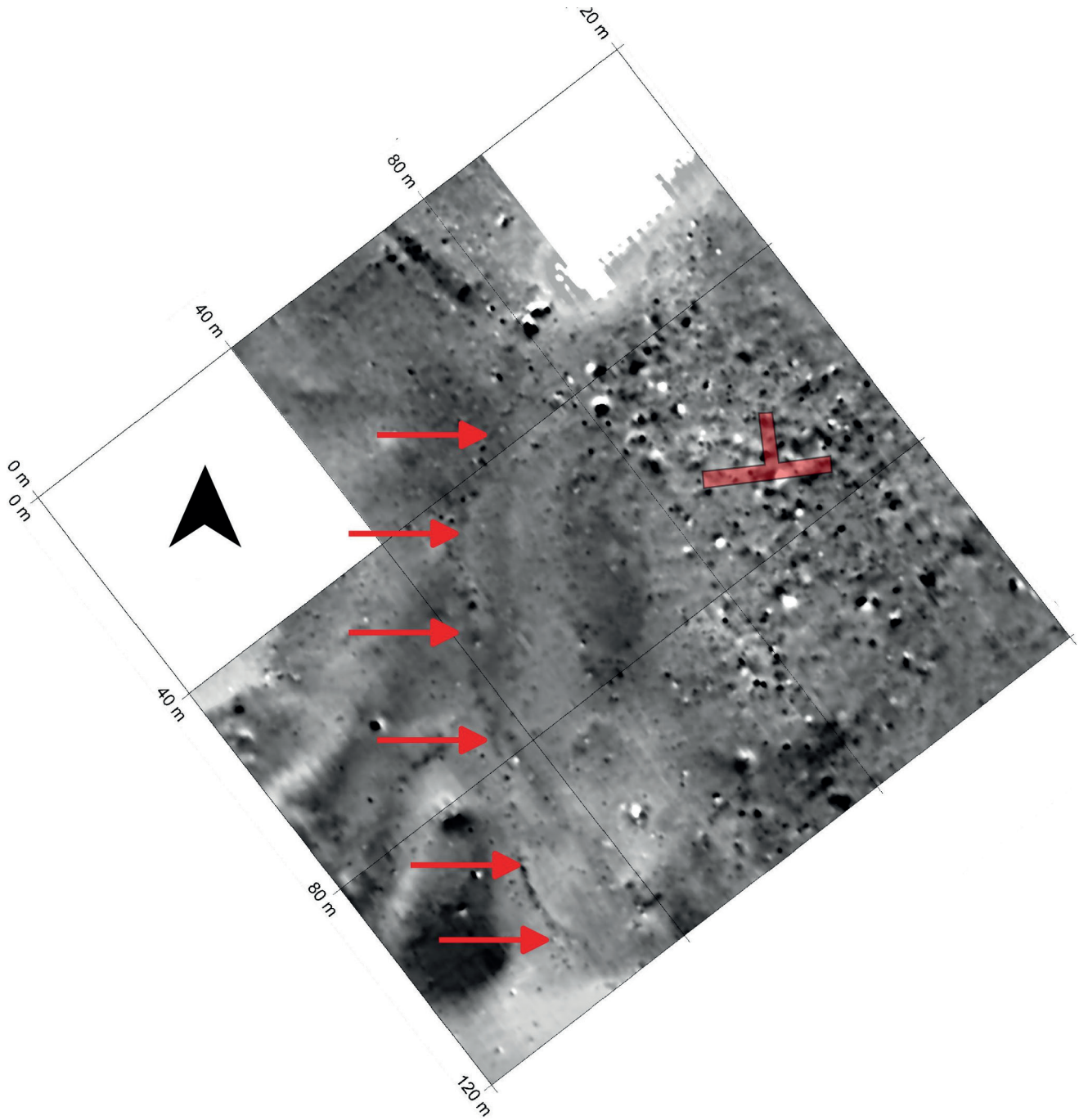


Fig. C3: Magnetogram of the western slope at Qalat-i Dinka, with the excavation trench marked in red. The red arrows in the southwest indicate a borderline, possibly a fortification wall. Magnetometer survey with Smartmag SM4G-Special caesium-magnetometer, sensitivity ±10 picotesla, variometer (duo-sensor) configuration. 40 × 40 m grid, spatial resolution 12.5 × 50 cm, interpolated to 25 × 25 cm, intensity of total Earth's magnetic field at the site: 47,290 nT ±30 nT. On the western slope, in red, the 2016 excavation trench. Image prepared by Jörg Fassbinder.

Fig. C4: View of the 2016 excavation trench at Qalat-i Dinka from the east. Photo by Janoscha Kreppner.

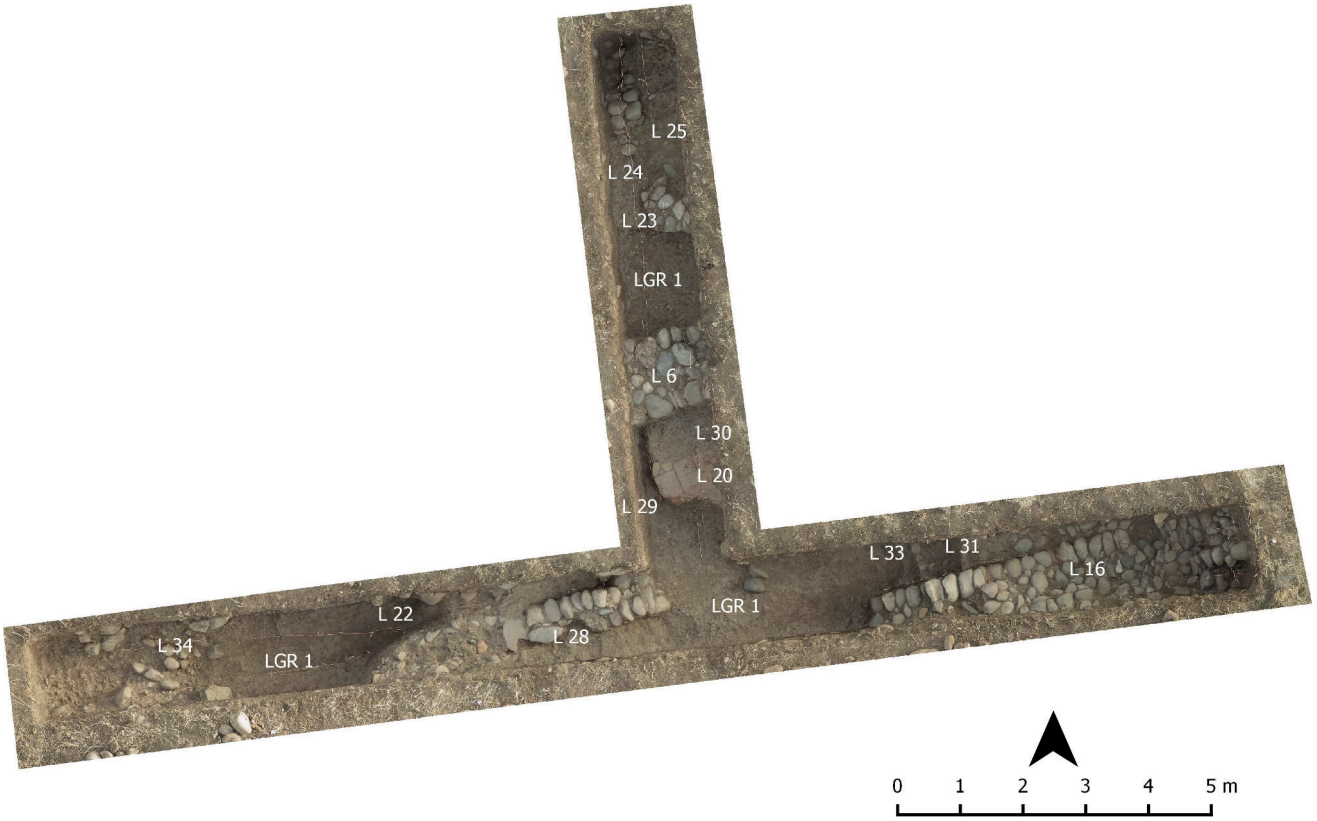


Fig. C5: Orthophoto of the excavation area at Qalat-i Dinka, with indication of the loci. Prepared by Andrea Squitieri.

change the square number 100000, in order to avoid confusion and reduce the risks of errors in the analysis.

C2. The 2016 excavation results

The 2016 excavation area has a T-shape and consists of three intersecting trenches, named the eastern sector, the western sector and the northern sector (**Fig. C5**).

Topsoil consisting of a soft brown-grey soil covered the entire test trench (**Figs. C6-C7**). It yielded many large stones and a large quantity of pottery sherds dating to the Iron Age as well as to other periods. We soon realised that the large stones encountered in the topsoil came from the stone walls of the Main Occupation Period that the looters had damaged and sometimes dismantled. As visible in **Figure C10**, the looting activity disturbed the deposits under the topsoil across the whole excavated area; these disturbed deposits have been grouped into the Locus Group 1 (LGR:0001). One of the looting pits (Locus:100000:004, part of LGR:0001) contained a plastic bag and a biscuit package, both found c. 1 m below the surface. The biscuit package bore the production date 1999 and the expiry date 2000, making the year 1999 the *terminus post quem* for the looting activity.

Inside the looting pits we found a large quantity of human bones and some small finds including an open copper-alloy bracelet (**Fig. C24**). These remains seem to originate from graves, which the looters irremediably destroyed.

One of these graves (Locus:100000:0021), although severely damaged, was sufficiently well preserved to show that it was not cut into the beaten floor (Locus:100000:030) associated with the Main Occupation Period. It is therefore stratigraphically younger. This grave yielded several small objects, which are discussed below. Because of the disturbance caused by the looters, the bones were found in a very bad state of preservation and it was not possible to reconstruct the position of the skeleton (**Fig. C8**).

Fig. C6: Topsoil of the western sector, view from the east. Photo by Janoscha Kreppner.

Fig. C7: Topsoil of the eastern sector. Photo by Janoscha Kreppner.

Fig: C8: Disturbed grave in the northern sector. Photo by Andrea Squitieri.

C2.1 Eastern sector

The eastern sector revealed the remains of a massive wall (Locus:100000:016): it is 1.1 m wide, 6 m long and 5 courses of stones are preserved. The faces of the wall are made with large stones (c. 40 cm long, c. 20 cm high), with smaller stones in between (**Fig. C9**). The wall is oriented EEN to WWS. It starts in the eastern baulk, where there may be a corner towards the north just under the eastern section: the orientation of the stones changes at this point and a very large stone is visible on the southern edge of the wall, which might have functioned as a cornerstone. Towards the west, the wall is not very well preserved because it was damaged by looting pits (Locus:100000:013 and Locus:100000:012; both part of LGR:0001). On the western edge of the wall, the lowest course was preserved. It rests on a deposit made of many small pebbles (Locus: 100000:026) (**Fig. C10**). This deposit has been detected under the walls and floors across the entire excavated area. We therefore interpret it as a foundation material put in place before the erection of walls and the construction of the floors.

To the north of wall Locus:100000:016, there is a stamped mud floor (Locus:100000:031), on which we found pottery corresponding to the typology and fabrics known from Gird-i Bazar (**Fig. C11**). The floor slopes down towards the west in steps (Locus:100000:033). Four flat stones are set into the edge of one of these steps, c. 45 cm below the floor. In between the floor and this step, an additional step was damaged by a looting pit (Locus:100000:007; part of LGR:0001). The presence of this additional step is inferred by the arrangement of the lowest course of the wall (Locus:100000:016). At its westernmost extremity, this wall was further damaged by the

Fig. C9: Wall in the eastern sector: Locus:100000:016. Photo by Andrea Squitieri.

aforementioned looting pit, which destroyed the archaeological remains in the junction among the eastern, the northern and the western sectors.

C2.2 Western sector

The western sector yielded the remains of a wall (Locus: 100000:028) oriented WWS to EEN (**Fig. C12**). It was built on the layer of foundation material (Locus:100000:026). It is 60 cm wide and 2.3 m long, with two rows of stones preserved. The stones are c. 30 cm long and 15 cm high and therefore smaller than those of the wall in the eastern sector (Locus:100000:016).

A flat stone slab situated at the western end of the wall could be the remainder of a threshold construction. Some stones visible in the southern section indicate that the wall continued beyond that point. However, both the possible threshold as well as the continuation of the wall were destroyed by the looting pit (Locus:100000:009; part of LGR:0001).

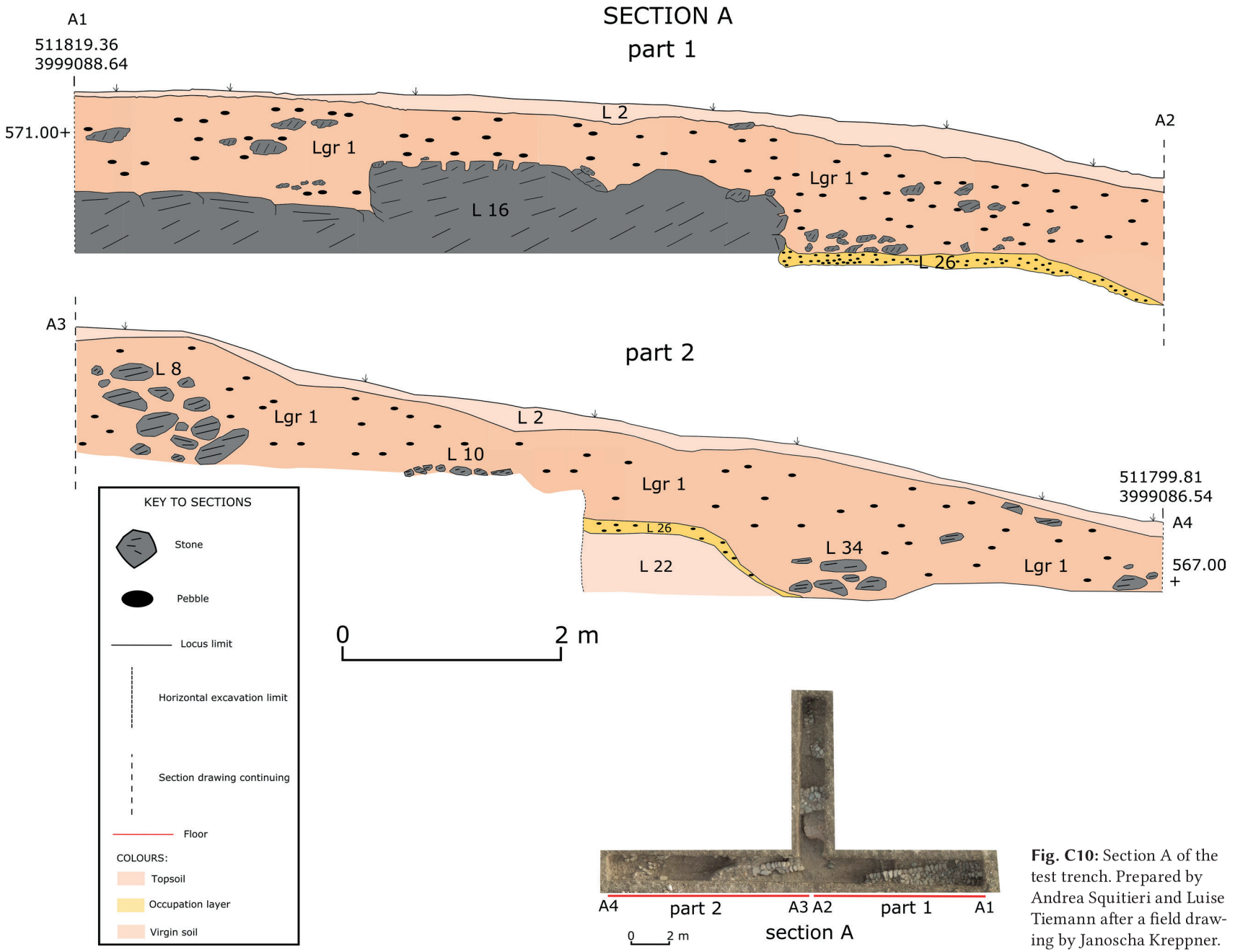


Fig. C10: Section A of the test trench. Prepared by Andrea Squitieri and Luise Tiemann after a field drawing by Janoscha Kreppner.

Fig. C11: Stamped mud floor (Locus:100000:031), yielding pottery corresponding to the typology and fabrics known from Gird-i Bazar. Photo by Andrea Squitieri.

Fig. C12: Wall in the western sector: Locus:100000:028. Photo by Andrea Squitieri.

Fig. C13: Dry soft deposit in the western sector: Locus: 100000:011. Photo by Andrea Squitieri.

Fig. C14: Pebble-rich foundation material (Locus:100000:026) in the western sector, above a red-brown clayey soil, likely the virgin soil (Locus:100000:022). Photo by Andrea Squitieri.

To the west of the wall Locus:100000:028, dry soft soil (Locus:100000:011, part of LGR:0001) (**Fig. C13**) occupies the western part of this sector; it is visible in both sections. This soil is rich in small stones and yielded some pottery and bone fragments, as well as one baked brick (c. 24 cm long, 18 cm wide). The deposit is what remained after the looting activity (Locus Group LGR:0001). Several huge stones (Locus:100000:033) indicate that there might have been a wall at the western edge, which was completely destroyed by looters. The looting pit intersected the foundation material (Locus:100000:026) down to a red-brown clayey soil which was sterile, most likely the virgin soil (Locus:100000:022) (**Figs. C10**, **C14**).

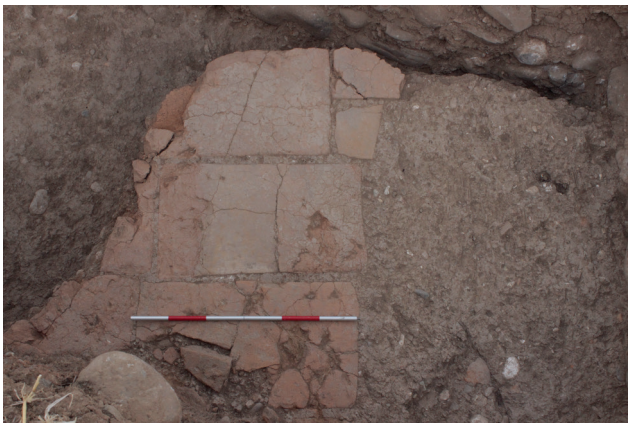


Fig. C15: Brick pavement in the northern sector: Locus: 100000:020. Photo by Andrea Squitieri.

Fig. C16: Wall (Locus:100000:029) visible in the western section of the northern sector. Photo by Andrea Squitieri.

Fig. C17: Two walls (Locus:100000:028 and Locus:100000:029) bonded with another at the corner between the northern and the western sectors. Photo by Andrea Squitieri.

Overall, excavation in the western sector showed that the level of the ancient settlement slopes down by 1.5 m towards the west.

C2.3 Northern sector

In its southern portion, the northern sector was damaged by a looting pit (Locus:100000:007; part of LGR:0001), which cut a brick pavement (Locus:100000:020) (**Fig. C15**). Two bricks of this floor were found complete and *in situ* while the pit cut three more bricks. The bricks are rectangular and measure 58 × 32 × 4 cm. To the north, a trodden mud floor abuts the brick pavement as well as the walls Locus:100000:006 (to the north) and Locus:100000:029 (to the west). This second wall is only visible in the western section (**Fig. C16**).

The wall Locus:100000:029 is bonded with the wall Locus:100000:028 (**Fig. C17**). This is built on top of the packing material (Locus:100000:026). It is 60 cm wide and preserved to a height of two to three courses of stones with a diameter of c. 35 cm. Its eastern edge comes out of the western section but is almost completely hidden by the baulk at the junction with the wall Locus:100000:006. The visible remains give the impression that walls Locus: 100000:029 and Locus:100000:006 abut. Wall Locus: 100000:029 is 3 m long and oriented in north-south direction. Its stones' size matches those used in wall Locus: 100000:028.

Wall Locus:100000:006 (**Fig. C18**) is built on the packing material (Locus:100000:026). It is 1.20 m wide and oriented EEN to WWS. The stones are up to 40 cm long and 15-20 cm high. The wall is preserved to a height of three courses of stones in the trench, but it is higher in the section where it can be seen to reach up to 80 cm.

Towards the north of wall Locus:100000:006, a looting pit (Locus:100000:004; part of LGR:0001) destroyed the archaeological remains in the middle of the sector down to the packing material (Locus:100000:026). This packing material continues underneath the walls Locus:100000:0006 and Locus:100000:023 as well as the beaten mud floor (Locus:100000:025).

Wall Locus:100000:023 is 50 cm wide (**Fig. C19**). The southern edge is cut by the looting pit (Locus:100000:004; part of LGR:0001). It seems that the corner was situated at this very point, as the stones continue into the east-

Fig. C18: Wall in the northern sector: Locus:100000:006. Photo by Andrea Squitieri.

Fig. C19: Another wall in the northern sector: Locus: 100000:023. Photo by Andrea Squitieri.

ern section. Also wall Locus:100000:023 was built on the packing material (Locus:100000:026) (**Fig. C20**) and is preserved to a height of two to three courses of stones, corresponding to c. 30 cm. The stones are up to 20-30 cm long and 10 cm high. At 1 meter from the southern edge of the wall, there was a row of small flat stones aligned with

Fig. C20: The wall of Locus:100000:023 (in the foreground) built on the packing material (Locus:100000:026). Photo by Andrea Squitieri.

the western edge of the wall; this suggests a threshold (Locus:100000:024), about 90 cm wide. Towards the north, the wall continues into the northern baulk, but is damaged by another looting pit. The trodden mud floor (Locus:100000:025) abuts the wall and continues beyond the threshold.

C3. Pottery and small finds

(*with contributions by Jean-Jacques Herr*)

Due to the looting activity most deposits excavated contained mixed material.

Only the eastern sector produced pottery from an undisturbed context, namely on the floor Locus:100000:032 (**Fig. C11**). Particularly significant is a hemispherical carinated bowl (PPP 100000:032:003; Figs. **C21-C22**). It was burnished inside and outside, using a technique attested also at Gird-i Bazar (TechP7; as discussed in **Chapter E1**) and fired in a semi-oxidising atmosphere. The con-

text further yielded three diagnostic sherds and ten body sherds whose fabrics match fabric groups A, B, C1 and C2 from Gird-i Bazar (see **Chapter E1**). The three diagnostic sherds (PPP 100000:032:001:001-003) belong to a type of jar also found in Gird-i Bazar, with an everted round and triangular rim thickened on the outside by means of a coil. The technological, morphological and fabric correlations between the pottery from the floor Locus:100000:032 and the material from Gird-i Bazar establish contemporaneity for the occupation of this floor and the main occupation phase of Gird-i Bazar, that is the Neo-Assyrian period (see below)

In total, 52 small finds were collected. Some of them belong to the modern era as they came from the topsoil and the looting pits. However, two small finds from looting pits are likely to date to the Iron Age. The first find (PPP 100000:007:006; **Fig. C23**) is an ivory disc decorated with a 12-petalled rosette. Rosettes are among the most common ornamental patterns in Neo-Assyrian art, appearing on different media such as wall paintings, stone reliefs, jewels and ivory plaques[41], and our specimen very closely resembles a popular design[42].

The second possible Iron Age find (PPP 100000:005:003; **Fig. C24**) is an open copper-alloy bracelet, whose surface is heavily corroded. Its extremities are in the shape of an open lotus flower, with an incised linear decoration just below the terminals. Two close parallels for both shape and decoration come from graves excavated by Woolley at Ur, one of which was dated to the Persian period based on the grave goods[43]. Another closely comparable piece, both in terms of shape and decoration, in the British Museum[44] is also thought to come from Ur. It is possible that this type of bracelet was already in circulation during the Neo-Assyrian period, as open bracelets similar in shape to PPP 100000:005:003, although devoid of any decorative motifs, were found in the Central Assyrian cities of Kalhu, Dur-Sharruken and Nineveh[45].

Several small objects may have been associated with the one reasonably well preserved yet heavily destroyed grave context encountered during the 2016 Dinka excavations (Locus:100000:021). But it must be stressed that the grave was so disturbed that its cut could not be clearly distinguished. Therefore, it is not at all clear whether all objects belonged to the original grave goods or whether some ended up near the bones during the looting activity. The objects in question are: two small identical ivory plaques with two tiny holes drilled into their extremities (PPP 100000:021:001 and PPP 100000:021:015; **Fig. C25**), with Neo-Assyrian parallels from Assur and Kalhu[46]; four small metal crescent-shaped earrings (PPP 100000:021:012; **Fig. C26**), whose design is well attested in the Neo-Assyrian period[47]; a prism-shaped quartz object, perhaps a pendant, though no perforation was noted (PPP 100000:021:020; **Fig. C27**); and 32 small beads in different shapes and raw materials (PPP 100000:021:019; **Fig. C28**).

Of all these objects, only the beads can be assigned to the burial with reasonable certainty, while the other objects with first millennium BC comparisons may well belong to the earlier architectural context. The beads, however, and in particular five red stone beads with a spheroid shape have parallels in specimens from graves excavated at Gird-i Bazar in 2015[48] and 2016 (see **Chapter G**), which according to the results of C14 analysis on collagen from root dentin date to the 4th to 5th century AD (see **Chapter D**). Beads were the only grave goods en-

Fig. C21: Carinated bowl (PPP 100000:032:003) from floor Locus:100000:032. Photo by Abdullah Bakr Othman.

Fig. C22: Base of the carinated bowl (PPP 100000:032:003). Photo by Abdullah Bakr Othman.

41 Winter 2010, 169-176; Albenda 2005, 84-92.
42 Wicke 2010, 128-131, pl. 25.
43 Woolley 1962, pl. 34: U6945 and U16730.
44 http://www.ur-online.org/subject/36016/: BM 1858,0101.5.
45 Curtis 2012, pl. 84.
46 Assur: Wicke 2010, 131-135, pl. 27-29; Kalhu: Curtis *et al.* 1993, fig. 19.
47 Curtis 2012, pls. 84-85.
48 Greenfield 2016, 78.

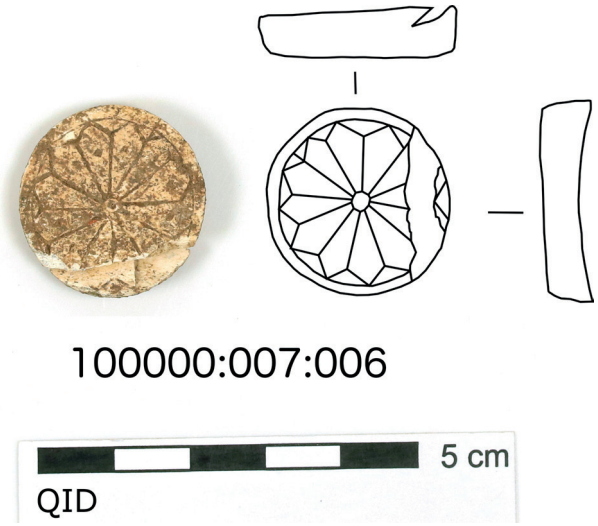


Fig. C23: Ivory disc decorated with a 12-petalled rosette: PPP 100000:007:006. Photo by Hayman Noori. Drawing by Luise Tiemann.

Fig. C24: Open copper-alloy bracelet: PPP 100000:005:003. The ends have the shape of an open lotus flower, with an incised linear decoration just below the terminals. Photo by Hayman Noori. Drawing by Luise Tiemann.

Fig. C25: Two small identical ivory plaques with two tiny holes drilled into their extremities: PPP 100000:021:001 and PPP 100000:021:015. Photo by Hayman Noori. Drawing by Luise Tiemann.

Fig. C26: Four small metal crescent-shaped earrings: PPP 100000:021:012. Photo by Hayman Noori.

Fig. C27: A prism-shaped quartz object, perhaps a pendant: PPP 100000:021:020. Photo by Hayman Noori.

Fig. C28: Small beads in different shapes and raw materials from the grave Locus:100000:021. The red spherical beads are made of carnelian. Photo by Hayman Noori.

countered in this cemetery. With kind permission of the Sulaymaniyah Directorate of Antiquities and Heritage, Dr Christoph Berthold (director of the Competence Center Archaeometry Baden-Wuerttemberg of the University of Tübingen) was able to perform a μ-XRD analysis on a red bead from the Dinka grave context (PPP 100000:021:007), which demonstrated that the bead was made of carnelian, a red variety of quartz.

C4. Conclusions

The excavation of the test trench on the western slope of Dinka uncovered, relatively close to the surface, substantial if disturbed architectural remains, with two large walls of a width of c. 1.1 m (Locus:100000:016 and Locus:100000:006) and a brick pavement (Locus:100000:020). Although the architecture was constructed on a slope and therefore covers different levels, it belongs to only one single occupation period.

An undisturbed context on the beaten mud floor (Locus:100000:032) yielded pottery matching the inventory known from Gird-i Bazar. This indicates that the Main Occupation Period at Dinka corresponds to that at Gird-i Bazar.

The area was most likely reused as a graveyard at a later time. Although we could only identify one heavily disturbed grave (Locus:100000:021), we can infer the existence of other burials from the high quantity of loose human bones recovered from the looting pits. The presence of carnelian beads makes it very likely that the burial dates to the same chronological horizon as the graves excavated at Gird-i Bazar, that is the 4th to 5th century AD. A tooth sample sent for ^{14}C analysis in February 2017 held too little collagen to yield results. But we cannot at present discount other possibilities, for example that human bodies rested on the floors of the Main Occupation Period that were disturbed and destroyed by the looters. Future research should clarify this issue.

The area was heavily disturbed by looting pits dug sometime in or after 1999. The magnetic anomalies noted in the geophysical survey are likely connected to these looting pits. At present, it is difficult to combine the excavation results and the data of the geophysical survey. In particular it is not yet clear why the linear features oriented NW-SW that are visible on the magnetogram do not match the orientation of the excavated walls, which are oriented WWS-EEN. Future research will clarify these issues.

In conclusion, the excavated area housed substantial architecture that is much grander than that encountered at Gird-i Bazar. The large walls and the brick pavement indicate that one or several monumental buildings were built against the natural slope of Qalat-i Dinka. The large walls seem to belong to the same building phase as the smaller walls. Because the area excavated is small it is too early to offer an interpretation of the general layout of the area. Nevertheless, it is possible that the brick-paved area was an open area, e.g. an alley or courtyard, bordered by the walls Locus:100000:016 and Locus:100000:006, and that a staircase followed the slope to the east.

The results of this first excavation season at Dinka are promising. Its substantial single-phase occupation dates to the Neo-Assyrian period and lies close to the site surface. However, the site was severely damaged by looters in the recent past. Further research at Dinka will be necessary to obtain a clearer idea of the layout and functional organisation of its Iron Age occupation.

D. Excavating Gird-i Bazar: the 2016 season

F. Janoscha Kreppner, Silvia Amicone, Francesca Chelazzi, Vera Egbers, Zahra Hashemi, Alessio Palmisano & Andrea Squitieri

The 2016 work programme continued directly from the results of the first excavation season at Gird-i Bazar in 2015.

In the eastern part of Gird-i Bazar (Squares 272927, 272928, 271927 and 271928; **Fig. D1**), where the excavation was started in 2015 under the supervision of John MacGinnis, work continued in 2016 (**Fig. D2**) under the supervision of Alessio Palmisano (Squares 272927, 272928 and 271927) and of F. Janoscha Kreppner and Andrea Squitieri (Square 271928). In this area, dubbed the "Eastern Trench" in the 2015 excavation report[49], Building A was identified in 2015 and then thought to be a single-room building. In 2016, the excavation goal was to further investigate this building which turned out to be a large multi-room building: Courtyard 2 and Rooms 1, 3, 23, 24 and 29 have so far been excavated, at least partially. In 2015, also a second building, called Building B, had been identified. The results of the 2016 excavations suggest that Building B is in fact a part of Building A. Additionally, the 2016 excavations unearthed Outdoor Area 26, Alley 25 and a wall belonging to another building towards the east, called Building J (**Fig. D2**). This building lies on the easternmost limit of the excavation, where the mound was heavily damaged by the construction of a road leading to the modern chicken farm.

In 2015, the central part of the mound was targeted by the 43 m long and 1.5 m wide "Connecting Trench", excavated under the supervision of Adam Stone[50] (**Fig. D1**). Here, several graves were found, but most importantly a pottery kiln and, towards the west, partial walls of two more buildings, called Buildings D and E. In 2016, Francesca Chelazzi continued the investigation of the Connecting Trench in the area west of the pottery kiln, between the latter and the Western Trench (**Fig. D15**). The aim was to understand the spatial connection between the kiln and the western part of the mound, as well as to further uncover Buildings D and E. The excavation of the kiln itself was supervised by Silvia Amicone. A rectangular trench was opened all around the kiln in order to fully investigate and sample the kiln structure and its fill (**Fig. D15**).

In the western part of the mound (**Fig. D1**), next to the metal fence surrounding the chicken farm, the 2015 excavations were supervised by Peter Bartl[51]. Here, in Square 267931, several buildings were partially uncovered: Buildings E, H, I, F, and G (**Fig. D17**). The 2016 excavations aimed to further investigate Buildings D, E, F and G, under the supervision of Vera Egbers and Zahra Hashemi. Because it is cut by the fence, it proved to be impossible to unearth Building G, extending towards the west, in full.

We will first present the methodology and review the dating of the site before discussing the various buildings, outdoor areas and alleys unearthed during the 2016 excavations.

D1. The excavation methodology

(F. Janoscha Kreppner and Andrea Squitieri)

D1.1 The digital documentation system

As already for the 2015 campaign, an important aspect of the 2016 season at Gird-i Bazar was the implementation of a digital documentation and registration system. This was achieved by enabling the trench supervisors to access the online database directly in the field in order to record as much data as possible in "real time". The database, based on MySQL, stores information regarding deposit and installation descriptions, find collections, photos, drawings, diaries as well as spatial data in the form of total station points and GIS-elaborated plans. It was designed by Christoph Forster (Fa. datalino, Berlin)[52] and is managed by Andrea Squitieri and F. Janoscha Kreppner.

The documentation system includes the creation of daily orthophotos, digital elevation models (DEMs) and

49 MacGinnis/Kreppner 2016.

50 Stone 2016.

51 Bartl 2016.

52 We gratefully acknowledge the Gerda Henkel Foundation's financial support towards the development of the database (Grant AZ 42/V/16, awarded to Karen Radner).

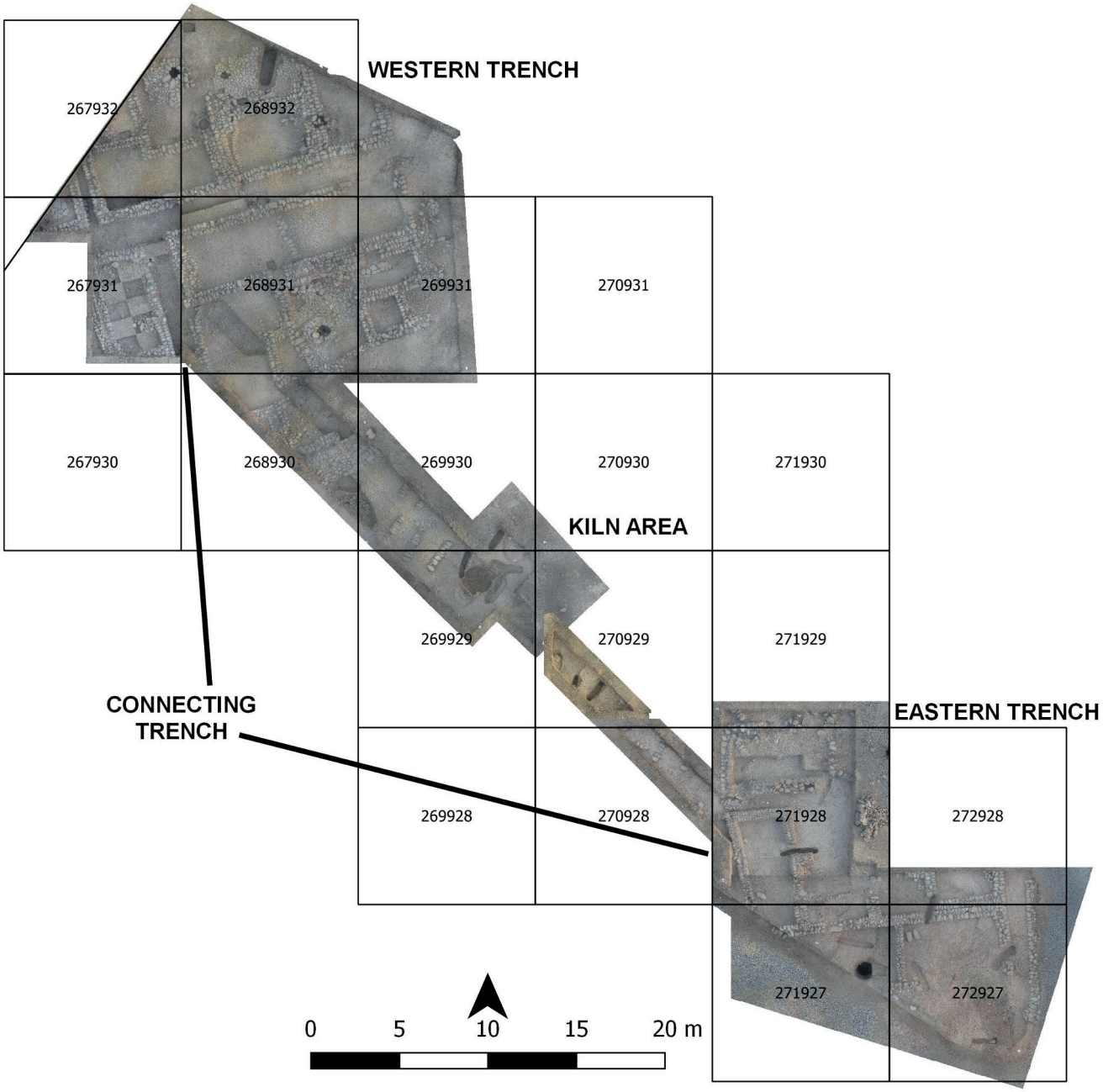


Fig. D1: Excavation grid of 10×10 m squares superimposed over the orthophoto of the 2015 and 2016 excavation areas at Gird-i Bazar. Prepared by Andrea Squitieri.

Fig. D2: Orthophoto of Buildings A, B, C and J; Outdoor Areas 8 and 26; and Alley 25. Prepared by Andrea Squitieri.

3D models by means of the software package Agisoft Photoscan. The daily orthophotos, DEMs, and 3D models help keeping data loss at minimum during the destructive process of the archaeological excavation; they also represent a valuable help for interpretation in post-excavation analysis, along with field photos and diaries. The orthophotos were used by the trench supervisors for their daily sketches in the field and later provided the basis for the 2D plans drawn in QGIS 2.18.

An advantage of using a digital documentation system is that it allows to better keep track of samples which are collected during the excavation (such as charcoal, phytoliths, soil samples for flotation) and to implement a more precise sampling strategy (see **Chapter G**), in particular when excavating deposits immediately overlying floors.

The creation of a 3D stratigraphy of the entire site is ongoing, using Photoscan generated 3D models, DEMs and 3D drawings. This is meant to contribute to the interpretation of the results as well as help with the presentation of the excavation data.

D1.2 The excavation grid and the locus / collection registration system

As in the 2015 campaign, the registration system was based on the locus / collection system, tied to an excavation grid based on UTM-WGS84 coordinates. In order to link up the 2015 spatial data with the 2016 data we recreated the 2015 excavation grid at the beginning of the 2016 season, using a dGPS (Leica Viva GS10). This is a grid of 25 10×10 m squares in northern orientation (**Fig. D1**), with each square name corresponding to the Easting and Northing coordinates of its SW vertex. So, for example, Square 271928 has a SW vertex with UTM-WGS84 coordinates East 512710, North 3999280. The square names form the first part of the locus, collection, find and sample names (see below).

In our system, loci (pl. for locus) are defined as discrete and detectable stratigraphic units representing a single event or action leaving traces in the archaeologi-

cal record[53]. Soil deposits and installations such as walls and floors constitute loci and are therefore given a locus number. This number is composed of the 6-digit number of the square where the locus lies, followed by a progressive number (e.g., Locus:271928:001 is Locus 1 in Square 271928).

During excavation, particular attention is paid to understanding deposit formation, firstly by excavating each complete deposit according to its specific shape and secondly by recording detailed data concerning the soil characteristics (*e.g.*, colour, consistency and particle size). Such loci often contain materials such as pottery or bones. These are then given a collection number, formed by the locus number followed by a progressive number, with the label being preceded by PPP (for "Peshdar Plain Project") instead of Locus (*e.g.*, PPP 271928:001:001 for Pottery Collection 1 from Locus 1 of Square 271928). Samples, such as phytoliths, charcoal and soil for flotation, and single finds are labelled in the same way (e.g., PPP 271928:001:002 for a charcoal sample from Locus 1 of Square 271928).

The database is structured in such a way that it is possible to access all loci within a square and all collections/samples/single finds within a locus. Finally, each pottery sherd coming from a pottery collection is given an additional progressive number (*e.g.*, PPP 271928:001:001:001 for Sherd 1 in the Pottery Collection 1 of Locus 1 in Square 271928). In the database, all sherds within a pottery collection can be accessed.

Sometimes, especially during post-excavation analysis, two or more loci are identified as belonging to the same stratigraphic unit. In such cases, the relevant loci are grouped together to form a so-called Locus Group (abbreviated LGR), identified by progressive numbers (*e.g.*, LGR:0001). Unlike locus numbers, these designations are not based on a square number. This is due to the fact that locus groups may link loci that describe the same stratigraphic unit extending across several squares. So, for example, if a wall runs across two continuous squares, *e.g.* Squares 271927 and 272927, then it will be initially assigned two locus numbers, one for each square: in our example, Locus:271927:008 and Locus:272927:007. These two loci will then be combined into a locus group, in this example LGR:0138. Locus group numbers appear in the orthophotos and the section drawings throughout this book. A concordance between locus numbers and locus groups is given in **Table D1**.

Lastly, as in 2015, graves are labelled with the letter G (for "grave") followed by a unique progressive number (*e.g.*, G51). Graves are units composed of (at least) four loci: the grave cut, the skeleton, the fill and the grave architecture.

D2. Dating the occupation of Gird-i Bazar

(F. Janoscha Kreppner and Andrea Squitieri)

The absolute chronology of the occupation at Gird-i Bazar was established by means of the ^{14}C analysis of a charcoal sample from a floor of Building A. This produced a *post quem* date of 937-829 calBC (92.2 % probability)[54] and confirmed the attribution of Gird-i Bazar's main occupation phase to the Neo-Assyrian chronological horizon, as assumed on the basis of the pottery finds. More precise dates may be available once ^{14}C analysis has been completed for the carbonised seeds isolated through flotation[55].

In order to elucidate the relative stratigraphy of the 2016 excavations at Gird-i Bazar, we present a new stratigraphic table (**Table D2**) that updates the stratigraphic table of the 2015 excavation[56]. Here, we summarise the information required to read the table:

- The rows of the table follow the timeline, from the oldest (bottom) to the youngest (top) occupation periods.
- The columns of the table contain the spaces, such as rooms of buildings, courtyards and open areas, arranged from east to west. Consequently, roughly contemporary depositional processes and occupation periods that span various areas of the site can be identified in the table by reading it horizontally.
- The cells of the table contain either a locus number (*e.g.*, Locus:271927:027) or a locus group number (*e.g.*, LGR:0010), followed by a brief description of the locus / locus group, be it a deposit, a wall or an installation; or else a grave number (*e.g.*, G6). The background colours of the cells indicate the temporal extent of the occupation as well as non-occupational or post-occupational periods. Hence, different pink shades are used for topsoil, modern occupation, graves and virgin soil; brown is used for post-occupation periods; yellow for occupation periods. The same colour coding is used in the section drawings so that the stratigraphic table and the section drawings can be read in parallel.

53 Kreppner/Forster/Squitieri 2016, 45.

54 Radner 2016b, 52.

55 In July 2017, Melissa Rosenzweig (Miami University, Oxford, Ohio) made a selection of suitable seed samples from good floor contexts that are currently being processed at Curt-Engelhorn-Centre Archaeometry gGmbH (Mannheim, Germany).

56 Kreppner/Squitieri 2016, 52-53.

Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus
2	271928	24	45	268931	7	78	268932	25	122	268932	66
2	271928	44	45	268931	8	79	272927	39	122	269932	18
3	271928	40	46	269930	4	79	272927	40	123	267931	28
3	271928	41	46	269930	5	79	272927	41	123	267932	34
3	271928	42	46	269930	6	79	272927	42	124	267931	15
3	271928	48	47	269930	7	80	268930	12	124	267932	33
4	271928	33	47	269930	8	80	268931	3	125	267931	29
4	271928	43	47	269930	9	80	268931	18	125	267932	36
5	271928	62	48	269930	10	80	268931	36	126	269930	2
5	271928	68	48	269930	11	80	268931	44	126	268930	2
5	271928	69	48	269930	12	80	268930	25	126	268931	2
5	271928	70	49	269929	8	80	268930	37	126	268931	13
7	271928	16	49	269929	9	80	268930	46	126	269929	24
7	271928	19	49	269929	19	81	269932	11	126	269930	15
7	271928	20	50	269929	7	81	269932	14	126	268931	35
8	271928	21	50	269929	17	81	269932	20	126	268930	21
8	271928	25	50	269929	18	82	268932	9	126	269929	45
8	271928	26	50	269929	41	82	268932	32	126	269930	26
8	271928	52	51	269929	11	82	268932	35	126	268930	42
9	269929	5	51	269929	12	82	268932	43	127	269929	3
9	269929	26	51	269929	13	83	268932	49	127	269930	3
9	269929	39	51	269929	21	83	268932	51	127	269929	4
10	271927	15	51	269929	22	84	269931	5	127	269929	14
10	271928	53	52	270929	23	84	269931	7	127	269929	25
10	271928	54	52	270929	24	84	268932	41	127	269929	46
10	271928	108	52	270929	25	84	268931	38	127	269930	28
11	271928	3	53	270929	16	84	269932	3	128	269930	29
11	271928	6	53	270929	17	84	269932	15	128	269930	30
11	271927	3	53	270929	18	85	268931	43	128	268930	23
11	271928	18	53	270929	19	85	268931	45	128	268930	24
11	271928	38	53	270929	20	86	272928	9	128	269930	31
11	271928	45	54	270929	3	86	271928	112	128	268930	45
11	272927	2	54	270929	4	86	272927	43	129	267931	7
11	271928	92	54	270929	13	86	272928	30	129	267932	7
11	272928	2	54	270929	14	87	268932	65	130	268931	22
12	271927	4	54	270929	15	87	268931	55	130	268931	41
12	271927	12	55	270929	21	88	268931	53	130	268930	38
13	271927	20	55	270929	22	88	268932	62	130	268930	47
13	271927	23	55	270929	26	88	268932	63	131	268930	43
14	271927	30	56	270929	8	88	268931	56	131	268930	48
14	271927	37	56	270929	10	89	268931	16	132	267931	45
14	271927	38	56	270929	11	89	268932	34	132	268931	61
14	271927	40	56	270929	12	90	268932	40	133	269929	29
15	271928	14	56	270929	27	90	269932	16	133	269929	48
15	271928	23	57	270928	6	91	272928	10	134	269929	34
15	271928	27	57	270928	9	91	272927	44	134	269930	20
15	271928	94	58	270928	20	91	271928	117	135	269929	30
16	271928	32	58	270928	21	92	272928	11	135	269930	21
16	271928	65	58	270928	22	92	272927	45	136	269929	28
16	271928	90	59	270928	12	92	271928	118	136	269930	16
17	271928	49	59	270928	13	93	268931	20	137	271927	32
17	271928	50	59	270928	14	93	269931	13	137	272927	10
18	271928	39	60	270928	5	94	269929	50	138	271927	8
18	271927	25	60	270928	15	94	269929	51	138	272927	7

Table D1: Gird-i Bazar 2016: concordance between locus numbers and locus groups. Prepared by Andrea Squitieri.

Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus
18	271928	60	60	270928	17	94	269930	36	139	272927	28
18	271928	64	61	270928	16	94	269930	37	139	271927	42
18	271928	66	61	270928	18	95	269930	32	140	271927	22
18	271928	111	61	270928	19	95	269929	52	140	272927	29
19	271928	59	62	271929	3	96	269930	27	141	271927	28
19	271928	63	63	271929	4	98	267931	41	141	271927	36
20	271928	57	64	272928	14	98	268932	67	143	271927	16
21	271928	58	64	272928	21	98	268931	58	143	272927	22
21	271928	102	64	272928	24	99	267931	3	144	272928	6
21	271928	103	64	272928	25	99	267931	9	144	272927	27
21	271928	104	65	272928	19	99	268932	14	145	272928	16
22	271928	67	65	272928	26	99	268931	65	145	272927	30
23	271928	74	65	272928	27	100	267931	46	146	272928	15
24	271928	75	65	272928	28	100	268931	63	146	272927	33
24	271928	114	66	267931	2	100	268932	74	147	272927	25
24	271928	115	66	267931	11	102	268932	38	147	272928	7
24	271928	116	66	267931	34	102	269932	4	148	272927	11
25	271928	76	66	267932	2	103	267932	25	148	272927	12
25	271928	99	67	267931	10	103	268932	33	149	271928	7
25	271928	100	67	268931	15	104	267932	11	149	271927	26
25	271928	101	68	267932	10	104	268932	15	150	271927	14
26	271928	61	68	267932	14	105	268930	35	150	271928	96
27	271928	72	68	267932	31	106	272927	46	151	271927	13
28	267931	38	69	272927	3	106	272927	47	151	271928	93
28	268931	60	69	272927	4	108	268931	49	152	269929	20
29	271928	30	69	272927	5	108	269931	24	152	269929	42
29	271928	78	69	272927	17	109	267932	17	153	268930	6
30	271928	9	70	272927	13	109	268932	30	153	268930	28
30	271928	13	70	272927	14	110	267932	9	154	268930	7
31	271928	83	70	272927	15	110	268932	16	154	268930	49
32	268932	61	70	272927	18	111	267932	6	155	268930	5
32	269932	17	70	272927	21	111	268932	23	155	268930	22
33	271928	34	71	269929	47	112	267932	26	155	268930	27
34	271928	35	71	269930	33	112	268932	75	156	268930	14
35	271928	84	72	268931	10	113	267932	20	156	268930	31
36	271928	85	72	268931	14	113	268932	20	157	268930	10
37	271928	86	72	269931	3	114	268932	3	157	268930	34
38	271928	4	73	269929	31	114	268932	26	158	268930	9
38	271928	5	73	269929	32	115	268932	68	158	268931	9
39	271927	18	73	269929	33	115	269932	19	159	268931	11
39	271928	98	73	269929	35	116	268932	29	159	268931	62
39	271928	105	74	269930	17	116	268932	46	160	268931	5
39	271928	106	74	269930	18	116	268932	54	160	268931	42
39	271928	107	74	269930	19	116	268932	59	161	267931	24
40	271927	19	74	269930	23	116	269932	6	161	268931	57
41	271927	7	75	272927	23	118	268932	42	162	267931	13
41	271927	17	75	272927	31	118	268931	50	162	267932	32
42	271927	5	75	272927	32	118	269932	12	163	267931	4
43	271927	6	75	272927	36	119	267931	5	163	267932	3
44	269929	10	76	272927	16	119	267931	36	164	268932	6
44	268930	15	76	272927	34	119	267931	37	164	268932	8
44	268930	16	76	272927	35	119	268931	25	164	268932	10
44	269930	13	76	272927	37	119	268932	39	165	268931	6
44	268930	18	77	272928	12	119	269932	7	165	269931	6
44	269929	49	77	272928	13	120	269932	9	165	268932	73

Table D1 – continued: Gird-i Bazar 2016: concordance between locus numbers and locus groups. Prepared by Andrea Squitieri.

Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus	Locus Group (LGR)	Square	Locus
44	269930	35	77	272928	22	120	269931	27	166	268931	26
45	268931	6	77	272928	23	121	267932	8	166	268931	29
			78	268932	4	121	268932	5			
			78	268932	21	121	268932	18			
						122	268932	58			

Table D1 – continued: Gird-i Bazar 2016: concordance between locus numbers and locus groups. Prepared by Andrea Squitieri.

Each occupation period is defined by a floor. When a new floor is detected that overlies an earlier one, a new occupation period is defined. Note that the term "floor" refers to the actual purpose-built floor or a hardened surface created by human use, which is assigned a specific locus number. The deposit found immediately above the floor is given its own locus number. This allows us to isolate material found on a floor and, at the same time, gain a better understanding of the formation processes of the deposits above the floor.

Reading the table from bottom to top, we have identified the following phases:

- Virgin soil.
- The first Construction Phase when the foundations of the buildings were laid down and the walls were created.
- The Main Occupation Period when these buildings were used. During this period, some alterations were implemented and there is evidence for new floors in Building A Room 1, Building F Room 15 and Building H Room 17 as well as Alley 13, indicating two distinct phases of use. We therefore subdivide the main occupation period into two phases called "Main Occupation Period 1" and "Main Occupation Period 2". Each of these two phases is divided into three sub-phases, from oldest to youngest:
  - Construction phase of the floor, comprising the construction of the floor and the installations created before the floor was used;
  - Occupation of the floor, resulting in deposits and installations from the time when the floor was in use;
  - End of occupation, resulting in deposits that indicate the destruction or abandonment of the floor, covering the finds collected directly on the floor.
- A Post-Occupation Period follows each occupation period, representing a period of non-occupation during which erosion phenomena sometimes caused the formation of archaeological deposits. These processes may be repeated cyclically, which is why yellow and brown rows alternate in the table.

The Main Occupation Period at Gird-i Bazar belongs to the Neo-Assyrian period, c. 9th to 6th centuries BC, as already established in 2015 on the basis of ^{14}C analysis and pottery observations. An important result of the 2016 excavation is that the Main Occupation Period is divided into two phases of use in some building contexts, both belonging to the Neo-Assyrian chronological horizon. Consequently, **Table D2** features Main Occupation Period 1 (identified in 2015 and further explored in 2016) and Main Occupation Period 2 (identified in 2016).

Main Occupation Period 1 represents the period when the buildings were founded on the virgin soil and when the oldest floors were laid down. The construction of new floors overlaying the earlier ones indicates the beginning of Main Occupation Period 2. The characteristic pottery of Gird-i Bazar's Neo-Assyrian occupation was also found on these younger floors. In some cases, new walls were erected during Main Occupation Period 2, thus modifying the function of the architectural units concerned. In contexts such as Building A Room 1 and Alley 13, no Post-Occupation Period layer was identified between the construction of the floors of the two main occupation periods. Thus, the two phases do not represent two strictly separate periods; the Main Occupation Period saw a continuous development of use that in some contexts resulted in changes. In many other rooms, the first and only floor remained in use from the beginning of Main Occupation Period 1 to the end of Main Occupation Period 2.

In Alley 13, a package of floors was uncovered. In the west, the oldest and the youngest floor lie on distinctly different levels and join to the east. The oldest floor can certainly be attributed to Main Occupation Period 1 since it is connected to the oldest floors in Building F Room 15 and Building H Room 17. The youngest floor in Alley 13, on the other hand, is connected to the younger floors of these two rooms. Overall, however, the continuous sedimentation in Alley 13 and the many superimposed floors show its uninterrupted use. Because of the new results, we now assign the second occupation of Building H and Building I, excavated in 2015[57], to Main Occupation Period 2.

57 Bartl 2016, 75.

GIRD-I BAZAR STRATIGRAPHY	EASTERN TRENCH								
	Building J			BUILDING A					
		Alley 25	Outdoor Area 26	Room 23	Room 24	Room 29	Room 1	Courtyard 2	
PRESENT SQUARE SURFACE	Locus:272727:001					272928:001	Locus:271927:001	Locus:271928:001	Locus:271927:001
TOPSOIL	LGR:0011								
MODERN OCCUPATION	Locus:272927:011 pit cut, Locus:272927:012 fill of the pit					Locus:271928:097 stone inst. Locus:271927:041 surface			
POST SPORADIC OCCUPATION PERIOD									
END SPORADIC OCCUPATION PERIOD SPORADIC OCCUPATION PERIOD CONSTR. FOR SPORADIC OCCUPATION PERIOD			Grave 51, Grave 58	Grave 46, Grave 47 (C14 sample), Grave 50	Grave 44, Grave 52	Grave 12, Grave 13, Grave 53	Grave 13, Grave 25, Grave 26, Grave 5	Grave 2, Grave 4, Grave 8, Grave 9, Grave 10, Grave 11, Grave 12, Grave 13	Grave 23, Grave 24
POST RE-USE OCCUPATION PERIOD									
END RE-USE OCCUPATION PERIOD RE-USE OCCUPATION PERIOD CONSTRUCTION FOR RE-USE OCCUPATION PERIOD								Locus:271928:055 tannur Locus:271928:022 tough grey clayish material: trodden surface	LGR:0041 charcoal and red burnt clay
POST MAIN OCCUPATION PERIOD 2		LGR:0147 Light brown and clayey soil, Locus:272927:024 stone collapse		Locus:272927:006 tough light grey clayey soil	Locus:272928:008 tough light grey clayey soil with some charcoals	LGR:0086 very tough light grey clayey soil; quite a lot of pieces of soft red burnt clay; quite a lot of bits of charcoals	LGR:143 tough light grey clayey soil with quite significant amounts of charcoal and burnt red clay	LGR:0019 red clayey earth	
END MAIN OCCUPATION PERIOD 2		LGR:0146 Light brown and clayey soil with a quite a bit patches of charcoal		Locus:272927:020 tough grey clayey soil with charcoal and much pottery	Locus:272928:017 tough light grey clayey soil with red burnt clay and a lot of charc.	LGR:0091 very tough dark grey clayey soil; quite a bit of pieces of soft red burnt clay; quite a lot of bits of charcoals	LGR:0142 very tough light grey clayey soil; quite a lot of pieces of soft red burnt clay; quite a lot of bits of charcoals	Locus:271928:110 dark brown silty clay with white particles	
MAIN OCCUPATION PERIOD 2							LGR:0140 floor, LGR:0141 brown clay with ash, charcoal		
CONSTRUCTION FOR MAIN OCCUPATION PERIOD 2							Locus:271927:039 floor		
POST MAIN OCCUPATION PERIOD 1									
END MAIN OCCUPATION PERIOD 1							LGR:0014 fill of the pit		
MAIN OCCUPATION PERIOD 1									
CONSTRUCTION FOR MAIN OCCUPATION PERIOD 1		LGR:0145 floor		Locus:272927:038 toilet(?) Locus:272927:048 door socket Locus:272927:019 floor	Locus:272928:032 stone inst., Locus:272928:018 floor	Locus:272928:031 stone inst., Locus:27928:119 circular stone inst., LGR:0092 floor	LGR:0139 floor, Locus:271927:031 cut of the pit	Locus:271928:089 pedestalled installation, Locus:271927:027 podium-like installation, 271928:109 drain?, LGR:0018 floor	
FIRST CONSTRUCTION PHASE FOR MAIN OCCUPATION PERIOD	LGR:0144 wall	LGR:0144, Locus:272927:009, Locus:272928:003 walls	LGR:0137 wall	Locus:272927:008, LGR:0138, Locus:272927:009, LGR:0137 walls	Locus:272928:003, Locus:272928:004, Locus:272928:029 walls	LGR:0138, 271927:009, Locus:272928:004, Locus:272928:005 walls	LGR:0137, LGR:0138, Locus:271927:010, 272927:008 walls, Locus:271927:029 threshold	LGR:0138, Locus:271928:008, Locus:271928:088, Locus:271927:009, Locus:271927:010, Locus:271927:011 walls, Locus:271927:029 threshold	
VIRGIN							Locus:271927:035		

Table D2: Synchronoptic stratigraphy table of the 2015 and 2016 Gird-i Bazar excavations. The rows follow the timeline, from the oldest periods at the bottom to the youngest periods at the top. The columns indicate the spaces (*e.g.*, rooms, open areas, etc.). The cells contain a short description of the locus or locus group. The background colours indicate the temporal extent of the occupational, non-occupational or post-occupational periods. Prepared by F. Janoscha Kreppner and Andrea Squitieri.

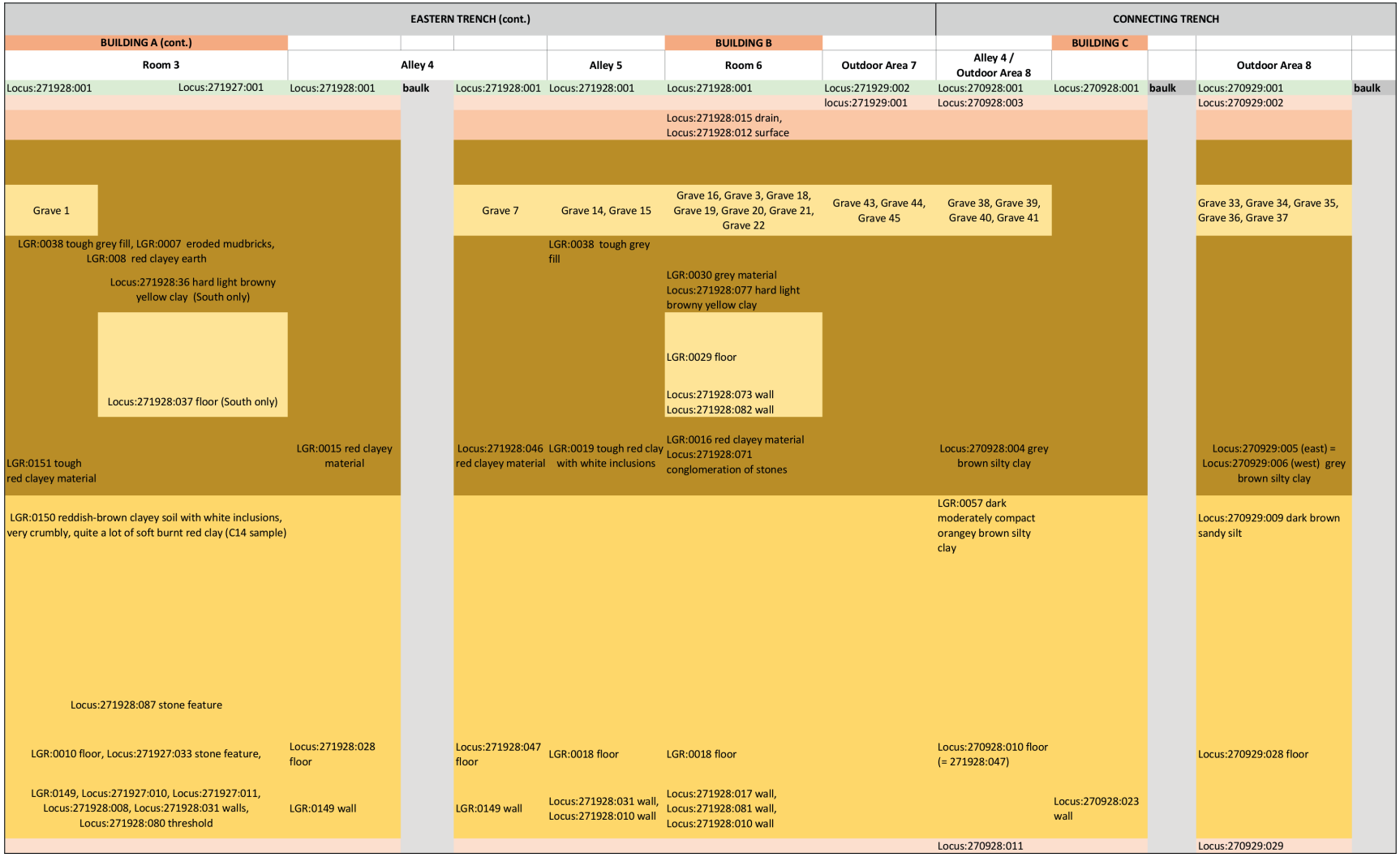


Table D2 – continued: Synchronoptic stratigraphy table of the 2015 and 2016 Gird-i Bazar excavations. The rows follow the timeline, from the oldest periods at the bottom to the youngest periods at the top. The columns indicate the spaces (*e.g.*, rooms, open areas, etc.). The cells contain a short description of the locus or locus group. The background colours indicate the temporal extent of the occupational, non-occupational or post-occupational periods. Prepared by F. Janoscha Kreppner and Andrea Squitieri.

CONNECTING TRENCH (cont.)						
			BUILDING D			
Outdoor Area 8	Outdoor Area 8	Outdoor Area 8	Room 9	Room 34	Room 10	Courtyard 11
Locus:269929:001	Locus:269930:008		Locus:268930:001			Locus:268931:001
		LGR:0126				
LGR:0128 modern pit						
		Locus:268930:003 hard and compact layer of grey brown sandy silt, Locus:268930:004 medium brown compact silty clay, Locus:268930:026 stone				
Grave 30, Grave 31, Grave 32, Grave 49, Grave 48	Grave 27, Grave 28, Grave 29, Grave 54, Grave 55, Grave 56, Grave 57		upper rows of walls LGR:0153, LGR:0154 reused,LGR:0155 surface			
LGR:0127, LGR:0136 compact grey silty clay		LGR:0080 hard yellowish brown sandy silt	Locus:268930:039 dry hard brown silty clay installation fill		Locus:268931:047 hard yellowish brown sandy silt, Locus:268930:011 and Locus:268930:013 wall collapse	LGR:0080 hard yellowish brown sandy silt, Locus:268931:018 crumbly and very hard soil
LGR:0071 dry, hard and silty soil; yellowish brown colour with some pottery, Locus:269929:027 grey brown, compact silty clay with sherds lying flat, LGR:0009 mixed deposit with dark grey brown silty clay, rich in pottery: upper kiln fill, LGR:0138 fill of a second kiln?		Locus:268930:036 dry, hard and silty soil	Locus:268930 dry hard and silty yellowish soil			LGR:0130 hard compact silty soil, light brown in colour with few white particles
LGR:0152 dark grey black ashy deposit rich in charcoal flecks and pottery: lower kiln fill					LGR:0158, Locus:268931:021 walls	LGR:0158, Locus:268931:021 walls
			Locus:268930:044 stone installation			
LGR:0133 floor, LGR:0135 possible floor, kiln fetures: Locus:269929:006, Locus:269929:015, Locus:269929:016, Locus:269929:036, Locus:269929:037, Locus:269929:038, Locus:269929:040, Locus:269929:043		LGR:0157 paved floor	LGR:0156 floor			LGR:0160 pebble floor, LGR:0131 floor, Locus:268931:023
		Locus:268930:008 wall	LGR:0153, LGR:0154, Locus:268930:029 walls	Locus:268930:032, Locus:268930:033 walls	Locus:268930:017 wall	Locus268930:033, LGR:0154, LGR:0072 wall, Locus:268931:040 wall, LGR:0159 threshold
		LGR:0044				LGR:0045

Table D2 – continued: Synchronoptic stratigraphy table of the 2015 and 2016 Gird-i Bazar excavations. The rows follow the timeline, from the oldest periods at the bottom to the youngest periods at the top. The columns indicate the spaces (*e.g.*, rooms, open areas, etc.). The cells contain a short description of the locus or locus group. The background colours indicate the temporal extent of the occupational, non-occupational or post-occupational periods. Prepared by F. Janoscha Kreppner and Andrea Squitieri.

WESTERN TRENCH (cont.)						
BUILDING D (cont.)				Building E		BUILDING H
Courtyard 27	Room 30	Room 31	Room 33	Room 19	Alley 12	Room 17
Locus:268931:013				Locus:268931:013		
				LGR:0084		
	Locus:269931:008 pebble surface	Locus:269931:009 mixed layer of smaller to medium size pebbles in hard dark brown soil				
LGR:0085 clayey to silty hard light brown soil, Locus:268931:051 grey-brownish soft moist soil in well	Locus:269931:012 hard dry soil			Locus:268931:017 reddish-brown clayey-silty soil, Locus:268931:028 hard brown clayey-silty soil, Locus:268931:031 reddish-brown clayey-silty soil	LGR:0161 hard lightgrey soil Locus:267931:039 stone collapse	Locus:267931:023 hard light grey soil, Locus:267931:018 stone collapse
Locus:268931:046 greyish smooth clayey soil with a huge quantity of pottery	Locus:268931:046 greyish smooth clayey soil with a huge quantity of pottery	Locus:269931:021 silty soil, brownish with white inclusions, little moist, many burnt mud brick fragments and pottery sherds, some charcoal		LGR:0166 reddish-brown dry hard silty-clayey soil with white particles, Locus:268931:032 light brown, hard soil	LGR:0028 dry hard silty soil brown colour	
LGR:0108, LGR:0093, Locus268931:021 walls, Locus:268931:059 stone podium	LGR:0093 wall					Locus:267931:047 wall, Locus:267931:021 wall, Locus:267931:049: floor
						Locus:267931:033 hard grey soil, Locus:267931:031 stone collapse
Locus:269931:052 well, Locus:269931:048 floor	Locus:269931:023 floor, Locus:269931:011 door socket	Locus:269931:025 oven, Locus:269931:022 floor		Locus:268931:027 floor, 269931:028 floor, Locus:268931:033 pebble floor, Locus:268931:024 pebbles in wall LGR:0072, 268931:039 bench?	LGR:0132 floor	Locus:267931:044 pebble floor
Locus:269931:019 wall	Locus: 269931:014, Locus:269931:015, Locus:269931:016 walls	Locus:269931:016, Locus:269931:017, Locus:269931:018, Locus:269931:019 walls	Locus:269931:016, Locus:269931:017, Locus:269931:018 walls	LGR: 0067, LGR:0072, LGR:0089, Locus:269932:008, Locus:269931:026 walls, Locus:268931:030 drain	LGR:0067, Locus:267931:019, Locus 268931:040 walls	Locus:267931:032 wall, Locus:267931:026 wall, Locus:267931:019 wall
				LGR:0165		

Table D2 – continued: Synchronoptic stratigraphy table of the 2015 and 2016 Gird-i Bazar excavations. The rows follow the timeline, from the oldest periods at the bottom to the youngest periods at the top. The columns indicate the spaces (*e.g.*, rooms, open areas, etc.). The cells contain a short description of the locus or locus group. The background colours indicate the temporal extent of the occupational, non-occupational or post-occupational periods. Prepared by F. Janoscha Kreppner and Andrea Squitieri.

WESTERN TRENCH (cont.)					
BUILDING I	BUILDING G			BUILDING F	
Room 18	Room 16	Alley 14	Alley 13	Room 15	Room 20
Locus:267931:001					Locus:267932:001
LGR:0066					Locus:267932:002
			Locus:268932:031 modern pit		
	LGR:0129 hard compact grey brown clay			Locus:267931:008 fine mud layer with tiny pebbles	
	Locus:267932:023 hard light brown-yellow soil				
	Locus:267932:022 reddish clayey soil		Locus:267931:025 stone feature, Locus:267931:017 river cobbles in dark brown soil, Locus:267931:027 stone collapse, Locus:267931:035 dark-brown heterogenous material with abandunt small pebbles and several large cobbles, Locus:269932:010 collapsed stones, Locus:267931:040, LGR:0087 stone collapse, Locus:267931:040 stone collapse	LGR:0110: silty clayey soil of light brown colour, Locus:267931:006 hard-packed light brown soil	Locus:267932:012 soft dry brown soil
		LGR:0124 dark-brown silty-clayey soil	LGR:0119: hard packed light brown gey soil		
Locus:267931:022 brown loamy soil	Locus:267931:014 burnt debris on stone installation, LGR0123: light brown soil on floor		LGR:0118 silty clayey soil with some white particles	LGR:0109 silty-clayey soil of light-brown colour	Locus:267932:024 hard dry silty soil, light brown colour
Locus:267931:020 wall, Locus: 267931:048 river-cobbelled floor			LGR:0088 floor	LGR:0103 floor, 267932:030 door socket	Locus:267932:027 floor, Locus: 267932:028 stone installation
					Locus:267932:029 dark-brown clayey soil
				Locus:267931:030 hard grey-brown soil with reddish/dark fragments	
			LGR:0098 dark-brown loamy soil with burnt plaster inclusions, LGR:0090 localised medium pebble floor, Locus:268932:064 localised big pebble floor, Locus:268932:053 stones against northern wall		
	LGR:0125 floor, Locus:267931:016 stone slab installation, Locus:267932:035 cooking place?	Locus:267931:046 floor	LGR:0100 beaten mud floor, LGR:0032 localised small pebble floor, Locus:268932:070 beaten mud floor	Locus:267931:050 floor	
	LGR:0162, Locus:267931:012 walls	LGR:0162, LGR:0163 walls,	Locus:267931:012, Locus:267931:026, Locus:268932:017, LGR:0089 LGR:0099, LGR:0102 walls	LGR:0099, LGR:0068, LGR:0104, LGR:0163, Locus:268932:007, Locus:267932:005 walls, Locus:267931: 043 threshold	LGR:0068, Locus:267932:005 walls
Locus:267931:042			Locus:268931:064		

Table D2 – continued: Synchronoptic stratigraphy table of the 2015 and 2016 Gird-i Bazar excavations. The rows follow the timeline, from the oldest periods at the bottom to the youngest periods at the top. The columns indicate the spaces (*e.g.*, rooms, open areas, etc.). The cells contain a short description of the locus or locus group. The background colours indicate the temporal extent of the occupational, non-occupational or post-occupational periods. Prepared by F. Janoscha Kreppner and Andrea Squitieri.

WESTERN TRENCH (cont.)				GIRD-I BAZAR STRATIGRAPHY
BUILDING F (cont.)				
Courtyard 21	Room 22	Room 28	Outdoor Area 32	
	Locus:267932:001			PRESENT SQUARE SURFACE
	Locus:268932:002	Locus:269932:002		TOPSOIL
Locus:268932:022 modern pit	Locus:268932:047 modern disturbance?			MODERN OCCUPATION
				POST SPORADIC OCCUPATION PERIOD
				END SPORADIC OCCUPATION PERIOD
				SPORADIC OCCUPATION PERIOD
				CONSTR. FOR SPORADIC OCCUPATION PERIOD
				POST RE-USE OCCUPATION PERIOD
				END RE-USE OCCUPATION PERIOD
				RE-USE OCCUPATION PERIOD
				CONSTRUCTION FOR RE-USE OCCUPATION PERIOD
LGR:0121 soft clayey soil of light brown colour, Locus:267932:015 brown clayey soil, Locus:268932:011 brown soil, soft and silty clay with charcoal, 268932:013 fill of drain, 267932:018 fill of well	LGR:0082 light brown silty clayey soil	LGR:0116 silty reddish brown clayey soil with charcoal and burnt clay	LGR:0120 accumulation of big cobble stones Locus:269932:013 silty clayey soil of white-pink colour	POST MAIN OCCUPATION PERIOD 2
LGR:0078 brownish clayey soil with much pottery, LGR:0113 brown-grey silty clayey soil, Locus:267932:013 brown-grey silty soil, 268932:012 silty soil with pottery, charcoal and ash	LGR:0083 silty dark brown clayey soil with charcoal and pottery	LGR:0122 clayey soil with charcoal and burnt clay		END MAIN OCCUPATIOD PERIOD 2
				MAIN OCCUPATION PERIOD 2
				CONSTRUCTION FOR MAIN OCCUPATION PERIOD 2
				POST MAIN OCCUPATION PERIOD 1
				END MAIN OCCUPATION PERIOD 1
267932:019 row of stones				MAIN OCCUPATION PERIOD 1
LGR:0111 well, LGR:0112 floor, LGR:0114 stone pavement, Locus:267932:016 pebble floor, 267932:021 door socket, 267932:077 socket for pole, 268932:050 small oven, 268932:052 big oven, Locus:268932:027 step to room 22	Locus:268932:057 floor, Locus:268932:027 drain, Locus:268932:044 stone boxes, Locus:268932:045 stone podium, Locus:268932:078 threshold	LGR:0115 floor, 268932:056 oven, 268932:069 stone podium?, 268932:071 clay podium?, Locus:269932:021 stone box		CONSTRUCTION FOR MAIN OCCUPATION PERIOD 1
LGR:0068, LGR:0104, LGR:0164, Locus:268932:019, Locus:268932:024, Locus:268932:037 walls, 268932:028 pilaster, 268932:048 substructure of stone pavement	LGR:0164, Locus:268932:017, Locus:268932:019, Locus:268932:036 walls, Locus:268932:028 pilaster	LGR:0102, Locus:268932:037, Locus:269932:005 walls		FIRST CONSTRUCTION PHASE FOR MAIN OCCUPATION PERIOD
			LGR:0081	VIRGIN

Table D2 – continued: Synchronoptic stratigraphy table of the 2015 and 2016 Gird-i Bazar excavations. The rows follow the timeline, from the oldest periods at the bottom to the youngest periods at the top. The columns indicate the spaces (*e.g.*, rooms, open areas, etc.). The cells contain a short description of the locus or locus group. The background colours indicate the temporal extent of the occupational, non-occupational or post-occupational periods. Prepared by F. Janoscha Kreppner and Andrea Squitieri.

Continuing to read **Table D2** from bottom to top, the Post-Main Occupation Period 2 is followed by a "Re-Use Occupation Period", a very ephemeral occupation identified already in 2015 but only in Building A and Building B[58]. As the use of the buildings changed totally and was then in no way comparable to their former, we define this period as a period of re-use.

It is followed by the "Sporadic Occupation Period", identified only above Building D's Room 9. Already in 2015[59], this sporadic occupation was dated to the Sasanian era because of pottery sherds found on a pebble floor (**§D7.1**). The 2016 investigations confirm this attribution: because of the ^{14}C results that date a tooth from Grave 47 to the late Sasanian period (calAD 390-533 (95.4 % probability); **§G4**), we assume that the remains of the pebble floor and the graves belong to the same occupation period. Unfortunately, the pebble floor was not preserved towards the east, due to the proximity to the recent site surface.

Finally, the Modern Occupation Period refers to the recent activities at Gird-i Bazar during the 20th to 21st centuries AD, including the damages caused by the construction of the chicken farm (*e.g.*, modern rubbish pits). It includes a small surface that can be dated to the Saddam era (**§D5.7**).

The following sections describe the structures and installations uncovered in 2016 from east to west, thus following the same order as in **Table D2**.

D3. Building J and Alley 25

(Alessio Palmisano)

Wall LGR:0144 of Building J adjoins Alley 25 in the east. Due to the presence of the road built during the construction of the modern chicken farm, it was not possible to investigate Building J any further (**Figs. D2-D3**).

Alley 25 is 8 m long and 1.10 m wide. It is limited to the west by walls Locus:272927:009 and Locus:272928:003, belonging to Room 23 and Room 24 of Building A, respectively. Alley 25 was very likely unroofed and had an earthen floor (LGR:0145), featuring a light brown dirt surface with patches of charcoal and flecks of grayish clay. It slightly sloped down from north to south. The deposit above the floor (LGR:0146) is a light brown, clayey soil with a moist friable consistency, covered by a deposit of light brown, clayey soil (LGR:0147) containing stone collapse (Locus:272927:027).

58 MacGinnis/Kreppner 2016, 61.

59 Stone 2016, 69; Herr 2016, 91.

D4. Outdoor Area 26

(Alessio Palmisano)

Alley 25 leads to Open Area 26, which is located to the south of Building A (**Figs. D2-D3**). However, it is difficult to understand the spatial arrangement of this area because of the damages of the large modern pit (Locus:272927:011) and the recent bulldozing of the southeastern edge of the site. Open Area 26 yielded the fill of the large pit (Locus:272927:012) and Grave 51.

D5. Building A

(Alessio Palmisano, Janoscha Kreppner & Andrea Squitieri)

This building is a multi-unit architectural complex of the Main Occupation Period.

D5.1 Room 23

(Alessio Palmisano)

Room 23 (**Fig. D3**) is located in the southeastern corner of Building A. It measures 4.30 m in north-southern direction and 6.40 m in east-western direction and is surrounded by four walls that were built on virgin soil and could have supported a roof. The walls (LGR:0138 = Locus:272927:007, Locus:272927:008 and Locus:272927:009; and LGR:0137 = Locus:272927:010) are about 55-60 cm wide and built with stones with a diameter of c. 20-25 cm, arranged in two rows with a core of pebbles and mud.

Unfortunately, most of the southern wall (LGR:0137 = Locus:272927:010) is not preserved because it was cut by the modern large pit cut (Locus:272927:011). The access to Room 23 from Open Area 26 was in the southwestern corner as indicated by a door socket (Locus 272927:048). No threshold is preserved, probably because it was removed by the cut of the nearby Grave 47.

An installation (Locus:272927:038) in the northwestern corner of Room 23 consists of two parallel flat stones and a channel in between (**Fig. D5**). In front of it, we found potsherds of a big jar and a small bowl (PPP 272927:020:004). We interpret the installation as a toilet whose users could clean themselves by using a bowl to pour water taken from the nearby big jar.

Unfortunately, given the presence of three graves (45, 46 and 50) and of the large pit cut (Locus:272927:011), little survives of the floor (Locus:272927:019), which was found in the southwestern and northwestern corners of Room 23 and around and below the jar south of the toilet (Locus:272927:038). The soil above the floor is a tough grey clayey soil with charcoal and much pottery (Locus:272927:020)

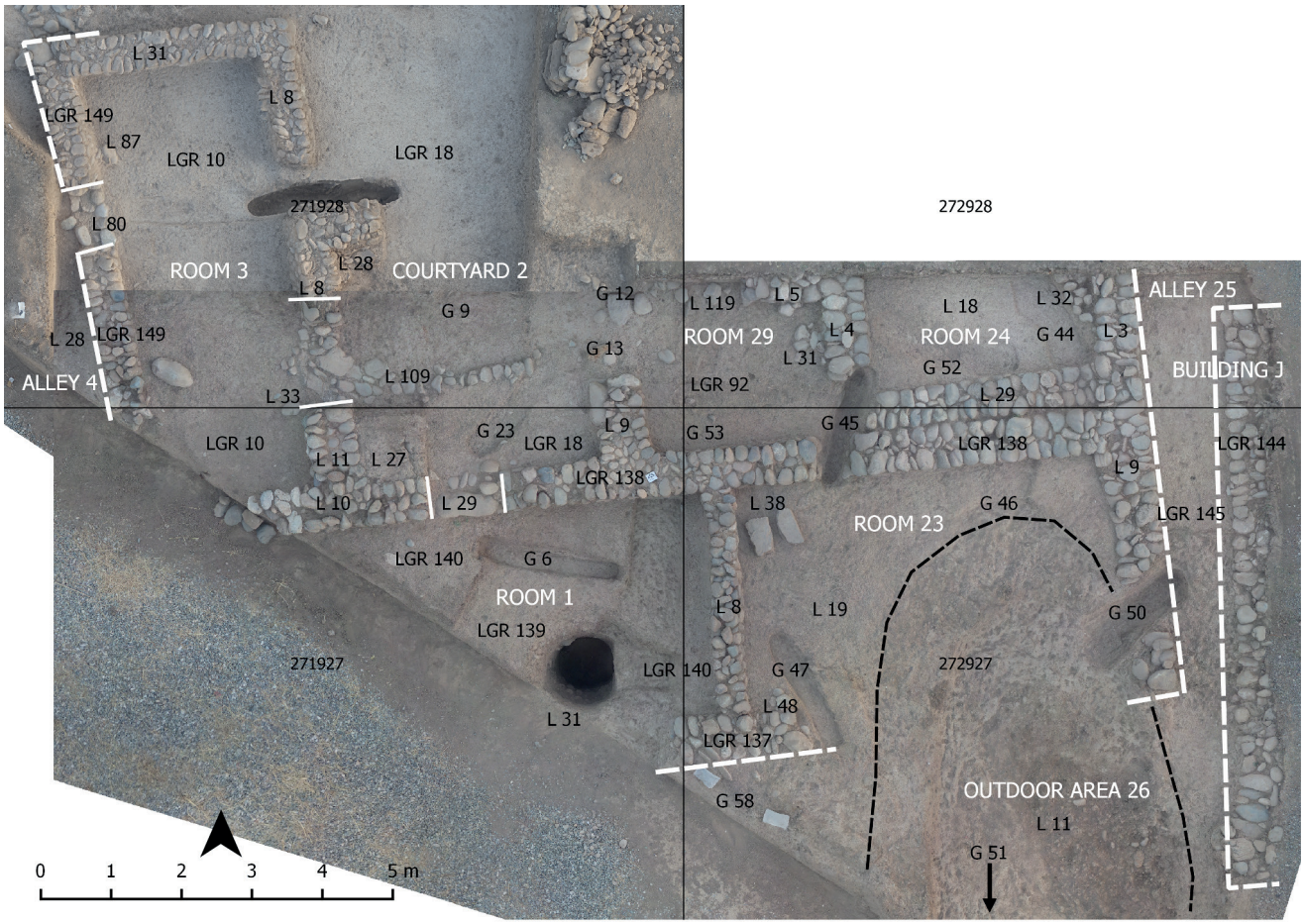


Fig. D3: Detailed orthophoto of Buildings A and J; Outdoor Area 26; and Alley 25. Prepared by Andrea Squitieri.

and marks the end of the occupation. Overlaying it, there was a tough light grey clayey soil (Locus:272927:006), resulting from post-occupational erosion processes.

D5.2 Room 24

(Alessio Palmisano)

Room 24 (**Figs. D3-D4**) is located north of Room 23. The excavated area measures 4.40 m from east to west and was excavated to a width of 2.10 m from north to south.

It is likely that the room was bounded to the south by the wall Locus:272928:029, to the east by the wall Locus:272928:003 and to the west by the wall Locus:272928:004. Further investigations to the north of the trench will clarify the plan. The wall Locus:272928:029 bonds with wall Locus:272928:003 and abuts the wall LGR:0138, belonging to Room 23, in the south. The southwestern corner of the wall Locus:272928:029 is cut by Grave 45, and therefore the connection to wall Locus:271928:004 is destroyed. All walls are 55 cm wide and preserved to the height of two courses of medium-sized stones with an average diameter of 25 cm.

The floor (Locus:272928:018) is an earthen surface with patches of charcoal and flecks of greyish clay. In the northeastern corner of the room, an installation of unclear function (Locus:272928:032), made of small to medium stones, was found; it may have served as a bench. The floor is cut by Graves 44 and 52.

The deposit on the floor was a tough light grey clayey soil with pieces of soft red burnt clay and a lot of charcoals (Locus:272928:017), covered by a tough light grey soil with some charcoals (Locus:272928:008).

D5.3 Room 29

(Alessio Palmisano)

West of Room 24, Room 29 (**Figs. D3-D4**) is bordered by the wall Locus:271927:009 in the southwest, an opening on the west, the excavation limit to the north, wall Locus:272928:005 in the northeast, and wall Lo-

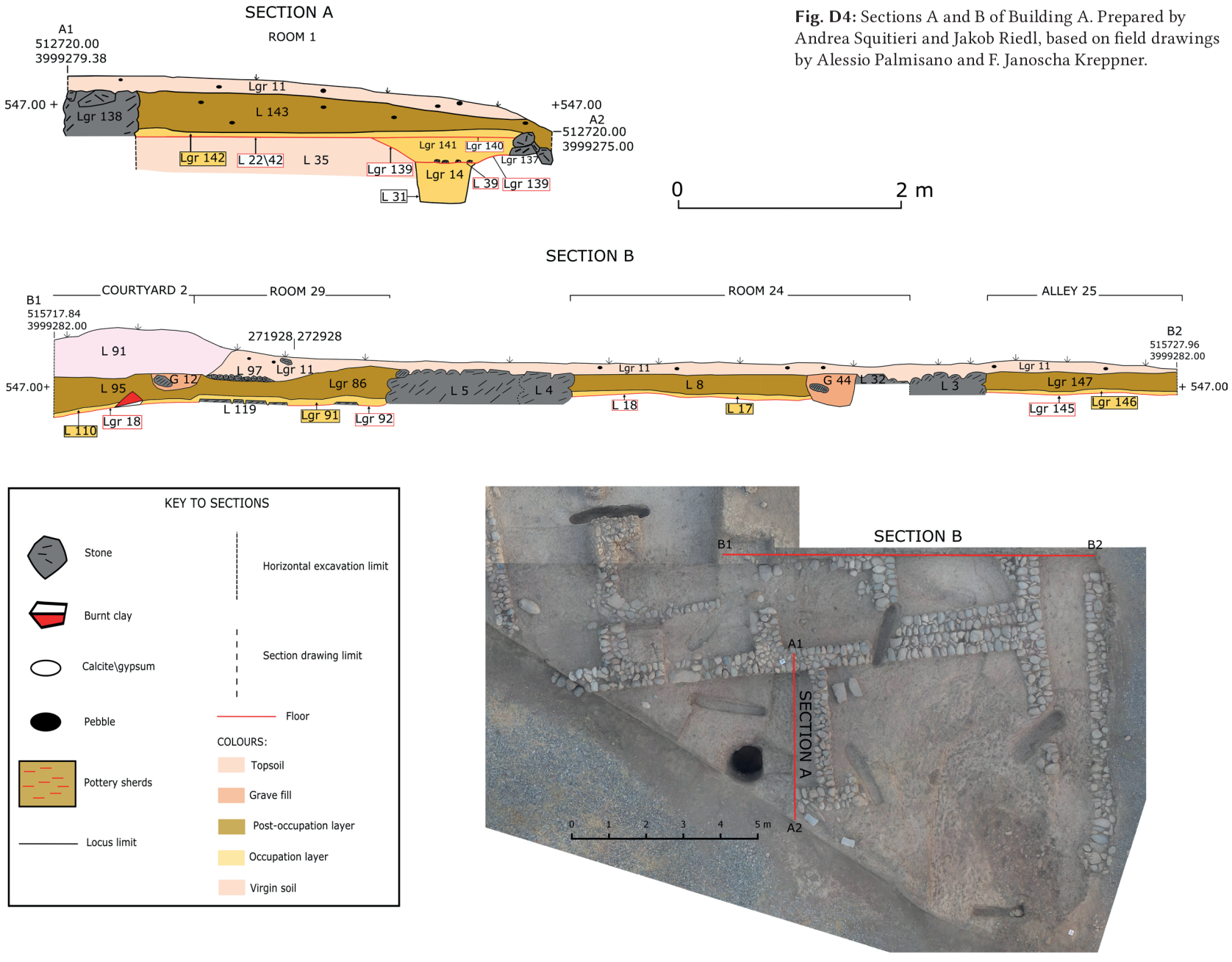


Fig. D4: Sections A and B of Building A. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Alessio Palmisano and F. Janoscha Kreppner.

Fig. D5: The assumed toilet (Locus:272927:038) in Room 23, with the remains of a large jar with a bowl inside (collection PPP 272927:020:004) next to it. Photo by Alessio Palmisano.

cus:272928:004 on the east. This last wall was cut by Grave 45, but would have otherwise continued to meet the wall Locus:272928:029 in the south.

The floor of Room 29 (LGR:0092) features many white particles and a few burnt traces, with some flat pottery sherds embedded in it. This floor was assigned different locus numbers during excavation: Locus:271928:118 in the north-west, Locus:272927:045 in the south (where it is cut by Grave 53), and Locus 272928:011 on the east (where it abuts walls Locus:272928:005 and Locus:272928:004).

An installation (Locus:272928:031) is located in the corner formed by walls Locus:272928:004 and Locus:272928:005. It is made of medium-size stones set against the two walls, with a fill in the middle and may have been used as a bench or a storage area. Similar stone installations have been found in corners of other buildings across Gird-i Bazar, including Building A Room 24.

Another installation (Locus:271928:119), made of stones set in circle, was sunk into the floor in the northwestern part of Room 29. This feature has not yet been excavated, but although its structure is less clearly defined, it resembles the wells in Building D (**§D7.5**) and Building F (**§D12.3.2**). Further work is needed in this area.

The floor of Room 29 was covered by a thin layer of very tough light grey soil (LGR:0091), with many particles of burnt material. This was sealed by a fill of very tough light grey clayey soil (LGR:0086), with a lot of pieces of soft red burnt clay and bits of charcoals. In turn, this deposit was covered by the topsoil (LGR:0011).

Three later burials (Graves, 12, 13 and 53) were excavated in this room. Grave 53 in particular was covered by large, only fragmentarily preserved stone slabs.

D5.4 Room 1

(Alessio Palmisano)

Room 1 lies in the southern portion of Building A (**Figs. D3-D4**). In this room, the eastern fill of the pit (LGR:0014; cut = Locus:271927:031; **Figs. D6-D7**) and the floor running in north-south direction along the wall (Locus:272927:008) were investigated.

Fig. D6: Room 1 with the pit (LGR:0014) in the foreground. Photo by Andrea Squitieri.

Fig. D7: Room 1 with the pit (LGR:0014) in the foreground and the floors Locus:271927:022 and LGR:0139 from which the pit was cut. The younger floors Locus:271927:039 and LGR:0140 are visible, abutting the wall. Photo by Alessio Palmisano.

The floor of Room 1 (Locus:271927:022 and LGR:0139) is a dirt surface abutting the walls LGR:0138 and Locus:272927:008, with patches of charcoal and reddened clay and fragments of pottery pressed into it. The section shows that the pit (Locus:271927:031) is cut into this floor (**Fig. D4**: Section A). This indicates that the pit belongs to Main Occupation Period 1, and not to an earlier phase, as we had assumed on the basis of the 2015 excavations[60]. The pit is sealed by the other floors (Locus:271927:039 and LGR:0140) that are located to the south of floor Locus:271927:022 and LGR:0139. The bottom of the pit is c. 2.5 m below floor Locus:271927:022; it is composed of medium-sized stones (average diameter: 25 cm) that form part of the bedrock.

The upper fill of the pit (Locus:272927:037, part of LGR:0014) consists of brown clay with ashes, charcoal, reddish inclusions and many pebbles and small to medium-sized stones. The lower fill of the pit (Locus:272927:040, also part of LGR:0014) is a dark brown-reddish clayey soil with some charcoal and, compared to the upper fill, very few stones. This fill yielded many stone tools, namely six pebble mortars, a polisher and a perforated circular tool (presented in **§F2**), and a rich amount of pottery.

Since the pit does not cut through the bedrock, it is not deep enough to be a well. The presence of a possible toilet installation in Room 23 (**§D5.1**) may suggest that the pit functioned as this toilet's drainage pit at the beginning of Main Occupation Period 1. At a later time, it lost its functionality and was filled up with rubbish.

After the structural change connected to the construction of the new floor (LGR:0140), Room 1 was used again until the end of the Main Occupation Period. A deposit of tough light grey clayey soil with quite a lot of pieces of soft red burnt clay and charcoal (LGR:0142) covers the floor and marks the end of its use. This deposit is covered by a deposit of tough light grey clayey soil (LGR:0143), quite possibly formed by erosion processes.

D5.5 Courtyard 2

(Andrea Squitieri & F. Janoscha Kreppner)

Courtyard 2 (**Figs. D2-D4**) is located north of Room 1. It is a large area, defined already in 2015 as bordered in the west by the walls Locus:271928:008 and Locus:272927:011 and in the south by the walls Locus:271927:010 and Locus:271927:008 (part of LGR:00138). It is connected to Room 1 through the threshold Locus:271927:029. In 2016, we removed the baulk and therefore uncovered a further portion of the floor, thus connecting floors LGR:0018 in the north and Locus:271927:025 in the south. Having established this connection, Locus 271927:025 was included in LGR:0018. The investigation in this area was particularly important to understand the difference in height of c. 10 cm between the floors LGR:0018 and Locus:271927:025.

The connecting floor under the baulk was named Locus:271928:111 (also part of LGR:0018). This floor features tiny white and black (possibly burnt) particles, with some red patches and a few flat pottery sherds sunk into it. It slightly slopes up from LGR:0018 and abuts the installation Locus:271928:109 (**Fig. D8**). This installation is made of a row of 21 unworked stones that run roughly in west-eastern direction. Starting between walls Locus:271928:008 and Locus:272927:011 in the west, the first seven stones are sunk into floor Locus:271928:111 (LGR:0018) so that their top is on the same level as the floor. Continuing towards the east, the stones sit between the two floor levels of LGR:0018 (see above).

The function of the installation is still unclear. One interpretation is to see it as a drainage system, which starts in Room 29 in the east (**§D5.3**), continues though Court-

Fig. D8: The installation (Locus:271928:109) in Courtyard 2. Photo by Andrea Squitieri.

60 MacGinnis/Kreppner 2016, 57.

yard 2 and ends in Room 3 in the west, where a large fieldstone was found lying on the floor. However, when excavating underneath a portion of the easternmost part of installation, there was no hollow space underneath the stones, unlike in the case of the drain excavated in Building F (**§D12.4**). So it is more likely to interpret the installation as a pavement / step construction that manages the difference in the floor levels around the podium (Locus:271927:027) in the southwestern corner of the room, which was excavated already in 2015[61].

Above the floor LGR:0018, a deposit consisting of dark brown silty clay with white particles (Locus:271928:110) was covered by red clayey earth (Locus:271928:095; part of LGR:0019), perhaps the remains of a brick collapse. In the portion of Courtyard 2 excavated in 2016, the deposit LGR:0019 was sealed by the topsoil (Locus:271928:091; part of LGR:0011). Further north, a re-use occupation was detected in 2015[62].

D5.6 Room 3 and Alley 4

(Andrea Squitieri & F. Janoscha Kreppner)

Room 3 (**Fig. D3**) is located west of Courtyard 2. It is defined by walls LGR:0149 in the west, Locus:271928:031 in the north, Locus:271928:008 and Locus:271927:011 in the east and Locus:271927:010 in the south; the southwestern corner was destroyed during the construction of the modern chicken farm. These walls belong to the first construction phase.

The removal of the baulk left in 2015 between Squares 271928 and 271927 revealed a further portion of the floor of Room 3 (Locus:271928:108; part of LGR:0010). It is a beaten-earth floor, with traces of burnt material and some flat pottery sherds sunk into it, as well as large unworked fieldstone (c. 70 cm long, c. 40 cm wide) in the western part of the room. The function of this stone, and whether it is connected to the installation Locus:271928:109 in Courtyard 2, is unclear.

In the western part of the room, the floor abuts the wall LGR:0149. In the eastern part, it ends at the opening between walls 271928:008 and 271927:011, which connects Room 3 with Courtyard 2. Here, some large flat stones paving the passage connect to the pavement / step installation (Locus:271928:109) in the courtyard (**§D5.5**). A stone (Locus:271927:033) that was partially uncovered in 2015 at the corner of wall Locus:271927:011, next to the baulk, was then interpreted as a door socket[63]. After removing the baulk this year, this stone was completely exposed. It is now clear that there is no depression in its centre and the identification as a door socket is therefore untenable. The passage leading from Room 3 into the adjoining courtyard may simply have been an opening without a door.

Immediately above the floor (Locus:271928:108), we identified a dry hard reddish-brown clayey soil yielding a lot of pottery sherds, phytoliths and charcoal but no bones. This deposit formed at the end of the floor occupation. It is consistent with the deposit excavated in 2015 above the floor in Room 3, and therefore along with the latter forms LGR:0150. This deposit was sealed by a compact hard layer (Locus:271928:093) of dark brown colour with many red particles, perhaps the remainders of a brick collapse. Together with the similar deposits excavated in 2015 in the other parts of Room 3, this deposit forms LGR:0151. It was in turn sealed by the topsoil (LGR:0011), which produced a modern Iraqi coin dated to the year 1970 (PPP 271928:092:004).

East of Room 3, Alley 4 is located in the westernmost part of Square 271928. It was already excavated in 2015 when we reached the floor (Locus:271928:028), a compact clay surface including a number of small pebbles (1-2 cm in diameter) and larger stones (up to 6 cm in diameter). Above this floor lies a deposit of hard red tough clayey soil with white inclusions (LGR:0015) that is sealed by the topsoil (LGR:0011).

During the 2016 excavations, the virgin soil underneath the floor was reached: a silty-clayey soil, rich in white particles and particularly hard (Locus:270928:011). The wall Locus:271928:007 (part of LGR:0149) borders the alley in the east and was built on the virgin soil.

D5.7 The graves and the modern occupation phase

(F. Janoscha Kreppner & Andrea Squitieri)

In the eastern part of Gird-i Bazar, graves lie above the Neo-Assyrian period structures. The chronological horizons of these graves has been clarified by the recent ^{14}C analysis conducted on a tooth from Grave 47, which was dated to the 4^{th}-5^{th} centuries AD (**§G4**). In order to clear the area and better delineate walls and floors, the graves encountered in Squares 271928, 272927 and 272928 were excavated by Tina Greenfield who presents a first assessment of the Sasanian-period graveyard in **Chapter G**.

61 MacGinnis/Kreppner 2016, 54.

62 MacGinnis/Kreppner 2016, 58.

63 MacGinnis/Kreppner 2016, 60.

A total of eight graves were excavated north of Building A's wall LGR:0138 (**Fig. D3**; "Grave" is abbreviated as G). From west to east, these are Grave 9, Grave 23, Grave 12 (currently only partially excavated as it continues under the excavation limit to the north), Grave 53 (cutting floor LGR:0092), Grave 45 (cutting walls LGR:00138 and Locus:272028:029), Grave 52 and Grave 44. Some of the burials contained small, spherical beads (with Grave 12 being particularly rich in them) and a very limited amount of pottery sherds. With the exception of Grave 53, all these graves had a stone capping made of a row of medium-size fieldstones, as already identified as a common feature of the Gird-i Bazar burials in the first excavation season[64]. Grave 53, on the other hand, has a more elaborate architecture: it is a cist grave lined with large stones and possibly covered by a flat stone that was found in fragments. Although small and less well preserved, this grave recalls Grave 2, a cist grave excavated in 2015 in Square 271928.

In Squares 271927 and 271928, we also encountered evidence for a sporadic modern occupation. Above the wall Locus:271927:009, a small pebble surface was found (Locus:271927:041), with three modern Iraqi coins, a bullet and a bullet case. This surface must have been in use after the year 1975 as one of the coins bears this date. Linked to this surface is an irregular stone installation or, given its haphazard nature, accumulation in roughly north-southern orientation (Locus:271928:097). Neither its function nor its stratigraphic relation to the modern surface (Locus:271927:041) are clear, although it may have been created in conjunction with the use of the latter surface. Both the graveyard and the modern occupation layer are covered by topsoil (LGR:0011).

D5.8 Concluding remarks on Building A

(F. Janoscha Kreppner & Andrea Squitieri)

Building A is a multi-unit architectural complex of the Main Occupation Period, bordered by Alley 4 in the west, Alley 25 in the east and Outdoor Area 26 in the south. Its northern extent is unclear because of the excavation being still incomplete. Further work may well show that Room 6 (excavated in 2015 and labelled Building B[65]) was in fact part of Building A.

The spatial arrangement of the walls and their construction technique suggest structural reasons for the existence of the double wall dividing Rooms 23 and 24. The wall LGR:0138 is 15 m long, with two walls oriented northwards (Locus:271927:011 and Locus:271927:009) and a third wall oriented southwards (Locus:272927:009) bonded to it. This indicates that from the beginning, Building A was designed to be organised on both sides of the wall. However, while Room 24 in the east of the building was constructed with a second wall (Locus:272928:029) set against wall LGR:0138, thus creating a double wall, Room 3 in the west of Courtyard 2 makes structural use of wall LGR:0138 itself. It seems reasonable, therefore, to assume that Room 24 was built as a separate unit during the first construction phase.

Overall, the following occupation periods can be distinguished:

- The main occupation period;
- The main usage period, which is divided into two phases in Room 1 whose drainage pit was filled and sealed by a new floor;
- A period of abandonment when the ruins of the main occupation period were covered by deposits;
- A period of a partial re-occupation, which was identified in Courtyard 2 and Building B Room 6 in 2015[66];
- Much later graves that were cut into the remains of these older levels;
- The modern occupation.

D6. Outdoor Area 8

(Silvia Amicone & Francesca Chelazzi)

Outdoor Area 8 (**Figs. D9**, **D15-D16**) was identified in 2015 as the large outdoor area west of Buildings A, B and C, stretching as far as the paved floor uncovered in 2015 in Square 268930 (LGR:0157). During the 2016 excavation, we further investigated this area, focusing on the excavation of the kiln identified in 2015 under the supervision of Silvia Amicone and on the area west of the kiln under the supervision of Francesca Chelazzi.

D6.1 The pottery kiln

(Silvia Amicone)

Moving westwards from Building A along the 2015 "Connecting Trench", a pottery kiln was found in Outdoor Area 8 (**Figs. D9-D11**) and partially excavated by Adam Stone in the first season[67]. In 2016, Silvia Amicone continued the investigation of the kiln by opening a trench of 5.5×3.3 m

64 Greenfield 2016, 78-79.

65 MacGinnis/Kreppner 2016, 61.

66 MacGinnis/Kreppner 2016, 58, 61.

67 Stone 2016, 66-67.

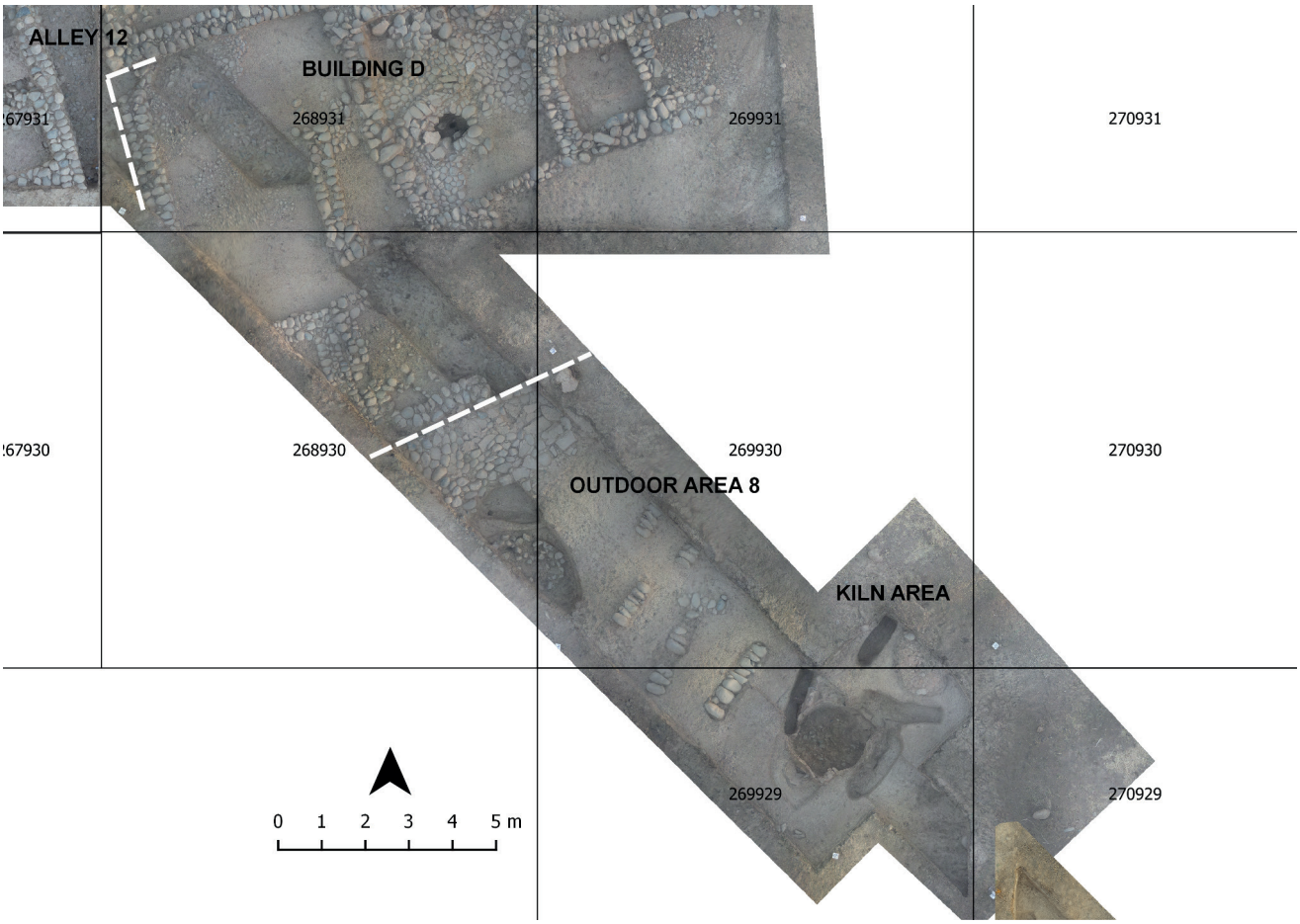


Fig. D9: Orthophoto of Outdoor Area 8 with the pottery kiln. Prepared by Andrea Squitieri.

extending to the southeast (Square 269929) and to the northeast (Square 269930) of the kiln.

During the investigation of the southeastern portion of the kiln structure it was possible to detect remains of the 5-10 cm thick kiln clay lining (Locus:269929:006), which had been already partially excavated in 2015. The kiln lining was well preserved for most of the height of the structure and burnt red on the outside and hard white on the inside (**Fig. D12**). Moreover, it was possible to identify different parts of the original kiln floor, featuring holes that originally allowed the heat from the lower combustion chamber to reach the upper chamber. A fragment of the kiln floor was still *in situ* (Locus:269929:036) while others were found in different levels of the kiln filling (Locus:269929:038 and Locus: 269929:040) (**Figs. D13-D14**). In the back wall of the kiln (Locus:269929:043) we identified a hole that allowed the smoke to get out while the kiln was in use. Behind the kiln wall and connected with this smoke opening, a small semi-circular plastered structure with a slightly concave upper surface was identified (Locus:269929:037). During the investigation of the northwestern portion of the kiln we found another portion of the kiln lining as well as the entrance to the kiln. In plan view, the kiln lining narrows and becomes smaller in correspondence with its entrance, which has a diameter of about 50 cm. About 1.5 m northwest of the kiln entrance, a filling containing much burnt clay was detected but not yet excavated (LGR:0134, with Locus:269929:034 and Locus:269930:020). It is likely that this filling belongs to a second kiln and this will be further investigated in 2017.

During the 2016 campaign it was possible to excavate the entire kiln fill. The lowest portion of this filling, below the fragments of the kiln floor (Locus:269929:040), was 25 cm thick (LGR:0152: Locus:269929:042) and consisted of a dark grey-black ashy deposit rich in charcoal; almost no pottery was found in this locus. As already observed by Adam Stone in 2015, this ashy deposit could be the residue of the original use of the kiln. This filling was very sharply separated from the above filling (LGR:0009: Locus:269929:039). The latter filling was very rich in

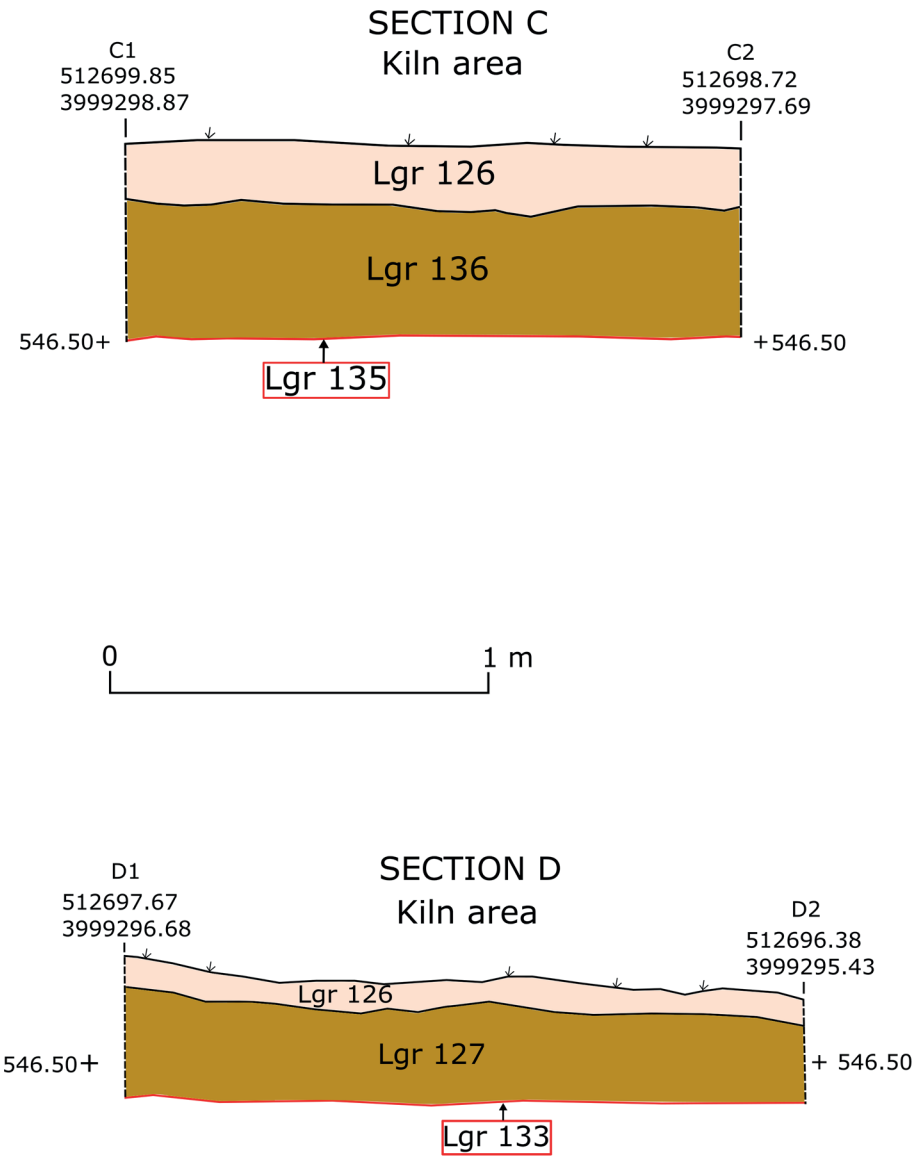


Fig. D10: Sections C and D around the kiln in Outdoor Area 8. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Silvia Amicone.

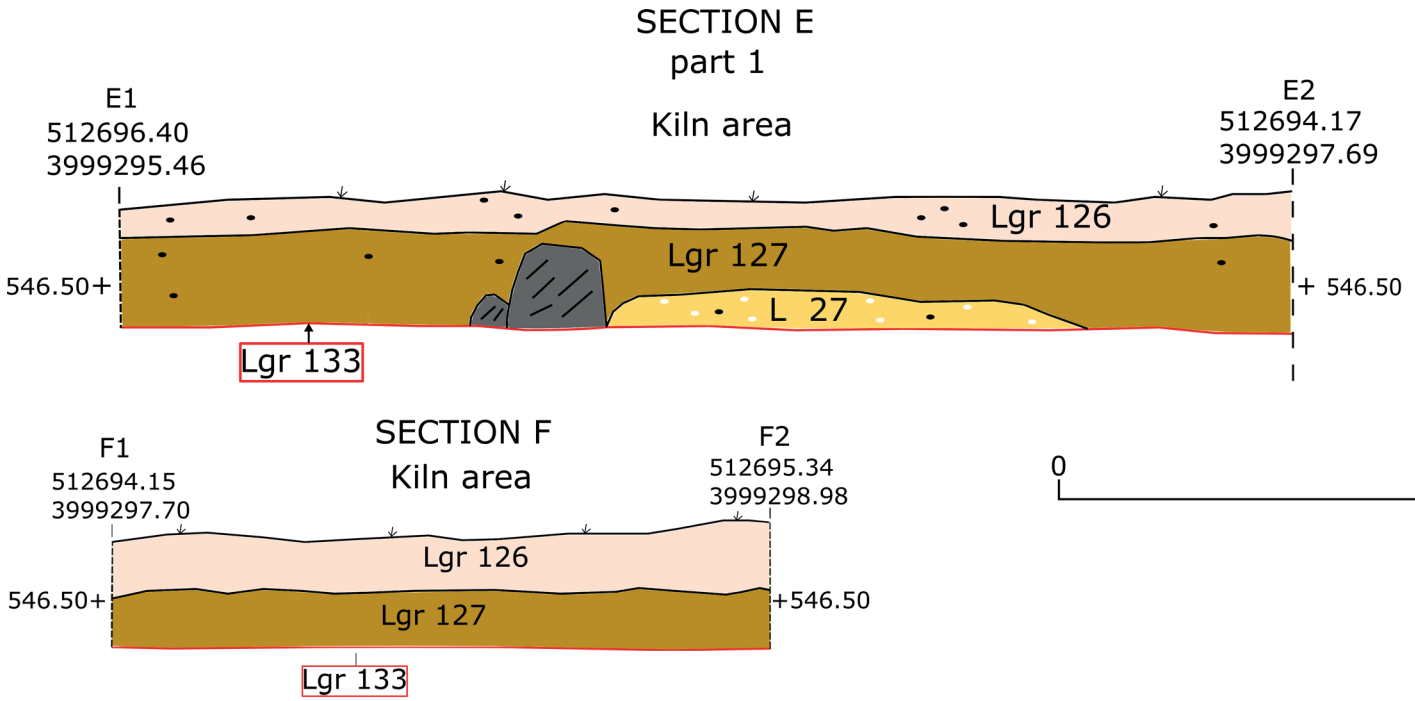


Fig. D11: Sections E (part 1) and F around the kiln in Outdoor Area 8. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Silvia Amicone.

pottery and included some complete and stacked vessels (e.g., PPP 269929:039:001, PPP 269929:039:003, PPP 269929:039:005 and PPP 269929:039:0018), together with several fragments of the kiln floor, which showed clear signs of vitrification (**Fig. D14**). The upper portion of the kiln filling (LGR:0009: Locus:269929:026) also yielded pottery sherds, but these were much more fragmented than those found in the filling below (Locus:269929:039). Additional fragments of the kiln floor were recovered from this locus. Moreover, a total of 36 animal bones (**Table G1**) were collected from the two kiln fills, of which only one pig bone was burnt, however (**§G2.4**; **Fig. G3**).

Fig. D12: The kiln at the end of its excavation, showing the kiln lining and the stone-rich lowest layer. Photo by Silvia Amicone.

Fig. D13: The pottery kiln during the excavation of its fills, with pottery vessels from the last kiln load. Photo by Silvia Amicone.

Fig. D14: Close-up of the kiln fill showing some fragments of the original perforated floor of the kiln with signs of vitrification, among pottery sherds. Photo by Silvia Amicone.

In order to retrieve more information about the fuel used during kiln activity, several flotation, charcoal and phytolith samples were collected from the kiln fills (Locus:269929:026, Locus:269929:039 and Locus:269929:042).

In the southwestern portion of the kiln area, a floor (LGR:0133) was detected, which abuts the kiln structure and is contemporaneous with the period when the kiln was in function. In the northwestern portion of the trench a surface (LGR:0135) was found that could be the possible continuation of the floor LGR:0133. These floors continue towards the west and likely connected the kiln area to the western structures described below (**§D6.2**); however, it was extremely difficult to follow these floors because of the damages caused by later graves and a modern pit.

Four later graves (Graves 31, 32, 48 and 49) are located around the kiln, two of which had already been excavated in 2015. Grave 49 yielded a metal spatula (PPP 269930:019:002), positioned just next to the skeleton.

The kiln was covered by a hard greyish deposit (LGR:0136 with Locus:269929:028 and Locus:269930:016 in the northeastern part of the kiln trench, and LGR:0127 with Locus:269929:025 in the southeastern part of the kiln trench). This deposit was covered by the topsoil (LGR:0126 with Locus:269929:024 and Locus:269929:015).

In conclusion, we now have strong evidence that the installation under investigation was a pottery kiln. The nature of the kiln filling, especially in the upper portion (Locus:269929:026), seems to indicate a secondary use for this structure as a waste pit. The numerous staked complete vessels found at the back of the kiln, in the lower part of the upper filling (Locus:269929:039), could be what remains of the last load of the kiln, which collapsed during firing activity, thus sealing this portion of the filling. However, the presence of unburnt bones in this fill as well as of pottery vessels requiring different firing techniques (**§E1.1.1**) would point to a mixed formation process of this fill (Locus:269929:039). In part it seems that this fill sealed the last kiln load with some pottery as well as portions of the kiln floor *in situ*. However, bones and perhaps other pottery vessels appear to be in a secondary context, indicating that perhaps this fill was disturbed when discarding activities occurred after the kiln had lost its functionality. The collapse of the kiln does not appear to have been a single event, but may have occurred over

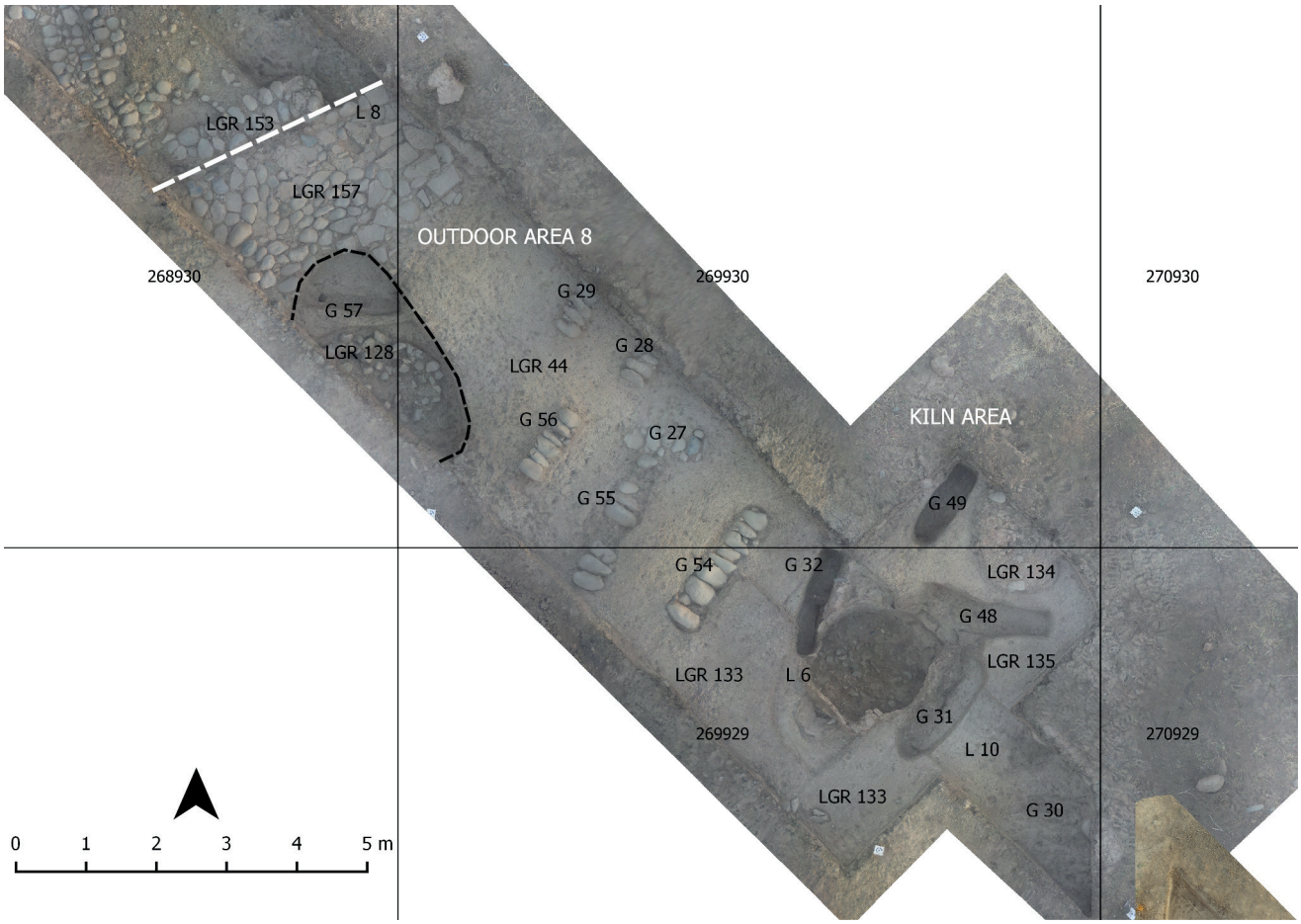


Fig. D15: Detailed orthophoto of Outdoor Area 8 and the kiln area. Prepared by Andrea Squitieri.

different stages. Importantly, however, the lowest kiln fill (Locus:269929:042, part of LGR:0152) appears to have formed in connection with the collapse of the kiln during its final firing, as it did not yield any material in apparent secondary context.

D6.2 West of the pottery kiln

(Francesca Chelazzi)

The primary goal of the excavation in this area was to understand the spatial connection of the kiln with the structures identified in the western part of the site.

West of the kiln area, a beaten earth floor (LGR:0133) was identified in an area of c. 2 m², made of a light brown, very hard soil with a silty matrix. The floor was covered by a c. 3 cm thick layer (LGR:0071, with Locus:269930:033 and Locus:269929:047) consisting of yellowish brown dry hard silty soil. Unfortunately, it was very difficult to identify the western edge of this floor because the area was damaged by several later graves (**§G4**): from east to west, Graves 54, 55, 27, 56, 28 and 29. West of these graves, a paved floor (LGR:0157) was found, partially uncovered in 2015. This is made of large flat and roughly regular stones with an average width of 20-40 cm. Despite being well laid, they do not seem to follow any regular pattern. This paved floor abuts on the east the virgin soil (LGR:0044), which was likely used as an occupation surface. The virgin soil is a very pale brown natural thin layer of silty clay. Covering the paved floor was a dry hard silty soil (Locus:268930:036) whereas the beaten floor as well as the virgin soil (LGR:044) were covered by a post-occupation deposit (LGR:0127, with Locus:269930:028 and Locus:269929:046) consisting of yellowish-brown dry hard, silty and moderately sorted soil.

Southeast of the paved floor, a modern pit (LGR:0128) was found that yielded a large quantity of fieldstones and modern material (plastics, glass, metal objects), likely dating to the time when the chicken farm was built in 2014. The pit disturbed Grave 57, which may explains why its stone capping was found in an unusual arrangement. The pit cut was not identified during the excavation of the

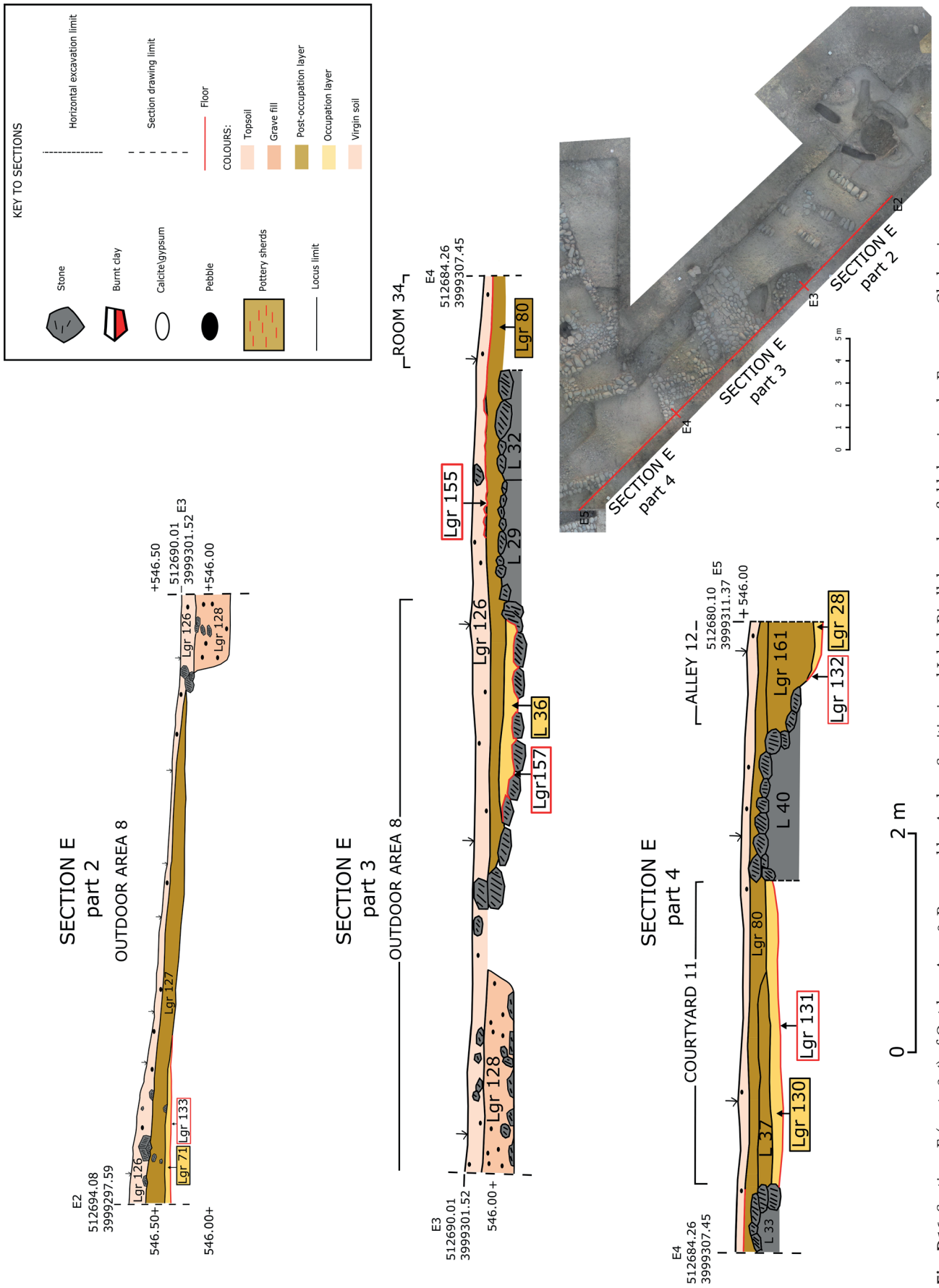


Fig. D16: Sections E (parts 2-4) of Outdoor Area 8. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Francesca Chelazzi.

overlying topsoil, so it is possible that the pit was created before the latter formed. The topsoil in this area was a dark yellowish-brown and rain-induced deposition of fine sediments and pebbles characterised by a remarkable bioturbation.

In conclusion, the investigation of this area permitted us to identify a floor connecting the kiln to the structures in the west, which is a very important datum to understand the general planning of the site. As already noted in 2015, it appears that Outdoor Area 8 does not have architectural features such as walls between the kilns and Building D. The 2016 results confirmed the assumption that Outdoor Area 8 was a large area that was used mainly for pottery production.

D7. Building D

(Francesca Chelazzi & Vera Egbers)

Building D's original plan consisted only of Room 31 (with a possible oven) and of Courtyard 27 (with a well). Subsequently, the building received its final design in Main Occupation Period 2 with the erection of three walls that delimit Courtyard 27 and separate it from Courtyard 11 in the west. These changes also affected Room 10.

The plan of the southern portion of Building D, with Room 9 and Room 34, as well as of its eastern portion is not yet fully understood and will have to be further investigated. Still unclear is also the relation between Building D and Building E to the north (**Fig. D17**). We currently assume that the two units were originally parts of the same large building ("Building D / E"; cf. **§D8**) whose later alteration led to the structural division.

D7.1 Room 9

(Francesca Chelazzi)

When first encountered in 2015, this space was thought to be an open area and therefore named "Outdoor Area 9"[68]; this is now obsolete.

Walls LGR:0153 and LGR:0154, situated at a distance of c. 2.4 m from each other, constitute the northern and southern limits of Room 9 (**Fig. D17-D18**). Wall LGR:0154, which is 80 cm long and 55 cm wide and survives in the shape of three courses of pebbles, separates the room from Courtyard 11 in the northwest. This wall forms a corner with wall Locus:268930:029, the western limit of Room 9. This wall is 3.1 m long and, again, 55 cm wide. Wall LGR:0153, Room 9's southern perimeter, separates the room from Outdoor Area 8. The wall is 1.5 m long and 50 cm wide and survives as a single course with a height of 15 cm. The same construction technique is used for all these walls, with two parallel rows of large river cobbles filled in with smaller stones.

The floor LGR:0156 abuts these three walls and hence is contemporary to them. It is made of small pebbles, ranging from c. 1-5 cm in diameter. The deposit immediately above this pebble floor (Locus:268930:030) consists of a yellowish brown dry hard and silty soil, yielding pottery, a few animal bones and a spherical limestone pounder (PPP 268930:030:006; **§F3**). A semi-circular stone installation (Locus:268930:044), made of large river cobbles, lies above the floor in the southwestern corner (at the intersection between the walls LGR:0153 and Locus:268930:029). This installation was filled by a deposit (Locus:268930:039) that was very rich in small pebbles of a diameter of c. 2-3 cm and also contained pottery sherds.

This stone installation (Locus:268930:044) was located below a number of large stones (Locus:268930:026) that occupied the southern part of Room 9. The overall distribution of these stones did not seem to follow any specific pattern and they appeared to be mixed in size and orientation; nevertheless, their arrangement would suggest an anthropic deposition. Perhaps these stones originally constituted a poorly constructed wall that may have been heavily damaged over time due to its proximity to the site surface. This wall may have belonged to a later period of occupation. Evidence for the existence of such a late period of occupation (called Sporadic Occupation in **Table D2**) comes from a pebble floor (LGR:0155) which covered part of the wall Locus:268930:029. This floor yielded pottery sherds (PPP 268930:029:001) displaying an incised wavy decoration that suggests a Sasanian dating (**§E1.1.6**). Three similar sherds were recovered in the ceramic assemblage coming from the immediately overlying topsoil (LGR:0126), which included a remarkable quantity of small pebbles. Pottery indicating a sporadic occupation during the Sasanian period had already been observed in 2015[69], on a surface that forms part of LGR:0155. In 2016, we were able to collect charcoal samples from the Sasanian-period surface for radiocarbon dating.

No architecture associated with a Sasanian-period occupation of this part of Gird-i Bazar has been identified so far, with the possible exception of the poorly constructed wall discussed above.

68 Stone 2016, 68.

69 Stone 2016, 69.

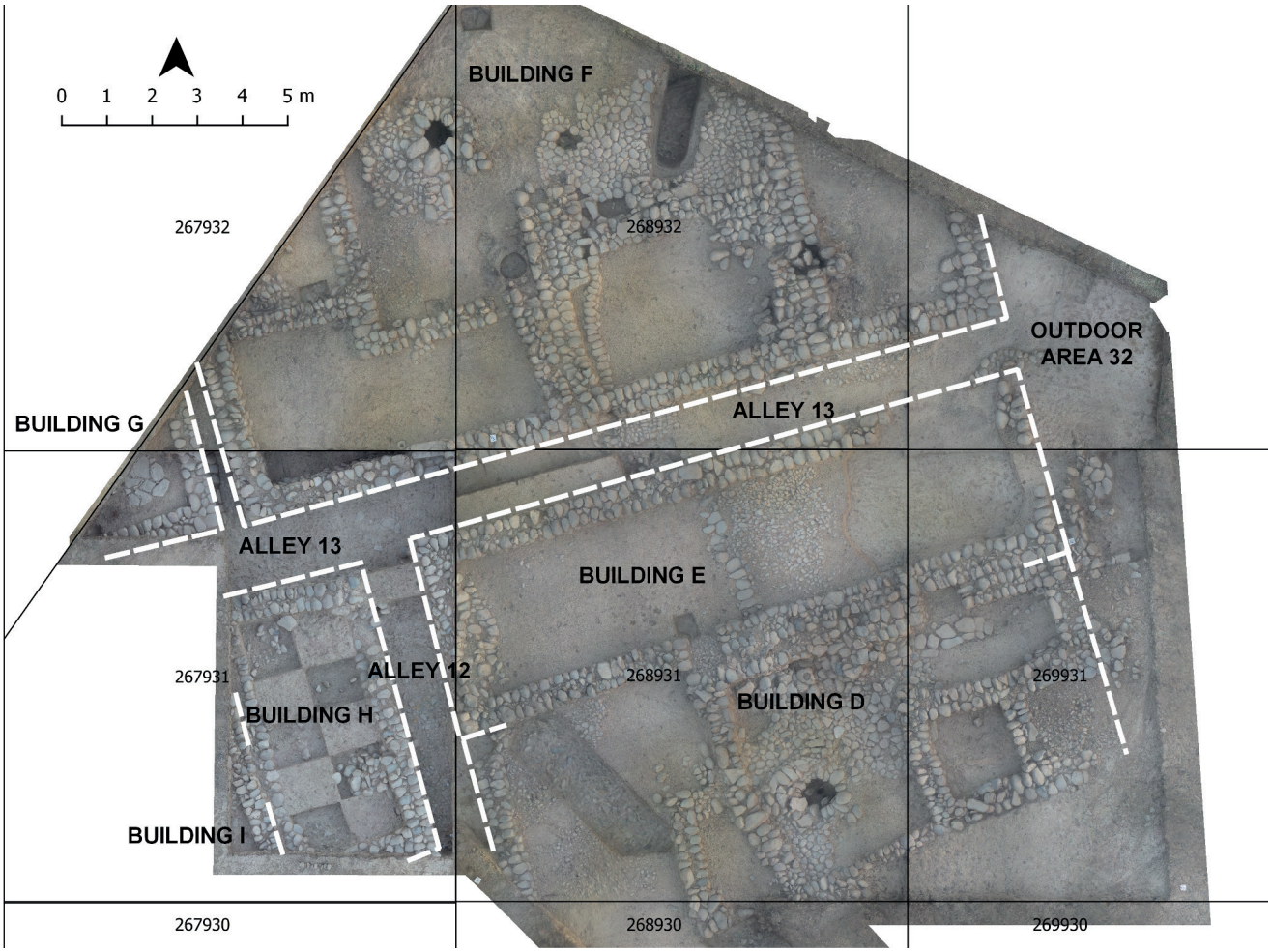


Fig. D17: Orthophoto showing Buildings D, E, F, G, H and I; Outdoor Area 32; and Alleys 12 and 13. Prepared by Andrea Squitieri.

D7.2 Room 34

(Francesca Chelazzi)

When excavating the wall Locus:268930:029, the western limit of Room 9, the adjoining corner formed by the two walls Locus:268930:032 and Locus:268930:033 was unearthed. This is the northeastern corner of an area named Room 34 (**Figs. D16**, **D18**), which could not be fully investigated in 2016. Work will continue in 2017.

Wall Locus:268930:032 was partially covered by the Sasanian-period floor (LGR:0155), which was also identified in Room 9. It constitutes the eastern perimeter of Room 34 and runs in southeastern to northwestern direction, parallel to Room 9's adjacent stone wall (Locus:268930:029). It is 2.85 m long and 60 cm wide. Only one course was visible, but it is likely that it was formed of at least three courses of river cobbles, like wall Locus:268930:033.

D7.3 Room 10

(Francesca Chelazzi)

North of Room 9, another room belonging to Building D was identified and named Room 10 (**Fig. D18**). This is a small space of about 2.2×1.3 m, slightly narrowing towards north. It is surrounded by the walls LGR:0158 in the west, Locus:268930:017 in the south and Locus:268931:021 in the east. The room was likely connected with Room 9 through a passage although this has not yet been found, as Room 10 was not fully excavated during the 2015 campaign.

D7.4 Courtyard 11

(Francesca Chelazzi)

Courtyard 11 (**Figs. D16**, **D18**), of which 22 m² were excavated, was very likely an unroofed space, located in the

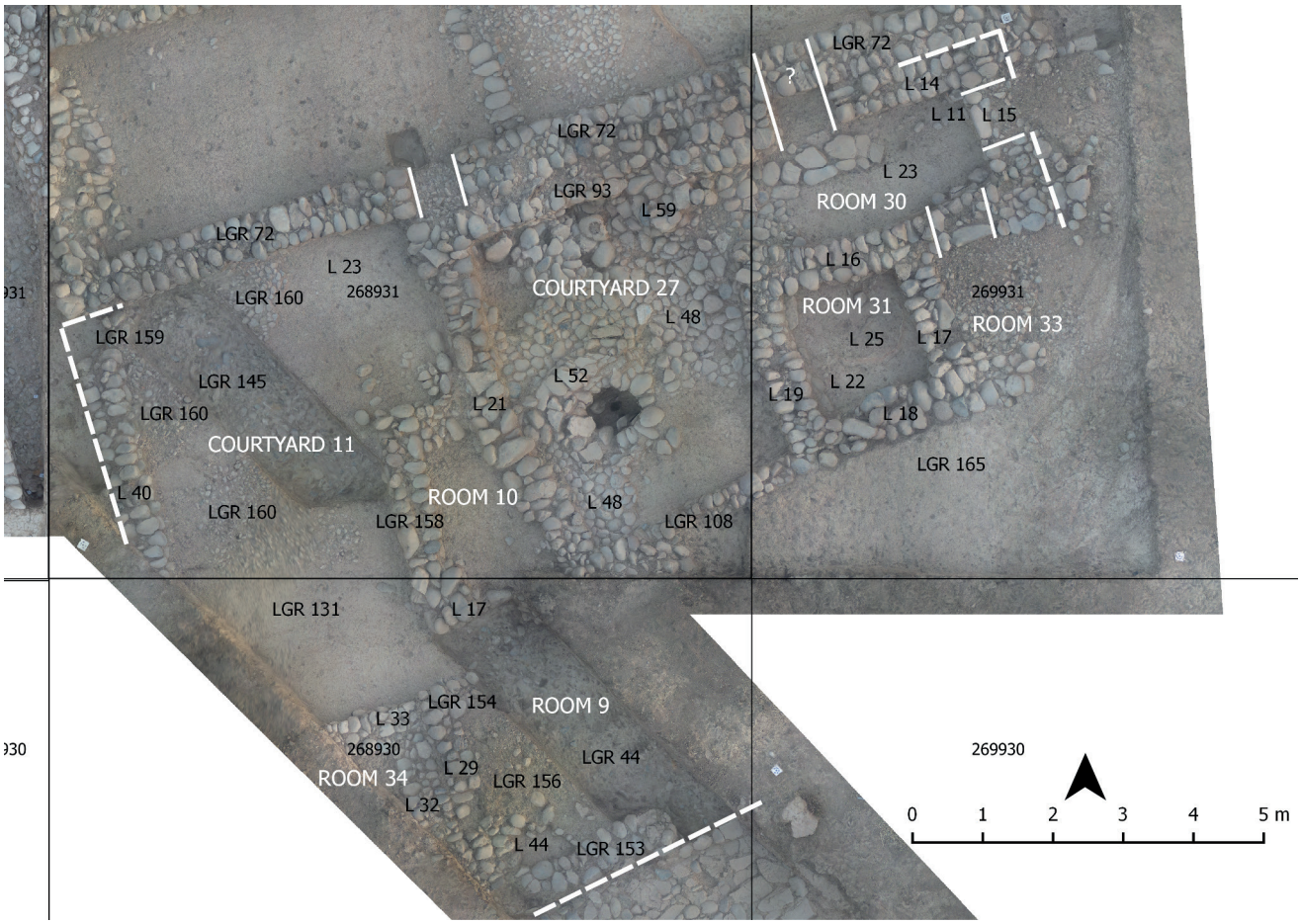


Fig. D18: Detailed orthophoto of Building D. Prepared by Andrea Squitieri.

western portion of Building D and connected to Alley 12 through a passage in the west. It is delimited in the south by the walls Locus:268930:033 and LGR:0154, in the east by the walls LGR:0158 and Locus:268931:021, in the north by the wall LGR:0072 and in the west by the wall Locus:268931:040. This last wall is abutted by a pebble floor (LGR:0160), identical with the floor excavated in 2015 as Locus:268931:005. A remarkable quantity of potsherds has been collected from this pebble floor, in particular a fragmentary jug (PPP 268931:036:002) and a group of fragmentary open vessels (PPP 268931:041:005). The pebble floor does not cover the entire surface of Courtyard 11. Towards the south and the east, trodden earth floors were found (named LGR:0131 and Locus:268931:023). The surface Locus:268931:023 abuts Courtyard 11's northern wall (LGR:0072). The reason why Courtyard 11 was paved with a patchy pebble floor is not clear, but it was possibly related to hydraulic purposes in order to improve the impermeabilisation of the surface in some areas of the courtyard. We assume that Courtyard 11 was during Main Occupation Period 1 connected in the east to Courtyard 27 and that they were subsequently separated during Main Occupation Period 2 by the erection of the wall Locus:268931:021.

During the post-occupation period, Courtyard 11 was filled with a layer of crumbly and very hard soil (Locus: 268931:018 in the north; LGR:0080 with Locus:268931:044 in the south), whose consistency and colour were the same as in the rest of the building (i.e., Locus:268931:017). On top of this layer, the topsoil accumulated (LGR:0126, with Locus:268931:013).

D7.5 Courtyard 27 and Rooms 30, 31 and 33

(Vera Egbers)

In the eastern part of Building D, Courtyard 27 and Rooms 30, 31 and 33 (**Figs. D17-D19**) form a group of units which is attached to the larger Building E in the south, so that they resemble an extension of the latter. While there is no wall separating Courtyard 27 and Room 30 from each other, the small Room 31 is surrounded by four walls (from north to

east: Locus:269931:016, Locus:269931:017, Locus:269931:018 and Locus:269931:019). These walls were constructed on the virgin soil and are bonded to each other. In particular, the eastern wall Locus:269931:017 abuts wall Locus:269931:018 to its south; it would seem that the construction began with this latter wall and continued clockwise. Locus:269931:016 is the wall between Room 31 and Room 30 and bonds with wall Locus:269931:015, the eastern limit of Room 30. Within this short wall, a long flat stone was installed that most likely served as the threshold to enter the building. The wall Locus:269931:015 connects with the northern wall of Room 30 (Locus:269931:014), which runs in parallel with the wall LGR:0072 of Room 19. Within the inner corner of the two walls (Locus:269931:014 and Locus:269931:015) lies a door socket (Locus:269931:011) still *in situ*. The door must have been installed in such a way that one would enter through the door in wall Locus:269931:015, stepping over the threshold stone and opening the door towards the inside of Room 30. The step down from the threshold to floor Locus:269931:023 (see below) was rather steep, about 45 cm. Similarly to the southern wall (LGR:0072) of Building E, the wall Locus:269931:014 of Room 30 is interrupted by a niche (90 cm long, 60 cm wide), possibly a passage to Room 19. Beyond this niche, the wall continues as LGR:0093.

The walls of Rooms 30 and 31 consist of two rows of cobbles, with pebbles and mud as filling in between, and seem to have been carefully planned before construction. In wall Locus:269931:019, a stone mortar was found, reused as building material (PPP 269931:019:001), as well as a stone pestle (PPP 269931:019:002; **§F3**), both reused as building material.

Because all walls are bonded with each other, they must have been erected at the same time. The chronological relation between these rooms and Room 19 is not clear, but judging from the layout and construction technique of the walls it seems likely that they were built either simultaneously or within a short time as two building units of a single house.

After the walls were built, the floor in Courtyard 27 (Locus:268931:048) was laid down and with it, a large round stone installation that is almost certainly a well (Locus:268931:052). Courtyard 27's floor is a very uneven surface of rather large, unworked stones that slope from the southwestern corner of the room down towards the northeast. The floor continues in the neighbouring Room 30 as Locus:269931:023. In the eastern portion of Room 30 no stones were used for the floor. Apparently the virgin soil was used as a surface on which also the walls were erected. Two stone mortars (PPP 268931:048:003 and PPP 268931:048:005), found with their cavities upside down, were reused during the construction of the floor (Locus:268931:048). Especially in the northeast of the floor, many large pottery fragments were discovered that served as a pavement. Moreover, one polisher (PPP 268931:048:001) and a pounder (PPP 268931:048:002) were found lying on the floor (**§F3**), indicating that this area was probably a working area (**Fig. D20**).

The stone floor in Courtyard 27 is interrupted by the well (Locus:268931:052) and by a small area of c. 1 m² towards the southeast corner, where only the virgin soil was uncovered – likely used as surface, as in Room 30. We observed that the paved floor abuts the wall Locus:269931:019 in the east, but clearly runs under the southern, western and northern walls of Courtyard 27, which indicates that these were built after the construction of the floor. Therefore, the well and the paved floor were most likely built in one construction event and later enclosed by the three walls of Courtyard 27 (see also below).

The well (Locus:268931:052; **Fig. D20**) resembles the one excavated in Building F (Locus:267932:006; **§D12.3.2**). The inner diameter of the circle formed by big cobble stones is about 70 cm. The big cobble stones go down in concentric rows, forming the inner wall of the well. It is possible that the well was connected to the drain (Locus:268931:030) excavated in Room 19 of Building E (**§D8**), as the stones of the floor in Room 27 run clearly under the northern wall LGR:0093. The fill inside the well was grey-brownish soft moist soil with small white inclusions (Locus:268931:051). Several soil samples were taken from this fill at different depths. The bottom of the well was not reached as the excavation of the well fill was stopped at a depth of c. 1.50 m due to safety reasons.

Another stone installation was built on the floor in Courtyard 27, attached to the wall LGR:0093; it is made of five cobble stones, two courses high and lying in a circle (Locus:268931:059). Close to this installation, many pottery fragments were found as well as the above mentioned pounder (PPP 268931:048:002) and polisher (PPP 268931:048:001; **§F3**). The function of this installation remains unclear. It may have been used as a bench: given the high amount of pottery sherds found around it, perhaps to hold pottery vessels, or alternatively as a sort of work bench due to the presence of the stone tools next to it.

As mentioned above, a short time after the first construction phase, three walls (LGR:0093, Locus:268931:021 and LGR:0108) were built that enclosed Courtyard 27. The southern wall (LGR:0108), when compared to other walls such as those of Building E / Room 19 (**§D8.2**), looks less stable and well constructed, being made of only two rows of stones next to each other. While this wall is bonded to wall Locus:268931:021 in the west, it abuts the wall Locus:269931:019 of Room 31 in the east, meaning that it was built later.

Fig. D19: Section G of Buildings D, E and F. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Zahra Hashemi and Vera Egbers.

Fig. D20: The well (Locus:268931:052) in Courtyard 27 of Building D, view from the east. Photo by Andrea Squitieri.

The western wall of Courtyard 27 (Locus:268931:021) connects at a right angle to the wall LGR:0093, thus obstructing a niche (Locus:268931:024, possibly a former passage) in the southern wall of Building E (LGR:0072; **§D8**), in which a pebble floor is still visible.

The northern wall of Courtyard 27 (LGR:0093) runs parallel to the eastern part of Room 19's wall LGR:0072. These two walls are constructed side by side like a double wall. As the other walls, LGR:0093 consists of two rows of cobble stones, with smaller stones and pebbles used as a filling in between.

Fig. D21: The reddish circular structure (Locus:269931:025) interpreted as an oven or a kiln in Room 31 of Building D, partially filled with a red and ashy fill. Photo by Vera Egbers.

The construction of the three walls (LGR:0093, Locus:268931:021 and LGR:0108) took place at a later point in time than Room 19 and Room 31, which raises the question why and when the area around the well in Courtyard 27 was closed off. This remains unclear for the moment.

During the removal of the fill in Room 31, a reddish circular structure made of mud and filled with a red and ashy fill became visible, which we interpreted as an oven (Locus:269931:025; **Fig. D21**). Seen from above, it is pear-shaped, with the thinner part in the northwest and the wider part in the southeast. The installation has a maximum length of 1.55 m and a maximum width of 1.10 m. It could not be completely excavated due to lack of time. Interestingly, the structure occupies almost the entire Room 31. The visible part of its wall is c. 3-5cm thick and seems to be heavily burnt. A thick piece of burnt clay was stuck in the middle of the fill, which may represent part of the collapsed structure's roofing. Some sherds were found in and around it. Surrounding the assumed oven, we encountered a mud floor (Locus:269931:022), with pottery sherds lying flat on it. It seems that the oven partially cut this floor, but this must be verified with further investigations.

Room 33 has not yet been completely excavated, and neither its complete plan nor its floor(s) are presently known. It is situated at the easternmost extremity of Building D, delimited in the west by the wall Locus:269931:017 and in the north by the wall Locus:269931:016. In the latter, a large flat stone slab was found that probably functioned as a threshold to connect Room 33 to Room 30.

D8. Building E / Room 19

(Vera Egbers)

We currently assume that Room 19 was originally part of Building D (**§D7**). The "Building D / E" unit was bounded to the north by Alley 13, to the west by Alley 12, to the south by Outdoor Area 8 and to the east by Outdoor Area 32. In Building D / E, the central Courtyard 27, equipped with a well and a drainage channel, was surrounded

(starting in the north and continuing in clockwise direction) by Rooms 19, 30, 31, 33, 9, 34 and 10 and Courtyard 11.

Courtyards 27 and 11 may well have originally constituted one large courtyard that was later divided when Room 10 was created by erecting the walls LGR:0093, Locus:268931:021, LGR:0108 and LGR:0158. These modifications also closed off access to Room 19 and changed its purpose, creating a separate Building E (**Figs. D17**, **D22-D23**). However, perhaps Room 19 remained connected to Building D, as a niche observed in the wall Locus:269931:014 of Room 30 possibly constitutes a passage to Room 19 (**§D7.5**).

D8.1 General layout

In 2015, parts of Room 19 were unearthed in the east of Square 267931, where a wall (LGR:0067) was partially uncovered near the excavation limit[70], and in the west of Square 268931 (part of the "Connecting Trench"), where a part of a wall (LGR:0072) was found[71]. The 2016 excavations uncovered the full extent of Room 19, which seems to be a single-room architectural unit ("Building E") composed by one large rectangular space of c. 36 m². It is delimited by the walls LGR:0067 in the west, LGR:0089 in the north, Locus 269932:008 and Locus:269931:026 in the east and LGR:0072 in the south.

D8.2 The walls

The walls were erected directly on the virgin soil, as already observed in 2015. They consist of large river cobbles (c. 30×18×15 cm), laid in two rows with small pebbles used as filling in between. The average width of the walls in Room 19 is c. 65 cm. No traces of the mudbrick superstructure have survived.

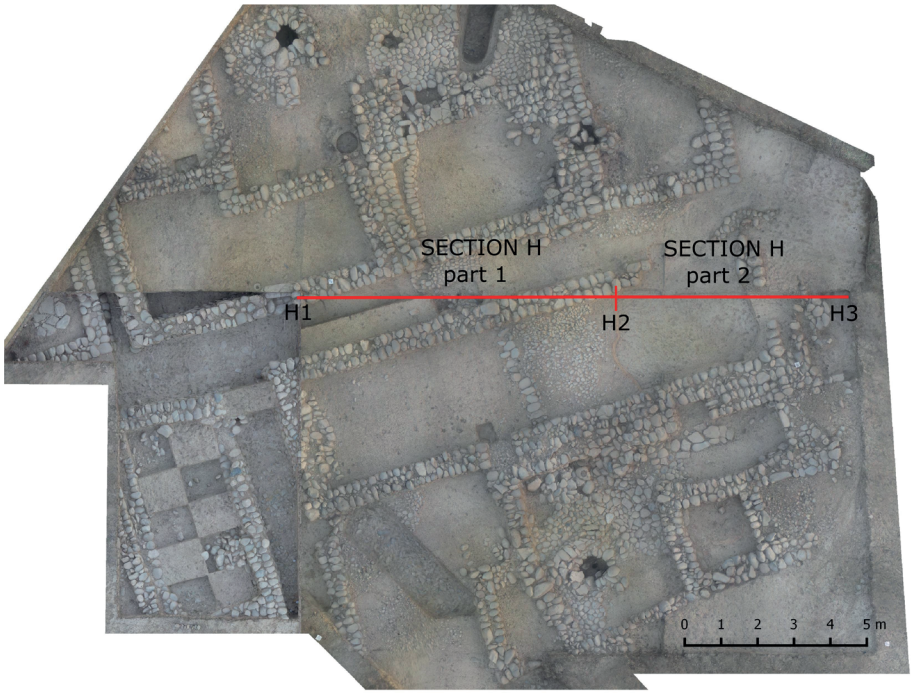
The southern wall LGR:0072 is preserved up to a height of three courses (c. 50 cm). The wall is connected in the southwest with wall LGR:0067. This c. 4.30 m long wall borders onto Alley 12, on whose other side Building H (excavated in 2015[72]) is situated (**Fig. D17**). It connects to

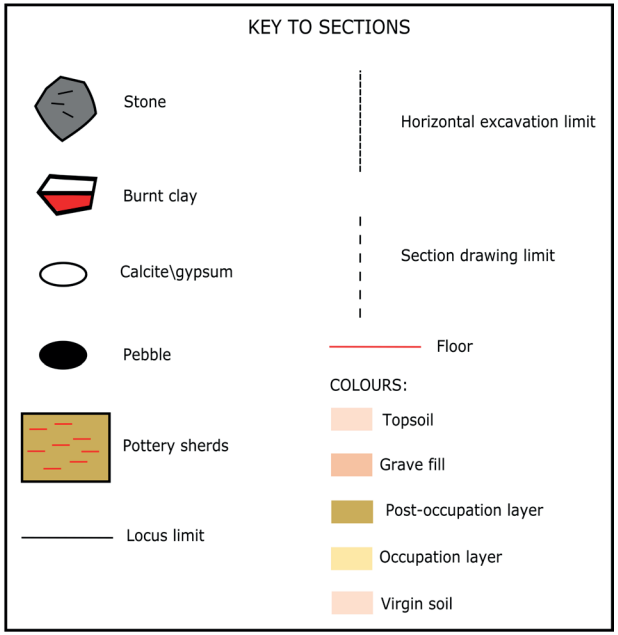
Fig. D22: Detailed orthophoto of Building E / Room 19. Prepared by Andrea Squitieri.

70 Bartl 2016, 75-76.

71 Stone 2016, 69-70.

72 Bartl 2016, 75-76.





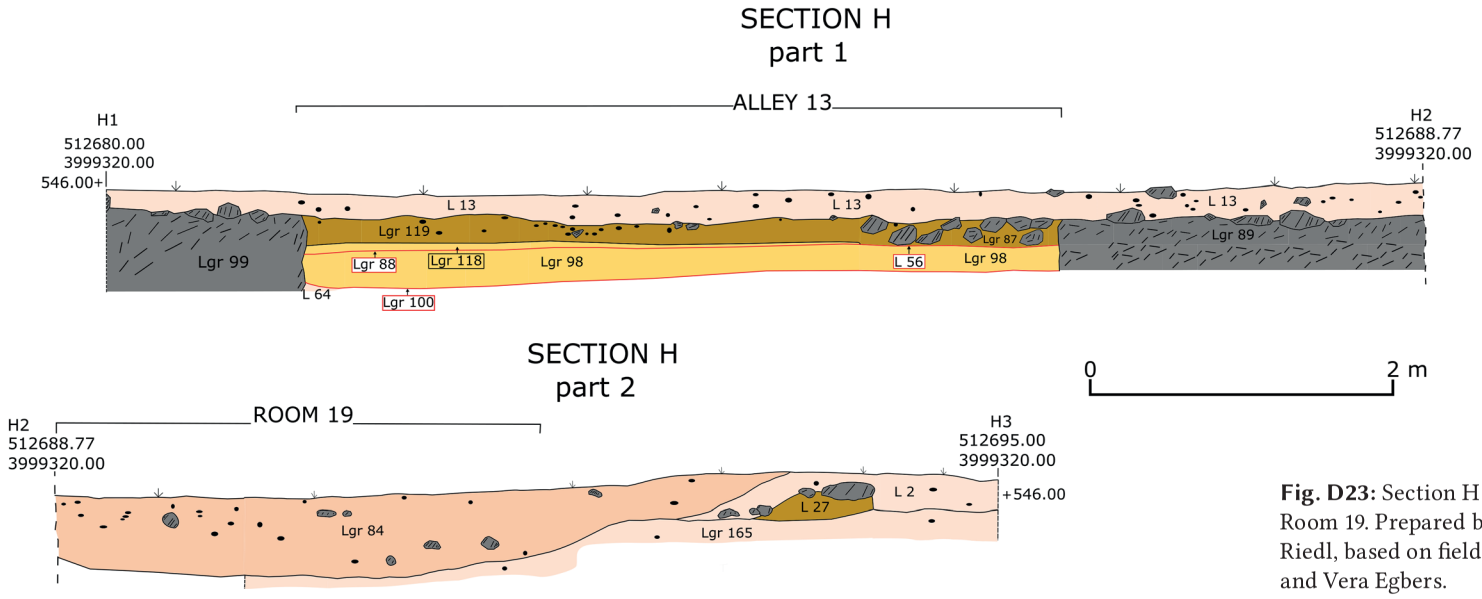


Fig. D23: Section H of Alley 13 and Building E / Room 19. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Zahra Hashemi and Vera Egbers.

the northern wall LGR:0089. The corner formed in the northwest of Room 19 by these two walls is preserved up to a height of five courses (c. 75 cm). The northern wall (LGR:0089) could be traced for a length of c. 10.90 m while the southern wall (LGR:0072) is 14.45 m long; its eastern limit is somewhat obscured by the adjoining stone collapse (LGR:0120). The eastern part of Room 19 is heavily disturbed by a modern pit (LGR:0084).

It is unclear where the entrance to Room 19 was located. A niche (Locus:268931:024) with a width of c. 70 cm is located in the western part of the southern wall (LGR:0072). It has a rather uneven surface consisting of fist-sized and smaller pebbles that slopes down to the smooth stoneless clayey floor of Room 19 (Locus:268931:027, see below). When first exposed, we interpreted this niche as the entrance to Room 19. But on its southern side, this "entrance" is blocked by the corner of Building D, formed by the walls LGR:0093 and Locus:268931:021 (**Fig. D18**). This means, as discussed above (**§D7.5**), that these walls were constructed later than Room 19 whose use therefore must have changed. It is also possible that the niche was not a door but a space for storage, for example a shelf unit.

If the niche (Locus:268931:024) was indeed not the entrance to Room 19, it is possible that the original threshold may have been located in the now destroyed eastern part of the room. No door socket or threshold has been identified elsewhere in the surviving wall structures.

D8.3 The installations

The installation Locus:268931:030 (**Fig. D24**) in the centre of Room 19 consists of a row of 13 single large cobblestones, flanked by smaller pebbles, running over a length of c. 2.90 m from underneath the southern wall (LGR:0072) to underneath the northern wall (LGR:0089). Since the structure lies below the walls it was constructed before them. Like the very similar stone installation found in Building F (**§D12.3**), we interpret this structure as a drain that ran through Room 19 and connected the well in Courtyard 27 of Building D to the south with Alley 13 in the north. The stones are sunk in the floor (Locus:268931:027) of the western part of Room 19. On the eastern side of this installation is a pebble floor (Locus:268931:033). On top of this floor, close to the middle of the adjoining installation, we found a large piece of burnt clay (PPP 268931:033:001), perhaps a brick fragment, which may have been part of an architectural feature. Where the drain runs underneath the northern wall (LGR:0089), a large stone is visible in the wall.

The function of a second stone installation (Locus:268931:039) is less clear. 17 large cobblestones, set in a line, are sunk into the floor (Locus:268931:027). The bottom part of the structure was not excavated. It was either built before or at the same time as the construction of the floor and adjoins the western wall (LGR:0067) but does not abut the southern wall (LGR:0072) and the northern wall (LGR:0089). Initially thought to be collapse from the western wall (LGR:0067), this interpretation was abandoned when it became clear that the stones were sunk into the floor. The structure may have been a bench, perhaps equipped with a superstructure that created an even surface on top of the stones, or the base for a shelf. No finds were discovered around or on top of it.

D8.4 The floors

Only one floor level of Main Occupation Period 1 was identified. The drain (Locus:268931:030) that divides Room 19 in two parts may mark the transition between a roofed area above the clay floor (Locus:268931:027) in the west and an unroofed area above the pebble floor (Locus:268931:033) in the east.

In the western part of Room 19, the floor (Locus:268931:027) is a greyish brown, firm clay floor with very few small stones pressed into the clay in some parts. Especially close to the niche (Locus:268931:024), the quantity of stones increased. The floor slopes up against the surrounding walls and flanks the western side of the drain (Locus:268931:030). A small sounding (**Fig. D24**) was opened directly in front of the niche, cutting this floor: this revealed that there was no other floor below, only a compact deposit of c. 15-20 cm of mud directly above the virgin soil, interpreted as the foundation for the floor[73].

Accordingly, the construction sequence here can be reconstructed as follows: the stones of the walls were built directly on the natural bedrock while the drain and the bench / shelf structure were put in place. Subsequently, a fill of firm clayey soil was brought into the new room to create an even surface. The top of this fill was then used as the floor, as far as we could observe, without any further preparation or alteration.

In the eastern part of Room 19, the pebble floor (Locus:268931:033) forms a relatively uneven surface. Close to the drain, it consists of many neatly laid pebbles of an average size of 7×10×5 cm with smaller pebbles of about fingernail size set in between as well as some pot sherds and loose, crumbly soil. Further to the east, the size of the pebbles diminishes until the appearance of the floor

73 It was therefore not assigned a separate locus number.

changes to a clayey surface with single small pebbles distributed irregularly over the area.

In this area, the floor was cut by a modern pit (LGR:0084; **Fig. D23**). The section created by this pit shows that there was only one floor. Similarly to the western floor (Locus:268931:027), a mud layer constitutes the foundation for the pebble floor[74]. Perhaps the stones were pressed into this layer when it was still wet. The pebbles of the floor do not reach the northern wall (LGR:0089) and the southern wall (LGR:0072), but stop a few centimetres before, indicating that they were put in place after the construction of those walls.

Fig. D24: Building E / Room 19 with the drain (Locus:268931:030) running across and the pebble floor (Locus:268931:033) beyond it. Photo by Andrea Squitieri.

Remarkably, very few objects and no charcoal were found in the deposits above the floor level of Room 19 (**Fig. F20**). The deposit above the western floor (Locus:268931:027) was a reddish-brown soil, dry and hard, silty to clayey, with many white inclusions of c. 3 mm (LGR:0166). The deposit above the eastern pebble floor (Locus:268931:033) was a light brown, hard clayey soil (Locus:268931:032) that could be separated easily from the pebbles below. These deposits were in turn covered by reddish-brown clayey-silty soil (Locus:268931:017), hard brown clayey-silty soil (Locus:268931:028), and reddish-brown clayey-silty soil (Locus:268931:031) that accumulated when Room 19 was exposed to decay.

The latest events in this building structure's history were the accumulation of topsoil (Locus:268931:013) and the cutting of the pit (LGR:0084). Both the topsoil and the pit were full of modern objects including shoes, glass bottle fragments and pieces of unidentified plastic objects. The topsoil consists of dark brown silty-clayey soil, very hard and dry, with inclusions of small pebbles. It formed a thick layer on top of the walls in the western part of Room 19 (Square 268931) but was less substantial in the eastern part (Square 269931) where the natural bedrock (Locus:269931:006) lies higher than in the west.

D9. Alley 12

(Francesca Chelazzi)

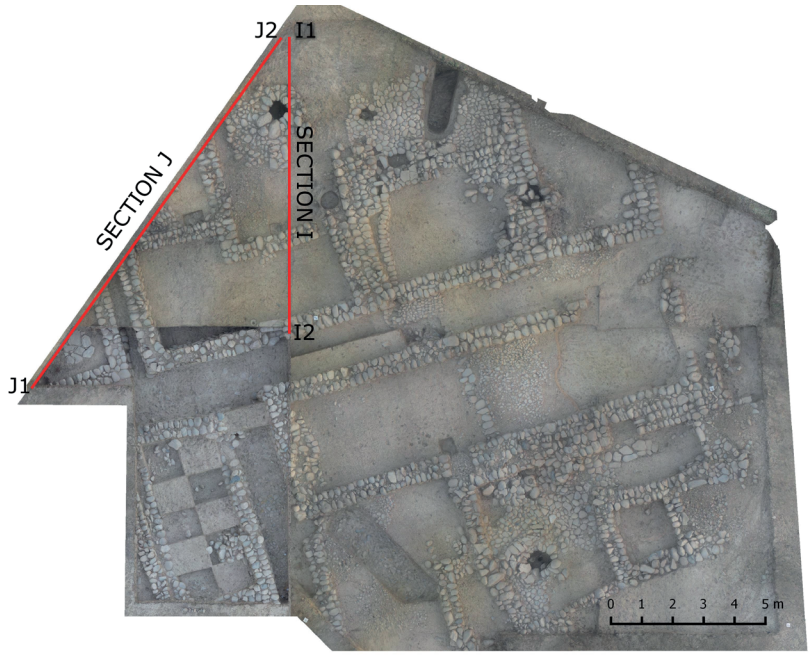
The western wall of Building D (Locus:268931:040), running in southeastern to northwestern direction, borders onto Alley 12 (**Figs. D16-D18**). This stone wall is 20 cm high, 3.50 m long and 60 cm wide, and it consists of two courses of large river cobbles; in between these cobbles smaller stones were placed as a fill. As elsewhere in Gird-i Bazar, no mortar was used to build this wall. In the northern part, there is a threshold (LGR:0159), which marks the western entrance to Building D's Courtyard 11.

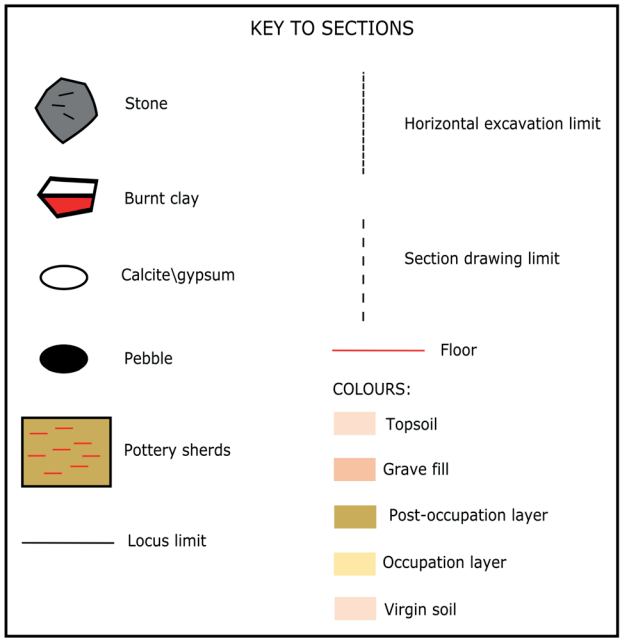
Alley 12 separates Buildings D and E from Building H in the west, which was excavated in 2015[75]. The wall to the west of the alley is Locus:267931:019. In 2015, the apparent lack of any floor in Alley 12, as well as the very low elevation of the virgin soil (Locus:267931:042), led to hypothesise that the occupational surface was particularly subjected to erosion. Therefore the 2016 excavation focused on the investigation of any possible preserved occupational surfaces in Alley 12.

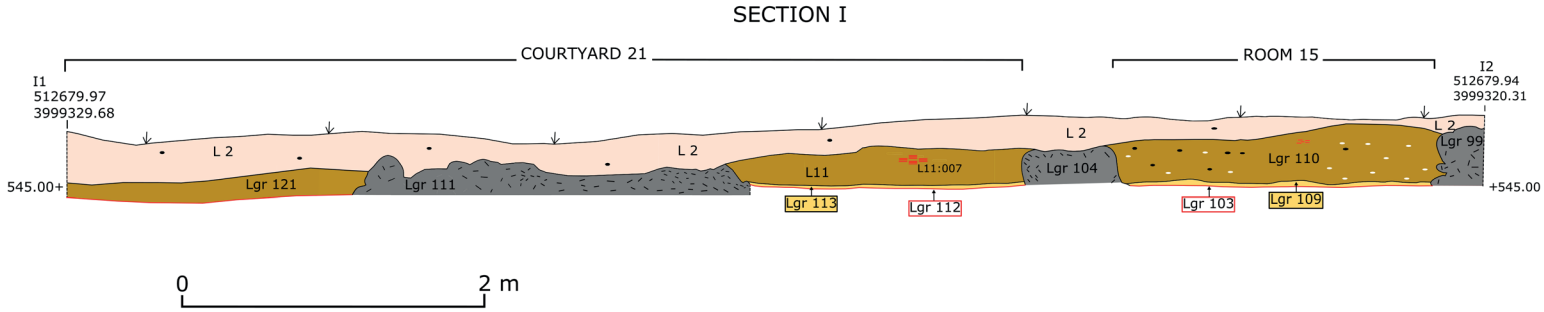
We noticed that the virgin soil was covered by a hard beaten earth floor (LGR:0132), which was only partially preserved in close proximity to the stone wall of Building

74 It was therefore not assigned a separate locus number.

75 Bartl 2016, 74-75.







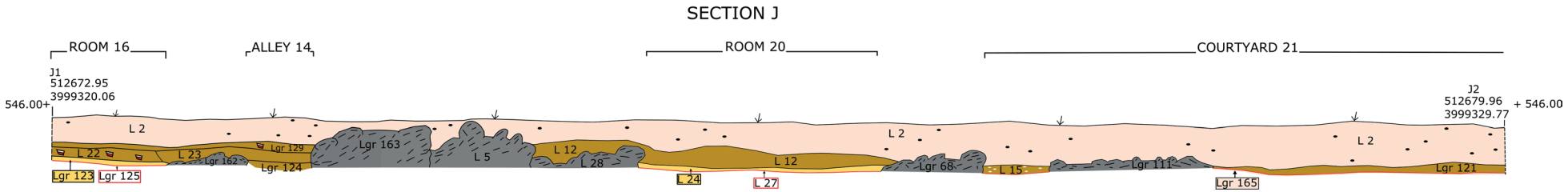


Fig. D25: Sections I and J of Buildings F and G. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Zahra Hashemi.

D (Locus:268931:040). Interestingly, the floor abuts this wall at an elevation c. 20 cm higher than the average elevation of the centre of Alley 12. The floor, therefore, sloped up towards the wall. The floor was covered by a 3-5 cm thick deposit (LGR:0028) of dry hard silty soil, not very rich in pottery.

D10. Building G

(Zahra Hashemi)

Building G (**Figs. D17**, **D25**) is located west of Building F and represents the westernmost limit of the excavation, where it is bordered by the modern metal fence. This building was already identified in 2015 when Room 16 was partially excavated[76]. It remains the only room known of this building.

The western portion of this room continues under the metal fence and therefore is beyond the excavation limits. The 2015 excavation had revealed that this room has a paved floor (Locus:267931:016) in its centre, made of large flat slabs, where a stone pounder and much charcoal were found. The deposit on this floor yielded many signs of heavy burning[77]. This led to the hypothesis that this room had been used for cooking purposes. In 2016, we decided to excavate a further portion of this room in the north, as far as the metal fence.

Continuing the 2015 excavation of Room 16 towards north, traces of another cooking installation with burnt clay and many charcoals were found (Locus:267932:035). This installation was surely connected to the one excavated in 2015. The floor (LGR: 0125) was covered by a deposit of light brown soil (LGR:0123), covered in turn by a reddish soft clayey soil (Locus:267932:022).

Room 16 is bordered in the south by the wall Locus:267931:012 and in the east by the wall LGR:0162. This wall separates the room from the narrow Alley 14, which adjoins Building F in the west. In the current state of excavation, two stone courses of this wall are visible. The fill of Alley 14 is a dark brown silty-clayey soil with white and reddish particles (Locus:267932:033, part of LGR:0124). The floor below was not yet reached in 2016.

A hard light brown silty-clayey soil (Locus:267932:023) covered the lower fill of Alley 14 (Locus:267932:033) and the wall east of Room 16 (Locus:267932:032, part of LGR:0162). On top of this layer, a silty clayey soil (Locus:267932:007) covers all the area to the west of Building F, and is in turn covered by the topsoil (Locus:267932:002).

D11. Alley 13

(Zahra Hashemi & Vera Egbers)

Between Buildings H and E to the south and Building F to the north, Alley 13 extends in east-western direction for a length of about 20 m (**Figs. D17**, **D19**, **D22-D23**). The westernmost part of this alley was already excavated in 2015. The alley is bordered in the north (from west to east) by walls LGR:0099, Locus:268932:017 and LGR:0102 and in the south (from west to east) by walls Locus:267931:026 (excavated in 2015[78]) and LGR:0089.

Alley 13 sloped down from east to west and consisted of a thick package of successive floors, one of top of the other. In the easternmost part of Alley 13, the virgin soil was reached (Locus:267931:046). Moving towards west, the oldest clayey floor was identified in 2016, extending for about 4 m and sloping up towards east (LGR:0100). In cross section, this clayey floor has a U shape and raises up on the sides abutting the walls.

To the east of this clayey floor, at the southwestern corner of Room 22, some large pebbles form a floor (Locus:268932:064), abutting the wall north of Alley 13 (Locus:268932:017), but not extending towards the south. This floor extends for about 2 m. It continues westwards as a floor made of smaller pebbles (LGR:0032), which was very eroded. This floor continues until reaching the end of Room 22. At the corner of Room 28, this pebble floor is replaced by another floor made of medium-sized pebbles (LGR:0090), which, like the floor Locus:268932:064, only extends on the northern part of Alley 13, for about 2 m. To the west of this floor, at the southern wall of Room 22 (Locus:268932:017), several stones were laid in a row against this wall, forming an installation (Locus:268932:053). In the southern part of Alley 13, we found a clayey floor rich in white particles (Locus:268932:070) abutting the southern wall (LGR:0089). This floor extends from the middle of the alley towards the east.

As visible in **Fig. D23**, the oldest floor (LGR:0100) was reached only in the northern portion of the alley, during the excavation of a sounding along the northern wall, thus leaving the southern portion of the alley at a higher level, where the youngest floor was identified as LGR:0088. The fill between the two floors (LGR:0098) was made of a densely packed accumulation of clayey floors and deposits, perhaps due to a gradual accumulation through time of sediments brought by the drains terminating in this alley. This sounding allowed us to observe that the oldest floor (LGR:0100) has a U shape in cross section and slopes

76 Bartl 2016, 74.

77 Bartl 2016, 74.

78 Bartl 2016, 71 Fig. C5.1.

Fig. D26: Detailed orthophoto of Building F. Prepared by Andrea Squitieri.

up towards the wall (**Fig. D27**); moreover, below this floor we reached the white silty virgin soil (Locus:268931:064), on which the walls were erected.

Continuing along the southern side of the alley, in correspondence to the pebble floor Locus:268932:064, some stones were found (LGR:0087), probably collapsed material of the wall LGR:0089. Under these stones, we found a clayey floor with small white particles (Locus:268931:056, part of LGR:0088) that is considered to be the continuation of the youngest floor (LGR:0088), under which the continuation of the oldest floor (LGR:0100) was intercepted.

As mentioned in the discussion of Building E (**§D8.3**), the drains coming from Buildings E and F end in the Alley 13. In the earliest occupation phase, the water coming to the Alley 13 likely flowed towards west because the alley's floors sloped down in this direction. This may explains why the western part of the alley was paved with pebble floors, and why the oldest floor (LGR:0100) has a U shape with a deeper lying central part; moreover, the flowing of the water in western direction also explains the thick packed accumulations of sediments (LGR:0098) observed in the western part of the alley.

At its easternmost extremity, Alley 13 was disturbed by the excavation of a large modern pit (LGR:0084), which also damaged the easternmost portion of Building E by

Fig. D27: Sounding in Alley 13 that allowed identification of the oldest floor (LGR:0100) and its U shape, sloping up towards the walls. Photo by F. Janoscha Kreppner.

obliterating the eastern part of wall LGR:0089. Continuing towards west, some stones were found aligned in the direction of the alley (Locus:269932:010), whose function remains unclear. It may be an installation or wall collapse.

D12. Building F

(Zahra Hashemi)

A small portion of Building F (**Figs. D17**, **D26**) was excavated in 2015 when two walls belonging to this building were detected in Square 267931[79]. Moreover, the result of the magnetometer survey in 2015 had revealed regular structures in this area[80]. All this prompted further investigations. In 2016, the excavation of this building was expanded towards north and northeast, as far as the metal fence that encloses the modern chicken farm and that constitutes our excavation limits.

Building F is separated from Building E in the south by Alley 13. Three of its rooms have been excavated: Rooms 15, 20 and 22 as well as the Courtyard 21. A fourth room on the east (Room 28) was only partly excavated; it may well belong to this building although its entrance has not yet been identified.

D12.1 Room 15

Room 15 (**Figs. D25-D26**) is located in the southwestern part of Building F and connected to the south to Alley 13 through a passage with a threshold (Locus:267931:043) and a door socket (Locus:267932:030), already unearthed in 2015. This room has a L shape and is surrounded by walls made of two rows of stones: wall LGR:0099 in the south, wall LGR:0163 in the west, walls Locus:267932:005 and LGR:0104 in the north and wall Locus:268932:007 in the east. Another passage, with its door socket (Locus:267931:021), is located in the northeastern corner of the room and connects it with Courtyard 21.

Two phases of occupation were identified in this room. The oldest floor was excavated in the south-western corner of the room in 2015. It is a beaten earth floor (Locus:267931:050) on a lower level than the threshold (Locus:267931:043). In 2016, a higher lying floor (LGR:0103) was found, at the same level as the threshold. This is a brown clayey floor, rich in small white particles. This floor slopes up from the west to the east and abuts the stones of the northern wall (LGR:0104) and the eastern wall (Locus:268932:007). However, in the west (LGR:0163) and south (LGR:0099) the walls go deeper than the floor. The deposit above the floor is a silty-clayey soil of light brown colour (LGR:0109) that yielded some pottery sherds and stone tools. In the Post-Occupation Period, the room was filled with a silty clayey light brown soil (LGR:0110).

D12.2 Room 20

Northwest of Room 15 lies Room 20 (**Figs. D25-D26**). It is limited in the south by the wall Locus:267932:005. The eastern limit of this room is a wall made of two rows of stones (LGR:0068), of which one course is visible. In the middle of this wall there is a depression that may be an entrance or simply a less preserved part of the wall (Locus:267932:031). No threshold or door socket was found near this wall. Due to the presence of the modern metal fence on the west, only a portion of this room could be uncovered, and it is therefore possible that the entrance was located towards the northern part of wall LGR:0068, connecting the room to Courtyard 21.

As in Room 15, two floors were observed in Room 20. The older floor is a beaten earth surface with flat lying sherds and some stones (Locus:267932:029) that was intercepted at the bottom of the small sounding opened next to the southern wall. The younger floor (Locus:267932:027) is a clayey brown soil, rich in small white particles. The sounding was opened to ascertain that Rooms 20 and 15 were not originally one single room and that the wall south of Room 20 (Locus:267932:005) was not a secondary wall built later and on top of the floors LGR:103 and Locus:267932:027. The sounding showed that the wall Locus:267932:005 went deeper than the floors LGR:103 and Locus:267932:027, having at least three courses of stones: the wall Locus:267932:005 is therefore not a secondary wall.

In the western part of Room 20, a concentration of stones, intermingled with much pottery, is interpreted as a stone installation of uncertain function (Locus:267932:028). The limits of this structure could not be defined as it continues under the metal fence.

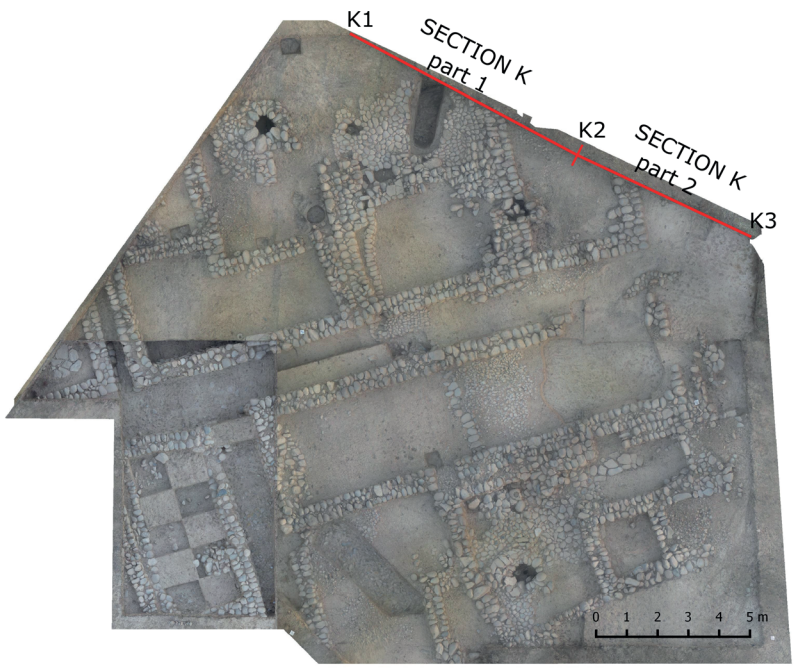
The younger floor (Locus:267932:027) was covered by a deposit of hard dry silty soil (Locus:267932:024). In the Post-Occupation Period, Room 20 was filled by a silty-clayey soil of light brown colour (Locus:267932:012).

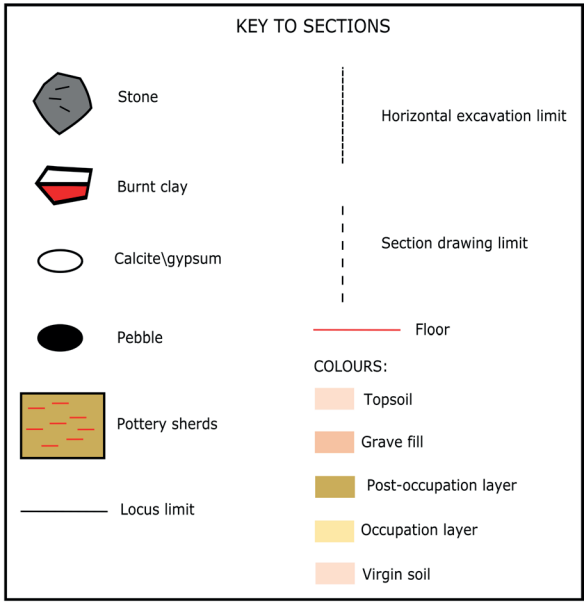
D12.3 Courtyard 21

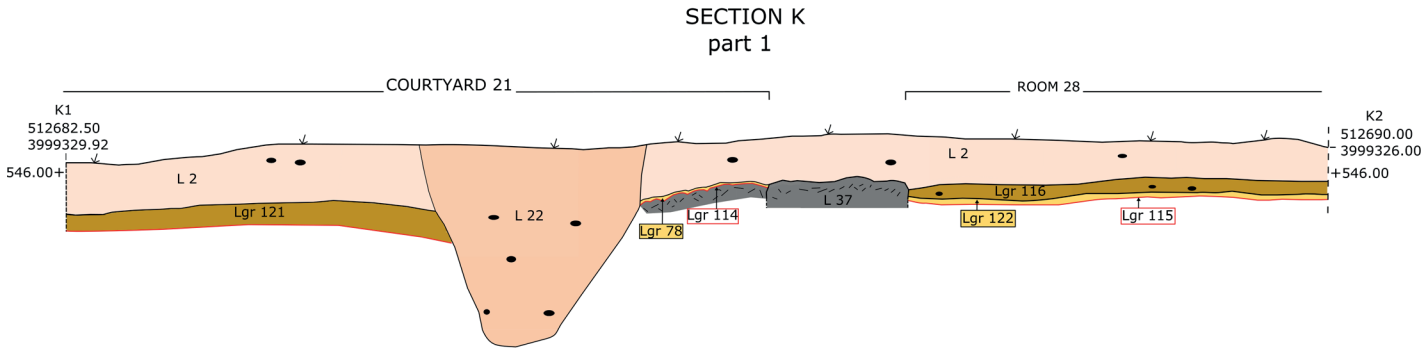
As already mentioned, the northern entrance of Room 15 gives access to Courtyard 21, which occupies most of the northern part so far excavated of Building F and con-

79 Bartl 2016, 73-74.

80 Fassbinder/Ašandulesei 2016, 38-39.







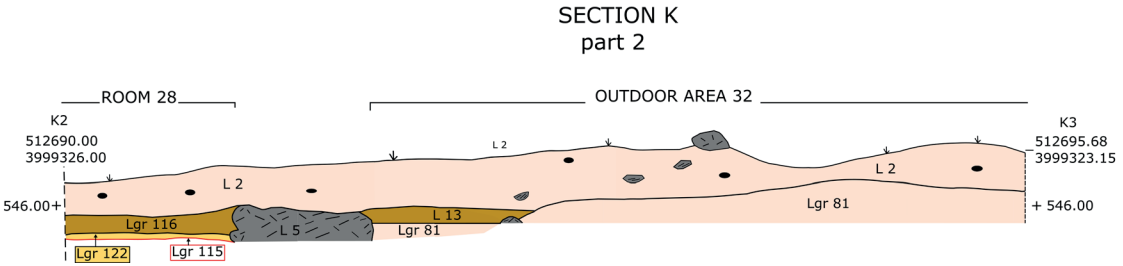


Fig. D28: Section K of Building F and Outdoor Area 32. Prepared by Andrea Squitieri and Jakob Riedl, based on field drawings by Zahra Hashemi.

Fig. D29: The well (in the background) and the hole for the water pulling structure (in the foreground) in Courtyard 21 of Building F. Photo by Andrea Squitieri.

tained installations that we will describe in the following (**Figs. D25-D26**, **D28**). The northernmost limits of this area were not found because the metal fence of the modern chicken farm delimits the excavation area.

D12.3.1 Stone paved floor

The eastern part of Courtyard 21 is covered by a stone paved floor (LGR:0114). This floor was cut by a modern pit (Locus:268932:022) that reached down to the bedrock. The stones of this floor abut the wall Locus:268932:037 in the east and the wall Locus:268932:019 in the south. The stone floor is not regular and slopes up from east to west.

D12.3.2 A well with a water pulling installation (*shaduf*)

In Courtyard 21, we found a well (LGR:0111) with a circular shape and made of stones (**Figs. D29-D30**). This well very closely resembles the one excavated in Courtyard 27 of Building D (**§7.5**). Their presence indicates a sophisticated water management plan for this part of the settlement.

The fill inside the well (Locus:267932:018) was excavated up to a depth of about 80 cm, at which point the excavation was stopped for safety reasons. Pottery was extremely rare in the well fill. Soil samples were collected at various depths for analysis. All around the well, and connected to it, are medium-sized stones that constitute a floor that must have been particularly suitable to protect the area from the water activity.

To the west of the well, we found a hole (Locus: 268932: 077), c. 70 cm in diameter and 50 cm deep. A well-worked rectangular stone (PPP 268932:012:009) was placed at its bottom, with a regular and very smooth circular depression in the middle. Small pebbles were placed all around the stone, perhaps to better fix it in the ground. On the concave part of the stone, a large body fragment of a ceramic vessel was found (PPP 268932:012:006), along with much charcoal. We interpret this installation as part of a water pulling device used to draw water from the nearby well. The concave part may have contained the bottom part of a wooden beam used as a vertical axis, which in turn may have supported a horizontal beam that reached the well. At the extremity of this horizontal beam a bucket would have been suspended with a rope, to be lowered into the well. This type of water pulling installation, called *shaduf* in Arabic, is very common in the Middle East.

The space to the south of the well, in the direction of wall LGR:0104, is covered by a floor of medium-sized pebbles in the west (Locus:267932:016) and by a whitish floor (LGR:0112) in the east. These two floors were separated by

Fig. D30: Hole used to support a vertical wooden pole for the water pulling installation in Courtyard 21 of Building F. Photo by Zahra Hashemi.

four large stones aligned in north-southern direction (Locus:267932:019). To the west and the north of the well, a white, silty calcified floor (LGR:101) was identified as the virgin soil, which was used as a floor in this area.

D12.3.3 A cooking area with ovens

Northwest of Room 15, immediately north of the entrance leading through wall LGR:0104, there is an area of Courtyard 21 delimited on the east by a wall (LGR:0164) belonging to Room 22. Here, the fill of the Post-Occupation Period (Locus:268932:011) was very rich in charcoal. We assume the existence of a roofed area, perhaps a sort of portico, which opened towards Courtyard 21.

In this area, two round ovens were found (Locus:268932:052 and Locus:268932:050; **Fig. D32**). They are made of burnt clay and have a circular shape, with small stones placed around. The bigger oven (Locus:268932:052), with a diameter of 62 cm, is located at the southeastern corner of the area and the smaller oven (Locus:268932:050), with a diameter of 35 cm, is situated immediately to the north of the first one. Both are set against the stones of wall LGR:0164. The bigger oven is the better preserved. In its western wall, a hole was found, which probably served for air circulation and / or was used to clean the oven after use. A charcoal layer was found at the bottom of this oven. The smaller oven is less well preserved and its southern part is not conserved. However, a cooking pot was found inside this oven (**§E1.1.3**).

Fig. D31: Above: Artist's impression of Courtyard 21 in House F, specifically the façade adjoining Rooms 22 (left) and 21 (right), as seen from northwest. Prepared by Jens Rohde after a sketch by Jean-Jacques Herr. Below: Courtyard 21 in House F, as encountered during the 2016 excavations. Photo by Andrea Squitieri, perspective modified by Jens Rohde.

To the west of these two ovens, much pottery was found, including a complete bowl lying on the floor (PPP 268932:020:001). The fill of this area (Locus:268932:011) was also rich in ceramics, including two jars (PPP 268932:011:004 and PPP 268932:011:005) and a complete vessel (PPP 268932:011:007), which were sampled by Elsa Perruchini for residue analysis (**§E3**).

D12.4 Room 22

Room 22 (**Fig. D26**) lies east of Room 15 and south of Courtyard 21. The western wall of this room (LGR:0164) backs against the eastern wall of Room 15 (Locus:268932:007) forming a sort of double wall, although LGR:0164 extends further towards north. Room 22 is limited in the south by the wall Locus:268932:017, in the east by the wall Locus:268932:036 and in the north by the wall Locus:268932:019. In the southern wall, two courses of stones are visible, whereas the eastern and northern walls have only one course of stone preserved. The middle of the eastern wall is disturbed, presumably by later (modern?) damage (Locus:268932:047).

Room 22 does not have access to Alley 13 in the south. However, two entrances lead from Room 22 through the wall Locus:268932:019 to Courtyard 21 in the north. The eastern entrance is marked by a flat stone (Locus:268932:072), presumably a step, while another flat stone (Locus:268932:078) indicates the second entrance in the west.

The most interesting aspect of the architecture of Room 22 is the façade along its northern wall, as seen from Courtyard 21. Large accumulations of stones were found adjoining the northern wall (Locus:268932:019) of this room; labelled Locus:268932:008 in the western part and Locus:268932:028 in the middle of the wall, they were initially thought to be some kind of stone installations. However, we then noticed that the stones form rectangular structures set against the wall that we now interpret as pilasters.

There are three pilasters structuring the façade (**Fig. D31**). The western pilaster continues from wall LGR:0164; the central pilaster (Locus:268932:028) protrudes from the middle of wall Locus:268932:019 and lies between the two entrances; and the eastern pilaster (only recog-

Fig. D32: The ovens (Locus:268932:052 and Locus:268932:050) in Courtyard 21 of Building F. Photo by Zahra Hashemi.

Fig. D33: On the right, the hollow of the drain (Locus:268932:027) running through Room 22 of Building F: note the two stones separated by a hole and supporting another stone, thus creating the drainage canal. Photo by Zahra Hashemi.

nised in post-excavation analysis) continues from wall Locus:268932:036. These three pilasters may have supported a protruding roof which would have offered shelter for the space in Courtyard 21 just in front of Room 22.

Turning now to the inside of Room 22, in its western part, we encountered a row of stones sunk into the floor that runs in roughly north-southern direction, ending in the north of the room in the corner between walls LGR:0164 and Locus:268932:019. Here, two stones are visible that are separated by a hole and that support another stone, thus revealing the hollow of a drain Locus:268932:027 (**Fig. D33**). The drain crosses Room 22 along its western wall and terminates in Alley 13 to the south. Here, another hole was found (Locus:268932:031) where the drain runs underneath the wall Locus:268932:017. This drain served to bring waste water from Courtyard 21, where the well is situated, to Alley 13. This can be compared to the drain that brings waste water from Building D in the south to this alley (**§D11**).

The floor of Room 22 is a brown clayey soil, rich in white particles (Locus:268932:057). It was very rich in ash and charcoal and contained much pottery, as well as a baked brick (PPP 268932:049:005) and some stone tools (**§F6**). The southwestern part of the floor had some small pebbles, which perhaps helped permeabilise the floor in proximity of the drain. At the northeastern corner, some stones form an installation, perhaps a bench (Locus:268932:044), in which much pottery was found. At the southeastern corner of the room, another stone installation is visible (Locus:268932:045), perhaps another bench. The floor was covered by a deposit of silty clayey soil with ash, charcoal and pottery sherds (LGR:0083).

The fill of the Post-Occupation Period of this room was a silty-clayey soil of light brown colour (LGR:0082), which was very rich in charcoal and pottery.

D12.5 Room 28

Room 28 (**Figs. D19, D26, D28**) is located to the east of Room 22. The western wall (Locus:268932:037) of this room is preserved up to two courses and backs against the eastern wall of Room 22 (Locus:268932:036), thus

Fig. D34: The oven in Room 28 of Building F. Photo by Zahra Hashemi.

forming a sort of double wall. Both walls are damaged where a hole with fill (Locus:268932:047) was excavated. Wall Locus:268932:037 continues towards north along Courtyard 21 where it is abutted by the stones of the floor LGR: 0114. The northern end of this wall exceeds the limits of our current excavation area.

A stone wall of two rows of stones (LGR:0102) in east-west orientation forms the southern limit of Room 28, and of Building F. Two courses of this wall are preserved. The eastern wall (Locus:269932:005) forms the eastern limit of the building, and only one course of stone is visible. The northern part of this wall is beyond the extent of the current excavation area.

No entrance to Room 28 has been found so far. We would expect an entrance in the west to lead from Courtyard 21 into the room, situated in the unexcavated portion of wall Locus:268932:037.

An oven (**Fig. D34**) was found on the western wall of the room (Locus:268932:056). This oven has a circular shape with a diameter of 40 cm and is made of burnt clay, closely resembling the ovens excavated in Courtyard 21. To the south of this oven, a stone installation (Locus:268932:069) was found, perhaps a bench. Much pottery, some burnt clay and a stone weight were found in connection to this installation. South of this installation we found a clay structure (Locus:268932:071), on which much pottery was found. This installation is limited in the south by the external wall of Room 28 (LGR:0102) and in the north by the stones of the first installation (Locus:268932:069).

The pebble floor of Room 28 (LGR:0115) slopes down towards the west. The deposit on top of it (LGR:0122) yielded much pottery. The fill in the northern part of the room (LGR:0116) was rich in charcoal and burnt clay while the fill in the southern part (Locus:268932:002) contained less charcoal and burnt clay, but pottery was still abundant. The fill was covered by the hard and dry topsoil.

D13. Outdoor Area 32

(Zahra Hashemi)

East of Room 28 of Building F lies Outdoor Area 32 (**Fig. D22, D28**). After removing the topsoil in this area, we immediately reached the white calcified-silty virgin soil (Locus:269932:020, part of LGR:0081), which was probably used as surface, as in other parts of the site. Towards east, the excavations could not continue due to the presence of an irrigated garden and the metal fence.

Towards the south of this open area, east of Building E, some stones were found lying on the virgin soil (Locus:269932:014, part of LGR:0081; corresponding to Locus:269932:020 in the north) but not in any regular pattern (LGR:0120). These stones may represent collapsed material.

D14. General conclusions

(F. Janoscha Kreppner)

While in 2015 an area of 204 m² was excavated across a length of about 65 m in east-western direction, the 2016 campaign at Gird-i Bazar more than tripled the excavated area to about 625 m², extending the excavation to the south and southeast of the 2015 "Eastern Trench", around the pottery kiln and to the west of the 2015 "Connecting Trench" and to the north and east of the 2015 "Western Trench".

After the 2015 campaign, the excavated area was still quite small. All architectural units uncovered were separated from each other by alleys. Thus, we assumed that the Main Occupation Period of Gird-i Bazar consisted of single-room buildings. After the 2016 campaign, this assumption had to be revised. The buildings, contrary to our original assumption, contain numerous rooms, which are organised around courtyards.

As already recognised in 2015, the walls of these houses were founded on virgin soil. They are built of river cobbles and usually preserved to a height of about 40-50 cm. A mudbrick superstructure was likely present but is not preserved. The floors usually consist of beaten mud, but in particular areas, notably courtyards, alleyways and also in selected rooms, stone pavements were installed. A new feature first encountered in 2016 are the wells uncovered in the courtyards of Buildings F and D, which supplied the inhabitants with fresh water. In turn, wastewater was drained from the courtyards into Alley 13 through

drains. Various other installations, such as ovens of various sizes, were used for domestic and craft activities. In some areas, the Main Occupation Period can be divided into two sub-phases, as evidenced by some architectural modifications.

Building F extends over 17 m in east-western direction, north of Alley 13. Four rooms and the courtyard were unearthed across an area of 117 m². The building certainly extends further north but could not be further excavated there because of the modern fence of the chicken farm enclosure. In Rooms 15 and 20, soundings led to the identification of older floors, and consequently the Main Occupation Period was divided into two sub-phases of use in these rooms.

Alley 13 separates Building F from Buildings E and D. In Buildings E and D, two building phases can be distinguished during the Main Occupation Period, since a wall of Building D was set against the southern wall of Building E / Room 19, thus obstructing its seemingly original entrance from Building D's courtyard. Room 19 is the largest excavated space in Gird-i Bazar, covering an area of 65 m² with a length of 13.8 m and a width of 4.5 m. In the second phase, Room 19 was possibly accessed from Building D through Room 30. If Room 19 is considered a part of Building D, this would result in a substantial building with an area of about 160 m². However, Room 19 may have constituted a single room building ("Building E") with a separate access solution. Future excavations will hopefully further clarify the relationship between Building D and Room 19.

The pottery kiln in Outdoor Area 8 was first investigated in 2015 and completely excavated in 2016. Remains of the kiln structure, fragments of the kiln's floor and vessels of the last kiln load were found in the rear area of the combustion chamber in fallen position. About 1.5 m to the west of the kiln opening, another feature, probably a second pottery kiln, was discovered but not yet excavated. The kilns identify Outdoor Area 8 as an area of ceramic production.

In the east of Gird-i Bazar, Building A is structured in parallel to the buildings unearthed in the west. Rooms 3, 1, 23 and 24 are arranged around Courtyard 2. However, the organisation of Building A is not quite clear as modern construction work for the chicken farm damaged the building in the south and its northern part it is not yet fully excavated: only a small part of Courtyard 2 is uncovered and the continuation of the building to the north is unknown. Up to now, only an area of 80 m² was excavated of Building A. Future excavations may reveal that Building B to the north of Building A, which was excavated in 2015, represents in fact a part of Building A. In this case, the excavated area of the combined building would increase to 140 m². In the east, Alley 25 separates Building A from Building J, of which only the western boundary wall has been excavated.

A characteristic feature of the architecture of Gird-i Bazar is the frequent use of double walls. Of these, only the construction of the wall LGR: 0093 represents a functional change in Buildings D / E after the first phase of use. On the other hand, the double walls in Building A (Rooms 23, 24), Building D (Rooms 9, 34) and Building F (Rooms 15, 22, 28) appear to have been built during the original construction phase and were likely designed as double walls for architectural reasons.

After the end of the Main Occupation Period, the buildings of Gird-i Bazar were abandoned. Only in one area, people returned, not long after the main occupation, and settled in Room 3 and Courtyard 2 of Building A as well as in Building B, where they installed the so-called Squatter Occupation floors excavated in 2015.

Another occupation phase, which we call the Sporadic Occupation Phase, was first observed in the western part of the 2015 "Connecting Trench". It consists of a small pebble floor surface, excavated in 2015 and 2016, which yielded Sasanian-period pottery. Due to its proximity to the modern site surface, this floor is not preserved further to the east. Thanks to the recent ^{14}C dating to the 4^{th}-5^{th} centuries AD of a tooth from Grave 47 at Gird-i Bazar (**§G4**), we can infer that this floor was the surface from which the burials were dug during the Sasanian era. Therefore we now assume that this floor and the graveyard belong to the same occupation period.

In various spots of the excavation area, floor fragments and pits with modern finds have been detected. These were covered by the topsoil representing the plough zone of the modern agricultural use of the Bora Plain, just below the modern site surface.

E. Pottery studies

E1. The 2016 season pottery and a first catalogue of the *chaînes opératoires* at Gird-i Bazar

Jean-Jacques Herr

With about 5000 diagnostic sherds (c. 130 kg), the 2016 campaign at Gird-i Bazar yielded rich pottery finds[81] and compares well to the 2015 season, with only 1617 diagnostic sherds (c. 30 kg). Also, much more of this material was discovered directly on the floors of several architectural units, which sharpens our understanding of how the pottery was used. Moreover, ten more or less complete vessels were found, and this significantly improved our knowledge of the Gird-i Bazar pottery repertoire. The additional data has allowed us to progress with the technological analysis of the pottery production, as will be demonstrated below.

The new material confirmed the overall validity of the pottery typology established on the basis of the 2015 material[82], although minor modifications are due. In the following, we will first discuss significant pottery types according to the archaeological contexts in which they were found and then present the results of the technological analysis on the pottery.

81 The pottery was processed by Jean-Jacques Herr (JJH), LMU research fellow & PhD candidate at École Pratique des Hautes Études-Sorbonne Paris (database registration, photography, analysis of typology, fabrics and *chaînes opératoires*) and by Abdullah Bakr Othman (AB), lecturer in the Department of Archaeology at the University of Salahaddin, Erbil & PhD candidate at ELTE Budapest (organisation of the workflow, photography, drawing). They were supported in drawing the pottery by Zuhair Rajab al-Samarrae (ZS), Professor Emeritus of the Department of Archaeology of Baghdad University; and by Hayman Noori, representative of the Sulaymaniyah Department of Antiquities, who took the collection photographs. Muhammad Aziz washed the pottery and, together with Bayaz Mala Issa, marked the diagnostic sherds with inventory numbers. – The author is indebted to J. S. Baldi for advice on the technological analysis and for critiquing the first assessment of the macro-traces and to the Competence Center Archaeometry Baden-Wuerttemberg (CCA-BW) team at Tübingen, in particular its director Christoph Berthold and Silvia Amicone, for the use of the Hirox Microscope and other devices in June 2017.

82 Herr 2016.

E1.1 Typologically significant pottery

Here we present the most significant pottery vessels and sherds recovered in 2016 in their archaeological contexts. On a number of these items, Elsa Perruchini (Glasgow) performed residue analysis (see **Chapter E3**).

E1.1.1 Pottery from the pit in Room 1 and from the kiln

The largest quantity of sherds was encountered in the fill of the pit (LGR:0014) and the upper fill of the kiln (Locus:269929:026; Locus:269929:039, both part of LGR:0009, **Figs. D13-D14**). Both contexts yielded complete profiles of vessels, the best preserved and largest sherds so far recovered in Gird-i Bazar. The range of vessels found in these contexts is representative of all types and fabrics unearthed in the different areas of the excavations.

The upper layer of the kiln fill (Locus:269929:039; LGR:0009) produced two almost complete bowls, one with a high pointed protruding carination (**Fig. E1.1: no. 9**) and the other with a rounded carination[83] (**Figs. E1.1: no. 10**; **E3.4**), a hemispherical incurved rim bowl (**Fig. E1.1: no. 3**) and a large deep bowl with well preserved burnishing (**Fig. E1.1: no. 8**). This assemblage of vessels is characterised by high variability in fabric hardness and colour that may indicate different firing techniques with different firing temperatures and atmosphere conditions (oxidizing, reducing). For instance, coarse lids and trays (**Fig. E1.2: no. 2**, **no. 4**) made with fabric A were recovered alongside with carinated bowls of fabric C1 (see below on the fabric types). Thus, we may hypothesise that only a part of the upper kiln fill (LGR:0009) was connected to the kiln's last firing run while another part was deposited there as the result of later repeated disposal actions (**§D7.1**). A selection of samples from the kiln fill is currently being studied by Silvia Amicone (Tübingen) in order to assess the pyrotechnological implications in more detail.

83 For the results of the residue analysis of this vessel see Chapter E3.

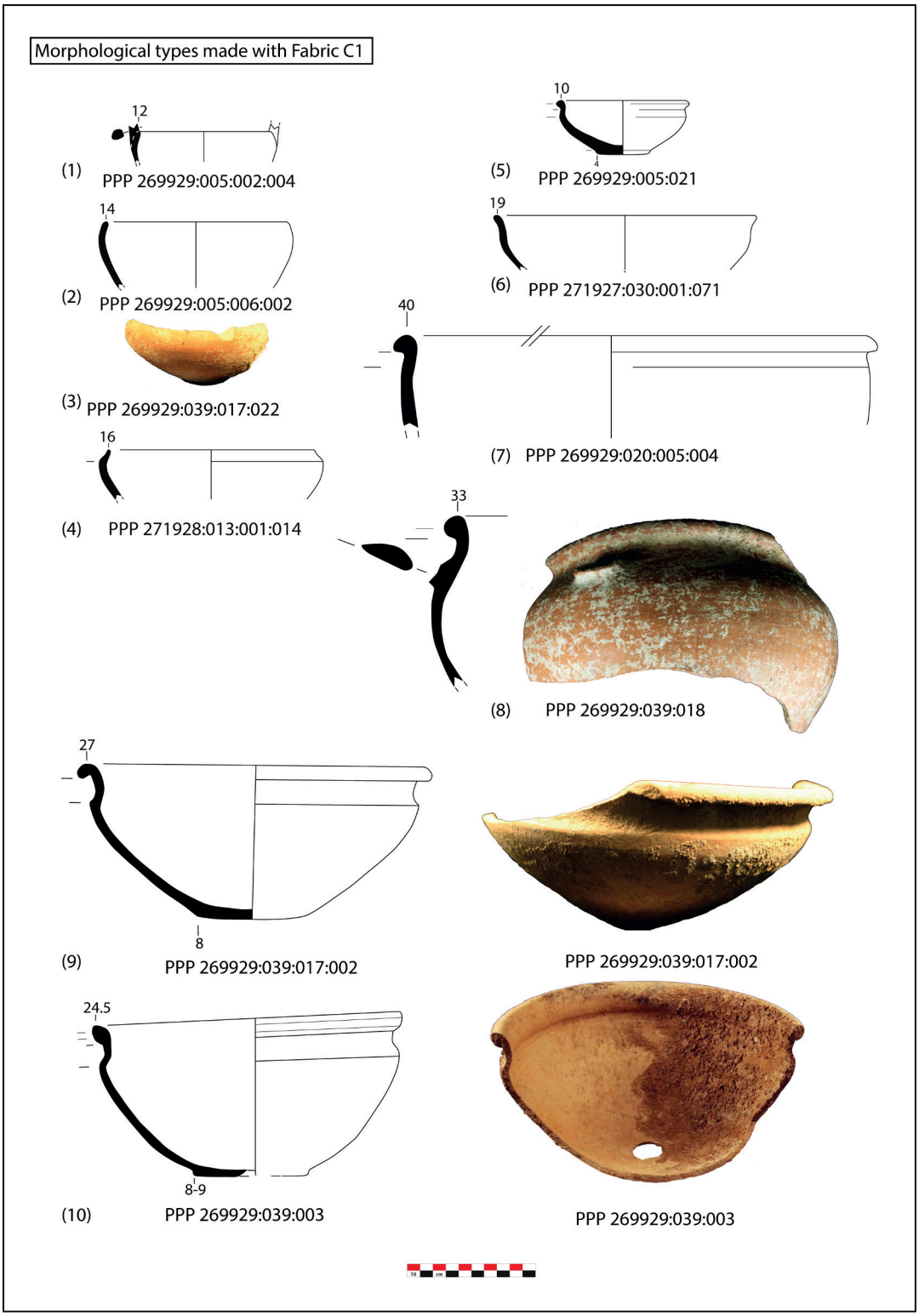


Fig. E1.1: Hemispherical bowls (1-4), carinated bowls (5-7, 8-10) and deep bowl (8), all made with Fabric C1. Prepared by Jean-Jacques Herr.

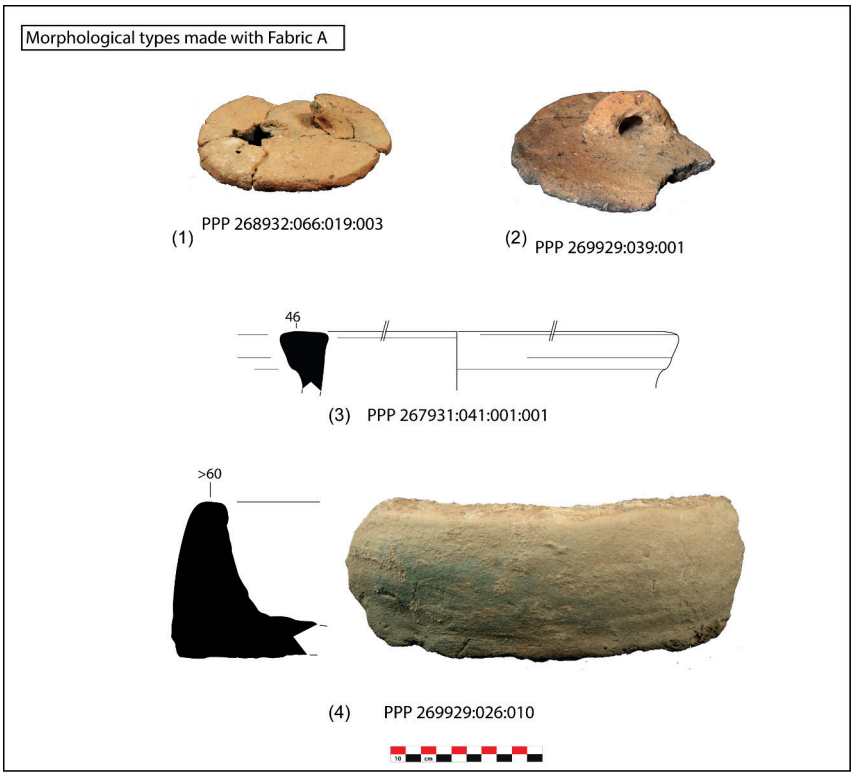


Fig. E1.2: Lid or plate (1), lid (2), jar (3) and tray (4), all made with the coarse Fabric A. Prepared by Jean-Jacques Herr.

E1.1.2 Pottery from Building A Room 23

The floor of this room Locus:272927:019 has yielded an almost complete smashed jar PPP 272927:020:004 (**Figs. D5**; **E3.1**), featuring a large quasi-rectangular rim thickened on the outside, with 28 cm diameter, and a shoulder marked by a rectangular band section with two circular lugs (PPP 272927:020:004:001-004). More than 23 kg sherds of this jar were collected from the floor together with a carinated bowl (also part of the collection PPP 272927:020:004, **Fig. E3.2**), both the jar and the carinated bowl were made with a C1 fabric (**Fig. E3.2**). The discovery of this jar with its preserved rim allowed us to link some similar rims found in 2015 (*e.g.*, **Fig. E1.2: no. 3**) with this type of jar. Interestingly, a concentration of phytoliths found around the neck and the mouth of the jar may argue for the presence of a textile closing the mouth. The jar was sampled for residue analysis.

E1.1.3 Pottery from Building F

Courtyard 21 yielded an almost complete jar with a hollowed band on its shoulder (PPP 268932:011:007) which was recovered as part of a fill in the south-eastern corner of the courtyard. It was sampled for residue analysis.

In the same courtyard, LGR:0113 (composed of Locus:268932:020 and Locus:267932:020), located next to the two ovens (Locus:268932:050 and Locus:268932:052), provided *in situ* ceramic material. A complete disintegrated bowl (PPP 268932:020:001) was found in upside down position. A collection of sherds (PPP 268932:050:001) belonging to a pot with B fabric was recovered inside one of the ovens (Locus:268932:050). Residue analysis was carried out on this pot as well as on the base of a small jar found just outside the same oven (PPP:268932:020:014, **Fig. E3.6**).

Inside the fill of the hole for the water pulling installation found in Courtyard 21 (Locus:268932:012), half of a burnished handle pot made with C1 fabric has been found set upside down around a stone tool (PPP 268932:012:009) (**Fig. E1.3: no. 2**). The remaining half of it (PPP 268932:021:008) was found in the deposit overlaying the floor LGR:0078. This type was already identified last year (PPP 269929:005:014:053 and PPP 269929:005:014:054), but the circular lug is a new feature noticed in 2016.

Room 28, where an oven was found, has provided sherds of cooking pots characterised by the calcite tempered fabric B on the floor LGR:0115 next to an oven (Locus:268932:056). An unusual sherd of a burnished handled pot (PPP 268932:066:020:001) was recovered next to it, close to a baked brick. The handle consists of a large strap handle set on the rim and the shoulder and marked on the outside by 3 large uneven grooves. In this same deposit overlaying the floor a complete lid or a "bread baking" plate (PPP 268932:066:019:003) was found. It consists of the coarse fabric A with a handle on its centre (**Fig. E1.2: no. 1**)

The other types found in this architectural complex were typical of the assemblage of Gird-i Bazar, such as carinated bowls, incurved rim bowls and necked jars with hollow band on the shoulder.

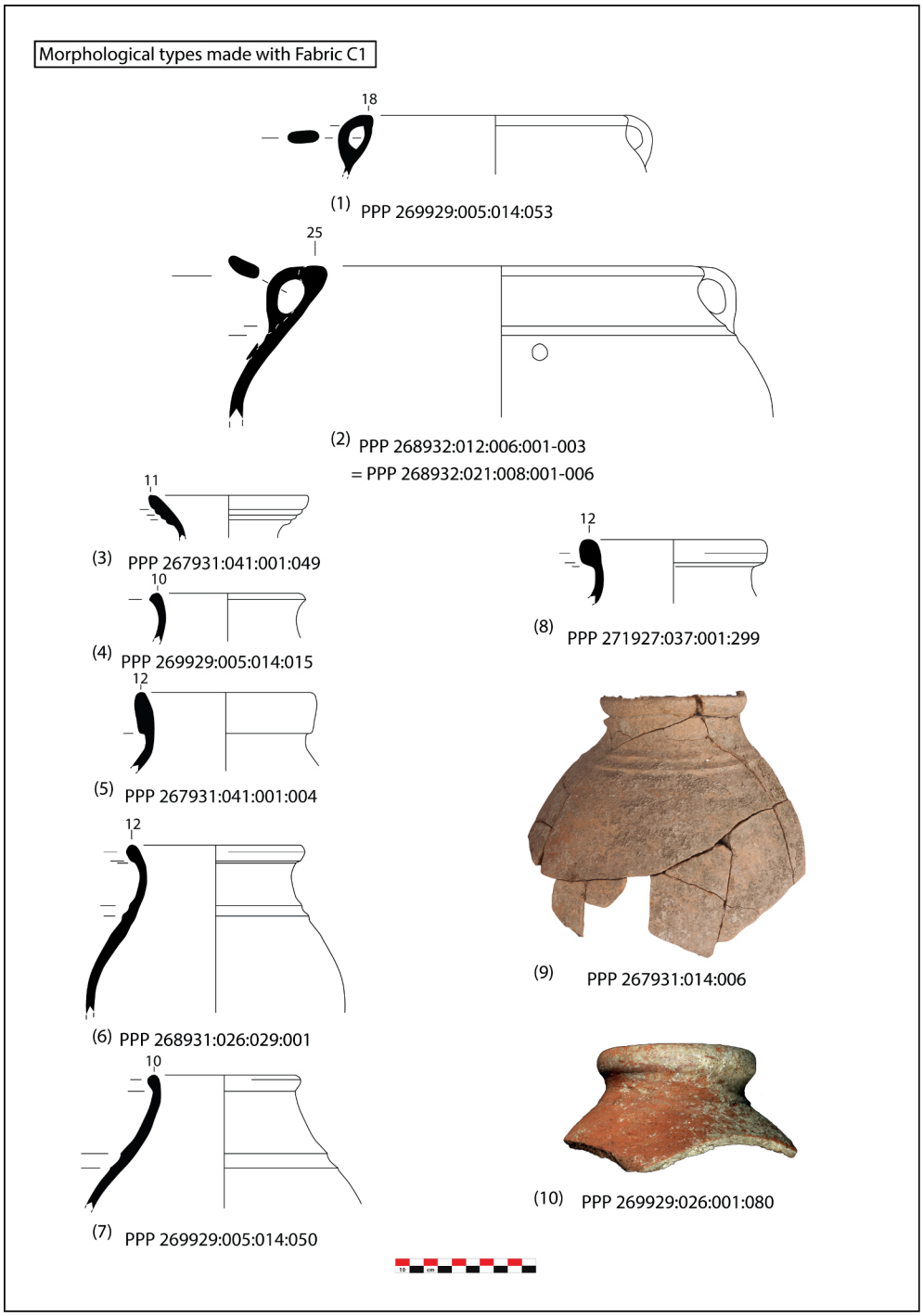


Fig. E1.3: Jars made with Fabric C1. Prepared by Jean-Jacques Herr.

E1.1.4 Pottery from Building D

Unfortunately, it was not possible to study during this campaign all the collections coming from the deposit overlaying the floor Locus:268931:046 in Room 27. The collection PPP 268931:046:049 includes an almost complete smashed tripod bowl with a convex bottom (PPP 268931:046:049:008-009) and a smashed pot of C1 fabric with an incurved rim grooved on top and circular lugs with a disc base and grooves under the rim (PPP 268931:046:049:018-020). Noteworthy is the body sherd 269931:008:003:001 (**Fig. E1.4: no. 5**) with zoomorphic lugs, probably from a similar deep bowl or another closed vessel.

E1.1.5 Pottery from Building E Room 19

Inside Building E / Room 19 few sherds have been found within the deposit (Locus:268931:026, part of LGR:0166) above the floor Locus:268931:027. These are mainly sherds of carinated bowls and necked jars made with C1 petrographic fabric. In deposits above floors, we also found a large specimen of a small necked jar (PPP 268931:026:029:001) marked with a hollow band, burnished and made with C1 fabric (**Fig. E1.3: no. 6**) and a carinated bowl (PPP 268931:041:005) broken in half by a large modern pit. An almost complete carinated bowl from a fill (PPP 268931:031:003; **Fig. E3.5**), that had been cut in half when a modern pit was dug, was sampled for residue analysis.

E1.1.6 Pottery from the Sasanian period levels

During the excavation of the erstwhile "Connecting Trench" in Square 268930, sherds with wavy combed incised decoration (*e.g.*, PPP 268930:027:001:013) were found on the floor of the Sporadic Occupation Period. It is worth to notice that, as in 2015, this area was the only one which yielded wavy combed decorated sherds (e.g., PPP 268930:005:001:036). The fabric is similar to C1 but looks slightly coarser. The colour is more pinkish than the one usually found on Gird-i Bazar pottery (**Fig. E1.4: no. 4**).

E1.2 Technological analysis

An important aspect of the study of the Gird-i Bazar pottery concerns the technological traditions adopted by the potters to create their vessels. We will first outline the framework of the technological study and the methodology applied before we present the results.

E1.2.1 The basic framework and the wheel throwing/wheel coiling problem

The technological study of Gird-i Bazar pottery falls within the broader framework of the technological analysis of the Middle and Neo-Assyrian pottery conducted in previous studies. In these studies, it has been argued that the pottery of the Neo-Assyrian period shows a high level of standardisation, and this has been connected to the supposedly general use of wheel throwing, a technique which is thought to have become widespread already in the Middle Assyrian period of the Late Bronze Age[84]. More recently, however, some technological observations have changed this picture, thanks to the use of new methods of investigations and tools. This section will briefly review the ideas concerning the wheel throwing and wheel coiling techniques during the Middle and Neo-Assyrian periods and highlight what the Gird-i Bazar pottery study can add to the current debate.

In his study on the 2nd millennium BC pottery from the Northern Mesopotamia, Peter Pfälzner developed a model of pottery production that implied pottery standardisation, mass production and general use of wheel throwing, although he observed that some pottery vessels appear to have been formed differently, by coiling and then shaping on a slow wheel[85]. Kim Duistermaat, who studied the Middle Assyrian pottery of Tell Sabi Abyad, disagreed with Pfälzner's observations regarding coiling and slow wheel use because these techniques would not fit with the mass pottery production model that both she and Pfälzner deem characteristic of the Middle Assyrian period pottery production[86]. To her mind, using the wheel coiling technique would seem "odd" and is not a "quick and careless way to produce pottery" suitable for a "mass production" in a "manufactory" type economy[87].

It seems clear that these studies are biased against the use of coiling and slow wheel for two main reasons: firstly, because they see these techniques as not efficient enough for mass production; secondly, because they assume that the Middle Assyrian period economy relied on pottery mass production. The latter is seen by these scholars as a mass production economy anticipating the economic growth and political development of the Neo-Assyrian imperial period. Duistermaat's arguments against coiling

84 Duistermaat 2008, 375-383, providing many observations on the use of wheel throwing at Middle Assyrian Tell Sabi Abyad in Northern Syria.

85 Pfälzner 1995, 244-245.

86 Duistermaat 2008, 379.

87 Duistermaat 2008, 378 fn. 141.

Fig. E1.4: Fabric B bodysherd (1), Dino-Lite microscope images showing fluid striations (2, 3), decorated sherds (4, 5). Prepared by Jean-Jacques Herr.

and slow wheel use would seem to be solely based on these assumptions rather than on any factual counter-evidence.

Concerning the Neo-Assyrian period, technological analyses have long led to the identification of the use of the wheel throwing technique although one must stress that these observations were conducted only macroscopically and on a restricted range of vessels[88]. More detailed analyses were recently conducted by Alice Hunt[89], who assessed the pottery both macroscopically and through thin-section analyses. Hunt identified the use of wheel throwing on the so-called "Palace Ware", a characteristic Neo-Assyrian fine ware with very thin walls of 0.2 cm. Her study developed a set of methods for recognising the wheel throwing technique, for example by looking at the orientation of the inclusions and by closely observing the section of the vessel, which typically would develop from a thicker bottom into a thinner upper part. Although very useful, her observations about the use of wheel throwing in the Neo-Assyrian period are exclusively based on the study of the "Palace Ware", an elite pottery production typical of the royal residences and the centres of the Neo-Assyrian Empire. To draw the conclusion that all Neo-Assyrian pottery was wheel-made and that coiling technique was obsolete is of course untenable. Indeed, F. Janoscha Kreppner observed the coiling technique on a group of large vessels found in the Neo-Assyrian period "Red House" of Tell Sheikh Hamad in north-eastern Syria[90]. One must therefore be prepared to allow for the use of the coiling technique in the Neo-Assyrian period.

Finally, if one considers the previously mentioned assumptions about the connection between wheel throwing and the existence of a mass pottery production economy, then the issue between wheel throwing and coiling techniques ultimately concerns the organisation of pottery production in the framework of the Neo-Assyrian Empire. Issues to be explored are, for example, how widespread the use of the fast wheel was across the Empire, whether the organisation of the pottery production was the same or similar across Empire, or whether there was an economic variability related to geographic areas and social groups within Assyrian society. Once more data are available, the technological study of the Gird-i Bazar pottery can potentially cast new light on these issues thanks to the site's location on the eastern frontier of the Empire, far away from the imperial centres.

These issues constitute the research context of the technological study of the Gird-i Bazar pottery. Based on the data from the first two excavation seasons, we will present below the methodology, the technological observations and some preliminary results that can be derived from these observations. Future campaigns will hopefully provide us with more data to tackle these research questions.

E1.2.2 Methodology

The technological study of the Gird-i Bazar pottery is based on the *chaîne opératoire* methodology developed by Valentine Roux[91], which focuses on the study of the macro-traces left by the potters before firing the vessels. Moreover, in studying the Gird-i Bazar pottery we give particular attention to the archaeological contexts in which the ceramic material was found, as this will allow us to assess the distribution of the techniques, and any variations, across the settlement.

As a first step in our technological assessment, the macro-traces left on the fired vessels are observed and described, both on the inside and outside walls of diagnostic sherds as well as in their sections; this helps to identify and reconstruct fashioning techniques. Then the fabric is classified. On site, the profile and the topography of the sherds as well as the granulometry are observed with the naked eye and then documented with a Dino-Lite Digital Microscope (model AM4113T, with up to 200x magnification) (**Figs. E1.5-11**). At the Competence Center Archaeometry Baden-Wuerttemberg (CCA-BW) at the University of Tübingen, thin section analysis was performed by Silvia Amicone on 77 carefully selected samples (**Chapter E2**), which further aided the technological assessment.

E1.3 Results

In the following, we present the results of the technological study, starting with the presentation of the various fashioning techniques identified and followed by the macroscopic description of the fabrics. The latter update, slightly correct and therefore replace the classification offered in the report on the 2015 season[92]. This improvement was possible thanks to Silvia Amicone's aforementioned thin section analyses. The association of techniques and fabrics then leads to the identification of techno-petro-

88 Rawson 1954.
89 Hunt 2015.
90 Kreppner 2006, 97: "Wulsttechnik", "Großgefäße 11".
91 Roux 2016.
92 Herr 2016.

graphic groups (abbreviated in the following as "TechP"), representing different *chaînes opératoires*.

E1.3.1 Catalogue of fashioning stages and techniques

We organise our description of the techniques used to make the Gird-i Bazar vessels by fashioning stages. The first stage is "forming", which corresponds to the very first step in the work process after the fabric has been prepared. The second stage is "shaping"[93], which gives a shape to the vessel. The third stage is "finishing", referring to the final treatment of the vessel such as coating, burnishing or brushing, which usually leaves visible traces on the surface. An additional fourth stage of "decorating" is optional.

Each of these stages manifests itself in one or more fashioning techniques which are described below. The interpretations offered here are preliminary and based on data derived from the first two excavation campaigns in 2015 and 2016. Additional techniques may well be identified in future finds.

E1.3.1.1 Fashioning Stage 1: Forming

Forming Technique: Coiling

Based on the pottery discovered so far, the first step in the *chaîne opératoire* for forming a vessel at Gird-i Bazar normally consists of assembling coils of different size ranging from 0.5 to 3 cm (**Figs. E1.6: nos. 1-2**, **E1.7: no. 3**).

Sherds from Gird-i Bazar frequently exhibit a preferential horizontal fracture (**Fig. E1.5: no. 1**). As noticed for example by Valentine Roux, preferential horizontal fractures are caused by the weakest part of the assembled elements, that is the horizontal joins between the coils, as vessels made with the coiling technique tend to fracture along the lines where coils were joined[94] (**Figs. E1.5 no. 3**, **E1.6 no. 3**). This may explain why of some sherds only the rim, without any part of the body, is preserved.

A closer look at the section of sherds with preferential horizontal fracture shows that the inclusions are distributed in a circular arrangement (**Fig. E1.5: no. 2**); this would seem to be the result of rolling the clay on a solid base, which produced the cylindrical coil[95]. Such a circular distribution of the inclusions was also noticed in the thin-section analysis.

Various ways of arranging the coils are attested in the Gird-i Bazar pottery: The coils are set in an outside position, with oblique joins visible (**Fig. E1.6: no. 4**); or the coils are set one above the other, alternating between an inside and an outside position (**Figs. E1.5: no. 4-5**). In some cases, the coil exhibits a "U" shape in its lower part that allows for a better fit with the cylindrical surface of the coil below (**Fig. E1.7: no. 2**)[96].

Coils are used in all parts of the walls of the Gird-i Bazar vessels, from base (**Fig. E1.7: nos. 3-5**) to body (**Figs. E1.5: no. 4**; **E1.6: nos. 4-6**) to neck (**Fig. E1.6: no. 3**) and to rim (**Fig. E1.5: nos. 2-5**). Some rims are created by adding a separate coil, what we call a rim "thickened towards the inside or the outside", respectively **(Fig. E1.5: nos. 2-3**). These are to be distinguished from "folded" rims where the wall is folded either on the inside or the outside (**Fig. E1.7: no. 6**) to create the rim.

E1.3.1.2 Fashioning Stage 2: Shaping

A range of diverse macro-traces suggests the use of a repertoire of different shaping techniques at Gird-i Bazar. This variability is likely to be linked to the morphological characteristics of the vessel, such as open vs. closed shape, which of course affects whether a specific technique can be applied or not.

Shaping Technique: Smoothing without rotative kinetic energy (RKE)

Vessels without any traces for the use of rotative kinetic energy (RKE) are interpreted as having been smoothed by hand. This interpretation is based mainly on the absence of macro-traces indicating the use of a slow wheel.

Shaping Technique: Slow wheel

The traces produced by the use of a slow wheel have been noticed on such shapes as the hemispherical rim bowls, the carinated bowls, the necked and handled pots and the necked jars exhibiting fluid sub-parallel striations under the rim or, for closed shapes, on the inside wall (**Fig. E1.8: no. 2**), where no surface treatment and finishing was performed (**Fig. E1.9: nos. 1-3**). Occasionally, it is possible to see these thin sub-parallel striations between the thicker striations of an uneven burnishing, as visible in the inside wall of a fragment from a carinated bowl (PPP 269929:020:005:004; **Fig. E1.8: no. 1**).

93 In French, "le préformage", see Roux 2016, 64.

94 Roux 2016, 202 Fig. 2.25.

95 Roux 2016, 197 Fig. 2.20.

96 Similar in Roux 2016, 188 Fig. 2.13a.

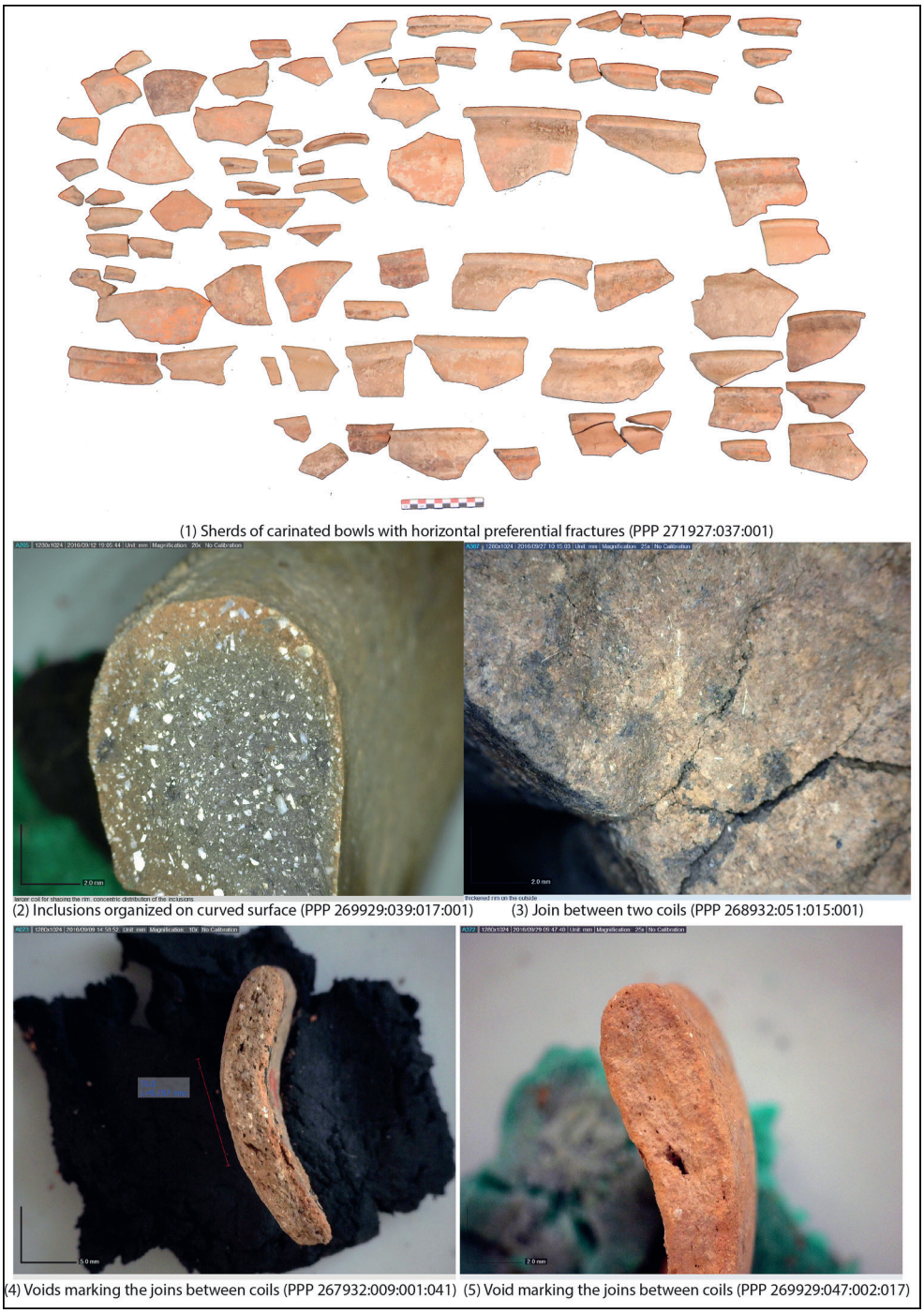
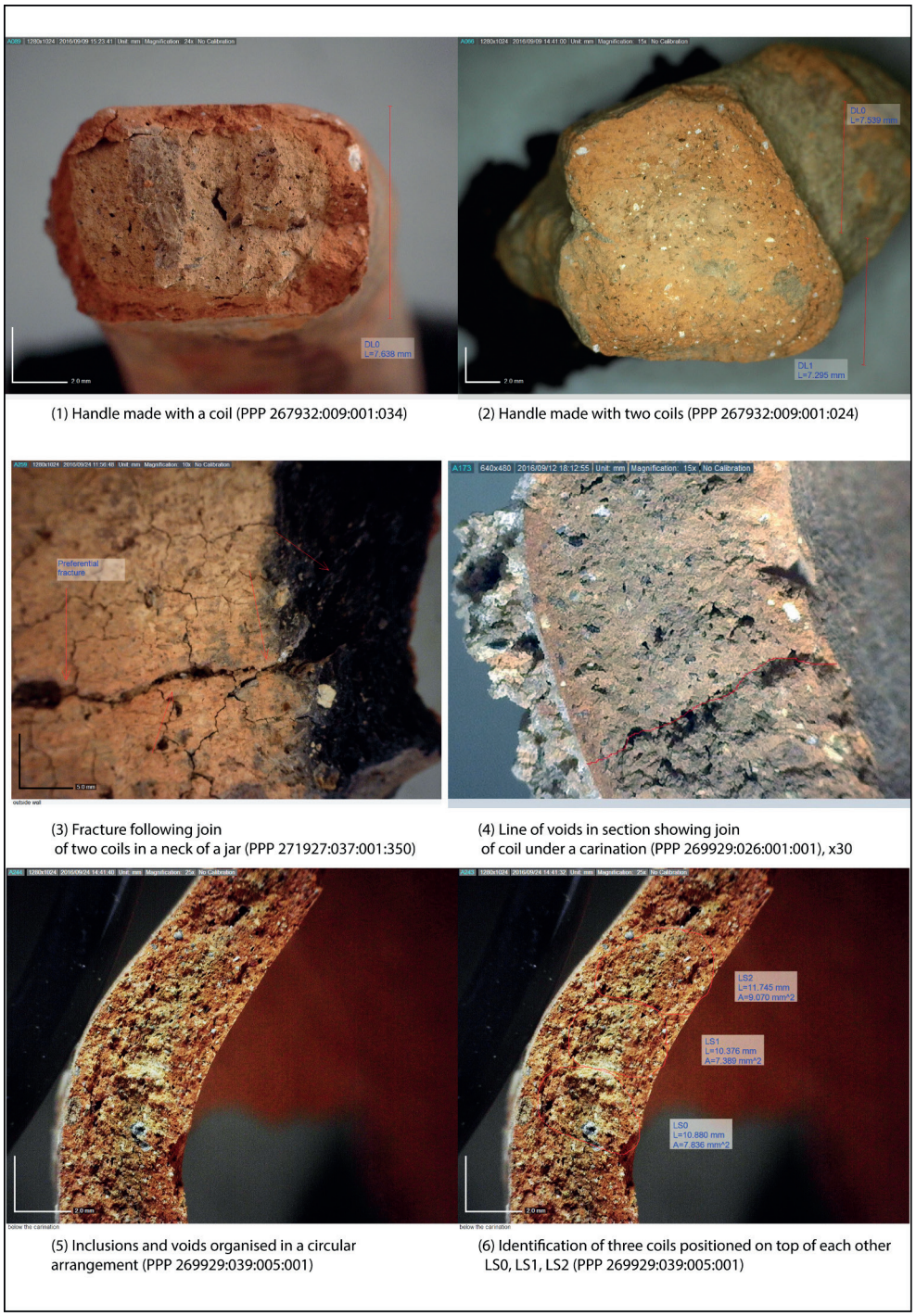


Fig. E1.5: Sherds showing horizontal preferential fractures (1), Dino-Lite microscope images showing evidence for coils (2-5). Prepared by Jean-Jacques Herr.



(1) Handle made with a coil (PPP 267932:009:001:034)

(2) Handle made with two coils (PPP 267932:009:001:024)

(3) Fracture following join of two coils in a neck of a jar (PPP 271927:037:001:350)

(4) Line of voids in section showing join of coil under a carination (PPP 269929:026:001:001), x30

(5) Inclusions and voids organised in a circular arrangement (PPP 269929:039:005:001)

(6) Identification of three coils positioned on top of each other LS0, LS1, LS2 (PPP 269929:039:005:001)

Fig. E1.6: Dino-Lite microscope images showing evidence for coils.
Prepared by Jean-Jacques Herr.

(1) Voids in section showing join of coil (PPP 269929:039:017:021)

(2) "U" shape lower surface of coil (PPP 268930:036:001:007)

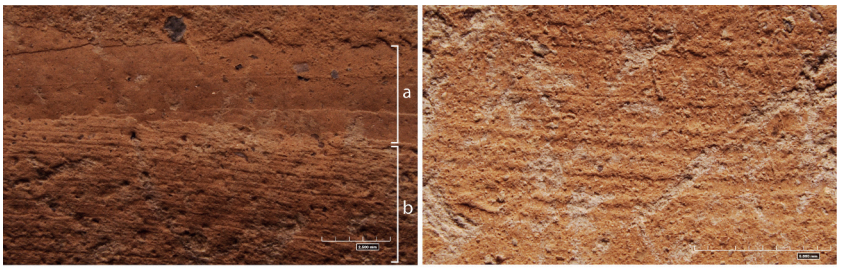
(3) Disc base with grooves made with coils of 4 mm diameter (DL0 and DL1) (PPP 270929:019:006:003)

(4) Voids marking a coil in the disc base sherd (PPP 269929:039:005)

(5) Coils above a flat base (PPP 268931:005:001:038)

(6) Folded rim towards the outside (PPP 268932:066:020:008)

Fig. E1.7: Dino-Lite microscope images showing evidence for coils (1-5); folded rim (6). Prepared by Jean-Jacques Herr.



(1) Thick compact striations of burnishing above (a) fluid sub-parallel striations made on a slow wheel (b). (PPP 269929:020:005:004) (Photography taken with a Hirox Microscope)

(2) Sub-parallel fluid striations made on a slow wheel (PPP 269929:005:014:050) (Photography taken with a Hirox Microscope)

Fig. E1.8: Dino-Lite microscope images showing striations resulting from slow wheel use and burnishing. Prepared by Jean-Jacques Herr.

In shapes such as the thin incurved rim bowls, the coils have elongated shapes likely due to the use of a slow wheel after the rough shape had been created by coiling (**Fig. E1.5: no. 4**). Marks for the use of a slow wheel are visible on some examples of carinated bowls where the "neck", i.e. the area above the carination and under the rim, shows sub-parallel striations, likely created by the combined actions of the potter's fingers and water. These striations run fluidly along the surface of the vessel (**Figs. E1.8: nos. 1-2**, **E1.9: no. 2**)[97]. It appears that the potter's hand rotated around the vessel's complete circumference, as the striations do not present any gaps in the orientation.

Such gaps are however visible in the striations of the cooking pots, about whose inclusion in the "slow wheel" shaping technique category therefore must remain some doubts (see below on TechP 4; **Fig. E1.4: nos. 2-3**). For the moment, we must base our assessment on sherds. We have yet to find complete vessels where we can follow these striations without interruptions along their circumference in order to have more evidence for the slow wheel use.

Shaping Technique: Planing[98]

On the inside walls of closed vessels made with C1 fabric, such as the necked jars, deep vertical lines (**Fig. E1.10: no. 1-5**) starting right under the neck can be noticed with scalloped edges (**Fig. E1.10: nos. 2-3**). This would seem to indicate the use of planing to make the vessel's surfaces more even and thin down the walls while the pots were of leather-hard consistency[99]. A hard tool, perhaps even a sherd, would have been used as a plane to obtain such a result.

There is a chance that planing may have been applied also to the lower part of carinated bowls as the walls are here often thinner than in the upper part. This hypothesis is based only on the observation of the vessels' uneven profile. Alternatively, this feature may be the result of clay being scraped from above the base while the vessel was of leather-hard consistency. Yet another possible explanation is that the potter used a thicker coil for reinforcing the carination in the upper part of the vessel and what looks like planing in the lower part is in fact the vessel's untouched surface.

E1.3.1.3 Fashioning Stage 3: Finishing

Before firing, a range of different surface treatments were applied to those vessels that had been shaped with a slow wheel. However, for vessels smoothed without rotative kinetic energy, only two finishing techniques have been identified: wet brushing and leather-hard brushing.

Finishing Technique: Barbotine

The finishing technique of barbotine consists of coating the surface of the vessel with a clay to which a certain quantity of water has been added[100]. The striations are fluid and their different orientation indicates that no rotative movement took place while coating the vessel by hand (**Fig. E1.11: no. 2**).

Some jar sherds from Gird-i Bazar show a thick reddish layer on their outer surfaces that can be interpreted as a barbotine (**Fig. E1.11: no. 1**). The topography of these sherds is characterised by cracks as well as protruding and floating inclusions (**Fig. E1.11: nos. 2**, **4**)[101]. In the 2015 campaign, only one rim and one body sherd exhibiting such features were found. More material became available during the 2016 campaign. The discovery of large sherds and one almost complete jar (PPP 269929:026:008) from inside the pottery kiln (LGR:0009, Locus:269929:026), led to the realisation that the protruding inclusions are the results of the barbotine being applied on the surface of vessels such as short neck jars with spherical body. Rim and body sherds of the jar from the kiln fill were sampled for thin section and physico-chemical analyses. A clear

97 Roux 2016, 191, Fig.2.16.a; 218-219, Fig.2.40.a-b.

98 In French, *rabotage*.

99 Similar observations found in Roux 2016, 216-217, Fig. 2.38.b.

100 Herr 2016 described this incorrectly as a "slip".

101 Similar observations found in Roux 2016, 242-243, Fig. 2.57.a; Fig. 2.58.d.

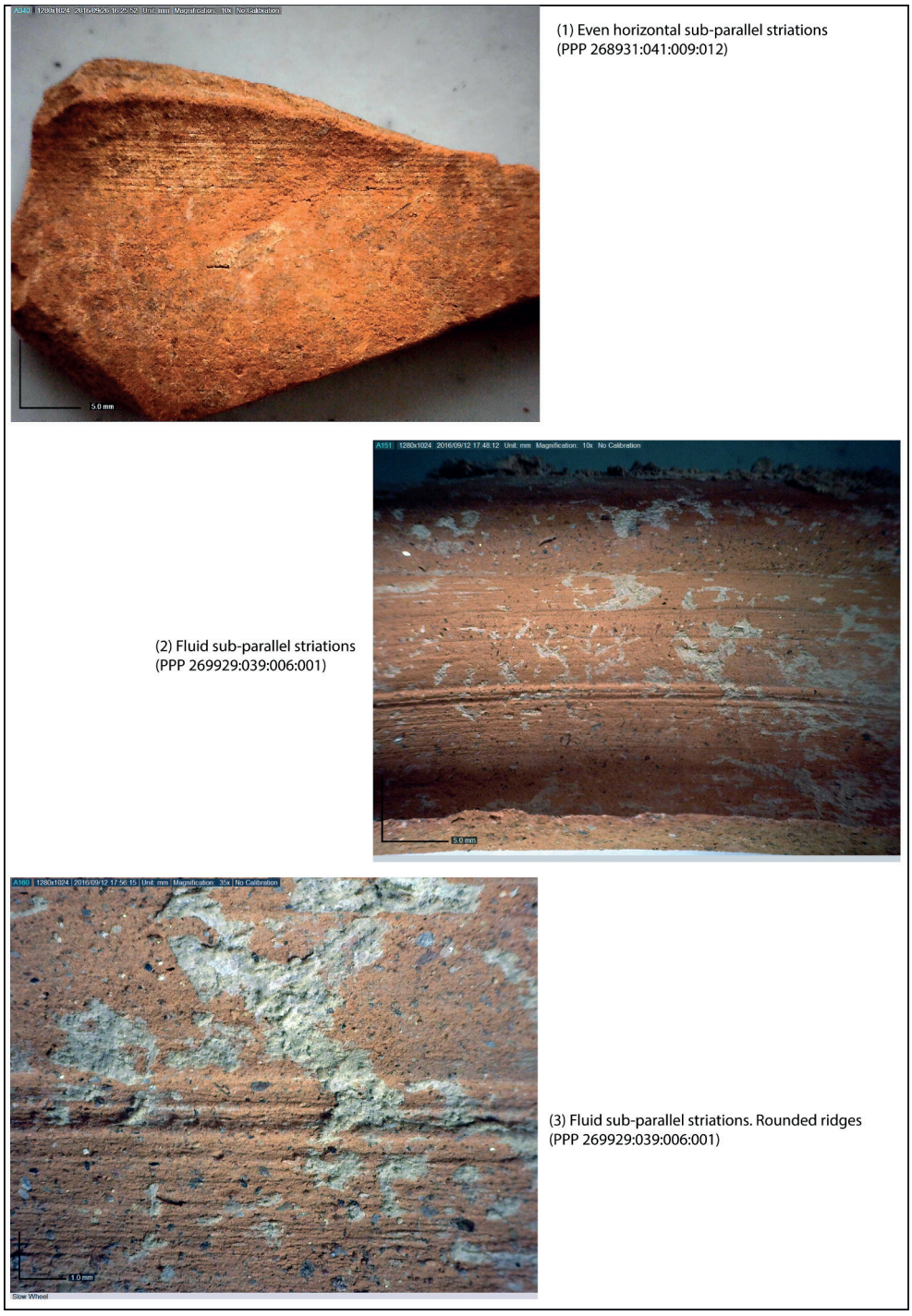


Fig. E1.9: Dino-Lite microscope images showing sub-parallel striations.
Prepared by Jean-Jacques Herr.

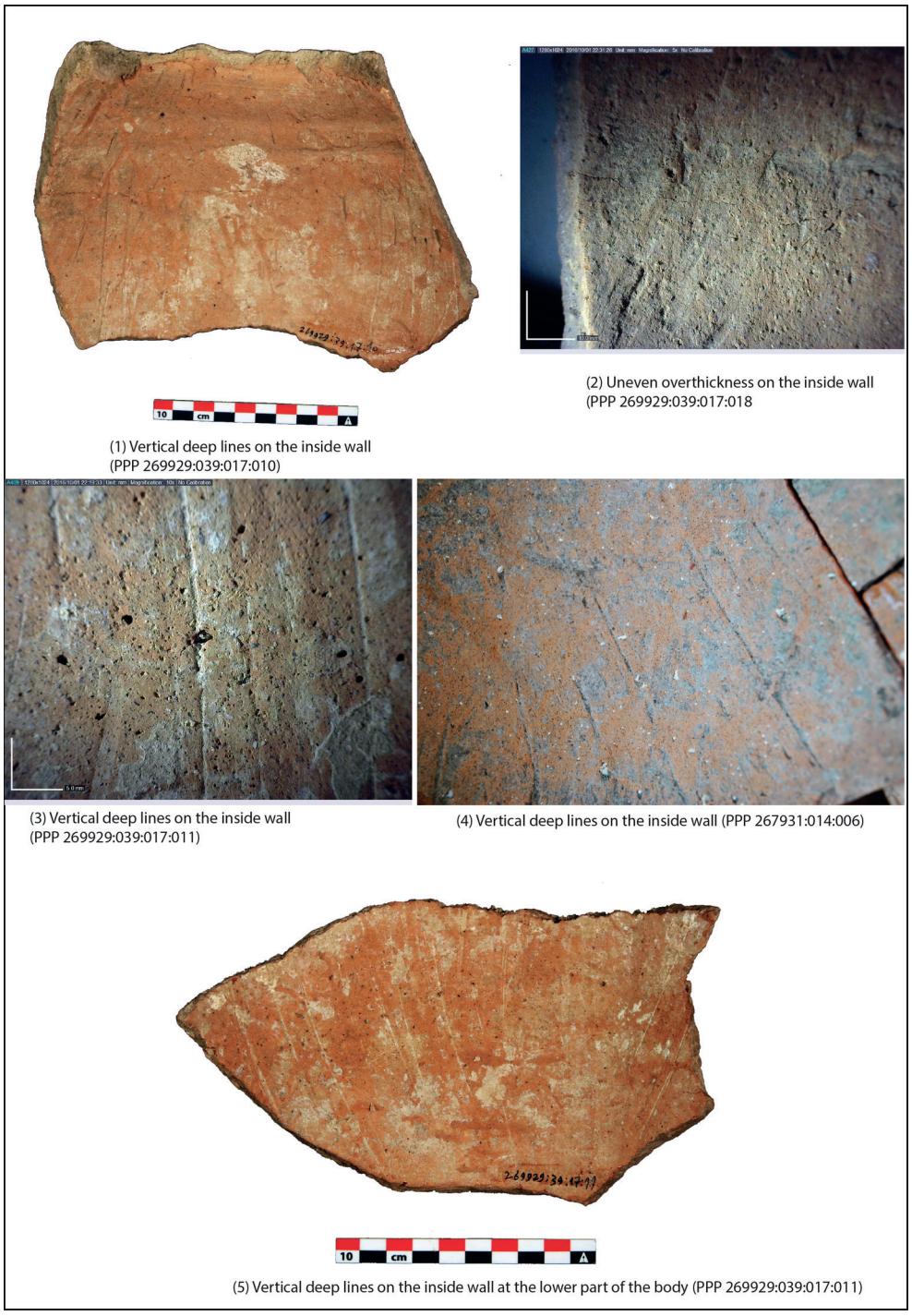
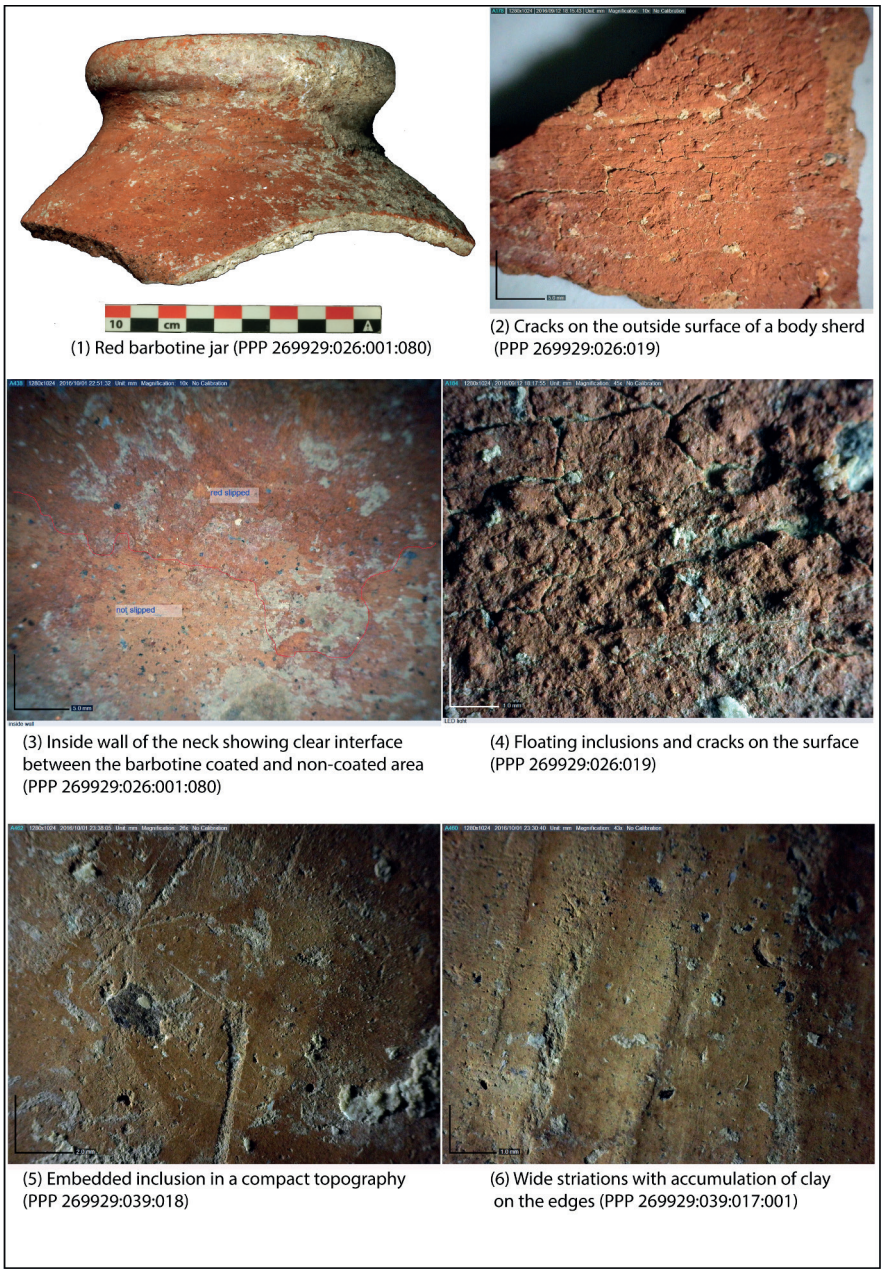


Fig. E1.10: Deep vertical lines on the inside of sherd walls (2, 3 and 5: Dino-Lite microscope images). Prepared by Jean-Jacques Herr.



(1) Red barbotine jar (PPP 269929:026:001:080)

(2) Cracks on the outside surface of a body sherd (PPP 269929:026:019)

(3) Inside wall of the neck showing clear interface between the barbotine coated and non-coated area (PPP 269929:026:001:080)

(4) Floating inclusions and cracks on the surface (PPP 269929:026:019)

(5) Embedded inclusion in a compact topography (PPP 269929:039:018)

(6) Wide striations with accumulation of clay on the edges (PPP 269929:039:017:001)

Fig. E1.11: Jar with red barbotine (1); cracks along a body sherd (2); Dino-Lite microscope images showing the difference between the barbotine coated and non-coated area on a sherd (3); floating inclusions and cracks (4); embedded inclusions (5); wide striations with clay accumulations on the edges.

interface can be observed between the red barbotine applied on the inside wall of the neck and the inside wall of the body (**Fig. E1.11: no. 3**).

Finishing Technique: Slip
On a very limited number of sherds we noticed the presence of a slip, showing as a very thin dark and shiny layer on the surface of incurved rim bowls and beakers (**Fig. E1.12: nos. 2, 6**) This assessment was confirmed by thin section analyses which show a clear interface. Research in order to evaluate the nature of this slip is ongoing.

Finishing Technique: Burnishing
Burnishing is the most frequent finishing treatment applied on the surface of Gird-i Bazar pottery. It consists of wiping the surface of the vessel with a hard tool when the vessel is of leather-hard consistency.

The traces of this technique are easily recognisable and consist of thick striations of 1-3 mm width with accumulations of clay on the edges (**Figs. E1.8: no. 1a**; **E1.11: no. 6**)[102]. This technique creates a surface with facets of varied orientation. The inclusions are thus embedded in the surface of the vessel's wall (**Fig. E1.11: no. 5**). According to Martineau's experiments[103], the relations between the exposure time for drying and the hygrometric value of the vessel can affect the lustre on the surface, producing a shiny or a matt effect.

The pattern of burnishing is very regular at Gird-i Bazar. On carinated bowls, the facets are horizontal on the inner and outer profiles right above the carination and become vertical under the carination. This pattern can also be observed on the hemispherical rim bowls.

The jars are only burnished on their outer profile and the facets are vertical both on the neck and on the lower part of the body. The luster is very variable across the morphological types and even on the surface of a single vessel. The term "burnishing" is therefore generic and covers what we can also describe as a "smoothed matt" surface treatment whose brightness is the only diagnostic criterion for differentiating it.

Finishing Technique: Leather-hard brushing/scraping
The surface of cooking pots made with fabric B is often brushed or scraped **(Fig. E1.4: no. 1**). Thin deep striations with uneven orientation characterise the inner and outer profile of these pots. The striations' unevenness may be due to the effect of the calcite inclusions present in the fabric. This technique appears to have been applied when the vessel was of a leather-hard consistency.

Finishing Technique: Wet brushing/scraping
The inner profile of jars made with fabric E shows fluid multi-directional striations with thick ridges, probably made by a brush applied on the wet surface in order to smooth the uneven wall resulting from coiling (**Fig. E1.4: no. 2**). This finishing technique was perhaps deemed necessary because vessels showing this treatment appear not to have been shaped on a slow wheel.

Also the inner profiles of cooking pots occasionally show traces that can be linked to this technique (**Fig. E1.4: no. 3**).

E1.3.1.4 Fashioning stage 4: Decorating

Overall, decorations were very rarely applied to the pottery so far recovered at Gird-i Bazar. For this reason, the techniques of this fashioning stage were not included into the classification of techno-petrographic groups (TechPs; "*chaînes opératoires*") described below and shown in **Figs. E1.14** and **E1.15**.

Decorating Technique: Stamped decorations
Based on the negative impressions left on the surface of some large jar sherds, it appears that these decorations were stamped with a tool whose cylindrical head features a regular thin rounded edge.

Decorating Technique: Modelling
Sherds with decorated lugs can be linked to the handled pot type. The zoomorphic decorated lugs discovered on pottery from Building D consist of modelled and incised small protruding animal heads with two rounded ears and a mouth[104]. The narrow and protruding muzzle with short ears suggests that the animal is a sheep (**Fig. E1.4: no. 5**).

Decorating Technique: Wavy combed
So far, this decoration style is not attested for the Neo-Assyrian period pottery from Gird-i Bazar and currently limited to the material from the later sporadic occupation phase (late Parthian / early Sasanian). It appears on the surface of some closed vessels whose firing technique is very different from the earlier pottery of the main occupation phase. The fabric of the relevant sherds is similar to C1 fabric but looks coarser (**Fig. E1.4: no. 4**). The wavy

102 Similar traces in Roux 2016, 187 Fig. 2.12.a; 240-241 Fig. 2.55.d.
103 Martineau 2010.
104 Similar applications, combined with circular impressions, have been found in the Iron Age horizon at Bakr Awa: Miglus et al. 2013, 48 Fig. 7a.

combed decoration was created while the vessel had a leather-hard consistency.

E1.3.2 Updated macroscopic fabric description

In the 2015 report[105], we presented a preliminary macroscopic description of the fabrics, labelled with the letters A to E. This first assessment of the Gird-i Bazar fabrics was tested by means of microscopic analysis in 2016 and this led, as was to be expected, to an update of the fabric classification.

This section presents the updated macroscopic descriptions of the fabrics of Gird-i Bazar pottery which are now labelled with the letters A to F (not always matching the letters used in the 2015 classification!). The fabrics, as described in the present chapter, correspond to the petrographic fabrics as discussed by Silvia Amicone in **Chapter E2** where she provides a detailed description of the compositional and technological characteristics that cannot be observed macroscopically.

Fabric A
This fabric is characterised by 20 % large sub-rounded brown and grey well-sorted inclusions, 15 % sub-rounded white inclusions and 15 % sub-rounded grey inclusions. It is used for shallow basins, plates, lids and large storage jars made with the coiling technique (**Fig. E1.2: nos. 1-4**). The wall thickness is 1.5 to 2 cm.

Fabric B
This fabric has around 25 % angular grey and white translucent inclusions. Some rectangular voids are visible on the surface of the sherds. The fabric is used for conical necked as well as neckless pots (**Fig. E1.13: nos. 1-6**) that were finished by brushing or by smoothing the leather-hard surface. This can be inferred from the unevenly oriented striations[106] that are visible on the outside. This treatment helps to level out protruding inclusions so to obtain a smooth final surface. The colour of the vessels made with fabric B is brown; they may have been fired in a reducing atmosphere.

Fabric C1
This fabric is characterized by 10 % sub-rounded fine white inclusions, 5-10 % sub-angular grey inclusions, 5-10 % angular tiny shiny yellow inclusions and 5 % sub-rounded fine red inclusions. Occasionally, vegetal rectangular voids are visible on the surface. At present, this fabric is the most commonly used at Gird-i Bazar and can therefore be classified as the "common ware" fabric. It is associated to wide range of shapes such as hemispherical incurved rim bowls, carinated bowls, necked jars and handled pots (**Figs. E1.1-3**). 93 % of the vessels made with this fabric have a wall thickness of 0.4-1 cm.

Fabric C2
This fabric is characterised by the presence of some long voids on the surface of the inside wall of the vessels, possibly indicating chaff temper. It has mineral and rocks inclusions, namely 10 % tiny shiny inclusions, 10 % sub-angular fine white inclusions and 55 % sub-angular fine grey inclusions. The fabric is used for lids, large storage vessels and for some trays.

Fabric D
This fabric is a highly levigated clay, representing the "fine ware" fabric of Gird-i Bazar. The fabric is associated to beakers (**Fig. E1.12: nos. 5-6**), carinated bowls (**Figs. E1.12: nos. 3-4**), small hemispherical incurved rim bowls (**Fig. E1.12: nos. 1-2**) and rarely small jars (**Fig. E1.12: no. 7**).

Fabric E
This fabric consists of 15 % of well sorted sub-angular white inclusions and 15 % of fine vegetal matter that left voids on the surface. Until now, this fabric is attested only for necked jars (**Fig. E1.12: no. 8**).

Fabric F
This is a fabric with 25 % of sub-angular buff inclusions. Round voids are visible on the surface of the sherds. So far, no rims or bases made with this fabric have been found but it would seem that the fabric is used only for closed vessels, possibly pots.

E1.3.3 Catalogue of the Techno-Petrographic Groups ("*chaînes opératoires*")

This section offers the reconstruction of the *chaînes opératoires* used for Gird-i Bazar pottery by cataloguing the attested combinations of the fashioning techniques described above with the petrographic fabrics (see **Chapter E2**) into "Techno-Petrographic Groups" (abbreviated TechP). Each Techno-Petrographic Group is the equivalent of one specific *chaîne opératoire*.

Labelled with consecutive numbers, the Techno-Petrographic Groups are defined as a combination of the dif-

105 Herr 2016.

106 The bottom of the striation is deep and has been made by a protruding inclusion that scratched the surface due to a smoothing movement made by the potter.

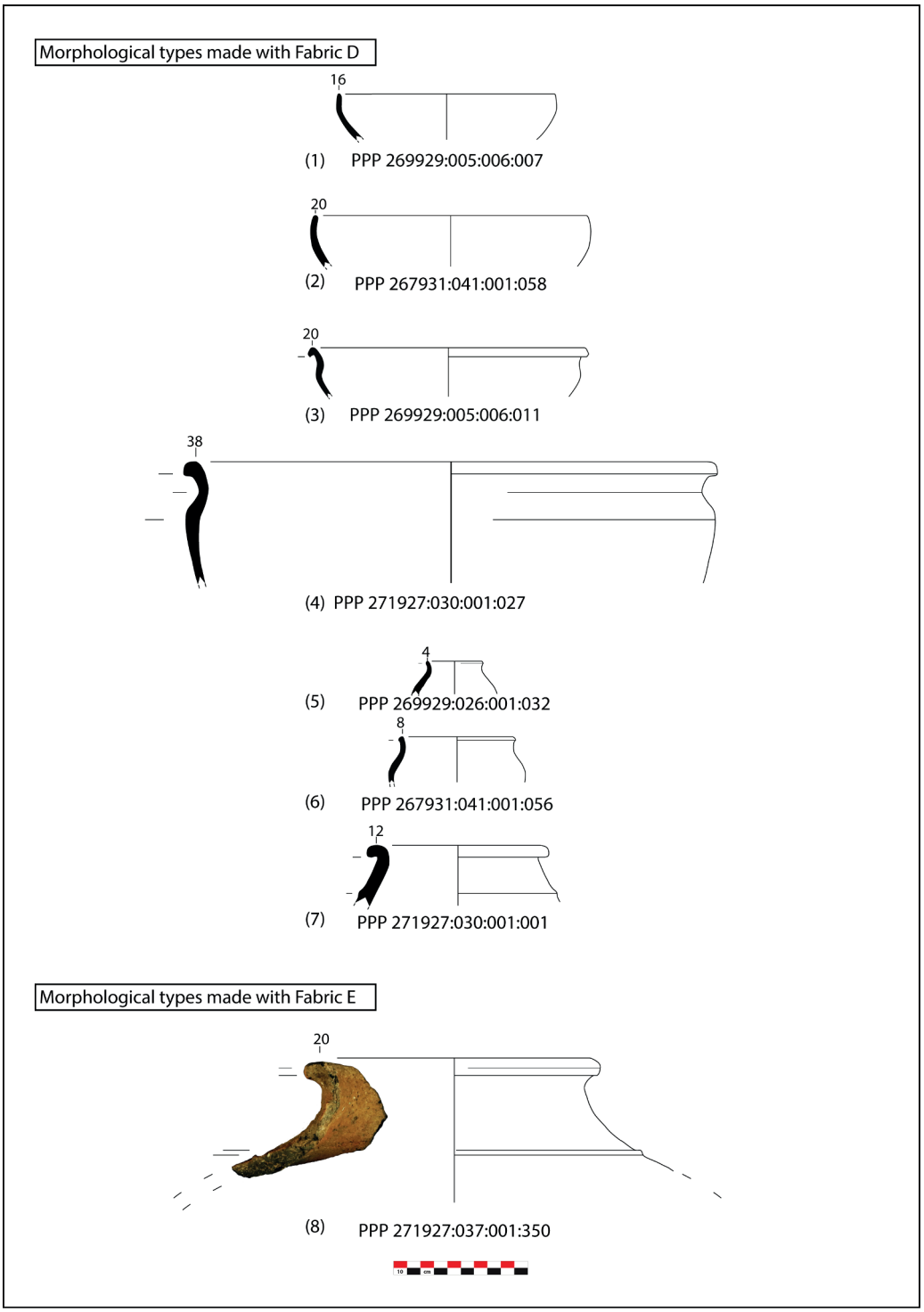


Fig. E1.12: Hemispherical bowls (1, 2), carinated bowls (3, 4), jars (5-7), all made with Fabric D; and a jar made with Fabric E (8). Prepared by Jean-Jacques Herr.

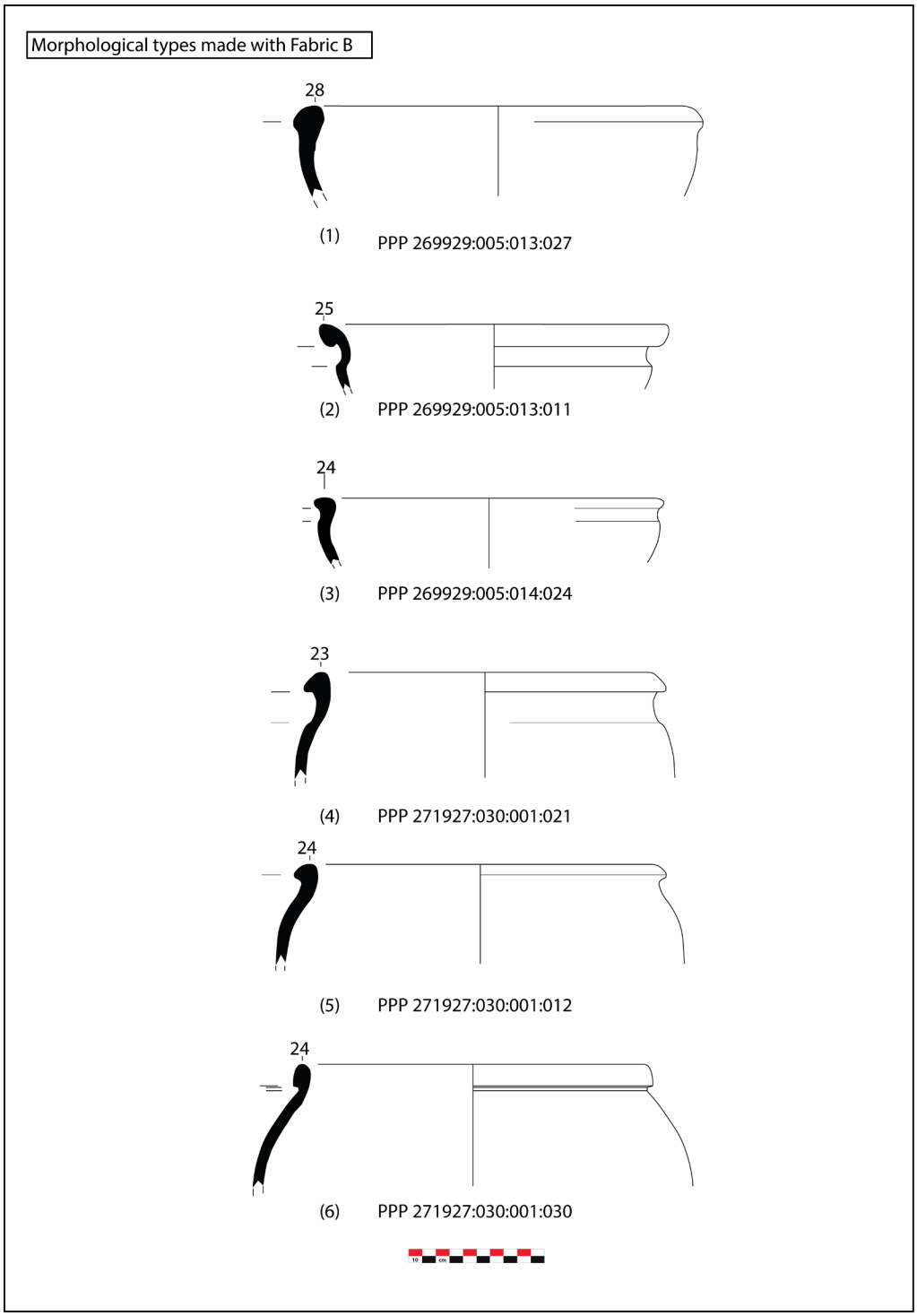


Fig. E1.13: Carinated bowls (1-5) and pot (6), all made with Fabric B.

TechP	Fabric	Technique	Fashioning stage
1 to 10	A, B, C1, C2, D, E	Coiling	1. Forming
1, 2, 3, 4?	A, B?, C1, C2, E	Smoothing without RKE*	2. Shaping
4?, 6, 7, 8, 9, 10	B, C, D	Slow wheel	
9, 10	C1	Planing	
10	C1	Barbotine	3. Finishing
7	D	Slip	
5, 6, 7, 8, 9	B, C1, D	Burnishing	
4	B	Leather-hard brushing / scraping	
3	E	Wet brushing / scraping	
non-applicable	A, C1	Stamped	4. Decorating**
non-applicable	C1	Modelling	

Table E1.1: Overview of the techno-petrographic groups so far identified among the pottery of Gird-i Bazar's main occupation phase.
* RKE = rotative kinetic energy.
** As it is not attested for the Neo-Assyrian period pottery, only for the later sporadic occupation associated with the Sasanian period burials, the "wavy combed" decoration technique (see above) is not included in this table.

ferent fashioning stages used for making the vessel and their respective techniques, which are associated with the attested petrographic fabrics. Therefore, each Techno-Petrographic Group includes the different fashioning techniques relative to each fashioning stage, plus a petrographic fabric.

As of now, we have assigned ten TechP numbers; with the excavations continuing, this must be considered preliminary. The resulting "techno-stylistic tree"[107] (**Figs. E1.14-15**) offers a concise overview of the TechP numbers: from top to bottom, the fashioning techniques have been hierarchically organised based on the stages, followed by the vessels' morphological types, the petrographic fabrics. This information is also summarised in **Table E1.1**.

TechP 1 results in vessels built up using thin coils with a diameter of 2 cm. According to the fabrics used, it is divided into two sub-groups:

TechP 1a = Fabric C1 + 1.Coiling.
Coils of fabric C1 are pressed together on a flat surface in order to make lids.

TechP 1b = Fabric C2 + 1.Coiling.
As TechP 1a, but using fabric C2 which contains some organic material.

TechP 2 = Fabric A + 1.Coiling.
Similar to TechP 1 except that fabric A is used. For now, attested for lids with handle, large trays and large storage jars. For the large storage jars and the trays, large coils of 1.5-2 cm diameter are assembled one on top of another and the surface is then smoothed. The vessels are fired in a semi-oxidizing atmosphere, and are characterized by fabric A, which acquires a reddish colour because of firing.

TechP 3 = Fabric E + 1.Coiling + 3.Wet brushing / scraping.
Results in vessels made with coils which are smoothed on the inside while the vessel is still wet, probably a brush. Fabric E contains organic temper. During the firing in a semi-oxidizing atmosphere, this temper burns and confers the characteristic blackish colour to the inner surface. The attested shapes are necked jars with a shoulder marked by a rib (PPP 271927:037:001:350; **Fig. E1.12: no. 8**).

TechP 4 = Fabric B + 1.Coiling + 2.Slow wheel (?) + 3.Leather-hard brushing.

107 Cf. Roux 2016, 272.

Coils made with the calcite tempered fabric B are used for fashioning neckless and necked cooking pots. The walls are smoothed by hands and brushed on the outside and on the inside, probably to even the surface by flattening the large protruding inclusions. The even section of the sherds suggests that these pots were shaped on a slow wheel but so far, no clear traces have been observed on the outside and inside wall to support this hypothesis. The pots are fired in a semi-oxidizing and frequently reducing atmosphere[108].

TechP 5 = Fabric B + 1.Coiling + 2.Slow wheel + 3.Burnishing.
Characterised by the use of calcite tempered fabric B, coil-formed vessels are shaped on a slow wheel and, when of leather-hard consistency, wiped on the inside and outside wall with a hard tool which achieved a smooth matt finish. So far, attested only for two carinated bowls (**Fig. E1.13: nos. 2-3**) and another bowl (**Fig. E1.13: no. 1**).

TechP 6
The majority of the vessels found at Gird-i Bazar belong to this group. The vessels are built up using thin coils with a diameter of less than 1 cm and then shaped on a slow wheel in order to even the walls. Afterwards, the vessels are burnished on the outside and on the inside both horizontally, at the rim and 2 cm beneath it, and vertically, on their lower parts. The vessels are fired in a semi-oxidizing atmosphere and, less frequently, in a reducing atmosphere.

According to the fabrics used, this TechP is divided into two sub-groups:

TechP 6a = Fabric C1 + 1.Coiling + 2.Slow wheel + 3.Burnishing.
Attested are carinated bowls and handled pots whose bottoms show an uneven profile thinning on the lowest part. This would seem to indicate that the potter cut away material from the inside of the vessel's bottom while leather-hard. However, the burnishing finish obliterated any traces of such an action.

TechP 6b = Fabric D + 1.Coiling + 2.Slow wheel + 3.Burnishing.
Results in large carinated bowls and small open vessel shapes.

TechP 7 = Fabric D + 1.Coiling + 2.Slow wheel + 3.Burnishing + 3.Slip.
Results in beakers and open vessels, such as hemispherical bowls, that are characterised by a thin dark slip on the inside and outside walls of the vessels.

TechP 8 = Fabric D + 1.Coiling + 2.Slow wheel + 3.Burnishing.
Closed vessels with an opening of less than 10 cm, such as beakers and small jars, are built up by coils and smoothed on a slow wheel. Unlike the vessels of TechP7 which are burnished on both inner and outer surfaces, these vessels are burnished only outside because this surface treatment is difficult or impossible to apply onto the inner surface due to the narrowness of the vessels' opening.

TechP 9 = Fabric C1 + 1.Coiling + 2. Slow wheel + 2.Planing + 3.Burnishing.
Vessels with a diameter of less than 1 cm are created using coils made with C1 fabric. The shaping stage probably involved the use of the slow wheel because of the thin fluid sub-parallel striations that can be observed on the outside walls. The inside walls are planed by applying a tool, maybe a sherd, vertically under the shoulder and horizontally on the shoulder. The outside surface is burnished vertically on the neck and the body and horizontally on the shoulder. On some examples, the shoulder is marked by two ridges separated by a large groove, probably made with a finger. The vessels are fired mainly in a semi-oxidizing to oxidizing atmosphere.

TechP 10 = Fabric C1 + 1.Coiling + 2.Slow wheel + 2.Planing + 3.Barbotine.
Rarely observed at Gird-i Bazar so far, this is currently only attested for short necked jars (including one with a complete profile: PPP 269929:026:008). The vessels are characterised by barbotine in the form of a layer of reddish clay that was applied by hand on the outside wall and sometimes also on the inside part of the neck.

E1.3.4 Discussion

Without exception, all vessels so far found recovered at Gird-i Bazar are coil-made. They can be divided into two main categories: vessels whose surface was smoothed by hand or by brush but without the use of a wheel (TechPs 1-4; **Fig. E1.14**); and vessels which were shaped on a slow wheel (TechPs 6-11, possibly also TechP 4; **Fig. E1.15**).

The first category of vessels comprises lids, trays and large storage vessels, made with fabrics that tend to be coarse. These vessels are made with coils of c. 2 cm diameter and in general do not show any surface treatment,

108 Curtis 1989, 41 no. 283 for comparable "cooking pots" from Khirbet Qasrij, described as "grit temper" fabric of brown colour, "fire-blackened on interior and exterior" with a diameter of 24 cm.

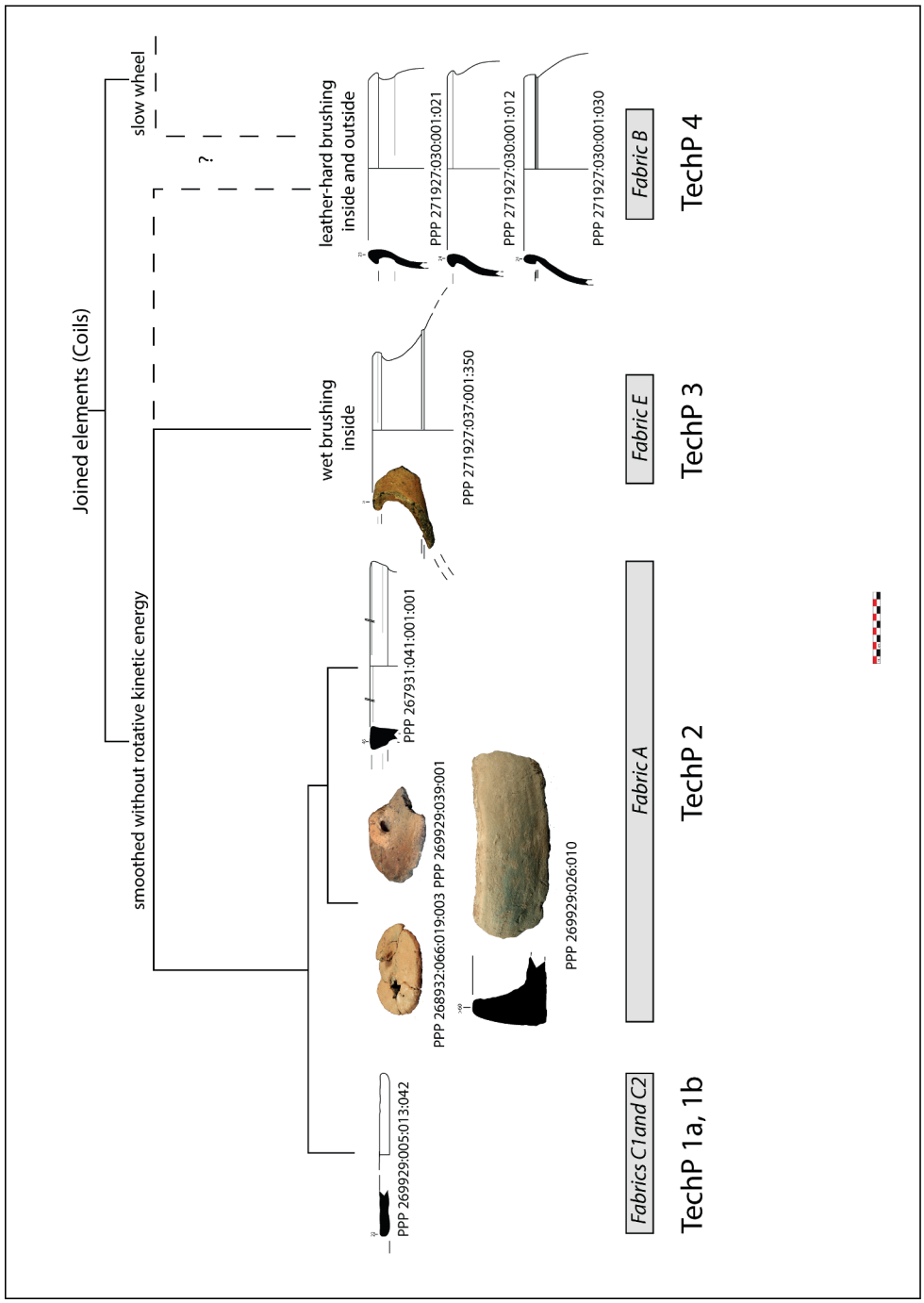


Fig. E1.14: Part 1 of the Techno-Stylistic Tree, showing (from top to bottom) the fashioning techniques arranged by stages, the morphological types, the fabric groups and the Techno-Petrographic Groups. Based on our current understanding of the Gird-i Bazar pottery. Prepared by Jean-Jacques Herr.

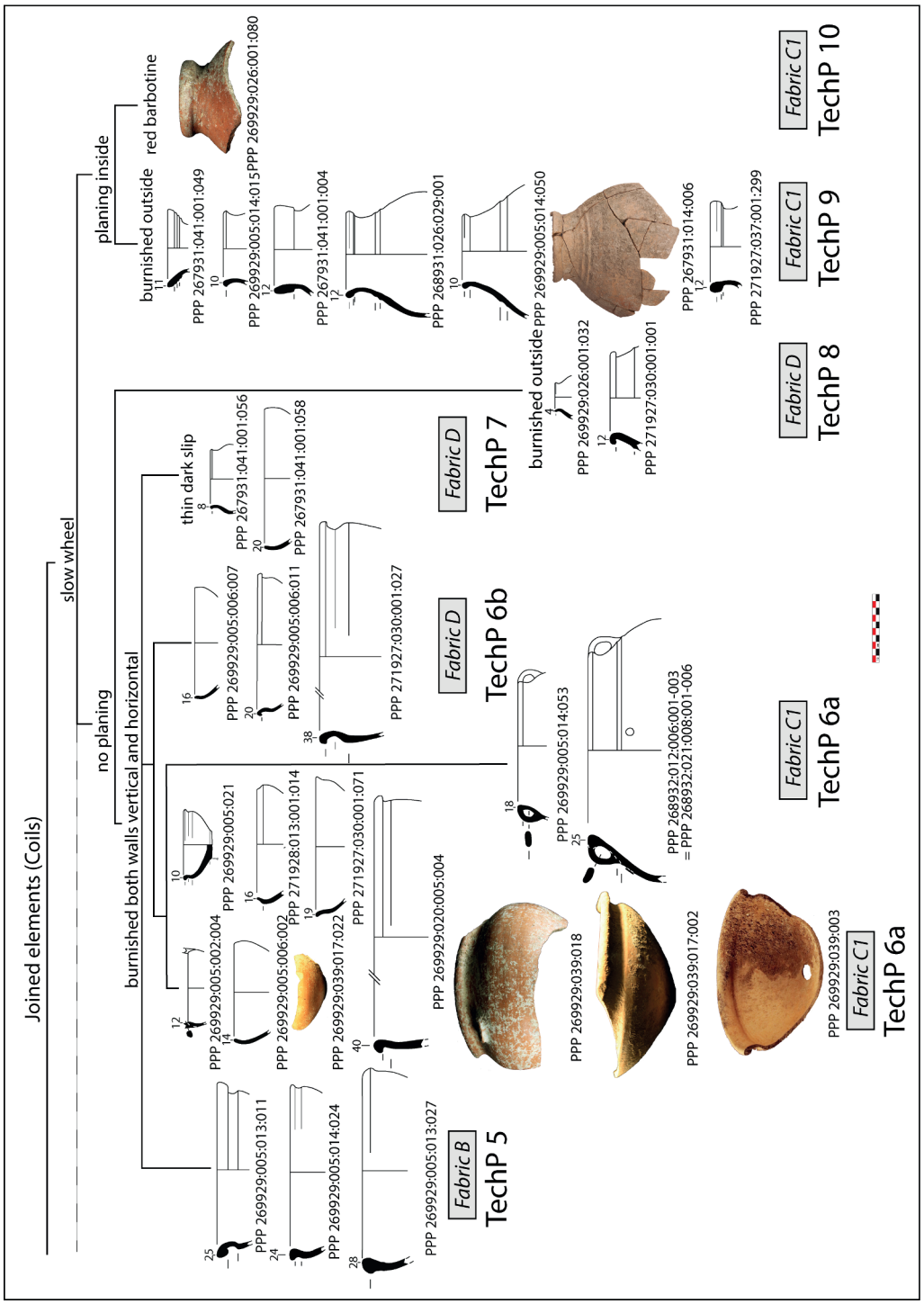


Fig. E1.15: Part 2 of the Techno-Stylistic Tree, showing (from top to bottom) the fashioning techniques arranged by stages, the morphological types, the fabric groups and the Techno-Petrographic Groups. Based on our current understanding of the Gird-i Bazar pottery. Prepared by Jean-Jacques Herr.

with the exception of wet brushing applied on the vessel's inside (TechP 3), a treatment which, however, has so far only been observed on one sherd.

The second category of vessels, constituting the vast majority attested so far at Gird-i Bazar, was shaped by use of a slow wheel. The cooking pots of TechP 4 may belong to this category but this is not certain (see below). Open vessels such as hemispherical bowls, carinated bowls and handled pots do not show any planing of their surfaces and appear to be burnished; they constitute TechPs 6-7, with the distinction mainly depending on the choice of fabric. In addition to burnishing, the bowls of TechP 7 show a thin dark slip, confirmed by thin section analysis. Vessels that only show burnishing on the outside, mainly jars, constitute TechP 8. TechPs 9-10 comprise jars that show planing on the inside, in the case of TechP 10 with barbotine.

The cooking pots of TechP 4 deserves some more attention as they represent a technologically and typologically homogeneous group made with fabric B, a fabric type that is rarely attested for other vessels. As Silvia Amicone discusses in **Chapter E2**, this fabric is characterised by the presence of sparry calcite deriving from crushed limestone. While sparry calcite improves the thermal resistance of the vessels, it also requires more time and energy for sourcing and preparation. The fact that the cooking pots of TechP 4 show a distinct *chaîne opératoire* with such a specific fabric may point towards a specialised production that went beyond the individual household scale. Whether this hypothesis holds up will be tested as additional data becomes available from newly excavated architectural contexts.

Concerning the slow wheel vs. wheel throwing debate discussed above (**§E1.2.1**), it is important to note that so far, none of the diagnostic traces for the use of wheel throwing observed by Alice Hunt in her study on Neo-Assyrian Palace Ware have been identified on the pottery of Gird-i Bazar. Only large fragments or complete vessels can provide enough information concerning the possible use of the wheel throwing. At Gird-i Bazar, however, no clear macroscopic evidence emerged from the available material.

It must be stressed that it is not easy to identify the use of the wheel for the forming stage because of the careful surface treatment applied to most vessels during the finishing stage, which tends to obliterate any marks left by the use of the wheel. This is particularly true for the open shapes. In closed shapes, the inside of the vessel is often planed (**§E1.3.1.2**), which masks possible marks characteristic of the wheel. Moreover, the high degree of erosion on the pottery of Gird-i Bazar makes it difficult to see possible wheel traces on the surface. On the bowls, only the part between the rim and the carination has the potential to show possible wheel marks. It is here that Arnulf Hausleiter observed traces of rilling on some ceramics from Assur[109]. However, even this rilling is not univocal evidence for wheel throwing.

Yet importantly, also none of the micro-structures observed by Silvia Amicone on the 77 thin-sections from Gird-i Bazar pottery (see **Chapter E2**) show any evidence for the use of wheel throwing. Whether this technique was at all used at Gird-i Bazar remains therefore an open question.

E1.4 Conclusions

The morphological types of pottery of the 2016 season match those of the 2015 campaign. They are: lids and trays; hemispherical incurved rim bowls (**Figs. E1.1: nos. 1-4**; **E.1.12: nos. 1-2**) and carinated bowls (**Figs. E1.1: nos. 5-7**, **9-10**; **E1.12: no. 4**); transfer vessels such as small and medium jars (**Fig. E1.3: nos. 3-10**); cooking pots (**Fig. E1.13: nos. 4-6**); and large storage jars (**Fig. E1.2: no. 3**). Thanks to a higher quantity of diagnostic sherds uncovered, the material found during the 2016 excavations permitted us to refine the description of these morphological types.

The morpho-typological distribution of the pottery appears to be homogenous across all the hitherto excavated areas, which supports the interpretation on the basis of the stratigraphic analysis (**§D14**) that the occupation of Buildings A, D, E and F and Outdoor Area 8, including the kiln was contemporaneous. Based on morphological and technological observations, also the pottery from Qalat-i Dinka (**§C3**) belongs to the same chronological horizon.

The technological analysis of the pottery coupled with the petrographic analysis of the fabrics has resulted in the identification of ten Techno-Petrographic Groups (or *chaînes opératoires*), and these are again represented across the Neo-Assyrian period occupation of the Dinka Settlement Complex.

Much about the overall organisation of pottery production at Gird-i Bazar is still unclear but two important points have emerged. Firstly, the cooking pots of TechP 4 (**§E1.3.4**) indicate the specialised production of specific shapes that were produced for more than one household. And secondly, the absence of any evidence for wheel-throwing, contrary to the commonly held assumptions regarding the modes of pottery production in the Neo-Assyrian Empire, has implications on our understanding of the overall pottery production not only in the Dinka Settlement Complex but the Empire more generally.

109 Hausleiter 2010, 266 on fragments of a size of 4 cm² and 25 cm², respectively.

E2. Petrographic analysis of the 2015-2016 pottery from Gird-i Bazar

Silvia Amicone

The study of pottery paste recipes and their distribution over time and space allows us to identify and follow the development of pottery traditions, thus helping us trace learning networks responsible for the reproduction of these practices. In order to better investigate the aspect of the selection and processing of raw materials, 77 diagnostic sherds were selected from among pottery assemblages recovered during the 2015-2016 excavations at Gird-i Bazar to be studied through thin section petrography.

The sherds selected are representative of the technological variability observed through the macroscopic analysis carried out by Jean-Jacques Herr and come from different sectors of the excavation (see **Table E2.1**). Priority was given to recording material from the most significant loci: the kiln and the floor levels. Particular emphasis has been given to the material discovered in the kiln (**§D7.1**).

E2.1 Methods

The petrography of archaeological ceramics consists of the description, classification, and interpretation of ceramic pastes or fabrics, adopting techniques that derived from those used in geology and soil micromorphology to describe rocks.

The primary research tool is the petrographic or polarising microscope. This microscope is characterised by the presence of two light filters: the polariser and the analyser. The polariser restricts light to one plane of vibration while the analyser is a second filter, positioned at an angle of 90° to the polariser. The analyser can be moved in and out to switch between plain polarised light (PPL) and cross polarised light (XP). In thin sections (at a thickness of c. 30 µm), minerals in the ceramic sample become translucent under the polarising microscope and can be identified on the basis of different optical properties visible in PPL and XP. This technique allows researchers to gain insights into different technological aspects (*e.g.*, forming technique, tempering) and helps to define raw material sources employed in pottery manufacturing, thus providing important information about artefact provenance[110].

Among the samples selected from Gird-i Bazar, 45 specimens from the 2015 season were prepared at the Wolfson Archaeological Science Laboratories at the Institute of Archaeology, University College London (UCL)[111], while 32 specimens from the 2016 season were produced at the Competence Center for Archaeometry Baden-Wuerttemberg (CCA-BW) at the University of Tübingen.

Firstly, a slice from the vertical cross-section of each sherd was cut. These sections, after having been consolidated with an epoxy resin, were lapped with silica powder (600 grain size) and pasted over a glass slide. The samples were then ground to approximately 40 µm using a Buehler PetroThin thin-sectioning system. Finally, they were brought to c. 20-30 µm thickness, again using silica powder (600 to 900 grain size) and covered with a removable transparent varnish. The prepared sections were analysed and described according to a description protocol based on the one provided by Whitbread and Quinn[112]. This description considers three main features that can be identified in ceramic thin section analysis: matrix, voids and inclusions.

E2.2 Geological setting

Iraqi Kurdistan sits at the meeting point of the Arabian and Eurasian plate, with the subduction of the Arabian Plate below that of the Eurasian Plate forming the Zagros Mountains[113]. This area is marked by four geological regions from north to south[114]: the Urumieh-Dokhtar Magmatic arc; the Zagros Imbricate Zone (ZIZ), characterised by a complex of intensely metamorphosed rocks; the Zagros Fold and Thrust Belt (ZFTB), dominated by sedimentary rock formations; and southwest of the ZFTB, the Mesopotamian Plain that covers central and southern Iraq and consists of alluvial sediments transported and deposited by the activity of the Tigris and Euphrates Rivers.

The Dinka Settlement Complex with Gird-i Bazar and Qalat-I Dinka is situated in the Bora Plain, part of the larger Peshdar Plain, in a narrow gently inclined plain of

110 Freestone 1995; Whitbread 1995; Quinn 2013.

111 The samples prepared at the Institute of Archaeology (UCL) were the subject of a MSc dissertation for the degree programme in GIS and Spatial Analysis in Archaeology under the supervision of Dr Patrick Quinn: Alexander Sammut, *Spatial and Petrographic Analysis of Ceramic Assemblage from Gird-i Bazar* (2016). I thank Patrick Quinn and Alexander Sammut for allowing me to use the samples prepared at the Institute of Archaeology (UCL) for this study.

112 Whitbread 1989; 1995; Quinn 2013.

113 Minc 2016, 801.

114 Ali *et al.*, 2014, 93.

Sample no.	Registration number	Locus / Locus group	Building	Space	Occupation period	Fabric	Firing	Technique	Mophrological type	Shape	Optical Activity
1	PPP 271927:030:001:021	Lgr:0014	A	Room 1	End of Main Occupation Period 1	B	Reducing	Coiling, slow wheel Non-determinable, leather hard brushing	Incurved triangular rim thickened on the outside	Necked pot	Moderate
2	PPP 271927:030:001:027	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Oxydising	Coiling, slow wheel, burnishing	Straight round rim folded towards the outside and plane beneath	Carinated bowl	Low
3	PPP 271927:030:001:001	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim folded towards the outside and plane beneath	Jar	Low
4	PPP 271927:030:001:019	Lgr:0014	A	Room 1	End of Main Occupation Period 1	B	Reducing	Coiling, slow wheel Non-determinable, leather hard brushing	Incurved triangular rim thickened on the outside	Pot	Low
5	PPP 271927:030:001:104	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Semi-Oxydising	Coiling, slow wheel	Flat base	Non-determinable	Low
6	PPP 271927:030:001:082	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Oxydising	Coiling, slow wheel, burnishing	Straight round rim thinned	Hemispherical bowl	Low
7	PPP 271927:030:001:106	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Oxydising	Coiling, slow wheel	Fat base	Non-determinable	Low
8	PPP 271927:030:001:053	Lgr:0014	A	Room 1	End of Main Occupation Period 1	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight triangular rim thickened on the outside	Carinated bowl	Moderate
9	PPP 271927:030:001:040	Lgr:0014	A	Room 1	End of Main Occupation Period 1	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim folded towards the outside	Carinated bowl	Low
10	PPP 269929:005:006:034	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C2	Semi-Oxydising	Coiling	Everted round rim plain (for 269929:005:006:035 which joins probably with 269929:005:006:034)	Ceramic mortar	Non-determinable
11	PPP 269929:020:005:004	Lgr:0152	/	Outdoor Area 8	Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted round rim folded towards the outside and plane beneath	Bowl	Low
12	PPP 269929:020:005:021	Lgr:0152	/	Outdoor Area 8	Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Non-determinable	Non-determinable	Low
13	PPP 269929:020:001:003	Lgr:0152	/	Outdoor Area 8	Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted square rim folded towards the outside and plane beneath	Carinated bowl	Low
14	PPP 269929:005:014:027	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Straight triangular rim thickened on the outside	Hemispherical bowl	Moderate
15	PPP 269929:005:014:049	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling	Straight round rim plain	Hemispherical bowl	Low
16	PPP 271927:030:001:002	Lgr:0014	A	Room 1	End of Main Occupation Period 1	A	Semi-Oxydising	Coiling	Straight round rim plain	Basin or tray	Moderate
17	PPP 268930:005:001:042	Lgr:0155	D	Room 9	Sporadic Occupation	C1	Semi-Oxydising	Coiling, slow wheel, planing, burnishing	Non-determinable	Jar	Low
18	PPP 269929:005:014:050	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted round rim thickened on the outside	Necked jar	Low
19	PPP 269929:005:014:042	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted quasi rectangular thickened on the outside hollowed inside	Jar	Low
20	PPP 269929:005:006:031	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C2	Semi-Oxydising	Coiling	Round plain rim and round bevelled	Plate or lid	Moderate
21	PPP 269929:005:006:011	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	D	Oxydising	Coiling, slow wheel, burnishing	Everted round rim folded towards the outside	Carinated bowl	Low
22	PPP 269929:005:014:024	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	B	Semi-Oxydising	Coiling, slow wheel, burnishing	Incurved round rim folded towards the outside	Carinated bowl	Moderate

Table E2.1: List of thin-sections of Gird-i Bazar pottery samples.

Sample no.	Registration number	Locus / Locus group	Building	Space	Occupation period	Fabric	Firing	Technique	Mophrological type	Shape	Optical Activity
23	PPP 269929:005:006:012	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Straight triangular rim thickened on the outside	Pot or jar	High
24	PPP 269929:005:013:065	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	B	Reducing	Coiling, slow wheel Non-determinable, leather hard brushing	Non-determinable	Cooking pot	High
25	PPP 269929:005:014:066	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling	Non-determinable	Jar	Moderate
26	PPP 269929:020:001:015	Lgr:0152	/	Outdoor Area 8	Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel	Non-determinable	Non-determinable	Moderate
27	PPP 269929:005:006:025	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	F	Semi-Oxydising	Coiling	Flat base	Non-determinable	High
28	PPP 269929:005:014:067	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C2	Semi-Oxydising	Coiling	Non-determinable	Jar	Moderate
29	PPP 269929:005:014:052	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, barbotine	Straight round rim thickened on the outside	Necked jar	Moderate
30	PPP 267931:041:001:058	Lgr:0098	/	Alley 13	Main Occupation Period 1	D	Reducing	Coiling, slow wheel, slip, burnishing	Straight round rim plain	Hemispherical bowl	High
31	PPP 267931:041:001:056	Lgr:0098	/	Alley 13	Main Occupation Period 1	D	Semi-Oxydising	Coiling, slow wheel, slip, burnishing	Straight round rim plain	Beaker	Low
32	PPP 269929:005:006:007	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Straight round rim thinned	Hemispherical bowl	Non determinable
33	PPP 269929:005:013:027	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	B	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim thickened on the outside	Hemispherical bowl	Moderate
34	PPP 269929:005:002:004	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim plain with a vertical handle round in section	Hemispherical bowl	Low
35	PPP 269929:005:013:024	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim plain	Hemispherical bowl	Low
36	PPP 269929:005:021	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Straight round rim thickened on the outside	Hemispherical bowl with a disc base	Low
37	PPP 271927:030:001:071	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim folded towards the outside	Hemispherical bowl	Low
38	PPP 271927:030:001:026	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Semi-reducing	Coiling, slow wheel, burnishing	Straight round rim folded towards the outside and plane beneath	Carinated bowl	Low
39	PPP 271927:030:001:046	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim folded towards the outside and plane beneath	Carinated bowl	Low
40	PPP 269929:005:014:053	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight round rim thickened on the outside	Pot or jar	Moderate
41	PPP 267931:041:001:049	Lgr:0098	/	Alley 13	Main Occupation Period 1	C1	Oxydising	Coiling, slow wheel	Everted quasi rectangular rim thickened on the outside with grooves outside	Jar	Low
42	PPP 269929:005:014:015	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted square rim plain	Jar	Low
43	PPP 267931:041:001:001	Lgr:0098	/	Alley 13	Main Occupation Period 1	A	Semi-Oxydising	Coiling	Straight triangular rim thickened on the inside with a hollow on top.	Jar	Moderate
44	PPP 271927:030:001:012	Lgr:0014	A	Room 1	End of Main Occupation Period 1	B	Semi-Oxydising	Coiling, slow wheel Non-determinable, leather hard brushing	Incurved triangular rim thickened on the outside	Pot	Moderate

Table E2.1 – continued: List of thin-sections of Gird-i Bazar pottery samples.

Sample no.	Registration number	Locus / Locus group	Building	Space	Occupation period	Fabric	Firing	Technique	Mophrological type	Shape	Optical Activity
45	PPP 271927:030:001:030	Lgr:0014	A	Room 1	End of Main Occupation Period 1	B	Semi-Oxydising	Coiling, slow wheel Non-deter-minable, leather hard brushing	Incurved quasi rectangular rim thickened on the outside	Pot	Moderate
46	PPP 268930:027:001:013	Lgr:0155	D	Room 9	Construction for the Sporadic Occupation	Non-deter-minable	Semi-Oxydising	Burnishing, wavy combed decoration	Non-determinable	Jar	Non determinable
47	PPP 268930:036:001:002	Locus: 268930:036	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Everted triangular plain rim	Jar	Moderate
48	PPP 268931:023:001:001	Locus: 268930:023	D	Courtyard 11	Construction for Main Occupation Period 1	D	Reducing	Coiling, burnishing	Flat base	Non-determinable	Low
49	PPP 268931:026:029:001	Lgr:0166	E	Room 19	End of Main Occupation Period 2	C1	Oxydising	Coiling, burnishing	Everted quasi rectangular rim thickened on the outside	Jar	Moderate
50	PPP 268931:041:009:006	Lgr:0130	D	Courtyard 11	End of Main Occupation Period 2	D	Oxydising	Coiling, slow wheel, burnishing	Carination	Bowl	Moderate
51	PPP 268931:041:009:012	Lgr:0130	D	Courtyard 11	End of Main Occupation Period 2	D	Oxidising	Coiling, slow wheel, burnishing	Carination	Bowl	High
52	PPP 268932:020:007:008	Lgr:0113	F	Courtyard 21	End of Main Occupation Period 2	C1	Semi-Oxydising	Burnishing	Hemispherical bowl with a light carination	Bowl	Moderate
53	PPP 268932:021:008:001	Lgr:0078	F	Courtyard 21	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Triangular rim thickened on the outside	Pot	Low
54	PPP 268932:049:001:004	Lgr:0083	F	Room 22	End of Main Occupation Period 2	D	Semi-Oxydising	Coiling, slow wheel, burnishing	Hollowed shoulder	Jar	Moderate
55	PPP 268932:066:019:002	Lgr:0122	F	Room 28	End of Main Occupation Period 2	C2	Semi-Oxydising	Coiling	Bevelled rim towards the outside	Plate	High
56	PPP 268932:066:020:008	Lgr:0122	F	Room 28	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling	Incurved round rim folded towards the outside	Bowl	High
57	PPP 268932:066:020:015	Lgr:0122	F	Room 28	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, burnishing	Incurved rim bevelled towards the inside and thickened in the inside	Bowl	Low
58	PPP 269929:026:001:032	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Reducing	Coiling, slow wheel, burnishing	Everted round rim plain	Jar	Low/absent
59	PPP 269929:026:016	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted round rim thickened on the outside plane beneath	Bowl	Low
60	PPP 269929:026:017	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C2	Semi-Oxydising	Coiling	Incurved round rim plain	Tray	High
61	PPP 269929:026:018	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, barbotine	Incurved quasi rectangular rim thickened on the outside	Jar	High
62	PPP 269929:026:019	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Oxydising	Coiling, slow wheel, barbotine	Non-determinable	Jar	High
63	PPP 269929:039:017:019	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Flat base	Jar	Low
64	PPP 269929:039:021	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Incurved round rim folded on the outside	Bowl	High
65	PPP 269929:039:022	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	B		Coiling	Non-determinable	Cooking pot	High
66	PPP 269929:039:023	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted round rim folded on the outside	Bowl	Low

Table E2.1 – continued: List of thin-sections of Gird-i Bazar pottery samples.

Sample no.	Registration number	Locus / Locus group	Building	Space	Occupation period	Fabric	Firing	Technique	Mophrological type	Shape	Optical Activity
67	PPP 269929:039:024	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	B	Semi-Oxydising	Coiling, slow wheel Non-determinable, leather hard brushing	Incurved triangular rim thickened on the outside	Pot	Moderate
68	PPP 269929:039:026	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Everted round rim thickened on the outside, hemispherical bowl with a high rounded protruding carination	Bowl	Moderate
69	PPP 269929:039:027	Lgr:0009	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-reducing	Coiling, slow wheel, burnishing	Straight triangular rim folded on the outside	Bowl	Low
70	PPP 269929:047:002:015	Lgr:0071	/	Outdoor Area 8	End of Main Occupation Period 2	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Triangular rim thickened on the outside	Jar	Low / absent
71	PPP 269929:047:002:017	Lgr:0071	/	Outdoor Area 8	End of Main Occupation Period 2	D	Semi-Oxydising	Coiling, slow wheel, burnishing	Incurved round rim of hemispherical bowl	Bowl	Moderate
72	PPP 271927:037:001:020	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Semi-Oxydising	Coiling, slow wheel, burnishing	Incurved round rim of hemispherical bowl	Bowl	Moderate
73	PPP 271927:037:001:264	Lgr:0014	A	Room 1	End of Main Occupation Period 1	D	Oxydising	Coiling, slow wheel, burnishing	Everted triangular rim	Bowl	Low
74	PPP 271927:037:001:299	Lgr:0014	A	Room 1	End of Main Occupation Period 1	C1	Semi-Oxydising	Coiling, slow wheel, burnishing	Straight quasi rectangular rim thickened on the outside	Jar	High
75	PPP 271927:037:001:359	Lgr:0014	A	Room 1	End of Main Occupation Period 1	E	Semi-Oxydising	Coiling, slow wheel, planing	Straight square rim horizontal	Jar	High
76	PPP 271927:037:001:367	Lgr:0014	A	Room 1	End of Main Occupation Period 1	A	Semi-Oxydising	Coiling	Incurved round rim plain	Tray	Moderate
77	PPP 272927:017:001:001	Grave 46	A	Room 23	Grave	C1	Semi-Oxydising	Coiling	Everted round rim thickened on the outside with a groove outside	Jar	Low

Table E2.1 – continued: List of thin-sections of Gird-i Bazar pottery samples.

small foothills[115] (**Fig. E2.1**). This plain is surrounded by the mountainscape of the Zagros with a geology characterised by bands of limestone interspersed with bands of igneous and metamorphic rocks (**Fig. E2.2**). The mountains are a fold and thrust belt with the area to the north and north-east of the Dinka Settlement Complex belonging to the Cretaceous Bulfat Group (rich in schist, limestone, phyllites and massive metamorphic rocks) and tertiary Walsh Volcanic Rock Group. The area is also marked by the presence of conglomerate, red shale and sandstone (Red Bed Series of Tertiary period) and by Cretaceous limestone formations (Aqra-Bekhme Formation). The latter extends immediately to the east of the Dinka Settlement Complex and consists mainly of limestones and dolostones and some chert and iron concretions occur too[116].

The area is also marked by a series of quaternary sediments of the Pleistocene and Holocene period which are still not well studied, mapped and dated. These includes for examples slope deposits consisting of rock fragments and fine clastic and alluvial fan and floodplain deposits marked by the presence of siltstone, sandstone and lenses of claystone and conglomerates.

One of the aims of our work is to carry out a systematic investigation of the landscape around the Dinka Settlement Complex in order to look for possible raw material sources. Three samples, named Geo 1-3, were collected at different locations around the site (**Fig. E2.3**). From these samples, made of sandy clays, briquettes were produced and fired at 700° C; thin sections of these briquettes were prepared and analysed. These raw materials differed in terms of plasticity and coarseness, but all seemed suitable for pottery making. The coarse fraction of the samples (**Fig. E2.4**) is marked by the presence of micrite (which is particularly abundant in sample Geo 1), sparry calcite, quartz and minor quantities of shells and microfossils. Samples Geo 2 and 3 are also characterised by the occurrence of muscovite, plagioclases, epidote, amphiboles, as well as fragments of metamorphic rocks (more abundant in sample Geo 3), opaque minerals, and very rarely igneous rocks.

E2.3 Results of the petrographic analysis

On the basis of the aplastic inclusions, the matrix and the voids observed in thin sections, it was possible to characterise the composition of the 77 samples from the Gird-i Bazar excavations. The summary of the results is shown

115 Aziz *et al.* 2013; Sissakian/Saeed 2012; Sissakian *et al.* 2016.

116 Sissakian *et al.* 2016.

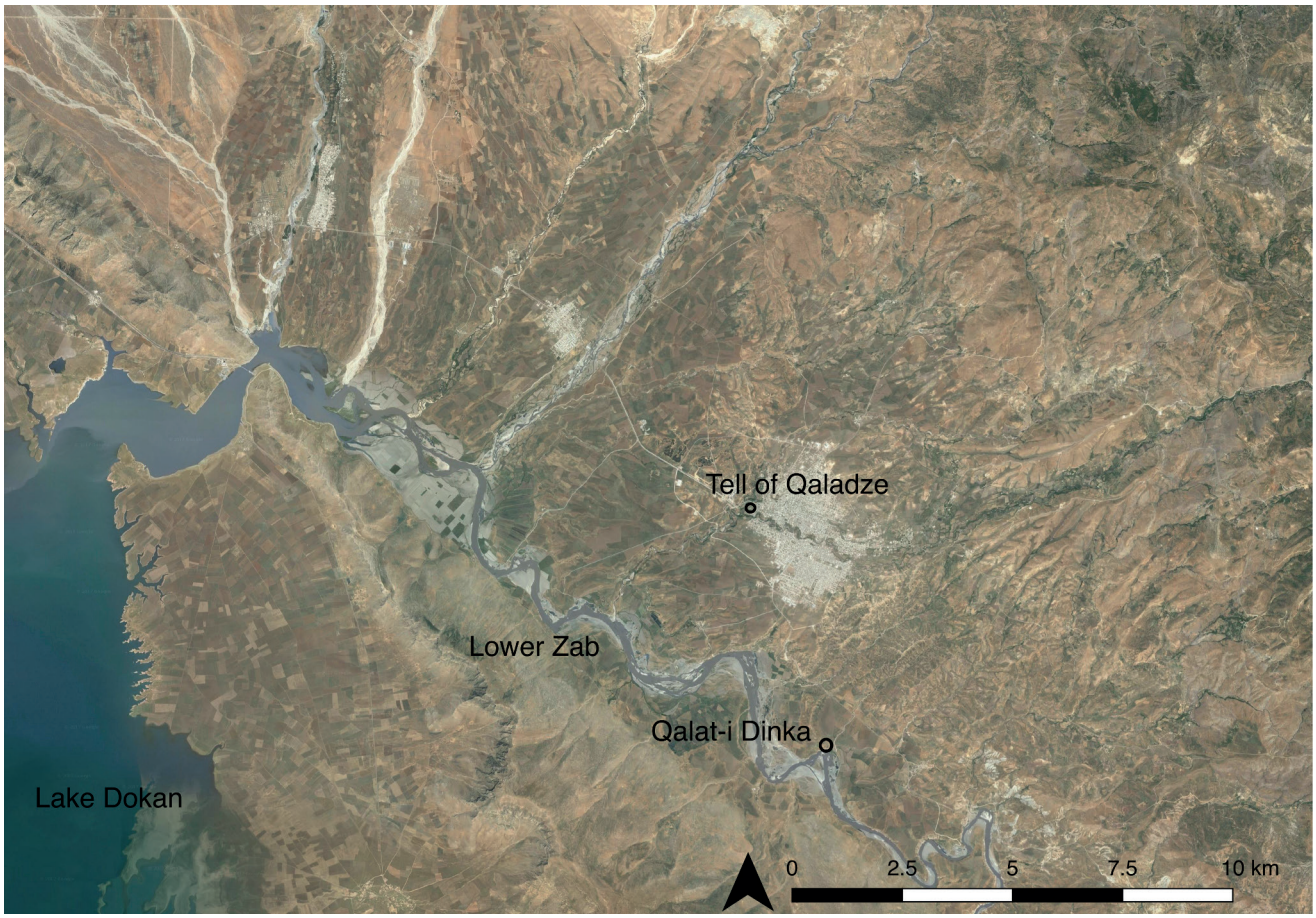


Fig. E2.1: The Bora Plain in the setting of the Zagros mountainscape. Data source: Google Earth Pro 7.1.8. May 17, 2017 (accessed: July 5, 2017). Elaborated in QGIS by Andrea Squitieri.

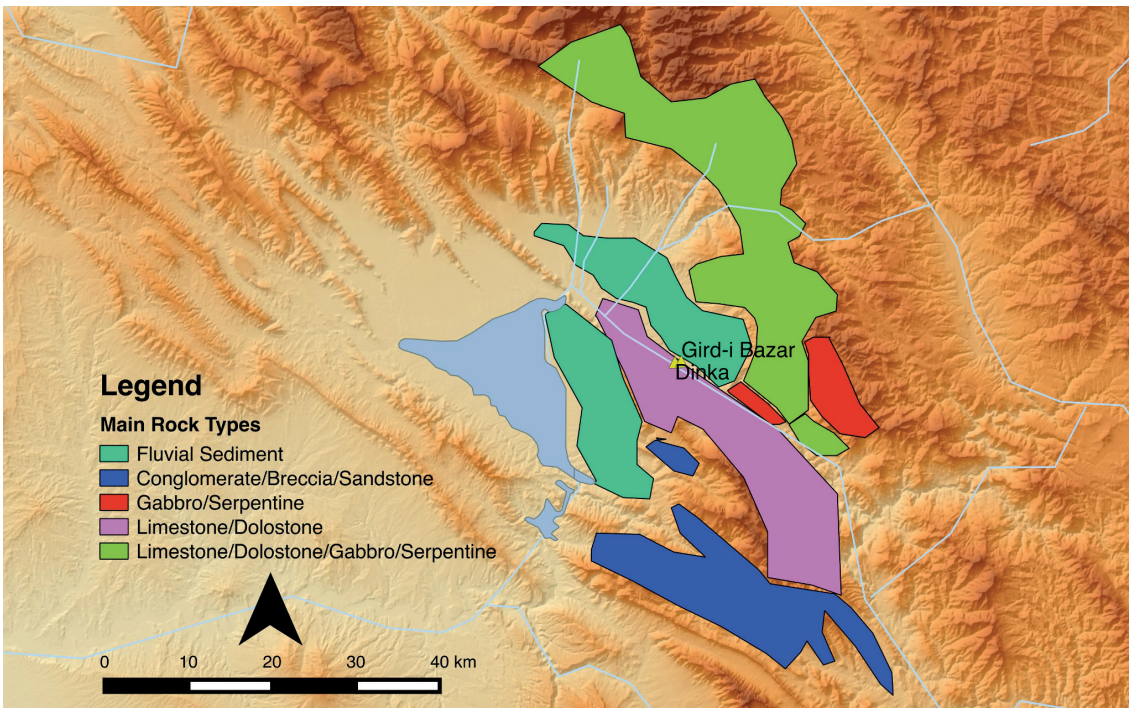


Fig. E2.2: Simplified geological map of the area around Gird-i Bazar. Data source: Sissakian/Saeed 2012, fig. 8. Prepared by Andrea Squitieri.

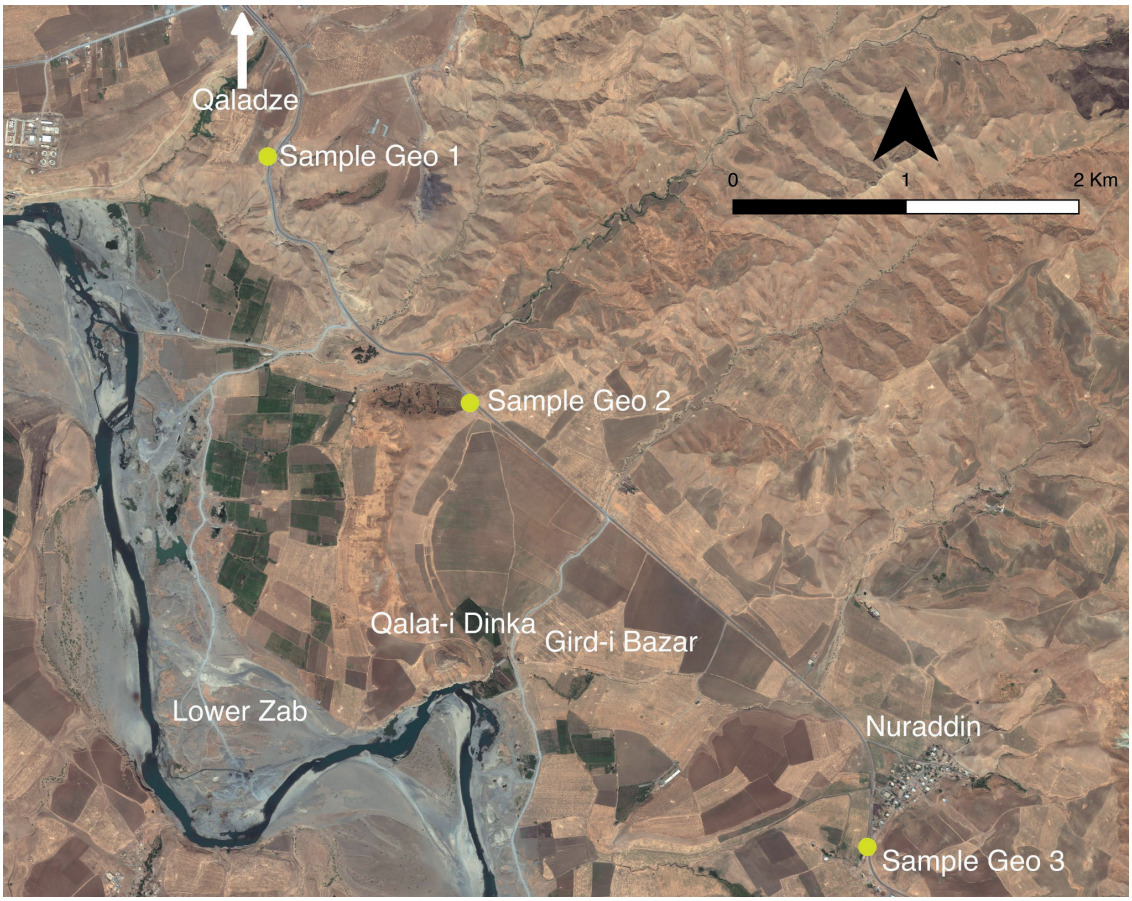


Fig. E2.3: Locations of the clay samples collected in the Bora Plain around Gird-i Bazar. Satellite image provided by Bing. Accessed in July 2017, annotated by Andrea Squitieri.

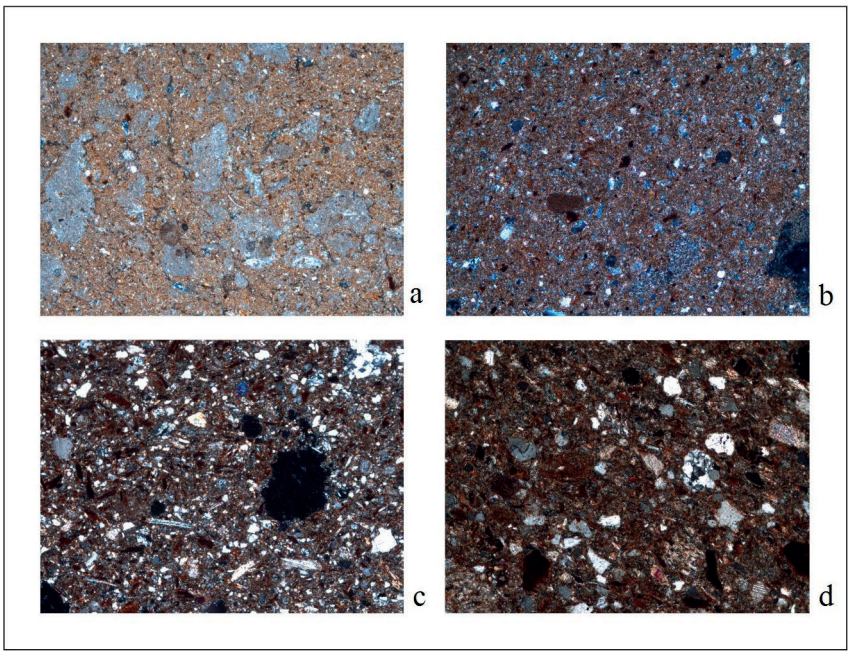


Fig. E2.4: Thin section photomicrographs of selected geological samples collected from the area surrounding Gird-i Bazar and analysed in this study. (a) Sample Geo 1: with abundant micrite, XP; (b) Sample Geo 2: fine with quartz and fragments of metamorphic rocks, XP; (c) Sample Geo 2: coarse with quartz, amphiboles and fragments of metamorphic rocks, XP; (d) Sample Geo 3: coarse with quartz and fragments of metamorphic rocks, XP. Image width = 8 mm (a, c) and 2 mm (b, d).

in **Table E2.1**. The samples are identified by a progressive number. The table provides the correspondence between this number and the registration number, along with some basic information about contexts of provenance.

Abbreviations and terminology used in the following discussion:
eq. = equant, el. = elongate;
va. = very angular, a. = angular, sa. = sub-angular;
sr. = sub-rounded, r. = rounded, wr. = well rounded;
max = maximum size, mode = average size.

Frequency of inclusions	%
Predominant	> 70%
Dominant	50-70 %
Frequent	30-50 %
Common	15-30 %
Few	5-15%
Very Few	2-5%
Rare	0.5-2%
Very rare	< 0.5

Fabric A: coarse metamorphic fabric
Sample nos. 16, 43, 76.
Samples of this fabric form a heterogeneous group (**Fig. E2.5a-b**) marked by well rounded fragments of metamorphic rocks.

Dominant mineral inclusions comprise fragments of foliated metamorphic rocks (wr.-el., max=2 mm, mode=1 mm) while quartz is frequent (sa.-eq., max=0.35 mm, mode=0.30 mm). Few inclusions of amphibole (sa.-el., max=0.35 mm, mode=0.30 mm), plagioclase (sa.-eq., max=0.50 mm, mode=0.20 mm), biotite (sa.-el., max=0.35 mm, mode=0.20 mm), muscovite (sa.-el., max=0.30 mm, mode=0.20 mm) and clays pellets (wr-eq., max=0.65 mm, mode=0.50 mm) were observed. Rarely fragments of mudstone (sr.-el., max=1.25 mm, mode=0.60 mm), serpentinite (sa.-eq., max=0.35 mm, mode=0.30 mm) and chert (sr.-el., max=0.35 mm, mode=0.20 mm) occur. The grain size distribution is bimodal.

Voids are vesicles and vughs, and they do not show any preferred orientation. Matrix is light brown in plain polarized light (PPL) and orange to dark brown in cross polarized light (XP). It often shows the typical layers attributed to irregular firing conditions. The matrix is non-calcareous and exhibits low to moderate optical activity. The inclusions and the textural characteristics of this group suggest that the raw materials employed to produce these vessels could originate from a secondary clay, to which fragments of metamorphic rocks could have been added as tempers.

Fabric B: sparry calcite fabric
Sample nos. 1, 4, 22, 24, 33, 44, 45, 65, 67.
Samples of this fabric compose a homogeneous medium-coarse group (**Fig. E2.5c**) marked by the presence of sparry calcite inclusions whose angular, crushed character suggests that they may have been added as temper.

Predominant mineral inclusions comprise sparry-calcite (va.-el., max=1.25 mm, mode=1.00 mm) while quartz is frequent (sa.-el., max=0.30 mm, mode=0.20 mm). Few inclusions of amphibole (sa.-el., max=0.35 mm, mode=0.20 mm) and clays pellets (wr.-eq., max=1 mm, mode=0.65) were observed. Rare occurrences of fragments of foliated metamorphic rocks (sr.-el., max=0.35 mm, mode 0.30 mm) together with fragments of mudstone (sr.-el., max=1.25 mm, mode=1.00 mm). Very rarely plagioclase inclusions were observed (sa-el., max=0.30 mm, mode=0.20 mm). The grain size distribution is strongly bimodal.

Voids are vesicles and vughs and they do not show any preferential orientation. Matrix is light brown in PPL and orange to brown in XP. It often shows the typical layers attributed to irregular firing conditions. The matrix is non-calcareous and the samples exhibit moderate to low optical activities (especially samples 33 and 44). The inclusions and the textural characteristics of this group suggest that the raw materials employed to produce these vessels could originate from a secondary clay, to which calcite inclusions deriving from limestone were intentionally added as tempers. Presence of relic coils, suggesting the employment of coiling forming technique, was observed.

Fabric C: micrite fabric
Sub-group C1: sample nos. 8, 9, 11, 12, 13, 14, 15, 17, 18,19, 23, 25, 26, 29, 32, 34, 35, 36, 40, 41, 42, 47, 49, 52, 53, 56, 57, 58, 59, 61, 62, 63, 64, 66, 68, 69, 70, 74, 77.
Sub-group C2: sample nos. 10, 20, 28, 55, 60.
Samples of this fabric form a heterogeneous medium-coarse to medium-fined group (**Fig. E2.5d**) marked by rounded inclusions of micrite and fragments of metamorphic rocks (particularly abundant in samples 17, 28, 26 and 43).

Dominant mineral inclusions comprise micrite (wr.-eq., max=2.5 mm, mode=0.85 mm). Quartz is frequent (sa.-eq., max=0.30 mm, mode=0.20 mm), and fragments of foliated metamorphic rocks (sr.-el., max=1 mm, mode=0.30 mm) composed of quartz and muscovite are common. Few inclusions of amphibole (sr.-el., max=0.35 mm, mode=0.30 mm), plagioclase (sr.-eq., max=0.50 mm, mode=0.20 mm), biotite (sr.-el., max=0.35 mm, mode=0.20 mm), muscovite (sa.-el., max=0.30 mm, mode=0.20 mm) and clays pellets (wr-eq., max=0.65 mm, mode=0.50 mm) were observed. Rarely fragments of mudstone (sr.-el., max=1.25 mm, mode=0.60 mm) and sparry calcite (sa.-el.,

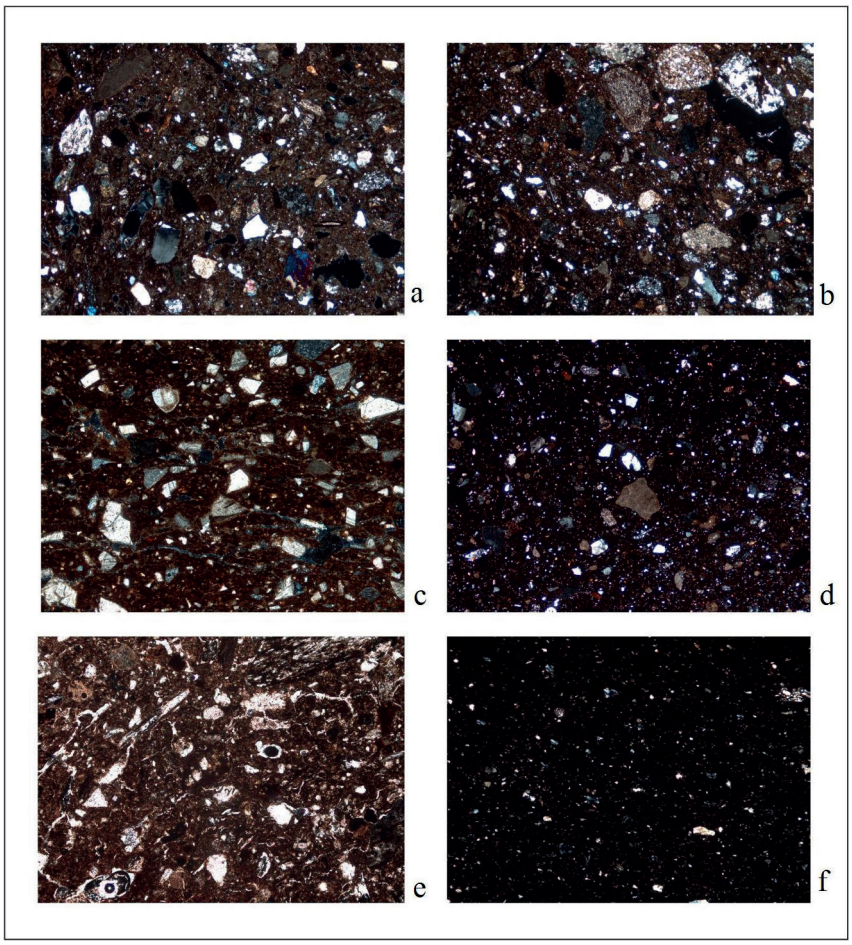


Fig. E2.5: Thin section photomicrographs of selected ceramics from Gird-i Bazar analysed in this study. (a) Fabric A (PH 43), with abundant quartz, amphibole and fragments of metamorphic rocks, XP; (b) Fabric A (PH 76), with abundant quartz and fragments of metamorphic rocks, XP; (c) Fabric B (PH 65), sparry calcite, XP; (d) Fabric C1 (PH 59), with abundant quartz and calcite, XP; (e) Fabric C2 (PH 55), possible plant tempering, PPL; f) Fabric D (PH 03), fine fabric, XP. Image width = 8 mm (a, b) and 4 mm (c, d, e, f).

max=0.35 mm, mode=0.30 mm) occur. Very rarely serpentinite (sa.-eq., max=0.35 mm, mode=0.30 mm), epidote (sa.-eq., max=0.35 mm, mode=0.30 mm) and fragments of igneous rocks (sr.-el., max=0.35 mm, mode=0.20 mm) composed from quartz were observed. The grain size distribution is strongly polymodal.

Voids are vesicles and vughs, and they do not show any preferential orientation. Matrix is light brown in PPL and orange to brown in XP. It often shows the typical layers attributed to irregular firing conditions. The matrix is non-calcareous and the samples exhibit both high (*e.g.* samples 55, 60, 61, 62, 64, 74) and low optical (*e.g.* samples 53, 57, 58, 59, 63, 66, 69, 70, 77) activities. The inclusion and the textural characteristics of this group suggest that the raw materials employed to produce these vessels could originate from a secondary clay. Samples belonging to subgroup C2 (**Fig. E2.5e**) also show possible evidence of plant tempering. Evidence for relic coils that suggest the employment of coiling technique has been noted in several samples (**Fig. E2.6a**).

Fabric D: fine fabric

Sample nos. 2, 3, 5, 6, 7, 21, 30, 31, 37, 38, 39, 48, 50, 51, 54, 71, 72, 73.

Samples of this fabric compose a homogeneous fine group (**Fig. E2.5f**). Dominant mineral inclusions comprise quartz (sa.-eq., max=0.1 mm, mode=0.8). Few inclusions of biotite (sa.-el., max=0.1 mm, mode=0.8 mm). Rarely tiny fragments of metamorphic rocks were observed (sr.-el., max=0.1 mm, mode=0.8 mm). The grain size distribution is unimodal.

Voids are vesicles and vughs, and they do not show any preferred orientation. Matrix is light brown in PPL and orange to brown in XP. It often shows the typical layers attributed to irregular firing conditions. The matrix is non-calcareous and the samples exhibit poor optical activities. The inclusion and the textural characteristics of this group suggest that the raw materials employed to produce these vessels could originate from a secondary clay that may have been cleaned through levigation. Presence of relic coils has been noted in samples 6 and 30. In addition, two samples (30 and 31) show evidence of a thin dark slip layer (**Fig. E2.6b**).

Fabric E: chaff tempered fabric

Sample no. 75.

This fabric is represented for the moment only by one medium-fine sample (**Fig. E2.6c**) that is marked by the presence of chaff tempering.

Dominant mineral inclusions comprise quartz (va.-eq., max=0.3 mm, mode=0.08 mm). Micrite (wr.-eq., max=2.5 mm, mode=0.85 mm) is common. Few inclusion of muscovite (va.-el., max=0.1 mm, mode=0.08 mm). Rare occurrences of tiny fragments of metamorphic rock (va.-el., max=0.3 mm, mode=0.1 mm) and chert (va.-el., max=0.1 mm, mode=0.08 mm). The grain size distribution is bimodal.

Voids are planar and run parallel to each other. Matrix is dark brown in PPL and black to red in XP. It shows the

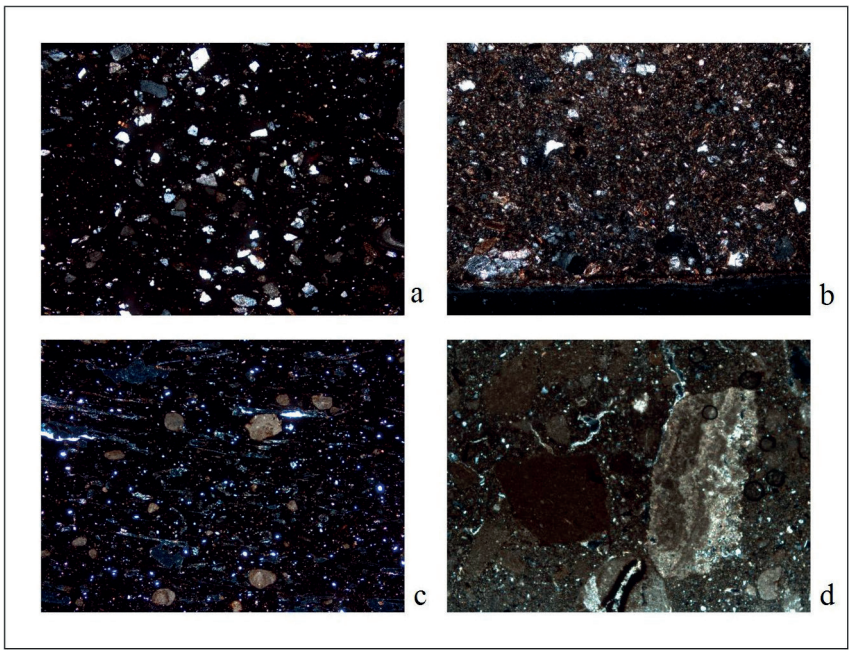


Fig. E2.6: Thin section photomicrographs of selected ceramics from Gird-i Bazar analysed in this study. (a) Fabric C1 (PH 49), possible relic coil, XP; (b) Fabric D (PH 30), slip, XP; (c) Fabric E (PH 75), abundant chaff tempering instead of organic tempering, XP; (d) Fabric F (PH 27), calcareous fabric, XP. Image width = 8 mm (a, c), 4 mm (d) and 2 mm (b).

typical layers attributed to irregular firing conditions. The matrix is non-calcareous and the sample exhibits moderate optical activity. The inclusion and the textural characteristics of this sample suggest that the raw materials employed to produce it could originate from a secondary clay into which chaff material was added as temper.

Fabric F: calcareous fabric

Sample no. 27.

This fabric is represented only by one medium-fine sample (**Fig. E2.6d**) made from a calcareous clay. Dominant mineral inclusions comprise micrite (sa.-eq, max.=2.5 mm, mode=0.85 mm). Few inclusions of quartz (va.-el., max=0.35 mm, mode=0.30 mm). The grain size distribution is bimodal.

Voids consist of vesicles and vughs, and they do not show any preferential orientation. Matrix is yellowy brown colour both in XP and PPL. It is calcareous and shows moderate optical activities. The inclusion and the textural characteristics of this sample suggest that the raw material employed to produce this pot could originate from a calcareous clay into which fragments of limestone could have been added as temper.

E2.4 Discussion

The results of the petrographic analysis enable us to trace different technological traits, which help to reconstruct pottery-making recipes at Gird-i Bazar. First of all, the results have provided important information relating to procurement and processing of raw materials (**Table E2.2**).

All fabrics, with the exception of **Fabric F**, are characterised by non-calcareous clays in which micrite, quartz and metamorphic rocks occur in varying amounts and coarseness together with other accessory minerals such as amphibole, biotite, epidote, muscovite, plagioclase chert and serpentinite.

Fabric B is used to make cooking pots (**§E1.3.3**: TechP 4). It is marked by the addition of crushed fragments of limestone. The advantages and limitations of having calcite within the clay paste are well known and this type of temper is often used in association with cooking pots[117]. Benefits include reduced shrinkage during the drying process, but it also increases thermal shock resistance, not only for the firing process, but also during its use. However, above 750-800°C calcite starts to lose CO_2, which is recovered during the cooling phase; this results in a decrease and increase of calcite volume respectively. As clay undergoes a shrinkage process during firing, the re-formed calcite no longer has enough space inside the ceramic body, thus causing breaks in the ceramic matrix[118]. Another disadvantage is connected to the amount of time required to source and prepare calcite, which is well attested by ethnographic studies of the production of cooking pots tempered with calcite in the Balkans[119]. Also two bowls (sample nos. 22 and 33) are made of **Fabric B**, but these are produced by a *chaîne opératoire* that differs from the one employed for the cooking pots **(§E1.3.3**: TechP 5).

While the polymodal distribution of the inclusions in **Fabric C** strongly indicates that the source material used to produce this paste was minimally processed, the bimodal distribution of the inclusions that marks **Fabric A** could suggest that fragments of metamorphic rocks

117 Rice 2005.

118 Picon 1995.

119 Richard Carlton (Newcastle University), pers. comm.

Fabric	Raw material	Temper	Levigation
A	Sedimentary non-calcareous clay	Metamorphic rocks	(none)
B	Sedimentary non-calcareous clay	Calcite	(none)
C1	Sedimentary non-calcareous clay	(none)	(none)
C2	Sedimentary non-calcareous clay	Plant material (possible)	(none)
D	Sedimentary non-calcareous clay	(none)	(Possible)
E	Sedimentary non-calcareous clay	Plant material (chaff)	(none)
F	Sedimentary calcareous clay	Non-determinable	(none)

Table E2.2: Summary of the results of thin-section analyses on Gird-i Bazar pottery.

were intentionally added. However, it is not possible to exclude that the potters used clay outcrops that were naturally coarser by comparison to those used for **Fabric C**. It is also very interesting to note that samples belonging to **Fabric C2**, which is used for plates and trays, show possible evidence of plant material being added as temper. However, only **Fabric E** (sample no. 75) is marked by abundant plant tempering (chaff). Interestingly, **Fabric D** is characterised by a unimodal distribution of the inclusions, suggesting that the clay source employed to produce this fabric was cleaned through levigation. Finally, **Fabric F** represented by Sample 27 is marked by a highly calcareous matrix (probably a marl), that could have been tempered, but the size of the sample is too small to confirm this.

Based on the orientation of the inclusions and voids, there is no strong evidence for the use of the fast wheel, while the presence of several relic coils indicates the use of the coiling technique. This evidence is reinforced by the results of Jean-Jacques Herr's macroscopic analysis (**Chapter E1**) that revealed the presence of macro-traces that are typical of this forming technique, such as preferential fractures and coil joints. The macroscopic analysis also points to the use of a slow wheel. The latter does not have a strong impact on the orientation of inclusions and voids, and, therefore, cannot be surely identified through thin section petrography.

The non-homogenous colour of the clay matrix together with the highly variable degree of optical activities seem to indicate that there was not a high degree of standardisation in the firing procedure. Very interestingly, samples that belong to **Fabric D** show consistently poor optical activity in the clay matrix, suggesting that pots featuring this paste may have been fired to higher temperature in comparison to the other pots. On the other hand, as explained above, samples of cooking pots assigned to **Fabric B**, marked by the presence of calcite tempering, should have been fired to temperatures below 750°C.

Overall the results seem to suggest that the pottery analysed could have been produced locally at the Dinka Settlement Complex. Judging by the geological literature and the specimens studied, the compositional characteristics of the ceramic samples analysed are compatible with the geology of the area surrounding the site. The presence of a pottery kiln (**§D7.1**) further corroborates this impression.

Potters selected and played with different raw materials immediately available from their surrounding landscape in order to produce the different fabrics identified. This tendency is not surprising. A worldwide study of distances travelled to acquire clays and temper sources suggests that the maximum threshold distance for raw material procurement lies at 7 km from the potter's place of production (assuming that their own bodies are used for transport). Most, however, did not travel more than 1 km to obtain clays and tempers under these conditions[120].

Before drawing this discussion to a close, it is worth pointing out that cooking pots, large trays and large storage jars were apparently produced not only using specific clay pastes, but also in a different *chaîne opératoire* of forming techniques (**§§E1.3.3**, **E1.3.4** on TechP 4). Therefore, these initial analyses have suggested a very interesting scenario that will need to be further investigated through a wider selection of samples and implemented with a wider range of analytical techniques. This will allow us to gain a better understanding of the way in which pottery production was organised at the Dinka Settlement Complex and of the social context in which this production was taking place.

120 Arnold 2000, 343.

E3. Organic residue analysis of the 2016 pottery from Gird-i Bazar and Qalat-i Dinka

Elsa Perruchini[121]

The analysis of organic residues from archaeological materials has become increasingly important to our understanding of ancient diet, socio-political organisation, trade and technology. Its core principle is based on the fact that, when ceramic vessels are used, remains of foodstuffs (like waxes, oils, fats) or natural products (like pitches, tars or resins) become trapped and preserved in the pores of the vessel's walls. The residues that are left behind degrade over time but still contain certain compounds that are characteristic of the substance that was once present in the vessel. Through the use of Gas Chromatography, we aim to identify lipids, molecules that are characteristic of certain plants or animals, and ultimately try to determine what the vessel originally held. The substance identified constitutes direct evidence for the way food and drink were transported, consumed and valued in ancient times.

With such information, it is possible to reconstruct food consumption and related practices in ancient times, a subject that has become a vast field of research and inquiry in the study of social complexity and identities in ancient societies. This chapter presents first data both for the Dinka Settlement Complex and for the Peshdar Plain.

E3.1 The objectives of the residue analysis at the Dinka Settlement Complex

By performing organic residue analysis and looking at the contents of the vessels discovered during the 2016 excavations at Gird-i Bazar and, in one case, Qalat-i Dinka, we begin to build an understanding of the diets of the people living in the ancient settlement as well as the local cultural traditions involving food production and consumption. The Dinka Settlement Complex, with its lower city and upper citadel, can potentially give us evidence about a possible spatial difference in food and drink consumption related, for example, to elite and non-elite contexts, or linked to the different functional sectors of the settlement.

The ultimate goal of the residue analyses performed on the Gird-i Bazar and Qalat-i Dinka material is to improve our understanding of the lifestyle of the different socio-economic groups living in the Dinka Settlement Complex, of the ways food and drink were consumed, of the food resources, and of the potential trade connections involving foodstuffs. Also, evidence from the Dinka Settlement Complex can increase our knowledge about food production and consumption patterns within the Neo-Assyrian Empire, and how these patterns might have been affected by cultural traditions surrounding the Empire. The latter aspect is particularly relevant at the Dinka Settlement Complex due to its position on the eastern border of the Empire.

At a smaller scale, the organic residue analysis can potentially inform us about the functions of particular wares and vessel types. A variety of morphological types and petrographic groups have so far been identified at Gird-i Bazar, such as hemispherical bowls, carinated bowls, plates and trays, jars and pots, a number of which show different production techniques (see **Chapter E1**). Residue analysis can potentially shed light on what the different types of vessels originally held.

The results presented in this chapter should be considered a first step towards the creation of a methodology and the collection of enough data from the Dinka Settlement Complex that will in the future hopefully enable us to offer full answers to the research questions outlined above.

E3.2 Testing a new on-site sampling strategy and method

The 2016 campaign at Gird-i Bazar presented the opportunity to design and test a new sampling methodology for organic residue analysis to be performed directly on-site. This new sampling strategy presents two advantages: it facilitates the process of exporting samples and, most importantly, it greatly diminishes the risk of modern contamination during the post-excavation process (*e.g.*, handling, recording, storage and transportation).

In seeking to characterise organic material from the past, residue analysts are often faced with the problem of trying to identify traces of significant compounds in the face of contamination, in particular in an environment full of similar compounds of modern origin. Unfortunately, little has been published about contamination and organic residues, but a basic knowledge of potential contaminants is crucial when seeking to interpret the results of residue analysis. Compounds from plastic bags used for storage as well as insect repellants, for example, have no ancient

121 After collecting relevant pottery samples during the excavations at Gird-i Bazar between 8-21 September 2016, the author conducted the organic residue analyses at the University of Glasgow's Biomarkers for Environmental and Climate Science (BECS) laboratory under the supervision of its director, her PhD supervisor Dr Jaime Toney. Thanks are also due to Dr Claudia Glatz (Archaeology Department, University of Glasgow) for engineering the contact with the Peshdar Plain Project team.

equivalent and can be relatively easily excluded from consideration. But other compounds might have been present in the ancient world; and distinguishing the modern from the archaeological can become very challenging.

The sampling strategy described below was employed in the hope of avoiding and/or assessing possible exogenous contamination with the ultimate aim of achieving good, but above all, reliable results.

On site, before making a decision concerning sampling for residue analysis, the field director F. Janoscha Kreppner, the relevant trench supervisor, the lead ceramicist Jean-Jacques Herr and the author discussed if the vessel was in fact suitable for organic residue analysis on the basis of criteria such as vessel type, archaeological context, and state of preservation. Once a vessel had been chosen for sampling, it needed to be decided where to take the sample from. In some cases it was deemed best to sample part of the base (since this is more likely to have been in contact with ancient substances) or at least the body of the vessel. On the other hand, for cooking vessels, fats at the base of a vessel can be degraded by direct contact with a source of heat[122], and therefore other parts of the vessel were selected for analysis. Moreover, sampling had to be balanced against the need to preserve the vessel's profile for drawing and photography.

The following list details the steps undertaken once a suitable vessel had been selected for residue analysis during the 2016 excavation:

1. After taking a picture of the vessel still in its archaeological context, we selected the part(s) of the vessel for sampling. Two sherds of c. 5 cm diameter were sampled for each vessel. The pottery sherds were never manipulated with bare hands, using cotton gloves already for their excavation. Most of the time, the vessel was already in a fragmentary state, thus facilitating the sampling. If the vessel was partially intact, the vessel was dug out with a portion of the soil around it to protect the residue from exogenous contamination and sampled at the excavation house. The samples were documented with photos and recorded in the database.
2. Samples of soil from around and/or inside the vessel were collected and used as a control to evaluate post-burial effects on our results. These samples can provide a picture of potential contamination coming from the burial environment (*e.g.*, leaching from decaying plant matter). The soil samples were processed using the same method as for the samples extracted from the sherds (see below).
3. Both the inner and outer surfaces were drilled with a cordless Dremel 8200 multi-tool, used as grinding tool with an abrasive point (cleaned with acetone before use) to remove part of the exogenous contamination. The resulting powders were kept for organic residue analysis. By comparing the inner and outer surfaces, we ensure that there is no information loss, and we can easily identify contaminants or archaeologically significant compounds.
4. One of the two sherd samples was then crushed into powder using an agate mortar and a pestle (previously cleaned with acetone). The resultant powder was put into a 40 ml glass vial (previously combusted in an oven with a 450°C temperature program running for eight hours). The other sherd sample was kept intact in aluminium foil to test results repeatability and that no contamination was added during the process previously described.

E3.3 The material selected in 2016

One sample (PPP 100000:032:005; **Sample no. 10**) was taken from a carinated bowl with completely preserved profile (PPP 100000:032:003; **Fig. C21**) that had been discovered in the author's absence on a floor at Qalat-i Dinka (**§C3**).

Otherwise, the material presented here was collected during the excavations at Gird-i Bazar between 8-21 September 2016. We decided to sample different types of vessels and wares (jars, cooking pots, and bowls) found in different archaeological contexts and parts of the site, so as to have the possibility to compare results coming from different vessel types across the site. Not all the vessels sampled have a complete profile, making it more difficult to interpret the results of organic residue analysis.

In Building A Room 23 (**§D5.1**), a large short necked jar (PPP 272927:020:004, **Fig. E3.1**), broken into many fragments, was discovered on the floor and sampled twice on the neck and the body (samples PPP 272927:020:014 and PPP 272927:020:015; not yet analysed). Interestingly, rim sherds of a carinated bowl (**Fig. E3.2**) were found inside and outside the mouth of this jar (**Fig. D5**). Two fragments were even found under the jar's rim. The carinated bowl was sampled on its body (PPP 272927:020:013; **Sample no. 1**).

In Building F, in the SE corner of Courtyard 21, one small jar with a hollowed band on its shoulder, recovered as part of a fill, was sampled (PPP 268932:011:007; **Fig. E3.3**). While the context of discovery was not a primary deposit, right above the floor or an installation, the fact that it was a complete vessel with an interesting shape

122 Charters *et al.* 1993, 216.

Fig. E3.1: Large jar (PPP 272927:020:004). Photo by Abdullah Bakr Othman.

Fig. E3.2: Rim sherds of a carinated bowl found inside and outside the mouth of the large jar (PPP 272927:020:004). Photo by Elsa Perruchini.

prompted us to investigate what this little jar originally contained. Two fragments were sampled: one from the base (PPP 268932:011:015; **Sample no. 2**) and one from the body near the rim (PPP 268932:011:014). Only the base sample was analysed.

A carinated bowl (PPP 269929:039:003) and a jar (PPP 269929:026:008) recovered from the fill of the pottery kiln in the Outdoor Area 8 (Locus:269929:039) were

Fig. E3.3: Jar (PPP 268932:011:007) from a fill in Building F Courtyard 21. Photo by Jean-Jacques Herr.

sampled (two sherds each: PPP 269929:039:012-013 and PPP 269929:026:014-15 respectively). One sherd was kept intact and the other one crushed into powder. While the possibility of finding food residues in pottery coming from a kiln is rare, it still exists, especially since it appears that one part of the fill of the kiln might have consisted of a discarded set of broken and used vessels rather than the original kiln load (**§D6.1**). Only the samples from the bowl PPP 269929:039:003 were analysed (**Sample nos. 3-4**; **Fig. E3.4**).

An almost complete carinated bowl (PPP 268931:031:003; **Fig. E3.5**) discovered as part of a fill in the eastern part of Building E (Locus:268931:031; **§D8**) and cut in half by a modern pit was sampled (PPP 268931:031:010; **Sample no. 5**). Despite coming from a fill, its shape and almost completely preserved profile made its analysis desirable.

Three body sherds of one or several cooking pots (**§E1.3.3**: TechP 4), coming from inside the oven (Locus:268932:050) found in Building F Room 28 (**§D12.5**), were sampled (PPP 268932:050:004-006). They were recovered in fragments in the oven along with burnt clay and ceramic sherds. Only the results from PPP 268932:050:004-005 are presented in this chapter (**Sample nos. 7-8**).

A vessel interpreted as a small jar was discovered in fragments near the same oven (PPP 268932:020) and sampled at its base (PPP 268932:020:014; **Sample no. 6**; **Fig. E3.6**).

Also in Building F Room 28, a concentration of pottery sherds was found in the fill (Locus:268932:059) near the stone installation (Locus:268932:069), likely a podium. Three samples were taken for residue analysis (PPP 268932:059:001, PPP 268932:059:004-005). Only the results gathered from PPP 268932:059:001 are presented in this chapter (**Sample no. 9**).

E3.4 The laboratory analysis

The tools used in the laboratory to perform organic residue analysis are the following: cotton gloves, acetone, agate mortar and pestle, a set of three types of tweezers, pliers, a cordless Dremel 8200 multi-tool, used as a grinding tool with an abrasive point, 40 ml glass vials and aluminium foil (both items previously combusted in an oven with a 450°C temperature program running for eight hours)

The organic residue analysis was carried out at the Biomarkers for Environmental and Climate Science (BECS) laboratory led by Dr. Jaime Toney and located at the University of Glasgow. For this analysis, we used the common methodology with several key steps:

ASE and lipid extraction: Lipids were extracted using a Dionex Accelerated Solvent Extractor (ASE) 350 in a mixture of dichloromethane and methanol (9:1 v/v DCM:MeOH). The ASE 350 can run 24 samples in 10 ml cells. On average, a 10 ml cell can hold 3 g of sample. This instrument enables better extractions in less time and with less effort than manual techniques, such as ultrasonication.

Derivatization of the resulting fraction. We chemically modify a compound to produce a new one, that is Trimethylsilyl (TMS) ethers with properties that are suitable for analysis using Gas Chromatography: increased volatility, detectability and stability. The samples were derivatized by heating at 80°C for two hours with addition of 30µl of the reagent N,O-bis(trimethylsilyl)trifluoroacetamide (BSTFA) and 40µl of Pyridine added as a basic catalyst.

Gas Chromatography: Finally, samples run on the Agilent 7890 Gas chromatograph-Flame ionization detector (GC-FID) for biomarkers quantification and then on the Agilent 5977 Gas Chromatograph-Mass Spectrometer (GC-MS) for biomarker identification. The analysis time was 63 minutes (starting at 7 minutes) and a specific column oven temperature program was created for this analysis. The GC oven temperature was held at 60°C for 2 minutes, then increased by 30°C/minute up to 120°C, then increased by 5°C/minute up to 300°C, then by 5°C/minute up to 340°C and held isothermally for 15 minutes.

E3.5 Results and discussion

The sherds were prepared to be run on the GC-MS along with samples used as a control to evaluate potential exogenous contamination (*i.e.*, drilled inner and outer surfaces, soil samples and blanks). After the analysis, we could observe that organic residues were well preserved with relatively little indication of modern contamination (*e.g.*, phthalates). In addition, after comparison with soil res-

Fig. E3.4: Carinated bowl (PPP 269929:039:003) from the kiln fill. Photo by Elsa Perruchini.

Fig. E3.5: Almost complete carinated bowl (PPP 268931:031:003) from Building E. Photo by Jean-Jacques Herr.

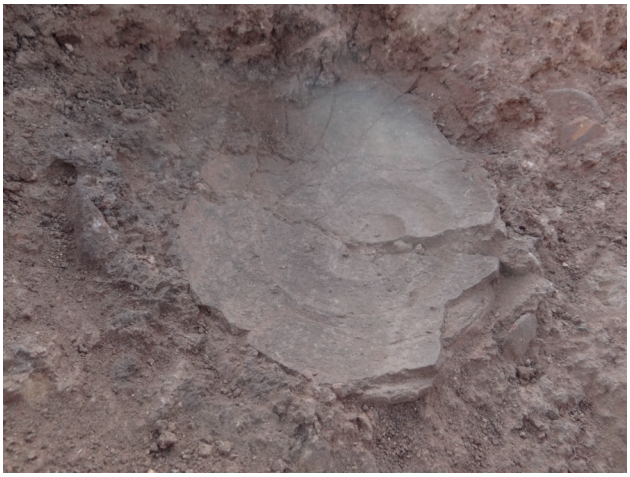


Fig. E3.6: Base of a jar in fragments discovered near the oven (PPP 268932:020) in Building F Courtyard 21. Photo by Elsa Perruchini.

idues and outer and inner surfaces, the results indicate that the samples have yielded possible compounds of archaeological significance. The results for each sample are shown in detail below.

Sample no. 1: PPP 272927:020:013
This sample was taken from the body of a fragmentary carinated bowl found among the fragments of a smashed jar lying on the floor of Room 23 in Building A. **Fig. E3.7** shows the partial total ion chromatogram produced by the residues extracted from this sample.

The sample yielded residues containing a series of odd (C9:0, C15:0, C17:0, C19:0, C25:0), and even chain fatty acids (C10:0, C14:0, C16:0, C18:0, C20:0, C22:0, C24:0).

The shorter-chain fatty acids (C8:0 and C10:0) are characteristic of milk fats but they can be found in varying proportions in all animal and plant lipids[123]. C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[124]. Those two compounds can be found in the inner and outer surfaces as well as in the accompanying soil sample (PPP 272927:020:016; Fig. **E3.10**).

The sample residue also contains mid-chain monounsaturated fatty acids (C16:1 – C18:1 cis-9). C18:1 (oleic acid) is the most abundant unsaturated fatty acid in milk, but like C16:1 (palmitoleic acid), it can be found in varying proportions in all animal and plant lipids[125]. A rare branched 19:1 fatty acid was detected in the sample (but not in the inner and outer surface samples: **Figs. E3.8-9**): 12-methyloctadec-11-enoic acid. Apparently, its origin has not yet been ascertained[126], though it is known that branched fatty acids, like odd chain fatty acids, are common in bacteria and can also be found, in low levels, in ruminant tissues[127].

The components identified also include a significant relative abundance of odd numbered alkanes (C23, C25, C27, C29, C31), which may indicate the presence of plant material[128]. The presence of stigmasterol and campesterol, sterols found in plant tissue, reinforces this interpretation[129]. Betulinaldehyde has been isolated from many plant species[130].

In conclusion, the vessel from which this sample originates may have contained plant remains.

Sample no. 2: PPP 268932:011:015
This sample was taken from the base of an almost complete jar (PPP 268932:011:007) found in the fill of Courtyard 21 in Building F. **Fig. E3.11** shows the partial total ion chromatogram produced by the residues extracted from a fragment from the base of the jar.

The sample yielded residues containing a series of odd (C9:0, C15:0, C17:0, C25:0) and even chain fatty acids (C8:0, C10:0, C14:0, C16:0, C18:0, C20:0, C22:0, C24:0). The shorter-chain fatty acids (C8:0 and C10:0) are characteristic of milk fats, but they can be found in varying proportions in all animal and plant lipids[131]. C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[132]. Those two compounds can also be found in the inner and outer surfaces of the sample as well as in the accompanying soil sample (PPP 268932:011:013; **Fig. E3.14**).

The sample residue also contains mid-chain monounsaturated fatty acids (C16:1 – C18:1 cis-9). C18:1 (oleic acid) is the most abundant unsaturated fatty acid in milk, but like C16:1 (palmitoleic acid), it can be found in varying proportions in all animal and plant lipids[133].

The presence of lignoceric acid (C24:0), with the detection of arachidic (C20:0) and behenic (C22:0) acids, might derive from the processing of seed plants[134].

The detection of C24:0 (lignoceric acid) and hexacosanoic acid (C26:0) acid (in conjunction with long-chain alkanes and fatty alcohols) points to the possible presence of beeswax[135]. Beeswax can be used as a sealant or can be linked to the presence of honey. However, we do not have sufficient data to conclude that these acids indeed originated from beeswax[136].

The components detected also include a significant relative abundance of odd numbered alkanes (C17, C25, C29 and C31) compared to even numbered alkanes (C16, C26, C28, C30) which may indicate the presence of plant waxes[137]. The presence of stigmasterol, sterols found in plant tissue, reinforces this interpretation[138].

123 Gunstone *et al.* 1994, 49.
124 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
125 Gunstone *et al.* 1994, 49.
126 Tang/Row 2013.
127 See *e.g.* Baeten *et al.* 2013, 1155; Marshall *et al.* 2008, 250 and Buonasera 2005, 962.
128 See *e.g.* Marshall et al. 2008, 250 and Baeten *et al.* 2013, 1161.
129 Malainey 2010, 530.
130 Elnagar/Modawi 2016, 896.
131 Gunstone *et al.* 1994, 49.
132 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
133 Gunstone *et al.* 1994, 49.
134 Eusebio 2015.
135 Evershed *et al.* 1997b.
136 Evershed/Dudd 2003.
137 See *e.g.* Baeten et al. 2013, 1161 and Marshall *et al.* 2008, 250.
138 Malainey 2010, 530.

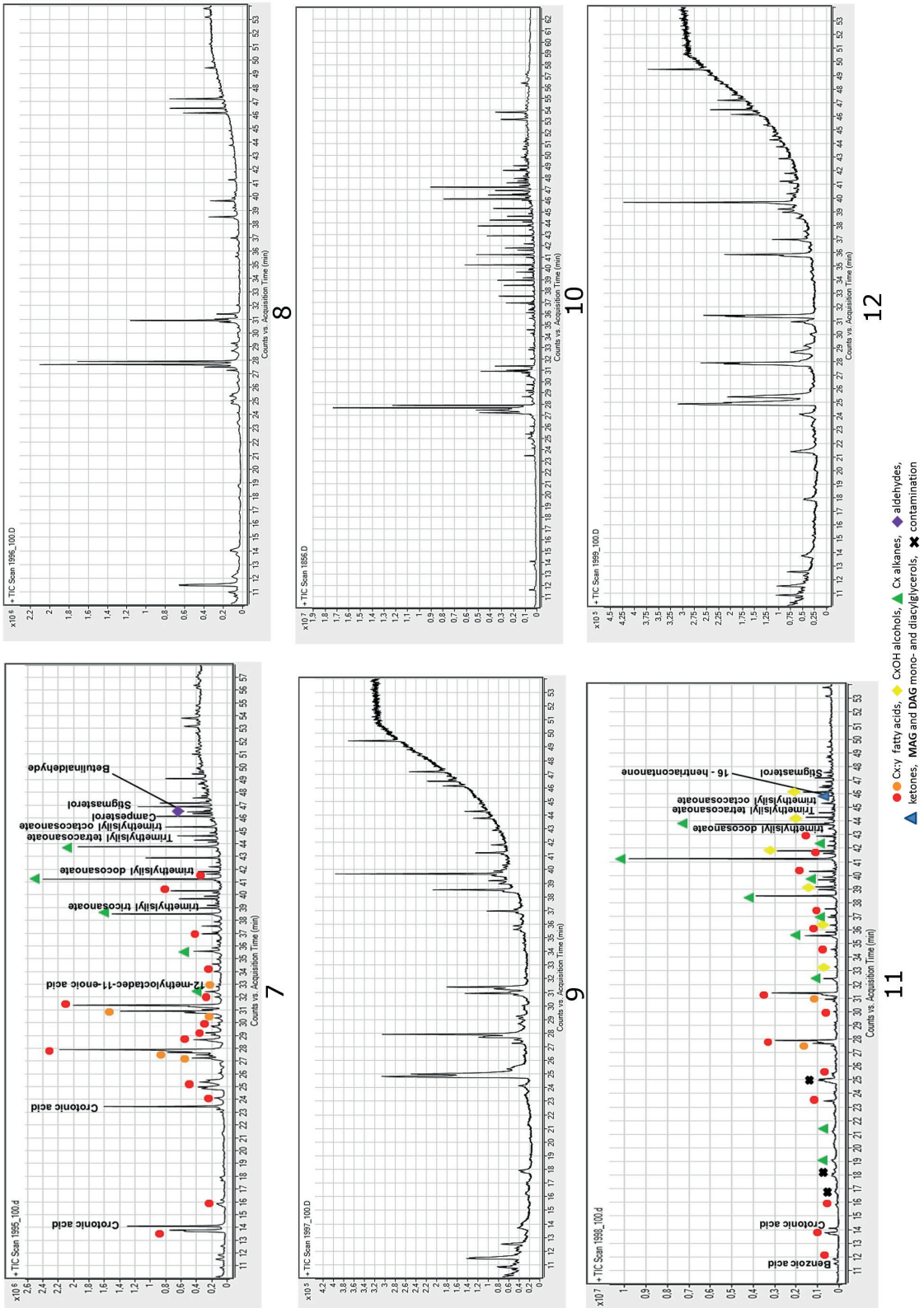


Fig. E3.7-12: (7) Partial total ion chromatogram of **Sample no. 1** = PPP 272927:020:013; (8) Drilled inner surface of **Sample no. 1**; (9) Drilled outer surface of **Sample no. 1**; (10) Partial total ion chromatogram of the soil sample (PPP 272927:020:016) associated with **Sample no. 1**; (11) Partial total ion chromatogram of **Sample no. 2** = 268932:011:015; (12) Drilled inner surface of **Sample no. 2**. Prepared by Elsa Perruchini.

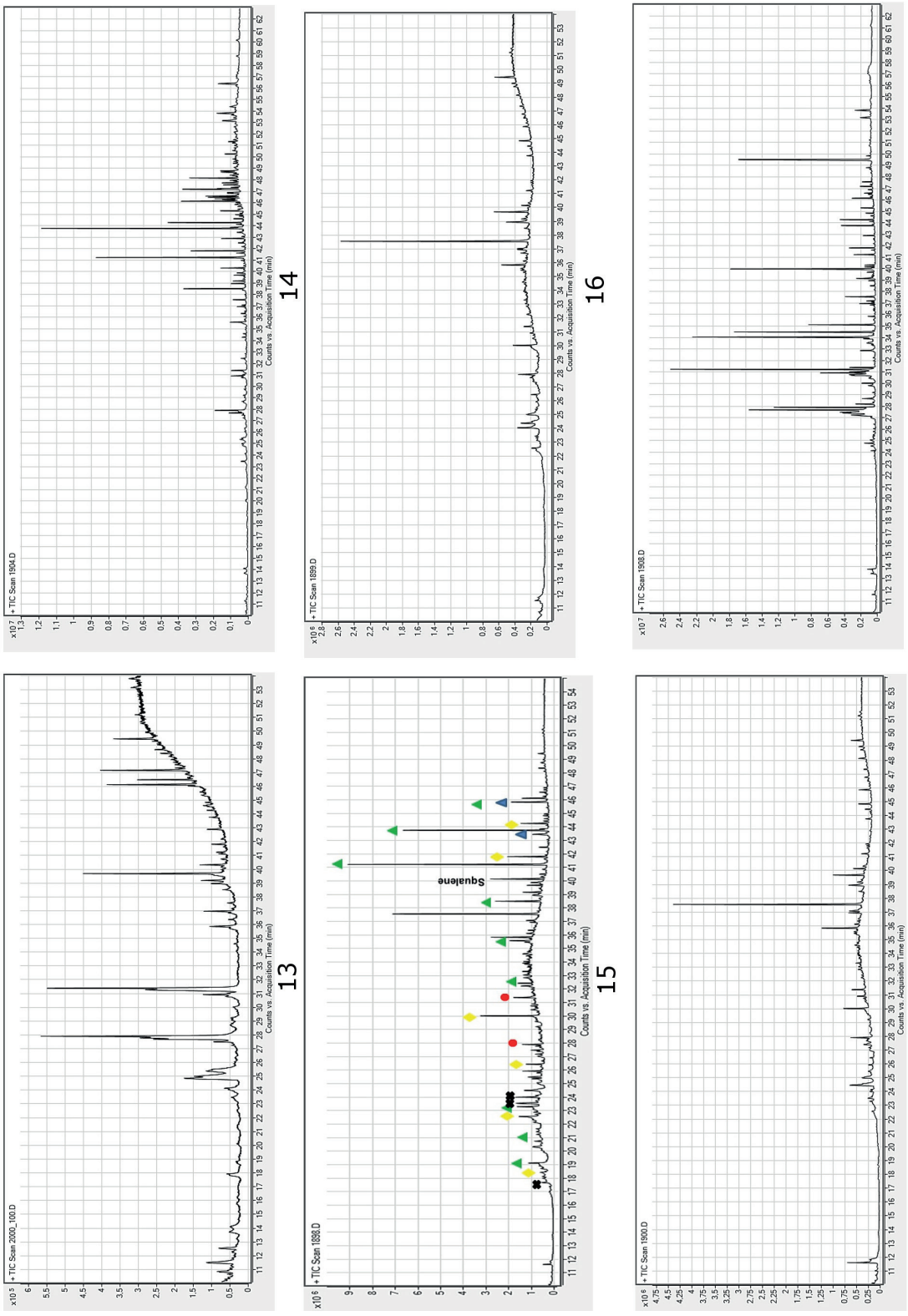


Fig. E3.13-18: (13) Drilled outer surface of **Sample no. 2** = PPP 268932:011:015; (14) Partial total ion chromatogram of the soil sample (PPP 268932:011:013) associated with **Sample no. 2**; (15) Partial total ion chromatogram of **Sample no. 10** = PPP 100000:032:005; (16) Drilled inner surface of **Sample no. 10**; (17) Drilled outer surface of **Sample no. 10**; (18) Partial total ion chromatogram of the soil sample (PPP 100000:032:004) associated with **Sample no. 10**. Prepared by Elsa Perruchini.

In conclusion, this sample yielded evidence for the presence of residue coming from seed plants and plant waxes.

Samples nos. 3-4: PPP 269929:039:012 and PPP 269929: 039:013

Both samples were taken from a carinated bowl (PPP 269929:039:005) discovered in the kiln fill. The kiln fill (Locus:269926:039) is characterised by some level of disturbance dating to the period when the kiln was re-used as a waste pit (**§D6.1**), therefore it is likely that the sampled vessel did not belong to the last kiln load, but was discarded in the kiln at some point after it went out of use.

One sherd (PPP 269926:039:013) was kept intact to be crushed into powder at the BECS lab (**Fig. E3.19**), the other (PPP 269926:039:012) was crushed into powder directly on site (**Fig. E3.23**). Both samples yielded the same compounds and have similar chromatogram profiles, proving the on-site sampling method successful.

The samples yielded residues containing a series of odd (C9:0, C15:0, C17:0, C25:0) and even chain fatty acids (C10:0, C12:0, C14:0, C16:0, C18:0, C20:0, C22:0, C24:0). The shorter-chain fatty acids (C8:0 and C10:0) are characteristic of milk fats, but they can be found in varying proportions in all animal and plant lipids[139]. C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[140]. Those two compounds can also be found on the samples' inner and outer surfaces as well as in the accompanying soil sample (PPP 269926:39:14; **Fig. E3.22**).

The detection of C24:0 (lignoceric acid) and hexacosanoic acid (C26:0) acid (in conjunction with long-chain alkanes and fatty alcohols) points to the possibilities of the presence of beeswax[141], which would be an interesting observation for a vessel found in a kiln. However, more data are needed to conclude that these acids indeed originated from beeswax[142].

The samples' residues also contain mid-chain monounsaturated fatty acids (C16:1 and C18:1 cis-9). C18:1 (oleic acid) is the most abundant unsaturated fatty acid in milk, but like C16:1 (palmitoleic acid), it can be found in varying proportions in all animal and plant lipids[143].

The samples' residues further show a significant relative abundance of fatty alcohols (eiocosanol, docosanol, tetracosanol and hexacosanol) as well as even (C24, C26, C28) and odd numbered alkanes (C23, C25, C27, C29, C31) which may indicate the presence of plant material[144].

In conclusion, the samples of the bowl coming from the pottery kiln yielded evidence for the presence of plant material whereas the possible presence of beeswax is far less certain.

Sample no. 5: PPP 268931:031:010

This sample comes from the body fragments of a vessel found in the eastern fill of Building E Room 19. **Fig. E3.30** shows the partial total ion chromatogram produced by the residues extracted from one fragment of the vessel (PPP 268931:031:003).

The sample yielded residues containing a series of odd (C25:0) and even chain fatty acids (C16:0, C18:0). C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[145]. Those two compounds can also be found in the inner and outer surfaces as well as in the accompanying soil sample (PPP 268931031:009; **Figs. E3.31-33**).

The sample residue also contains two fatty alcohols and a significant relative abundance of odd numbered alkanes (C21, C23, C25, C27, C29, C31) in comparison to even numbered alkanes (C18, C20, C24, C28, C30), which may indicate the presence of plant material[146].

Moreover, the sample residue contains two long chain ketones present in vegetal waxes: nonacosane-10-one (C29) (identified e.g. in cabbages) and hentriacontane-16-one (C31)[147].

In conclusion, this sample yielded evidence for the presence of plant remains and vegetal waxes.

Sample no. 6: PPP 268932:020:014

This sample was taken from the base of a jar found next to the oven in Building F Courtyard 21 (Locus:268932:050). **Fig. E3.26** shows the partial total ion chromatogram produced by the residues extracted from the fragment.

The sample yielded residues containing a series of odd (C9:0, C15:0, C17:0, C19:0, C25:0) and even chain fatty acids (C8:0, C10:0, C14:0, C16:0, C18:0, C20:0, C22:0, C24:0, C26:0). The shorter-chain fatty acids (C8:0 and C10:0) are

139 Gunstone *et al.* 1994, 49.
140 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
141 Evershed *et al.* 1997b.
142 Evershed/Dudd 2003.
143 Gunstone *et al.* 1994, 49.
144 See *e.g.* Marshall *et al.* 2008, 250 and Baeten *et al.* 2013, 1161.
145 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
146 See *e.g.* Marshall *et al.* 2008, 250 and Baeten *et al.* 2013, 1161.
147 Leray 2012, 79.

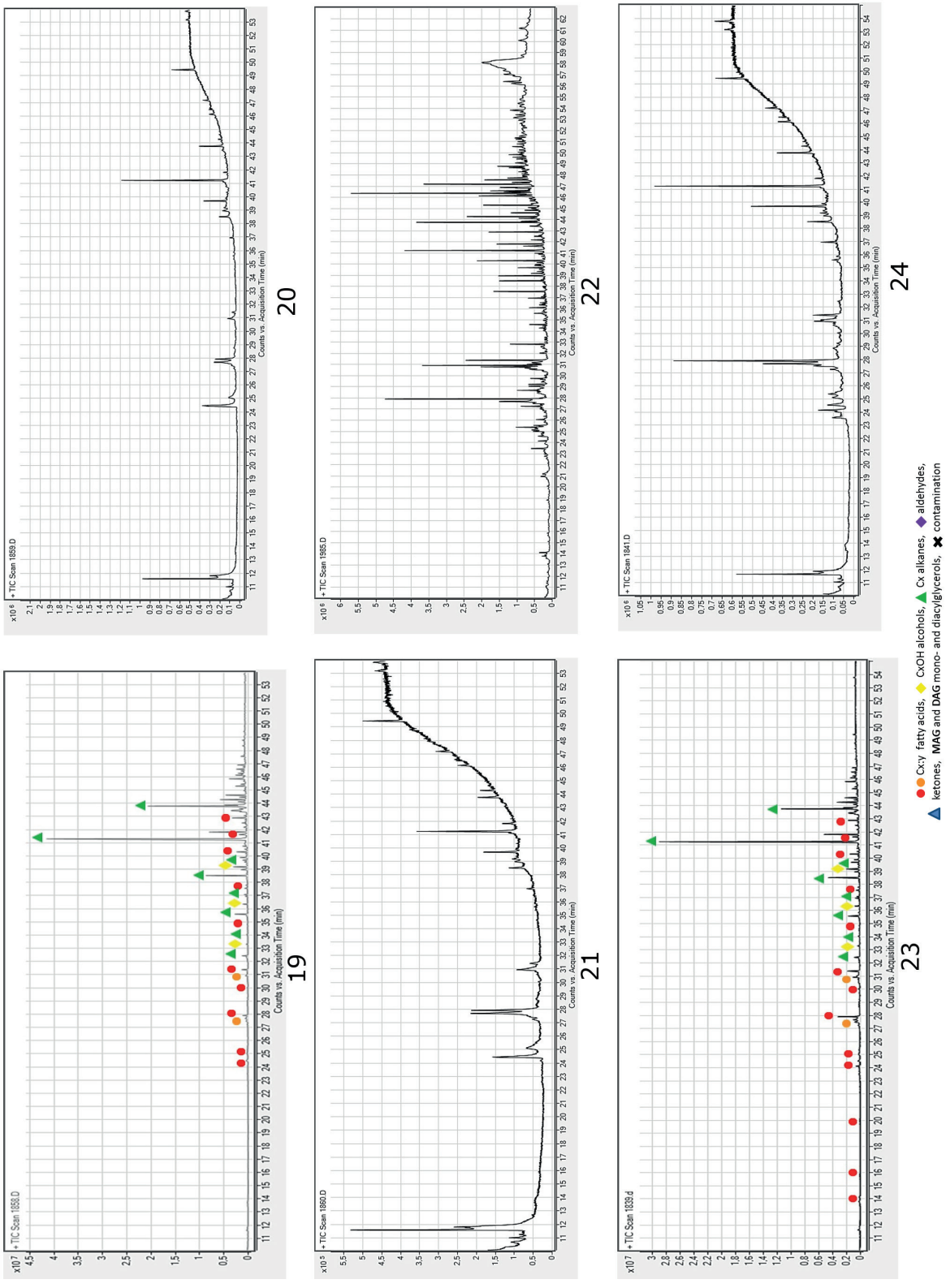


Fig. E3.19-24: (19) Partial total ion chromatogram of **Sample no. 4** = PPP 269926:039:013; (20) Drilled inner surface of **Sample no. 4**; (21) Drilled outer surface of **Sample no. 4**; (22) Partial total ion chromatogram of the soil sample (PPP 269926:039:014) associated with **Sample nos. 3 and 4**; (23) Partial total ion chromatogram of **Sample no. 3** = PPP 269926:039:012; (24) Drilled inner surface of **Sample no. 3**. Prepared by Elsa Perruchini.

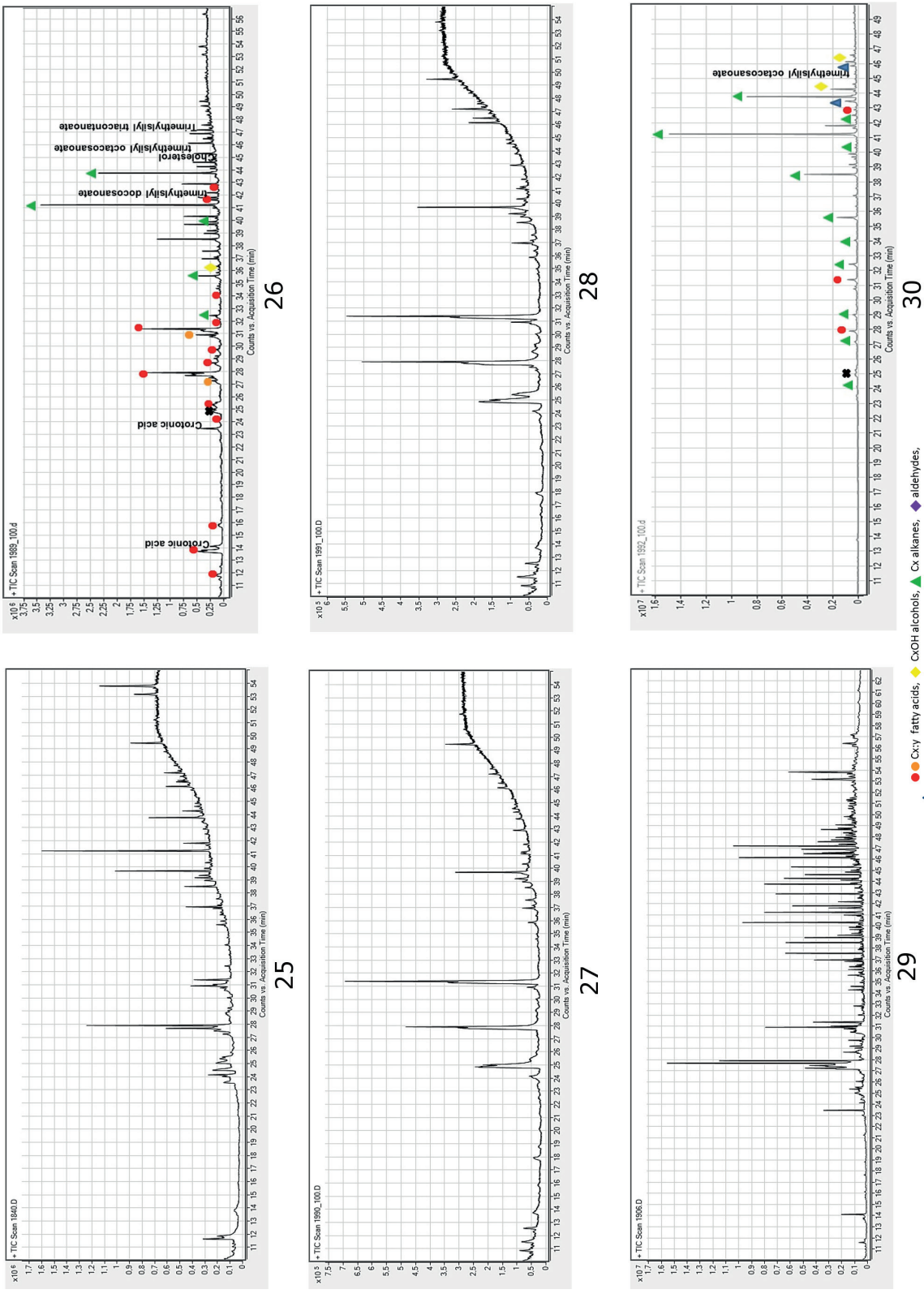


Fig. E3.25-30: (25) Drilled outer surface of **Sample no. 3** = PPP 269926:039:012; (26) Partial total ion chromatogram of **Sample no. 6** = PPP 268932:020:014; (27) Drilled inner surface of **Sample no. 6**; (28) Drilled outer surface of **Sample no. 6**; (29) Partial total ion chromatogram of the soil sample (PPP 268932:020:013) associated with **Sample no. 3**; (30) Partial total ion chromatogram of **Sample no. 5** = PPP 268931:031:010. Prepared by Elsa Perruchini.

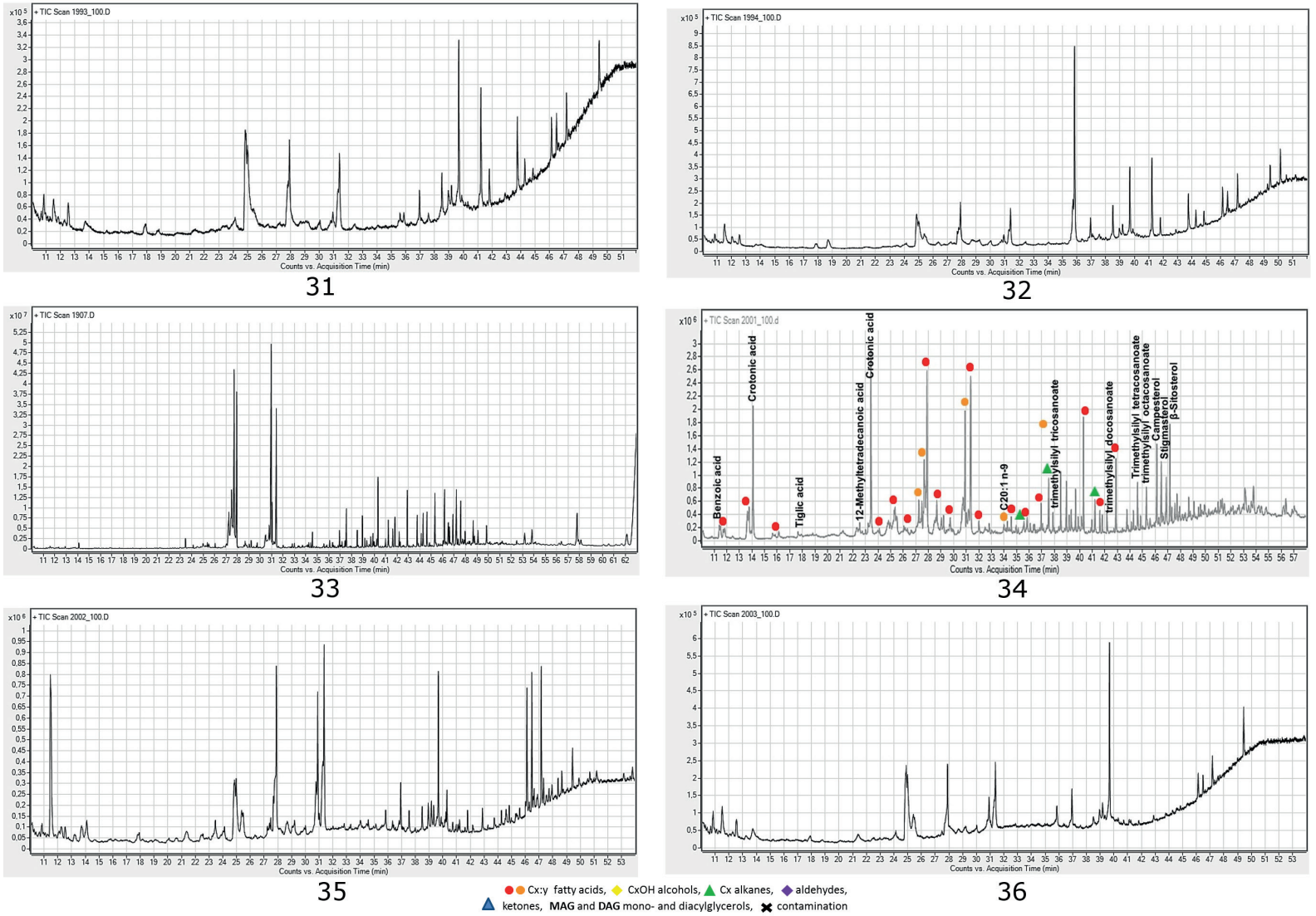
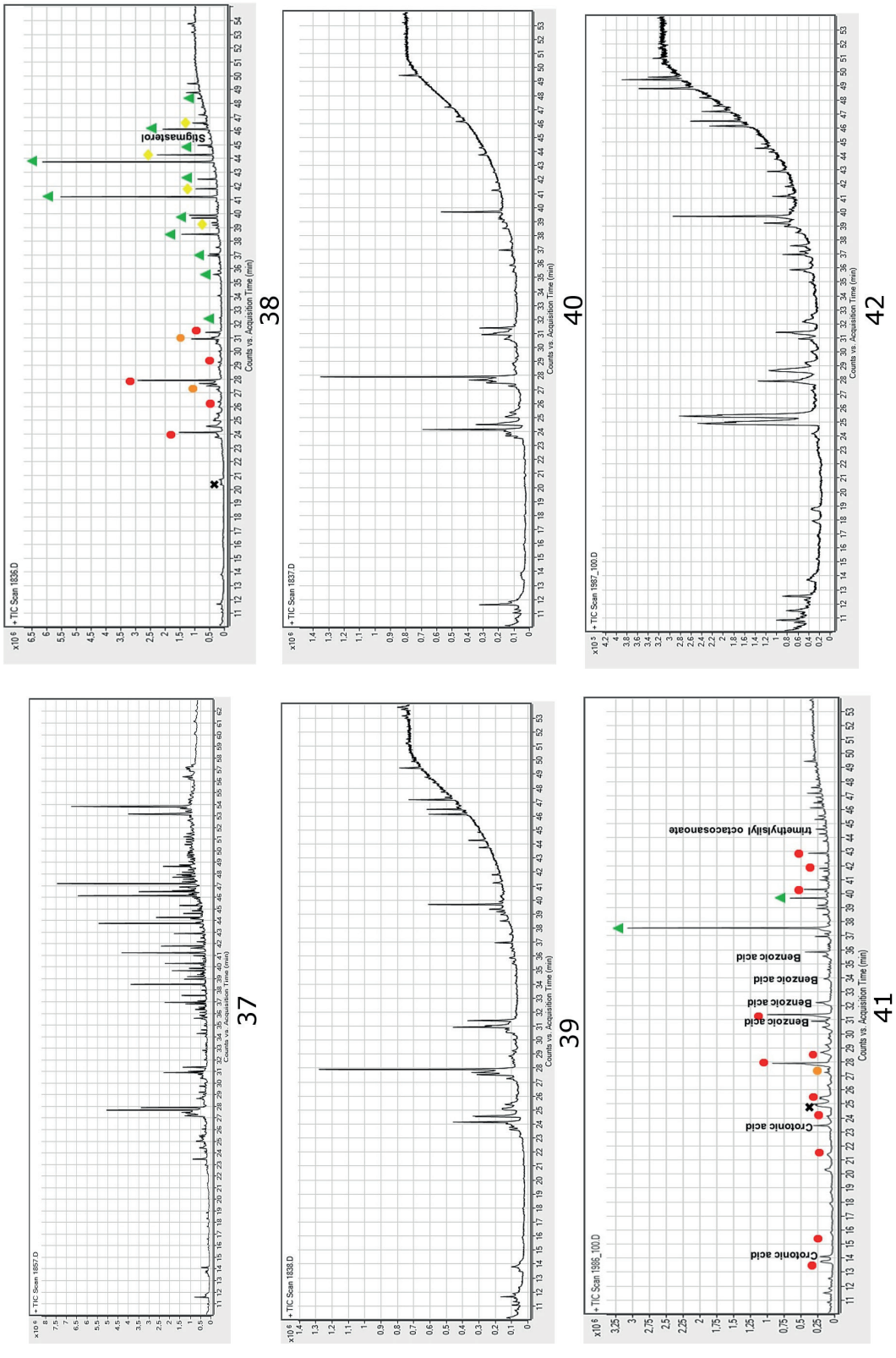
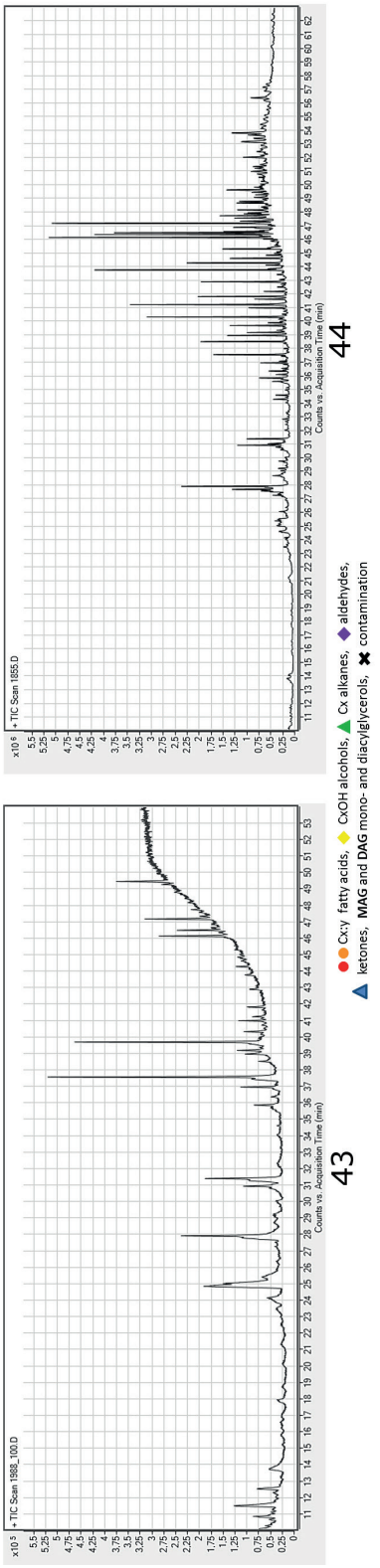


Fig. E3.31-36: (31) Drilled inner surface of **Sample no. 5** = PPP 268931:031:010; (32) Drilled outer surface of **Sample no. 5**; (33) Partial total ion chromatogram of the soil sample (PPP 268931:031:009) associated with **Sample no. 5**; (34) Partial total ion chromatogram of **Sample no. 7** = PPP 268932:050:004; (35) Drilled inner surface of **Sample no. 7**; (36) Drilled outer surface of **Sample no. 7**. Prepared by Elsa Perruchini.


+ TIC Scan 1836.D
Stigmasterol
Counts vs. Acquisition Time (min)
38
+ TIC Scan 1837.D
Counts vs. Acquisition Time (min)
40
+ TIC Scan 1887_100.D
Counts vs. Acquisition Time (min)
42
+ TIC Scan 1857.D
Counts vs. Acquisition Time (min)
37
+ TIC Scan 1838.D
Counts vs. Acquisition Time (min)
39
+ TIC Scan 1986_100.D
Crotonic acid
Crotonic acid
Benzoic acid
Benzoic acid
Benzoic acid
Benzoic acid
trimethylsilyl octacosanoate
Counts vs. Acquisition Time (min)
41



Figures E3.37-44: (37) Partial total ion chromatogram of the soil sample (PPP 268932:050:007) associated with **Sample nos. 7 and 8**; (38) Partial total ion chromatogram of **Sample no. 8** = PPP 268932:050:005; (39) Drilled inner surface of Sample no. 8; (40) Drilled outer surface of **Sample no. 8**; (41) Partial total ion chromatogram of **Sample no. 9** = PPP 268932:059:001; (42) Drilled inner surface of **Sample no. 9**; (43) Drilled outer surface of **Sample no. 9**; (44) Drilled outer surface of **Sample no. 9**. Prepared by Elsa Perruchini.

characteristic of milk fats, but they can be found in varying proportions in all animal and plant lipids[148]. C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[149]. Those two compounds can also be found in the inner and outer surfaces as well as in the accompanying soil sample (PPP 268932:020:013; **Fig. E3.29**).

The sample residue also contains a significant relative abundance of odd numbered alkanes (C23, C25, C27, C29, C31) in comparison to even numbered alkanes (C24, C26, C28), which may indicate the presence of plant material[150].

The detection of C24:0 (lignoceric acid) and hexacosanoic acid (C26:0) acid (in conjunction with long-chain alkanes and fatty alcohols) points to the possible presence of beeswax[151]although we do not have sufficient data to conclude that they indeed originated from beeswax[152].

Crotonic acid, a short-chain unsaturated carboxylic acid, has been tentatively identified, but because it can also be found in the associated soil sample, it may derive from post-depositional processes.

In conclusion, this sample yielded some evidence for plant remains.

Samples nos. 7-8: PPP 268932:050:004-005

Both samples come from a vessel (or possibly more) registered as PPP 268932:050:001, found in fragments inside the oven of Building F Courtyard 21 (Locus:268932:050).

At a first glance, we can notice that the two samples have very different chromatogram profiles. This could either be the result of a possible post-excavation contamination or it can point to the possibility that the two fragments came from different parts of the same vessel (rim, base, body) or even from two different vessels.

Sample no. 7: PPP 268932:050:004

Fig. E3.34 shows the partial total ion chromatogram produced by the residues extracted from this sample. It yielded residues containing a series of odd (C25:0) and even chain fatty acids (C16:0, C18:0). C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) were detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[153].

148 Gunstone *et al.* 1994, 49.
149 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
150 See *e.g.* Marshall *et al.* 2008, 250 and Baeten *et al.*, 2013, 1161.
151 Evershed *et al.* 1997b.
152 Evershed/Dudd 2003.
153 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.

Those two compounds can also be found in the inner and outer surfaces of the sample, as well as in the soil sample PPP 268932:050:007 (**Fig. E3.37**).

The sample residue also contains two fatty alcohols and a significant relative abundance of odd numbered alkanes (C25, C27, C29), which may indicate the presence of plant material[154]. Furthermore, stigmasterol, campesterol and β-sitosterol are sterols found in plant tissue[155].

Moreover, the sample residue contains mid-chain monounsaturated fatty acids (C16:1 and C18:1 cis-9). C18:1 (oleic acid) is the most abundant unsaturated fatty acid in milk, but like C16:1 (palmitoleic acid), it can be found in varying proportions in all animal and plant lipids[156].

12-Methyltetradecanoic acid (anteiso-pentadecanoic acid or a15:0), a branched chain fatty acid, was also detected. Like their odd chain counterparts, branched chain fatty acids are common in bacteria, but are also found in low levels in ruminant tissues[157].

The important relative abundance of lignoceric acid (C24:0), coupled with the detected arachidic (C20:0) and behenic (C22:0) acids, points to the presence of residue coming from the processing of seed plants[158].

The detection of C24:0 (lignoceric acid) and hexacosanoic acid (C26:0) acid (in conjunction with long-chain alkanes and fatty alcohols) points to the possibilities of the presence of beeswax[159] although there is insufficient data to conclude without a doubt that they originated from beeswax[160].

Benzoic acid, only identified in this sample and on its drilled inside surface **(Fig. E3.35)**, is a product resulting from fermentation processes[161]. It is also present in smoke and charred materials[162]. However, it should be noted that benzoic acid is also a common environmental contaminant produced by plants' natural processes of decay and decomposition, which makes it difficult to conclusively connect its presence in this sample to actual fermentation processes occurring in the vessel.

In conclusion, this sample yielded evidence for the presence of residue coming from the processing of seed plants.

154 Marshall *et. al.* 2008, 250 and Baeten *et al.* 2013, 1161.
155 Malainey 2010, 530.
156 Gunstone *et al.* 1994, 49.
157 See *e.g.* Baeten *et al.* 2013, 1155; Marshall *et al.*, 2008, 250 and Buonasera 2005, 962.
158 Eusebio 2015.
159 Evershed *et al.*, 1997b.
160 Evershed/Dudd, 2003.
161 See *e.g.* Han *et al.* 2016.
162 Lejay *et al.* 2016.

Sample no. 8: PPP 268932:050:005

Fig. E3.38 shows the partial total ion chromatogram produced by the residues extracted from this sample, which was crushed into powder directly on-site.

The sample yielded residues containing a series of odd (C15:0, C17:0) and even chain fatty acids (C14:0, C16:0, C18:0). C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[163]. Those two compounds can also be found in the inner and outer surfaces as well as in the accompanying soil sample (PPP 268932:50:007; **Fig. E3.37**).

In contrast to the other samples, the peak relative abundance of oleic acid (C18:1) is noticeably higher in this sample than that of stearic acid (C18:0). In addition palmitic acid (C16:0) has a relative abundance, almost twice as high as stearic acid (C18:0), which possibly indicates a plant source or an aquatic food source[164].

The sample residue also contains fatty alcohols and a significant relative abundance of odd numbered alkanes (C25, C27, C29, C31, C33, C35) in comparison to even numbered alkanes (C24, C26, C28, C30, C32), which may indicate the presence of plant material[165]. The presence of stigmasterol, in particular, is indicative as this is a sterol found predominantly in plant tissue[166].

In conclusion, this sample yielded some evidence for plant remains. Levels of oleic and palmitic acids that are higher than in other samples may point to a plant source or an aquatic food origin for the residue found on this sample.

Sample no. 9: PPP 268932:059:001

This sample was taken from the body sherd of a fragmentary vessel found in the fill of Room 28 in Building F. **Fig. E3.41** shows the partial total ion chromatogram produced by the residues extracted from the sample.

Few compounds were identified as archaeologically significant; the majority were also found in the drilled outer surface (**Fig. E3.43**). The sample yielded residues containing a series of odd (C9:0, C15:0, C17:0, C25:0) and even chain fatty acids (C14:0, C16:0, C18:0, C24:0, C26:0). C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered

163 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
164 Olsson/Isaksson 2008.
165 See *e.g.* Marshall *et al.* 2008, 250 and Baeten *et al.* 2013, 1161.
166 Malainey 2010, 530.

in plant and animal tissues[167]. Those two compounds can also be found in the inner and outer surfaces as well as in the accompanying soil sample (PPP 268932:059:002; **Fig. E3.44**).

In contrast to the other samples, very few alkanes (C29 and C31) were identified that may indicate the presence of plant material[168].

Benzoic acid has also been identified, which is a product resulting from fermentation processes[169] and also present in smoke and charred materials[170]. However, as mentioned above in our discussion of **Sample no. 7**, one cannot dismiss the possibility that it derives from the natural decay and decomposition of plants.

In conclusion, this sample yielded no archaeologically significant results.

Sample no. 10: PPP 100000:032:005
This sample was taken from a partially complete bowl found on floor Locus:100000:032 in Qalat-i Dinka (**§C3**). **Fig. E3.15** shows the partial total ion chromatogram produced by the residues extracted from the sample. The sample's drilled inner and outer surfaces and the associated soil sample's ion chromatogram are shown in Fig. **E3.16-18**.

Only C16:0 (palmitic/hexadecanoic acid) and C18:0 (stearic/octadecanoic acid) have been detected, which are the most abundant and common fatty acids typically encountered in plant and animal tissues[171]. Those two compounds can also be found in the inner and outer surfaces.

The sample residue also contains a significant relative abundance of fatty alcohols (tetradecanol, hexadecanol, octadecanol, hexacosanol) as well as even (C16, C18, C24) and odd numbered alkanes (C17, C25, C27, C29, C31), which may indicate the presence of plant material[172].

The sample residue also contains two long chain ketones present in vegetal waxes, that is nonacosane-10-one (C29) (identified *e.g.* in cabbages) and hentriacontane-16-one (C31)[173].

Moreover, squalene was detected in the sample; it is produced by both plants and animals, making it difficult to interpret its presence in this sample. Moreover, it could also be a product of modern contamination (handling and plasticizer)[174]. It is important to notice that this sample yielded more pronounced traces of modern contamination, namely phthalates, phenols and DEET (insect repellent), than all the other samples. The vessel was recovered in a previous season of excavations, before a strict on-site protocol for sampling was implemented, and it is therefore likely that this reduced its prospects for organic residue analysis..

Finally, this sample, the only one from Qalat-i Dinka, yielded results for possible vegetal waxes although the high levels of contaminants in this sample cast doubt on the reliability of the overall results.

E3.6 Conclusions

Table E3.1 summarises the residue analysis results obtained so far from the Dinka Settlement Complex data.

Thanks to the rigorous sampling strategy, the samples from Gird-i Bazar show low levels of modern contamination (*e.g.*, phthalates), as observed after comparison with control samples (*i.e.*, drilled inner and outer surfaces, soil samples and blanks). On the other hand, the sample from Qalat-i Dinka, which was collected from a vessel excavated during the spring campaign in the author's absence and before the protocol had been implemented, shows significant contamination. The newly implemented on-site sampling protocol can therefore be judged as successful.

The organic residue analysis for the Gird-i Bazar samples yielded compounds of potential archaeological significance in the samples. Although it is not possible, based on these results, to draw clear conclusions on what the different vessels originally held, most of the samples analysed produced evidence, namely for plant remains, plant waxes, seed plant processing and perhaps an aquatic food source.

These results make it certainly worthwhile to continue collecting data, which may allow us to eventually determine the functions of some vessels and contribute to a better understanding of food production and consumption patterns at the Dinka Settlement Complex.

167 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
168 See *e.g.* Marshall *et al.* 2008, 250 and Baeten *et al.* 2013, 1161.
169 See *e.g.* Han *et al.* 2016.
170 Lejay *et al.* 2016.
171 Evershed *et al.* 1997a; Heron/Evershed 1993; Evershed 2008.
172 See for instance Marshall *et al.* 2008, 250 and Baeten *et al.* 2013, 1161.
173 Leray 2012, 79.
174 Lejay *et al.* 2016.

Sample no.	Sherd description	Notable compounds identified by GC-MS	Results summary
1	Body sherd from a jar from a floor in Building A: PPP 272927:027:013.	Mid-chain monounsaturated fatty acids (C16:1 and C18:1), odd numbered alkanes (C23, C25, C27, C29, C31), sterols (stigmasterol and campesterol), and betulinaldehyde.	Possible plant remains.
2	Base sherd from a jar in a fill of Building F: PPP 268932:011:015.	Mid-chain monounsaturated fatty acids (C16:1 and C18:1), odd numbered alkanes (C25, C29, C31) and stigmasterol.	Possible seed plant processing; plant waxes.
3	Body sherd from a jar from the pottery kiln in Outdoor Area 8: PPP 269929:039:012.	Mid-chain monounsaturated fatty acids (C16:1 and C18:1 cis-9), fatty alcohols (eiocosanol, docosanol, tetracosanol and hexacosanol) as well as even (C24, C26, C28) and odd numbered alkanes (C23, C25, C27, C29, C31).	Possible plant remains.
4	Body sherd from a jar from the pottery kiln in Outdoor Area 8: PPP 269929:039:013.	Mid-chain monounsaturated fatty acids (C16:1 and C18:1 cis-9), fatty alcohols (eiocosanol, docosanol, tetracosanol and hexacosanol) as well as even (C24, C26, C28) and odd numbered alkanes (C23, C25, C27, C29, C31).	Possible plant remains.
5	Body sherd from a jar from a fill in Building E: PPP 268932:031:010.	Fatty alcohols, odd numbered alkanes (C21, C23, C25, C27, C29, C31), two long-chain ketones: nonacosane-10-one (C29) and hentriacontane-16-one (C31).	Possible plant remains and vegetal waxes.
6	Base sherd from a vessel found next to the oven in Building F: PPP 268932:020:014.	Palmitic (C16:0) in high relative abundance. Odd numbered alkanes (C23, C25, C27, C29, C31).	Possible plant remains.
7	Body sherd from a vessel from within the oven in Building F: PPP 268932:050:004.	Fatty alcohols, odd numbered alkanes (C25, C27, C29), sterols (stigmasterol, campesterol and β-sitosterol), mid-chain monounsaturated fatty acids (C16:1 and C18:1 cis-9). Long-chain fatty acids (C24:0, C20:0 and C22:0).	Possible seed plant processing.
8	Body sherd from a vessel from within the oven in Building F: PPP 268932:050:005.	Palmitic (C16:0) in high relative abundance. Odd numbered alkanes (C25, C27, C29, C31, C33, C35) and stigmasterol.	Possible plant remains and aquatic food source.
9	Body sherd from a vessel from a fill in Building F: PPP 268932:059:001.	No significant results.	No significant results.
10	Body sherd from a vessel from a floor in Qalat-i Dinka: PPP 100000:032:005.	Long chain ketones: nonacosane-10-one (C29) and hentriacontane-16-one (C31).	Possible vegetal waxes (but high contamination).

Table E3.1: Overview of the results from the samples from Gird-i Bazar and Qalat-i Dinka analysed so far.

F. Neo-Assyrian period small finds of Gird-i Bazar, 2016

Andrea Squitieri

During the 2016 campaign at Gird-i Bazar a total of 180 small finds were collected and registered[175]. Of these, 53 came from the levels of the Main Occupation Periods 1 and 2 (**Table D2**), that is the levels datable to the Neo-Assyrian period (9th - 7th centuries BC). Another 74 objects, mainly beads, came from the younger burials overlaying the Neo-Assyrian structures, now datable to the Late Sasanian era (see **Chapter G**).

These finds will be published separately once the graveyard at Gird-i Bazar has been uncovered in full. The remaining 51 objects came from the levels of the Modern Occupation Period, modern pits and the topsoil and document human activity of the 20th and 21st centuries AD; these objects include four Iraqi coins bearing the date 1970, and various modern plastic and metal items.

This chapter will discuss the 53 objects excavated in the Neo-Assyrian occupation layers and another four groundstone tools that were found in the topsoil but are likely to belong to the Neo-Assyrian horizon, cataloguing 43 of these objects in detail. 39 of the 53 objects found in the Neo-Assyrian levels are groundstone tools, representing the vast majority of items, as in 2015[176]. They constitute a mix of pebble mortars, polishers, pounders and/or weights (often difficult to distinguish), perforated stones and pestles. The rest of the 2016 small finds are: a single iron object, possibly a razor (= no. 24); a ceramic object, possibly a pot stand (= no. 34); seven small flint flakes, which may derive from the process of lithic reduction; and two mudbricks and three brick fragments (cf. nos. 23 and 31). All these finds can be described as utilitarian and simple objects. As in the 2015 season, no decorated items or luxury objects were uncovered[177].

We will first introduce the most numerous group, the groundstones, before discussing the small finds in their archaeological contexts.

F1. On the groundstone tools

A variety of groundstone tool typologies and terminologies have been proposed in the archaeological literature, some based on morphology, others on function[178]. This report will present the stone tools based on their morphology. There is no general consensus on the terminology; we will refer to the typological works by K. Wright and D. Eitam and employ the terminology adopted by them[179]. Although their work deals with older data, it can be easily adapted to the material from the Neo-Assyrian period.

	2016	2015
Pebble mortars	17	2
Pounders and/or spherical weights	10	3
Polishers	7	2
Perforated stones	4	1
Pestles	1	0

The most frequently attested material among the groundstone tools of Gird-i Bazar is brownish or whitish hard limestone. This is likely of local origin, as limestone of different varieties is abundant in the Bora Plain around Gird-i Bazar and in general in the region east of Lake Dokan[180] (**Fig. E2.2**).

More rarely attested is a medium- to fine-grained dark greenish stone, likely a basaltic rock. The volcanic material is likely to originate from deposits in the Zagros moun-

175 Andrea Squitieri supervised the registration of the 2016 small finds. Bilind Shushe and Haymann Noori entered the objects into the database. The latter also took the photographs while Francesca Chelazzi made the drawings.

176 Wilkinson/Squitieri/Hashemi 2016, 100.

177 Wilkinson/Squitieri/Hashemi 2016, 108.

178 *E.g.*, Adams 2002; Wright 1992.

179 Wright 1992; Eitam 2009.

180 Karim *et al.* 2011, fig. 11.

tain range east of Gird-i Bazar, in areas other than those yielding limestone[181].

Judging from the 2015 and 2016 finds, only polishers and pestles are made of basaltic rock, whereas all other stone tools are fashioned out of limestone.

Pebble mortars

The 17 Gird-i Bazar pebble mortars found in 2016 are made of a hard variety of limestone, likely collected from the site's vicinity. The pebble mortars show one or two opposite shallow depressions in an otherwise unworked or only roughly cut-to-shape pebble with a disc or oval shape. In some cases, they fit in the palm of an hand. The shallowness of their depressions shows a low degree of intensity of use and force applied during their use, so it is possible that these depressions were just the result of continuing pounding/hammering and crushing.

Pebble mortars similar to those from Gird-i Bazar are common in Middle Eastern and also Eastern Mediterranean sites since prehistory[182]. Following Adams' distinction between expedient and strategic design tools[183], the Gird-i Bazar pebble mortars can be considered as typical expedient design tools as their manufacture did not require time-consuming and highly intensive labour, as most of the tool's body was left unworked or only roughly shaped. Their expedient design makes them suitable for short usage. This explains why some of the Gird-i Bazar pebble mortars were found in rubbish pit fills or were reused in walls: they seem to have been discarded at a high rate.

Some Gird-i Bazar pebble mortars have depressions showing small pecking marks inside, which suggests that these tools were used for pounding and/or grinding small-size substances: perhaps seeds or herbs, but possibly also minerals. Given that close parallels to the Gird-i Bazar pebble mortars are known from the Iron Age copper smelting sites of the Timna region in the Arabah Valley in the Southern Levant[184] the latter interpretation is attractive. The Timna tools were certainly connected with industrial activities and this raises the possibility that at Gird-i Bazar, too, such tools were used for production activities other than food processing.

Pounders and/or spherical weights

We interpret spherical tools made of hard limestone that fit easily in a hand's palm as pounders, whenever tiny pecking or battering marks are visible on their surface[185]. However, many Gird-i Bazar pounders are covered by a thick patina, making such wear marks hard to spot. The size of such pounders would make them ideal counterpart of the already discussed pebble mortars. But so far, no set of pounder and pebble mortar has been together found at Gird-i Bazar.

At least some of these spherical tools may have been used as stone weights, perhaps for balance. Since a discarded weight could have been easily reused as a pounder it is of course entirely possibly that some tools were used both as weights and as pounders at different times in their life-cycle.

On the other hand, the small size of some objects certainly excludes the function as a pounder since this would have damaged the user's fingers. These smaller tools seem more likely to have been used as weights only. During the registration process, the objects are all weighed in order to see whether a pattern in their weight distribution emerges, as could be expected if they were used as fixed units of measurements. So far, however, the sample size at Gird-i Bazar is too small to allow the identification of patterns with certainty.

Polishers

Polishers can be easily identified because of their subspherical shape featuring two or three very flat and shiny surfaces. Except for one piece made of diorite or gabbro, all polishers found so far at Gird-i Bazar are made of a compact variety of basaltic rock.

Their very flat surfaces suggests that the intensity of use of these tools was high. These tools were ideal to polish or burnish other objects' surfaces, making them smoother and shinier. The use of such polishers matches the evidence of Neo-Assyrian texts according to which volcanic stones were used to polish (*kapāru*) metal objects[186].

Perforated stones

Of the four perforated stones found in 2016, two can be connected to a well-shaped example found in 2015, although the new specimens are of irregular shape. All three objects are made of hard stone, likely limestone. Their holes have a biconic section: they were perforated from both sides of the pebble, rather than being drilled

181 Karim *et al.* 2011, fig. 11.

182 Eitam 2009, 90; Stroulia 2010, fig. 27; Wright 1992, 65.

183 Adams 2001, 21.

184 Greener/Ben-Yosef 2016, 200-201.

185 For similar prehistoric tools, see Wright 1992, 71.

186 For the use of "Stones from Izalla", i.e. from the volcanic deposits of the Tur Abdin mountain range, to polish precious metal objects, including silver furniture and doors, see Radner 2006, 293 and Gaspa 2009, esp. 90-93.

through. So far, no drilling devices for making stone tools have been found at Gird-i Bazar.

The function of such perforated stones is not clear although various interpretations have been offered: lathe flywheels, weights for hammers, weights for digging sticks attached to a plough or post sockets[187]. The last hypothesis can be excluded for Gird-i Bazar as the three objects have not been found in conjunction with door or passages. The post and door sockets encountered at Gird-i Bazar display a characteristic shape which is rounded in plan view and whose very deep depression shows clear circular marks on its surface (cf. **Fig. D30**).

Two more perforated stones were found during the 2016 campaign. With off-centre holes and very irregular bodies, these are tentatively interpreted as perforated weights.

Pestles

Pestles are elongated tools fitting well into the hand's palm, with a roughly cylindrical shape. They were used for grinding and/or pounding activities in conjunction with a mortar. Of the two pestles found in 2016, one is made of compact basaltic rock and stands out because of its regular and well-made shape. It was found in secondary use as part of a wall.

F2. Small finds from Building A (nos. 1-12)

The multi-room Building A (**§D.5**) occupies the easternmost part of the excavated area of Gird-i Bazar. Overall, floors and fills were very poor in objects, as if the rooms had been cleaned before abandonment. Small finds were encountered only in Rooms 1, 23 and 29, and twelve of these objects are catalogued in detail in the following.

Most of the extant objects were found in the pit fill of Room 1. This pit, with a depth of about 2 m, may initially have been constructed as part of a drainage system, but was later used for rubbish disposal (see **Chapter D**). The resultant fill yielded a very high quantity of pottery, along with the eight stone tools described below. Five of these (= 1-5) come from the top part of fill (Locus:271927:037) which contained also many unworked fieldstones while the three more stone tools (= 6-8) were found in the bottom part of the fill (Locus:271927:040).

187 For references see Wilkinson/Squitieri/Hashemi 2016, 107-108.

Despite being largely destroyed by a large modern pit, Room 23 yielded several objects on what little of its floor is preserved. There is a large stone installation that may be a toilet and a large jar (Locus:272927:020:004) was found smashed next to it. Of the three sub-spherical stone tools found on the floor of Room 23 (= 9-11), two were situated underneath this jar. The room's fill (Locus:272927:006) contained three 3 flint chips (PPP 272927:006:004-006-007) and a stone polisher (= 12).

Although much of Room 29 was damaged by later burials, some stone installations were encountered here, a bench and a well (not excavated), but on its floor only one object was found, a small flint flake (PPP 272927:044:002).

(**1**) Registration number: PPP 271927:040:005.
Material: basaltic rock.
Dimensions: length 14.1 cm, width 11.45 cm, height 3.2 cm.
Weight: 774g.
A pebble mortar with a very irregular, likely unworked shape, showing a very shallow depression on one side. Broken in half and mostly covered in patina. From the pit fill of Room 1.

(**2**) Registration number: PPP 271927:040:002 (**Fig. F1**).
Material: hard limestone.
Dimensions: length 8.6 cm, width 16.9 cm, height 5.3 cm.
Weight: 1364 g.
An oval pebble mortar showing on shallow circular depression each on the opposite sides, the larger with a diameter of 5.4 cm and a depth of 1.7 cm, the smaller with a diameter of 3.5 cm and depth of 1.2 cm. From the pit fill of Room 1.

Fig. F1: Pebble mortar: PPP 271927:040:002. Photo by Hayman Noori.

(**3**) Registration number: PPP 271927:040:004 (**Fig. F2**).
Material: hard limestone.
Dimensions: length 8.6 cm, width 14.7 cm, height 13.6 cm.
Weight: 2356 g.
A perforated stone cut to an irregular circular shape, with an irregular perforated hole off-centre. Its surface shows many traces that seem connected to the removal of large chips, perhaps due to a manufacturing process through heavy pecking. From the pit fill of Room 1.

Fig. F2: Perforated stone: PPP 271927:040:004. Photo by Hayman Noori.

(**4**) Registration number: PPP 271927:037:004 (**Fig. F3**).
Material: hard limestone (?).
Dimensions: diameter 14.7 cm, height 5.4 cm.
Weight: 1752 g.
A circular pebble mortar, roughly cut to shape, showing a shallow depressions on both sides. Entirely covered with patina. From the pit fill of Room 1.

(**5**) Registration number: PPP 271927:037:005.
Material: hard limestone.
Dimensions: length 17.1 cm, width 12.9 cm, height 3.9 cm.
Weight: 1354 g.
A pebble mortar, broken in half and covered by a thick patina. The object has an ovoid shape and two shallow depressions on either side, each with a diameter of 5 cm and a depth of 1.3 cm. From the pit fill of Room 1.

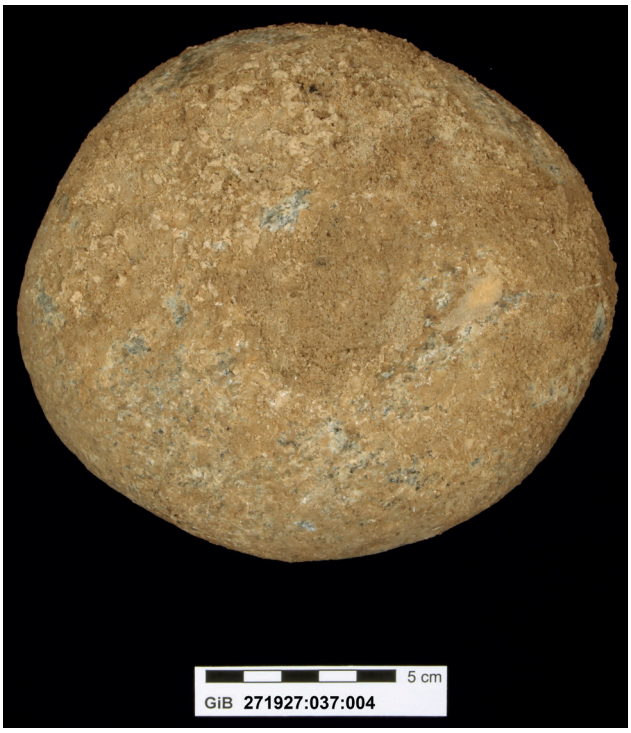


Fig. F3: Circular pebble mortar: PPP 271927:037:004. Photo by Hayman Noori.

(**6**) Registration number: PPP 271927:037:006
Material: basalt (?).
Dimensions: Diameter 6.6 cm.
Weight: 348 g.
A sub-spherical polisher with two flat sides with diameters of 3.2 cm, one being smooth and the other rougher: perhaps it had a secondary function used as an abrader.[188]
A patina covers most of the tools so closer inspection was impossible. From the pit fill of Room 1.

(**7**) Registration number: PPP 271927:037:007
Material: hard limestone.
Dimensions: length 13.7 cm, width 10.0 cm, height 6.0 cm.
Weight: 1339 g.
An oval pebble mortar with an unworked body and a shallow depression (diameter: 5.1 cm) on one side. Almost entirely covered by patina. From the pit fill of Room 1.

(**8**) Registration number: PPP 271927:037:008
Material: hard limestone.
Dimensions: diameter 7.7 cm, height 2.5 cm.
Weight: 281 g.
A small disc-shaped pebble mortar showing a shallow depression on either side. From the pit fill of Room 1.

188 For the characteristics of abraders see Wright 1992.

(**9**) Registration number: PPP 272927:020:003 (**Fig. F4**).
Material: basaltic rock.
Dimensions: diameter 6.5 cm.
Weight: 296 g.
Spherical pounder or perhaps a weight, broken on one side. Most of the tool is covered in whitish patina that obscures any possible wear marks. From the floor of Room 23.

(**10**) Registration number: PPP 272927:020:011 (**Fig. F5**).
Material: hard limestone (?).
Dimensions: length 5.5 cm, width 5.8 cm, height 5.3 cm.
Weight: 211 g.

Fig. F4: Spherical pounder or a weight: PPP 272927:020:003. Photo by Hayman Noori.

Fig. F5: Sub-spherical pounder: PPP 272927:020:011. Photo by Hayman Noori.

(**11**) Registration number: PPP 272927:020:012.
Material: basalt (?).
Dimensions: length 4.4 cm, width 4.8 cm, height 3.5 cm.
Weight: 112 g.
Two sub-spherical pounders or, because of their small size, more likely weights. Covered in whitish patina. Both found on the floor underneath the large jar next to the toilet installation in Room 23.

(**12**) Registration number: PPP 272927:006:005 (**Fig. F6**).
Material: metamorphic rock (?).
Dimensions: length 8.4 cm, width 6.4 cm.
Weight: 610 g.
Spheroid polisher with one larger flat surface and two smaller ones. The large flat surface is covered by patina. There are some pecking marks visible on the small flat surfaces, whereas the rest of the object is polished. Because of the pecking marks, it is possible that is object was also used as pounder or abrader at some point. From the fill of Room 23.

Fig. F6: Spheroid polisher: PPP 272927:006:005. Photo by Hayman Noori.

F3. Small finds from Alley 12 and Building D (nos. 13-22)

Small finds were found in two parts of the multi-room Building D (**§D7**). Firstly, a pounder (= 13) was found on the floor of Room 9. Secondly, a more voluminous and interesting assemblage of stone tools (= 14-21) was excavated in Courtyard 27, which features a well surrounded by a stone floor: a large perforated stone (perhaps part of a water pulley), two polishers, a pounder and a pebble mortar were found on the floor. Three more stone objects were encountered in a secondary position, recycled as building material: a pebble mortar was set into the stone floor pavement (Locus:268931:048), and a pebble mortar and a pestle were reused in the construction of a wall (Locus:268931:019).

Alley 12 (**§D9**), located between Building D and Building H, yielded only one object, a perforated stone (= 22) from the fill.

(**13**) Registration number: PPP 268930:030:006
Material: hard limestone (?).
Dimensions: diameter 8.5 cm.
Weight: 735 g.
Spherical tool likely used as a pounder as it shows many pecking marks on its surface. Found in Room 9.

(**14**) Registration number: PPP 268931:046:043.
Material: hard limestone.
Dimensions: length 21 cm, width 25 cm, height 18 cm.
Weight: 4916 g.

Large and irregular perforated stone, only half preserved, from the floor of Courtyard 27. The part preserved has an irregular, slightly pointed shape. The hole is also irregular and shows pecking marks, but without circular striations, in its internal surface. This perforated stone is very different from the others found at Gird-i Bazar: it is much heavier and more irregularly shaped. It is tentatively assumed that it was used as a weight in conjunction with a pulling device connected to the well found in the same courtyard.

(**15**) Registration number: PPP 268931:046:047.
Material: basaltic rock.
Dimensions: length 6.5 cm, width 7.5 cm, height 6.5 cm
Weight: 362 g
Polisher with two flat surfaces found on the floor of Courtyard 27.

(**16**) Registration number: PPP 268931:048:001.
Material: basaltic rock.
Dimensions: length 5.8 cm, width 6.5 cm, height 5.5 cm.
Weight: 300 g.
Sub-spherical polisher with two flattish opposite surfaces. One side is covered in patina but the other side is clean with a very polished and shiny surface that indicates this object was used as a polisher. This polisher and the pounder PPP 268931:048:002 were found close to a stone installation (Locus:268931:059) in Courtyard 27, together with much broken pottery. The installation may have been used as a bench or a working surface.

(**17**) Registration number: PPP 268931:048:002 (**Fig. F7**).
Material: hard limestone.
Dimensions: length 6.4 cm, width 7.5 cm, height 5.8 cm.
Weight: 400 g.
Sub-spherical pounder, partially covered by whitish patina. The tiny pecking marks on the surface indicate its use as a pounder. Like the polisher PPP 268931:048:001, it was found close to the stone installation (Locus:268931:059) in Courtyard 27.

Fig. F7: Sub-spherical pounder: PPP 268931:048:002. Photo by Hayman Noori.

(**18**) Registration number: PPP 268931:048:003 (**Fig. F8**).
Material: hard limestone.
Dimensions: diameter 13.5 cm.
Weight: 1048 g.
Pebble mortar, rounded in plan view and slightly pointed on one side. On the two faces, there are small and shallow depressions, each 4 cm in diameter and 1.5 cm deep. Light circular marks are visible in one depression, suggesting the tool was used for light grinding. One side of the object is covered in thick patina, whereas the other side shows a smoothened surface with pecking marks towards the edges, likely due to the manufacturing process. From Courtyard 27.

Fig. F8: Pebble mortar: PPP 268931:048:003. Photo by Hayman Noori.

(**19**) Registration number: PPP 268931:048:005.
Material: hard limestone.
Dimensions: length: 17 cm, width 12 cm, height: 6.5 cm.
Weight: 1868 g.
Pebble mortar, oval in plan view, with one small and shallow depression, about 2 cm deep. The mortar was reused as a part of the floor pavement 268931:048 of Courtyard 27. It was found lying upside down and slightly sunk into the stone paved floor. The object is chipped off on the top side and mostly covered by a calcite patina, except for on the underside. There, the stone appears white, with some recent damage due to the fact that it was hit with the pick during the excavation.

(**20**) Registration number: PPP 269931:019:001.
Material: hard limestone.
Dimensions: diameter 17 cm.
Weight: 2400 g.
Pebble mortar, roughly circular in plan view. Roughly shaped, with heavy pecking marks on the surface and one circular depression, 7 cm in diameter and 2 cm deep. Pecking marks are also visible inside this depression. The underside is uneven and also shows heavy pecking marks. Found inside the wall Locus:269931:019.

(**21**) Registration number: PPP 269931:019:002 (**Fig. F9**).
Material: basaltic rock.
Dimensions: length 9.5 cm, width 3.5 cm, height 3,0 cm.
Weight: 247 g.
Elongated pestle in the shape of a parallelepiped, tapering towards one extremity. One end is slightly rounded, the other one is squarish flat. The edges are rounded and the vertical surfaces flat. The object is well smoothed on all surfaces. This pestle was likely used for light crushing and/or pounding, perhaps in conjunction with a pebble mortar with shallow depressions. No pecking marks are visible. Found in the masonry of wall Locus:269931:019.

Fig. F9: Elongated pestle: PPP 269931:019:002. Photo by Hayman Noori.

Fig. F10: Perforated stone: PPP 268931:057:002. Photo by Hayman Noori.

(**22**) Registration number: PPP 268931:057:002 (**Fig. F10**).
Material: hard limestone.
Dimensions: diameter 12 cm.
Weight: 285 g.
Perforated circular stone, half broken, with a hole of a diameter of 4 cm. Found in the fill of Alley 12.

F4. Small finds from Building E (nos. 23-25)

The floors of Building E / Room 19 (**§D8**) were nearly empty of objects: only a fragment of a baked brick (= 23) and an iron item, possibly a razor (= 24), were excavated. In the northern wall of the building, a pebble mortar (= 25) was found, reused in the masonry.

(**23**) Registration number: PPP 268931:033:001.
Material: baked clay.
Dimensions: Length: 12 cm, Width 6 cm, Height 4 cm.
Weight: N/A.
Fragment of a baked brick, possibly part of collapsed building superstructure. Floor of Building E.

(**24**) Registration number: PPP 268931:029:009 (**Fig. F11**).
Material: iron.
Dimensions: length 2.8 cm, width 7.8 cm, thickness: 0.4 cm.
Weight: 17 g.
Flat and thin iron object, much corroded, showing a complete edge on one side, while the opposite edge is damaged. Due to its shape, it may be a razor. Floor of Building E.

Fig. F11: Iron object, perhaps a razor: PPP 268931:029:009. Photo by Hayman Noori.

(**25**) Registration number: PPP 268932:034:001 (**Fig. F12**).
Material: hard limestone.
Dimensions: diameter 17 cm, height 4 cm.
Weight: 1410 g.
Pebble mortar, half broken but originally circular in plan view, with two depressions in the centre on the opposite sides (diameter 4.5 cm, depth 3.0 cm). Some pecking marks are visible on the body and also inside the depressions. These are without circular marks. The tool was reused as part of the masonry of the northern wall (LGR:0089) of Building E.

Fig. F12: Pebble mortar: PPP 268932:034:001. Photo by Hayman Noori.

F5. Small finds from Alley 13 (nos. 26-27)

Located between Building E in the south and Building F in the north, Alley 13 (**§D11**) is a long corridor of about 20 m. But only a small flint flake (PPP 268932:042:026) was found on its pebble floor, with two pebble mortars (= 26-27) unearthed in the fill above the floor.

Fig. F13: Pebble mortar: PPP 268931:058:002. Photo by Hayman Noori.

(**26**) Registration number: PPP 268931:058:002 (**Fig. F13**).
Material: hard limestone.
Dimensions: length 13.5 cm, width 10 cm, height 6 cm.
Weight: 1478 g.
A pebble mortar with a squarish shape in plan view and rounded edges. Shallow depression with a diameter of c. 3 cm and a depth of 0.5 cm are visible in the centre of both faces. One side of the object is completely covered by a thick patina, whereas the other side has a smooth surface with pecking marks towards the edges.

(**27**) Registration number: PPP 268932:067:003.
Material: hard limestone.
Dimensions: diameter 9 cm.
Weight: 265 g.
A half broken pebble mortar, roughly rounded in plan view with depressions partly preserved on either face. Pecking marks, likely from the manufacturing process, are visible on the edges of the object.

F6. Small finds from Building F (nos. 28-39)

The multi-room Building F (**§D12**) features several interesting installations, especially in its courtyard: a well, a water pulling device, three ovens and stone installations that may be interpreted as benches or working surfaces. As of now, Building F has yielded the highest number of

objects in Gird-i Bazar, mainly stone tools, which may indicate that several production and working activities took place in this building. Objects were found in Rooms 15, 20, 22 and 28 and in Courtyard 21.

The floor of Room 15 yielded a flint flake (PPP 267932:017:026) and and a pebble mortar (= 28). A pebble mortar (= 29) and a perforated stone, possibly a weight (= 30), were found on an installation (Locus:267932:028) located in a corner of Room 20, perhaps a bench or a working surface. A mudbrick (= 31) and a polisher (= 32) were excavated on the floor of Room 22. Room 28 features an oven and two installations connected to it. On one of these, a podium made of clay (Locus:268932:071), a stone weight (= 33) and a ceramic object, perhaps part of pot stand (= 34) were found.

Courtyard 21 yielded a relatively high number of objects. Two possible stone weights and a pebble mortar were found on the stone floor (LGR:0114) of Courtyard 21 (= 35-37). A possible pounder (= 38) and a pestle (= 39) were found in the fill (Locus:268932:012) of a socket (Locus:268932:077) set into this stone floor, likely used to support a water-pulley device. Finally, a fragment of a baked brick (Locus:268932:008:001) comes from what remains of a pilaster set against the facade of Room 22; perhaps it collapsed from the superstructure of this room.

(**28**) Registration number: PPP 267932:017:036.
Material: hard limestone (?).
Dimensions: diameter 7.2 cm, height 2.4 cm.
Weight: 115 g.
Small, half broken pebble mortar with two depressions on the opposite sides. Floor of Room 15.

(**29**) Registration number: PPP 267932:028:001.
Material: hard limestone (?).
Dimensions: diameter 12.25 cm; height 3.50 cm.
Weight: 932 g.
A circular pebble mortar with a very shallow depression on one side, just 0.6 cm deep. From installation Locus:267932:028 in Room 20.

(**30**) Registration number: PPP 267932:028:003 (**Fig. F14**).
Material: hard limestone.
Dimensions: length 9.6 cm, width 9.6 cm, height 8.20 cm.
Weight: 551 g.
A perforated stone of roughly circular shape and a hole with a diameter of 3.3 cm, perforated off-centre. The biconic section of the hole indicates that the stone was perforated from both sides. Because of the hole's off-centre position and the irregular body, this object may have functioned as a perforated weight, hung from a rope passing through the hole. From installation Locus:267932:028 in Room 20.

Fig. F14: Perforated weight (?): PPP 267932:028:003. Photo by Hayman Noori.

(**31**) Registration number: PPP 268932:049:005 (**Fig. F15**).
Material: baked clay.
Dimensions: length: 11 cm, width 21 cm, thickness 9 cm.
Weight: 330 g.
Rectangular mudbrick, almost entirely preserved, but with several cracks running across its body. It likely fell down to the floor of Room 22 from the superstructure of the room or from an installation.

Fig. F15: Mudbrick: PPP 268932:049:005. Photo by Hayman Noori.

(**32**) Registration number: PPP 268932:049:007.
Material: basaltic rock.
Dimensions: length 6.2 cm, width 8.0 cm, height 4.2 cm.
Weight: 322 g.

Sub-spherical polisher, covered on one side with a whitish patina. The opposite side has a flat surface, with some pecking marks visible. Although the pecking marks might suggest a pounder the flat surface indicates that it served as a polisher. Floor of Room 22.

(**33**) Registration number: PPP 268932:071:002 (**Fig. F16**).
Material: hard limestone.
Dimensions: diameter 5 cm.
Weight: 184 g.
Spherical object, with no evident pecking marks. It is too small to be a pounder and therefore most likely a weight. Mostly covered in patina. Found on the clay podium 268932:071 in Room 28.

Fig. F16: Possibly a weight: PPP 268932:071:002. Photo by Hayman Noori.

Fig. F17: L-shaped ceramic object: PPP 268932:071:003. Photo by Hayman Noori.

(**34**) Registration number: PPP 268932:071:003 (**Fig. F17**)
Material: ceramics (fired clay).
Dimensions: length 12.4 cm, width 10.5 cm, height 5.3 cm.
Weight: 546 g.
L-shaped ceramic object, broken on one side. In section, it is rounded on one side and squarish on the other. In the middle, part of a squared hole is visible. The fabric is reddish in colour and quite coarse. Heavy burning traces are visible on one side, the other is partially covered in whitish patina.

The interpretation of this object is unclear. The presence of the burning traces and the fact that it was found near the oven in Room 28 on the clay podium 268932:071 may support the hypothesis that it is a pot stand, used to keep the pot on the fire.

(**35**) Registration number: PPP 268932:021:014 (**Fig. F18**)
Material: hard limestone.
Dimensions: length 6.2 cm, width 4.9 cm.
Weight: 172 g.
Spheroid object with no flattened surface, likely used as a weight. Too small to be a pounder as it would not be comfortable to hold. Moreover, no pecking or other marks are visible on its surface. Found on the paved floor (LGR:0114) of Courtyard 21.

Fig. F18: Possibly a weight: PPP 268932:021:014. Photo by Hayman Noori.

(**36**) Registration number: PPP 268932:021:011.
Material: hard limestone.
Dimensions: length 5.7 cm, width 4 cm.
Weight: 174 g.
Spheroid weight with one small flattish surface covered in whitish patina. No pecking marks are visible, and the object surface looks polished. Due to its small size it may be a weight. Found on the paved floor (LGR:0114) of Courtyard 21.

(**37**) Registration number: PPP 268932:004:006.
Material: hard limestone.
Dimensions: length 6.1 cm, width 5.1 cm.
Weight: 218 cm.
Small sub-spherical pebble mortar with traces of pecking on one of the ends and a small shallow depression on one side. Found on the paved floor (LGR:0114) of Courtyard 21.

(**38**) Registration number: PPP 268932:012:005.
Material: hard limestone.
Dimensions: diameter 5 cm.
Weight: N/A
Spheroid pounder, with visible pecking marks on much of its surface. Found in the fill of the installation 268932:077 in Courtyard 21.

(**39**) Registration number: PPP 268932:012:008.
Material: hard limestone (?).
Dimensions: length: 10.2 cm, width 3.7 cm.
Weight: N/A
Elongated pestle, with two rounded extremities. As it is entirely covered in patina no marks are visible on its surface. Found in the fill of the installation Locus:268932:077 in Courtyard 21.

F7. Small finds from the topsoil (nos. 40-43)

Three groundstone tools found in the topsoil match in shape and raw material specimens found in the Neo-Assyrian levels, and therefore likely date to this period (= 40-42). A fourth object, a stone mortar (= 43), does not correspond to known examples from Gird-i Bazar and may be of younger date.

(**40**) Registration number: PPP 267932:002:004 (**Fig. F19**).
Material: basaltic rock.
Dimensions: diameter 7.0 cm, height 4.3 cm.
Weight: 364 g.
Oblate polisher with two very flat and smooth surfaces, each with a diameter of 4.2 cm.

Fig. F19: Oblate polisher: PPP 267932:002:004. Photo by Hayman Noori.

(**41**) Registration number: PPP 268931:013:014.
Material: hard limestone.
Dimensions: length 4.70 cm; width 4.12 cm.
Weight: 101 g.
Spheroid stone object, perhaps a pounder or a weight. Mostly covered in patina.

(**42**) Registration number: PPP 268932:002:005
Material: basaltic rock.
Dimensions: length 8.4 cm, width 5.8 cm.
Weight: 452 g.
Spheroid polisher with two flat surfaces. No pecking marks are visible.

(**43**) Registration number: PPP 268931:013:017.
Material: hard limestone.
Dimensions: length 17.6 cm, width 12.5 cm, height 5.5 cm.
Weight: 2123 g.
Irregular stone mortar with a deep cavity in an unworked body. This tool looks different from the small pebble mortars otherwise found at Gird-i Bazar, as its cavity is much larger and deeper. Its attribution to the Neo-Assyrian occupation period is therefore not certain at all.

F8. Preliminary conclusions

Continuing the trend already observed in 2015, the 2016 small finds are simple and utilitarian objects. No evidence for luxury objects, decorated items or even items requiring intensive labour has been found so far at Gird-i Bazar.

Most of the objects are concentrated in Buildings D and F (**Fig. F20**), whereas the other buildings were almost entirely without small finds. This may suggest that most of the inventory was removed when the structures were abandoned.

The almost complete absence of metal objects of any kind, with the exception of the possible razor (no. 24), is noteworthy. Were more metal objects once present but removed when the occupation of the quarter came to an end? Or is their absence linked to the types of activities occurring in the area?

The stone tools are the most abundant category of objects, but they only represent a limited range of tool types, likely used for light grinding, pounding, polishing and weighing. The complete absence of the types of larger groundstone tools usually associated with food processing in domestic contexts (such as querns, handstones, large mortars, well-made mortar bowls and stone vessels) is very striking. Were these objects once present but removed when the buildings were abandoned? Or were the structures excavated so far mainly used for industrial activities and therefore had no space for food production and/or processing activities of the kind usually linked to domestic areas?

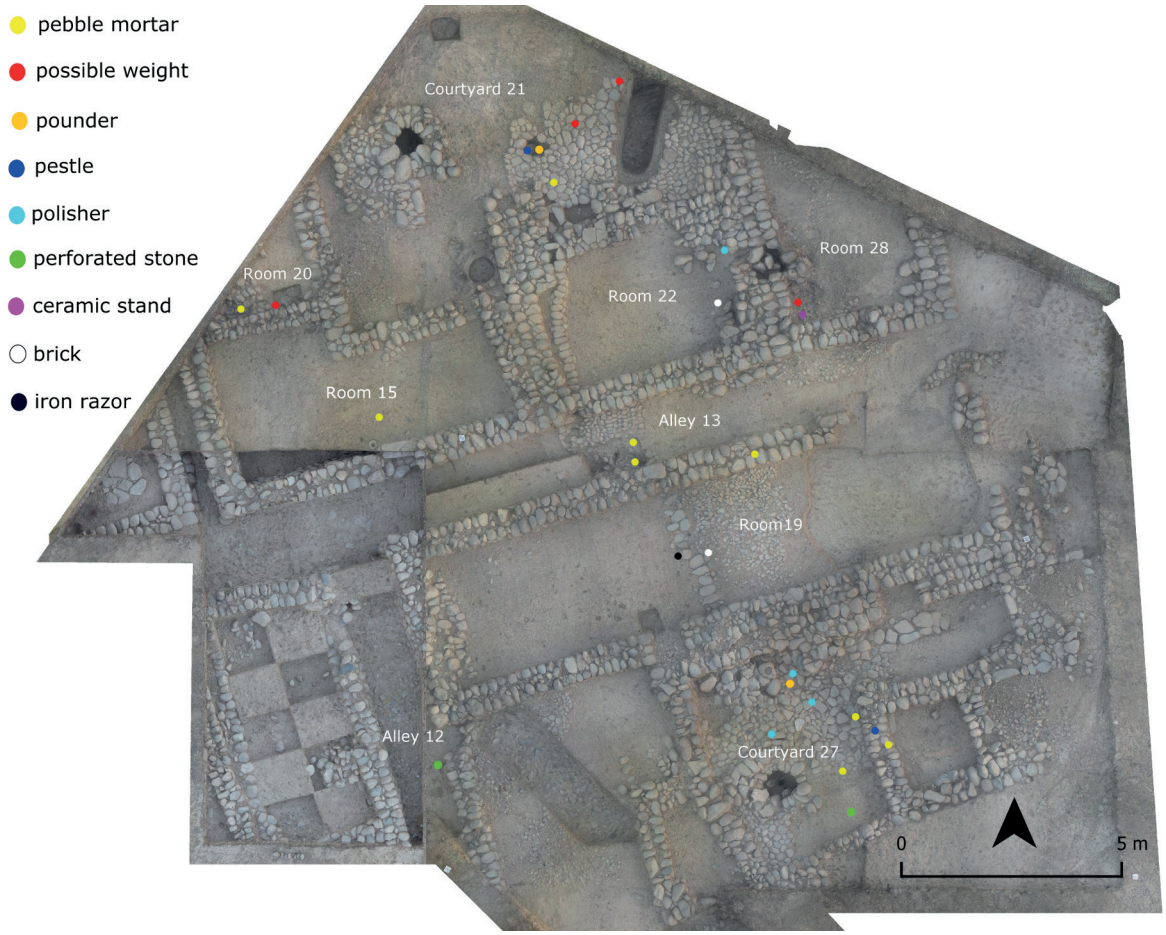


Fig. F20: Object distribution in Buildings D, E and F. Prepared by Andrea Squitieri.

Registration no.	Object type	Provenance	Catalogue
272927:020:012	Pounder / weight	Building A	11
272927:020:011	Pounder / weight	Building A	10
272927:020:003	Pounder	Building A	9
272927:006:005	Pounder	Building A	12
271927:040:005	Pebble mortar	Building A	1
271927:040:004	Perforated stone	Building A	3
271927:040:002	Pebble mortar	Building A	2
271927:037:008	Pebble mortar	Building A	8
271927:037:007	Pebble mortar	Building A	7
271927:037:006	Polisher	Building A	6
271927:037:005	Pebble mortar	Building A	5
271927:037:004	Pebble mortar	Building A	4
269931:019:002	Pestle	Building D	21
269931:019:001	Pebble mortar	Building D	20
268932:071:003	Ceramic L-shaped object	Building F	34
268932:071:002	Weight	Building F	33
268932:067:003	Pebble mortar	Alley 13	27
268932:049:007	Polisher	Building F	32
268932:049:005	Mudbrick	Building F	31
268932:034:001	Pebble mortar	Building E	25
268932:021:014	Weight	Building F	35
268932:021:011	Weight	Building F	36
268932:012:008	Pestle	Building F	39
268932:012:005	Pounder	Building F	38
268932:004:006	Pebble mortar	Building F	37
268931:058:002	Pebble mortar	Alley 13	26
268931:057:002	Perforated stone	Alley 12	22
268931:048:005	Pebble mortar	Building D	19
268931:048:003	Pebble mortar	Building D	18
268931:048:002	Pounder	Building D	17
268931:048:001	Polisher	Building D	16
268931:046:047	Polisher	Building D	15
268931:046:043	Perforated stone	Building D	14
268931:033:001	Baked brick	Building E	23
268931:029:009	Iron razor (?)	Building E	24
268930:030:006	Pounder	Building D	13
267932:028:003	Perforated stone	Building F	30
267932:028:001	Pebble mortar	Building F	29
267932:017:036	Pebble mortar	Building F	28

Table F1: Concordance of the small finds' catalogue and registration numbers with object types and architectural contexts.

G. Bioarchaeological research at Gird-i Bazar, 2016

Tina Greenfield,
with contributions by Christoph Berthold & Melissa Rosenzweig

Following the larger research design developed for the Peshdar Plain Project in 2015 in order to recreate human/animal interactions with the surrounding environment[189], a systematic, intensive and partially revised protocol for sampling and analysing ancient bioarchaeological data (animal and human bones, shells, charcoal, seeds[190] and phytoliths) continued during the 2016 autumn field campaign at the site of Gird-i Bazar with further refinements. A significant amount of these data was recovered from several areas at the site, namely Building A, Building D, Building F, Alley 13 and Outdoor Area 8 with the kiln.

While the specific focus on the Neo-Assyrian period (9th to 7th century BC) within the larger Iraqi Kurdistan landscape is the temporal mandate for this project, the graves excavated on top of the Iron Age settlement yields further information on the environment and inhabitants of the region during the Sasanian period[191].

G1. Sampling procedures and protocols

Detailed protocols for procuring carbon, phytolith, zooarchaeological, soil and botanical remains were directly dependent on the procurement of organic data, and thus a sampling protocol was implemented daily in the field. As in 2015, all the deposits right above floors were gridded with 1 × 1 m² grid for tighter spatial control. The tight spatial control of data allowed for a robust picture of artefactual remains across each of the floors. Bioarchaeological data retrieved from the 2016 autumn season are listed in the following:

- Animal bones and shell sampling (zooarchaeology): Archaeological specimens of animal bones and shell were excavated from several different contexts, and comparative samples were collected around the site.
- Palaeobotanical sampling: Palaeobotanist Melissa Rosenzweig (Miami University, Oxford, Ohio) was on site from 3-6 September 2016 to oversee and refine the sampling protocol for the collection of carbonised remains from Gird-i Bazar.
  - Charcoal samples retrieved from secure deposits in the 2015 excavations have already provided the for ^{14}C dating of the site[192], but additional charcoal samples were removed from stratigraphically secure deposits in order to study the types of wood used for building purposes. Secondarily, these additional samples may be used for ^{14}C dating in case short-lived samples (e.g., carbonised seeds) are unavailable.
  - Soil samples of a minimum of 20 litres were taken from each secondary fill, as per last year's protocol. For primary archaeological contexts (e.g., deposits right above floors), 100% of the deposit was collected[193]. In the case of floors, samples were taken within each 1 × 1 m² grid. Each sample was selected for the maximum recovery of micro-artifacts, charcoal and palaeobotanical remains. Each bag of soil floated yielded two unique sample assemblages for further analysis: light fraction and heavy fraction.
    - Light fraction can potentially contain carbonised seeds; being short-lived samples, these can provide more precise radiocarbon dates than charcoal samples. Moreover, light fraction can give

189 Greenfield 2016.

190 Thanks are also due to Melissa Rosenzweig (Miami University, Oxford, Ohio) for generously sharing her first preliminary results of her ongoing research on the palaeobotanical samples.

191 Silvia Amicone was instrumental in arranging for Dr Christoph Berthold, head of the Competence Center Archaeometry Baden-Wuerttemberg (CCA-BW) of the University of Tübingen, to analyse beads from Graves 5 and 47, the results of which are presented below with kind permission. The author is indebted to both of them as well as to Andrea Squitieri for selecting a tooth from Grave 47 for ^{14}C dating at the Curt-Engelhorn-Centre Archaeometry gGmbH (Mannheim, Germany).

192 Radner 2016b, 52.

193 This approach is somewhat different from last year's protocol where we only took 2 litre samples within each 1x1m2 grid; the paucity of remains from last year and the first two weeks of excavation in 2016 warranted a full collection of the entire floor to ensure a maximum chance of retrieving carbonised remains.

us important insights into the types of plants consumed. All light fraction samples recovered in 2015 and 2016 have been shipped to Rosenzweig's lab and analysis has begun.

- Heavy fraction contains micro-fauna, tiny pottery sherds and micro-artifacts (e.g., flint) that can shed light on the activities that occurred on the floors. The heavy fraction material from 2015 and 2016 was sorted during this campaign as a means of procuring the largest sample of organic and non-organic data possible. The purpose of 'picking' through the heavy fraction remains is to separate micro-artifacts (ceramics, beads, micro-fauna, micro-lithics, etc.). The subsequent analysis of each artifact category will allow for a spatial reconstruction of activity areas such as floors, courtyards and alleyways[194]. Future campaigns will see a systematic quantification of these data to help reconstruct daily domestic life at Gird-i Bazar during the first millennium BC. All heavy fraction samples recovered in 2015 and 2016 are in storage at the Sulaymaniyah Archaeological Museum.

- Phytolith sampling: While continuing to maintain a rigorous sampling program for uncovering phytoliths from primary deposits, a new protocol was initiated under the joint directive of the author and Arlene Rosen (University of Texas at Austin, USA). As a specialist in phytolith analysis, Rosen helped design a refined system of collection appropriate for the project's research questions. In 2016, the new protocol for phytolith sampling was initiated at Gird-i Bazar according to Rosen's specifications. Samples were taken from all secure deposits such as pits, floors and courtyards and each of the graves. Two types of sampling procedures were used:
  - 'Pinpoint' samples were taken where specific phytoliths were observed. This sample type is taken to determine the specific phytoliths present at the observed point and target a specific point in a deposit such as a grave, an installation or a pit.
  - 'Averaging' samples were taken by collecting a 'scrape' from the floors according to the grid established – one sample per grid, if possible, as this will theoretically provide a general idea of the plants that were originally in the space. Scrapes were also taken from along walls (since plant remains are often swept to the sides of rooms and courtyards) and from the middle of courtyards. Additionally, if there is a feature, such as a pit with micro-stratigraphy, it is possible to do a scrape of the profile to get an average of the phytoliths present in the deposit.

  The phytolith samples have been sent to Rosen's lab, to be studied there under her direction by Fatemeh Ghaheri.

- Human remains: A total of 14 graves with human remains were uncovered and fully excavated during the 2016 season. The vast majority of these burials were found stratigraphically above Building A. Three additional burials were uncovered and excavated above the structures of Outdoor Area 8. As per last season's protocol, each individual specimen was recorded on osteological sheets and detailed notes were recorded for further analysis. In total, 58 graves have hitherto been identified across the site, with a total of 27 excavated in 2015 and 2016 (**Fig. G1**).
  - Parasitology: As part of the investigation of human remains, samples of the soil within the graves continued to be taken from the graves excavated in 2016.

G2. Preliminary results of the zooarchaeological analysis

Specimens were preliminarily identified and analysed during the 2016 field season to determine diet and species preference, disposal, consumption, and distribution practices of animals and their by-products across the site.

G2.1 Taphonomy

All of the specimens exhibited a high level of weathering, heavy root etching across their surfaces and heavy fragmentation (**Figs. G2a-c** and **G3**). Additionally, many of the remains were completely covered in calcium carbonate. All of these taphonomic factors suggest that the bones were exposed to the elements (either in open pits or on the walking ground) for an extended period of time and once buried, remained in very close proximity to the surface.

G2.2 Quantitative data and taxon diversity

A total of 182 specimens were identified in 2016 from deposits right above floors, fills, pits and alleys. Any assemblages collected from topsoil or modern pits were not analysed. **Tables G1** and **G2** show the quantitative distribution of bones across Gird-i Bazar, with **Table G1** showing data from fills and **Table G2** data from deposits right above floors. These data are to be considered only

194 Rainville 2000.

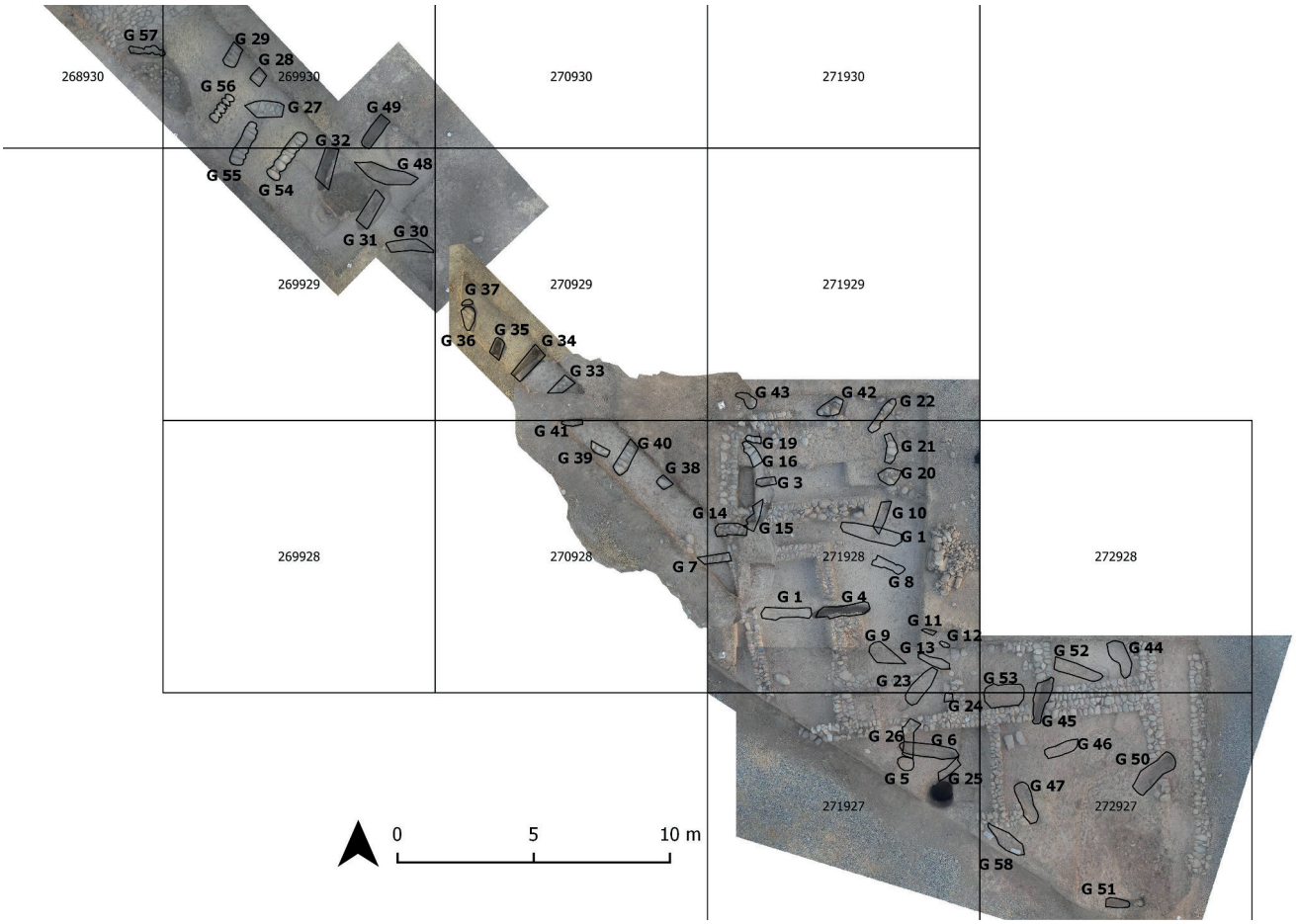


Fig. G1: The 58 graves so far identified at Gird-i Bazar superimposed on the orthophoto of the excavation area. Prepared by Andrea Squitieri.

Fig. G2: Animal bones with bashes (a) and slices (b-c) from the pit (LGR:0014) in Building A Room 1, showing weathering and heavy root etching across their surfaces. Photos by Tina Greenfield.

Fig. G3: Highly burnt bone of a domestic pig that was discarded post-consumption. From the pit (LGR:0014) in Building A Room 1, showing weathering and heavy root etching across the surface. Photo by Tina Greenfield.

preliminary as some contexts have not been analysed yet; moreover, data from flotation samples (heavy fraction) are not included in this analysis.

Nevertheless, it is possible to already observe that the herded animals (cattle, sheep and goat) were the most frequent species identified, followed by domestic pig. Caprines (sheep and goat) had the highest frequency within the entire assemblage.

G2.3 Dietary preference

While the assemblage is quantitatively quite small, it is possible to tentatively observe some patterns of species diversity. The standard domestic mammals are present in all areas and include the domestic herded species sheep (*Ovis aries*), goat (*Capra hircus*), and cattle (*Bos taurus*). The presence of these taxa is not surprising, given the pastoral society present in the foothills of the Zagros mountains for millennia. Additionally, domestic pig (*Sus scrofa* dom.) is present in large numbers (**Fig. G4**), and this is generally representative of individual homestead farming[195]. The sample size is too small to do a statistically valid comparison of the different areas since sample size disparity is too great.

Patterns of dietary preference are relatively similar to the modern dietary habits in the region, with specific regard to the high frequency of caprines (sheep and goat) with just under 50 % of the taxa representation in the assemblage. Domestic pig (*Sus scrofa* dom.) is the second highest frequency of species with a significant 30 % of the total corpus. Domestic cattle (*Bos Taurus*) has the lowest frequency of the mammals generally exploited for food, but still possesses a moderate frequency at Gird-i Bazar with just over 20 % of the assemblage, signifying a varied diet of several different herded and non-herded domestic species. The lack of wild species such as deer or boar is interesting and warrants further investigation beyond the preliminary analysis. Rodents are present in the assemblage with a very low frequency of 1 % of the total corpus. We assume that rather than providing evidence for consumption purposes they are present for taphonomic reasons, such as bioturbation.

G2.4 Consumption patterns

Upon a first analysis of the remains it was determined that a total of 3 specimens (ca. 2 % of the total bone corpus) displayed evidence of butchering marks in the form of bashes (**Fig. G2a**) and slices (**Fig. G2b-c**) to the surface of the bone. These butchered specimens come from the pit (LGR:0014) in Building A Room 1. A specimen from a domestic pig that was highly burnt and discarded in the kiln post-consumption offers further evidence for food preparation (**Fig. G3**). Further analyses are ongoing for this particular data set, and once more data is added from upcoming field campaigns, this information will provide further insights into consumption and distribution patterns across the site.

G2.5 Concluding observations

It is evident that the occupants of the houses at Gird-i Bazar during the Neo-Assyrian period ate in the vicinity, and kept the living quarters clean. This pattern is evidenced by the majority of intact faunal remains coming from middens where their rubbish was placed and only small bone fragments having been uncovered on the living floors within buildings. Hence, the heavy fragmentation of bones found within the buildings and rooms resulted in a much lower rate of species identification compared to the bones coming from the middens.

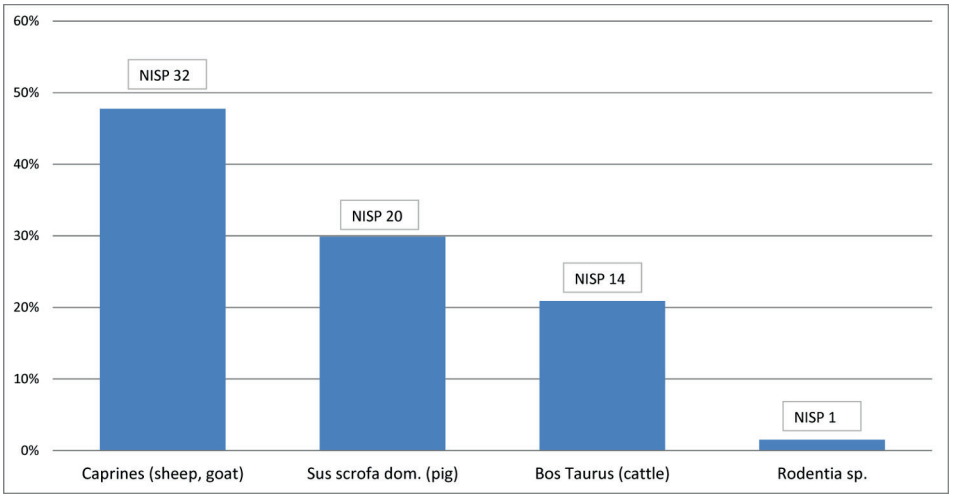


Fig. G4: Percentages of taxa based on the 2016 campaign data. Prepared by Andrea Squitieri.

195 Greenfield 2014; Zeder 1991.

Building	Space	Occupation period	Locus/Locus group	Context	Collection no.	Taxa	NISP	% of NISP
Building A	Room 1	End Main Occupatio Period 1	LGR:0014	Pit fill	271927:037:002	Capra hircus	1	0.51 %
Building A	Room 1	End Main Occupatio Period 1	LGR:0014	Pit fill	271927:037:002	Large mammal	1	0.51 %
Building A	Room 1	End Main Occupatio Period 1	LGR:0014	Pit fill	271927:037:002	Medium mammal	47	23.28 %
Building A	Room 1	End Main Occupatio Period 1	LGR:0014	Pit fill	271927:037:002	Ovis aries	2	1.02%
Building A	Room 1	End Main Occupatio Period 1	LGR:0014	Pit fill	271927:037:002	Ovis / Capra	10	5.1 %
Building A	Room 1	End Main Occupatio Period 1	LGR:0014	Pit fill	271927:037:002	Sus scrofa dom.	5	2.55 %
Building A	Courtyard 2	Post Main Occupation Period 2	LGR:0019	Fill	271928:095:004	Small mammal: rodent	1	0.51 %
Building A	Room 3	Post Main Occupation Period 2	LGR:0151	Fill	271928:093:002	Capra hircus	1	0.51 %
Building A	Room 3	Post Main Occupation Period 2	LGR:0151	Fill	271928:093:002	Medium mammal	1	0.51 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Bos taurus	7	3.57 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Large mammal	13	6.63 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Medium mammal	2	1.02 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Ovis aries	2	1.02 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Ovis / Capra	3	1.53 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Small mammal	1	0.51 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:026:004	Sus scrofa dom.	1	0.51 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:039:007	Bos taurus	2	1.02 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:039:007	Ovis aries	2	1.02 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:039:007	Ovis / Capra	1	0.51 %
/	Outdoor Area 8	End Main Occupation Period 2	LGR:0009	Kiln fill	269929:039:007	Sus scrofa dom.	2	1.02 %
/	Outdoor Area 8	Post Main Occupation Period 2	LGR:0127	Fill	269929:046:002	Bos taurus	1	0.51 %
/	Outdoor Area 8	Post Main Occupation Period 2	LGR:0127	Fill	269929:046:002	Medium mammal	3	1.53 %
/	Outdoor Area 8	Post Main Occupation Period 2	LGR:0136	Fill	269930:016:002	Medium mammal	2	1.02 %
/	Outdoor Area 8	Post Main Occupation Period 2	LGR:0136	Fill	269930:028:003	Bos taurus	1	0.51 %
Building D	Room 10	Post Main Occupation Period 2	Locus:268931:047	Fill	268931:047:001	Medium mammal	8	4.08 %
Building D	Courtyard 11	Post Main Occupation Period 2	LGR:0080	Fill	268931:036:003	Medium mammal	1	0.51 %
Building D	Courtyard 11	Post Main Occupation Period 2	LGR:0080	Fill	268931:036:003	Ovis / Capra	3	1.53 %
/	Alley 13	Post Main Occupation Period 2	LGR:0119	Fill	268932:039:002	Sus scrofa dom.	1	0.51 %
/	Alley 13	Post Main Occupation Period 2	LGR:0119	Fill	269932:007:002	Bos taurus	1	0.51 %
/	Alley 13	Main Occupation Period 1	LGR:0098	Fill	268932:067:002	Medium mammal	1	0.51 %
Building F	Room 20	Post Main Occupation Period 2	Locus:267932:012	Fill	267932:012:002	Medium mammal	1	0.51 %
Building F	Courtyard 21	Post Main Occupation Period 2	Locus:268932:011	Fill	268932:011:011	Bos taurus	1	0.51 %
Building F	Courtyard 21	Post Main Occupation Period 2	Locus:268932:011	Fill	268932:011:011	Large mammal	2	1.02 %
Building F	Courtyard 21	Post Main Occupation Period 2	Locus:268932:011	Fill	268932:011:011	Medium mammal	2	1.02 %
Building F	Room 22	Post Main Occupation Period 2	Locus:268932:009	Fill	268932:009:003	Medium mammal	12	6.12 %
Building F	Room 22	Post Main Occupation Period 2	Locus:268932:032	Fill	268932:032:019	Medium mammal	1	0.51 %
Building F	Room 22	Post Main Occupation Period 2	Locus:268932:032	Fill	268932:032:034	Sus scrofa dom.	1	0.51 %
Building F	Room 22	Post Main Occupation Period 2	LGR:0082	Fill	268932:035:029	Ovis/Capra	1	0.51 %
Building F	Room 28	Post Main Occupation Period 2	LGR:0116	Fill	268932:029:002	Medium mammal	3	1.53 %
Building F	Room 28	Post Main Occupation Period 2	LGR:0116	Fill	268932:029:002	Ovis/Capra	2	1.02 %
Building F	Room 28	Post Main Occupation Period 2	LGR:0116	Fill	269932:006:004	Bos taurus	1	0.51 %
Building F	Room 28	Post Main Occupation Period 2	LGR:0116	Fill	269932:006:004	Medium mammal	5	2.55 %
Building F	Room 28	Post Main Occupation Period 2	LGR:0116	Fill	269932:006:004	Sus scrofa dom.	1	0.51 %

Table G1: Distribution of animal bones in the fills excavated at Gird-i Bazar, 2016. Prepared by Andrea Squitieri.

Building	Space	Occupation period	Locus/ Locus group	Context	Collection no.	Taxa	NISP	% of NISP
/	Outdoor Area 8	End of Main Occupation Period 2	LGR:0071	Deposit right above floor	269929:047:005	Medium mammal	6	3.29 %
/	Outdoor Area 8	End of Main Occupation Period 2	LGR:0071	Deposit right above floor	269929:047:005	Capra hircus	1	0.51 %
/	Outdoor Area 8	End of Main Occupation Period 2	LGR:0071	Deposit right above floor	269929:047:006	Medium mammal	4	2.19 %
/	Alley 13	End of Main Occupation Period 2	LGR:0118	Deposit right above floor	268932:042:012	Medium mammal	1	0.51 %
/	Alley 13	End of Main Occupation Period 2	LGR:0118	Deposit right above floor	268932:042:025	Sus scrofa dom.	1	0.51 %
Building F	Room 15	End of Main Occupation Period 2	LGR:0109	Deposit right above floor	267932:017:023	Large mammal	1	0.51 %
Building F	Room 15	End of Main Occupation Period 2	LGR:0109	Deposit right above floor	267932:017:028	Medium mammal	1	0.51 %
Building F	Courtyard 21	End of Main Occupation Period 2	LGR:0113	Deposit right above floor	268932:020:008	Medium mammal	3	1.53 %
Building F	Room 22	End of Main Occupation Period 2	LGR:0083	Deposit right above floor	268932:049:002	Ovis aries	1	0.51 %
Building F	Room 28	End of Main Occupation Period 2	LGR:0122	Deposit right above floor	268932:058:002	Ovis / Capra	1	0.51 %
Building F	Room 28	End of Main Occupation Period 2	LGR:0122	Deposit right above floor	268932:066:031	Medium mammal	2	1.02 %

Table G1: Distribution of animal bones on the floors excavated at Gird-i Bazar, 2016. Prepared by Andrea Squitieri.

G3. First observations on the palaeobotanical analysis (*with Melissa Rosenzweig*)

A total of 252 soil samples were taken for flotation. All primary context samples from installations, deposits right above floors, pits, and ceramic vessels were sent to Melissa Rosenzweig's laboratory at Miami University (Oxford, Ohio).

Based on Rosenzweig's preliminary analysis, which is still incomplete, there is evidence of grape (*Vitis vinifera*), lentil (*Lens culinaris*), common pea (*Pisum sativum*) and various cereals, namely barley (*Hordeum sp.*), wheat (*Triticum sp.*), free-threshed wheat (*Triticum aestivum* / *durum*), emmer (*Triticum dioccum*) and bitter vetch (*Vicia Ervilia*), present in the light fraction remains coming from deposits right above floors.

G4. Grave chronology and preliminary observations on the human remains

A total of 14 graves were excavated during the 2016 season, for a total of 37 individuals. All of the human remains were curated and sent to the Sulaymaniyah Archaeological Museum for further osteological studies by Kathleen Downey, Ohio State University (Columbus, Ohio, USA), during the 2017 autumn campaign.

In March 2017, a tooth from Grave 47 was sent to the Curt-Engelhorn-Centre Archaeometry gGmbH (Mannheim, Germany) for ^{14}C analysis. It was analysed as sample no. 30505 and dated to 1619 ± 19 years BP (with BP = AD 1950). Using the OxCal v4.2.4 radiocarbon calibration software of the Oxford Radiocarbon Accelerator Unit with the atmospheric curve IntCal13[196], this corresponds to 389-535 calAD (95.4 % probability) (**Fig. G5**).

This result indicates that the body buried in Grave 47 dates to the 4-5th century AD, that is the Sasanian era. This datum matches the Sasanian pottery horizon identified in both 2015 and 2016 on a small pebble surface located above the Neo-Assyrian structures of Outdoor Area 8 (**§D2** and **§D7.1** on the Sporadic Occupation Period), and we therefore assume that the entire graveyard of Gird-i Bazar dates to the Sasanian period. It is of interest that the bodies were buried in the ground rather than exposed, as Zoroastrian custom demands; the region is of course known to have had a sizable Christian population under Sasanian rule[197].

Preliminary observations on the human remains yielded important additional information. Based on initial analysis of the orientation and position, age and overall health of the population, some tentative patterns have emerged.

196 Bronk Ramsey 2009; Reimer *et al.* 2013.

197 Morony 1982, 14-17; 1989 on Bēṯ Garmē / Beth Garmai (courtesy Karen Radner).

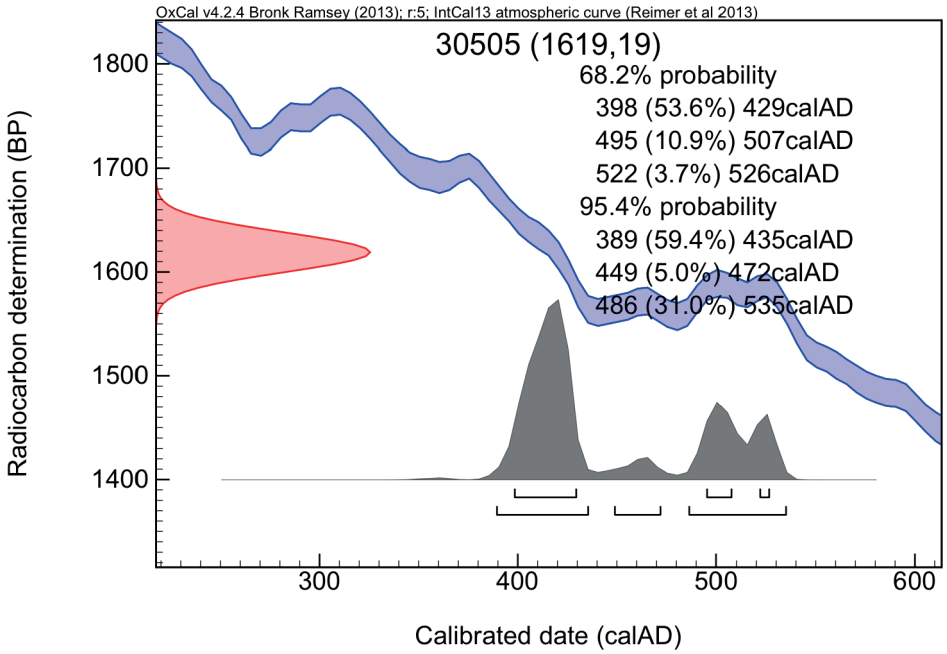


Fig. G5: Results of the ^{14}C analysis on a root dentin from Grave 47, carried out at Curt-Engelhorn-Centre Archaeometry gGmbH, Mannheim, Germany.

G4.1 Orientation of the head

As already observed for the graves from 2015, there is no strict unified pattern of burial orientation at Gird-i Bazar. Individuals were most frequently buried with the cranium point oriented south (24 %), followed closely by skeletons facing east (22 %), suggesting an almost equal incidence of these two directions. North and west facing individuals likewise represented a 19 % frequency while skeletons with an uncertain orientation have a 16% frequency rate (**Fig. G6**).

G4.2 Age

While it is difficult to determine the ages of the individuals from the 2016 graves accurately, especially for the multiple burials where not all of the elements are present for each individual, it appears that there are no children in these graves. It is estimated that the ages of the individuals range from subadult to adult.

G4.3 Health

Preliminary observations revealed no evidence for the cause of death of the individuals. Soil samples for parasitological testing were taken from several graves to determine overall health and welfare of the individuals. These samples will help highlight their diet and their general health as well as the location of where these individuals might have lived.

G4.4 Multiple individual burials

A total of six graves had more than one individual present in the deposit. Graves 45, 46, 47, 50, 52 and 53 all had two or more individuals present within the grave. It is an interesting pattern that all of the multiple burials were in the easternmost parts of the excavation while only individual interments were found in Square 269929 (in the area of the Connecting Trench).

G4.5 Grave goods and burial customs (*with Christoph Berthold*)

Few grave goods were found within the graves. Similar to last year, the absence of grave goods was evident for most burials, except for a variety of (mostly dark red) beads found in Graves 32, 47, 52 and 53. While not necessarily considered grave goods in the traditional sense, the beads probably represented necklaces worn by the individual up to their death as most of the beads were found around the neck and thorax region.

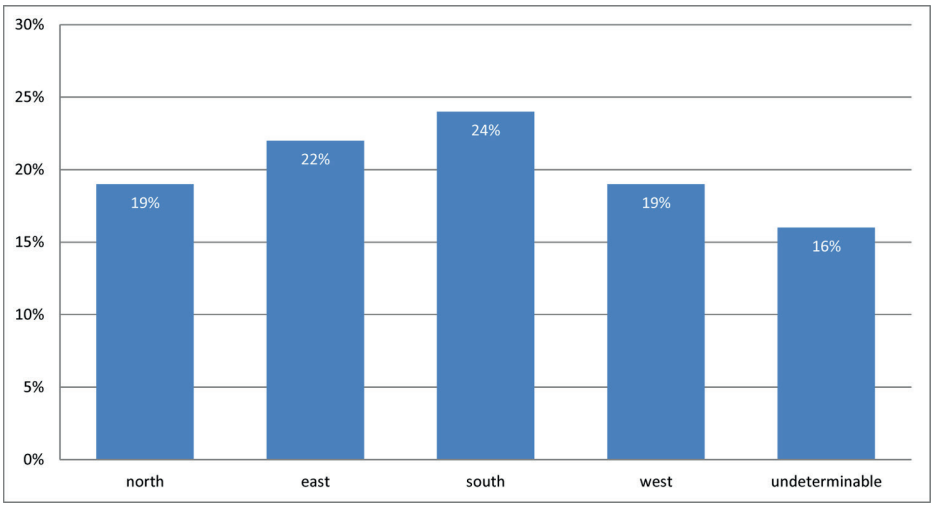


Fig. G6: Head orientations of the skeletons excavated in the 2016 campaign. Prepared by Andrea Squitieri.

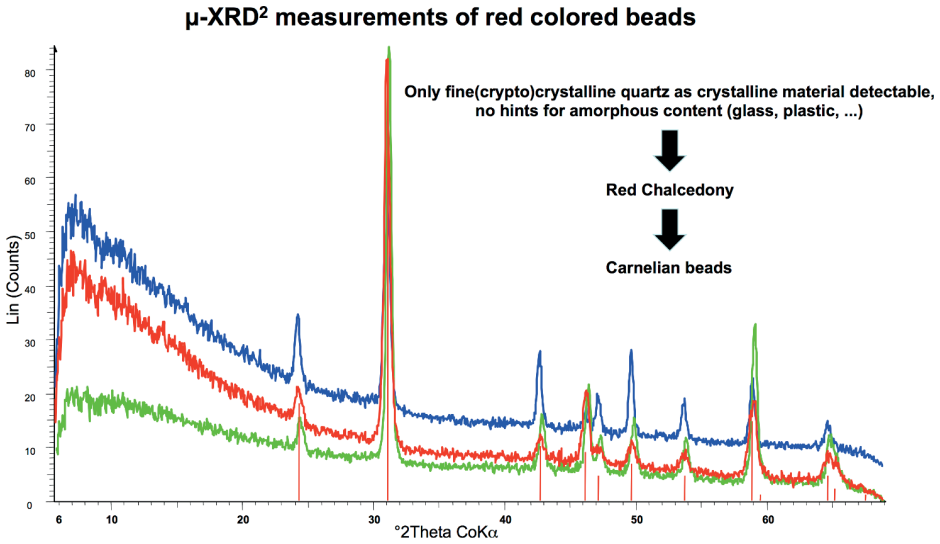


Fig. G7: Results of the µ-XRD² analysis on two carnelian beads from Graves 5 and 47 (PPP 271927:004:004 and PPP 272928:015:023), carried out by Christoph Berthold, CCA-BW Tübingen.

A X-ray microdiffractometer (µ-XRD²) analysis on two dark red beads from Graves 5 and 47 (PPP 271927:004:004 and PPP 272928:015:023) revealed that the material of these beads is carnelian (**Fig. G7**), a red variety of chalcedony, a cryptocrystalline form of siica (mostly quartz) that was highly prized in antiquity and whose closest source to Gird-i Bazar is found in Gujarat in northwestern India[198]. The µ-XRD analysis and interpretation was conducted in February 2017 by Dr Christoph Berthold, head of the Competence Center Archaeometry Baden-Wuerttemberg (CCA-BW) of the University of Tübingen.

198 Fulljames 1838/39 regarding the mines at Rajpipla, Bharuch District, Gujarat, India (courtesy Karen Radner).

Grave 32 had a bronze pin (PPP 269929:022:003) associated with the skeleton that was found beside the right upper arm; the pin possibly served to hold clothing together. Additionally, the remains of what appears to be a ring was found associated with the left hand around one of the phalanges. This artefact was found in very poor condition and conservation must be completed prior to any further analysis.

The vast majority of the graves presented evidence of phytoliths above, beside and often below skeletons that preliminarily suggest either linen wrappings around the bodies, or perhaps that plants or flowers were placed within the graves. Phytolith samples were collected and exported for analysis in Arlene Rosen's lab at the University of Texas at Austin.

H. Conclusions and future lines of research

Karen Radner, F. Janoscha Kreppner & Andrea Squitieri

In 2016, the Peshdar Plain Project carried out first excavations at Qalat-i Dinka and continued work at Gird-i Bazar with a second season of geophysical prospecting and excavations. The results achieved by the interdisciplinary international research team have been presented in this volume and substantially add to our knowledge of the Iron Age occupation of the Bora Plain on the upper reaches of the Lesser Zab, just before the Zagros main ridge that today constitutes the border between Iran and the Kurdish Autonomous Region of Iraq.

In particular, the geophysical survey, in combination with the surface pottery survey and the excavations, made it clear that large parts of the Bora Plain were once taken up by a large settlement dating to the Neo-Assyrian period. Provisionally dubbed the "Dinka Settlement Complex", it extended over an area of c. 60 ha, including the seemingly distinct sites of Gird-i Bazar and Qalat-i Dinka. At present, it would appear that there is no other period in which the area was used as intensely as during the time when it was controlled by the Assyrian Empire. Therefore, the ancient *qanat* irrigation system, which is still partially in use in the Bora Plain today and which we started to trace with electrical resistivity tomography in 2015 and 2016 (**Chapter B2**), was very likely created to provide for the Neo-Assyrian "Dinka Settlement Complex"; further investigation of the complex subterranean system will hopefully substantiate this hypothesis.

We are presently not able to identify the name under which the "Dinka Settlement Complex" was known during the Neo-Assyrian period. It is very likely that Anisu(s)[199] was the ancient name of Qaladze, on whose sizeable settlement mound pottery was collected during a 2013 surface survey surface that matches the Iron Age assemblage from Gird-i Bazar[200]. But at the moment, we do not know any other place names from the region.

At present, we still lack an understanding of the basic nature of the "Dinka Settlement Complex". Is it a city? Is it a settlement designed to support the fortress (Assyrian *birtu*) that we assume to be situated on Qalat-i Dinka? Is this how the Assyrian state settled deportee populations, such as the 10,000 Aramaeans moved from Northern Babylonia to the Border March of the Palace Herald after the 745 BC campaign[201]? Or is the "Dinka Settlement Complex" something else entirely?

After Jessica Giraud's 2015 surface survey had identified Neo-Assyrian period pottery over an area of c. 60 hectares including and around Dinka and Bazar[202], the results of the 2016 magnetometer prospection between these two sites clearly demonstrated the existence of an extensive lower town which was densely covered by buildings. In addition to the already partially excavated areas on the "citadel" of Dinka and in the chicken farm enclosure of Gird-i Bazar, the cityscape includes neighbourhoods of different character. It is possible to identify a relatively isolated district with several large buildings, a number of densely built-up residential quarters and a workshop area (**Chapter B1**).

In spring 2017, first excavations were carried out in order to validate the magnetometer readings and to assess the state of preservation of the archaeological remains. For this purpose, a U-shaped test trench was dug in the district with the large buildings in a way to include parts of three structures that could be identified in the magnetogram (**Fig. H1**). Buildings K, L and M, as they were labelled, were indeed encountered just where the magnetometer readings had indicated their presence. Alleys separate the buildings whose floors and the lower parts of their walls, constructed in stone, are well preserved. This data will be published in the third volume of the Peshdar Plain Project Publications (4P). Since the pottery assemblages deposited on the floors of these buildings match the repertoire from Gird-i Bazar, we can assume that the buildings in these two parts of the settlement were in use at the same time.

The same is true of the occupation uncovered on Qalat-i Dinka. The 2016 test sounding demonstrated the existence of substantial architecture, with 1.10 m wide walls and a paved floor made of baked bricks (**Chapter C**). The

199 Radner 2016a, 18-21.
200 D'Agostino *et al.* 2016, 91.
201 Radner 2016a, 19.
202 Giraud 2016.

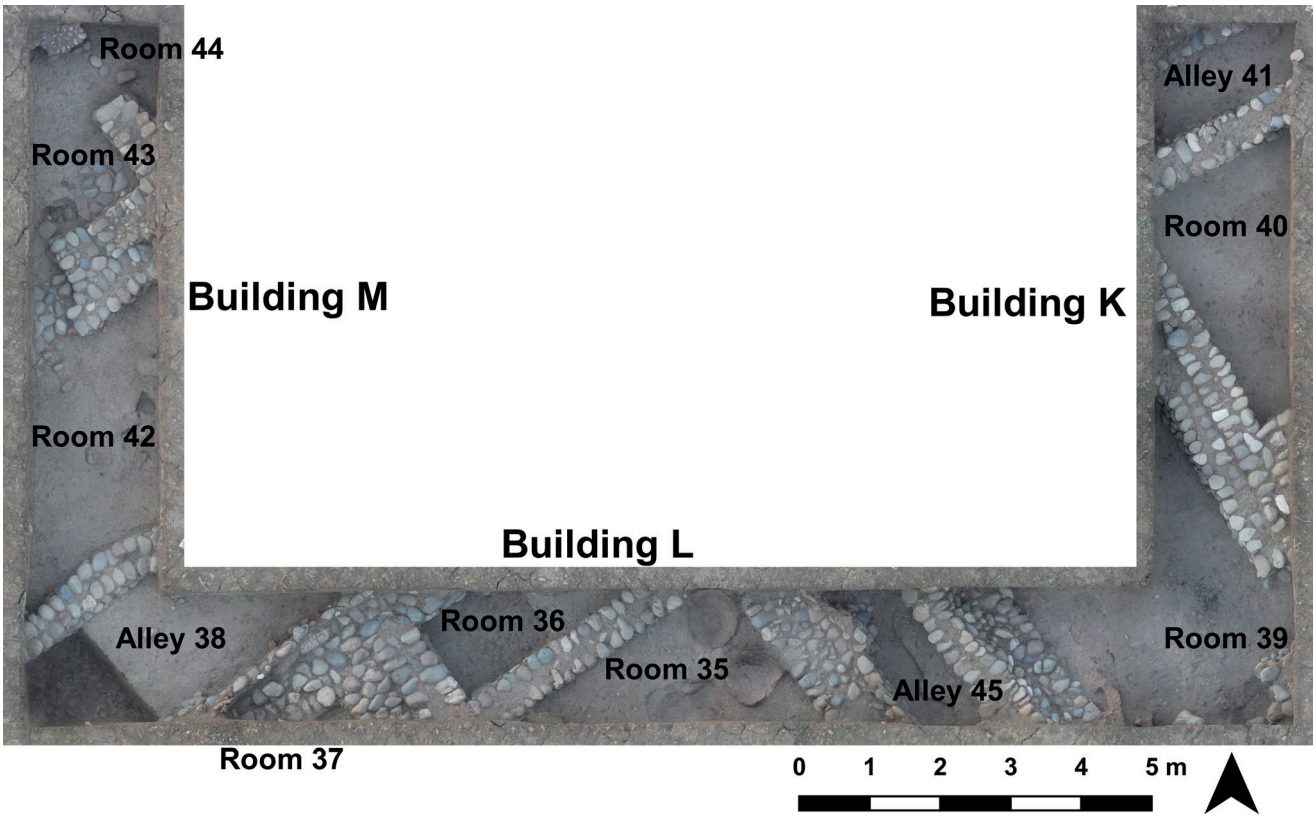


Fig. H1: Orthophoto of Buildings K, L, and M in the area dubbed "Dinka Lower Town 2", as excavated in May 2017. Prepared by Andrea Squitieri.

architecture is much more monumental than that uncovered in the lower town and indicates that the buildings in this elevated part of the "Dinka Settlement Complex" served a different purpose. That they are contemporary with the occupation of the lower town is made clear by the pottery which matches that from Gird-i Bazar and also the area first excavated in spring 2017.

To better understand the apparent occupation gap in the centre of the lower town between the eastern and the western neighbourhoods, where no architecture is visible in the magnetogram, we conducted a hydrology analysis. This provides a useful method for understanding the physical features of a surface by modelling the flow of water on a Digital Elevation Model (DEM). Our hydrology analysis was conducted in QGIS, using data derived from a 2016 drone image[203] and the algorithms provided by SAGA GIS (**Fig. H2**). The first algorithm applied was the "Strahler Order", based on the study of A. N. Strahler[204], which determines where water flows on the basis of the terrain surface and assigns to each identified stream a "Strahler Number", representing the branching complexity of a given stream. The application of this analysis in the area of the lower town of the "Dinka Settlement Complex" identified two streams with a Strahler Number of 8.25. The first one (shown on the left in **Fig. H2**) still exists today, flanking the modern road. The other one lies further to the east and traverses the lower town, but it is no longer obvious in today's landscape. Subsequently, a "channel network" algorithm was used in order to isolate the streams that have a Strahler Number > 8. The result of both analyses indicates that the gap visible in the magnetogram between the eastern and the western neighbourhoods was crossed, at some point in the past, by a water stream with a Strahler number of 8.25 that does no longer exist today but could have eroded any structures that once were situated in this area. This is a possible explanation for the signs of destruction visible on the edges of the gap in the settlement, which Jörg Fass-

203 Drone image created by ICONEM (Paris; http://iconem.com), courtesy of Un Film à la Patte (Strasbourg; http://www.unfilmalapatte.fr) and Jessica Giraud.

204 Strahler 1957.

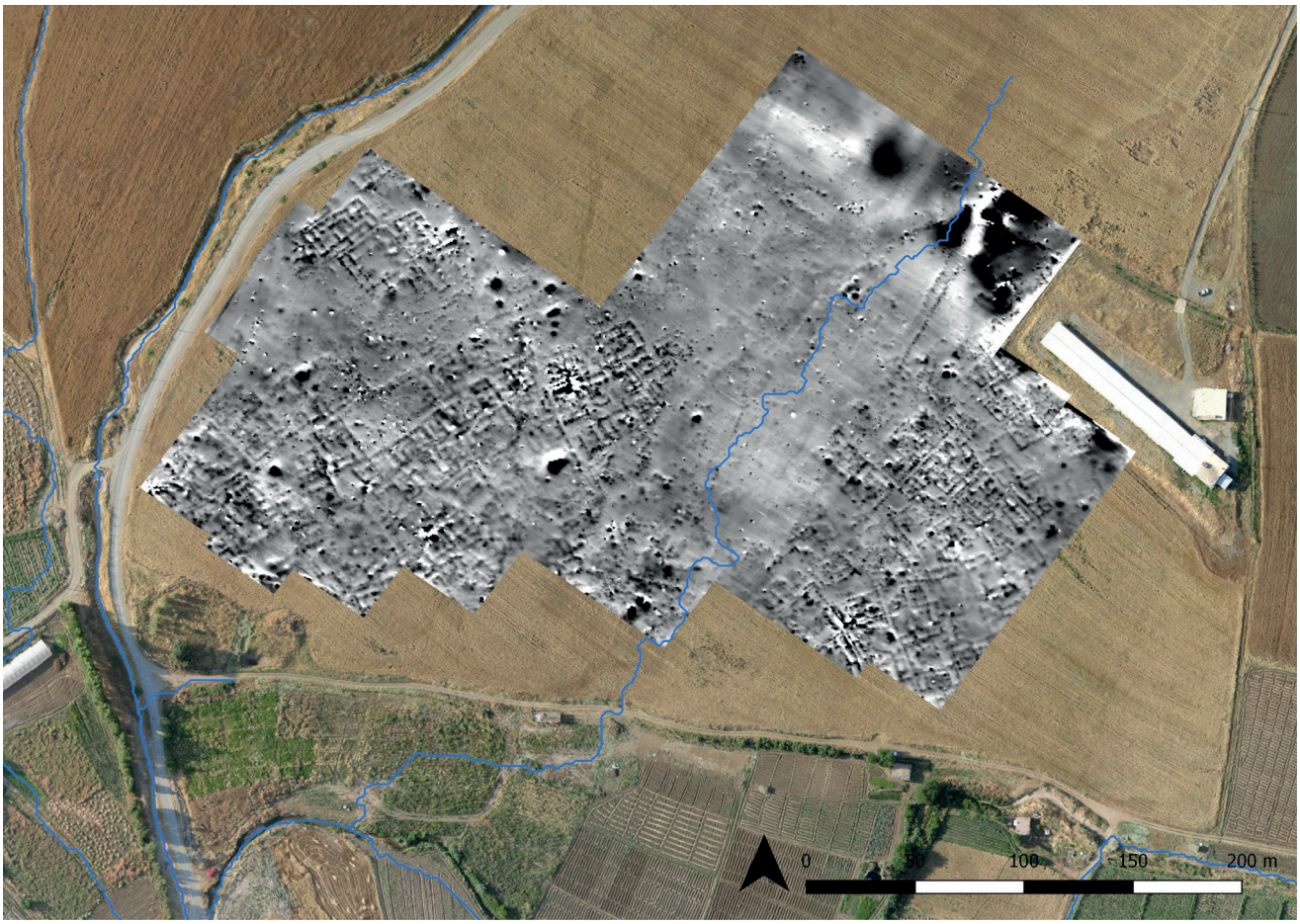


Fig. H2: Result of the "Strahler Order" and "Channel Network" analyses carried out in QGIS-SAGA, using a Digital Elevation Model (DEM) generated with data derived from a drone image created by ICONEM (Paris; http://iconem.com); courtesy of Un Film à la Patte (Strasbourg; http://www.unfilmalapatte.fr) and Jessica Giraud. The image shows the water streams with a Strahler Number > 8, overlaying the drone image combined with Jörg Fassbinder's magnetogram of the lower town of the "Dinka Settlement Complex". Note the stream crossing the lower town in the area without visible architecture. Prepared by Andrea Squitieri.

binder highlighted in his interpretations of the magnetograms (**Chapter B1**). The results of the hydrology analysis raise new questions about the changing hydrological system in the Bora Plain. We hope that our planned work programme of corings, deep soundings and electrical resistivity tomography analyses will be suitable in detecting further evidence for ancient water stream beds and / or fluvial deposits.

The results of the 2016 excavations in Gird-i Bazar (**Chapter D**) allow us to draw preliminary conclusions about the functional organisation of the neighbourhood in the northeast of the "Dinka Settlement Complex". It is organised around an open area that was used for ceramic production. This is demonstrated by the presence of a pottery kiln whose excavation was completed in 2016. Next to it, we identified a structure that is likely to be a second pottery kiln; it will be excavated in autumn 2017. The presence of two kilns would indicate that the ceramic production in this area exceeded the usual domestic scale, pointing towards a specialised workshop industry. Further investigations of this area will provide opportunities to learn more about the technical and social organisation of ceramic production in the "Dinka Settlement Complex".

An important preliminary result is that, so far, certain pottery fabrics and shapes that are considered typical for the Neo-Assyrian ceramic repertoire in sites excavated in the Assyrian heartland are entirely absent at the "Dinka Settlement Complex", such as the high quality fabric called Assyrian Palace Ware or the bowls with a distinctive double rim ("ribbed rim"). The ceramic repertoire encountered across the various excavations in the "Dinka Settlement Complex", at Gird-i Bazar, Qalat-i Dinka and

the new operation in the lower town, is extremely simple and limited, with only ten different *chaînes opératoires* identified so far. Some techniques are extremely common: coiling was generally used to construct the basic shape of the vessels, and the surfaces of most vessels were burnished (**Chapter E1**). The material analysis of the pottery identified only six different fabrics and highlighted the predominant use of local clays as raw material (**Chapter E2**). The manufacturing technology, range of fabrics and morphology of the pottery assemblage so far recovered at the "Dinka Settlement Complex" exhibit distinct characteristics. It represents a local pottery tradition in which influences from Central Assyria in the west and Western Iran in the east are recognisable. Future research will show to what extent new finds from other parts of the settlement will expand the known repertoire and elucidate the distribution of pottery types in different functional areas.

The 2016 excavations at Gird-i Bazar allowed us to develop a more detailed understanding of the organisation of the housing in this distinct quarter of the "Dinka Settlement Complex" (**Chapter D**). We still have not excavated any building in its entirety; the 2017 autumn campaign should remedy this. Nevertheless, it is now clear that, contrary to our preliminary assessment based on the 2015 excavations[205], the houses are not single room buildings but multi room buildings arranged around an inner courtyard.

Numerous domestic installations such as the bread ovens in Building F or the box-like stone structures in Buildings A, D and F indicate that the houses served residential purposes. As far as we can see, all courtyards were equipped with complex irrigation and drainage installations that would have allowed the residents to be self-sufficient in their water consumption and closely control their sanitary conditions. In Buildings F and D fresh water was provided by a simple well while the well in Building F featured an additional water pulling mechanism (*shaduf*). In addition to serving as living quarters, the houses were used for production activities, sometimes on a larger scale than needed for one household. In House D, a big oven (to be excavated in autumn 2017) takes up all of Room 31. But while in use, the oven was probably situated in the courtyard and its remains were walled up when its use was discontinued, thus creating the inaccessible "Room 31".

On the whole, the houses, open area and alleys exposed at Gird-i Bazar have been encountered remarkably free of finds, that is the area was relatively clean without accumulations of waste. The preliminary archaeozoology results show that the inhabitants kept the living areas of their houses very clean since only a few and highly fragmented animal bones have been found on the floors. The evidence is more numerous in some waste contexts, but altogether the animal bone finds are extremely limited. Domestic herded species like sheep (*Ovis aries*), goat (*Capra hircus*), and cattle (*Bos taurus*) are clearly prevalent in the meat diet. In addition, the high number of pig bones (*Sus scrofa dom.*) suggests individual homestead farming (**Chapter G2**).

The majority of manufactured objects other than pottery uncovered so far at Gird-i Bazar are small stone tools of different types. Large grinding tools, which are typical for domestic contexts, are missing entirely (**Chapter F**). Were they removed when the houses were abandoned, or did the inhabitants acquire flour rather than grind cereals themselves? The latter seems unlikely as the provisional analysis of the botanical remains isolated from deposits immediately above the floors (**Chapter G3**) shows the presence of various unground cereals, namely barley (*Hordesum sp.*), wheat (*Triticum sp.*), free threshing wheat (*T. aestivum* / *durum*), emmer (*Triticum dioccum*) and bitter vetch (*Vicia Ervilia*). There is also evidence for the use of lentils (*Lens culinaris*), peas (*Pisum sativum*) and grapes (*Vitis vinifera*). In order to gain further insight into the diet and consumption patterns of the inhabitants of the "Dinka Settlement Complex" a programme of residue analyses on intact and almost complete vessels was started and a field sampling protocol was successfully implemented (**Chapter E3**). Further work on the archaeobotanical and archaeozoological remains and the residue analysis of the pottery will provide data on food production and dietary habits in a frontier settlement of the Assyrian Empire.

At present, after having evaluated all stratigraphic units excavated so far, we assume that there was a main occupation phase in Gird-i Bazar, in which the houses and Open Area 8 with the pottery kiln were in use. The houses were built directly on the virgin soil / bedrock. Changes in some areas indicate a division into two sub-phases (Main Occupation Periods 1 and 2) before the buildings were abandoned. A piece of charcoal from the floor of Room 3 in Building A provides the calibrated date of 937-829 calBC (92.2 % probability) and therefore a *terminus post quem* for the use of this wood in the building[206].

We are currently awaiting ^{14}C results from charred seeds and vegetable remains recovered from good floor contexts of the main occupation phase at Gird-i Bazar, which should contribute to fine-tuning the dating of the site's occupation – unless the results fall into the infam-

205 Kreppner/Radner 2016, 109-110.

206 Radner 2016b, 52.

ous Hallstatt Plateau between 700-400 BC when a decrease in the atmospheric ^{14}C concentration appears to slow down the ^{14}C clock and similar radiocarbon ages seemingly correspond to dates across a range of several centuries[207].

For the time being, we assume, because of historical data and the results of ^{14}C analysis on two pieces of charcoal excavated in two distinct areas of the "Dinka Settlement Complex" in 2015[208], that the site was founded in the second half of the 9th century BC when Shalmaneser III of Assyria (r. 858-824 BC) had the Border March of the Palace Herald established to guard access along the Lesser Zab to the Assyrian Empire's heartland. Its creation is probably linked to that of the neighbouring province of Mazamua in 842 BC[209]. That the site was still occupied in 725 BC, during the reign of Shalmaneser V (r. 726-722 BC), is evidenced by the slave sale document found at Qalat-i Dinka in 2013[210]. But as the oracle queries of Esarhaddon of Assyria (r. 680-669 BC) indicate a highly volatile political situation in the 670s BC, with Scythian raiders repeatedly crossing over the mountain border separating the Assyrian territory from the neighbouring kingdom of Ḫubuškia[211], and as there is very little information about the region available in later 7th century BC sources, it is entirely possible that the Empire lost control over the Peshdar Plain long before the Median forces took possession of Arrapḫa (modern Kirkuk) in 615 BC[212].

Whenever it was that the Assyrian occupation ended, it is clear from our excavations that after the main occupation period of the buildings uncovered at Gird-i Bazar came to an end, some squatters continued to make a living in the ruined structures there: this is clear for Courtyard 2 of Building A and for Building B.

After a long period of abandonment and non-use, the site was occupied again, at least sporadically. Evidence for this sporadic occupation period was identified already in 2015 in a higher-lying outdoor surface[213], which was dated to the Sasanian period due to pottery finds. This surface was identified on top of the remains of Building D, relatively close to the modern surface. Towards the east, this ancient surface is not preserved because of ploughing. The result of the ^{14}C analysis performed on the dentine of a human tooth from Grave 47, dated to calAD 390-533 (95.4 % probability), indicates that the graveyard, to which this burial belonged, was created during the time when the surface was in use, *i.e.* the Sasanian period (**Chapter G4**). A total of 58 graves have been identified so far, of which 37 burials have been excavated. In autumn of 2017, the excavation of the Sasanian-period, presumably Christian graveyard is to be completed and the anthropological investigation of the individuals will start. The data will substantially further our knowledge about the people of the Peshdar Plain and their living conditions in the centuries before the Islamic conquest of the region.

As of July 2017, we have completed four excavation campaigns at the "Dinka Settlement Complex" and exposed more than 800 m² of buildings, streets and production areas. Together with the bioarchaeological and material data recovered, they provide rich new information for many aspects of life on the eastern frontier of the Assyrian Empire. The third and final excavation campaign in the chicken farm enclosure of Gird-i Bazar will commence in September 2017.

207 Hajdas 2008, 16.

208 Altaweel/March 2016, 27-28: charcoal from sounding GA42, dated 830-789 calBC (95.4 % probability); Radner 2016b, 52: charcoal from Building A Room 3, dated 937-829 calBC (92.2 % probability).

209 Radner 2008, 52.

210 Radner 2015; 2016a, 17-18.

211 Radner 2016a, 21.

212 Grayson 1975, 92: Chronicle 3: 23.

213 Herr 2016, 91.

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M. Zeder, Feeding Cities: *Specialized Animal Economy in the Ancient Near East*, Washington 1991.

Addenda et Corrigenda to volume 1:

pp. 55-56 (Chapter C), Figs. C3.2 and C3.3:
The cuts of graves 23, 11 and 9 shown in sections B, C and D should start from below the topsoil and not from the present surface, as shown in these figures.

p. 112 (Appendix), second paragraph:
Lehmann-Haupt visited the area in the year 1899 (not in 1915).
Boehmer visited the area with Fenner (rather than Wolfram Kleiss). Replace "Kleiss" with "Fenner" (twice).

p. 124 (Bibliography), add:
Lanfranchi 1995
G. B. Lanfranchi, "Assyrian geography and Neo-Assyrian letters: the location of Hubushkia again." In M. Liverani (ed.), *Neo-Assyrian Geography*, Rome 1995, pp. 127-137.