

# **Preliminary Report on work undertaken in the Main City South at Tell el-Amarna**

**7 October – 2 November 2017**

*Anna K. Hodgkinson*



*Figure 1: The site after excavation on October 31st 2017.*

## **1      *Introduction and background***

An area of 309m<sup>2</sup> was excavated in the Main City South at Tell el-Amarna between October 7<sup>th</sup> and November 2<sup>nd</sup> 2017 (see fig. 1). The work focussed on the area of a building complex denominated M50.14, .15 and .16 by C. L. Woolley, who initially excavated these buildings in 1922 on behalf of the Egypt Exploration Society (EES: Peet and Woolley 1923). Therefore, the work encompassed both re-excavation and new excavation. A previous season of excavation had taken place in October and November 2014, uncovering an area of 217m<sup>2</sup>, and the work carried out in 2017 aimed to complete the area occupied by buildings M50.14, .15 and .16.

The 2014 work was planned after an area of vitrified material (kiln debris) was discovered on the surface of M50.14, an indicator of high-temperature industries. Furthermore, the original publication of the building complex described it as a workshop for the manufacture of glass and faience objects. Since the field director's expertise lies in the study of the Late Bronze Age Egyptian glass industries, the site was selected for excavation. Since a large amount of material related to glass-working, possibly raw glass production, together with faience manufacture and stone bead production, although no oven structure, was discovered, an application was made to excavate and to complete the area of the houses as described by the 1923 EES publication.

## **2      *Participants***

The team of archaeologists consisted of the following members: Dr. Anna K. Hodgkinson (field director, Freie Universität Berlin), Antonio Cantele, Kay Kossatz (both Freie Universität Berlin) Thais Rocha da Silva (University of Oxford), Kimberley Watt (University of Cambridge), Dr. Cordula Werschkun (formerly University of Liverpool), and our inspector from the Ministry of State for Antiquities, Kariman Abdelalim. We were joined by our trainee inspector, Nabil Abdeltieff, who remained with the team until November 2<sup>nd</sup>. The team employed thirteen Egyptian workmen from Hagg Qandil and Et-Till: Walid Mohamed Omar, Ahmed Mohtar Salan, Salah Osman Mehenni, Hilal Mohamed Omar, Abdelaal Talaat Abdelaal, Ahmed Hamdy Ali, Bilal Nazzer Omar, Hosny Osman Mehenni, Abdel Hafiz Abdel Aziz Ibrahim, Reda Omar Mohamed, Osman Mohammed Osman, Hassan Mohammed Raleb and Mohammed Abdelghafar Abdelhag.

## **3      *Acknowledgements***

The members of the team are indebted to the Amarna Project for their kind support of this project, in particular for their permission to use the excavation house and equipment. We are furthermore grateful to the Ministry of State for Antiquities, and we would also like to thank the Egypt Exploration Society, who kindly funded our work.

## 4 The archaeological remains

### 1. Introduction and excavation methodology

The building complex, as originally published in “The City of Akhenaten I” (Peet and Woolley 1923, 19) lies in the Main City South of Amarna, in the direct surrounding of the House of Ranefer and the Grid 12 excavations carried out in the early 2000s (Kemp and Stevens 2010). The complex encompasses a domestic house, M50.16, a second house to the east of this house, M50.15 and the surrounding courtyard, which describes the overall area of the building complex, M50.14. Since the southern portion of house M50.16, together with a large area of the southern courtyard, M50.14, were excavated in 2014, the 2017 season encompassed the northern sections (including the northern boundary wall) of house M50.16, the whole of house M50.15, as well as the eastern, south-eastern and south-western portions of courtyard M50.14 (see fig. 2).<sup>1</sup> This was done in order to gain a complete picture of the industrial activities which took place in the courtyard and to place them into context with the activities found in the domestic houses and the industrial activity encountered in Grid 12 and the House of Ranefer.



Figure 2: Plan of the site, showing gridsquares excavated in 2014 and 2017, as well as the 1922 plan of the site and walls and features excavated in 2014.

The excavated area encompasses a total of 18 gridsquares, measuring 25m<sup>2</sup> each, although only six of these were fully excavated (one of which – G-3 was already opened in 2014, but only completed

<sup>1</sup>See [http://www.amarnaproject.com/pages/recent\\_projects/excavation/beadwork/](http://www.amarnaproject.com/pages/recent_projects/excavation/beadwork/)



in 2017). The size of the other squares has been adjusted in order to take into account a large spoil heap to the north, and to limit the excavated area to the features under investigation. Although some discrepancies between the encountered archaeology and the original plan had already been discovered in 2014, it has been possible to further revise the original plan and to add previously unknown walls and features (see fig. 1).

The initial set-out of the gridsquares was done by total station. Squares were extended by tape measure. Prior to excavation, a topographical survey was undertaken across each gridsquare. Workmen were then employed to remove overburden layers, which usually consisted of windblown sand and/or backfill from the 2014 season. All archaeological deposits were removed by trowel and brush, and spoil was 100% sieved for finds. Hollow features, such as pit cuts, were initially half-sectioned before being fully excavated, and the entire area was planned at 1:25. The excavation was back-filled after the conclusion of the work, using spoil from the excavation, and clean sand.

## **2. The courtyard, its industrial installations and evidence of industrial activity**

The area of courtyard M50.14 appears to have been open, without a permanent roof. No remains related to a temporary structure have been found. The partition walls excavated within this area were usually thin and poorly preserved, usually being no more than two courses high. This was particularly evident in gridsquares K-2, K-3, L-2 and L-3 to the east, and L-4, L-5, K-5 and J-5 to the south-east, where the archaeological remains were found only a few centimetres below the modern surface (see fig. 3).



*Figure 3: The eastern extent of the courtyard, showing partition walls and an oven, looking south.*

The southern boundary wall as marked on the 1923 plan has been identified, although its preservation is somewhat poor, with only a few bricks remaining in place. The best preserved section of the wall was encountered in L-5, although further south than marked on the 1923 plan with another thin strip of a wall running roughly east-west through the square slightly to the north (fig. 4).



*Figure 4: The south-eastern extent of the courtyard, showing the remains of the boundary wall. Looking north-west.*

The floor surface appears to have directly overlain the desert surface (*gebel*) and consisted of a trampled surface, which contained pottery fragments and pieces of charcoal. Only one small patch of mud-floor with two layers of gypsum whitewash was found against the remains of two mud-bricks forming a corner in L-4. The original extent of this floor surface is uncertain, and its presence in an otherwise industrial courtyard setting was somewhat surprising. A series of small and ephemeral fireplaces was encountered in this eastern part of the courtyard.

The southern courtyard incorporated one probable oven pit, which may have once been lined with clay, indicated by the presence of two fragments of vitrified clay in its eastern cut. The oven contained one fill, which included pieces of charcoal, and several objects related to glass-working and faience manufacture were found, including ingot fragments, rods and several faience bead wasters. The southern boundary wall of the courtyard forms a corner against this oven in J-5, taking this structure into account (see fig. 5). This firing structure appears to have belonged to a series of fire pits discovered in the southern courtyard during the 2014 season. These pits, too, may have been lined with clay or mud-bricks, and this is supported by the presence of vitrified clay and sandstone fragments excavated as a concentration to the south of house M50.16 in 2014.





*Figure 5: The oven found in J-5, with the boundary wall forming an angle around it.*

The 1923 publication describes the “remains of a glaze kiln: pit cut in sand 1.00m diam. by 0.50m deep, full of burnt brick, glass and glaze slag, and fragments of the pots used in the kiln for standing the vessels on: the bottoms and sides of these are covered with tricklings of glaze.”. This point was in fact marked on the original plan with the letter “X” next to a circular feature. This feature was excavated in the area between squares **K-4** and **L-4** in 2014, and revealed a pit, although no oven. Some glass-working related materials were found in this area in 2014. However, a second, unmarked, circular feature was shown on the 1923 plan, in the north-eastern area of the courtyard, in gridsquare **L-3**. The 2017 excavation revealed a circular pit in this area, which was interpreted as an oven pit, since it contained four different fills with ashes and charcoal, although no structural remains (see fig. 6). These may have been removed, or never been in place.



*Figure 6: The circular oven pit in L-3, during excavation.*

No direct evidence of glass-working was found in the area of this oven, although the surrounding rooms contained numerous objects related to high-temperature activities. A small fireplace was found against the eastern enclosure wall, and the adjacent bricks have been reddened because of this.

An almost intact, clay-lined and blue-painted water-jar was found in the south-eastern corner of the room containing the aforementioned oven, and this was filled with some collapse and organic material (see fig 7).

The north-eastern area of the courtyard M50.14 contained some walls not previously marked on the 1923 EES plan of the complex. This is probably due to the fact that the complex was not fully excavated in 1922, although it was published as such. In fact, the northern boundary wall of both houses M50.15 and 16 was located further to the north than marked on the 1922 plan, and the same was the case with the north-eastern boundary wall. Rooms with ashy fills were excavated in gridsquares **K-2** and **L-2**, and these were partially covered by spoilheaps from the Woolley excavations of 1922 as well as some ancient collapse. These rooms yielded numerous items related to industrial activity. By contrast, the excavation of gridsquares **G-5** and the western portion of **H-5** did not reveal any features, and the only evidence of industrial activity came from the excavation of two overhanging parts of a spoilheap created by Woolley's excavations.

Evidence of metal-working activity in the northern courtyard was first encountered during the 2017 excavations, since this activity was not noticed in 2014. Other activities observed in the courtyard include stone-working, particularly of agate – some unfinished beads have been found – glass, and faience. Tools from stone and metal have been found, including some metal rod fragments, which may have been used as mandrels in the manufacture of glass beads.

The western sections of the courtyard were found to be covered with vast quantities of mud-brick collapse from the boundary walls of buildings M50.16 and M50.15. It was decided to remove some of this mud-brick collapse, but to leave other parts in place in order to protect the underlying archaeological features. However, the removal of the mud-brick collapse in **G-3** and **G-2** revealed the outline of a possible well, indicated by a brown tinting of bricks and soil in this area. Furthermore, the western boundary of **G-3** revealed the uncertain outline of what may have been a rectangular corn bin for the storage of grain.

Gridsquare **G-4**, the north-eastern corner of which was excavated in 2014, was cleaned and excavated fully, and the northern parts of **G-5** and **H-5** were cleared in order to complete the plan of the courtyard. A short stretch of a poorly-preserved wall was found to the south of the south-western corner of building M50.16 in **G-4**. A small oven pit was discovered in the western section of **H-5**, but no further features have been found. The original site plan does not indicate the southern boundary wall in this area, and the extent of the gridsquares excavated in 2017 did not include the continuation of this wall to the south-west. The final instance of this wall was found in the south-western corner of **J-5**, in the shape of a single mud-brick.



*Figure 7: The blue-painted water-jar during excavation. Looking south-east.*



### 3. The remains of the domestic houses, M50.15 and M50.16

#### 1. M50.16

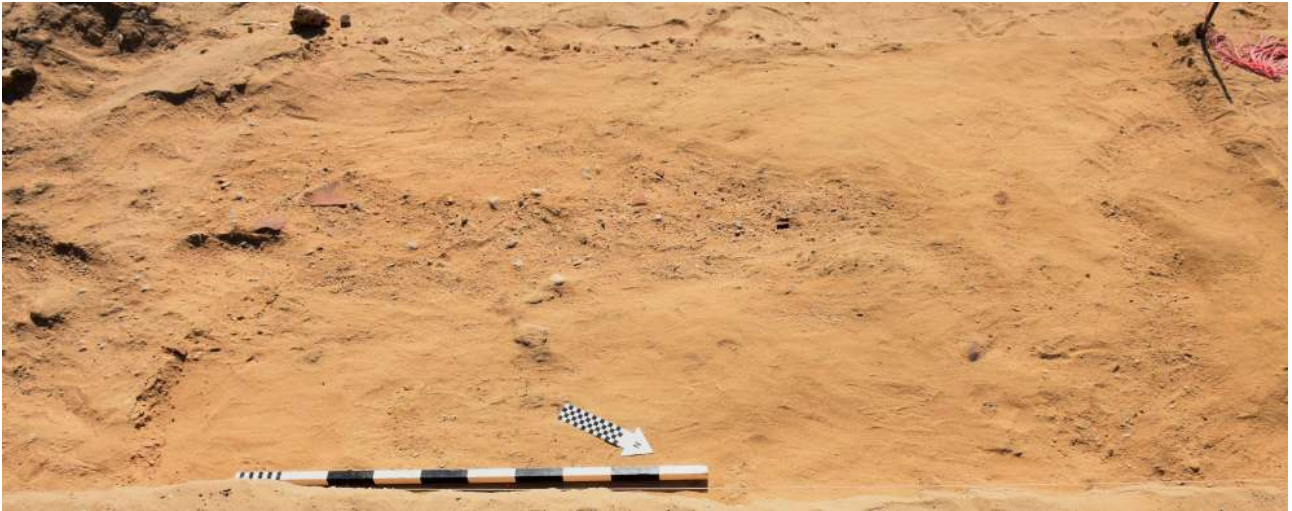
Since the larger part of this building was already excavated in 2014, only the northernmost strip of this building was uncovered in 2017, measuring c.25m<sup>2</sup> (fig. 8).



*Figure 8: The northern sections of M50.16, with the parts excavated in 2014 to the south. Looking east. Mud-brick wall collapse can be seen to the west and towards the centre of the image.*

Since the original 5(E-W) x 2.5(N-S)m squares did not reveal the northern boundary wall of this building, as predicted by the EES plan, the gridsquares were extended by another 1.5m to the north. The wall appears to be in relatively good condition in squares **G-2** and **H-2**, although it becomes very unclear in **I-2**, where large parts have collapsed. A gravel trench covered the course of the wall in **I-2**, outlining the 1922 excavation (fig. 9).





*Figure 9: A gravel trench, probably the result of the 1922 excavation, running E-W on top of the northern boundary wall of M50.16.*

*In situ* dumped pottery was discovered in the gap between the western side of the eastern boundary wall of M50.16 and the western wall of M50.15 in **room 9** of M50.16 (fig. 10). Due to a cylindrical household oven having been found here in previous seasons, this room was interpreted as an open area for cooking activities. Due to the series of collapse layers and weathered surfaces, consistent from water-hardened sand and mud-brick collapse it was not possible to add much further detail to the plan of M50.16.



*Figure 10: Dumped pottery in the north-eastern part of M50.16.*

## 2. M50.15

Building M50.15 was not excavated during the 2014 season, although the southern boundary wall was planned. Since the 1922 excavations did not examine this structure in great detail, it was decided that the 2017 excavations should pay special attention to this building.



Figure 11: House M50.15, looking south.

House M50.15 consists of 10 rooms, covering an area of c.51m<sup>2</sup> in gridsquares **I-3** (eastern section), **J-2**, **J-3**, as well as in **K-2** and **K-3** (western sections; see figs. 2 and 11):

**Room 1** was the central room, bounded by a set of mud-brick walls. These appear to have been built on a bed of gravelly *gebel*, which slopes downwards to the north from the centre of the room. The eastern boundary of this room is marked by a mass of mud-bricks, which were initially interpreted as a staircase due to their density and alignment. The northern extension of this, however, was a straight mud-brick wall, which connected with the northern enclosure wall of the house. For this reason, a box-section was cut into the mass of bricks to reveal a thick layer of collapse above the natural desert gravel, behind which the outline of the N-S wall became apparent (fig. 12).



Figure 12: Box-section through wall collapse.



Further north, **room 2** was directly accessible from room 1. A gravel-filled trench, which ran from the northern enclosure wall to the centre of room 1, and which was probably cut by the previous excavation,

covered a series of weathered collapse and silt layers in this area. These, in turn, covered an uneven surface, which was interpreted as the top surface of an ancient refuse pit, containing



Figure 13: Approximate extent of ancient refuse pit in rooms 1 and 2 in M50.15, indicated by extent of *gebel*. Looking north.

dumped potsherds and occasional pieces

of charcoal (see fig. 13). The original floor surface, which lay approximately 0.35m above the top surface of the pit, was only preserved in the south-western corner of room 2, where the trench created by the 1922 expedition revealed a section through a dump of charcoal material and hardened gravel. The remains contained a small, superficial fireplace. Some burnt mud-bricks were found in this fireplace, and – as mentioned above – evidence of metal-working, including ceramic crucible fragments, came from the adjacent collapse and silt layers. A box-section was cut into the charcoal dump in order to gain information on the nature of the wall in this area. It was discovered that the wall separating rooms 1 and 2 E-W is built upon the top layer of the refuse pit, while the N-S wall separating rooms 8 – 10, as well as the N-S wall separating rooms 3 – 5 from room 1, are built on the *gebel*.

**Room 3** was found to be an individual unit, and it had not been recognised as such by the 1922 mission. It is separated from room 2 by the northern extension of the mud-brick mass found to the east of room 1. The walls surrounding this room were built directly onto the *gebel*, and while the western wall was preserved up to a single course of bricks, the eastern wall was only preserved to a single course above this layer. Some organic material was found in this room.

**Room 4** is the long, rectangular room to the east of house M50.15. Again, the *gebel* was reached very soon after initial clearance. No function could be determined for this room.

**Rooms 5 and 6** appear to have been connected, the surface and collapse layers found in room 5 sloping downward into room 6. A *mastaba* feature, a row of bricks, was found built against the northern wall of room 5 (see fig. 14). It is not certain whether this functions as a stabilising wall, or if it had an architectural function.



*Figure 14: A row of bricks visible under the northern wall of room 5. Looking north.*

**Room 7** was found to be a separate unit from room 6, which had not been recognised by the previous excavators. This was a small room, the function of which is not clear.

**Rooms 8 and 9** lie in the western section of the building. The primary mud-brick collapse layers were left inside these rooms due to time constraints.

**Room 10** consists of two sections, separated by an E-W wall. An aligned and slightly convex mass of mud-bricks in the northern area may be the remains of a bin for the storage of corn. This feature remains unexcavated.

In summary, house M50.15 can be said to have been smaller in area than M50.16, probably having functioned as a secondary building to the latter. In terms of preservation, both houses appear to have suffered a similar fate, having been excavated during the 1922 excavations and subsequently left exposed to the elements, after which numerous instances of collapse occurred, and water action affected the collapsed bricks, the remains of which mixed with wind-blown sand.

## **5      *The Finds***

### **1. Recording Methodology**

The finds from the 2017 excavation were sorted into trays by material at the end of each workday: glass, faience, metal, worked stone, organic remains (charcoal, animal bone, shell and other), vitrified material (i.e. vitrified sandstone, vitrified sandstone and mud-brick), industrial and architectural remains (gypsum, brick), pottery (diagnostic), blue-painted pottery, industrial pottery, and industrial other (including faience moulds). Glass and faience are then further separated into fragments, beads, inlays or working pieces (ingot fragments, bars, rods, etc.).

Faience beads were recorded by bead type (classified according to Andrew Boyce's Amarna bead corpus (1995, pp. 75-82)), recording the related square, unit number, excavation date, number of beads, colour and further notes. Glass beads have been counted and recorded in a similar fashion,



and classified based on that used by Kemp and Stevens (2010, pp. 111-115). A selection of beads has been photographed.

Industrial materials, such as vitrified materials and agate fragments have been counted and weighed. They have been logged by square, unit number and date excavated. Organic remains, such as charcoal, animal bone and shell have been logged (as with the agate above) counted and/or weighed. The numerous small fragments of faience tiles were treated similarly, as were unidentifiable copper-alloy fragments.

## 2. The corpus and variety of objects

### 1. Glass fragments, rods and bars

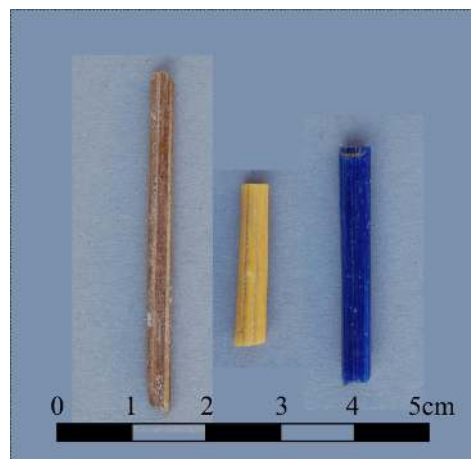
150 fragments of glass have been excavated, most of which are chips of glass ingots, indicating that the processing of glass took place at this site. A fine layer of lime powder (the so-called “parting layer”) was found adhering to several of these fragments, indicating that these were once part of a larger glass ingot. The parting layer was applied to the inside of the vessels used as ingot moulds, in order to separate the glass from the ceramic material after the batch had been melted and cooled down. Two ingots (one almost complete, and a larger fragment) were found at the site during the 2014 season, and the impression of the ceramic vessel was visible on both of these objects. Many of the chips are very small and eroded and weathered, while others are larger.



*Figure 15: A glass ingot fragment.*

Bubbly fragments, and those fragments which are translucent and light green, may indicate primary glass manufacture, since these may be the effects of inclusions contained in the glass matrix. These fragments are usually chipped in the same manner as flint, demonstrating that at least part of the workforce employed here was skilled in the chipping of stones and able to transfer this skill to the cold-working of glass (fig. 15).

The colour of the glass ranges from dark blue and turquoise blue/green, the two most common colours for ancient Egyptian glass, over purple, yellow, translucent, almost colourless glass to opaque white glass.



*Figure 16: Three glass-rods.*

In addition 101 glass-rods (see fig. 16), bars and strips were found, some of which bore tool marks, demonstrating the chaîne opératoire of glass-working, particularly the manufacture of beads. One undecorated, monochrome dark blue glass vessel fragment was found. Two further monochrome dark blue vessel fragments found in 2014 may indicate that fragments of undecorated glass vessels, which broke during manufacture, may have been recycled at site M50.14-16 in order to produce new glass ingots.



*Figure 17:  
Fragment of an eye  
inlay.*

An extremely clear fragment of glass, with only a very slight light blue tint, has been found, and this fragment is very carefully chipped and highly polished. It appears to have broken vertically in the centre, but this piece was most likely intended as an eye inlay for a piece of sculpture.

## **2. Cylindrical vessels for glass manufacture**

28 vessel fragments of cylindrical shape were found across the site in total. A large number of these came from the spoil heap to the south and south-east of the site, which was created during the 1922 excavations. These vessels were used as moulds for glass ingots, and some fragments had blue and purple glass adhering to them (see fig. 18). Their standardised size is reflected in the glass ingots discovered aboard the Late Bronze Age Uluburun Shipwreck, and the large glass ingot fragment discovered at site M50.14-16 in 2014 also fits into most these vessels, which may hint towards Amarna being the place of their production. The cylindrical vessels may also have been used for the re-melting of glass, and the drawing of glass-rods for the decoration of vessels and the production of beads.



*Figure 18: The fragment of a cylindrical vessel.*

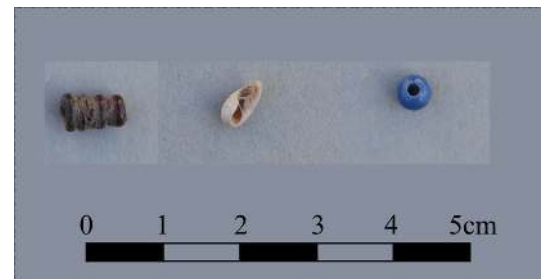
## **3. The glass and faience beads**

In total, 286 faience beads of a variety of types has been found. The most common type is the small ring bead, followed by the disc bead and segmented and spacer beads (fig. 19). In addition, a total of 40 wasters, i.e. manufacturing errors, where beads have fused together and were thus discarded, were found.



*Figure 19: Some faience beads.*

56 glass beads have been discovered in total, the most common type being a small sphere bead. These were usually blue in colour and heavily weathered. A large number of these beads was unfinished, showing trails of glass yet to be polished off. Again, waster beads were discovered, which had not fused properly (fig. 20).



*Figure 20: Finished and unfinished  
glass beads.*



#### 4. Faience jewellery and moulds

A small number (25 in total) of faience ring fragments was found, in most cases decorated with an open udjat-eye design, although two plaque-shaped bezels were also found, one of which is decorated with a fish.



Figure 21: A selection of faience pendant and amulets.

24 faience amulets and pendants have been registered, some of which are floral in nature (i.e. poppy buds, corn flowers and leaves), while others depict household deities, including Bes, and one faience scarab was also found.

The excavations furthermore yielded a total of 12 faience moulds from fired clay, the designs of which did not repeat, although one mould found in 2014 formed a direct parallel to one found in 2017. Designs include a scarab, floral amulets, a Bes playing the tambourine, a frog, a nefer symbol and two fragments (not matching) of a cartouche design.



Figure 22: Faience mould for an Udjat eye.

#### 5. Faience inlays, tiles and other fragments



Figure 23: Fragment of a faience tile.

A total of 120 fragments of faience tiles or inlays were found, and the monochrome fragments were grouped by colour (light turquoise: 41 fragments, dark turquoise: 40 fragments, and dark blue: 29 fragments). These objects functioned as decorative elements for walls and wooden furniture, set into plaster.

#### 6. Metal objects

Most of the metal found across the site came in the form of small, indiscernible copper-alloy fragments and lumps, which have been weighed and counted by unit and square number. In addition, a total of 8 blade fragments and two possible chisel fragments were found alongside one rectangular piece of metal sheeting and 6 metal rods. These rods may have been used in glass-bead production as mandrels, when the molten glass rod would be wrapped around the rod to form the bead. They may, however, have been used for several other purposes, such as decorative wire.



Figure 24: A selection of metal tools.

## **7. Metal-working crucibles**

This type of object has only been identified in the 2017 season. These items are crude fragments of Nile clay bowls, although only a very small number of diagnostic sherds has been found.

## **8. Agate debitage, including the work carried out on the assemblage excavated in 2014**

The 2014 object corpus included a total of 1.135kg of agate debitage. Most of this material consists of small and medium-sized chippings, while some raw bead products have also been found. A smaller, but similarly distributed range of agate objects was found in 2017, c. 420g in total. The 2014 material has been analysed and evaluated by lithics specialist Cordula Werschkun.

## **9. Stone and tools and other worked stones**

A small range of stone tools, mainly polishing stones from sandstone or quartzite, has been found. In addition, tools from pottery sherds were probably used in the manufacture of glass objects.

## **10. Vitrified sandstone and mud-brick**

While the 2014 season yielded almost 26kg of vitrified mud-bricks, clay and sandstones, only c. 4.5kg of vitrified material was found during the 2017 season. This may be due to the fact that a small amount of the material from the concentration located in 2014 has scattered. It has not been possible to reconstruct a kiln structure according to this material.

## **11. Other objects**

A small number of clay sealings has been registered during the 2017 season, and most of these may be document sealings. One fragment with a stamped cartouche and string impressions has been found.



*Figure 25: Mud sealing.*

## **6 Conclusions**

The excavated complex, M50.14-16 comprises a main, domestic building, some secondary buildings and some outside working areas with some thin partition walls and firing structures. We can infer from the large numbers of raw materials and objects related to industrial activity found at the site that the excavated workshop must have processed relatively large quantities of glass, metal and stone objects. These finds are similar to those discovered during the recent excavations at the nearby house of Ranefer (Kemp and Stevens 2010), and concur to the hypothesis that this area of the Main City South at Amarna was somewhat specialised in this activity.

The evidence would suggest that the workshop integrated into the courtyard was specialised in the production of glass- and faience-beads, but also produced beads from other materials, such as chalcedony. The general layout of this complex fits well into the greater picture of Amarna, in particular that of the Main City, where it is believed that areas of small, industrial houses developed



amongst the larger, elite houses, to which they reported.

The project has succeeded in enhancing our understanding of the socio-economic structures of the Main City South at Amarna, as well as the architecture and functionality of domestic structures and their involvement in industrial processes at Tell el-Amarna during the 18<sup>th</sup> dynasty in ancient Egypt.

## **7 Bibliography**

Boyce, Andrew, 1995. House P46.33: the finds, in: Kemp, Barry J., (ed.), 1995. *Amarna Reports VI*, EES Occasional Publications 10, London: Egypt Exploration Society, 44-136.

Kemp, Barry J. and Stevens, Anna, 2010. *Busy Lives at Amarna: Excavations in the Main City, Volume II: The Objects*, London: Egypt Exploration Society.

Nicholson, Paul T. 2007. *Brilliant Things for Akhenaten: The Production of Glass, Vitreous Materials and Pottery at Amarna Site O45.1*, EES Excavation Memoirs 80, London: Egypt Exploration Society.

Peet, Thomas E. and Woolley, C.I., 1923. *The City of Akhenaten. Part I: excavations of 1921 and 1922 at el-Amarna*, EES Memoirs 38, London: Egypt Exploration Society.