British Mission to Tell el-Amarna

# Report on a study season on material excavated at site M50.14–16


*Fragments of kiln waste (including ceramic industrial vessels) awaiting cleaning*

Anna Hodgkinson

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A study season was carried out between the 30 September and 5 November 2018 on material excavated at the domestic workshop site M50.14-16 at Amarna in the autumn of 2014 and 2017. The following team members were present: Dr. Anna K. Hodgkinson (project lead, Freie Universität Berlin), Dr. Cordula Werschkun (lithics specialist, formerly University of Liverpool), Thais Rocha da Silva (finds registrar, University of Oxford), Kay Kossatz (finds illustrator, Freie Universität Berlin) and Qa'ud Abdullah (conservator, Egyptian Ministry of Antiquities). The work was carried out in collaboration with the local inspectorate, notably the magazine inspector Therwat Shawky Demian, to whom the team is most grateful.

**Object registration and documentation**

A number of individual object categories were registered, the information for each object was entered into a database and each individual object was photographed:

1) Faience beads excavated in 2014 and 2017. Database entries for faience jewellery that had already been registered were checked and corrected (T. Rocha da Silva).


***Figure 1.*** *Faience amulet 40557 and beads 42539 and 42571 (Bottom right).*

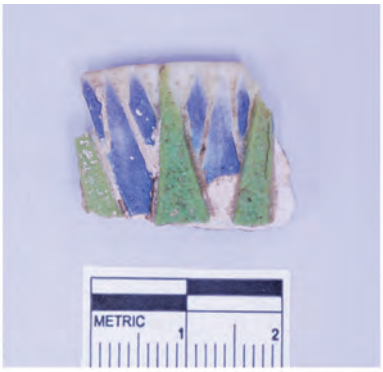


***Figure 2.*** *Faience inlay 41799.*

2) Faience tile fragments excavated in 2014 (not all) and 2017 (C. Werschkun).

3) Glass beads excavated in 2017 (C. Werschkun).

4) Metal (copper-alloy) fragments excavated in 2017 (A. K. Hodgkinson).

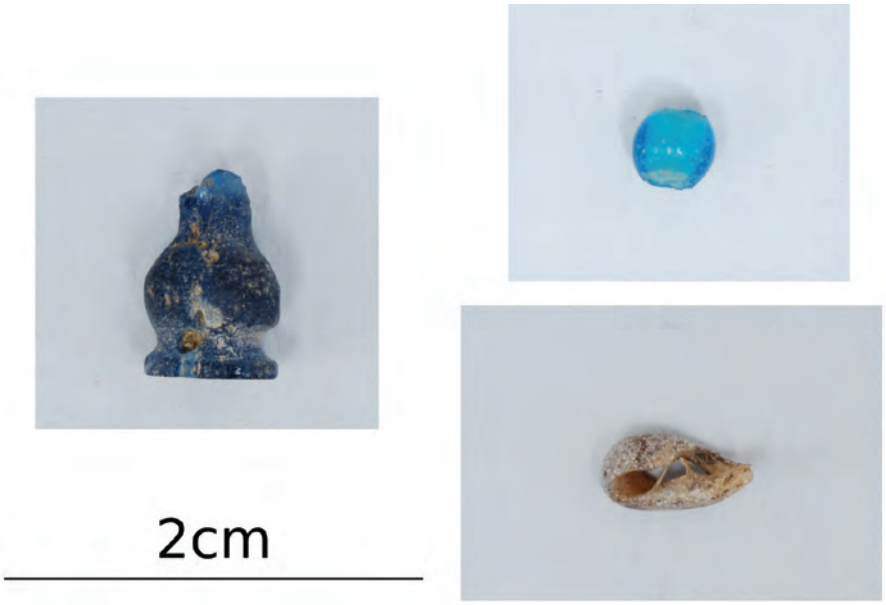


***Figure 3.*** *Glass pendant 43042, bead 43011 and bead waster 43025.*

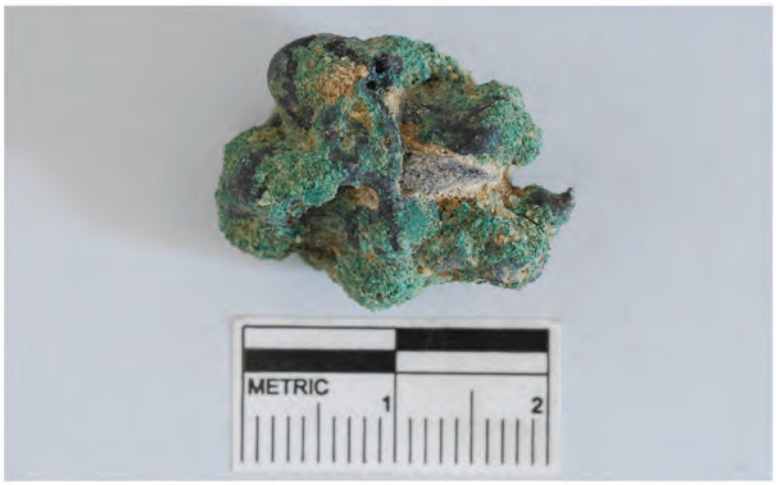


***Figure 4.*** *Amorphous copper alloy fragment 40592.*

In addition, the following object categories were studied and processed, sometimes according to specific research questions:

1) Cylindrical vessels excavated in 2014 and 2017: these objects were used for the production and processing of raw glass. A number of these objects were drawn and measurements compared (see Tables 1 and 3), since it is believed that these objects were standardised in terms of size. Each object was examined for remains of glass and a specific layering in the ceramic matrix (a series of reaction interfaces between the glass, a lime parting layer and the ceramic material, possibly indicating primary (raw) glass production. A number of these vessels were re-photographed and some objects initially believed to be part of this group were re-interpreted and sorted (A. K. Hodgkinson).

2) Other technological ceramics excavated in 2014 and 2017: Re-used sherds and pieces of oven furniture were examined for traces of glass and vitrification.


***Figure 5.*** *Cylindrical vessel fragment 41674 showing layering in the ceramic matrix.*

3) Stone objects, in particular agate, excavated in 2014 and 2017: The objects excavated towards the end of the 2017 field season were added to a stone and agate database. Some objects were re-photographed and a selection was illustrated by C. Werschkun.

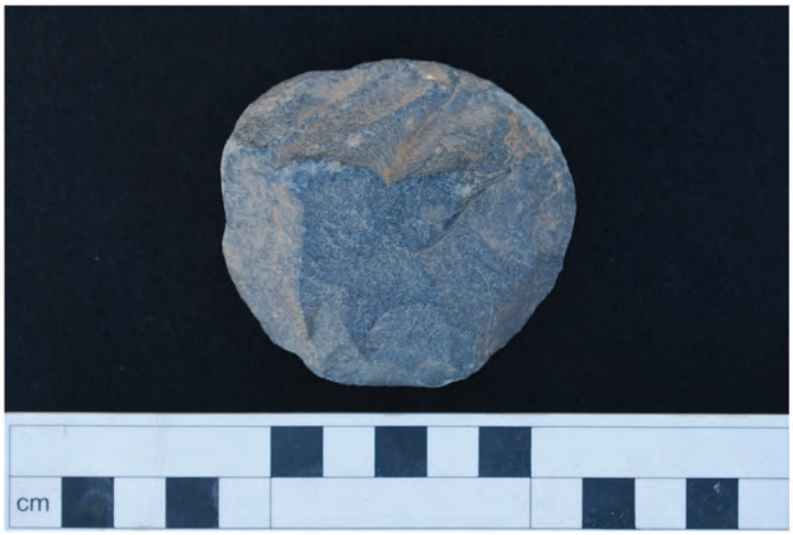


***Figure 6.*** *Reg. 41730: hand-held hammerstone from TA-MC 17 #12 I-2 (17644).*

| Object number | Diam. rim | Diam. body (in) | Diam. body (out) | Diam. base (in) | Diam. base (out) | Th. wall (min) | Th. wall (max) | Th. base (min) | Th. base (max) |
|---|---|---|---|---|---|---|---|---|---|
| **40349** | - | 12.50 | 15.20 | 12.00 | 15.00 | 1.33 | - | 1.90 | 2.10 |
| **40601** | - | - | 15.50 | - | 16-16,5 | - | - | - | - |
| **41671** | - | 15.50 | 18.40 | 15.00 | 19.20 | 1.48 | 1.73 | 1.90 | 2.40 |
| **41674** | - | 10.40 | 12.90 | 9.00 | 13.00 | 1.32 | 1.71 | 1.10 | 1.15 |
| **40340** | - | 12.40 | 14.00 | 12.00 | 13.30 | 1.06 | - | 1.30 | 1.50 |
| **40451** | 15.00 | - | - | - | - | 0.81 | 1.11 | - | - |
| **40593** | - | - | - | 14.00 | 16.70 | - | - | 1.84 | 2.30 |
| **40602** | - | - | - | 11.00 | 14.40 | - | - | 1.50 | 2.00 |
| **41997** | - | 16.60 | 18.80 | 14.50 | 18.60 | 1.15 | 1.77 | 1.84 | 1.86 |
| **40606** | - | 13.50 | 15.50 | 13.00 | 15.90 | 1.21 | - | 1.50 | 1.65 |
| **40348** | - | - | - | 15.00 | 18.40 | - | - | 1.90 | 2.00 |
| **40630** | 16.00 | - | - | - | - | 1.59 | 1.63 | - | - |
| **41675** | - | - | - | - | - | - | - | 3.00 | 3.20 |
| **41920** | - | 12.20 | 15.00 | 11.60 | 15.40 | 1.40 | - | 1.72 | 1.90 |
| **41765** | - | - | 15.00 | - | 13.0 | - | - | - | 2.55 |
| **41998** | - | - | 14.00 | 11.00 | 13.00 | - | 1.66 | - | 2.10 |
| **41759** | - | 16.00 | 19.00 | 13.00 | 15.00 | 1.56 | 1.66 | - | - |
| **40596** | 20.00 | - | - | - | - | 1.06 | 1.24 | - | - |
| **40347** | - | 12.40 | 14.80 | 12.00 | 15.80 | 1.26 | 1.40 | 1.15 | - |
| **41766** | - | - | 17.00 | 12.00 | 17.80 | - | - | 2.65 | 2.96 |
| **40608** | - | 15.00 | 17.40 | 14.00 | 15.50 | 1.30 | 1.70 | - | - |
| **41914** | - | ~11,75 | ~13,5 | 11.50 | 13.50 | 1.56 | 1.74 | - | - |
| **40361** | 15.50 | - | - | 12.00 | - | 0.90 | 1.20 | - | - |
| **40457** | 16.00 | - | - | - | - | 1.12 | 1.45 | - | - |
| **40362** | 21.00 | - | - | - | - | 1.03 | 1.16 | - | - |
| **40453** | 16.00 | - | - | - | - | 0.87 | 1.16 | - | - |
| **40594** | 18-19? | - | - | - | - | 1.03 | 1.13 | - | - |
| **40636** | - | - | - | 12.00 | 16.00 | - | - | 0.96 | 1.23 |

***Table 1.*** *Cylindrical vessel size ranges (in cm).*

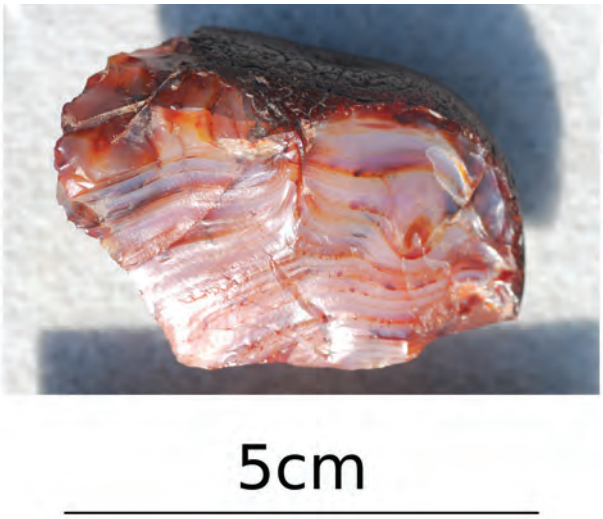


***Figure 7.*** *Unifacial agate core from TA-MC 14 #12 H-4 (15646).*


***Figure 8.*** *Reg. 40576: unfinished bead with hexagonal cross-section and off-centre drill hole, partly polished and reg. 40576: unfinished bead with hexagonal cross-section and off-centre drill hole, partly polished.*

*4) Vitrified oven and kiln debris.*

*5) Glass objects (working waste and raw material): These objects were studied for unfused quartz grains in the glass matrix and the interaction between glass and ceramic material.*

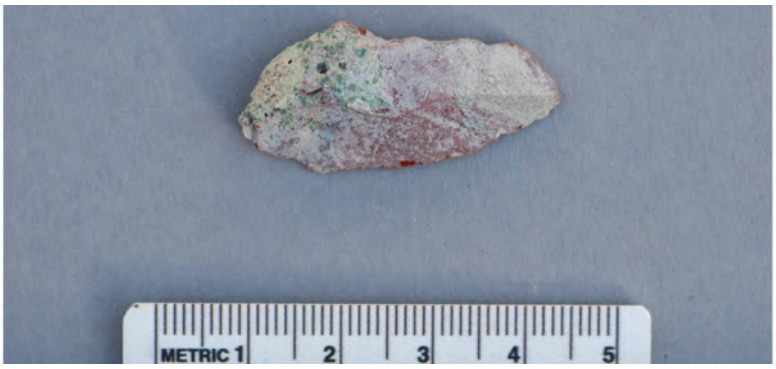


***Figure 9.*** *Glass ingot fragment 40671 (red, opaque, but weathered green).*

The database for the 2014 and 2017 excavations now contains a total of 2231 individual entries of numbered objects.

**Conservation**

Conservator Qa'ud carried out the mechanical cleaning of the following object categories, using conservation brushes and metal conservation picks, as well as occasional water and cotton wool (see Table 2).

1) A selection of cylindrical vessels for the production and working of glass in addition to some tools and pieces of oven or kiln furniture.

2) All metal-working crucibles (mainly copper-alloy metallurgy) excavated in 2014 and 2017.

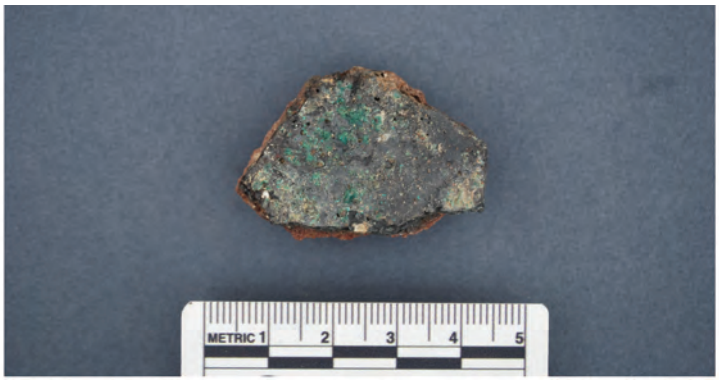


***Figure 10.*** *Metal-working crucible fragment 41702.*

3) Faience amulets and pendants excavated in 2017 (see Figure1).

A detailed and thorough work programme of cleaning and consolidation was carried out by Mr. Qa'ud on the almost complete blue-painted vessel (registration number 42030) excavated in the north-eastern part of the site (gridsquare L-3) at the end of the 2017 fieldwork.

***Figure 11.*** *Conservator Qa'ud cleaning and consolidating blue-painted vessel 42030.*

| Object no. | Object type | Object no. | Object type |
|---|---|---|---|
| **40559** | Amuletic faience bead – cowroid | **41693** | Ceramic metal-working crucible |
| **42030** | Blue-painted vessel | **41694** | Ceramic metal-working crucible |
| **40340** | Ceramic cylindrical vessel | **41695** | Ceramic metal-working crucible |
| **40341** | Ceramic cylindrical vessel | **41696** | Ceramic metal-working crucible |
| **40345** | Ceramic cylindrical vessel | **41697** | Ceramic metal-working crucible |
| **40347** | Ceramic cylindrical vessel | **41699** | Ceramic metal-working crucible |
| **40348** | Ceramic cylindrical vessel | **41700** | Ceramic metal-working crucible |
| **40349** | Ceramic cylindrical vessel | **41701** | Ceramic metal-working crucible |
| **40355** | Ceramic cylindrical vessel | **41702** | Ceramic metal-working crucible |
| **40356** | Ceramic cylindrical vessel | **41754** | Ceramic metal-working crucible |
| **40357** | Ceramic cylindrical vessel | **41760** | Ceramic metal-working crucible |
| **40358** | Ceramic cylindrical vessel | **41864** | Ceramic metal-working crucible |
| **40451** | Ceramic cylindrical vessel | **41907** | Ceramic metal-working crucible |
| **40593** | Ceramic cylindrical vessel | **41908** | Ceramic metal-working crucible |
| **40594** | Ceramic cylindrical vessel | **41909** | Ceramic metal-working crucible |
| **40596** | Ceramic cylindrical vessel | **41910** | Ceramic metal-working crucible |
| **40600** | Ceramic cylindrical vessel | **41911** | Ceramic metal-working crucible |
| **40601** | Ceramic cylindrical vessel | **41912** | Ceramic metal-working crucible |
| **40602** | Ceramic cylindrical vessel | **41913** | Ceramic metal-working crucible |

| | | | |
|---|---|---|---|
| **40606** | Ceramic cylindrical vessel | **41924** | Ceramic metal-working crucible |
| **40608** | Ceramic cylindrical vessel | **41947** | Ceramic metal-working crucible |
| **40630** | Ceramic cylindrical vessel | **41948** | Ceramic metal-working crucible |
| **40632** | Ceramic cylindrical vessel | **41949** | Ceramic metal-working crucible |
| **40635** | Ceramic cylindrical vessel | **42020** | Ceramic metal-working crucible |
| **40639** | Ceramic cylindrical vessel | **42021** | Ceramic metal-working crucible |
| **41670** | Ceramic cylindrical vessel | **42026** | Ceramic metal-working crucible |
| **41671** | Ceramic cylindrical vessel | **41686** | Ceramic metal-working crucible (?) |
| **41674** | Ceramic cylindrical vessel | **41996** | Ceramic oven sherd |
| **41675** | Ceramic cylindrical vessel | **41999** | Ceramic oven sherd |
| **41677** | Ceramic cylindrical vessel | **41687** | Ceramic reused sherd / pigment bowl |
| **41759** | Ceramic cylindrical vessel | **40624** | Ceramic tool |
| **41766** | Ceramic cylindrical vessel | **41763** | Ceramic tuyére |
| **41914** | Ceramic cylindrical vessel | **40557** | Faience collar pendant bead - date |
| **41915** | Ceramic cylindrical vessel | **40548** | Faience collar pendant bead - lotus petal |
| **41920** | Ceramic cylindrical vessel | **40550** | Faience collar pendant bead - lotus petal |
| **41922** | Ceramic cylindrical vessel | **40555** | Faience collar pendant bead - lotus petal |
| **41997** | Ceramic cylindrical vessel | **40551** | Faience collar pendant bead - lotus petal (or Date?) |
| **41998** | Ceramic cylindrical vessel | **40556** | Faience collar pendant bead - lotus petal? |
| **40634** | Ceramic cylindrical vessel (?) | **40549** | Faience collar pendant bead - mandrake fruit? |
| **40638** | Ceramic cylindrical vessel (?) | **40552** | Faience collar pendant bead - palm leaf |

| | | | |
|---|---|---|---|
| **41678** | Ceramic cylindrical vessel (?) | **40553** | Faience collar pendant bead - poppy bud |
| **42029** | Ceramic cylindrical vessel (?) | **40554** | Faience collar pendant bead - poppy bud |
| **40607** | Ceramic industrial vessel | **41797** | Faience inlay |
| **40640** | Ceramic industrial vessel | **41798** | Faience inlay |
| **42022** | Ceramic industrial vessel | **41799** | Faience inlay |
| **40627** | Ceramic metal-working crucible | **40538** | Faience pendant |
| **40627** | Ceramic metal-working crucible | **41866** | Faience tile fragment |
| **41688** | Ceramic metal-working crucible | **42002** | Faience vessel fragment |
| **41689** | Ceramic metal-working crucible | **40344** | Fragment (ingot?) |
| **41690** | Ceramic metal-working crucible | **40615** | Limestone Monkey figurine |
| **41691** | Ceramic metal-working crucible | **41755** | Metal-working crucible |
| **41692** | Ceramic metal-working crucible | **41742** | Stone furniture: stool leg |

***Table 2.*** *Objects cleaned by conservator Qa'ud.*

**Illustration**

In total, 102 objects from various materials and of a variety of functions, were illustrated during the 2018 study season (K. Kossatz). The main object categories include cylindrical vessels and other technological ceramics (including metal-working crucibles), glass objects (mainly raw glass and working pieces), copper-alloy objects (mainly fragments of tools), stone objects (technological and furniture), faience objects (jewellery and inlay fragments) and clay objects (tokens).

50 worked stone (agate) objects were drawn by C. Werschkun in order to illustrate better the manufacturing process and worked surfaces. Of these, two were given object numbers (40626 and 41504, see Table 3).

| Object number | Object type | Object number | Object type |
|---|---|---|---|
| **40340** | Ceramic cylindrical vessel | **40719** | Clay token |
| **40347** | Ceramic cylindrical vessel | **42027** | Clay token |
| **40348** | Ceramic cylindrical vessel | **40587** | Copper-alloy awl |
| **40349** | Ceramic cylindrical vessel | **40503** | Copper-alloy blade |
| **40361** | Ceramic cylindrical vessel | **40591** | Copper-alloy blade |

| | | | |
|---|---|---|---|
| **40362** | Ceramic cylindrical vessel | **41851** | Copper-alloy blade |
| **40451** | Ceramic cylindrical vessel | **41854** | Copper-alloy blade |
| **40453** | Ceramic cylindrical vessel | **41858** | Copper-alloy blade |
| **40457** | Ceramic cylindrical vessel | **41848** | Copper-alloy blade (?) |
| **40593** | Ceramic cylindrical vessel | **40667** | Copper-alloy chisel (?) |
| **40594** | Ceramic cylindrical vessel | **40708** | Copper-alloy chisel (?) |
| **40596** | Ceramic cylindrical vessel | **41846** | Copper-alloy chisel (?) |
| **40601** | Ceramic cylindrical vessel | **41946** | Copper-alloy chisel (?) |
| **40602** | Ceramic cylindrical vessel | **40668** | Copper-alloy fishing hook |
| **40606** | Ceramic cylindrical vessel | **40589** | Copper-alloy fragment (rod?) |
| **40608** | Ceramic cylindrical vessel | **40586** | Copper-alloy rod |
| **40630** | Ceramic cylindrical vessel | **41860** | Copper-alloy rod |
| **40636** | Ceramic cylindrical vessel | **41847** | Copper-alloy sheet |
| **41671** | Ceramic cylindrical vessel | **40500** | Copper-alloy strip |
| **41674** | Ceramic cylindrical vessel | **42001** | Copper-alloy wire |
| **41675** | Ceramic cylindrical vessel | **42033** | Faience amulet fragment |
| **41759** | Ceramic cylindrical vessel | **41799** | Faience inlay |
| **41765** | Ceramic cylindrical vessel | **41757** | Faience inlay fragment |
| **41766** | Ceramic cylindrical vessel | **41797** | Faience inlay fragment |
| **41914** | Ceramic cylindrical vessel | **41866** | Faience tile fragment |
| **41920** | Ceramic cylindrical vessel | **42002** | Faience vessel fragment |
| **41997** | Ceramic cylindrical vessel | **40671** | Glass fragment (raw glass) |
| **41998** | Ceramic cylindrical vessel | **40344** | Glass ingot fragment |
| **41676** | ceramic cylindrical vessel (?) | **40924** | Glass inlay |
| **41767** | Ceramic faience mould | **41743** | Glass inlay |
| **41838** | Ceramic faience mould | **41798** | Glass inlay |
| **41842** | Ceramic faience mould | **40961** | Glass working piece |
| **41843** | Ceramic faience mould | **41034** | Glass working piece |
| **41862** | Ceramic faience mould | **41834** | Glass working piece |
| **40351** | Ceramic industrial object (tool?) | **42019** | Limestone earring fragment |
| **40624** | Ceramic industrial object (tool?) | **41976** | Quartzite inlay fragment |
| **41703** | Ceramic industrial object (tool?) | **42031** | Quartzite inlay fragment |

| | | | |
|---|---|---|---|
| **40597** | Ceramic industrial vessel | **41705** | Spherical agate bead |
| **40607** | Ceramic industrial vessel | **41706** | Spherical agate bead |
| **41688** | Ceramic industrial vessel | **40576** | Stone (agate) bead |
| **41697** | Ceramic industrial vessel | **40695** | Stone (agate) bead |
| **41699** | Ceramic industrial vessel | **41440** | Stone amulet |
| **41754** | Ceramic industrial vessel | **41845** | Stone grinding tool |
| **41922** | Ceramic industrial vessel | **41978** | Stone mortar |
| **40360** | Ceramic oven furniture (?) | **41742** | Stone stool leg (furniture) |
| **41071** | Ceramic oven furniture (?) | **40617** | Stone tool |
| **41996** | Ceramic oven sherd | **40618** | Stone tool |
| **41687** | Ceramic reused sherd / pigment bowl | **41049** | Stone tool |
| **40537** | Ceramic tuyère | **41730** | Stone tool |
| **41763** | Ceramic tuyère | **41707** | Unfinished agate bead |
| **40700** | Clay token | **40626** | Knapped agate point |
| **40717** | Clay token | **41504** | Unfinished agate product |

***Table 3.*** *Objects illlustrated during the 2018 study season.*

**Work on the fieldwork archive**

While the final top plan of all mud-brick structures had already been digitised using GIS software, some additional deposit outlines were now digitised from the unit sheets (T. Rocha da Silva). This work is carried out in order to facilitate a spatial analysis of the distribution of the various object types across the site and to better understand the functions of the living and working spaces.


***Figure 12.*** *The digitised plan of site M50.14–16.*

**Appendix 1: numbers of trays and object categories studied**

| Tray number given by MSA inspectors | Tray number project | Contents |
|---|---|---|
| 109/1 | 2 | TA-MC 14 #12 Worked stone (1 of 2) |
| 109/2 | 3 | TA-MC 14 #12 Worked stone (2 of 2) |
| 106/2 | 8 | TA-MC 14 #12 Environmental samples and samples of vitrified material |
| 99/4 | 9 | TA-MC 14 #12 Environmental samples and samples of vitrified material |
| 110/2 | 12 | TA-MC 14 #12 Organic material, shells and blue-painted pottery |
| 99/1 | 13 | TA-MC 14 #12 Vitrified material (1 of 4) |
| 99/2 | 14 | TA-MC 14 #12 Vitrified material (2 of 4) |
| 99/3 | 15 | TA-MC 14 #12 Vitrified material (3 of 4) |
| 99/5 | 16 | TA-MC 14 #12 Vitrified material (4 of 4) |
| unknown | 17 | TA-MC 14 #12 Industrial pottery (1 of 2) |
| 110/1 | 18 | TA-MC 14 #12 Industrial Pottery (2 of 2) |
| 112/2 | 19 | TA-MC 14 #12 Glass objects (mainly raw glass) |
| 112/3 | 20 | TA-MC 14 #12 Small finds (faience (incl. beads), metal, worked agate) |
| 99/6 | 21 | TA-MC 17 #12 Worked stone |
| 112/1 | 22 | TA-MC 17 #12 Small finds (metal, faience, glass, industrial, textile) |
| 108/1 | 23 | TA-MC 17 #12 Organic materials (bones, shells, fruit) |
| 111/111; 110/3 | 24 | TA-MC 17 #12 Industrial pottery (etc.) |