Reading rubbish : using object assemblages to reconstruct activities, modes of deposition and abandonment at the Late Bronze Age Dunnu of Tell Sabi Abyad, Syria

Klinkenberg, V.

Chapter 2.
Methodology

2.1 Introduction

Reconstructing the activities in the Tell Sabi Abyad *dunnu* is achieved through examining the material remains which were left behind at the site in antiquity. This is however not a straight-forward exercise; there are three main problems with the interpretation of this large dataset which need to be addressed.

Firstly, the dataset is composed of a daunting 10,000 objects and numerous architectural elements. All these objects and features were part of densely packed stratified deposits in which their relationships are sometimes hard to identify. This large and complex dataset requires a fast and reliable data management system. With this, it should be possible to manage and visualize all finds and features. Also the numerous characteristics of, and relationships between, finds and features should be included in this system.

Secondly, the objects found during the excavation do not always represent the activities which were carried out at the location where they are found. Processes such as the cleaning of houses and natural processes such as decay influence the state, location and presence of objects and features. Also, some activities might have left behind very clear traces while other activities leave no traces at all. The processes which have occurred between the activities in the past and the excavation of the material remains are considered to have *formed* the archaeological record and are consequently known as (site-) formation processes (Ascher 1961; Schiffer 1983). Interpreting material remains requires an accurate reconstruction of these formation processes. The identification of formation processes can subsequently help in understanding the functional relationship between the object and the space in which it was found.

The third issue is one of temporality: in the past a large number of activities may have taken place in a certain location, which together express the changing meaning and function of that space. The number of activities which are consecutively carried out is often higher than the number of phases which are recognized in stratigraphic reconstructions. The periodization then does not reflect the detailed changes which in fact occur in that settlement. These small events which make up an archaeological phase are, however, important for a thorough understanding of the history of a site. Therefore, a method should be in place which records all activities which were carried out in a given space.

The methodology which is presented in this chapter is concerned with systematically investigating the material remains from Tell Sabi Abyad with regard to the problems outlined above. To this end a largely digital workflow is employed which ensures the adequate handling of large amounts of data (paragraph 2.2). By critically evaluating the formation processes for every deposit the depositional history of all objects is determined, aiding the functional relationship between objects and space (paragraph 2.3). Ultimately, the reconstructed activities are charted in a temporal framework, visualizing the order in which activities were carried out in each area (paragraph 2.4).

2.2 Digital model of the material remains

The archive of the Tell Sabi Abyad excavations consists of large amounts of folders with paper forms and drawings. Also hundreds of A0-sized field drawings were created in the course of the excavations. To ensure that the archive will remain intact in the future and to make the archive more accessible for research a large scale digitization campaign was set up at the start of this study (Klinkenberg 2014). The work included making an inventory of and classifying all the available data. Subsequently every document was provided with a unique file name which included information about the document and processed by a scanning company. The file name was recorded physically on the documents as well as in the digital files to ensure that they could be related with one and another in future if needed. The resulting digital files were archived in a straightforward folder structure which enables users to easily locate certain documents. Additionally, a database was created which contains a wealth of information about the documents. This database can, for instance, be used to search for all object forms which describe figurines. Also it can be used to locate all documents, forms, drawings or photographs, which are related to a certain trench. The entire archive was deposited for long-term online and open access storage at the Data Archiving and Networked Services institute of the Royal Dutch Academy of Science[2].

Interpreting the material remains from Tell Sabi Abyad is undertaken using this digital archive in combination with a three-dimensional GIS (3D GIS). GIS and 3D reconstructions are widely applied in archaeology (Renfrew and Bahn 1991; Burrough and McDonnell 1998; Wheatley and Gillings 2002) and can shed light on many question regarding the spatial distribution of objects or architectural remains. While they are often considered to be separate techniques, in some research like the current, they are explicitly combined (Losier *et al.* 2007; Katsianis *et al.* 2008; Klinkenberg in press). There is a marked difference between 3D reconstructions which are made for publications and reconstructions created for use in conjunction with 3D GIS. Most 3D reconstructions of archaeological remains focus on specific (monumental) buildings from a site, such as a single temple building. Furthermore, most archaeologically inspired 3D models are focussed on the reconstruction of architecture as it may have looked in the past.

The 3D reconstruction of the Tell Sabi Abyad excavations is different as every archaeological feature will be reconstructed as it was found during excavation: in their ruined state. The model is used by Tijm Lanjouw (2016) to reconstruct the construction history of the

[2] The digital Tell Sabi Abyad archive can be found at http://dx.doi.org/10.17026/dans-294-p94z.

dunnu. For this research the digitized 3D model will consist of every architectural element of the *dunnu* with every retrieved object that was found within. Rather than an end product for visualizations, the 3D model will be used as a tool, the basis for the spatial analysis of the find material from the *dunnu*.

The 3D model will be a schematic representation of the original architecture and objects and through a link with databases it is used as a GIS model. The model therefore incorporates the spatial information of location and extent of architectural features and finds but it also includes the associated information from the database. In a practical sense it means that simply clicking on a feature or find results in the display of background information and even the scanned excavation documentation from the digital archive to pop up.

A straightforward data structure was created consisting of Spaces, Features, Deposits and Objects. Spaces are defined by excavated walls and mainly consist of courtyards, rooms and doorways. The spaces are defined as convex spaces, meaning that from every point in the space it should theoretically be possible to see all other points in the same space. Subsequently, the objects within the space are allocated to separate deposits. Commonly, a space will hold one floor layer deposit and several roomfill deposits. Lastly, (semi-) fixed features such as ovens and grinding platforms are defined. These are treated as part of the architecture of the space, separately from the deposits and the finds. The relationship between the spaces, deposits and objects can be described as follows: every space may contain one or more deposits which in turn may contain one or more objects. These relationships are modelled in the database as one-to-many relationships. These relationships also mean that a single object may not be present in several deposits, nor can a deposit be present in more than one room. If in reality an archaeological deposit such as a dump layer is present throughout several consecutive spaces, in the dataset this is described separately for every space as unique deposits. This rigid division of all material remains from the *dunnu* into numbered elements is employed simply in order to create workable, systematic units of analysis. It should not be interpreted as a representation of the division of the *dunnu* architecture in the past. During the analysis, ambiguities in the dataset are described to ensure that the rigid data structure does not interfere with an adequate understanding of the complex material remains. In the case of a large deposit spanning several spaces for instance, while for every space a separate deposit is created in the database, they are described to relate to one and another as one original deposit.

The database was created in Microsoft Access version 2010, the GIS files in ESRI ArcMap version 10. For additional 3D modelling Trimble Sketchup pro version 8 and occasionally Agisoft photomodeler version 1.1 for some photogrammetric models were used. For the 3d visualization of models and excavation data ESRI ArcScene version 10 was used.

2.3 Site formation processes

Reconstructing activities in a certain location based on the objects which were found there is only viable if the objects were indeed used in that space. Unfortunately, this is not often the case. There are many processes which have an influence on the presence, state and location of objects. For a correct interpretation of the archaeological record it is therefore essential to obtain a thorough understanding of the processes which have ultimately formed the site.

Because of the importance of these site formation processes, they were the subject of scholarly research and debate for decades (Ascher 1961; Schiffer 1972; Wood and Johnson 1978; Binford 1981; Schiffer 1983; Schiffer 1987; Schiffer 1995; LaMotta and Schiffer 1999). These studies often focus on how certain processes blur our view on the past, termed by Rathje and Schiffer (1982) as cultural and natural transforms. In this sense, the archaeological context is an altered representation of the original or 'systemic' context (Rathje and Schiffer 1982: 106). Following this notion one could suggest that it is possible to reach a reconstruction of the *real past* in any site, as long as the formation processes are taken into account.

This position was most vocally critiqued by Binford (1981) who linked this view to a supposed 'Pompeii premise' in archaeology (Ascher 1961: 324; Binford 1981: 199). Binford rejects Schiffers proposals with the notion that if Cultural and Natural transforms simply distort our view of the past, it is presupposed that the original archaeological deposit was of a Pompeii-like nature and quality. Binford states that, rather, the archaeological remains should be regarded as a complex reflection of social structures in the past, and not a time slice of history.

Archaeological remains *are* however a consequence of human behaviour and it is clear that the processes which were described by Schiffer and others are indeed recognizable in the archaeological record. The main problem is that by considering these processes as 'disturbing' or 'altering' the archaeological record, it is assumed that there is a one typical past which is the most important to reconstruct. It is, however, a fallacy to assume that one particular time slice is completely representative of the variety of activities which were carried out in the past. The past should, therefore, not de defined as a series of static moments but as a dynamic process. Consequently, (pre- and post-) depositional processes should perhaps then not be considered to *distort* the archaeology but simply as contributing to the formation of the archaeological remains which are ultimately excavated.

For the current research this means that not only the remains on floor levels are investigated but that all deposits will be analysed for their relation to activities in the *dunnu*. The identification of formation processes, such as modes of deposition, aid in interpreting the discovered artefacts. For many similar excavations (Klein 1995; Bonatz 2013), excavators do point out the diversity of modes of deposition but do not specify a method by which these were recognized and analysed. Many other researchers have attempted to recognize the different manners in which artefacts were deposited. Verhoeven (1999) for instance, discusses all possible ways in which prehistoric contexts at Tell Sabi Abyad may have been formed, but he does not specify this for the individual deposits he has analysed. Others (Otto 2015; Pfälzner 2015) have set up elaborate ways in which to describe the degree to which deposits are considered *in situ*. The structures in the sites in question appear to have been rapidly abandoned, yielding assemblages of objects on floors which were deposited where they were last used (Pfälzner 2001: 47-53; 2013; Otto 2006: 27-29). However, the methods seem less appropriate for the floor contexts of Tell Sabi Abyad, here it is not as clear how objects were deposited on floors. The rooms were probably slowly abandoned, and used in a large variety of ways during their existence, which means that there is a high chance of palimpsest formation.

For the current study, due to the complex make-up of object assemblages, it was decided to emphasize the qualitative description of the deposits themselves in order to deduce their mode of deposition consistently. Subsequently, based on this mode of deposition of deposits, the manner in which a structure was used and abandoned can be interpreted.

Like many of the mentioned studies, this research is strongly based on the work of Schiffer and others. Hence, the possible modes of depositions and other formation processes are also nearly identical to these previous studies. What is new in this study is that a formalized model of identification of these modes of deposition is applied. This is subsequently used to define the functional relationship between the finds in the deposit and the space they are discovered in. As an example: a collection of objects which have been deposited in a large catastrophe will be particularly representative of the activities which were carried out at that spot. Broken tools which are discarded in a garbage heap however, do not indicate specific activities at that location, save for refuse deposition. Turning this around, by determining the mode of deposition of objects from the excavation, it is possible to determine how the objects relate to the space they are found in.

In the following paragraphs, the different modes of deposition are introduced after which the identifying characteristics of deposits, such as the object content, soil matrix and its location are discussed. The final paragraph considers post depositional processes such as decay and erosion.

2.3.1 Modes of deposition

Most items at archaeological sites are deposited as refuse through the process of discard (Rathje and Schiffer 1982; Hayden and Cannon 1983; Deal 1985). Rathje and Schiffer (1982) observe four types of discard: primary, provisional, secondary and *de facto* refuse deposition (figure 2.1). Primary discard is the process of discarding items directly at the location of use. This might be exemplified by the presence of broken pieces of overfired pottery around the remains of a pottery kiln. In settlements, refuse is often removed from the household areas and deposited in dumps outside the house or settlement. In this case the deposit is termed secondary refuse. In some cases, waste might provisionally be accumulated on a heap inside the house with the intention of, on a later moment in time, discarding the waste elsewhere. These temporary deposits are termed provisional refuse.

In some cases, objects are deposited intentionally, not through discard but for the purpose of retrieving the objects at a later stage or as ritual deposition. This is known as caching. Contexts in which objects seem to have been deposited in votive hoards or as offerings are termed 'ritual caches'. In the case of storage, with the intent of picking up the stored items at a later stage, the caches are termed 'banking caches'. It is assumed that the main difference between these two types of caches may be apparent in their content; in the case of banking caches it is

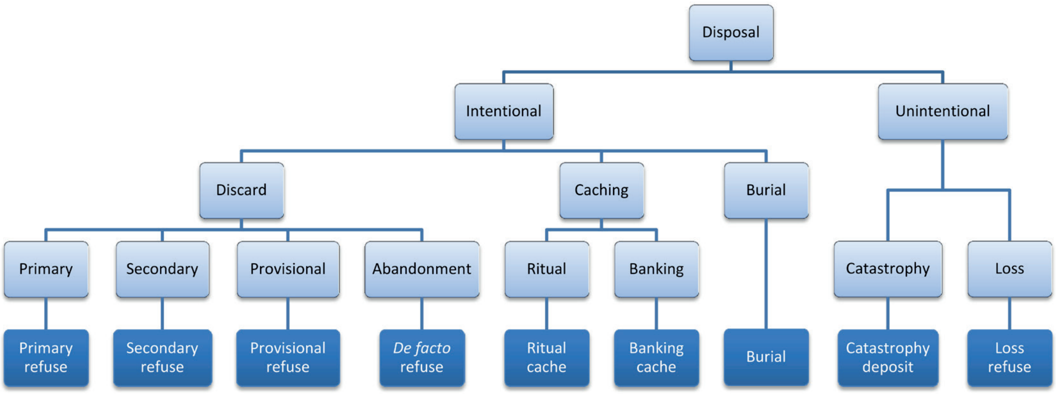

Fig. 2.1: Chart displaying the relationship between different modes of deposition and the resulting deposit types.

more likely to find a homogenous set of items, kept for trade, in an easily retrievable location in a structure which is inhabited or at least owned by the owner of the cache. A typical ritual cache might be considered to contain a smaller, or more varied assemblage of items, particularly placed in a location which is not supposed to be reached or opened again. Typically, there is no functional relation between the objects in the ritual cache and the location they are found in.

A special intentional deposit is in the form of burials. These are recognizable as deposits of human remains in a container, sometimes together with grave goods. Typically, the container, a pit or ceramic jar for instance, does not contain other deposits. When human remains are found among refuse it could be argued that this does not constitute a formal burial.

The term '*de facto* refuse deposition' is used by Rathje and Schiffer (1982) to describe the process of leaving behind items in a structure during abandonment. *De facto* refuse consists of objects which are still (re)usable but are left behind at abandonment. In the case of rapid, sudden abandonment of a settlement, primarily small, valuable items are taken along. If the abandonment is undertaken simply to move the activities to a different settlement nearby, it is likely that even large, heavy items may have been taken along. Clearly, any combination of factors will result in a different, characteristic make-up of the abandoned assemblage (Stevenson 1982; Cameron and Tomka 1993; Montgomery 1993; Inomata and Webb 2003).

De facto refuse may be seen as the final deposit of material at the actual moment of abandonment. The process of abandonment may occur gradually in a settlement however, so while one structure is abandoned, the adjacent one might still be in use. In this situation, the abandoned spaces may be used for different purposes and refuse or other material might end up in the abandoned structure. These items should however not be considered to be *de facto* refuse, as they are not left behind at the moment of abandonment. These objects are deposited through primary or secondary discard, and should be interpreted as such. As the objects from different depositional processes end up in the same context, often on the floor level of a house, a palimpsest is created. Therefore, during the analysis of floor contexts in Tell Sabi Abyad, the objects are further analysed to distinguish their original mode of deposition.

In addition to intentional discard processes, objects might also be unintentionally deposited in the archaeological record. One of these processes is loss. Loss of objects is only possible and likely depending on the size of the object (it needs to be relatively small) and the properties of the location it is lost in. An object is more likely to get lost on a soft loam floor where it may be trampled in than on a hard plastered floor, and some areas and features such as alleyways and cesspits are likely to become 'artefact traps'. The amount of cleaning which is carried out in a room is also of influence on the probability of losing items, it is easy to spot a lost earring in a clean bathroom but finding your dice on a messy smithy floor is trickier. Since these items which are lost, termed loss refuse, are deposited at the location of use it is likely that there is a clear spatial relation between the object and the activities carried out in this place.

This clear functional relation between deposited objects and the spaces is even more evident for catastrophic deposits. A catastrophic deposit is characterized by a large number of whole objects which form meaningful and logical assemblages, relating to the room or structure they are found in. Unfortunately for archaeologists, these processes occur less frequently and most archaeological deposits consist of intentional discard.

2.3.2 Characteristics of deposits

Several properties of archaeological deposits can be used for the identification of their formation. These are described below. The main characteristics for the deposit as a whole are its location or context, and the variety of objects within the deposit. The location may be quite specific per deposit; a catastrophe deposit will for instance not be likely to end up in a pit. Equally, a banking cache is not likely to be stored on the floor of a house. Likewise, the variety of objects is expected to be low for primary refuse deposits and higher for secondary refuse deposits. This paragraph will discuss the various characteristics which are taken into account when analysing deposits. It should be noted that the variables which are determined below are specific for the situation at Tell Sabi Abyad. The term variety for instance relies heavily on the documentation system employed there. With other variables such as the damage patterns observable within a deposit, it should be clear that this regards only those finds which were recorded as objects, all fragmented ceramic and bone material was not available for this study. Obviously, an approach which would incorporate all finds from a certain context, or even the micro-debris (Rainville 2015) would result in significantly different patterns.

2.3.2.1 Context

Not often explicitly mentioned in earlier publications about the identification of formation processes, the location or context of the deposit is telling of the most likely mode of deposition. Four different context types are recognized for deposits: on top of a floor or surface, in a pit, on a dump or pile and finally in a container. Floor contexts are considered to be those deposits which are deposited as a flat layer on top of a floor or surface. Usually this is to denote a collection of objects lying on top of a floor before being covered up by later deposits. Often at Tell Sabi Abyad a thin layer of soil is deposited along with these objects of some 5-10 centimetres thickness. Probably this soil was deposited together with the objects, therefore this thin layer of soil is considered to be part of the floor level context.

Deposits inside a pit are most likely the result of deliberate deposition of soil and related objects. A pit is regarded as an out-of-the-way feature, and is therefore a perfect recipient of material which needs to be gotten rid of. The pit feature is however not necessarily dug for the purpose of accumulation of discarded material, an example from the Tell Sabi Abyad *dunnu* is provided by the dry moat which surrounded the level 6 *dunnu*, completely filled with discarded material. Pits may also be used to deposit non-refuse materials as is the case with burials, ritual caches or in the case the intention was to reclaim the material at a later stage, as in banking caches.

A related context is that of a location on dumps or piles. Similar to pits, it is a context related to refuse deposits. However, contrary to pits, it is unlikely for burials and caches to be located on dumps or piles. A common dump layer at Tell Sabi Abyad is that of 'roomfill', deposits of secondary refuse and mudbrick debris in abandoned house structures.

The fourth recognized deposit context is the location inside a container. These containers can range from ceramic jars to a vault in a wall. A ceramic jar can itself be interred in a pit, in this case the jar has a 'pit' context while the content of the jar is considered to have a 'container' context. Objects deposited in a container are considered to have been kept there deliberately, either in an effort to formally bury something (or someone) or to temporarily store objects.

2.3.2.2 Variety

The term variety describes the diversity of material categories in a deposit. These categories are based on the documentation for find processing during field work. The categories therefore are often based on physical properties, but in some cases functional characteristics were used to define an object category. This has resulted in classes which partly overlap, for instance the category 'beads and pendants' contains many stone and metal objects. Furthermore, the selection of the appropriate find category for objects has not been consistent throughout the documentation. These issues suggest that a measure of variety based on these find categories is not a valuable exercise. However, since the categorization of finds was based on observations in the field it is believed that certain patterns might emerge from it. Therefore, a calculation was made of the amount of find categories per deposit, separately for deposits containing one until ten finds and for eleven or more. Subsequently the average and standard deviation was calculated and plotted on a graph (figure 2.2). Afterwards a linear trend line for the average plus one standard deviation and a trend line for the average minus one standard deviation was calculated. These trend lines have subsequently been simplified to give a rounded number for every deposit. These lines, dubbed low average and high average in figure 2.2, indicate the minimum and maximum extent of the average amount of objects for a deposit with a given amount of objects. A low variety for a deposit is considered to lie below the low average line, a high variety above the

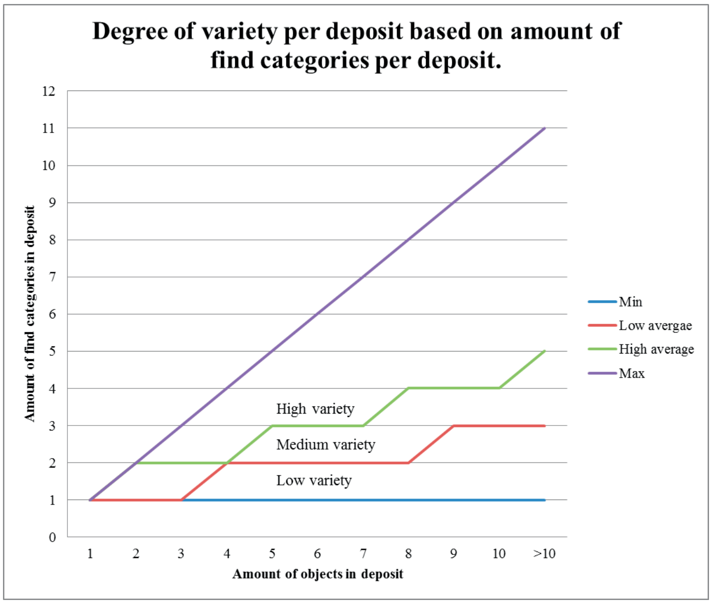

Fig. 2.2: Degree of variety of objects within a deposit.

high average line. A medium variety is considered for deposits with an amount of find categories which is equal to or lies between the two average lines. Despite the many problems concerned with these calculations, it is hoped that large scale patterns will emerge.

2.3.2.3 Structuring

An important characteristic of the composition of a find bearing deposit is the functional relationship between objects. Dubbed by Rathje and Schiffer (1982: 107) as the 'principle of dissociation' and by Schiffer (1983: 685) as 'measurement of disorganization', here the term 'structuring' is used. If all objects in a deposit relate to the same activity, the deposit is regarded to be highly structured. An object can relate to an activity as tool, waste product, raw material, by-product or as end product. An object may relate to many activities at the same time, a ceramic jar is the end product of pottery production but also a tool in food preparation or storage. This makes it difficult to quantify the degree of structuring. High structuring is proposed for deposits in which all objects can be related to one activity. A medium structuring is suggested for two activities and low for more than two. An example of a highly structured deposit could be one containing the discarded material from a production process. This may contain waste products, broken tools and end products. Despite a high variety in material categories, the objects in the deposit are strongly related to each other; it is highly structured. No quantifiable method was devised to examine the degree of structuring. Instead, this deposit attribute will be discussed on a case by case basis.

2.3.2.4 Size

The size of objects in a deposit can be informative of the related depositional process. Items which are lost are by definition small in size while a house floor assemblage with a number of very large items likely represents *de facto* refuse, and not provisional discard (Schiffer 1983: 679). For some objects from Tell Sabi Abyad the exact measurements were noted on object forms, for others unfortunately not, therefore a coarse size classification was set up. Based on the size classification of coarse gravel, cobbles and boulders (ISO 14688), three size classes based on the maximal dimension of objects are defined. Small objects equal to or smaller than two centimetres, medium sized objects have a maximal dimension between two and twenty centimetre and large objects are equal to or larger than twenty centimetre.

2.3.2.5 Use-life

The mode of deposition may also partly be deduced from the use-life stage the objects are in (Schiffer 1983: 681). A categorization was made into raw material, waste products, by-products, new end products and worn end products. For every object their position in their potential use-life is defined. If all objects in a deposit are part of a production process, as raw material or waste or by-products, they are most likely deposited as refuse. If the deposit contains primarily newly produced items, it is more likely that there is another process involved.

2.3.2.6 Damage

Also the physical state of objects is indicative of certain depositional processes. Although most studies dealing with damage patterns on objects are interested in the post-depositional processes (Brain 1981), here the variable is used mainly to deduce the mode of deposition. While fragmentary objects designate a discard process, intact items suggest something else. Three categories are defined: complete, damaged and fragmentary objects. Although it is often hard to deduce the state of objects from the documentation, in general objects are considered complete if there are no fragments missing of the object. Objects which were broken slightly after deposition are also considered complete if it is clear that they were complete at deposition. Objects with some fragments missing but with more than fifty percent of the object preserved are considered to be damaged and objects with less than fifty percent preservation are dubbed fragmentary.

2.3.2.7 Replacement cost

The replacement cost of an object can be an important indicator for its mode of deposition, very 'expensive' items will not be deposited easily whereas inexpensive, common articles can be deposited without a second thought. Although it is hard to speak of 'value' of objects as this is a culturally determined notion, the replacement cost of an object in the past is considered to be related to the availability of the material. A problematic category is that of precious or hard to replace objects made of non-expensive materials. An example is that of a cuneiform tablet which is made from readily available clay but is hard to replace because of the unique information on them. For the Tell Sabi Abyad objects a division into high, medium and low replacement cost is used. A high replacement cost for an object is considered for end products made of the following materials: metal, glass, ivory and (semi) precious stone. Medium is tentatively set for cuneiform tablets, figurines and beads and pendants. A low replacement cost is determined for clay, stone, pottery and waste products.

2.3.2.8 Relation to space

Finally, the relationship between the objects and the functional characteristics of the space they are found in is of importance (LaMotta and Schiffer 1999). In short, a logical relation between a deposit and a space may be a dump of kiln waste in an apparent pottery workshop. An illogical relationship would be inferred for butchers' waste on the floor of the same workshop. An illogical relationship could indicate that the objects which are deposited have not been used at that same location but were only discarded there. A third relationship is that of intrusive Neolithic material in Late Bronze Age architecture.

2.3.3 Properties of modes of deposition

For this research nine types of deposits are recognized (see above). In this paragraph all types will be discussed with regard to the deposit characteristics described above. This is used to identify the characterization of deposit types which is defined below. Subsequently, these are compared with the find bearing deposits at Tell Sabi Abyad. Matching characteristics are taken to identify matching modes of deposition.

2.3.3.1 Primary refuse

Context: primary refuse is deposited at the location of use, therefore the most likely location of this deposit is on floor levels. As this type of refuse might pile up during deposition, it could be argued that it is found on a heap or pile. A typical example is that of kiln waisters on the floor of a potters workshop.

Variety: primary refuse is considered to be the result of one main activity, the items within this deposit may vary in size and shape but will often be of the same material. Typically the deposit is composed of a large amount of waste material from one production process for instance.

Structuring: although several material categories can be present in the deposit, they will all relate to the same activity, the deposit should therefore be highly structured.

Size: the size of the objects within this type of deposit may vary from very large to very small, depending on the activity they were part of.

Use-life: the objects in this type of deposit are part of a process in this space, it is therefore likely that they constitute of waste- or by-products, or raw material. Also tools on the end of their use-life may be deposited in this type of process.

Damage: it is highly probable that if there are end products present in this deposit, they are damaged. Undamaged end products are more likely to have been taken away to be used.

Replacement cost: as primary refuse items are deliberately discarded they probably do not have a high replacement cost. This is particularly the case for waste- and by-products.

Relation to space: as primary refuse is a consequence of activities in that very space, there should be a logical relation between the architecture and the objects. The room may have been built with a different purpose than for the activity which is denoted by the primary refuse however. In such a case, the architecture should at least not inhibit the activity.

2.3.3.2 Secondary refuse

Context: Secondary refuse is to be found away from the location of use. It is most likely present in out-of-the-way locations, outside the inhabited areas of the settlement. The location of secondary refuse is therefore to be found mostly in pits or on heaps or piles, preferably in uninhabited areas. In the level six *dunnu*, the dry moat surrounding the settlement was recipient of large amounts of secondary refuse, after the moat had apparently lost its defensive function. Floors which are still used are unlikely recipients of secondary refuse. After abandonment however, house structures are often used as locations for this type of deposit.

Variety: this type of deposit may contain a large variety of objects and sediments but may also contain large amounts of similar materials. If a location was considered suitable for secondary refuse disposal, it is likely that many comparable deposits were sequentially deposited on top of each other in this location. As these can be hard to discern from one and another, a palimpsest is created, with a potential large variety of items.

Structuring: Comparable to the variety within a deposit, palimpsests in secondary refuse deposits may result in low structuring. Individual deposits can however be structured, if they are the result of the secondary discard from one activity.

Size: There can be a large variety of sizes of objects in this type of deposit, both very small and very large items may be discarded through secondary discard. Typically due to a heterogeneous makeup of the deposit there should be a large variety in size classes present.

Use-life: Items discarded as secondary refuse are suspected to be of no functional use, therefore they are either part of a production process as waste- or by-products or are at the very end of their use-life. Complete, prime objects are usually not to be expected in this type of deposit.

Damage: Most objects in this deposit which are end products will be broken or fragmented. If there are complete objects within this deposit, they might have been accidentally discarded.

Replacement cost: As secondary refuse is intentionally discarded it is assumed that the replacement cost of the items as they appear in the refuse (broken or worn) is low.

Relation to space: Secondary refuse is deposited outside the area of use. Therefore, the relation between the location of the deposit and the objects should not be logical. It could be expected however that secondary refuse is not carried away further than necessary, so the presence of production waste may indicate that the related production process was located relatively close by.

2.3.3.3 Provisional refuse

Context: Provisional refuse is discarded with the intention of cleaning up at a later stage. Provisional refuse is therefore discarded at the location of use, for instance in a workshop, but is concentrated on a heap or in a bin in some out-of-the-way location. Often this will be a corner of a room or a bin or sack against a wall. The expected location for this type of refuse is therefore on the floor or in a container.

Variety: provisional refuse is constituted of objects which were used in the room they are deposited in, as a consequence, these objects will be part of the same one or multiple activities and show a low to moderate variety.

Structuring: likewise, the variety of activities represented by the objects depends on the variety of activities which were carried out in the room. Provisional refuse is often the result of a single activity and will show high structuring.

Size: provisional refuse is constituted of items which could be temporarily deposited without being in the way. Therefore the objects are probably usually not very large. As a typical example of provisional refuse, floor sweepings may constitute of very small items indeed.

Use-life: provisional refuse is common in areas of production processes in which a temporary heap of production waste might accumulate. As provisional refuse deposition is an intentional discard process, it is not expected to contain many complete and whole objects.

Damage: As mentioned above, this deposit may consist of damaged and fragmentary items mainly, along with production waste. The deposit will likely not consist of complete end products.

Replacement cost: As provisional refuse consists of waste products, the replacement cost of the objects is expected to be low.

Relation to space: As with primary refuse, the functional relation between the space and the deposit should be logical. Provisional refuse is a direct consequence of the activities which have taken place in a space.

2.3.3.4 De facto *refuse*

Context: The name '*de facto* refuse' is given to the objects which were left in a settlement during abandonment which would normally not have been discarded. The term abandonment stage refuse is also often used to denote this type of deposit with items which apparently were not considered worth the effort to take along. The items have not been deposited through a common discard process but were left behind, which makes them 'in fact' refuse. *De facto* refuse is located on the floors of houses and courtyards, or on roofs.

Variety: *De facto* refuse may consist of a large variety of material categories.

Structuring: The objects which were left behind on floors at abandonment will most likely have been used at that location. This would suggest a high structuring in the assemblage. As many activities may have taken place at a location, this implication is not unambiguous.

Size: Objects in *de facto* refuse deposits can be of all sizes, both small items may not have been cleaned up when abandonment is imminent and very large immobile objects will be left behind because of their size and the effort which is required to take them along.

Use-life: *De facto* refuse may consist of objects in all use-life stages but typically *de facto* refuse can be recognized by the presence of complete and whole items which would normally not be discarded.

Damage: Objects within a *de facto* refuse deposit may be damaged slightly but typically this type of deposit contains a high number of complete and undamaged items at deposition.

Replacement cost: Objects within *de facto* refuse have a replacement cost which is high enough for them not to be discarded in a normal situation but not so high that they are taken along at abandonment. The decision to leave some items in the structure and take others along at abandonment is strongly tied to the mode of abandonment, consequently the average value of objects in the deposit will depend on and be indicative of this mode of abandonment.

Relation to space: *De facto* refuse is considered to be left behind on the location of use, therefore, the relation between the artefacts and the activities which were carried out in the structure should be logical.

2.3.3.5 Ritual cache

Context: Ritual caches are intentional deposits of items in an offering. Typically the objects are not supposed to be retrieved at a later stage. In the process of caching, objects are placed in a location such as a container or in or under some architectural element such as a floor, a doorstep or a wall.

Variety: The objects in a ritual deposit do not necessarily represent one set of object types, often they are considered to have been valuable items of any material category.

Structuring: Items in a ritual cache relate to one and another particularly because they are deposited together in a ritual cache, no techno-functional relationship between them has to exist.

Size: The size of the objects stored in ritual caches is depending of the size of the cache. It is assumed that most ritual offerings will be quite small.

Use-life: Ritual caches are typically deposits with valuable or meaningful objects, appropriately it is not likely to find raw material or waste- or by-products from a production process in them.

Damage: In the case of an offering of valuables, the deposited objects are probably not exhausted items, but some damage may be present. Particularly, in some situations items may have been deliberately broken as a part of the deposition process.

Replacement cost: The replacement cost of the items which are deposited in a ritual cache will in some cases be very high. In other cases, such as with clay figurines, not a monetary value but a certain meaning of the objects was deemed important. The replacement cost of ritually deposited items may therefore vary.

Relation to space: The relation between the objects found in a ritual cache and the space it is located in will often be meaningful; it is a deliberate deposition in a certain location. The strictly functional relationship between the items in the deposit and the activities which were carried out in the structure it is located in may however seem illogical.

2.3.3.6 Banking cache

Context: 'Banking caches' are deposits of valuables which are supposed to be retrieved at a later stage. The items are stored in a location which is accessible but typically not easily so. The presence of banking caches in archaeological contexts implies that there was a reason the owner of the objects was not able to retrieve his or her valuables. Typical locations are in a container such as a wall vault or sometimes in a pit.

Variety: Typically, a banking cache will contain a selection of items which are owned by one person and relate to one type of activity. The variety of material categories is therefore probably low.

Structuring: The items in a banking cache are often part of a single person or activity so the structuring is often high. Banking caches may also be used to store a variety of valuables, resulting in a slightly lower structuring.

Size: Because of their very nature, banking caches will consist of small or medium sized items with high replacement cost.

Use-life: Banking caches may contain raw material, such as metal ingots or unworked precious stones, but can also contain finished products.

Damage: A banking cache may contain damaged or fragmented items, provided they are to be used as raw material.

Replacement cost: As mentioned above, the items placed in a banking cache will have a high replacement cost.

Relation to space: As the banking cache is supposed to be opened by the owner only, it is likely that it is located in a space which is inhabited or used by the owner. In this sense, a logical relation between the space and the items in the cache may be expected. However, the objects might be used in a different location and the location choice for the cache may be depending on other factors too.

2.3.3.7 Catastrophe deposit

Context: The objects deposited during a large catastrophe such as an earthquake or volcanic eruption are assumed to have been left at the location of use, consequently they are usually located on floor levels. If the objects have fallen from shelves or higher storeys they may be located slightly higher than the floor or within collapse layers.

Variety: The deposit should contain objects relating particularly to the activities which are carried out at the moment the catastrophe struck. All types of artefacts should be trapped in the deposit, relating to the activities which took place in the location of deposition.

Structuring: Catastrophe deposits should be highly structured because they were deposited at the location they were used.

Size: In a catastrophe deposit, objects of all sizes are trapped. Catastrophe deposits are characterized by the fact that no selection of size classes has occurred.

Use-life: As with other categories of artefact variability in this type of deposit, objects of all stages of use-life may be present in catastrophe deposits.

Damage: Catastrophe deposits will contain a relatively high amount of whole or reconstructable objects.

Replacement cost: Objects of all values will have been trapped in this type of deposit.

Relation to space: Objects from catastrophe deposits are likely to relate directly to the location they are present in. Catastrophe deposits may even indicate unlikely activities in a room because of the strong *in situ* character of the objects.

2.3.3.8 Loss refuse

Context: Small items which may be lost are often lost in what is known as 'artefact traps' (Schiffer 1987). This includes corners of rooms, cracks in floors or a soft floor in which artefacts may be trampled. Loss refuse may be considered to occur among other deposits as well as it is for instance accidentally discarded with garbage or in spaces such as narrow alleyways or cesspits.

Variety: The amount of loss refuse in one location is assumed to be very small but the few items in one deposit may have been deposited at different moments in time, making it possible for a large variety of objects and related activities to be represented.

Size: items which were lost are almost by definition small. Also large items can be lost, but in contexts from which they are difficult to reclaim such as wells or deep pits.

Use-life: lost objects may be from any stage of use-life, whether an object was lost might however not be clear if it is a low-value waste product; it could be simply left there. The designation loss refuse is commonly restricted to those items which are considered worth retrieving.

Damage: Objects which were lost are often small and valuable, it is unlikely they are damaged.

Replacement cost: In the case of loss, the value of the item does not make it more or less likely to get lost. In fact, one would invest more effort into retrieving a highly valued item than for a cheap object. The designation of loss refuse is however restricted to those objects of which it is likely they have accidentally been deposited; in the case of a cheap object it could be argued it was deliberately left behind. So while items of all values may have been lost, it is most likely apparent for items of high value.

Relation to space: As loss refuse was deposited unintentionally, it is assumed that they indicate the activities in a certain space well.

2.3.3.9 Burial

Context: human or animal burials are usually located in pits or containers such as ceramic jars. Objects which are deposited in conjunction with a burial are therefore also deposited in a pit or container. If human or animal remains are located on a heap or pile or on a surface, it is likely a different process than burial was responsible for the deposition. The combination of two characteristics, the presence of human or animal remains in the context of a pit or container are therefore the most important to designate a deposit as burial.

Variety: objects within burials may vary in material categories.

Size: the variety in size classes may equally be high, both very large and very small items may be included in the deposit.

Use-life: typically, items which are interred with an individual are foodstuffs or end products, although this is not a strict distinction.

Damage: objects in a burial are usually not damaged or fragmented.

Replacement cost: items in a burial deposit were deemed worthy to accompany an individual in death, this may range from foodstuffs in ceramics to precious jewellery. The replacement cost of these objects may therefore vary considerably.

Relation to space: burials may be located inside and outside of houses, both in abandoned and inhabited areas. In some cases burials may be part of a large cemetery while in other cases a solitary burial is found.

2.3.3.10 Probability index

Table 2.1 summarizes the deposit description above, by denoting the probability of particular characteristics of deposits to occur. The probability for primary refuse to be located in a pit for instance is very low, and is denoted with the number 0 ('impossible'). It is highly probable that primary refuse is located on a floor, hence the number 3 – probable. In this sense, for every deposit type a signature composition of characteristics is obtained. Turning this around, when investigating a certain deposit, its characteristics will identify its most likely related mode of deposition. If a deposit is located on a floor level for instance, it is likely to be either primary, provisional or *de facto* refuse, or the result of a catastrophe. It is less likely that the deposit is constituted of secondary refuse or the result of caching. Investigating all characteristics of the deposit will reveal its most likely mode of deposition. This index is the basis for all deposit analyses in the following chapter. In many cases the characteristics described here appear to correctly identify associated modes of deposition. In several other cases however, the interpretation of the mode of deposition was contradicted by the deposit characteristics. Often these conflicting interpretations were the result of additional evidence such as photographs or information retrieved from the field diary.

2.3.4 Post-depositional processes

After material remains of human activity have been deposited at a certain site, they are subject to various cultural and non-cultural processes, so-called post-depositional processes. The main natural processes which can be of influence are structural collapse, erosion, decay and sedimentation. Cultural processes are earth movement processes such as digging of pits and reclamation activities such as pothunting and scavenging. Every process has a specific and particular influence on the material remains. Large scale erosion for instance may cut away half a tell site without differentiating between different deposits. In contrast, 'pothunting' is a very selective process, solely aimed at retrieving valuable artefacts from a site (Wood and Johnson 1978; Rosen 1986; Schiffer 1987). Every type of process affects the site either by adding, altering or removing artefacts from the site. In order to reconstruct activities at a certain location, it is vital to understand which of these processes were at play and what their influence was. For this study, identifying the presence and influence of post-depositional processes is achieved by looking at their specific indicators described below.

2.3.4.1 Structural collapse

Structural collapse is the process in which parts of a house collapse due to decay and lack of upkeep. In fact, this process is composed of a sequence of processes. Typically, for mudbrick houses such as at the Tell Sabi Abyad *dunnu*, the sequence of collapse can be described as follows: after a building is abandoned and left to deteriorate, firstly the roof and wall plaster are affected by wind and rain. Walls erode on top and on the outside, resulting in deposits of loam on the ground against the walls (McIntosh 1974; Friesem *et al.* 2011; 2014)it is desirable to find ethnographic analogies to throw light upon processes of decay and the subsequent deploy-

legend	
0	*impossible*
1	*improbable*
2	*possible*
3	*probable*
4	*required*

	context				variety			structuring			size			use-life				damage			replacement cost			relation to space	
	floor	pit	dump/pile	container	high	medium	low	high	medium	low	large	med	small	raw material	waste product	by-product	new product	whole	damaged	fragmentary	high	medium	low	logical	unlogical
Primary refuse	3	0	1	0	1	2	3	4	2	0	2	2	2	3	3	3	0	0	2	2	1	1	3	2	1
Secondary refuse	1	3	3	1	2	2	2	3	2	1	2	3	3	3	3	3	0	0	3	3	1	2	3	1	3
Provisional refuse	3	1	1	3	0	2	3	4	2	1	0	2	3	3	3	3	0	0	3	3	0	1	3	3	1
De facto refuse	3	1	1	0	2	3	3	2	3	2	3	3	3	2	2	2	3	3	3	2	2	3	3	2	0
Ritual cache	1	2	1	3	1	2	3	3	3	2	1	2	3	1	0	0	3	3	2	1	3	2	1	0	3
Banking cache	1	2	1	3	0	1	3	3	3	2	0	2	3	1	0	0	3	3	1	0	3	2	0	2	3
Catastrophe deposit	3	0	0	0	0	2	2	3	2	2	2	2	2	2	2	2	3	2	2	0	2	2	2	2	0
Loss refuse	2	0	0	0	2	2	2	2	2	2	0	0	4	0	0	0	3	2	2	0	2	2	0	2	0

Table 2.1: Probability index of characteristics of deposits and the objects therein. The numbers indicate the probability of a characteristic to be related to a particular deposit type.

ment of altered material during all phases of deterioration, and to provide any indirect clues to the recognition of former walls. Two approaches are followed, taphonomy and ethnographic analogy. Taphonomy (a term developed in palaeontology. Particularly during this initial deposition of wall loam, natural aeolian sediments such as sand may be deposited as well. On the inside of the structure, roof material collapses onto the floor. If there are objects present on top of the roof (or second storey) these will collapse inward at this stage as well. If the roof material is largely composed of organic material, the objects which fall in may be perceived as being located on top of the floor. Objects trapped inside mudbricks of the walls may also end up on floors during collapse (LaMotta and Schiffer 1999: 25).

If the roof was taken off before abandonment, or in the case of an unroofed structure, the sedimentation of wall loam and aeolian deposits will also be present on the inside of the structure and obviously no roofing material will collapse on the floor. Often post-abandonment, the structure was used as garbage dump, resulting in a large amount of objects recorded for these layers (Hayden and Cannon 1983).

Next, large parts of walls collapse into and around the building. This is either due to a further deterioration of wall structure and therefore constitutes a natural phenomenon or is part of the renovation of the structure. In the last case, the badly eroded upper parts of walls are demolished in order to rebuild them on the structurally sound lower parts. The resulting deposits are constituted of mudbrick debris in loam with a small amount of finds, commonly none are present. These deposits are present against the walls, which creates a depression in the middle of the room. If the structure is renovated during or shortly after the deposition of mudbrick debris, this depression may be deliberately filled up to level the surface, resulting in a homogeneous layer of material. If the structure is left open for a longer period of time, refuse and natural sediments may accumulate in this depression. At Tell Sabi Abyad often simple hearth structures are found throughout these deposits, suggesting that these spaces were often used for a variety of activities.

2.3.4.2 Erosion

Erosion of material remains can be visible in the archaeological record as an abrupt discontinuation of features or deposits. Erosion can be caused by (rain) water or wind, eroding large parts of material remains, often in the shape of a gully or slope (Schiffer 1987; Goldberg and Macphail 2006). Additionally, erosion can take place through man-made sewers or channels, this usually has a smaller effect on the material remains. Erosion commonly affects softer materials such as clay and sand more than harder materials such as stone. Erosion may also be present as a selective process, for instance depleting a surface of clay material and leaving larger stones behind. The resulting surface may be erroneously interpreted as a pebble floor for instance. At Tell Sabi Abyad large scale erosion was observed particularly on the south side of the hill (Brüning and Plug 2016). Large parts of the Late Bronze Age architecture were eroded here, limiting our knowledge of the extent of the level 3 and 4 *dunnu.*

2.3.4.3 Sedimentation

As sediments and objects are takes away by erosion, these are subsequently deposited somewhere else. Additionally, wind and rain bring other sediments to the site, depositing these among the cultural deposits. These natural sediments often cover archaeological remains and thereby protect them from other processes (LaMotta and Schiffer 1999; Goldberg and Macphail 2006). Sedimentation of eroded find-bearing material on the other hand complicates archaeological analysis by creating 'false features'. Deposits which are the result of this process can be recognized by several characteristics. Firstly the location of the deposit at the end of an erosional feature such as the bottom of a slope may be indicative. Also, secondly, the composition and spatial distribution of objects within the deposit can indicate the influence of a natural process on the deposit. Clustering or sorting of objects of a particular size class for instance can indicate the influence of water transport. Thirdly, the matrix in which the objects are present is indicative of the processes involved; a pebble layer can hardly have been blown in.

2.3.4.4 Decay

Here, the term decay is used to denote any process in which an object is altered or eradicated through biological or chemical decomposition. The processes of decay are mostly of influence on organic materials such as wood and textiles (Gillis and Nosch 2007) but also glass and metal objects are subject to extensive decay through oxidation (Fagan 1996: 466-7; Smith 2003: 94). Other materials such as ceramic and stone are markedly less affected by these processes, creating a strong bias in the archaeological record towards them (Rathje and Schiffer 1982). Table 2.2 lists the degree to which material categories at Tell Sabi Abyad were affected.

Material	Preservation at Tell Sabi Abyad
Unbaked clay	Objects made in unbaked clay are softer and therefore more sensitive to decay than baked clay, pottery. However, at Tell Sabi Abyad many objects of unbaked clay have been found, indicating that these have not been affected much by decay.
Metal	Metal objects have been largely preserved at Tell Sabi Abyad, although in a corroded state. Most iron objects are heavily rusted and bronzes are commonly green oxidized and show traces of corrosion. Thin bronzes are often broken into segments due to corrosion (Greco 1999).
Glass	The few glass fragments from Late Bronze Age deposits at Tell Sabi Abyad have been corroded slightly, resulting in an iridescent patina on most fragments. The overall state of the fragments indicates that they have not been subject to severe decay.
Bone, ivory and shell	Bone, ivory and shell objects have been preserved well at Tell Sabi Abyad. The many objects made from these materials have been recovered in an undamaged state.
Wood	Only in a charred state has wood been preserved among the material remains of the *dunnu*. It should be assumed that a large part of the original tool assemblage was constructed of wood.
Wicker	Like wood, all non-charred plant remains have been decomposed. Therefore all basketry from the site has decayed and has only been attested for as imprint in other materials (see Berghuijs 2013 for Neolithic examples from Tell Sabi Abyad).
Textile	All textiles at Tell Sabi Abyad have also decayed. Remains of these have only been found as imprint on other materials (Berghuijs 2013).
Seeds	Charred macrobotanical remains have been preserved very well (Fantone 2016).
Pollen	No pollen samples have been obtained during fieldwork.

Table 2.2: Degree of preservation of material categories at Late Bronze Age Tell Sabi Abyad.

2.3.4.5 Scavenging

Two processes of reclamation are observed at Tell Sabi Abyad, scavenging and pothunting. Scavenging is the process in which previously deposited objects are picked up from the surface and used in a new activity. If at abandonment of a structure many objects are left behind, it may be expected that useful objects were reclaimed, thereby depleting the assemblage from this structure.

2.3.4.6 Pothunting

A process prominent in modern times, pothunting aims at retrieving valuable items from an ancient site for antiquarian reasons. Tell-tale traces of pothunting include the presence of pits through ancient burials and a conspicuous lack of valuables where these are expected. As far as it can be reconstructed, at Tell Sabi Abyad there is no evidence for the occurrence of this process.

2.3.4.7 Earth movement

Through the digging of pits, levelling of surfaces for floors and the production of mudbrick building material, older deposits, objects and architectural remains are transported and transformed. These processes of earth movement can thoroughly alter the objects assemblage of a location. At Tell Sabi Abyad many examples of these processes are visible. Digging the large dry moat around the level 6 *dunnu* has cut away a large portion of the underlying Neolithic remains, which was either used to create new mudbricks or was deposited somewhere else.

Often, Neolithic objects were discovered amongst the Late Bronze Age remains, these objects probably originate from mudbricks made of Neolithic deposits. In many abandoned structures a layer of debris was deposited in order to level the surface for a new floor. The objects which are part of these deposits are thereby also deposited in this room.

2.3.5 Problems of this approach

The deposit description and the probability index described above should not be considered as a straightforward formula by which a mode of deposition can be unambiguously determined. There are four main problems with this approach which need to be taken into account.

Problem 1: the deposit description focusses on the object content and does not take into account other content of deposits such as the soil matrix and non-object items such as mudbricks. A large amount of mudbrick debris may for instance suggest that the deposit is largely made up of demolition material, secondarily deposited. If there is a large amount of burnt material contained in the matrix, such as charcoal and burnt seeds, and the registered objects within are not burned, the deposit has most likely been deposited secondarily. In the overall description of deposits in this research, the matrix is therefore also described and taken into account during interpretation.

Problem 2: during excavation, not all artefacts were registered as objects. Loose shards and bones for instance were collected in buckets and are not available for this study. In some cases pottery vessels were reconstructed after excavation by refitting the shards. These vessels could unfortunately not be included in this study as their exact location has not been documented and it proved difficult to add these to the dataset used in this study. This has a major impact on the recorded objects content of a deposit. While a floor of a house may have been completely covered with ceramics, if there were no obviously complete jars or pots present, none were registered as objects. The object content of this deposit would therefore falsely be considered to be lacking in pottery vessels. Particularly for floor level deposits this might severely influence interpretation. Therefore, for these deposits, details from the field diaries and photographs are also included in analysis. Commonly the presence of large amounts of pottery or bones is included in the matrix description.

Problem 3: the probability index is a rigidly numbered schema, not representing a realistic variety of the composition of deposits. Undoubtedly, some deposits will not adhere to the rules set out above. Therefore, the conclusions brought forward from this analysis should be taken cautiously. In some cases the final interpretation of a deposit may in fact contradict the suggestions made by the probability index, but this will be supported by sufficient argumentation.

Problem 4: a major issue for interpretation of modes of deposition is that some deposits are in fact composed of several different deposits and form a so-called palimpsest. Particularly on floors and other surfaces, many separate processes may have been at work, depositing artefacts and other items. An example of a palimpsest is that of an abandoned house floor littered with large, heavy objects and other items which would normally not be discarded - typical abandonment stage refuse. After abandonment, this very same floor may be used to discard other objects on, for instance by the people of a neighbouring house. As these objects are mixed on the floor the composition of the floor level deposit will not, or falsely, be representative of a certain mode of deposition. In reality, every floor level assemblage may be considered to be the result of several depositional processes. Therefore an effort is taken during the analysis of these deposits to unravel them into possible separate deposits. Four approaches are used in this process. Firstly, the spatial distribution of objects is observed to extract any clusters of objects or object categories. The spatial analysis is carried out using the 3D GIS with which patterns in vertical distribution can be determined. Secondly, object characteristics such as size and damage are investigated to observe any patterning. Thirdly, objects are compared to functional characteristics of the space they are found in, perhaps some objects clearly relate to the space while others are obviously intrusive. Lastly, evidence for post depositional processes on objects is investigated for patterning. In some cases, a hiatus in deposition may be evidenced by a layer of dust or dirt accreted on some objects. Other objects, lacking this accretion, will have been deposited later. Unfortunately, in most cases, this strict disentanglement of a floor level deposit is not feasible. If some objects seem likely to have belonged to a different process than the ascribed mode of deposition of the deposit it belongs to, this will of course be taken into account during interpretation.

2.4 The "Sequence of Events" approach

The historical periodization of the *dunnu* (Akkermans and Wiggermann 2015) originally consisted of four main Assyrian phases, levels 6, 5, 4 and 3. The revised chronology (Brüning and Plug 2016) is slightly extended but still is comprised of several consecutive phases which cover the entire site. In their analysis of the stratigraphy, Brüning and Plug have allocated every stratum (a single use phase or construction event which is recognized in one trench) to certain Levels. In many cases multiple strata were allocated to a single Level. It follows that in some cases during the course of one Level, several actual use phases were attested in a building. Consequently there is a larger variability and more complex make up of activities identifiable in the archaeological record than is suggested by the periodization.

During one Level many different activities may have been carried out in a building. This makes it hard to speak of a single or 'main' function of the building during this Level. Additionally, the changes in use and function of rooms and courtyards do not necessarily correspond to the general periodization, there could be continuity of use from one phase to another while change is implied by the subdivision. Periodization of archaeological remains is a helpful tool in describing the complex succession of strata but it inevitably generalizes the very data it attempts to clarify.

One way of avoiding the generalization of the entire settlement is by examining smaller elements such as single houses. This was performed in a large number of cases under the theoretical umbrella of what is known as household archaeology. Household archaeology

(Allison 1999; Müller 2015) was coined in 1982 by Wilk and Rathje and was aimed at focussing on "the smallest and most abundant activity group" (Wilk and Rathje 1982: 618), the household. Although the intention was mainly to reach a better understanding of the social processes underlying the organisation of the house, inadvertently many household studies have also for a large part sidestepped the problem of non-contemporaneity and diachronic dynamics. Because of the small scale of the investigated unit, the chronological order of the related archaeological deposits is much less problematic (Arnold 1989; Ault and Nevett 1999; Müller 2015). It should be noted however that in fact every single deposit is the product of several activities and that no excavation has yielded a context which is truly frozen in time (Allison 1999: 12).

In the Tell Sabi Abyad *dunnu* it is problematic to apply household approaches which focus on the characterization of single households or socio-economic units (Wilk and Rathje 1982; Allison 1999; Müller 2015). The settlement was used in official as well as residential ways, not to mention the specialized production areas. The settlement was constituted of a constantly changing structure and layout of rooms and corridors. Equally, the function and use of these areas was prone to continuous reappropriation. Additionally, the *dunnu* was not abandoned in great haste, leading to a variety of complex archaeological deposits on the house floors. Whereas many household archaeology, or activity area, studies focus on sites with nearly intact house floor contexts from rapidly abandoned settlements (see for instance Allison 1999, Pfälzner 2001 and Müller 2006), in this research the analyses are focussed on more scant evidence. Ideal models of residential space such as the case with the Bronze Age Mesopotamian houses at Tell Bazi (Otto 2006; Otto 2015) cannot be recognized in the *dunnu* as a whole. Certain structures, such as the monumental residence, do lend themselves for a characterization of this kind but other structures in the settlement are incomparable in layout and probable function. As a method for distinguishing function and use on a small scale, activity area analysis, with its focus on repeated, formal use of certain areas, relies heavily on undisturbed contexts (Pfälzner 2001; 2013: 36). These ideal contexts are not available in the *dunnu* of Tell Sabi Abyad. Analysing the *dunnu* as a whole and the individual contexts within therefore requires a different approach. This is why the *dunnu* is analysed on an even smaller scale, using every room and doorway as separate spatial units, termed spaces. In the text however, these spaces are grouped into 'areas'. Each area may be considered a group of spaces which have some functional or spatial relationship. However, this grouping into areas is merely created for the sake of subdividing the paragraphs, they do not necessarily represent a functional spatial division in the past, although in many cases they might have.

In each space the archaeological evidence is analysed to chart the activities which were carried out there in the past. All activities and processes which have occurred are recorded as 'events', which are subsequently visualized in a flow chart, a so-called 'Sequence of Events' (figure 2.3). This Sequence of Events includes all events which can be derived from archaeological evidence and displays the chronological order in which they must have occurred. Additionally, it includes the related feature names and deposit numbers. These are also indicated in the text and on overview plots. By linking the sequences from various spaces, a comprehensive overview is offered of the events which have taken place in an area. In a sense it comprises of a 'Harris matrix of events'.

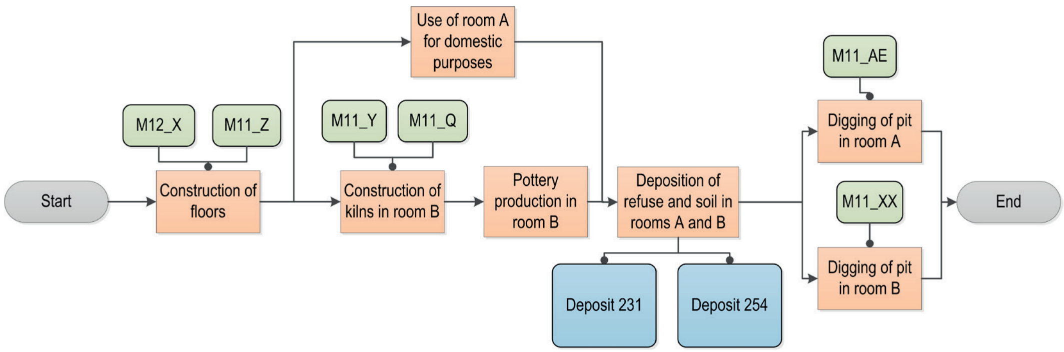

Fig. 2.3: A Sequence of Events model of two fictional rooms. Orange rectangles indicate events which have occurred in a certain space such as the construction of a floor. The green smaller rounded rectangles connected to the top of events indicate the related trench and feature name. M12_X for instance concerns feature X from trench M12. The large blue rounded rectangles connected to the bottom of events indicate the related deposit numbers.

2.5 Conclusion

The methodology described in this chapter was set up to ensure a systematic and consistent interpretation of the archaeological remains of the Tell Sabi Abyad *dunnu*. Three consecutive steps are taken in this research: digitizing, reconstructing (post-) depositional processes, and the setting up of a detailed Sequence of Events. The digitization ensures that all finds and architectural remains are included in the dataset. The reconstruction of the processes such as loss and discard which have caused and influenced the deposition of objects and architecture helps in understanding how they should be used in the reconstruction of past activities. Finally the construction of the Sequence of Events is crucial to obtain a thorough understanding of the variety of activities which were carried out in the *dunnu* through time.

It should be emphasized however that the methodology is strongly dependant on the data which are used. If, for any reason, finds have not been recorded as objects they will not have been digitized, and therefore also not used in the consecutive steps. In the analyses in the following chapter therefore, the outcome of the methodology described above is complemented with photographs, field diaries and even common sense in order to achieve a comprehensive interpretation of activity patterns. In the ensuing chapter (chapter 4) the methodology will be evaluated on the basis of the analysis results.