# APPLICATION OF GIS AND MULTIPROXY ANALYSIS IN NEOLITHIC ANATOLIA: AN INTRA-SETTLEMENT SPATIAL ANALYSIS AT BARCIN HÖYÜK

By

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# ABSTRACT

*Barcın Höyük, a seventh millennium BC Neolithic settlement in Bursa Province, Turkey, provides a crucial link between the Balkan and Anatolian regions and contributes to the understanding of how the Neolithic and its material culture expanded. By conducting a spatial intra-settlement analysis focused on the material assemblage, small-scale practices of Barcın Höyük can be assessed using a bottom-up approach. Additionally, recurring events allow daily practices to be addressed in long-term larger regional frameworks. Ultimately, this leads to a better understanding of the daily life of Neolithic societies in the Anatolian region and contributes knowledge about the transition from foraging to sedentary life.*

*Examining the material assemblage from different settlement areas and structures in a synchronic and diachronic way, studying the effects of fragmentation, variation in material and abrasion rate of multi-sized artifacts, archaeologists can understand reoccurring practices of activity and movement across the site. The potential of Geographic Information Systems (GIS) to handle large complex spatial datasets can be of significant value in this regard, as it enables comparison of a multitude of different proxies based on material culture. Multi-proxy analysis is used to compare different kinds of proportional data over several of the site's occupational phases, to gain insight into practices and activities taking place at the household level. Using a bottom-up approach to study the site's material is one of the first interpretative processes to assess variations between different areas of the settlement, and in this way aids in the understanding of the site as a whole.*

**Keywords***: Geographic information systems (GIS), spatial analysis, household archaeology, macro- and microarchaeology, Neolithic period, Barcın Höyük.*

# ÖZET


*Bursa ilinde bulunan ve M.Ö. 7.binyıla tarihlenen Barcın Höyük; bir Neolitik yerleşim yeri olarak Balkanlar ve Anadolu arasında önemli bir bağ kurmakta, Neolitiği ve Neolitik materyal kültürünü anlamakta büyük katkılar sağlamaktadır. Bu anlamda, buluntu toplulukları üzerine yapılacak bir yerleşim yerleri arası analiz, genel bir bölgesel yaklaşım yerine Barcın Höyü has küçük ölçekli pratiklerden yola çıkarak gerçekleşmiş olan olaylara ışık tutabilir. Buna ek olarak tekrar eden günlük olaylar; bu pratiklerin, uzun vadede bölgesel ağlara katkıda bulunmasını sağlamaktadır. Sonuç olarak, Anadolu'da yaşamış Neolitik toplumlarının günlük yaşamlarına ve toplayıcılıktan yerleşik yaşam biçimine geçiş sürecini daha iyi anlamayı mümkün kılmaktadır.*

*Arkeologlar tekrar eden pratikleri ve yerleşim yeri içindeki hareketi farklı sit alanlarından malzeme gruplarının, senkronik ve diyakronik şekilde incelenmesi ile anlamlandırabilmektedir. Buradaki yöntem kapsamında malzeme çeşitliliği, ufalanma ve aşınma oranındaki değişimin farklı büyüklükteki buluntularda etkisi çalışılmaktadır. Coğrafi Bilgi Sistemlerinin (CBS/ GIS), büyük ve karmaşık veri grupları ile başa çıkmadaki potansiyeli; buluntu topluluklarına dayanan çok-yönlü analiz (multi-proxy analyses) karşılaştırılmasını mümkün kıldığı için oldukça değerlidir. Çok-yönlü analiz bir yerleşim yerinin çeşitli dönemleri ile ilgili farklı oransal verilerin karşılaştırılmasında faydalı olur. Dolayısıyla hane içinde yapılan faaliyetler ve günlük aktivitelere dair bilgi edinmek için kullanılmaktadır. Aşağıdan yukarıya bir yaklaşım ile; bir yerleşim yerinin malzemesini çalışmak, o yerleşim yeri içindeki farklılıkların belirlenmesi için kullanılan ilk yorumsal süreçlerden biridir ve bu yolla, yerleşim yerinin bir bütün olarak anlaşılabilmesine yardımcı olmaktadır.*



**Anahtar Kelimeler:** *Coğrafi bilgi sistemleri (CBS), mekansal analiz, hane arkeolojisi, makro ve mikroarkeoloji, Neolitik Dönem, Barcın Höyük.*

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# Chapter 1: Introduction

In archaeological sites, spaces are in a continuous dynamic relation between use and abandonment. However, examining these processes requires more than looking at the architectural features themselves, but should be accompanied by an assessment of associated material remains. The natural course of any enclosed space is that it is actively used and exploited or left to the elements, abandoned and ultimately taken back by nature. At the heart of this lies the reciprocal interaction between humans and material products, which significantly affect human life as the use of tools and objects is necessary to carry out daily practices.

These interactions between humans and things, vital concepts within household archaeology for decades, have long been a focus of research for archaeologists to decode the specifics of ancient lives. This research is aimed at understanding the development of the spatial organization of a Neolithic settlement by analyzing and comparing large quantities of their everyday use items and relating them to the meaningful spaces in which these items were once used, discarded or forgotten.

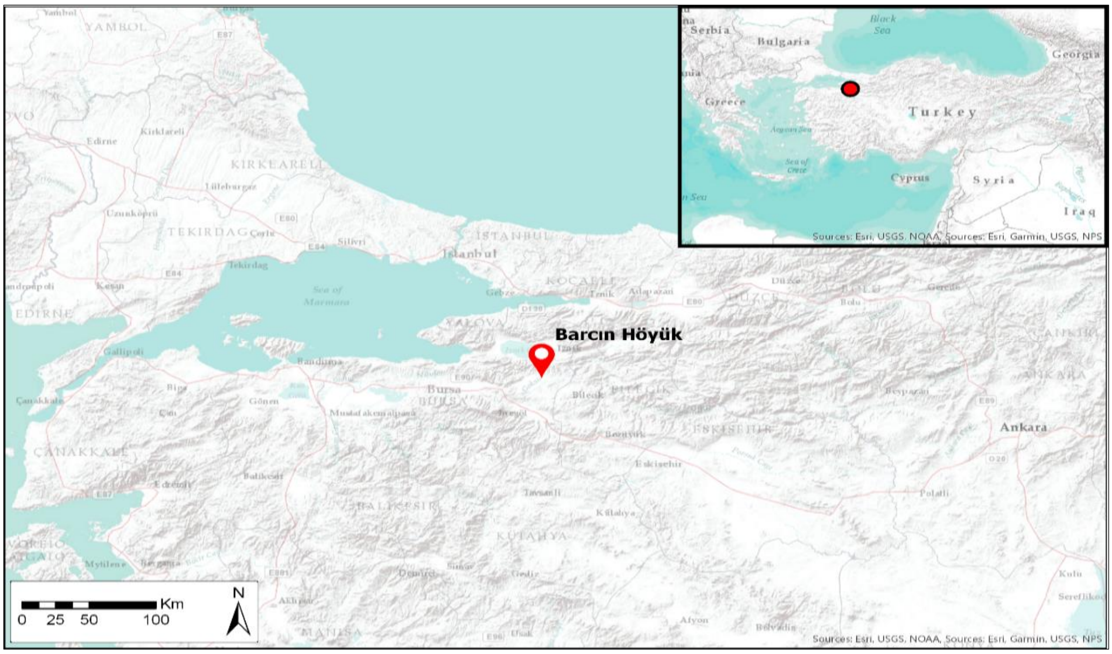



*Figure 1 - Location of Barcın Höyük, the Neolithic settlement in the Marmara region, focused on in this thesis.*

This thesis studies the remains of Neolithic Barcın Höyük, located in Western Turkey, close to the city of Bursa and South of the Sea of Marmara. The site exhibits one of the oldest early farming communities in the Marmara region. The early evidence for sedentism and farming and the fact that it was a settlement that practiced farming from the start makes it an important site to consider in Neolithization processes of the Marmara region and other nearby regions. In this research, focus lies at the early and middle stages of the Neolithic occupation at Barcın Höyük, corresponding to roughly 6600 to 6200 BC (Gerritsen, Özbal, and Thissen 2013a, 2013b, Özbal and Gerritsen 2015, Groenhuijzen et al. 2015, Özbal et al. 2015, Gerritsen and Özbal 2016).

Although research about the Neolithic sedentary life in the Marmara region has gained academic interest in the last decades, still little is known about how these earliest Neolithic farming communities organized their living space (Gerritsen and Özbal 2016, 199, Özdoğăn 2014). This makes Barcın Höyük an interesting place to conduct an intra-settlement analysis. In addition to the fact that sedentary life was already present at Barcın Höyük from the start of the site and continued throughout, it also seems that an organized way of living, in terms of use of space and similarities in the shape and orientation of buildings was part of the occupants' tradition and continued throughout several generations.

The excavators for example state, "The spatial stability indicates a corresponding continuity in the intra-community social relations. Overall, all the evidence points to the conclusion that we see an organized, structured way of living together at Barcın Höyük…" (Gerritsen and Özbal 2016). However, this statement was so far mostly based on architectural information only. By analyzing the variations in material assemblages between settlement spaces and structures, in terms their size, shape, and type (e.g. ceramic, bone, organic material, etc.), this study attempts to understand how material assemblages were used and ultimately discarded or abandoned.

Although the more coarse-grained separation of spaces based on architecture worked well during the excavation, a more detailed spatial and quantitative analysis allows for a better understanding of spaces in terms of differences in use practices or depositional processes. For example, indoor practices such as sweeping and other cleaning activities might show a different set of signatures in the archaeological record, compared to other settlement spaces. Furthermore, a detailed material study can also be used to identify similar material inside spaces over longer periods of time. The Archaeological Information System (AIS), developed for this excavation and used to record the excavated material, formed the perfect tool to conduct a multi-layered spatial analysis that provides a more nuanced picture of the spatial organization of the site.

Not only the indoor spaces and individual structures are considered in this research, but also non-enclosed areas directly abutting several of Barcın Höyük's buildings, form a good example of spaces that can be better understood by qualitative and quantitative artifactual spatial analysis. At Barcın Höyük, annexes appeared to have been actively used during some of its Neolithic phases based on the material evidence but less so in other periods. If these areas were used intensely, one would expect there to be an abundance of archaeological material. Quantifying the material found in these spaces allowed for a better direct comparison with other settlement areas. Other examples of examined areas are courtyard and midden areas. In this way, the cause of deposition, whether it was a primary, secondary or de facto deposit can be better interpreted (Hull 1987, Schiffer 1987). Evaluating the size, state, type, and quantity of material artifacts in these spaces provides a supplementary layer of information related to how spaces might have been used.

From a methodological perspective, this thesis will look at the spatial distribution of ceramics, everyday use artifacts/objects (hereafter: objects) and the sorted heavy fractions (hereafter: microartifacts), on which to base its interpretations.[1] The well-documented ceramic material of Barcın Höyük provides the opportunity not only to examine spatial differences in fragmentation of pottery, but also the rate of abrasion as a second category of ordinal spatial information. Together with the other objects, this forms the macroartifacts dataset used to examine the site.[2] These multiple proxies of data will be analyzed, compared and based on these hypotheses were raised as to what to expect for different settlement areas.

By analyzing material found in interior and exterior spaces of the settlement, over several of Barcın Höyük's Neolithic phases, this thesis aims to understand the relationships between these different areas and built environments. Analyzing the synchronic and diachronic variation between spaces is one of the ways in which an archaeologist can begin to understand how settlement spaces, indoor and outdoor, were actively exploited during the time of use, via a bottom-up approach. This ultimately can contribute to the formative processes that reflect a characteristic Neolithic village life and contributes towards understanding bigger processes of Neolithization occurring in the Marmara region during the second half of the 7$^{th}$ millennium BC.

[1] Microartifacts are referred to as artifacts smaller than 1 cm in size. However, different interpretations to what exactly should be considered microlevel were made in the past (Sherwood, Simek, and Polhemus 1995b, Sherwood 2001, Dunnell and Stein 1989).
[2] Macroartifacts are referred to as the artifacts that were documented with a find number and collected during the excavation. They are generally larger than 1cm in size and were not part of the sorted heavy fractions. Spatial recording for the macroartifacts is done per individual context or locus.

## 1.1. Research question

**Main question**: How can multiproxy analyses based on the archaeological record contribute to the understanding of Barcın Höyük's sequences of use and abandonment of spaces and the built environment?

**Sub-questions**:

1. What patterns in terms of macro- and microartifact variation relating to specific types of use, refuse or post-depositional practices can be identified?
2. Can spatial analyses contribute to a more nuanced picture between structures, by comparing macro- and microartifacts?
3. Analyzing macro and microartifact variations of multiple phases, do we see changes or perhaps continuity in the use of space over time?

## 1.2. Chapter outline

**Chapter 2 -** aims at providing a comprehensive overview and discusses the theoretical frameworks on which this thesis research is based. The research in this thesis is concerned with the understanding of spaces and places within the settlement. Therefore, an archaeological definition of space and place in literature is provided. The progressions made in the household archaeological subfield, followed by an inclusive perspective on how places of use and abandonment are analyzed with the help of artifact distribution is presented.

**Chapter 3** – gives the background of the Neolithic Barcın Höyük Project and a more detailed overview of the site's earliest occupational history. Additionally, the phases discussed will also be used for the site's analysis of data in the subsequent results chapters.

**Chapter 4** –presents the methodology which supports the analyses conducted and gives a more thorough reasoning of the data categorization. Additionally, it provides the expected hypotheses for each settlement area, based on works outlined in chapter 2 and 3.

**Chapter 5** – provides an overview of the results in chronological order and categorized by analysis category and data type.

**Chapter 6** – discusses previous results, not in chronological order but instead provides an interpretation of differences between settlement areas and use practices within the built environments. Afterward, a short section highlights the significance of the research, summarizes the strong points and discusses potential future research and improvements.

# Chapter 2: Evaluation of space and place, GIS and Multiproxy Analysis in archaeology: Literature review

## 2.1. Changing perspective on space and place in archaeology

The word "space" is often used in archaeology, but its meaning can be deceitful depending on its context. One of the definitions in the Oxford dictionary is: "The dimensions of height, depth, and width within which all things exist and move".[3] Although space is often perceived geographically, in archaeology the term can entail a more profound meaning; it is also considered an area in which one lives and conducts activities. Salisbury and Keeler define space in an alternative way, applicable to this thesis and suggest that it can also be "an area reserved for some particular purpose" (Salisbury and Keeler 2009, 4). To fully understand conceptualizations of space and the significance it has had for the intra-settlement conducted in this thesis, it is necessary to review the history of the study of space in archaeology and its establishment in archaeological theory.

The foundation for the study of space in archaeology can be traced back to the second half of the 1960s. In this period, the necessity of defining space in archaeology increased after changes in theoretical perspectives started to look at different social units and artifact assemblages. During this period, scholars such as Lewis Binford and David Clark critiqued the normative model of understanding culture and the past (Binford 1965, Clarke 2014a). The processual theoretical thinking was influenced by the ideas from the early 20$^{th}$-century sociologist Emile Durkheim (Durkheim 1895, Binford 1971, Clarke 2014b [1972], Trigger 1989). Durkheim's research was key to a new system-based understanding of society and explanation of social facts and implied

[3] "Space | Definition of Space in English By Oxford Dictionaries". 2018. Oxford Dictionaries | English. Accessed June 21 2018.

that society is something bigger than the sum of its individual parts (Durkheim 1982, 80, Trigger 1989, 320).

Characteristic for the New Archaeological, functionalist, processual approach was that it understood past societies as a balanced system in which culture and adaptive behavior were separated and changes mostly occurred due to external factors. As Binford states, culture can be "viewed as the system of the total extra-somatic means of adaptation" (Binford 1965, 209). The Cultural-Historical archaeological perspective, popular in the earlier half of the 20th century, was more descriptive in nature and attempted to connect archaeology with a more general narrative based on typologies and a categorical conceptualization of the past (Wheatley and Gillings 2002, 4-5, Binford 1965, 203, Taylor 1948). In contrast, positivistic, analytical reasoning was key in the New Archaeological way of thinking. Wheatley and Gillings state that in New Archaeology space, "acted as a canvas upon which cultural activity left traces" (Wheatley and Gillings 2002, 5). However, they considered the environment as an agent that triggered adaptive external change on peoples. People, in turn, adapted to their surroundings and were seen as passive entities (Salisbury and Keeler 2009, 7).

The Processual paradigm was soon followed by a heavy critique referred to here as "interpretive archaeology," but several noteworthy events that took place during the Processual period are discussed here given their relevance to this thesis. First, we begin to see the growth of analytical methods for analyzing data and artifacts. Many spatial analyses, such as spatial autocorrelation and nearest neighbor, both nowadays often used in GIS, were first developed between the 1960s-1980s and contributed to the analytical understanding of space (Anselin 2010, 10, Goodchild and Haining 2004). The main reason for this sudden increase in analytical methods relates to the scientific analytical approach that Processual archaeological thought practiced during this period

(Salisbury and Keeler 2009, 7-8). The application of these new techniques brought a new perspective on space, settlements, and household archaeology.

A second equally important element in the archaeological definition of space is the changing perspective on research scales and social units. The Cultural-Historical period did not take space, as a geographical unit, into consideration. In general, they preferred to combine many cultural elements on a large geographical scale and used diffusion theory as a way to define these culture zones (Clarke 1977, 2, Gosden 1994, 70, Wheatley and Gillings 2002, 4). Therefore, regional and settlement studies were not deemed as significant at a small scale (Salisbury and Keeler 2009, 6). Gordon Willey's prehistoric settlement analysis conducted in 1953 in the Viru valley in Peru is one of the first smaller, regional-scale investigations ever to take place (Willey 1953). For the Near East, the impact of the work of Robert McCormick Adams must also be mentioned (Adams 1965).

Roughly starting in the 1960s, interest shifted to smaller social units, including the household. Among the pioneers discussing this geographical level of space are Wilk and Rathje. In their 1982 article, the authors state that the household level study enables adaptation to be studied most directly (Wilk and Rathje 1982, 618). They contend that mid-level theoretical inferences can be applied in the best possible way at this finer scale.[4] Clearly, Wilk and Rathje were ahead of their time and introduced the concept of the household before such a unit of analysis had been adopted by archaeology in general. While many of their ideas are now considered a bit too simplistic, their approach does mark the change towards examining smaller spatial units in archaeological thought. The household unit does not lend itself to be easily defined

[4] The section about Post-depositional processes discusses Middle Range Theory and its application in archaeology in more detail.

spatially because many different forms of households can exist. Nevertheless, most agree that the household area is composed of much more than just the built structure. For example, Souvatzi states: “It may involve the use of several types of spaces other than the domestic dwelling, including external work areas, spaces of leisure, household properties, and areas designated by the community or the wider society…” (Souvatzi 2008, 11-12, McKie, Bowlby, and Gregory 1999). Therefore, areas like the courtyard areas, Southern residential areas, or refuse areas at the outer perimeter can also be considered part of the household space (Wheatley and Gillings 2002, 6-7, Wilk and Rathje 1982). The reproductive and social significance of the household unit and its application for this thesis will be discussed in more detail in the next section.

By the mid-1980s the processual approach was challenged by interpretive archaeology, mainly because of its lack of addressing human action and intentionality. By envisioning data within hypothesis-based research frames, Processual Archaeology lacked concern towards human reasoning and thinking, and rendered the human agent as passive and powerless. An example of such critiques was given by Ian Hodder, who stated: “The result of this view is that cultural remains are seen as *reflecting*, in a fairly straightforward way, what people do. Even work on depositional and post-depositional processes, while adding complexity to the situation, still assumes that material culture is simply a direct, indirect or distorted reflection of man’s activities.” (Hodder 1982, 51). Hodder’s 1982 book “Symbols in Action” can be considered among the first publications to apply an interpretive viewpoint to objects in archaeology (Hodder 2004, 22-39). Material culture can be more meaningful, and in addition can structure behavior and play a role in the everyday social life of peoples (Düring 2006, 26-27).

With regards to the definition of space in interpretive archaeology, space was no longer perceived as a passive canvas on which events took place, nor merely geographical, because it contributes as an active, continuous force in the formation of meaning and the perception of agents. Lefebvre's research concerning the different perspectives of space can be considered instrumental in the better understanding of space in an interpretative manner and definition (Lefebvre and Nicholson-Smith 1991). In a similar way, Tilley suggested subdividing space into abstract and human space (Tilley 1994, 8-9, Düring 2006, 31).[5] This differentiation shows the increased interest in agency and highlights the importance of human interaction in a particular space. From a different perspective, the important works by Bourdieu and Giddens in the late 1970s and early 1980s marked the foundation for the means of social reproduction and structuration theories. The main concept is that social structures are constructed on a continuous basis by our daily practices and our notion of *habitus* (Bourdieu 1977, Giddens 1979, 1984, Düring 2006, 28-29). The objects that we use in shared spaces, the areas that we clean, shape, and organize, are all part of a continuous *modus operandi* in which we participate on a daily basis (Giddens 1984, 79). These continuous interactions between humans and things and places produce habitus —'systems of durable, transposable dispositions' — that direct the actions of people through which structures are reproduced (Düring 2005, 6, Bourdieu 1977).

From an interpretive archaeological perspective, human agents used and shaped their surroundings throughout their everyday lives. Likewise, their surroundings influenced the human agents socially, emotionally, and physically in a continuous dichotomy. Additionally, the objects they used were active agents and carried meaning. The directionality of relations between humans and things has been discussed to a greater extent by Latour and others (Streeck 1996, Latour 2005, Olsen 2010, Hodder

[5] Tilley's definition of human space can be considered to be similar to what has been called in other discussions the difference between space, as a geographical unit, and place.

2012, Stockhammer 2012). Whether we look at Thing theory, Actor-Network theory, the concept of Entanglement, or the relations in a tanglegram, the underlying concepts revolve around the idea that "things" have meaning and share a relation with other things or with the people who use them. In other words, we, and people in the past, are all dependent on certain material goods which take part in our daily lives; in this way, objects have agency upon us. In this thesis, the form and fragmentation of objects are compared and is thus significant. However, regardless of shape, size or form, we should consider that these objects all were once part of a shared network of use or reuse by their owners. Therefore, analyzing the place in which an object was used might shed light upon past practices of use and discard.

To summarize, in this chapter the historical background of the use of space and place were described. In this thesis, due to the selection of multiproxy analysis and the particular focus on size distribution throughout different phases of the Neolithic settlement, a combination of analytical analyses and theoretical perspectives mentioned in the above will be considered.

## 2.2. Household Archaeology

Although the study of the household was already briefly mentioned in the previous section, this section will discuss household archaeology by highlighting several aspects of this sub-discipline. The focus here is, in particular, on the social reproductive properties of the social unit and examples of case studies from Anatolian Prehistory. The intra-settlement spatial analysis conducted in this thesis validates a more detailed analysis of this archaeological subfield.

There are multiple reasons why household archaeology became established as a field of study after the 1960s, but one of the most important factors is related to the awareness that inferences between the social cooperative unit and material culture can be observed most directly (Düring 2006). During the 1990s household archaeology became increasingly important after more interpretative studies were conducted. For example, studies in gender and feminist archaeology started focusing more on particular members of the household (e.g.Tringham 1991, 1995, Hendon 1996).

One should not consider the household as merely consisting of kin, but rather the whole group of members who contribute to the social and economic benefit of the unit. Furthermore, a household can live under one roof or in multiple structures, or on the other hand, one structure can house multiple households (e.g. Horne 1982 for a different perspective on the house and household arrangement). Defining areas within the household is subjective and may differ for every place and social group. Therefore, defining what a household indicates should be done by using a bottom-up analytical approach, considering every space as possible of being connected in some form to a larger household. Several buildings and other areas could hold meaning for a household; consequently, care should be taken when analyzing the spatial area which defines the household.

An influential article by Wilk and Rathje in 1982 was one of the earliest examples to consider the household in this way. Basing their notion of the household on ethnological research, Wilk and Rathje did not interpret the household in a hierarchical or purely spatial manner but rather focused on the household as a functional mode of production, a social resource of pooling and distribution (Wilk and Rathje 1982, 631-632). They state: “This total household is a product of a domestic strategy to meet the productive, distributive and reproductive needs of its members” (Wilk and Rathje 1982, 617-618). This notion played an important role in the development and understanding of the modern archaeological perspective on households and continues to be part of many more recent articles. Their way of interpreting a household remains trivial in many ways in today’s research. For example, the notion that a household is not defined by its spatial boundaries or kin but rather by the activities in which a group partakes together is nowadays a significant consideration in the archaeological understanding of a household (Özbal 2012, 324).

Current theories concerning the formation of households are built around the ideas of several scholars such as Bourdieu, Latour, and Giddens. Especially Bourdieu’s description of *habitus* shows how the agency of a person paired with action enables the continuous formation of social processes. These methods of structuration connect people, place, and objects together and create a deeper social memory which develops gradually through repeating routine social rules over time (Hodder and Cessford 2004). “Each agent, wittingly or unwittingly, willy-nilly, is a producer and reproducer of objective meaning, which together binds social memory. The actions and works are the product of a modus operandi of which he is not the producer and has no conscious mastery…" (Giddens 1984, 79). It is the social memory and shared practices which we hope to expose in the archaeological record. The theoretical approach functions as a mechanism for archaeologists who try to interpret the practices that took place within the household in the past.

One example of ways in which social practices can manifest themselves separate from the material culture is seen in the continuity of buildings. Despite the fact that the layout and structure of a building, or house, does not encompass the whole notion of a household, construction practices such as building maintenance, spatial planning and organization say much about the mindset of the people who planned and built the structure. In Anatolian prehistoric settlements, new houses were often built or rebuilt in a style and orientation similar to previous ones. For the Neolithic period, there are many examples found in central and western Anatolia, as well as in Eastern Europe. One of the best-known examples in the Neolithic is Çatalhöyük. At Çatalhöyük, houses were sometimes rebuilt up to seven times on the same location using the foundation of the previous house (Düring 2005, 2006, Brami, Horejs, and Ostmann 2016). Both functional, as well as social reproductive reasons, have been proposed as the reason for this rebuilding of houses on the same foundation as a previous structure (Hodder and Cessford 2004, Düring 2006, Brami, Horejs, and Ostmann 2016). These reasons will not be discussed in this thesis, but it seems clear that the passing on of knowledge, from one generation to the next contributed to the social formation of this practice. This continuity ultimately might have resulted in the house becoming more than just a space to shelter in but instead an actual home which could be passed on to future generations (Brami, Horejs, and Ostmann 2016).

Like these previously mentioned Neolithic examples, the continuation of the built environment in a similar orientation is also part of the settlement history of Barcın Höyük. As Byrd states, “The tangible structure of the built environment provides a focus for spatial analysis aimed at gaining insights into social organization, how social relations are reiterated, and how community organization changes over time” (Byrd 2002, 66). Although the tangible structure is not a central focus of this research, it does play a minor role in understanding the life histories of buildings and of shared areas such as abutting courtyards and other spaces and can give a better understanding of how the people at Barcın perceived their settlement. The similarities in terms of the settlement’s spatial planning and use and abandonment of areas at certain points in time make the material study of the Barcın household meaningful. Taking the life histories of the structures and shared areas into account enables the study of the household as a social process using a bottom-up approach.

## 2.3. From static data to complementary evidence for household and settlement related practices

Ultimately, all excavated archaeological contexts are abandoned places. However, although the space was once abandoned, the material found inside and the condition of the things themselves may still be able to offer us insights into the daily lives of the people who once lived there. As the theoretical frameworks in previous sections have shown, the use of space and the complexity of a household can vary greatly between settlements. Studying the material remains within a space is an essential step to disentangle a settlement and reveal new perspectives. As Allison (1999, 5) states, “While it is true to say that archaeologists do not dig up households it is also true to say that they do not just dig up houses.". The difficulty lies, however, in making correct inferences about the past, based on the material excavated today. In this section, the ways in which the study of macro- and microartifacts relates to the study of use and abandonment of spaces and how these artifacts can provide complementary evidence for daily practices within the household is discussed.

The study of artifact size distribution and use and abandonment processes have relied heavily on experimental and ethnoarchaeological studies. These types of studies were used in the past to understand distribution patterns as the result of certain human practices or behavior (Fladmark 1982, Clark 1986, Tani 1995, Schiffer 2010, Binford 1981, 1978a). One of the earliest examples of experimental archaeology comes from Robert Ascher, who conducted experiments on the evolution of artifacts (Ascher 1961). However, probably one of the most known examples of ethnoarchaeological study was conducted by Binford on the Nunamuit Eskimos (Binford 1978a, b). In this research, he found different types of artifact disposal, each type related to the different activity areas in which they were discarded. This example reminds us that the practices that accompany discarded objects should not be overlooked.

Although analogies are undoubtedly effective for bridging the gap between the material and immaterial world, using modern analogies to study the past should be conducted with caution, as discussions related to middle-range theory between the 1960s and 1980s have shown (Maschner 1996, 469). One cannot simply use ethnoarchaeological studies or analogies to project the present onto the past. To attempt to make correct inferences, material culture and the context in which it was found should be taken into consideration as well, when making inferences about past societies (Silberman 2012, 65-66, Hodder and Hutson 2003, Hodder 2008). Similarly, archaeologists should also not directly rely on materials they excavate, as formation processes disturb the archaeological record (Schiffer 1987). Archaeologists do not dig up Pompeii like settlements, and careful interpretation is needed to entangle sites from a bottom-up perspective (Binford 1981, Schiffer 1985).

Studies on site formation processes have been very effective in helping archaeologists make better inferences on the past; the study of abandonment processes has been particularly significant. Abandonment studies that concentrate on macroartifacts have impacted microarchaeological analysis (Schiffer 1972, 1987, Hull 1987). In Schiffer's description of abandonment processes, he described three ways in which (macro) artifacts could be discarded: (1) *Primary refuse* (2) *Secondary refuse* and (3) *de facto refuse*. *Primary refuse* refers to artifacts that were used and discarded in the same place. *Secondary refuse* referred to deposits that were transported to a distinct location to be disposed of. *De facto refuse* was used to describe artifacts that were left by accident and can be considered *in situ* artifacts, directly related to activity patterns (Schiffer 1987, Hurcombe 2007, 57-58). Although refuse areas can be far more complex in certain cases, for example if multiples of the above apply, they are still often used as a starting point to see how the material relates to certain locations.

The study of macroartifacts traditionally focused on the composition and morphology of the particular macroartifacts, in which their characteristics were used to interpret changes in technology, define a relative chronology and create typology classes (Sherwood 2001, 327, Dunnell and Stein 1989). However, household and settlement archaeology made the study of spatial distribution of macro-ceramics more significant. Especially in the tradition of southeastern US archaeology, there has been a wide field of studies related to the deposition of artifacts (Peacock, Davis, and Ryan 2008, Peacock and Galloway 2015, Homsey-Messer and Ortmann 2016, Homsey-Messer and Humkey 2016, Cyr et al. 2016). A distinctive feature between macroartifacts and microartifacts during use is that macroartifacts are more likely to be moved around vertically and horizontally than microartifacts. For example, vessel type pottery or other forms of useful items can be reused multiple times, and consequently their deposition might not be in the place where they were most commonly used. Also, the cleaning of the place of deposition, even though this cleaning would possibly also affect any microartifacts, would more likely result in the moving of larger artifacts to a new location (Peacock and Galloway 2015, Homsey-Messer and Ortmann 2016, 4).

Most macroartifacts found by archaeologists were discarded during some time in the life history of the object. Primary refuse, referring to artifacts which were dropped in their position of use are scarce, but do indicate that not all discarded artifacts can be considered to be rubbish. Rather, it is the intent by which an item was discarded that is interesting for archaeologists (Chapman and Gaydarska 2006). Nevertheless, the object's condition, within its respective contexts, presents the best opportunity to understand the reason for discard. As Hurcombe states, "for archaeologists artifacts can have more meaning than purely their artistic or functional values" (Hurcombe 2007, 11).

For the study of (indoor) use practices, the study of microartifacts became increasingly important after the 1980s. Knut Fladmark published one of the most influential articles studying the micro debitage of lithic manufacturing (Fladmark 1982). According to Isaac Ullah and others, (1) the small size makes them less likely to be disturbed by external processes, (2) as explained above, they are better suited for researching direct activity areas, and (3) activities that produce micro debris are more likely to have a high quantity of particles, therefore it's more likely to find them in a higher concentration at places where the activities occurred (Ullah, Duffy, and Banning 2015, Ullah, Parker, and Foster 2012, Brown, Witschey, and Liebovitch 2005, LaMotta and Schiffer 1999, Sherwood, Simek, and Polhemus 1995b, Dunnell and Stein 1989). Microartifacts are more likely to be the residue of a certain spatially localized practice, yet one should approach making such inferences with caution, as the artifacts can still be influenced by natural and cultural formation processes (Homsey-Messer and Ortmann 2016, 4-5). Cessford and Shillito also argue that microartifacts are influenced by post-depositional processes which can cause "background noise." Therefore, they suggest that the texture of the context in which the microartifacts were found, for example, should be taken into account as well when making inferences (Cessford 2003, Shillito 2017).

Although there are inherent differences between the study of macroartifacts and the study of microartifacts, they can complement each other in certain occasions very well, as several earlier studies have shown (e.g. Hull 1987, Dunnell and Stein 1989, Sherwood, Simek, and Polhemus 1995b). Kathleen Hull, for example, conceptualized how macro- and microartifacts could be combined in analysis. In her research, Hull defined similar refuse areas as Schiffer used, but then complemented these areas with the study of micro debris analysis. She defines (1) primary refuse as places where macro and microartifacts cluster together, (2) Secondary refuse as places with only macroartifacts, and (3) De facto refuse as areas similar to the first one, but generally with more *in situ* remains, less fragmented and higher in density (Hull 1987, 773).

By comparing different size classes and artifact conditions, stronger inferences related to the places in which people once lived can be made and, in some cases, have the possibility to determine a room's function (Peacock, Davis, and Ryan 2008). One example of a daily practice that can be studied, as defined by Cessford and Hodder, is sweeping and maintenance activities (Hodder and Cessford 2004, 26-28). This has more often been used for microartifact studies but should relate to macroartifacts as well. Additionally, more directly, corresponding microartifact types with certain macroartifacts could prove more insight into certain processes like cooking or other productivity practices (Hastorf 2012). In another recent study, Peacock (2008, 51) states that not only can we define certain areas, but it can also be argued that places with a close juxtaposition of micro- and macroartifacts have a shorter occupational duration, meaning that daily practices that happened on such places occurred over a relatively shorter time span. In this way, primary deposits can be distinguished from secondary ones if both macro and microartifacts correlate. This, he argues, can be assumed based on the fact that both macro- and microartifacts were not removed by either depositional processes or other activities.

To conclude, this section discussed in what ways size distribution contributes to the understanding of activity areas within a settlement, and how this distribution relates to studies of use and abandonment. There is a wealth of information available about the study of micro and macroartifacts and this brief discussion hardly does justice to the wide-ranging case studies that are available. Nevertheless, although there are active forces that can disrupt the archaeological assemblage, when considered from multiple perspectives, such analyses can be used to make inferences on past daily practices. In this interpretive process, modern documentation techniques, quicker methods of micro debris analysis and better visualization software, as discussed in the following section, take up an important role.

## 2.4. The use of GIS and Multi-Proxy analysis for an interpretative process

The Neolithic excavation of Barcın Höyük yielded close to 20,000 individually tagged Lithics and Pottery remains, which are referred to as macroartifacts in this study. Additionally, 650 liters of soil was wet sieved for microartifact analysis. In total, these artifacts related to more than 2,700 different archaeological contexts, documented from within a total (estimated) volume of almost 4,000 cubic meters of soil. Taken together, this information forms the archaeological assemblage that we, as archaeologists, have to base inferences on. This section will discuss the use of multiproxy analysis combined with GIS (Geographic Information Systems) as one of the best possible ways to examine larger complex archaeological datasets. Looking at the multiple layers of archaeological data is an increasingly used approach in archaeology, which has the potential to make stronger, more comprehensive arguments and interpretations possible, as was shown in some previous studies (e.g. Hopwood and Mitra 2012, Cyr et al. 2016, Shillito 2017).

"It is fair to say that for the majority of the 20th-century spatial archaeological data has been tabulated and plotted by hand on simple, flat maps. The analysis and synthesis of the carefully recorded spatial information was restricted to the visual appraisal of these static distribution maps, looking for similarities, trends and differences." (Wheatley and Gillings 2002, 5). During the 20$^{th}$ century, in general, this was what most of the excavations based their interpretations on. GIS is similarly based as its origins lie within traditional cartography. Nowadays GIS and other digital techniques are used to record large amounts of spatial data and textual data in academic research. The storing of this complex data in an efficient system allows the user to make easier relations between spatial contexts and artifacts and to match qualitative and quantitative data. Witcher suggests that GIS, like cartography, can visualize data in a variety of forms and therefore, like cartography, does not necessarily have to be objective. He states, “Each map creates its own version of the world, as mediated by the interests of its author.” (Witcher 1999, 14). GIS as a tool is therefore heavily dependent on the input of data and the theoretical framework that motivates the research.

However, being able to combine, store and visualize this data is one thing, but using it for an analysis proves to be more difficult. To enable proper analytical research requires us to combine method and theory. This is a terrain in which GIS and spatial analysis must still move forward. Especially combining theory with practice remains difficult. As Salisbury and Keeler also acknowledge, “Archaeology has certainly discovered space, and while it is doubtful we can ever *conquer* space we may be able to conquer how we analyze and interpret it” (Salisbury and Keeler 2009, 1-2).

Around the 2000s, GIS was depicted as being mostly environmental and economically deterministic, focusing primarily on the *longue durée* approach (Witcher 1999, 14-15).  However, since then GIS has been used in several other studies and has shown potential in contributing smaller social units as well. More recently, GIS has also been used in household-scale archaeological projects, beyond only environmental data. Also, its advantage for the perception of artifact distribution makes GIS an especially useful tool in the field of microarchaeology that has helped in making inferences about the past. One good example is the case study Isaac Ullah conducted on a Late Neolithic settlement in Northern Jordan, Tabaqat al-Buma (Ullah, Duffy, and Banning 2015). By doing these analyses and displaying them spatially, he could find activity areas that sometimes seemed to have multiple functions. Using the density analysis identified “more active” areas (Ullah, Parker, and Foster 2012, 155-156).

As mentioned earlier, one of the strong elements of GIS is its ability to combine multiple proxies of data into one analysis, making it possible to visualize and analyze the data spatially. This can be done by combining different strands of data, often referred to as doing multi-proxy analysis. Often multiproxy analysis is conducted in geoarchaeology, combining sediment data with other types of environmental analyses (e.g. Bogucki et al. 2012). Other case studies using multiproxy analysis include the work of Lisa-Marie Shillito on the Neolithic settlement of Çatalhöyük in central Anatolia. She refers to the strengths of multiproxy analysis as follows, "The potential of a multiproxy approach is that it provides a more complete characterization of the archaeological material record, and the specific relationships between different categories of materials, and thus focuses the range of possible interpretations (Shillito 2017, 238-239). Another case study is a microartifact analysis that combines sediment, geochemical, and macro botanical data to understand the history of the Widow's Creet Site in the southeastern US and the influence of a nearby river. These previous studies also stress the increased power provided by the ability to make inferences based on multiple perspectives (Cyr et al. 2016, 62).

As previously discussed, the difficulty with understanding the archaeological assemblage is that one can never truly grasp whether something can be referred to as *in situ*. Furthermore, due to the possibility of "background noise," taking into account several proxies almost seems a necessity. Especially when attempting to understanding differences in household organization and activity patterning, looking at one element can give a biased perspective. Shillito also mentions that ethnoarchaeological interpretations and experimental interpretations can be a contribution to these kinds of analysis. Basing our understanding on previously tested material gives another layer of interpretation (Shillito 2017, 241-242).

The aim of multiproxy analysis and the use of GIS is to find patterns that indicate areas of use and abandonment within the settlement area. Combining this analysis with the extensive research done on this topic, better inferences can be made on the household areas. The study at Barcın Höyük is in line with the research conducted by Shillito, Hopwood, and others in that it aims to combine microartifacts with larger "macroartifacts" (Hopwood and Mitra 2012, Cyr et al. 2016, Shillito 2017).[6] In the process of combining these separate proxies and interpretations, GIS also plays an important component. As was explained in the above, GIS can be used to store and display not only quantitative data but also qualitative data recorded or interpreted by specialists. Therefore, the following analyses in this thesis also considered ordinal data, in which the rate of abrasion on pottery is taken into account. Based on previous studies, it is my understanding that the convergence of the different strings of data enables a better interpretation of the available data.

[6] See the methodology chapter for a better differentiation of the categories. In this case, macroartifacts can be roughly seen as artifacts larger than 1 cm and were not a result of flotation analysis.

## Chapter 3: Background of Barcın Höyük

### 3.1. General background

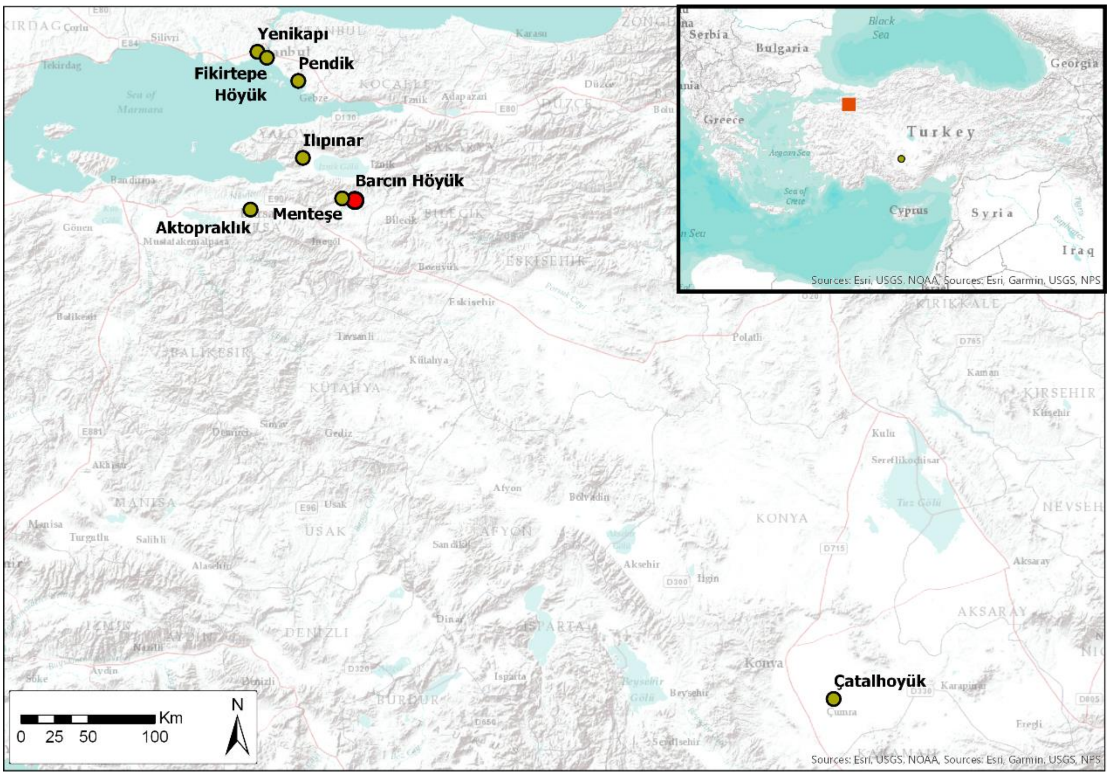



*Figure 2 - Location of Barcın Höyük and other sites mentioned in the text.*

The Barcın Höyük Excavation Project researches one of the oldest Neolithic settlements in the Marmara region, with settlement starting by roughly the middle of the seventh millennium. The site is named after the nearby village called Barcın and is located in Yenişehir, Bursa, just south of the Marmara Sea at a distance of 50 kilometers east of the Bursa city center (Figure 2). The excavation project itself started in 2005 under the directorship of Dr. J. Roodenberg and after two field seasons was taken over by Dr. F. Gerritsen. The project is part of a larger-scale research project in the region aimed at studying 'Early Farming Communities in the Eastern Marmara Region' and was carried out by the Netherlands Institute in Turkey (NIT). The early evidence for sedentism and farming makes it an important site to consider in Neolithization processes of the Marmara region and other nearby regions. This thesis is aimed at researching the early and middle stages of the Neolithic occupation at Barcın Höyük corresponding to roughly 6600 to 6200 BC (For earlier research see: Gerritsen, Özbal, and Thissen 2013a, 2013b, Özbal and Gerritsen 2015, Groenhuijzen et al. 2015, Özbal et al. 2015, Gerritsen and Özbal 2016).

### 3.2. Geographical background

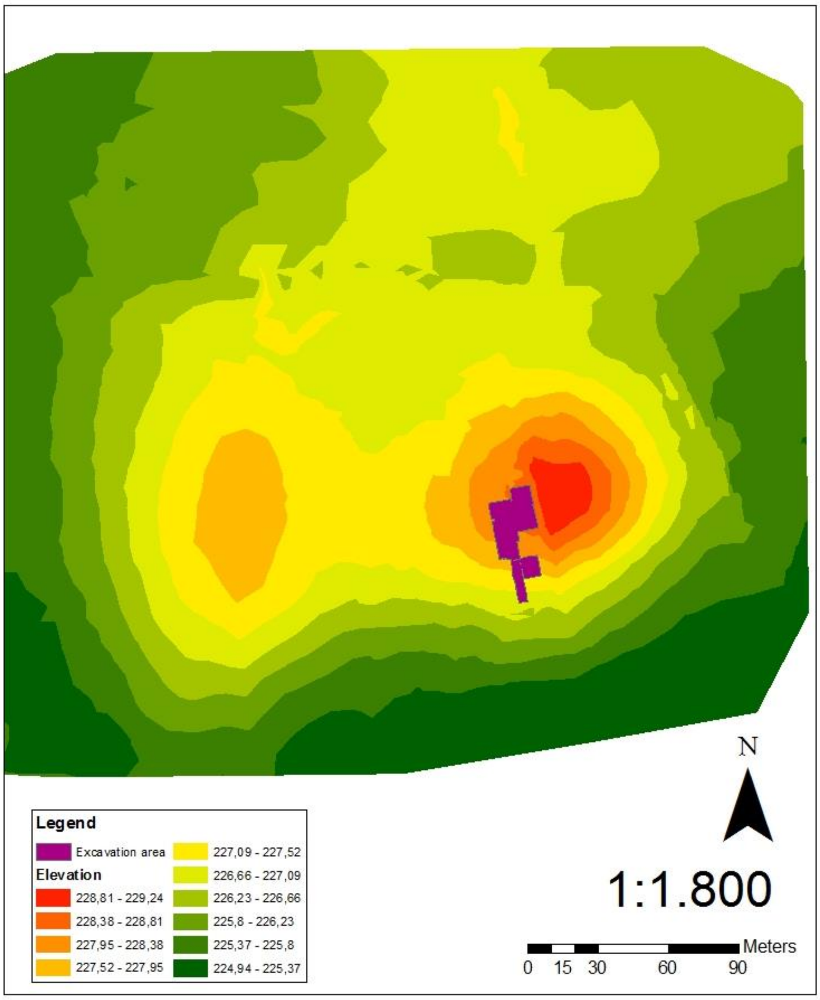



*Figure 3 - Digital Elevation Model of Barcın Höyük's settlement mound.*

The site is comprised of two connected mounds and is roughly 2 hectares in size (Figure 3). The excavations were carried out on the eastern, larger mound which rose to about four meters above the surrounding area. Survey observations made it likely that the eastern mound had more potential to yield the oldest, Neolithic, occupational layers (Gerritsen, Özbal, and Thissen 2013a, 94). Geomorphological studies carried out by

Groenhuijzen and colleagues (2015, 8) in the past suggest that during the occupation period the site was bordered by wetland areas to the south, drier terrain suitable for arable farming to the north and upland areas within easy walking distance. This is a typical pattern that was also seen at neighboring sites, but there were some variations in, for example, distances to lakes and settlement elevations. Furthermore, Groenhuijzen and colleagues suggest that as Barcın Höyük was the oldest settlement in Northwest Anatolia, it seems to share some landscape characteristics with Central Anatolian sites, for example, Çatalhöyük. Both of the sites were founded on naturally elevated ground that was surrounded by wet terrain that flooded seasonally (Groenhuijzen et al. 2015). The geoarchaeologists hence suggest that the settling of Barcın might have been a conscious and considered choice for the farming pioneers of the Marmara Region.

## 3.3. Neolithization of the Marmara Region

From the beginning onwards, the settlers at Barcın Höyük were dependent on sedentary farming, which is similar to the situation at nearby sites excavated in the region, such as Ilıpınar, Menteşe, and Aktopraklık (Gerritsen, Özbal, and Thissen 2013a). However, Barcın Höyük predates these settlements (for the location, see Figure 2). Differences between daily practices in this region and other regions of Anatolia vary widely, remain complex and are under continuous academic debate (for discussions concerning

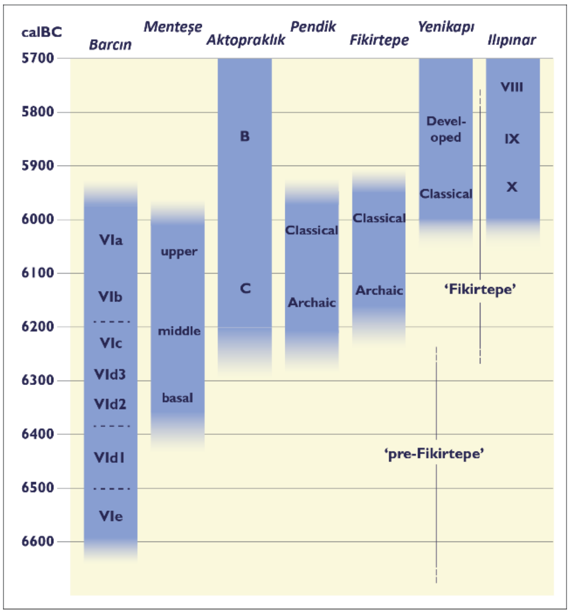



*Figure 4 -Image of Neolithic sites located in the Marmara region with their corresponding periods (by Fokke Gerritsen).*

differences between regions, see Düring 2006, Düring 2010, Düring 2013, Özdoğan 2013, Özdogăn 2014, Özdoğan 2015). However, it is beyond the scope of this thesis to discuss these differences in detail. Speaking from a general perspective, current archaeological understanding of the Neolithization process does not consider the transition in these regions to have developed in a linear way but was rather the process of local connections happening over a long period of time, perhaps even by using seafaring connections (Özdogăn 2014, Horejs et al. 2015).

From a regional perspective, Barcın Höyük's material and architectural elements are hard to define as it reflects social practices connected to inland Neolithic farming communities, as well as material remains connected to pre-Neolithic coastal communities living in the region, referred to as the Ağaçlı group (Gerritsen and Özbal 2016, 206). One of the most striking examples suggesting connections with the local coastal communities is the existence of the so-called Fikirtepe boxes. These were four-legged boxes with possibly two handles at the side. One of the oldest ones found to date was at Barcın Höyük, and it bears striking resemblance to ones found at sites such as Fikirtepe Höyük, Pendik, and Yenikapı (Özdoğan 2011). However, Barcın Höyük seems to have also other practices which more closely resemble central Anatolian sites, such as the choice of settlement and the rectangular building practices (Groenhuijzen et al. 2015, Gerritsen and Özbal 2016). These are just a few examples of how complex and "individual" the study of the Neolithic can be. By studying the material remains of Barcın Höyük, new elements that played an important role in the everyday life of the inhabitants at Barcın will be discovered. Therefore, to make a well-constructed foundation for cross-regional inferences, one should begin with researching the site's material culture and practices, as they belong to the oldest ones found in the region.

## 3.4. Neolithic occupation at Barcın Höyük

*Table 1 - The main phases of Barcın Höyük in Roman numerals, with period name and the primary nature of excavated remains (Gerritsen, Özbal, and Thissen 2013a, 94).*

| Phase | Period | Nature of Excavated Remains |
|---|---|---|
| I | Byzantine | Cemetery (Middle Byzantine) |
| II | Hellenistic / Roman | Architectural remains on southern flank |
| III | Iron Age | Possible pits |
| IV | Bronze Age | Pits and silo of later EBA date, unstratified MBA finds |
| V | Chalcolithic | Late Chalcolithic settlement remains, brief occupation period, early fourth millennium BC |
| VI | Neolithic | >4 m of stratified settlement deposits |

This thesis researches the earliest stages of Neolithic occupation at Barcın Höyük corresponding to roughly 6600BC and continuing until at least 6000BC (Gerritsen, Özbal, and Thissen 2013a, 2013b). Excluding the Neolithic, the site has five more occupation periods, which are all assigned using Roman numerals. The material found in the later periods mentioned in Table 1 will not be considered in this thesis.

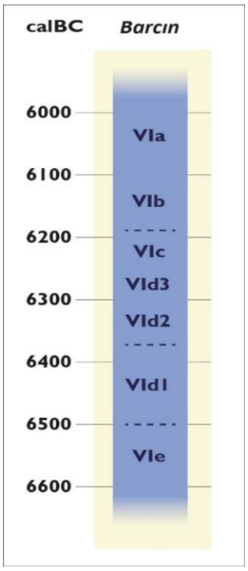


*Figure 5 - Timeline of the Neolithic occupation of Barcın Höyük*

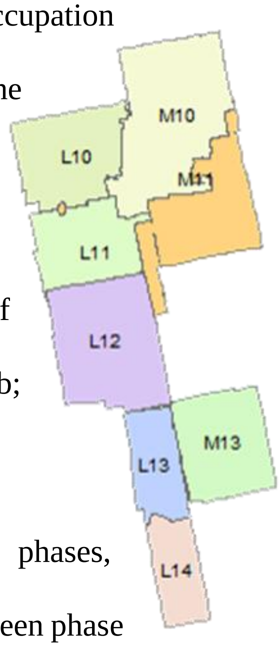
The Neolithic occupation was further sub-divided into multiple phases (Figure 5). These phases are all part of the Neolithic life at Barcın Höyük, but significant differences in architecture, ceramics subsistence or practices were exposed, making a subdivision necessary. The latest two Neolithic periods at Barcın Höyük were phase VIa and VIb, which roughly fall into the last 2 centuries of the 7th millennium. The Chalcolithic and Neolithic VIa phases show a great amount of pit digging activity, so much so that it makes stratigraphic clarity for these layers difficult. These activities also had negative effects on the lower

VIb layer; however, more architectural elements and surfaces could be recovered from this phase. The structures that were found during this phase are referred to as Str.5 and Str. 12. In the following sub-sections, the remaining Neolithic phases that are of main interest in this thesis will be discussed in more detail.

### *3.4.1. Phase VIe*

Occupation in phase VIe started at about 6600 BC, based on botanical/charcoal taken from this phase (Gerritsen, Özbal, and Thissen 2013b; 71).

*Figure 6 - Excavation trench overview.*




Gerritsen and colleagues (2013b, 59) suggested that occupation continued without hiatus from VIe to VId, as well as for the whole Neolithic occupational period. The continuous occupation was supported by the gradual development of ceramic material and can be strengthened by the continuation of settlement organization (Gerritsen, Özbal, and Thissen 2013b; 59, Gerritsen and Özbal 2016).

Despite continuous occupation between the two phases, practices did change. One of the most striking differences between phase VId1 and VIe was the increase in the ceramic material and pottery in general despite the fact that the total volume of soil excavated from VId1 exceeds that of VIe. Phase VIe yielded roughly 100 cubic meters of soil, phase VId1 yielded almost double this amount (see below in the next section and Figure 8).[7] Regardless, even when considering the large difference in total volume, the relative number of sherds is still

[7] Also mentioned in Gerritsen et al. 2013b and based upon personal calculations.

much lower in phase VIe compared with phase VId1. This suggests that the use of ceramics seem to increase and may be used in different ways in daily life. The overall decrease in fire-cracked stones implies that ceramics became more common and everyday use-ware in phase VId1(Gerritsen, Özbal, and Thissen 2013b; 73). Furthermore, Gerritsen and colleagues (2013b) also point out that the shape and form of pottery undergo changes during this transitional period.

During the final two excavation seasons, in 2014 and 2015, architectural elements of VIe were exposed in trenches L10, M10, and M11 (Figure 6). Figure 7 depicts the location of Structure 24 and 25. These two structures contained several well-preserved indoor surfaces. Additionally, several pyrotechnic features were recorded and often contained macro artifacts such as ceramics or other objects. The southern walls of both structures were better preserved than those on the northern side. However, Structure 25, located on the east, did yield several preserved postholes on the northern side. Most likely, Structure 25 also continued eastwards to the eastern excavation border, but the indoor surfaces were most clearly discovered on the western side of the structure.

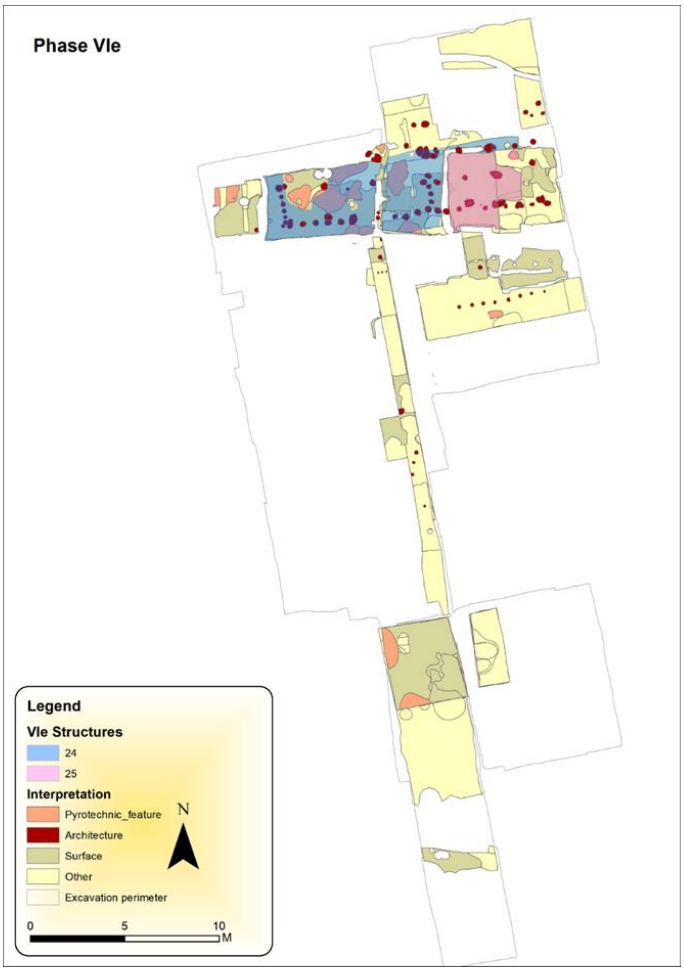



*Figure 7 - Overview of structures related to phase VIe.*

### *3.4.2. Phase VId1*

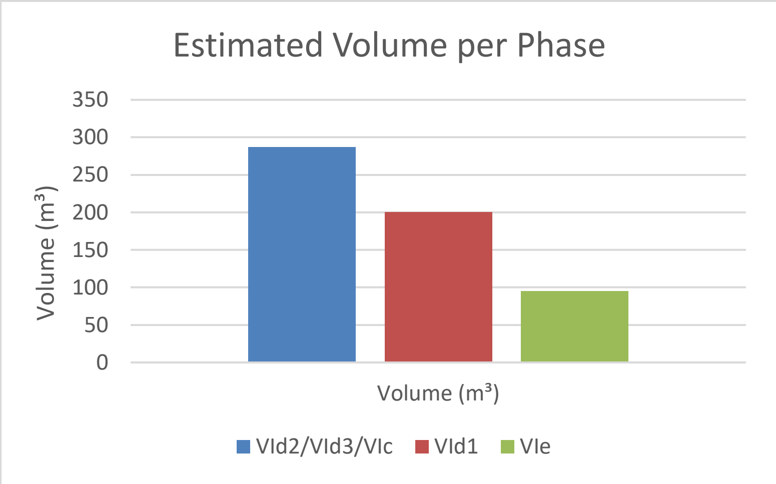



*Figure 8 - Estimated volume calculations for each phase, based on 2.5D context reconstructions. The volumes are measured in cubic meters.*

Phase VId1 reflects the longest continuous occupation at the site during the Neolithic and consists of the most intact residential complexes found during the Neolithic excavation. Phase VId1 can be dated to start at about 6500 BC.[8] The total Neolithic occupation is estimated to be a 5-meter thick deposit (Gerritsen, Özbal, and Thissen 2013b; 57). By making a 2.5-D representation of each Neolithic phase, an estimate of the total cubic meters per phase could be determined. Phase VId1 has an estimated volume of roughly 200 cubic meters (Figure 8).[9]

According to the pottery specialist, VId1's pottery had three main advantages: (1) the ceramic fabric changed, making the ceramics overall less heavy and thinner, (2) they had higher thermal shock resistance; and (3) they had the ability to be used without cooking stones, making heating things more effective (Gerritsen, Özbal, and Thissen 2013b; 73). These advantages, combined with the overall increase in ceramic sherds and a decrease of fire-cracked stones, suggests that pottery gained a more profound place in inhabitant's lives during this period.

[8] Barcın Höyük Excavations 2013 and 2014 report.
[9] 2.5D is a term in GIS that refers to the creation of simplified 3d polygons based upon the area and height of the excavated context/locus. By summarizing these contexts, a value was derived for each phase. A view of this model can be accessed here: http://bit.ly/2A6LKRf

During phase VId1, the structures remain in the same location and with a similar east-west orientation as in VIe. However, the construction of the houses was different in terms of building techniques. In the earlier phase, VIe, the houses were presumably built with much larger posts. In phase VId1 the construction changes to a tradition known from other places, such as at Ilıpınar. These structures are built with smaller wooden posts of about 8 cm in diameter to support the roof and were filled with mud for coating.

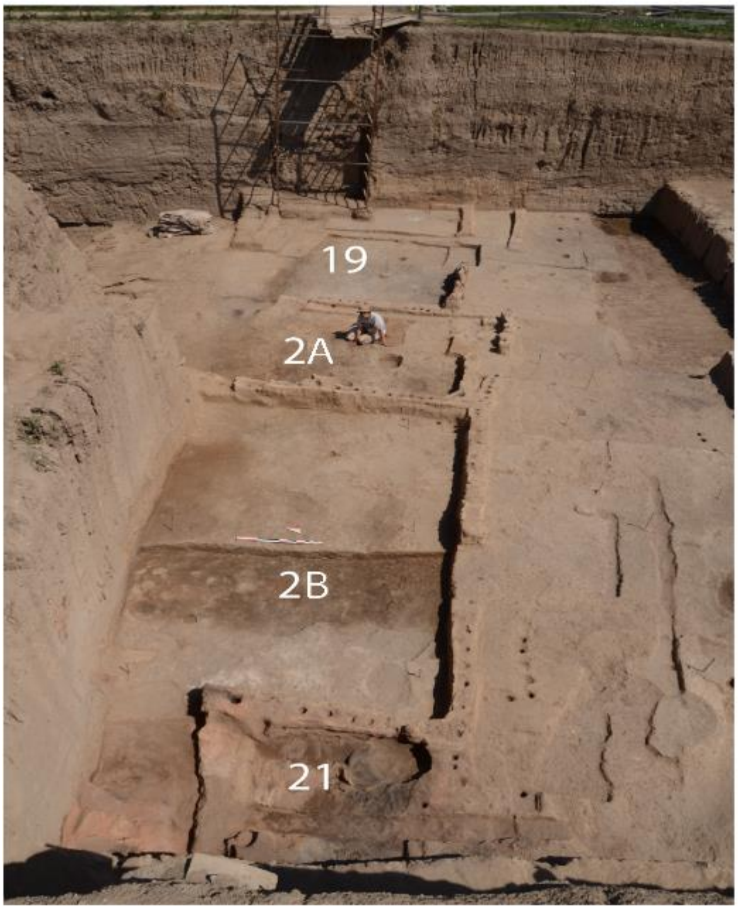


*Figure 9 - Overview of structures within phase VId1.*

From West to East, the structures that were recovered during Phase VId1 were: 21, 2b, 2a and 19. Structures 2a and 21 yielded well-preserved floors constructed of mud mixed with straw elevated on a framework of thin wooden posts (Figure 9). In Structure 2b several well preserved in-situ remains were found (Gerritsen, Özbal, and Thissen 2013a, 2013b). However, the most noticeable feature discovered in 2a was a pair of footprints, pressed into the mud (Atamtürk et al. 2018; 164-165). Both footprints were preserved as the result of a fire. Directly beneath the left footprint, excavations yielded a horned bovine skull (Atamtürk et al. 2018; 167). The way it was deposited, directly embedded into the first floor of the house, suggests it must have been placed with intent. Another notable feature was the red floor that covered most of the surface of Structure 19. Although its construction technique remains unclear, it reflects much effort and shows a resemblance with practices uncovered in other Central Anatolian sites, such as Çatalhöyük, Ulucak, and Hacılar (Gerritsen and Özbal 2016; 203, Çilingiroğlu, Çevik, and Çilingiroğlu 2012, Mellaart 1961).

As can be seen in Figure 10, the settlement had a courtyard between the structures and L13, where a depression, filled with midden deposits, outdoor surfaces and installations were found. The courtyard is believed to have had a communal function (Gerritsen and Özbal 2016; 203). The midden area yielded no sign of structures. Nevertheless, the variety in different living spaces presents a great potential for a more detailed intra-settlement analysis, which could only start at the end of the excavation in 2015.

One noteworthy stratigraphic event taking place within the residential area of phase VId1 is the burned phase. This event divided the area of phase VId1 with a clear terminus post- and antequem during the

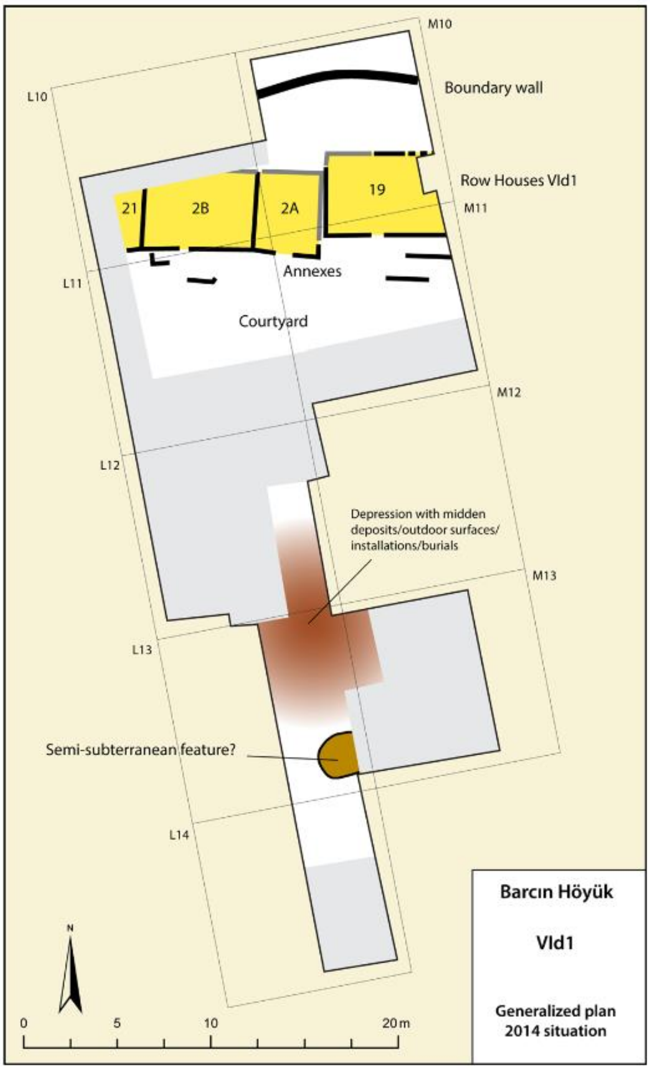



*Figure 10 - Graphical overview of phase VId1, after:(Gerritsen and Özbal 2016).*

excavation. Structure 21, Structure 2b and Structure 2a all showed signs of burning. Signs of burning are seen at multiple places across Anatolia and the Balkans (Brami 2014; 164-165). The phenomenon of burning structures is a common trend in the Neolithic and is studied by many scholars (e.g.Brami 2014, Twiss et al. 2013, Chapman and Gaydarska 2006). This burned layer was taken into account in the following contextual and spatial analyses, and as shall be shown later, patterns in fragmentation and abrasion were seen between the two episodes. Although the difference in fragmentation of ceramics can contribute to understanding the process of abandonment, this is beyond the scope of this paper, as more data should be used to draw conclusions about the possible motives for the abandonment. It is difficult to separate this burned phase from other areas of the excavation, as the division is mostly found in deposits related to the built environment.

### *3.4.3. Phase VId2, VId3, and VIc*

The spatial analyses conducted in this research combine the material of phase VId2, 3 and VIc. These phases were combined because the architecture remained largely similar during these phases. Although there are some overlapping structures such as Structure 14/15 and 9/13 (see Figure 12), most of the structures were occupied for longer consecutive periods during this phase. The biggest change in architecture took place in Trench L12, where new structures and features were exposed.


*Figure 11 - Image showing the structures of VIc, facing North. From East to west, structure 2 (VId1), 3, 10 and 4 are shown.*

The residential structures in the northern area of the excavation remained in a similar orientation compared with earlier phases. In the east of the main row of structures, three rooms (Structures: 3, 4 and 10, Figure 11) with in situ artifacts and ceramics were exposed in Trench M10 and M11(Gerritsen, Özbal, and Thissen 2013a, 96). On the north side of this row of buildings, several outdoor surfaces abutting the structures were found, suggesting the area to the north was actively used during this period. On the northwest side of the excavation in Trench L10, the wall ditches of

Structures 14 and 15, similar in size and in orientation to structure underlying 2b were found. Unfortunately, little of the indoor area and walls remained and fragmentary patches of the surface were exposed for Structure 15. These surfaces yielded several in situ objects (Özbal and Gerritsen 2015, 32).

Structures and features found in the south area of the excavation indicate a change in occupational structure during the early beginning of this phase, VId2/VId3 (Gerritsen and Özbal 2016, 204). Additionally, during this phase, the area encompassing Trench L12 and the central courtyard was separated by a constructed clay embankment. Structures 20 and 22 were located in Trench L12. Structure 22 was interpreted as a small rectangular semi-subterranean room containing ceramic material interpreted as cooking vessels by the pottery specialist; nevertheless, it seems unlikely the place was used as a living space (Gerritsen and Özbal 2016, 204). From Structure 20, only the west-wall could be excavated, and the remaining part fell beyond the excavation perimeter east of the balk. Structure 18, abutting Structure 20, consisted of a series of white surfaces which covered a large extent of Trench L12. No architectural elements were found although several clusters of fire pits ranging in size, some with burnt soil

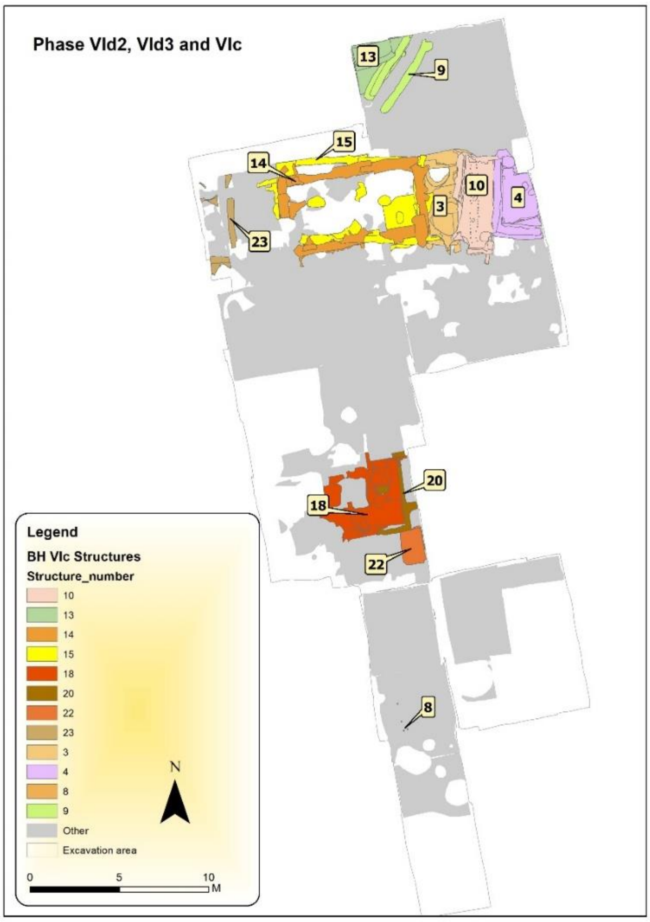



*Figure 12 - Overview of the structures discussed in this section.*

and organic material, suggest that extensive activity took place in this area. Possibly, Structure 18 served as a semi-enclosed area contemporary with and belonging to adjacent Structure 20 (Özbal and Gerritsen 2015, 37-39).

The material culture went through several noteworthy changes during this period, in particular by the end of this phase (phase VIc). Phase VIc, the end of this period in the analysis, is considered to be contemporary with the so-called Archaic Fikirtepe styles from a regional perspective (Gerritsen and Özbal 2016). Lastly, one noteworthy material change we see at the end of VIc is a gradual shift in ceramic composition, from a predominance of calcite inclusions to a predominance of quartz and feldspars particles (Gerritsen, Özbal, and Thissen 2013a, 98).

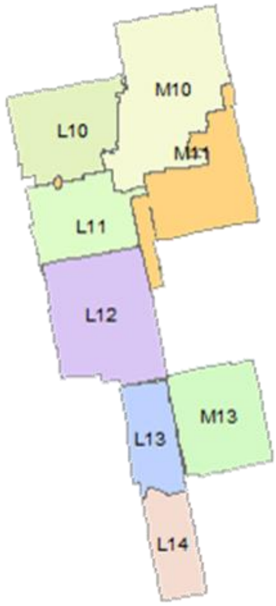
# Chapter 4: Case-specific methodologies and hypotheses

For the last few decades, GIS has increasingly played a significant role in documenting data during an archaeological excavation. This modern process of digital documentation allows for more careful recording of archaeological datasets in which much of the material is recorded in a 2-dimensional and sometimes 3-dimensional geographical space. However, it is the aim of this thesis to surpass the mere descriptive functionality of GIS and to use it as a technique to analyze the material culture and different areas within the settlement. How can a spatial analysis of archaeological material from Neolithic Barcın Höyük be conducted and be meaningful for the interpretive side of archaeology? By applying several multiproxy analyses in a spatial manner, the research questions will be studied. In this way, the research attempts to study formation processes and the material assemblage from a bottom-up perspective. This is done by using the archaeological material that has been carefully recorded during the course of the excavation. First, a brief overview of the excavation methodology is presented, afterward, a more detailed discussion of the methodology applied for this thesis is given.

## 4.1. Excavation methods.

At the start of the excavation in 2005, the excavation methods for documentation were mainly paper-based. In 2005, the digitalization of field archaeology in Anatolia and most other parts of the world was still in its early phase. Therefore, initially, information about contexts was written down on locus and lot paper forms. Later, this data was added to a relational database (Microsoft Access). The locus form was used to describe the complete context. The lot form was used to describe the process of excavating the locus on a daily basis. The contexts were first drawn on paper, but most of these got digitized (by the author among others) in later years. In addition to the context information and field drawings, the finds were recorded using tags that were numbered by a so-called: "BH (Barcın Höyük)" number. These finds were immediately applied, but later re-evaluated in specific categories and added to the database. Several of these Categories were: Chipped Stones, Grindstones, Objects, Shell, Pottery, Animal Bone, Human Bone, Worked Bone, Sample, Glass or Plaster. In addition, information about the date, the texture of the soil, elevation, and excavator was recorded. Several of these categories were studied for this research and will be explained further in this chapter.

*Figure 13 - Excavation trench overview.*




Barcın Höyük started to use a relational database for its excavation in 2011. In this relational database, a unique ID was used to link the nominal data recorded during the excavation to its spatial context in the field (combination of trench and locus). In this way, all the individual contexts found during the excavation could be linked to information corresponding to this spatial unit. Information such as its elevation, number of artifacts, year of excavation, stratigraphical placement, phasing, etc., are recorded. For this thesis, however, the most important link available in the dataset is the connection between the context, its artifacts, and its phasing assignment. The connection between these three elements allowed for a more detailed intra-settlement spatial analysis, in which clusters of artifacts could be analyzed.

After the completion of the excavation in 2015, the database was used to assign a relative stratigraphic phase to most archaeological contexts. Working on this relative phasing assignment is still ongoing but has progressed enough to allow for a more detailed study of the material culture. Most probably more stratigraphic changes will be made in the future.[10] The relative phasing assignment used in this thesis is based upon the relative phasing of architecture and pottery, as well as on the Harris Matrix which was constructed after the excavation. The establishment of this relative phasing for the archaeological material of Barcın Höyük was essential for the research conducted in this thesis.

Analyzing the archaeological material was done based on the relative sub-phases that were established for the Neolithic settlement period. As was also presented in the earlier background chapter, Figure 14 illustrates the Neolithic time periods and their corresponding stratigraphical names. The Neolithic occupation at the site starts around 6600 calBC and continues until the beginning of the 6th millennium. Although habitation continued without any significant hiatuses during the Neolithic period, the sub-phases show signs of noticeable changes in architecture and material culture. The spatial analyses conducted in this thesis aim at shedding a different light on these changes in occupation and add a different perspective over the changes in use of space that occurred over time.

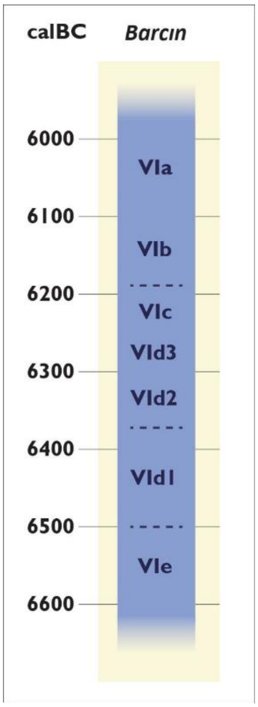



*Figure 14 - Subdivision of the Neolithic occupation phases at the excavation.*

[10] The database used in this thesis, was updated until January 19, 2018. Future improvements to the database will definitely be made by Dr. F. Gerritsen and other members of the excavation. Additionally, some provisional data related to the macro ceramics was provided by L. Thissen's, which was used in the analyses in this thesis. In the future, data will be made accessible via the Data Archiving and Networked Services (DANS): https://dans.knaw.nl/.

## 4.2. Spatial analysis methods for intra-settlement analyses

The aim for this thesis is to examine places of activity and abandonment on an intra-site level, to allow for a better understanding of the use of space at Barcın Höyük. By analyzing the spatial distributions in GIS, we are able to reconstruct the proportional distribution of artifacts within the settlement to a more accurate degree than would be possible without a digital recording system. Furthermore, having the geographical location of the artifacts enables for quicker analysis of multiple strings of artifacts and data. This allows for more careful spatial analysis and the ability to combine many different strings of data types, shapes, and sizes, as is done in this research.

The proxies used for analysis in this research will be compared from two primary "scales of observation". The larger scale aggregates the material assemblages and contexts to the level of proposed household sectors. This is done to understand possible differences between courtyards, residential complexes, and midden areas. The smaller scale looks at the data from per locus, the smallest archaeological context spatially identifiable. This point pattern analysis can be more meaningful in determining differences between structures, or within different areas of one single courtyard. Additionally, this data is used to interpret differences between structures and contexts.

Some archaeological work on spatial analysis and point-pattern analysis was conducted by David Clark, Ian Hodder, and Kenneth Kvamme, starting in the early 1970s (Hodder and Orton 1976, Clarke 1977, Kvamme 1990). One of the more recent examples employing this spatial analysis is Richard Fletcher's work on several Chalcolithic settlements in Southern Israel in 2008 (Fletcher 2008). In his study, he used spatial autocorrelation of settlement to define a methodology for his research. One of the most important factors to take into considerations when conducting spatial analyses is the following: How is the spatial data distributed and related? From a cartographical perspective, data can either be classified as continuous or discrete. Discrete data is data that has clearly defined edges, whereas continuous data smoother transitions between two fixed locations. In archaeology, for example, microartifact concentrations are often calculated as continues data, using interpolation techniques such as Inverse Distance Weighting or Kernel Density analysis to calculate average values in between points on a certain extent. In contrast, boundaries of loci are often drawn as a clear, discrete, boundaries representing the edges of a certain context. The point-pattern analyses in this thesis are not interpolated using special techniques, instead, other spatial autocorrelation tools were applied.

Many of the methods to calculate statistically significant areas are based on Tobler's First Law of Geography, which states that: "everything is related to everything else, but near things are more related than distant things" (Tobler 1970). In this thesis, the ArcGIS for Desktop software package was used to visualize and interpret the data in a GIS. For the calculation of significant clustering, the Local Moran's I tool was used to determine zones that yielded higher or lower clusters of values within the dataset, on several occasions. This spatial autocorrelation tools developed by Luc Anselin is based upon the statistics developed by Moran in the early 1940s.[11] "Local Moran's I" can be useful for calculating the significance and probability of significant

[11] The way this tool operates is that it calculates the mean of the entire dataset. After calculating the mean, it calculates the standard deviation of each individual feature (point of locus). Based on this, a P-value and Z-score are assigned to each individual point, corresponding roughly to the probability of non-randomness and standard deviation, respectively. After the features are weighted according to their significance, each feature is compared with its neighboring features, to understand the similarity of neighboring P-values and Z-scores. If spatial autocorrelation exists within a group of neighboring P and Z data, they are evaluated either as a Low Spatial Cluster, a statistically significant cluster that shares similarly low values, or a High Spatial Cluster, a statistically significant cluster that shares similarly high values. Values outside these clusters are marked either as insignificant, if they are close to the mean value in the dataset or are considered outliers.

clusters on a local scale (Anselin 2010, 11-12). The high number of insignificant points identified in analyses of Barcın's data makes the tool unsuitable for comparing settlement spaces as a whole. However, in some cases, cluster analysis proved effective in pinpointing artifact concentrations.

To analyze differences between settlement spaces and buildings, a spatial join of geographical data was used to calculate averages that combine quantities of for these areas. For synchronic artifactual analysis between spaces and buildings, this proved overall more effective. However, such analysis is more heuristic in nature and assumes discrete boundary of spaces, based on architectural elements or other features, rather than solely based on statistics or values. The following maps are aimed at illustrating how the rough division of settlement sectors was divided, during the time of excavation, and was used to compare different areas during this analysis as well.

### 4.3. Interpretative division of settlement areas.

As was already mentioned in the introduction (chapter 1) and further discussed in the background chapter (Chapter 2), during the course of the excavation Barcın Höyük was divided up into different segments, mostly based on architectural information. In this section, these area divisions will be briefly discussed. These sections are introduced here first, so that the later suggested area hypotheses and conditions (e.g. shapes, sizes, and quantities) of material can be better depicted. The settlement areas will once again be shown in chronological order, starting with the earliest VIe phase. One thing to note at this point is that these divisions are not aimed at differentiating the built environments of each phase. Structures have been discussed in Chapter 3 and will be re-explained in chapter 6.

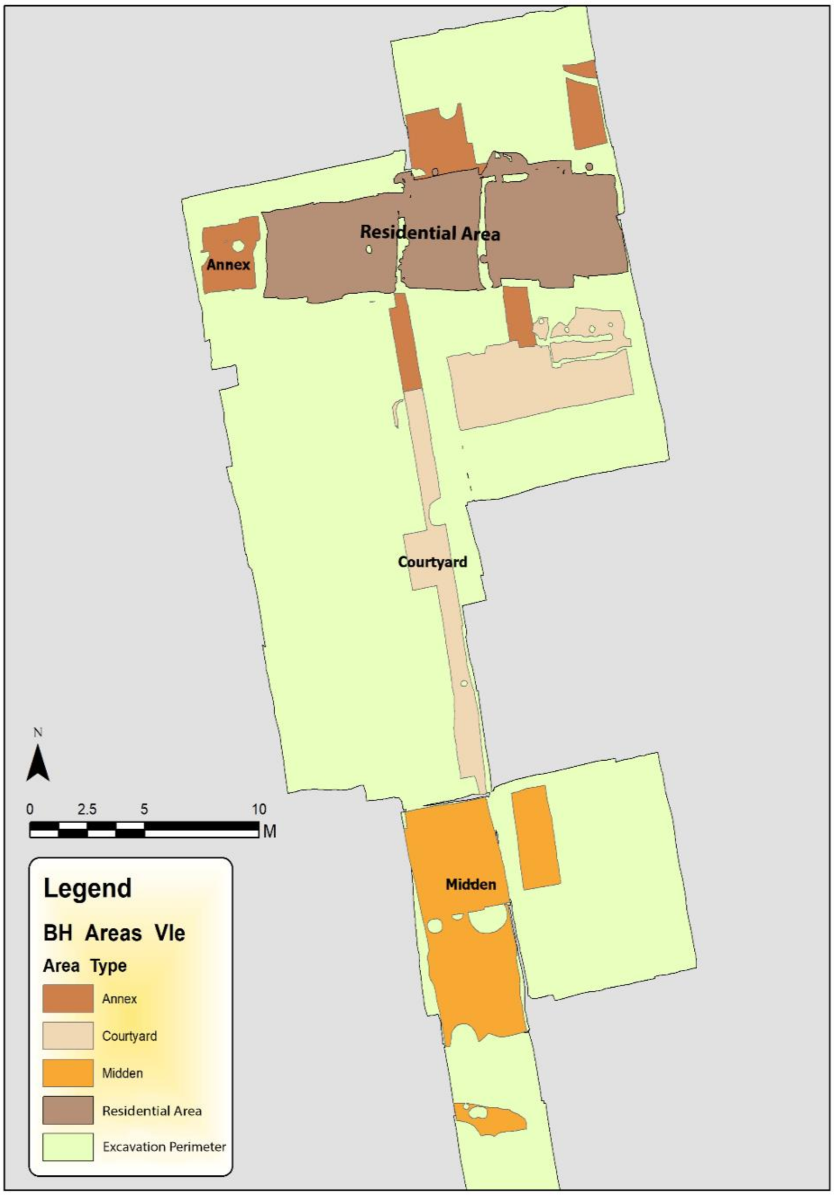



*Figure 15 - Showing the division of settlement areas for phase VIe, based on interpretation and earlier research.*

The Neolithic occupation period called phase VIe, marking the beginnings of the settlement was divided into four areas based on earlier described, architectural interpretations. These four areas are defined as residential area, annex, courtyard and midden area. These four areas are also depicted in Figure 15. As was mentioned earlier, there seems to be a continuation of the use of space throughout much of the Neolithic occupation. Therefore, descriptions of these four independent areas are also used in later phases. Nevertheless, a more nuanced depiction of these areas, including differences between built environments, is presented in the discussion Chapter of this research (Chapter 6). Although the structures changed and were rebuilt numerous times, they often were constructed in similar locations after settlement in Phase VIe. By researching the archaeological material of the other areas, we see whether there is a continuation in material refuse as well. In other words, researching these areas shows the correlation use of space and abandonment locales related to the site's archaeological material. Ultimately this might lead to a better understanding of the behavior of the inhabitants over time.

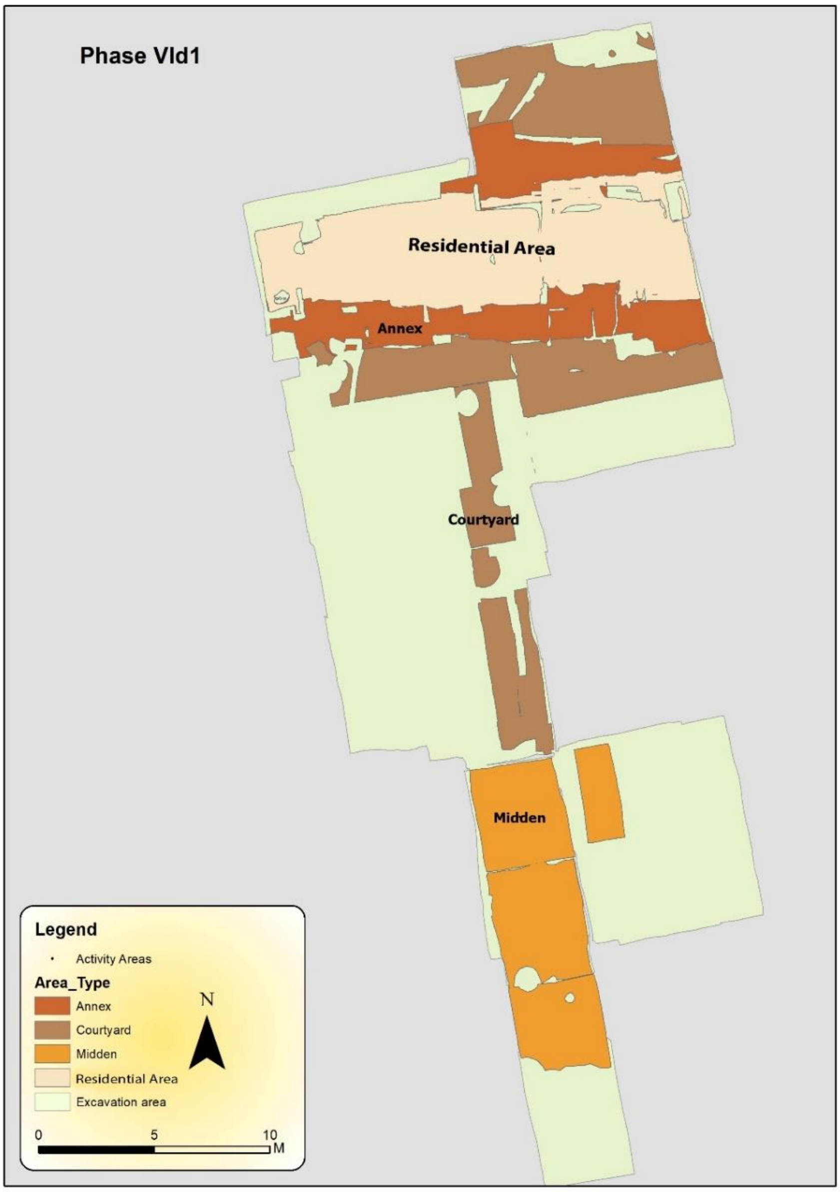



*Figure 16 - Showing the division of settlement areas for phase VId1, based on interpretation and earlier research.*

During phase VId1, the distinct "settlement areas" have been adapted slightly compared to the earlier VIe phase, as can be seen in Figure 16. Spatially, only small changes occurred within the settlement layout. For example, one of these changes is the expansion of the residential area slightly more westwards, with the addition of Structure 21 in phase VId1. What we do see is that the midden area in the southern part of the excavation remained on the same location. This, however, does not necessarily indicate that the refuse of material remained in the same manner, as we shall analyze in the later steps of this research.

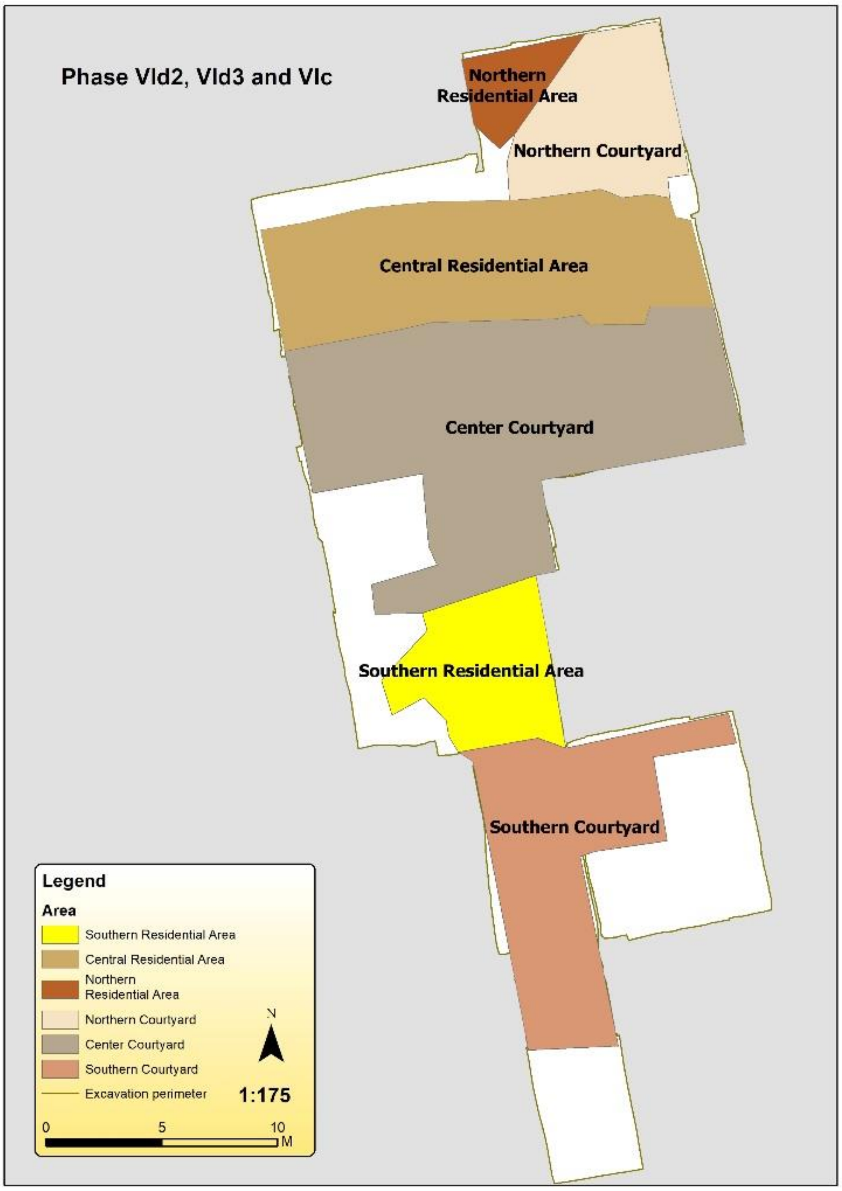



*Figure 17 - Settlement area division of phase VId2, VId3 and VIc combined.*

Based on the settlement layout discussed in the background chapter (Chapter 3), Figure 17 illustrates the generalized settlement areas used for the spatial analysis of Phase VId2, VId3, and VIc in the next chapter. In contrast to the previous periods, there were no clearly distinguishable annexes defined during the excavation, meaning the south and north side of the row of houses did not clearly identify an annex area, as was the case in earlier phase VId1. Instead, for this phase three courtyards are defined: North, Central, and South as well as three similarly-described distinctive “residential” areas. The southern courtyard does not show signs of being used as a midden, as in older phases, therefore in this phase this area is also described as a courtyard. However, one of the reasons for differentiating this area is to see whether the material from this space, shows similar patterns compared to earlier phases.

## 4.4. Categories for multiproxy analysis

The archaeological assemblage of Barcın Höyük was compared and analyzed in several different ways, in order to create a more balanced understanding of the locations afterward. The analyses are composed of different datasets that can roughly be categorized as Macro- and Microartifacts. There were two fundamental criteria in the decision-making process in which the "proxies" had to fit. First and foremost, the category had to be meaningful for studying use and abandonment processes. Second, the category had to be proportionally quantifiable. For example, one cannot use direct counts of pottery sherds for each locus, because a larger locus would likely yield more sherds. To equalize these measurements, the analysis in this thesis chose to rely on proportional measurements only. For example, for ceramics, an average sherd weight per context was calculated, and for microartifacts, samples per liter were taken into account. Categories other than the ones described below were experimented with. For example, the fragmentation of lithic macroartifacts, but unfortunately yielded insufficient information for inclusion in these analyses. Additionally, an attempt was made to categorize and "rank" the "use objects" (discussed below) in terms of their condition, but this proved to be too time-consuming and produced results that were too unsatisfying to be included.

### *4.4.1. Macroartifacts*

#### 4.4.1.1. Average Sherd Weight (ASW)

The first artifact type to be considered for the analysis was the large ceramic artifacts. Ceramics were the ideal type to study for use and abandonment processes because the data in the database was well-defined by pottery specialist Laurens Thissen and the whole dataset was more or less completed by the time this research began. In the analysis, Average Sherd Weight (ASW) and Abrasion are considered. Both of these analyses were conducted per locus.

For the ASW, the total amount of ceramic sherds found within each locus was divided by the total weight of these sherds in each locus. The total weight and amount were calculated by summing all individual BH numbers belonging to a particular locus. The division of the sherd weight by the total amount results in an average weight per sherd for each of the loci in the excavation. Therefore, a high ASW refers to contexts which have on average bigger sized sherds. This can only be compared if the composition and thickness of the ceramics are roughly the same, otherwise, sherds with a higher density would also result in a higher ASW. However, in the early and middle stages of Barcın Höyük's Neolithic occupation, such big changes were not documented. Additionally, cross-comparison of phases in a diachronic way was not the main focus of this research. Instead, the synchronic comparison between different settlement areas was most significant.

#### 4.4.1.2. Abrasion Index

The abrasion of ceramics was considered for each locus. The abrasion rate was calculated in two ways. First, the abrasion of sherds was ranked using an ordinal scale for each locus. This scale is determined based on the classification the pottery specialist assigned during the study of the ceramics. The classifications in the analysis of this thesis are No abrasion, Mixed abrasion (although sometimes, wrongly, referred to as medium abrasion), and Strong abrasion. No abrasion means that the sherds showed no signs of wear and were found mostly in perfect condition. Strong abrasion illustrates the opposite, heavily weathered deposits. Mixed abrasion means that the ceramic specialist had difficulty determining the samples and that there were artifacts that showed light abrasion or medium to strong abrasion. Ultimately, sherds indicated as mixed abrasion do not yield much information about the formation processes.

Second, an Abrasion Index was calculated as a score between 0 and 1. The value was derived from the same ordinal data as was explained above. However, for point-pattern analysis and spatial distribution purposes, calculating a score proved more effective. This score was calculated based on the number of sherds categorized as “Strong”, “Mixed” and “No” abrasion. The score represents a total value that was calculated per locus. This means that a locus with a score of 1, would consist of sherds that only were strongly abraded. In contrast, loci that are closer to 0 contain more Non-abraded sherds with fresh breaks on average. Naturally, 0.5 score equates to contexts containing both Non-abraded, Strong abraded and Medium abraded sherds.

4.4.1.3. Objects

Artifacts referred to as "objects" during the excavation were included in this analysis. For the objects, the concentration of finds was studied. As was explained earlier in this section, at the Barcın Höyük excavation BH numbers were used to tag all the finds during the excavation. One of the most common artifacts tagged were the objects. Objects included in the analysis were the ones made of bone, stone, and ceramic. In general terms, objects can be defined as items that can be connected to some form of daily use. Some examples of objects are (bone) spatulas, (bone) awls, (bone) pins, (bone) hook buckles, ceramic spindle whorls, stone grinders, stone axes, etc. Therefore, we can consider objects in the way Dunnell and Stein argued, as "products of human technology" (Dunnell and Stein 1989, 32).

The combination of objects with the other material categories can be a strengthening factor in making inferences about certain places. Naturally, working with the counts of objects can give biased views if solely used, as larger contexts are expected to have more objects naturally. However, since this research has targeted specific contexts (surfaces, layers of collapse, pyrotechnic features, and layers), and taken out pits, burials, and other contexts that might yield large concentrations of finds, a comparison can be done more evenly. Additionally, not just one context or locus is seen as significant, but rather a collection of concentrations of multiple loci within an area is more meaningful and can, for example, be regarded as an area with higher overall "activity".

### *4.4.2. Microartifacts*

Lastly, microartifacts were studied and used for a detailed spatial analysis. At Barcın Höyük microartifacts were classified as less than 1 cm in size and recovered from the heavy residues after wet-sieving remains of floor deposits collected from various contexts. Studying microartifacts can be an important tool in understanding how spaces were used during their lifetimes. In this study, microartifacts represent the smallest scale of artifacts being examined. The benefit of the study of micro-artifacts for the analysis of human activity is that they are more likely to be found on the place they were deposited, and moreover less likely to be moved by either cultural or natural formation processes, as suggested by Ullah and colleagues. Therefore, they are a great contribution to making inferences linked to people's use of spaces (Ullah, Duffy, and Banning 2015; 1240).

In the field, each micro artifact sample was recorded using a total station, and its location was determined using GPS coordinates. During the excavation, microartifact (MDA) samples were mostly taken from surface contexts in order to research their composition. For larger, more spacious, contexts, GPS coordinates were taken from these locations marking the area from which they were taken, based on a 50 by 50-centimeter grid. For smaller loci (roughly less than half a meter diameter square), MDA samples were recorded for the whole context and a center point was used to visualize the separate values for that particular context. The sampling methodology used during the excavation parallels Ullah's randomly selected "pinch" sampling points (Ullah, Duffy, and Banning 2015; 1243).

For each of the samples taken, the total liter of soils was recorded. This allowed a detailed relative distribution analysis of the micro-artifact distribution. The total amount of particles per liter was recorded and compared using several cluster analyses, which will be discussed in the following section. By studying the total number of particles per liter, “cleaner” and “dirtier” areas could be analyzed. This will be referred to in the analysis as the “cleanliness index” (Özbal 2006). In addition to this, although not the main focus, the variation in micro artifact types will be mentioned. For example, in some cases, it might be noteworthy to see whether there is an overlap between concentrations of ceramic macroartifacts and ceramic microartifacts.

The sampling recording method for microartifacts was used from early on during the excavation, but the number of samples increased over the years. This means that the earliest phases are represented by more samples (Figure 18). On the one hand, this results from the method becoming more standardized, while on the other, it reflects an increase in the surface contexts exposed in the earliest occupational periods of the Neolithic. In large part, this has to do with heavy pit digging activities that disturbed Neolithic phases VIc and later.[12]

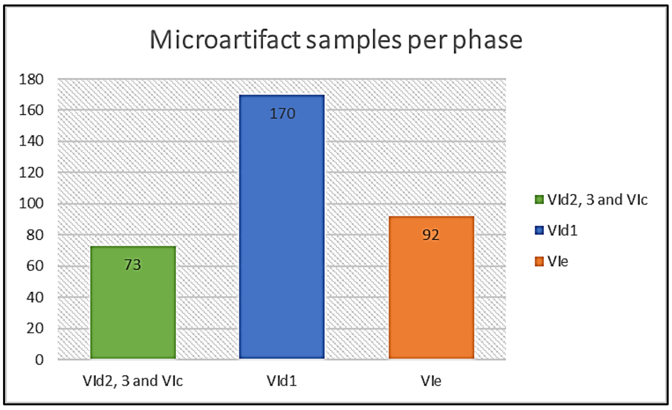



*Figure 18 - Overview of microartifact samples taken per phase. In this research, VId3, VId2 and VIc were combined.*

[12] See the background chapter for more detailed information about these phases.

## 4.5. Hypothesizing settlement areas and indoor structures at Barcın Höyük

*Table 2 - Summary of settlement areas hypotheses, based on earlier research and personal predictions. The content of this table is discussed in more detail in the sections below.*

| Analysis Proxy | Midden Areas | Courtyards | Annexes | Residential Areas |
|---|---|---|---|---|
| **Average Sherd Weight (ASW)** | Low: fragmentation by secondary deposition, and post-depositional forces (also abrasion). | Low: More secondary deposits and trampling. | High/average (lower than residential areas): possible more secondary deposits. | High: Presence of more primary deposits due to increased activity. |
| **Abrasion Index** | Average/High: Secondary refuse material deposited here, post-depositional processes. | High: strong abraded due to trampling. secondary depositions and natural formation processes. | High: relatively strong abraded due to trampling other natural formation processes. | Low: Primary refuse, Indoor Practices, less exposed to natural formation processes. |
| **Cleanliness Index** | High/Relatively "Dirty": Fragmentation, Abrasion debitage | Low/Relatively "clean": secondary refuse, aeolian transport | High/Relatively "Dirty": Secondary refuse, aeolian transport, and activity | High/"Dirty" areas: Trampling, Indoor practices |
| **Objects Count** | High: Secondary refuse, more fragmented, strong abrasion(?). | Low: Expected to be found closer to Primary deposits. | High: Secondary sweeping material, usage of Annexes for activity related purposes. | High: More Primary Contexts: More indoor activities, Production related practices. |

In this section, the settlement areas described earlier will be discussed with regards to the multiproxy criteria and analyses that were chosen to test. In this way, this section is aimed at providing the most suitable expectations for different parts of the settlement. Table 2 provides my personal predictions based on common sense and previous studies (see below) about the types of patterning one would expect to see regarding the breakdown of the macro and microartifacts across the various spaces within the settlement. It should, however, be noted that this always remains a generalized picture, as one cannot simply assume that one area is the same as the other. However, in order to categorize the material assemblage in some form, some generalization or hypotheses about what to expect for certain areas should be made. Although there are many different reasons for artifact deposition to consider, and the possibilities opted in this section might not do justice to all, it will discuss possible differences in artifact deposition per area and base a hypothesis on these expectations. However, first, a brief introduction to the classification methods as discussed earlier in Chapter 2 is needed to justify the testing methods.

Studies in the past have generally categorized material assemblages according to the intent they were disposed of. Most noteworthy names mentioned related to this topic were Lewis Binford, Kathleen Hull and Michael Schiffer in the late 1980s (Binford 1978b, Schiffer 1983, Hull 1987). Although all of the above attempted to construct a model for the ways in which material was discarded (and by which intent) using similar terminology, their descriptions differed slightly. In this thesis, the description of Hull is followed most closely, as she described the process of discard specifically for the combination of macro and microartifact distribution, whereas Schiffer and Binford focused mostly on the deposition of the larger macroartifacts. In this way, a most suitable case-specific division of *primary*, *secondary* and *de facto refuse* for different settlement areas will be discussed (Hull 1987, 773).

Generally speaking, in Hull's definition, we can consider areas where we find large macroartifacts, together with a high quantity of microartifacts more likely to be *primary refuse* areas. In her study, she exemplifies for example flint knapping places as an activity that could produce such a pattern in macro and micro debris. However, depending on the activity the source material might change.  For Barcın Höyük, no such related workshops were interpreted directly. However, this theory might still be applicable to some areas of the settlement. *Secondary refuse*, on the other hand, is defined as areas with only macroartifacts, and little to no micro refuse. Significant in this definition is that macroartifacts are more prone to be moved after usage, taking it away from its primary context. This can also result in material getting more scratched, abraded or fragmented, supposing more external forces are applied to the material. *De facto refuse* is difficult to define and might not be as applicable for Barcın Höyük's material assemblages. It refers to depositions that were abandoned because of size and relatively unimportance (Hull 1987, 773, Schiffer 1983, 679).

### *4.5.1. Residential Areas*

Returning to Barcın Höyük's settlement areas, the built environment, or more commonly in this thesis referred to as the "residential area", will be discussed in this section. In general, it can be argued that this part of the settlement contains the most primary contexts among other areas and most likely saw the highest amount of human activity. Naturally, these higher amounts of daily activity had its effect on the material assemblage as well. But how can we separate primary refuse areas from secondary or de facto refuse areas within the residential area? Following Hull's definition of primary refuse areas -where macro- and microartifacts are both abundantly found- residential areas do not necessarily contain solely one category. For example, for cooking related practices, one might leave some pots on the fireplace, but this would not leave microartifact debris in a similar way which, for example, flint knapping would do. Therefore, even though this area probably contains more primary refuse material than any other area, it is nearly impossible to generalize one all material from one settlement area or structure. Since overgeneralizations for whole settlement areas, it is more suitable to discuss the "conditions" of the multiproxy criteria individually and how they relate to these generalized terms.

In terms the Average Sherd Weight (ASW) for macro-sized ceramics, we can argue that activities, as well as other formation processes, affect the ASW of artifact assemblages differently in indoor spaces, compared to outdoor areas. For example, the fragmentation of artifacts due to foot traffic most likely was more significant on the interior spaces of the settlement.  Increased trampling would most likely lower the overall ASW of ceramics (or other large-sized artifacts) within the residential area. However, this also largely depends on what type of surface on which the artifact rested while being trampled. For example, in Eren and colleague's experimental research it is suggested that dryer surfaces tend to have a higher degree of fragmentation compared to saturated surfaces (Eren et al. 2010, 3017). However, the overall impact of trampling within was in the indoor spaces still might be insignificant on the whole, because the likelihood of having "whole" pots or other use wear inside the house might be different than elsewhere in the settlement. In primary contexts, this would most likely give higher ASW values. Maintenance related activities, such as cleaning or sweeping, creating a secondary deposit, might have an increasing effect on the ASW as well. Based on this material, and the fact that the indoor spaces of Barcın Höyük contained a relatively high number of primary contexts, I predict that the expected Average Sherd Weight is higher than other areas of the settlement. Naturally, as was stated earlier this is a generalized prediction and the results may reflect a different picture for some indoor spaces. This issue will be discussed in the interpretation chapter.

Regarding the Abrasion Index for the residential area, some things can be discussed. In this thesis, we take the definition of abrasion as how it was first explained by Skibo and Schiffer in 1987. In order for abrasion to take place; there must be dynamic contact between an abrader and the artifact.[13] Abrasion can happen due to fluvial, aeolian or cultural types of transport. These different mechanisms of friction also play an important factor in the speed of abrasion, as well as the shape it would get (Schiffer and Skibo 1989, Skibo 1987). As mentioned earlier, the rate of abrasion is an ordinal number in this analysis, determined by the experience of the ceramic specialist

[13] This is in contrast with weathering, where force or contact is not necessarily applied by friction, but by mostly natural or chemical processes.

at Barcın Höyük, who made an estimate of the abrasion per find number. In the indoor spaces of Barcın Höyük transport by wind or water seems unlikely, unless it occurred as a post-depositional process. Movement during the time of use of the building would happen more likely due to conscious or unconscious actions by the inhabitants. Nevertheless, the material that was excavated can very well have been exposed to post-depositional processes. In this scenario, the material in which the remains would rest are the determinants for the rate of abrasion. Gravelly, more porous deposits would make abrasion by fluvial transport more likely, while enclosed and thus relatively protected deposits would have an opposite effect. In indoor spaces, and the fill by which structures were later overlain the latter seems more likely. Therefore, it is expected that the abrasion for residential areas to be lower on average, compared to other areas of the settlement.

In terms of microartifact samples, much research studies have used indoor areas and surfaces to determine activity and different use practices. However, as Homsey-Messer and Ortmann (2016) acknowledge, for microartifact analysis there is no "one size fits all" recipe. Therefore, careful considerations are needed to compare settlement spaces for Barcın Höyük. The "Cleanliness Index", part of this research and explained in the previous section, calculates the total amount of microparticles per liter (Özbal 2006). This index, however, does not necessarily directly correspond with secondary or primary deposits. As the models from Hull (1987), but also from Sherwood and colleagues (1995a) suggest, the understanding of primary or secondary refuse places is best done by comparing macro- and microartifacts together. If both sizes are abundantly present and are of similar type, then the finds a more likely a primary deposit and perhaps a sign of an activity.[14] Many studies argued that places where more activities happen, yield a higher concentration of microartifacts (e.g.Ullah, Duffy, and Banning 2015, Ullah, Parker, and Foster 2012, Brown, Witschey, and Liebovitch 2005, LaMotta and Schiffer 1999, Sherwood, Simek, and Polhemus 1995b, Dunnell and Stein 1989). However, cleaning related practices, sweeping of interior surfaces, for example, have also shown to lower the average microartifacts of indoor spaces (Özbal 2012, 330-332). In this case, particles might have been transported to secondary deposits. Some studies also show that the smallest particles remain "trapped" in the surfaces even after cleaning activities, which might still increase the average microartifact quantities of indoor spaces (Homsey-Messer and Humkey 2016). Furthermore, lastly, post-depositional processes might also distort the microartifact number of indoor spaces as porous layers can drop microartifacts from overlaying layers (Sherwood 2001). Considering the above-mentioned arguments, the hypothesis for the cleanliness index of indoor areas still remains higher, on average, relatively, compared to other areas of the settlement.

Lastly, for the number of objects, it is considered that indoor areas have on average a relatively high concentration. This is related to the assumption that many activities went onside inside the structures, and therefore more primary deposits are found inside this area. Naturally, some part might still have been moved around, as Peacock and Galloway (2015) also acknowledge for example that bigger objects are more likely to be moved to secondary refuse areas, but in general it seems more likely to assume a higher amount still remained in the area they were once used.

[14] This is especially the case for flint knapping, or other production related artifact-waste activities.

### *4.5.2. Annex areas*

The annex areas, as discussed in the background chapter of this research already, seemed to have an active role in the daily lives of the occupants during some of the Neolithic phases at Barcın Höyük. This was already interpreted earlier by the researchers, but so far was not supported yet by material analysis (Gerritsen and Özbal 2016, 205). In this section, the expectances of the multiproxy criteria analysis are considered for these areas of the settlement

The expected Average Sherd Weight should be roughly similar to the residential area discussed earlier. This is because annexes tend to show signs of similar activities, including some bench-like features in some of the phases. Specific literature that discusses the ceramic deposition, or other material assemblages, of surrounding built environments seems practically non-existent. Therefore, it is assumed that this area does contain more secondary material, as material from indoor spaces might ultimately be transported to these areas. However, this is more of a speculation, as it is difficult to say where these areas exactly might have been used for.

However, the abrasion rate of the annex area can supposedly show a different scenario. Considering the area was not roofed, the material deposited here may have been more exposed to wind and water-related abrasion, compared to indoor deposits. Furthermore, considering these areas seemed high in activity due to previously mentioned considerations, the effects of trampling, and therefore the movement of the material might also have created higher amounts of wear than in other parts of the settlement. Therefore, the Abrasion Index might be expected slightly higher on average, compared to the residential area.

I hypothesize that the Cleanliness Index will be relatively dirty in the annex areas of the settlement. Considering the inhabitants did some form of cleaning of indoor spaces, microartifact material most likely was transported outside of the structures in some way. This would leave a higher concentration of microartifacts in the annex areas, as a secondary deposit. Additionally, the activities happening in these areas might have left some micro debris as a result. Furthermore, microartifacts might have accumulated against the walls of structures due to aeolian or fluvial transport as well.

Lastly, in terms of object count one would expect a high number of objects in the annex areas compared to the courtyard area, but roughly similar to the indoor and midden areas. In general, as was already discussed for the ASW the bench-like features and some other contexts suggest that at Barcın, for several of the phases, a lot of activities might have taken place on outside of the buildings. This might have increased the total amount of objects discarded here. Possible, the condition of the objects in this part of the settlement might differ, meaning more secondary deposition then on the inside spaces. However, the conditions of these objects were not taken into consideration, but hypothetically they should display more wear than the ones found inside, according to these interpretations.

### *4.5.3. Courtyard areas*

The courtyard areas, especially the ones in the latest two analyzed phases, seemed to have played a role in the settlement at least starting from phase VId1. The Central courtyard, south of the residential area, remained actively used up until at least phase VIc. After phase VId1, we see a development in the south area of the central courtyard and some structures, fireplaces, and surfaces appear. The courtyard area in this phase was located south of the houses and was referred to as the southern residential area.

The courtyard housed some pebbly surfaces, fire pits and was continuously used for burial placement, although it is difficult to link the dead directly to the occupants of the houses (Gerritsen and Özbal 2016, 202-203). So far most of the information about the courtyards comes from evidence such as previously mentioned, but it is interesting to see what activity patterns the artifact assemblage has to offer as well.

Starting with the average sherd weight I would expect to find more secondary refuse in this area, than other places of the settlement because the area was unroofed. Perhaps ceramics used at the fireplaces might have had different activity patterns, but that seems hard to relate to the whole courtyard. Since the courtyard did have an active role in the settlement for a longer period of time, one would expect trampling to have fragmented some of the ceramic material discarded there, most likely lowering the overall average sherd weight in this area. Additionally, wind and water might have had an increased effect on the material found in this part of the settlement as well. Because of this, it seems fair to assume that the average sherd weight in this area could hypothetically be among the lowest across the settlement.

The Abrasion Index, calculated by taking into account the considerations of the material by pottery specialist Laurens Thissen should be, according to my assumptions, high as well. Abrasion rate of sherds increases if affected by wind and water, in the same way that it can fragment sherds and cause a lower overall lower ASW. However, for the abrasion rate, we look at the "roundedness" of the sherd, rather than the rate of ceramic fragmentation within each locus. Furthermore, also the foot traffic in the courtyard area might have an increased effect on the Abrasion Index as well.

The microartifacts, or Cleanliness Index, is difficult to predict for courtyard areas. There are many variables that could change the expectations, for example, one could argue that outside areas such as courtyards and annexes are in general dirtier, but on the other hand, microartifact material might also be more transported and scattered by fluvial and aeolian depositions. Post-depositional processes, such as the overlaying material might also have a large effect on the total outcome for courtyard areas, considering it is a large extent in general. This is very much dependent on what type of soil (porous or not) is laying on top of the courtyard or other areas, as suggested by Dunnell and Stein and others (Homsey-Messer and Ortmann 2016, Dunnell and Stein 1989). Taking these things into consideration, the assumption in this research is that the natural effects outweighed the cultural formation processes and therefore the expectations for the Cleanliness Index are overall lower in the courtyard areas.

Lastly, for the object concentrations, or counts per locus a low number of is to be expected as well for the courtyard area. Most likely, the majority of the objects found in this area are of secondary nature, perhaps deposited of dropped in this area. Unless it is more related or near specific contexts, such as firepits or other types of related contexts that can be related to activity related purposes.

### *4.5.4. Midden areas*

The midden areas excavated in the southern area of the excavation at Barcın Höyük appeared to have a continuous use, at least during phases VIe and VId1. In the phases VId2, VId3, and VIc, the situation of this area remained unclear. In this section, the expectation for the material assemblages, as discussed in the previous section will be discussed. Midden areas are interesting areas to research for archaeologists as they are generally home to larger concentrations of secondary deposits. The appearance of these material artifacts, however, can vary greatly and it seems that the characteristics of midden areas are also case-specific. The research conducted by Kent Fowler (2011), who conducted ceramic depositional analyses on an Iron Age settlement in South Africa, was a great source of information for interpreting such these settlement areas.

As Fowler suggests, the material inside midden area can consist of relatively large, non-fragmented sherds as well as smaller fragmented ceramic material. Therefore, we do not have to expect either a lower or higher ASW. This phenomenon, he refers to as the Completeness Index, in these types of areas for Barcın Höyük's midden areas as well. Furthermore, he adds that these types of areas vary also greatly expected ceramic material, depending on the other surrounding contexts. For example, in his case, midden areas contain also fire pits and small structure like features which naturally tend to change the outcome of the ceramic assemblages. This mainly is caused by the varying human activity it might cause, which would more likely fragment the material in midden areas. Supposing the midden areas at Barcın Höyük were only used as discard area, and therefore not heavily stepped and walked upon, we would expect sherds to be less fragmented in this area and present a Higher Average Sherd Weight compared to for example the Courtyard area of the settlement.

In terms of the Abrasion Index, the midden areas are also interesting to research. As mentioned earlier in this section, In order for abrasion to take place; there must be dynamic contact between an abrader and the artifact (Schiffer and Skibo 1989, Skibo 1987). However, abrasion can also occur due to fluvial, aeolian or cultural types of transport (Schiffer and Skibo 1989, 111). In midden areas, these types of transport are likely to take place as post-depositional processes. At Barcın Höyük, the midden area was located at the southern, lower elevated area of the settlement. This might also have supported these types of transports further. Lastly, the secondary deposited remains may already have been abraded during the transport to the midden area. In the event that the middens were used as depicted above, it is expected to have an average to high rate of abrasion, meaning an Abrasion Index between 0.5 and 1, in this area of the settlement.

I would expect the concentration of microartifacts per liter to be fairly high in the midden area. This is based on the assumption that midden areas are generally the "dirtier" areas of the settlement and that abrasion debris, caused by strong post-depositional processes allows for more micro debris. Additionally, the deposition of the material allows for a relatively porous layer of material to be formed, which might indicate that microartifacts from other elevation levels might distort the overall picture. Because the Cleanliness Index is mostly raised by post-depositional processes, it is also less likely to suppose that transport by wind can decrease this overall index value.

Lastly, I would expect the object count to be relatively high in these areas of the settlement. As many "used" products get discarded in this area of the settlement, I assume that most of the objects are secondary deposits in this area. Although not part of this analysis, as this was not documented during the excavation, I also expect that objects found in this area show more signs of wear, breakage and abrasion patterns, compared to objects found within the indoor areas of the settlement.

# Chapter 5: Data presentation

The results in the following chapter are ordered based on the Neolithic sub-phases discussed in the previous methodology section. Initially, multiple lines of data are discussed, including macro and micro artifacts independently and these results are combined in the interpretation and discussion in the following chapter.

## 5.1. Phase VIe


*Figure 19 - Overview of structures – Phase VIe.*

### *5.1.1. Macro-artifacts*

The macro ceramic artifacts studied by specialist Laurens Thissen refer to all ceramic finds recorded during excavation and recovered from both hand-picked and screened contexts. In the following analyses, material from contexts not directly related to use related floors, such as burials, pits, and other "mixed" deposits was not considered.[15]

#### 5.1.1.1. Average Sherd Weight – VIe


*Figure 20 - Distribution of macroartifacts sherd weight (gram) in phase VIe.*

[15] The choice for removal of these specific contexts was because, these contexts would give a biased comparison between the micro and macroartifacts analysis, as only very little microartifact samples were taken from these contexts. Only the contexts: Pyrotechnic features, layers and Surfaces and collapse (if present) were taken into account into the analysis.

Analyses of the average sherd weight (ASW) of macro ceramics, referring to ceramics which come from hand-picked contexts show they mostly concentrated in L13 (south of the excavation). Though rare, the 19 sherds found within Structures 24 and 25 (see Figure 19 for overview structures) were overall bigger and hence less fragmented (Figure 20). In fact, the sherds from Structure 24 were larger than the ones from Structure 25, although some large-sized sherds were located on the outer edges of Structure 25. These bigger sherds were located on the east side of Structure 25, where

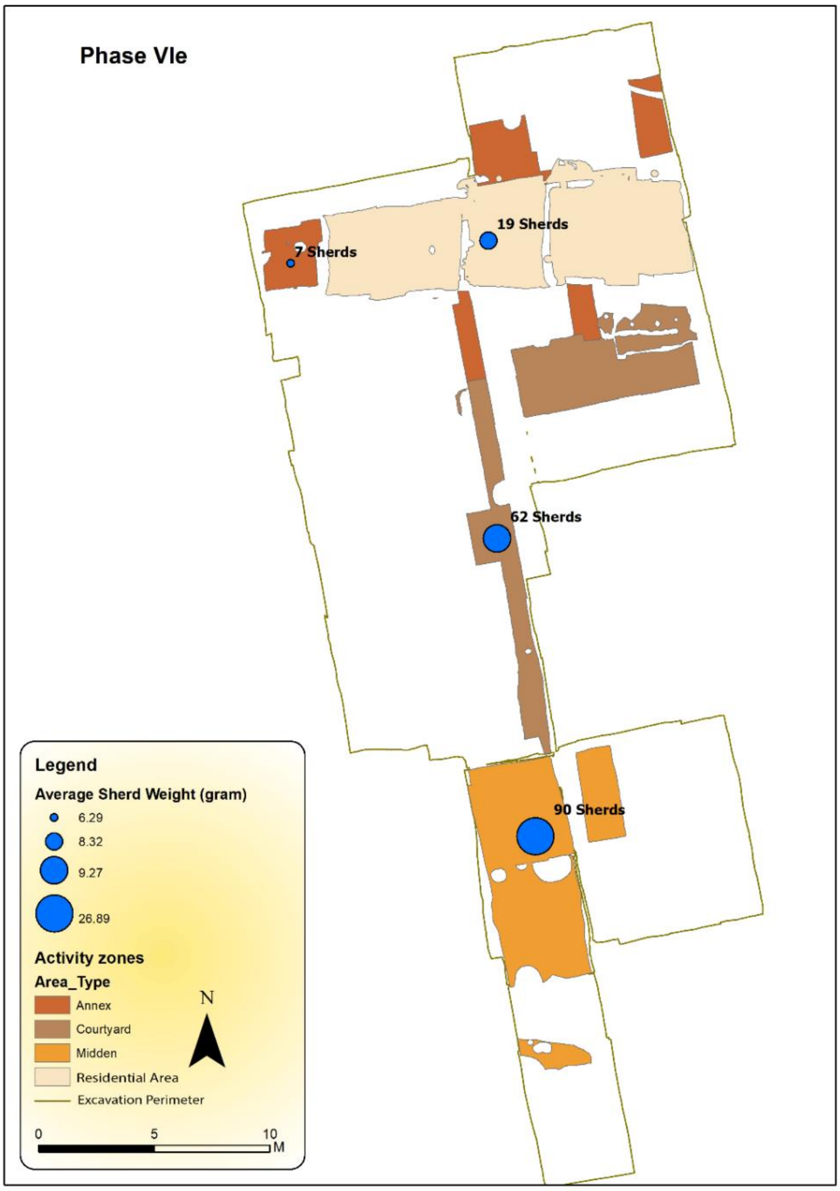



*Figure 21 - Average Sherd Weight aggregated per settlement area.*

surfaces were less well-preserved. Nevertheless, the total number of sherds in this phase that was found was very small overall.

ASW analysis shows a larger variety of sherd weights in the southern area of the excavation, an expected pattern for a midden area, very different from the pattern near and within the structures. L12 and L11 (center of the excavation) represent the courtyard areas of phase VIe. This area seems to have yielded smaller-sized sherds. Though the total pottery counts are not high it does show an even distribution between the outdoor areas, the midden, and the courtyard areas.

This differentiation between the above-mentioned areas within the settlement is presented in more detail in Figure 21 which shows the average sherd weight of phase VIe per sector as was determined at the beginning of this chapter. This map is based on the same data as Figure 20, but instead, all the data is aggregated within the defined areas. The size of the circle symbol indicates the average ASW of these areas. The midden area has a higher overall ASW than the areas with structures and its annexes. To elaborate, this average is based on a total of 178 sherds found in phase VIe that had weight data. Of these 177 sherds, only 7 were found in the annex area, 19 sherds in the residential complex, 62 in the courtyard area, and 90 in the midden area. The numbers are also labeled graphically in Figure 21.

5.1.1.2. Abrasion

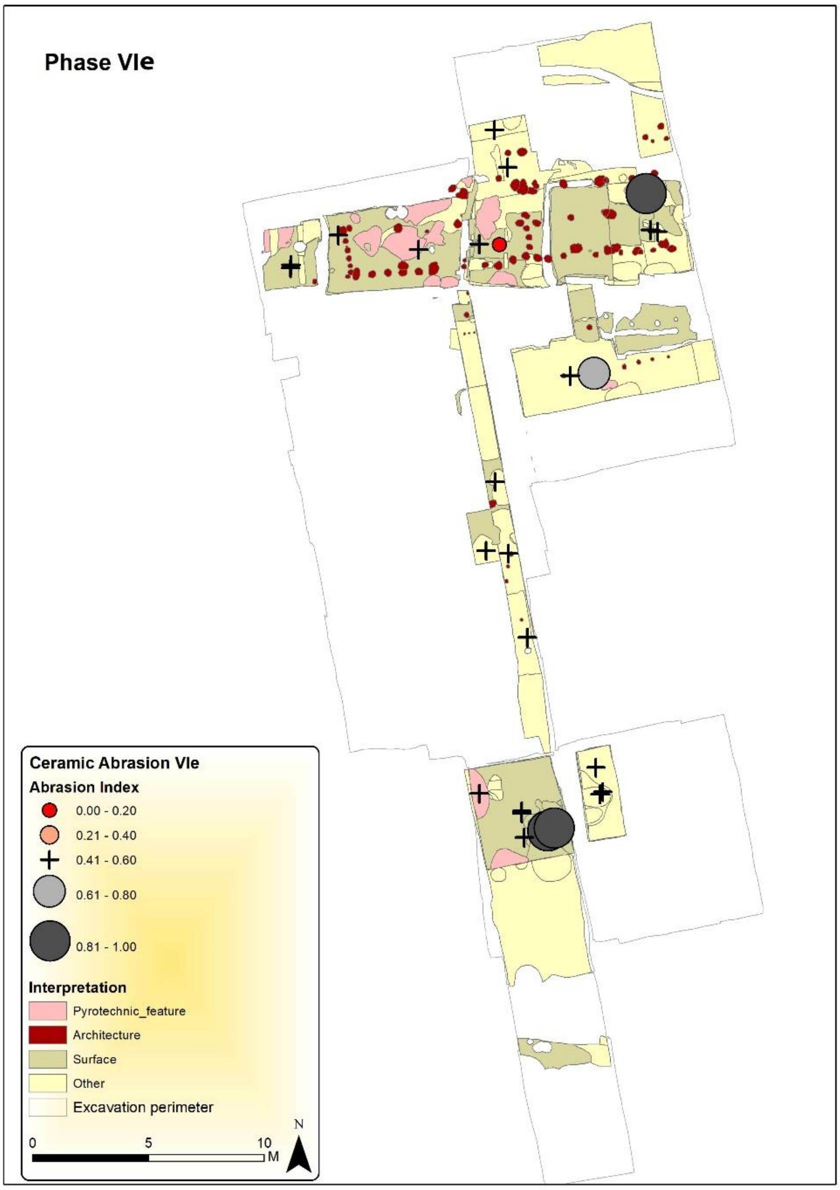
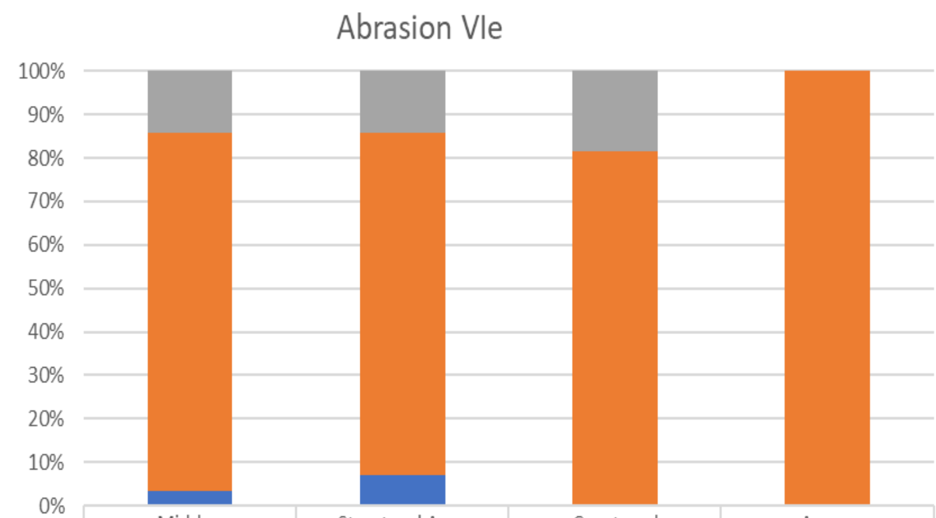



*Figure 22 - Map representing the Ceramic abrasion of phase VIe. The colors and sizes represent the calculated Abrasion Index. A high index value (1,00, dark color and larger size), indicates a locus that only consists of heavily abraded sherds. A low value (0.00, red and smaller sized) accounts for the opposite, a locus with a relatively high concentration of non-abraded sherd fragments. For loci containing index scores around the middle, a cross symbol was used.*

Figure 22 shows the sherd abrasion totals from independent loci across the settlement. The distribution portrays the contrasting sherd counts between the structures and the other outdoor areas, especially trench L13.[16] This pattern parallels the one observed for

[16] Two sherds in trench M11, loci 403 and 431, are part of relatively large layers excavated in 2013. From locus 403 the top elevation was missing, as was mentioned in the database description. Both layers have been interpreted to be VIe as a result of ceramic assessment, rather than a combination of

the ASW. Although the number of ceramics near and inside the structures is low the pattern we see in VIe partially supports the hypotheses raised earlier.




| | Midden | Structural Area | Courtyard | Annex |
|---|---|---|---|---|
| Strong Abrasion | 12 | 2 | 12 | 0 |
| Medium Abrasion | 72 | 11 | 51 | 6 |
| No Abrasion | 3 | 1 | 0 | 0 |

*Figure 23 -Image showing the overall distribution of abrasion per settlement area of phase VIe.*

In the midden area, in the south part of the excavation, we see a more varied appearance of pottery abrasion compared to elsewhere in the settlement (see: Figure 23).[17] Especially considering the pottery counts for this area is higher compared to the other areas. In total, 84 sherds were found in the midden area, 14 in the area with structures, 63 in the courtyard area and only 6 belong to the annex.

[17] I do not discuss the area with structures here, as the number of sherds is very low, and it is difficult to base interpretations on this small amount of sampling data. Generally, at least 20 sherds would be a minimum criterion to base any interpretations on.

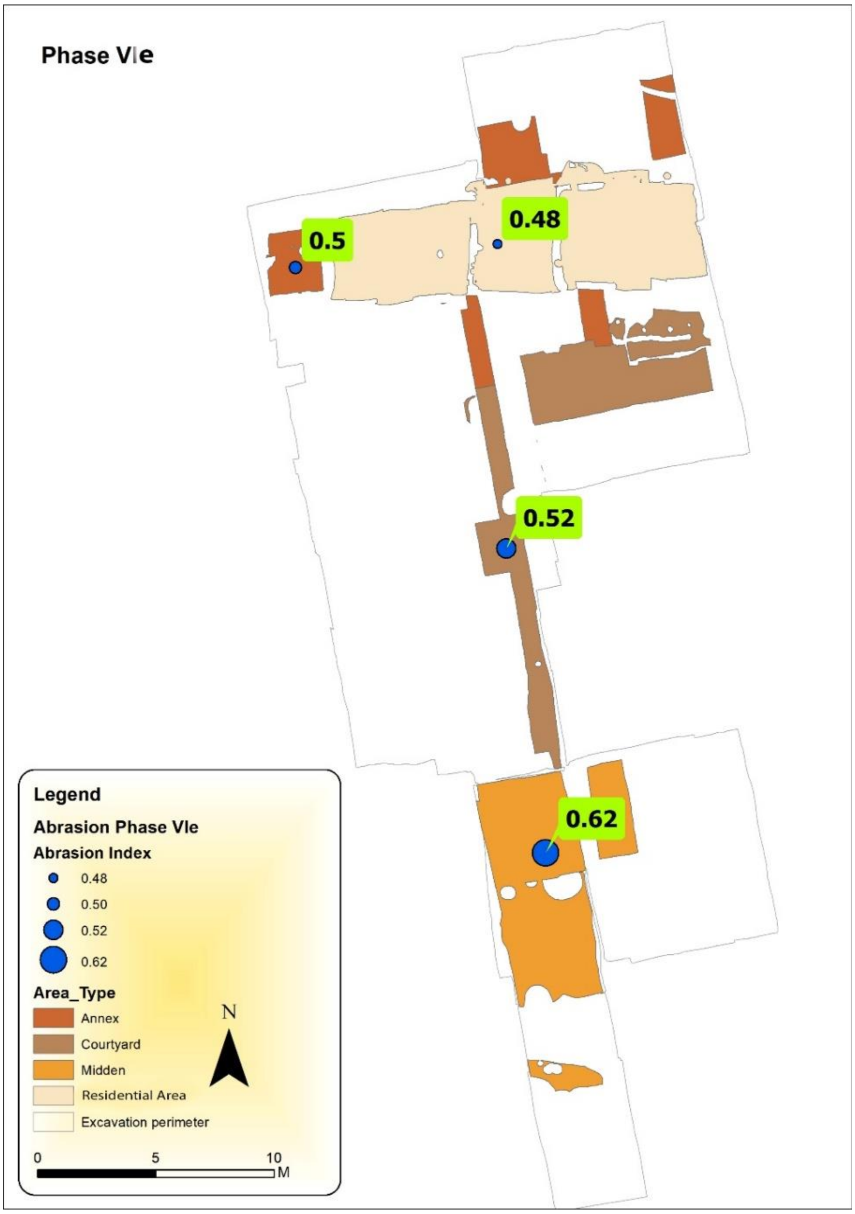



*Figure 24 - Aggregated Abrasion Index for phase VIe per settlement area.*

The area with structures is more difficult to define. Overall, there are far fewer sherds found in this area of phase VIe and many contexts within the structures have a mixed abrasion distribution.[18] However, there was one sherd within the structures lacking abrasion altogether. It was deposited in the Southeast corner of Structure 24 and is the only example of a well-preserved sherd belonging to Structure 24. Although

[18] In this situation, the term "mixed context" is used to define a context that is composed of sherds that are Not, Medium and Strong abraded. Inferences are more difficult to make on these types of contexts.

the residential area shows the highest percentage of sherds lacking abrasion, the sample size is too small to distinguish differences in this situation.

Only a small group of sherds in the northeast corner of Structure 25 showed traces of strong abrasion. One reason why there is a concentration of highly weathered sherds in this corner may be the pyrotechnic feature found nearby (trench M11, locus 690). This circular feature was filled with an abundance of ash and charcoal and had a shallow depression.[19] Possibly, the pottery used in this feature may have had a different composition that deteriorated faster compared to the other pottery. However, the ceramics were found near the feature and may not have been directly related to the context, making it difficult to establish a solid association.

Figure 24 shows the aggregated ceramic abrasion combined per activity area for phase VIe. Figure 24 stresses the higher variation we see in the midden area of L13 and the relatively small number of sherds that were located in the annex and areas with structures. The fact that we see highly abraded sherds in the courtyard, might indicate more abrasion has occurred in this area.

[19] Information from database.

5.1.1.3. Objects

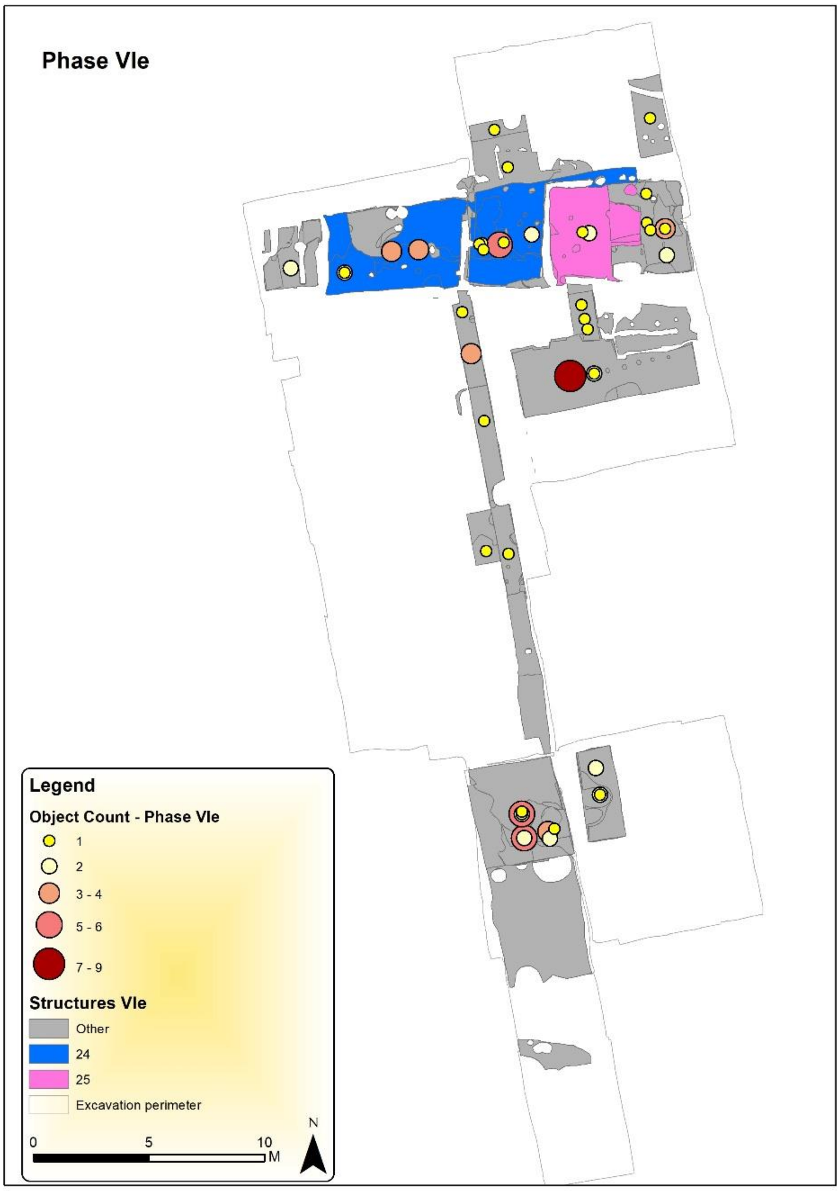



*Figure 25 - Distribution of object density for phase VIe.*

Another category in this research was to look at the overall distribution of object counts during phase VIe (Figure 25). The term 'objects' in this case is used as an umbrella term that is composed of all artifacts that could be related to use practices. In general, the hypothesis raised earlier would be that in primary use spaces, such as living areas, we would expect a higher count of objects. The type of objects can be different sorts of elements, such as clay, shell, stone, bone, and ceramic. Additionally, the artifacts can be included as long as they were found in one piece and only endured light abrasion.

For this analysis, a comparison is made between possible daily use spaces. Among these contexts, it is assumed that a higher concentration of whole objects means a higher possibility that the area was used as a space for living or other active-use. Areas or contexts used for refuse would either show a more dispersed pattern of objects, which presumably would be in a more fragmented state. In phase VIe at Barcın Höyük, the objects included in the analysis show a spatial pattern in line with the suggested hypothesis. Objects seem to show a higher concentration within Structure 24 and 25, with the first containing the highest amount.

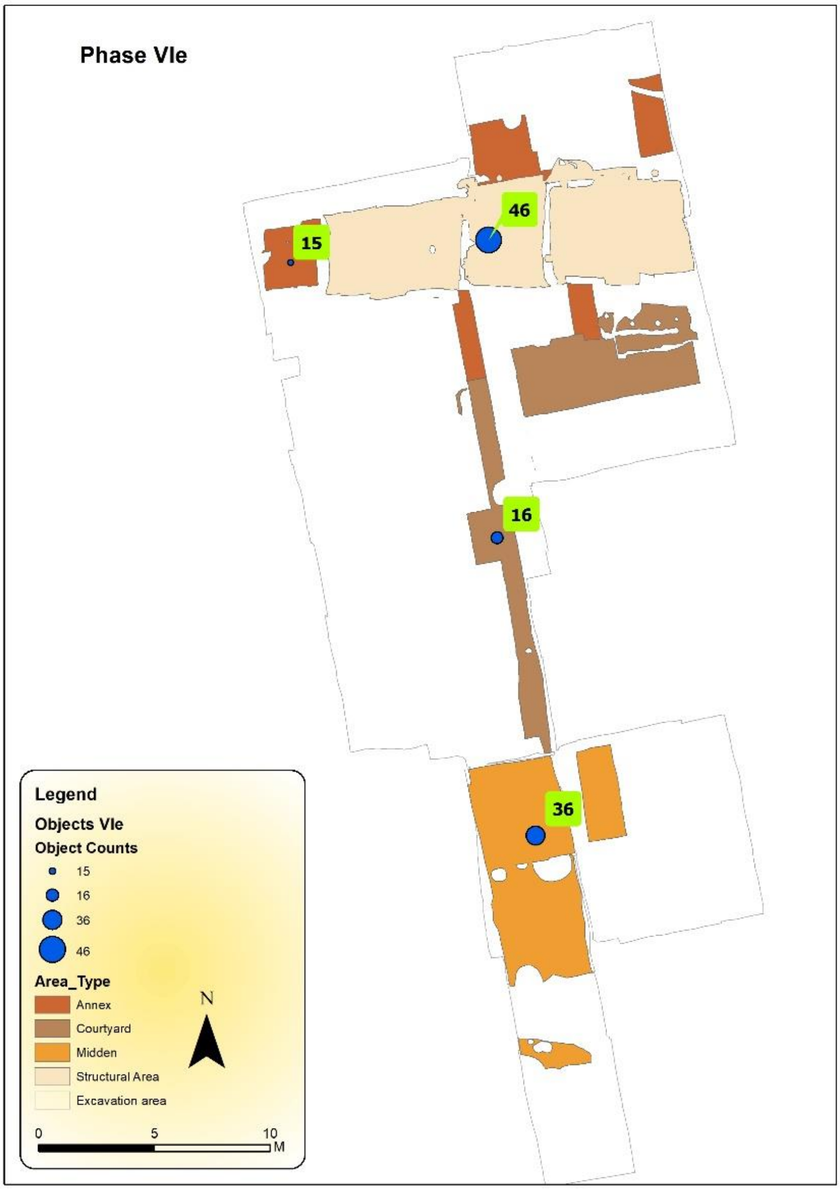



*Figure 26 - Distribution of object density per settlement area for Phase VIe.*

The courtyard and other outdoor areas, on the other hand, reflect a more dispersed pattern with only one or two objects per context. Thirty-six contexts yielded only a single object, the majority of which were found in areas presumed to be at the border of the settlement, in trenches L13 and L14.[20] Figure 26 shows a summary of the object counts per activity area. The structures contain 46 objects, the annexes and the courtyard about 15 and 16 objects. The refuse area has also a higher number of finds with 36 categorized objects.

[20] There is however one high outlier in M11, but this is a mixed context of which it is difficult to make a correct, single, interpretation.

*5.1.2. Microartifacts*

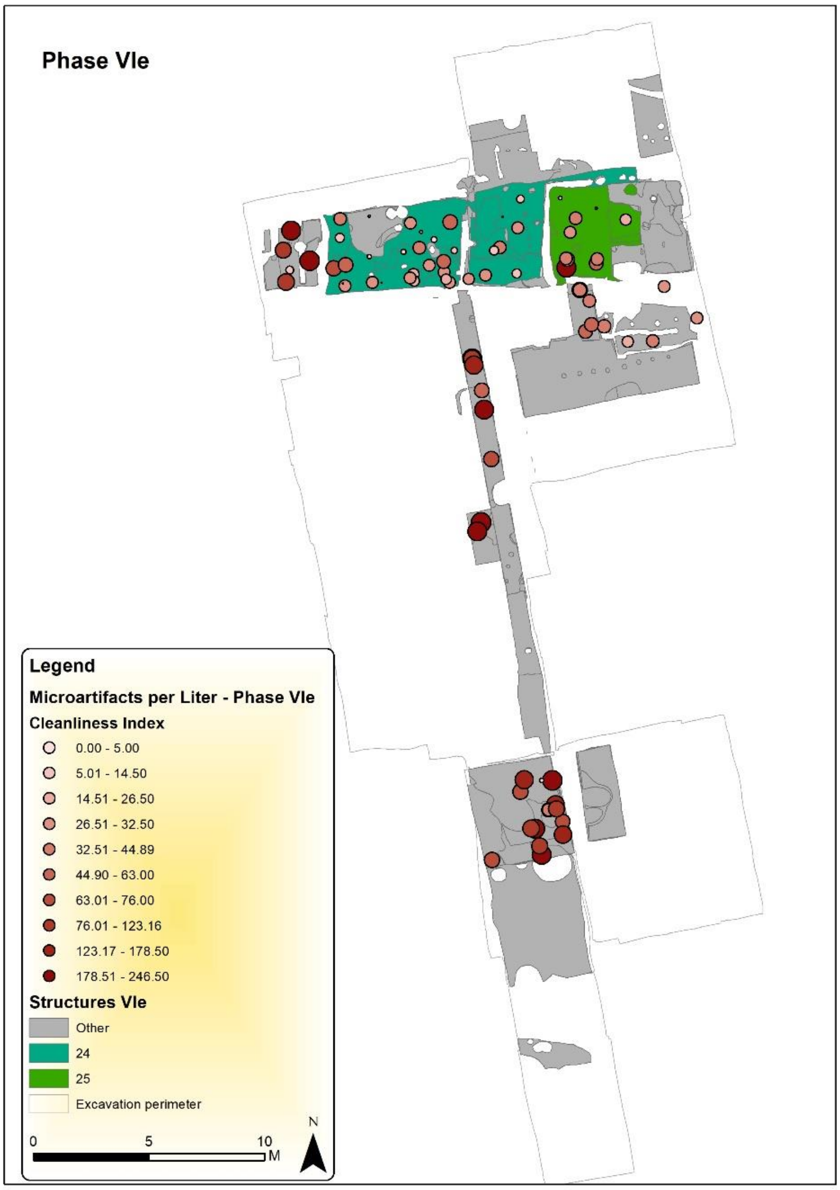



*Figure 27 - Microartifact distribution, cleanliness index (particles per liter), of phase VIe. Larger, dark red points represent a high concentration of Microartifacts per Liter, smaller light red circles represent low concentrations.*

The method used in this analysis for microarchaeology samples is the spatial distribution of the so-called cleanliness index (Özbal 2006), which refers to the number of micro artifacts per liter. Potentially, this index helps test the hypothesis that by the intensity of sweeping effects, the density of microartifacts in indoor living spaces will have overall lower values. Because the number of liters of floor sediment was recorded for each sample, calculating the relative density of microartifacts across different contexts is possible. Figure 27 illustrates the cleanliness index of phase VIe per context. Structure 24 and 25 are indicated in green and purple respectively. The green points on the map represent "cleaner" places with fewer particles per liters than the areas that are marked red or orange.

Figure 27 demonstrates that Structures 24 and 25 are both cleaner than outdoor and abutting areas. Furthermore, the dirty area on the west side of Structure 24 makes it likely that the housing did not continue further west, as is the case for some later phases. The samples from courtyard area L11 and L12 are likewise dirtier than the areas

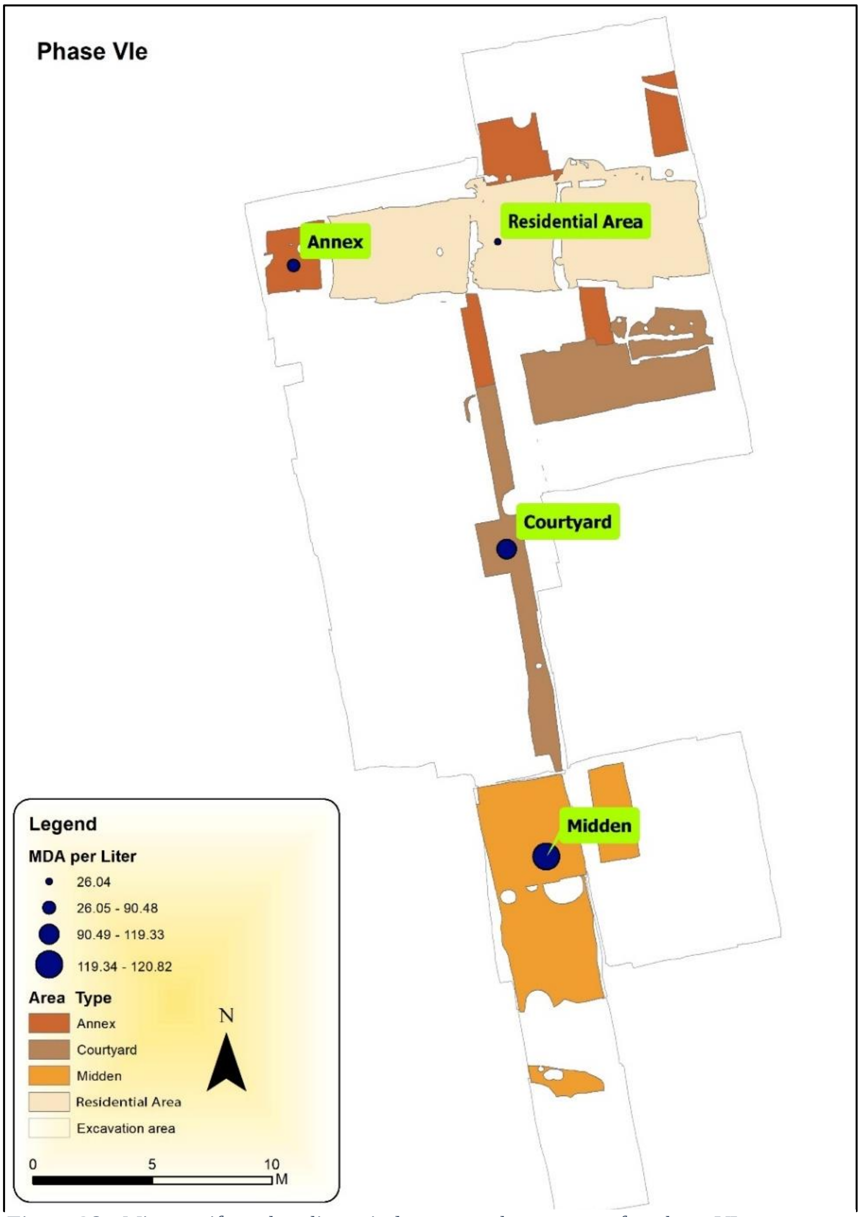



*Figure 28 - Microartifact cleanliness index per settlement area for phase VIe.*

surrounding the structures, as can be seen in Figure 28. The refuse area in L13 displays a mixed concentration of clean and dirty samples but the latter comprises the majority. The mixed nature of the cleanliness concentration may be the overlap of several sub-phases. Further investigations in this area might reveal a more comprehensive explanation for this spatial pattern.

*Table 3 - Cleanliness index for buildings and outdoor areas phase VIe.*

| **Data** | **24** | **25** | **Non-Structures** |
|---|---|---|---|
| Total microartifacts | 1277.16 | 469.01 | 8553.11 |
| Sum of liters | 42.75 | 11 | 116.4 |
| **MDA per liter** | **29.88** | **42.64** | **73.48** |

The cleanliness index per context often yields a pattern that distinguishes outdoor indoor surfaces. Table 3 shows that layers or surfaces not affiliated with structures are dirtier than the ones that were linked with structures and may resemble the cleaning activities that took place in indoor surfaces. This pattern is especially visible for Structure 24. Structure 25 on the other hand, was less clean perhaps resulting from the absence of clearly defined surfaces in this particular structure. Nevertheless, the overall pattern with other contexts is noteworthy.

In terms of microartifact variation (Figure 29), no real noteworthy differences can be seen in this phase by comparing different structures. The majority of the microartifacts consist of micro bone samples, as is the case for almost all samples researched at Barcın Höyük. Noteworthy is the presence of shell in both the indoor and outdoor area, as well as the relatively consistent presence of microchipped stones across all areas (about 5% of the complete micro assemblage).

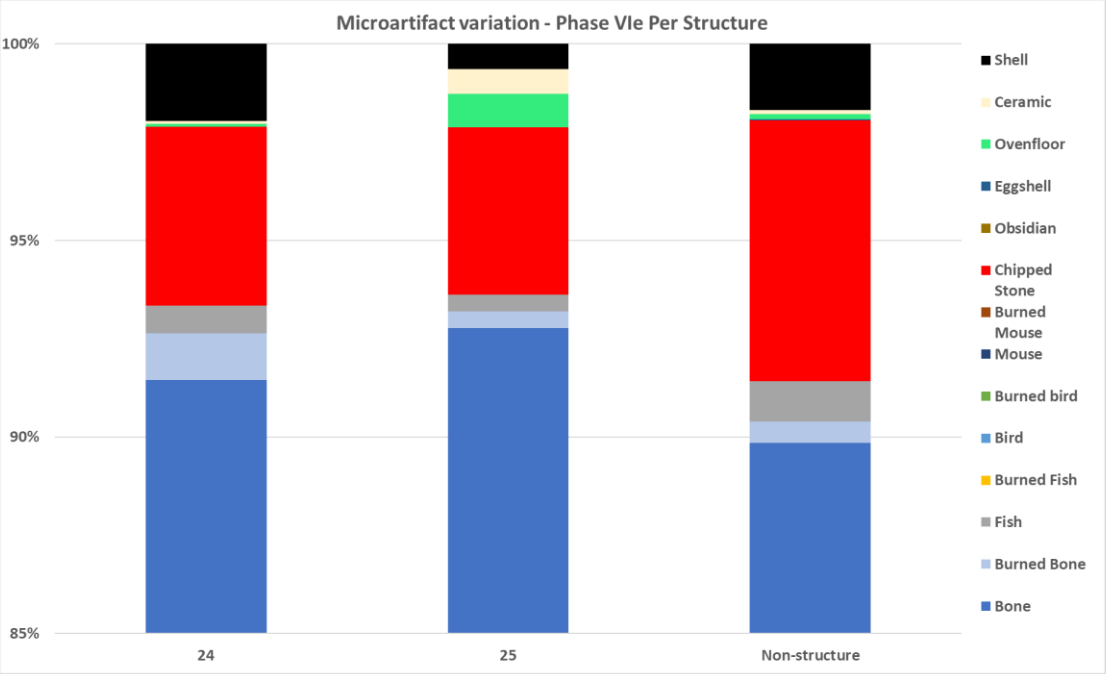



*Figure 29 - The variation and percentage of microartifact types per structure. Note that the percentage does not show the complete 100% stack. This is done, because otherwise variation in smaller categories would not be recognized. The remaining percentages (roughly 90%), should be ascribed to micro bone artifacts.*

### *5.1.3. VIe result summary*

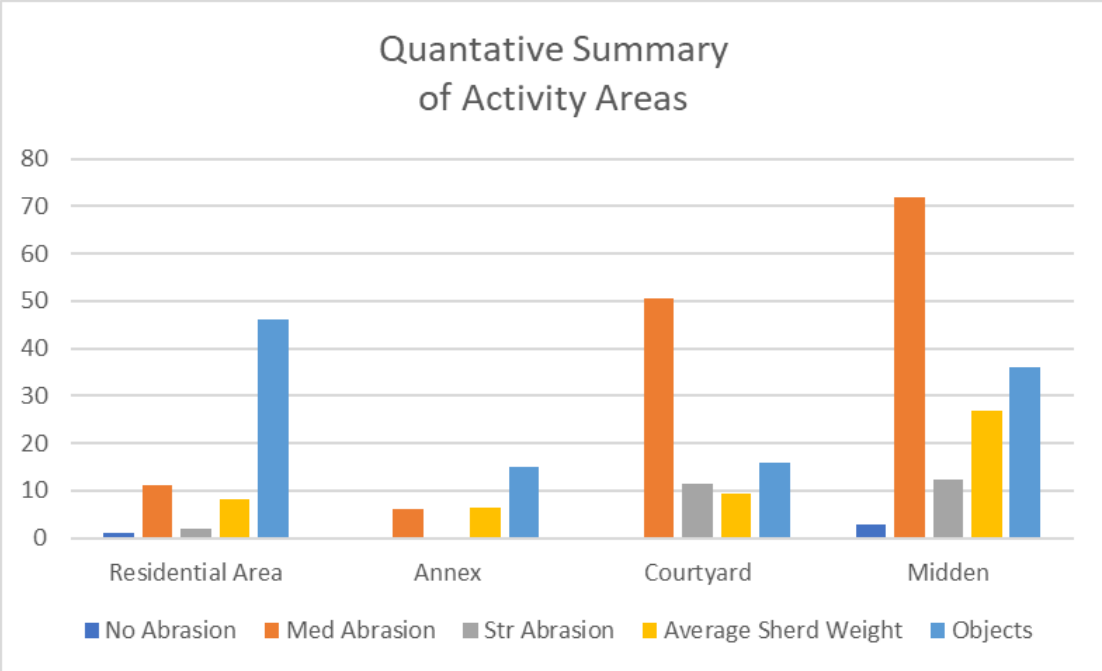
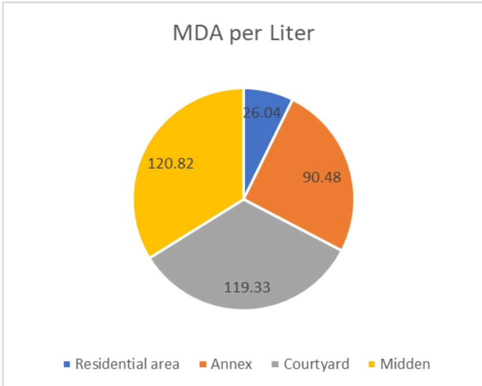



*Figure 30 - Summary tables of analysis categories for phase VIe.*




By combining the four main analysis categories: abrasion, average sherd weight, cleanliness index based on microartifacts, and the objects, the aforementioned analyses have attempted to map the difference in activity areas of Phase VIe. By differentiating the area in 4 main sectors: structural area, annex, courtyard and midden, certain assumptions about the expected variation of the material can be made (discussed in the next section). The analyses as mentioned above express the difference in these main areas based on their size distribution and variation.

Table 4 and Figure 30 are combined versions of the results mentioned above. noteworthy differences are (1) the high average sherd weight for the midden area, (2) the overall dirtiness of the midden area, and (3) relatively dense objects counts for this area as well, all indicating a heavily “mixed” combination of artifacts of several size categories. The residential area, on the other hand, yielded (1) the highest object count among the four sectors, (2) a fairly low average sherd weight (although the annex appears to be lower) and (3) a low cleanliness index as reflected by the low microartifact densities, making this one of the cleaner areas within the settlement.

*Table 4 - Summary of the distribution of analysis categories for the settlement areas.*

| | Abrasion (Estimated Count) | | | ASW | Objects | Cleanliness |
|---|---|---|---|---|---|---|
| **Area** | **No Abrasion** | **Medium Abrasion** | **Strong Abrasion** | **ASW** (gram) | **Objects** (count) | **Total_MDA** (Per Liter) |
| Residential Area | 1 | 11 | 2 | 8 | 46 | 26.04 |
| Annex | 0 | 6 | 0 | 6 | 15 | 90.48 |
| Courtyard | 0 | 51 | 12 | 9 | 16 | 119.33 |
| Midden | 3 | 72 | 12 | 27 | 36 | 120.82 |

## 5.2. Phase VId1

In terms of buildings, a new row of houses appears on the North side of the excavation (Figure 31). The following results will first discuss the spatial distribution of the macro-ceramics, by analyzing the average sherd weight and thereafter will analyze the distribution of objects and MDAs.

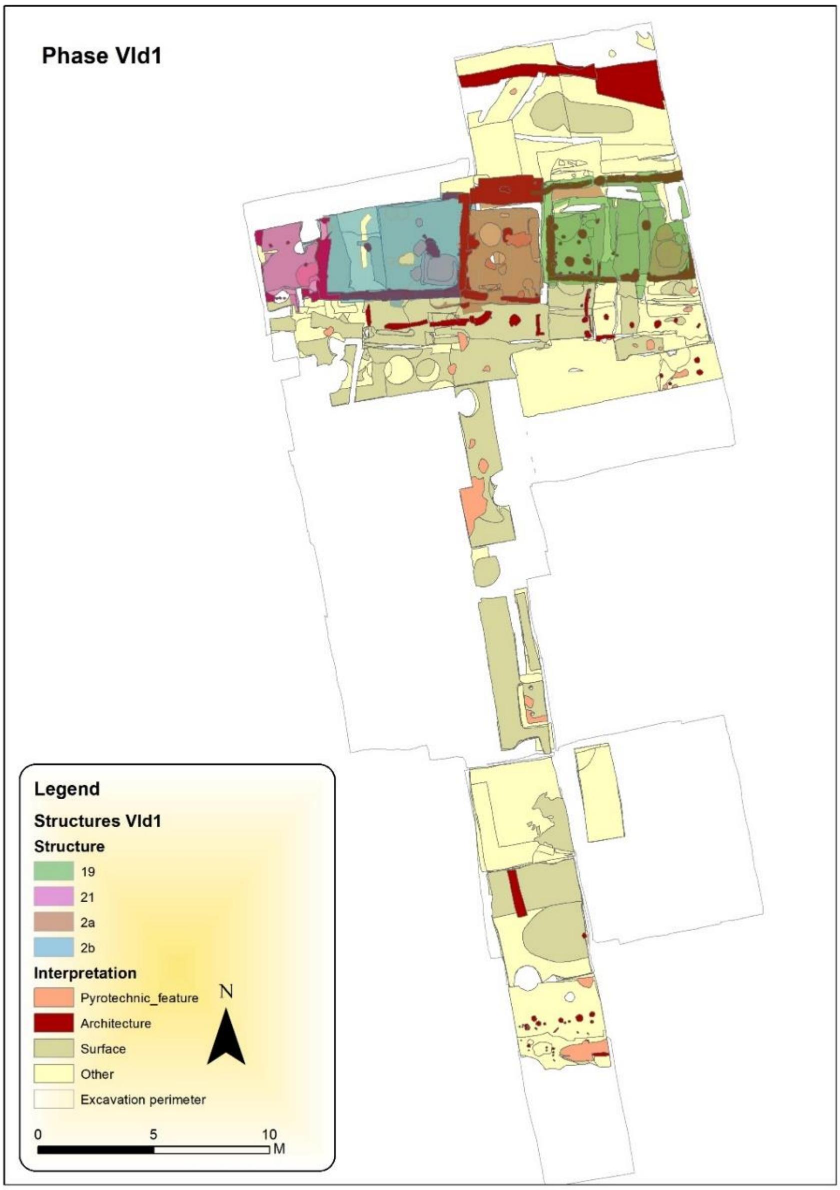



*Figure 31 - Structures of phase VId1 mentioned in the text.*

### *5.2.1. Macro-Artifacts*

#### 5.2.1.1. <u>Average Sherd Weight – VId1</u>

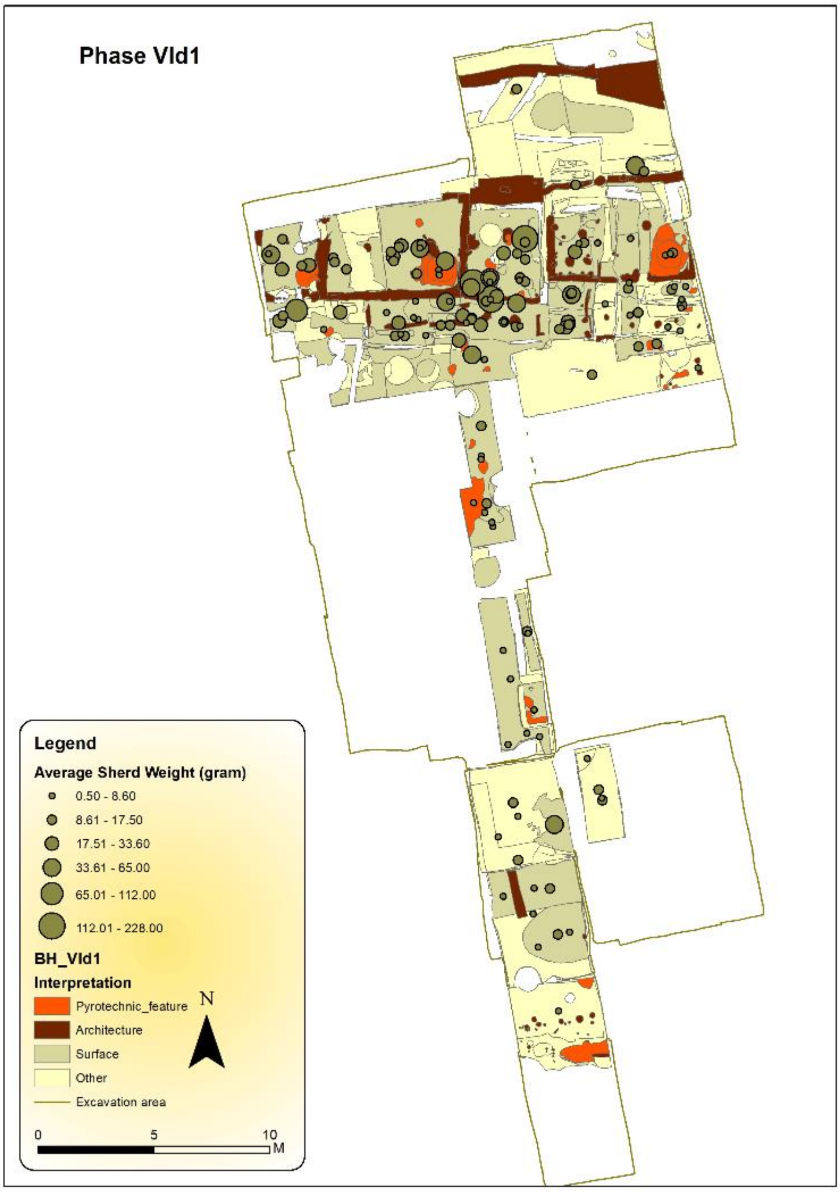



*Figure 32 - Spatial distribution of the Average Sherd Weight for phase VId1.*

While it remains difficult to make a direct inference based upon the visible patterns in fragmentation, differences in spatial distribution present the opportunity to further investigate areas with potential. In this section, the average sherd weight (ASW) across all loci across the site as shown in Figure 32 will initially be discussed. Thereafter, analyses will consider the ASW distributions collectively for the four sectors as described above: structures, annexes, courtyard and midden area. Finally, a contextual approach comparing noteworthy contexts will be briefly discussed.

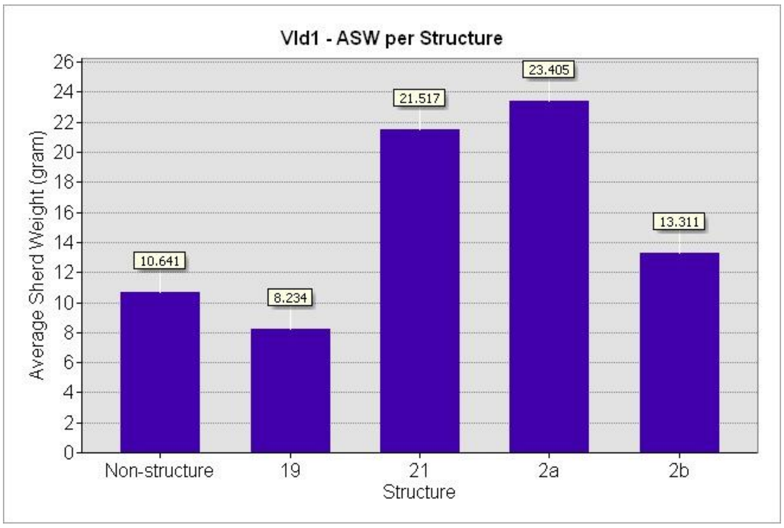



*Figure 33 - Variation in Average Sherd Weight between buildings VId1*

The average sherd weight as shown in Figure 32, demonstrates that many of the less trampled or fragmented sherds were found within or near the structures possibly due to the relatively high number of primary contexts found in this area. Especially Structure 21 and Structure 2a, yielded large-sized sherds inside and near the presumed entrances of the buildings. Figure 33 presents the difference between the structures in more detail. The ASW of Structures 21 and 2a is 21 and 23 grams respectively. The ASW of the other structures is far lower, at around 12 grams per sherd. Therefore, it can be concluded that overall the sherds within the first mentioned structures were less fragmented overall, compared with the other structures, but also with the areas that were not affiliated with structures.

Within the structures of phase VId1, the plethora of sherds and fragmentation makes it difficult to distinguish groups with higher and lower fragmentation. Therefore, a statistical method was used to define areas of statistical significance among the samples. The results of this analysis are presented in Figure 34. Based on this calculation the highest statistically significant outliers were near the entrances of Structure 2a and Structure 21. Figure 34 displays these clusters as purple colored points.[21] What became apparent was that loci containing heavier sherds on average were found near the entrances of both structure 21 and 2a.

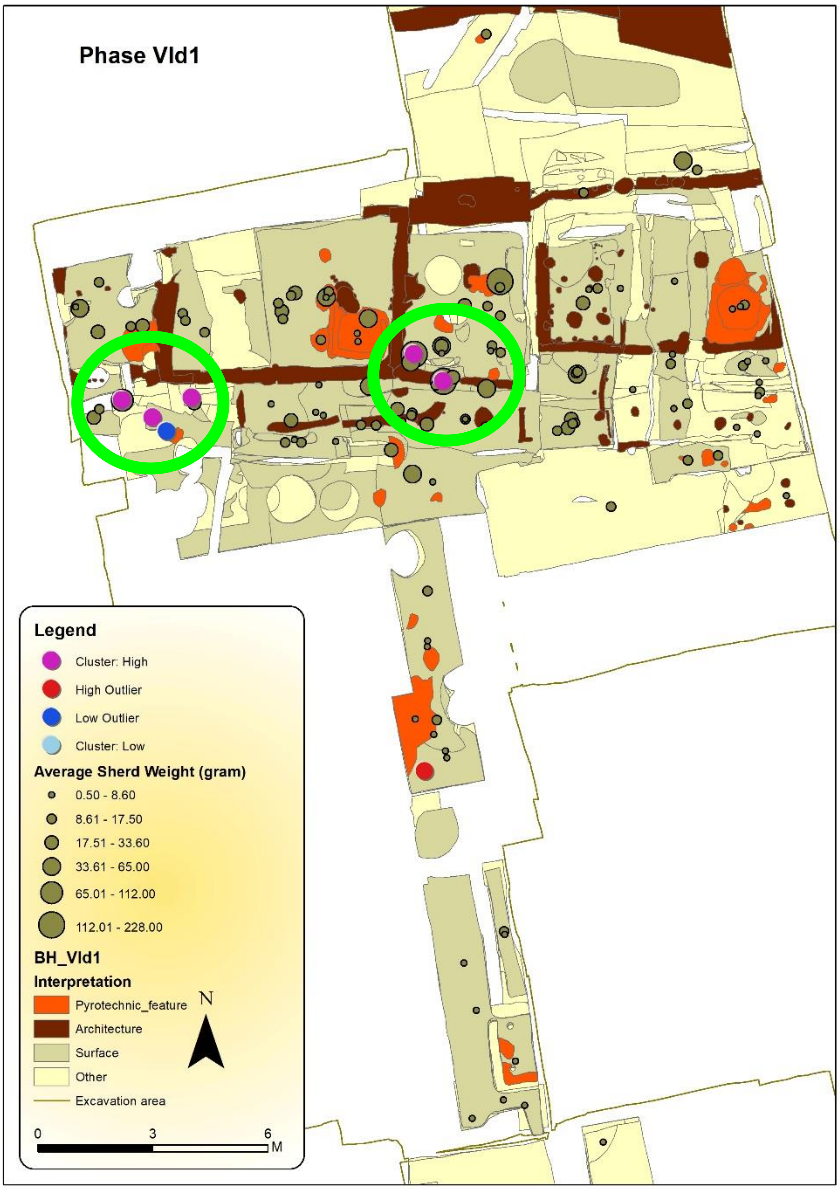



*Figure 34 - Result of the Anselin Local Morans I statistical calculation illustrated on top of previously shown average sherd weight data layer. The image shows the high clusters in terms of Average Sherd Weight (gram) for phase VId1. The clusters are highlighted by green circles and purple locations.*

However, during this phase, a correct interpretation of the artifacts requires that it is divided into sub-phases. With this in mind, Figure 36 and Figure 36 show the spatial distribution of the ceramics pre- and post-dating the fire respectively. Out of the

[21] A more detailed discussion of this tool is discussed in the methodology part of this thesis.

301 sherds that were stratigraphically linked to one of these layers, 129 belonged to the pre-burned phase. 172 Sherds belonged to the burned phase. The difference in average sherd weight between these two layers was negligible, both have an average sherd weight of about 30 grams. This is a high number on average, considering that the average sherd in phase VId1 weighted 12.3 grams.[22] This indicates that there was no significant difference between burned ceramic fragmentation and sherds pre-dating the fire. Therefore, it can be argued that the structures were not emptied, cleaned, or otherwise prepared before abandonment, or at least it does not appear to be represented in the ASW records. One would expect more traces of complete pottery, resulting in a higher ASW, if the place was abandoned in hurry because of a fire. Or, if the place was maintained and cleaned regularly, a lower ASW overall.

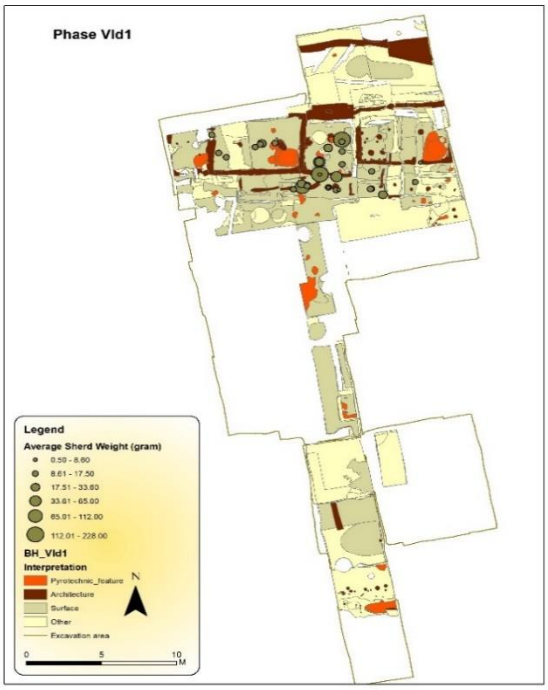



*Figure 36 -Showing the locations of the average sherd weight samples of the pre-fire phase of VId1*

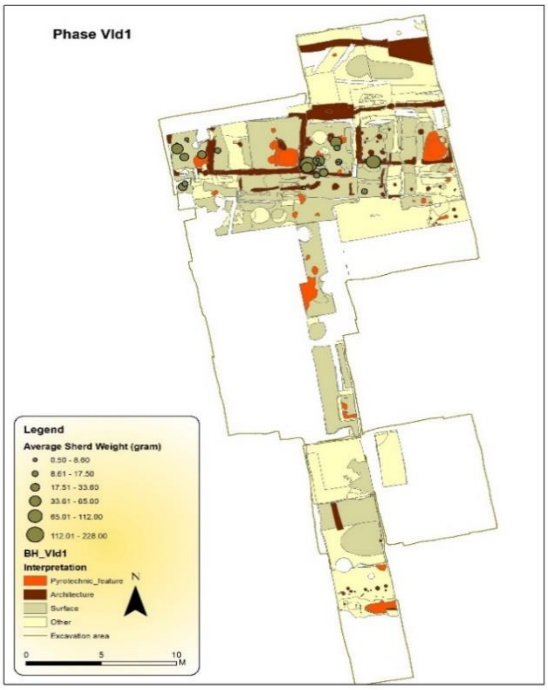



*Figure 36 - Showing the locations of the average sherd weight samples of the burned phase of VId1.*

[22] In total there were 1290 sherds found in this phase. The collective weight of these sherds was 15.658 grams.

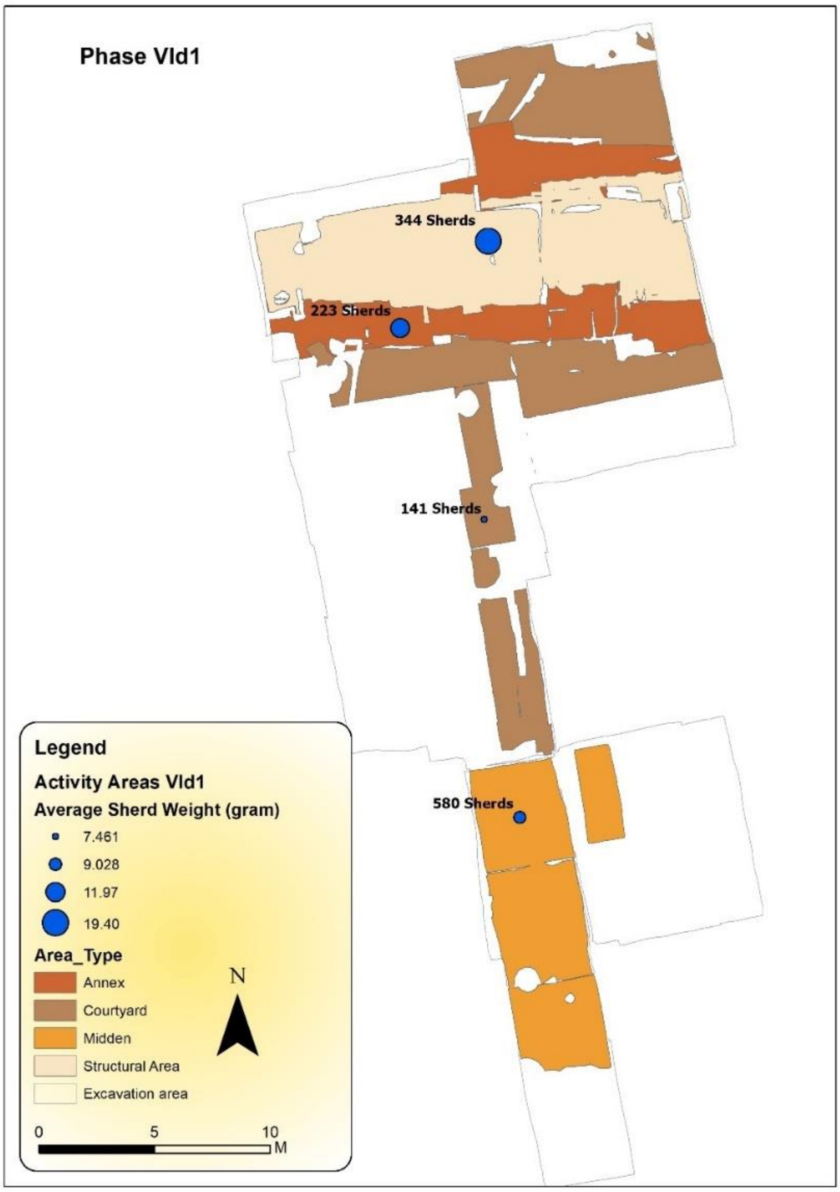



*Figure 37 - Distribution of Average Sherd Weight (gram) per settlement area for phase VId1.*

This high number of non-fragmented sherds is a similar pattern which can be seen in Figure 37. Figure 37 shows the division of average sherd weight per sector. It suggests that in phase VId1 on average, smaller sized, fragmented sherds were found in the courtyard and the midden area. In contrast, the bigger sized sherds were found within and around the structures. Combined with the more detailed analysis above, it is apparent that the residential area and annex area are less fragmented. Compared with phase VIe, this is a different pattern as in that phase most of the fragmentation was located within the structures and the highest average sherd weight was seen in the midden area. Differences between certain areas will be elaborated on in the next chapter.

5.2.1.2. Abrasion

This section discusses the results of the ceramic abrasion of phase VId1. The ceramic abrasion at Barcın Höyük was documented by calculating the composition of ceramic abrasion per context. Additionally, afterward, this section will discuss the abrasion division per activity area briefly.

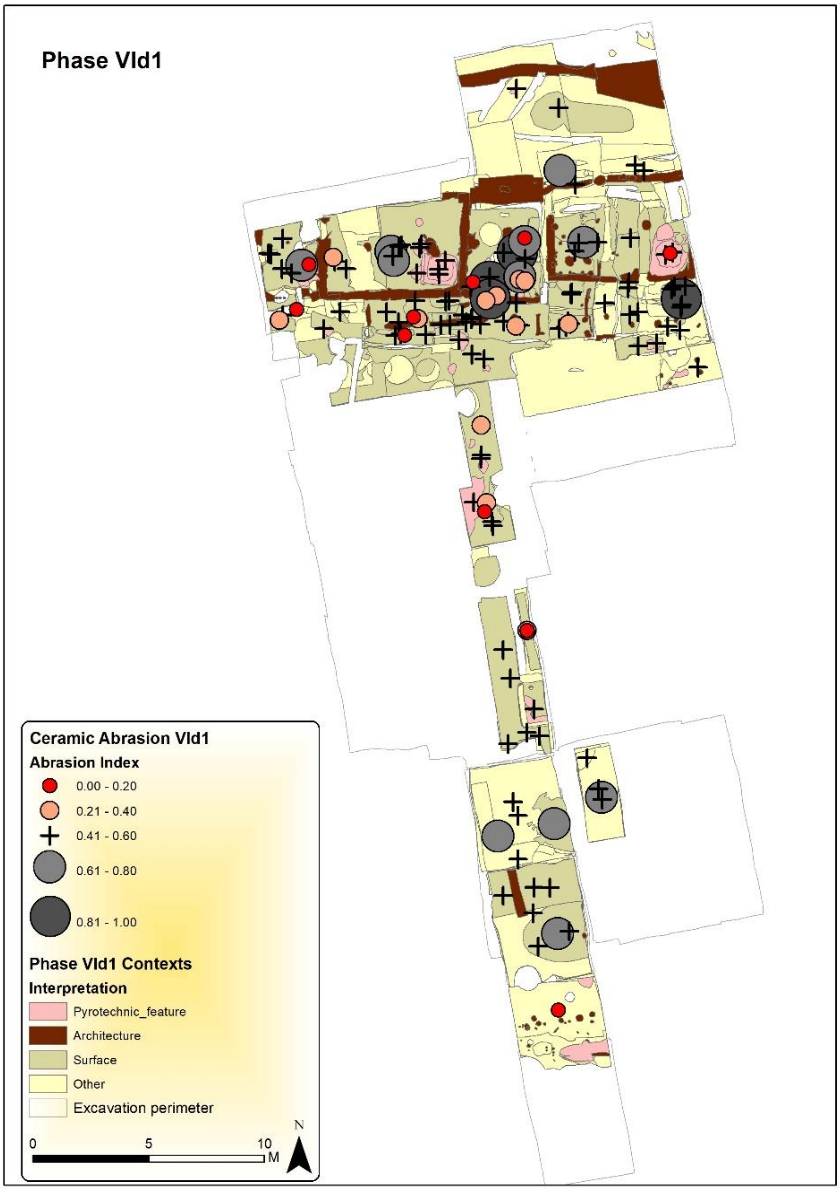



*Figure 38 - shows the distribution of ceramic abrasion for the excavation. The colors and sizes represent the calculated Abrasion Index. A high index value (1,00, dark color and larger size), indicates a locus that only consists of heavily abraded sherds. A low value (0.00, red and smaller sized) accounts for the opposite, a locus with non-abraded sherd fragments. For index scores around the middle, a cross symbol was used.*

In the northern section of structures, Figure 38 shows that most of the sherds that were non-abraded (reddish, smaller symbols), were found in or near the annex of Structure 2a, which is the central structure in the middle of the residential row of buildings (see Figure 31). However, also two larger contexts contain sherds that are strongly abraded. As will later be pointed out, these contexts are mostly related to the collapse layer of the structure, rather than the inhabited or pre-burned phase of the structure. It is however interesting that we do not see a similar pattern inside the Structures, 2b and 19 (see Figure 13 for the overview of structures). In these structures, it appears to be more mixed contexts. Only in Structure 21, there are also some smaller contexts that contain sherds without traces of abrasion.

In the southern section of the excavation, phase VId1 is not as clearly distributed. Many of the contexts found in this area, the midden area mostly, have mixed abrasion deposits. Considering the size of deposits, it is clear that the number of sherds is higher in this area than most contexts in the area with structures. Considering the area was interpreted as a midden area, that seems to be expected as the deposits tend to be a bit larger in volume as well.

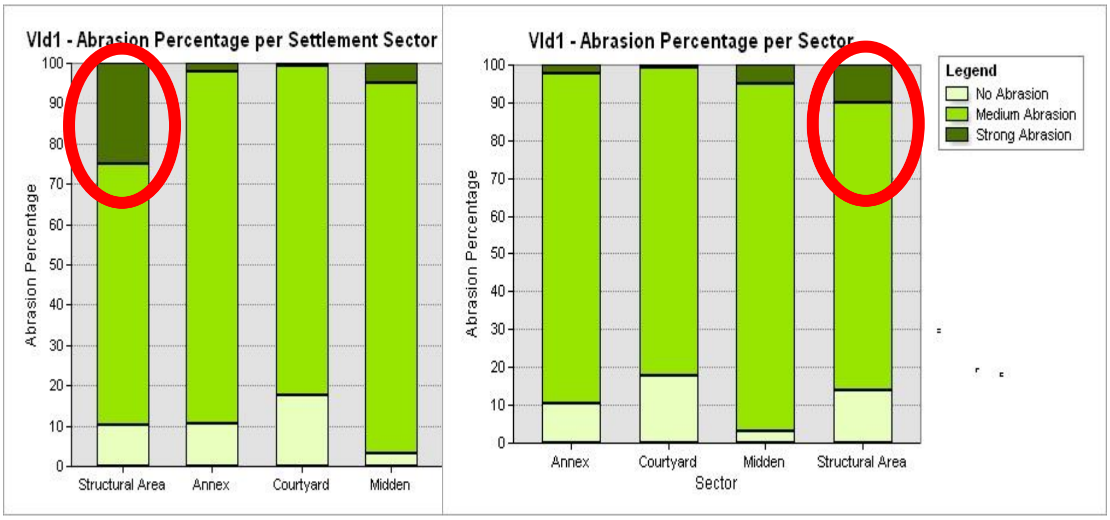



*Figure 39 - Tables showing the distribution of abrasion per activity sector in the settlement. In the table on the left, the "collapse" layer of the structural area was included in the calculation, on the right it was left out (red circles). In this way it considers the considerable percentage the collapse contexts contribute to the overall percentage of sherds that are categorized as "strong abrasion".*

The substantial "mixed" areas become clearer by looking at Figure 39 these tables show the division of abrasion per defined living area in the settlement for phase VId1. The argument to depict this data in two tables is because it is uncertain whether "collapse" should be included in the area with structures of phase VId1. This layer of collapse is difficult to interpret as it was only documented above Structure 2a and 21. Additionally, above Structure 2a the collapse layer was unevenly distributed in terms of height, the northern collapse section was about 30 cm thick, whereas the south part

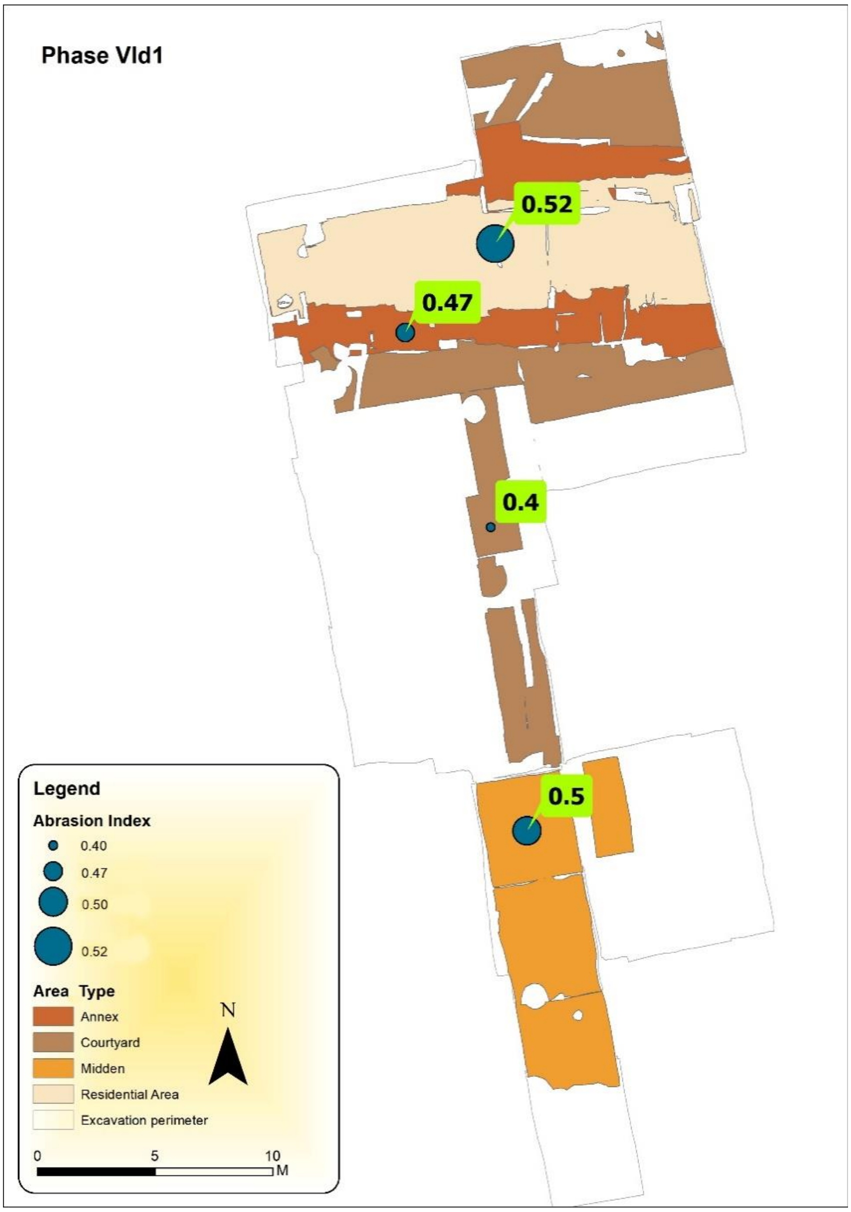



*Figure 40 - Aggregated abrasion data for phase VId1 per settlement area. The collapse layer has not been taken into consideration in this distribution map. Also, Locus M10_304 was removed as it was a high outlier, containing 524 sherds.*

only 10 cm. The large amount of "extra" strong abraded sherds come from the Northern half of Structure 2a (locus 202 from Trench M10). No "non-abraded" sherds were found in the collapse, in either Structure 2a or 21. In contrast to the average sherd weight data, the abrasion data acknowledges that there is a difference in sherds between the pre-burned phase and burned phase deposition, as can be understood from the collapse data.

Figure 39 and Figure 40show that the total amount of non-abraded sherds is highest on average in the residential area and smallest in the courtyard area (although by only a small difference). Considering the midden area had the largest number of sherds, this is surprising as one would expect a higher abrasion rate in this area due to the increase in secondary deposits. The overall number of non-abraded sherds is also lower in the annexes then it is in the midden area of the settlement, which would be expected due to perhaps more primary contexts.

5.2.1.3. Objects

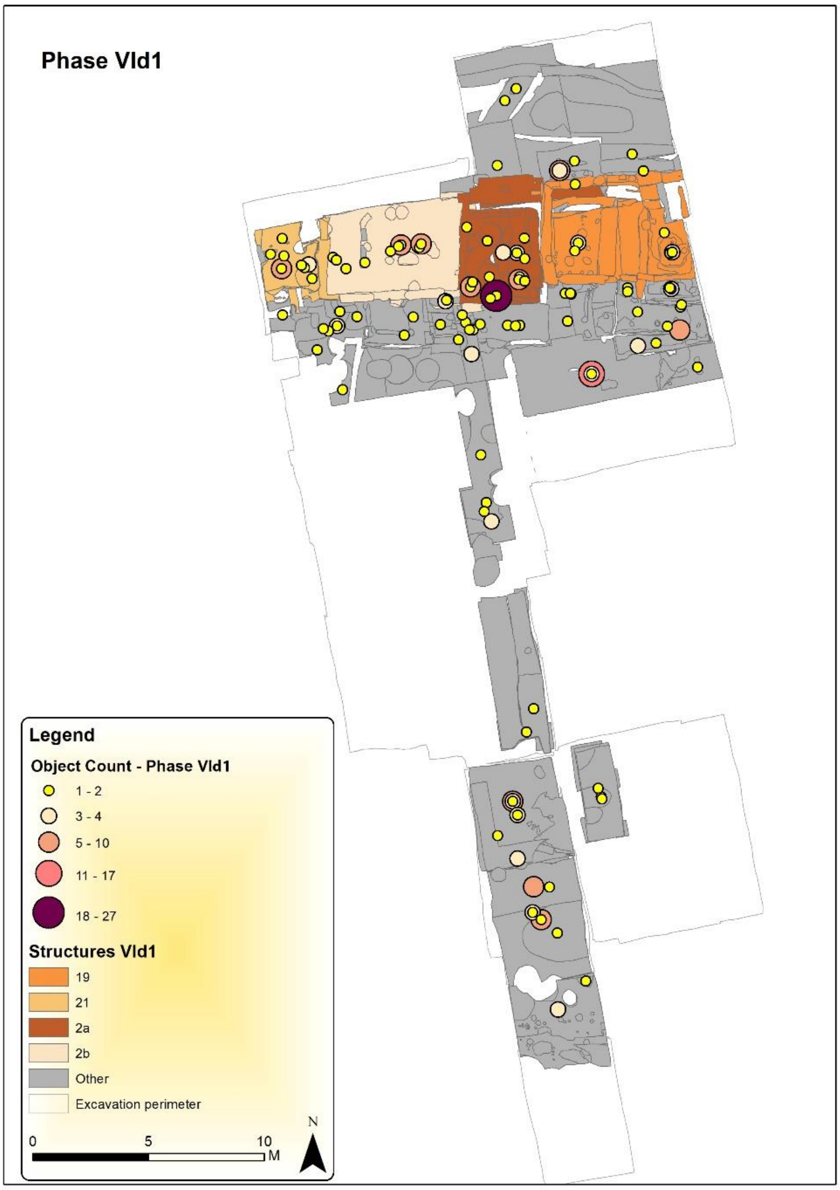



*Figure 41 - Distribution of object density for phase VId1.*

Another proxy that is analyzed is the distribution of objects in the settlement. Objects here is used as a combination of multiple artifact types that mostly were used in the inhabitant's daily life. The objects were very often found complete, or not severely damaged. In terms of fragmentation distribution, this category should be the most complete and least fragmented one. Analyzing their spatial distribution contributes to the understanding which areas were more significant and were more likely to be used on regular basis. According to the early stated hypothesis, a higher count of objects regardless of the type of object is more likely to be found in activity areas.

In phase VId1 there is a clear concentration of objects found surrounding the settlement area and annexes (Figure 41). Apart from the quantity, it appears also the density of loci with a single object appears to be higher in this area. The highest amounts of objects were found in front of the entrance of Structure 2a. This is near the location of where the bovine skull and footprint were found, which was mentioned earlier. Another concentration of objects was found in Structure 21. Considering the

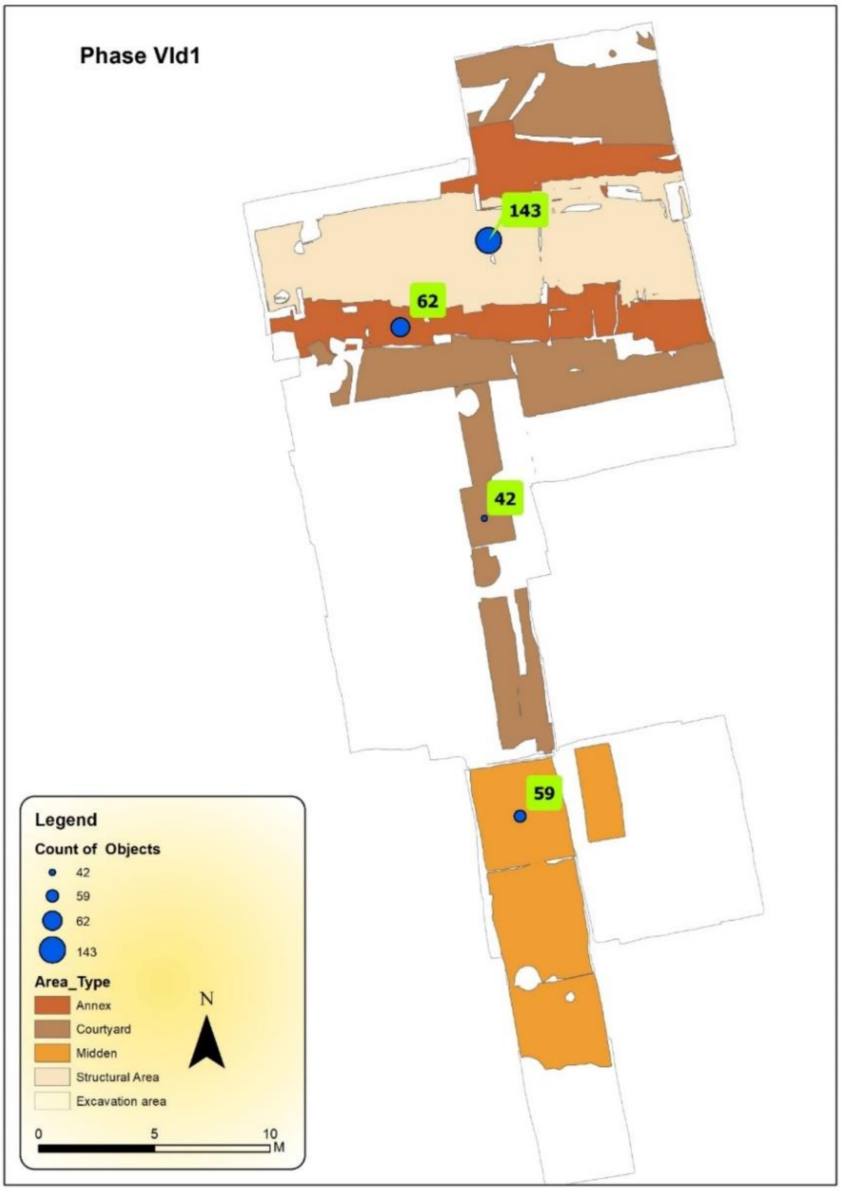



*Figure 42 - Aggregated values of object density per settlement area for phase VId1.*

well-preserved floors immediately under the burned layer in these two houses, this most likely has had a great outcome on this number. More about this will be discussed later. Within the residential area, it appears that Structure 19 is the least dense in terms of objects. The midden area, although some concentration of objects, shows a far lower concentration of objects in this area compared to previous VIe phase.

Figure 42 combines all the objects for each suggested sector within the settlement. This tells a similar story about the higher number of sherds within the structures of VId1 and its annexes. However, this number should consider with care, as this analysis in itself does not present a case on whether there was more activity in this region as a result. Combined with the ASW and microartifact data, however, we can make a stronger inference about activities areas across settlement areas.

### 5.2.2. Microartifacts

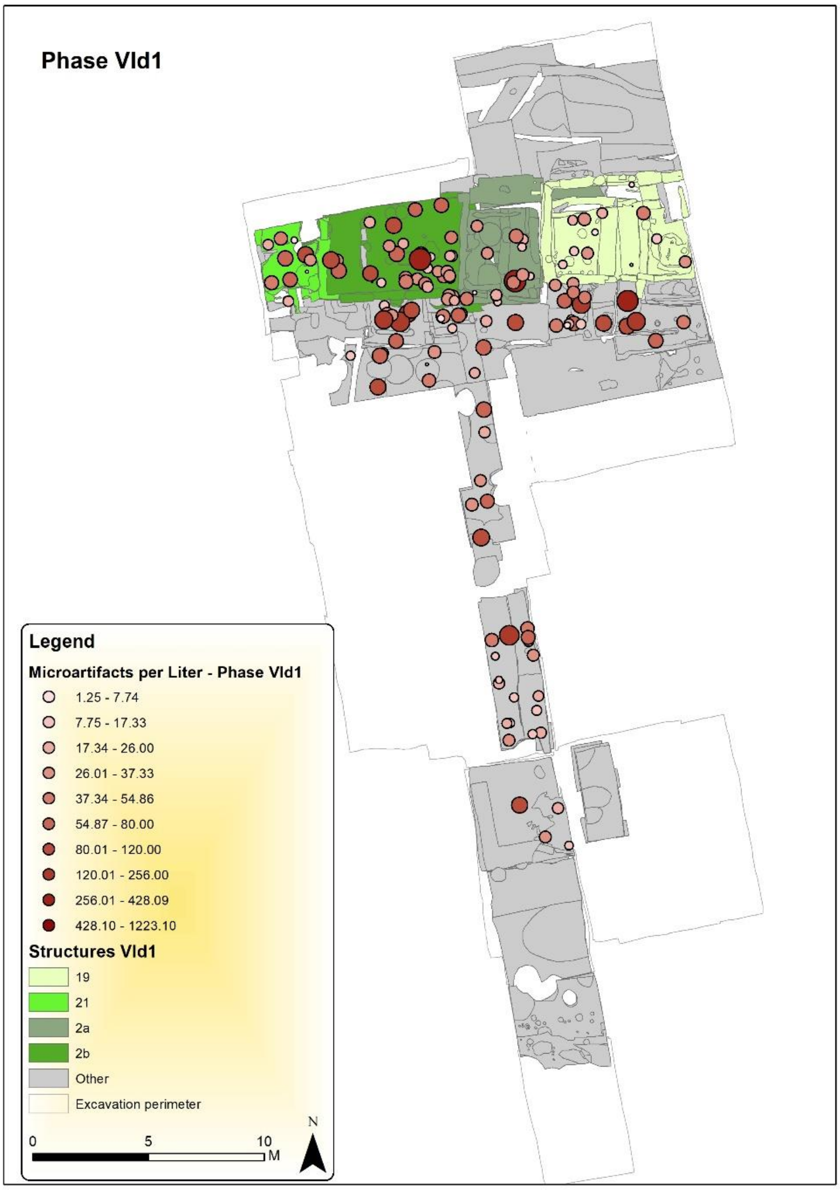



*Figure 43 - Distribution of microartifacts per sample taken. The larger, dark red points represent a high concentration of Microartifacts per liter, smaller light red circles represent low concentrations.*

The last analysis of phase VId1 is based on the microartifact data or Cleanliness Index. Similar to the previous phase, the analysis calculates the number of particles per liter, for every context that was sampled and derives a cleanliness index. This data is illustrated per locus and also considered per individual living sector.

In terms of differences between structures, by looking at the data in Figure 43 it appears that as expected most samples were taken from inside the structure. This is because most well-preserved surface contexts were found inside the residential areas. However, in contrast with phase VIe, there does seem to be a higher number of samples from the annex area, which will be made more clearer by comparing Figure 44 and Figure 45.

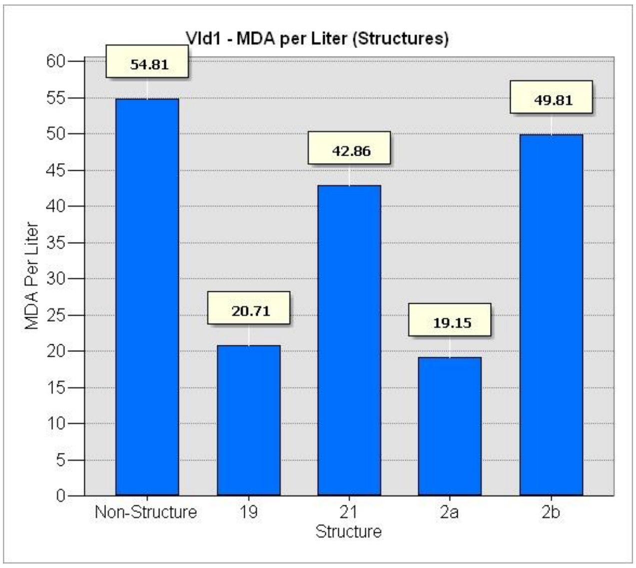



*Figure 44 - Chart shows the total amount of MDA samples per liter for each of the structures of Phase VId1*

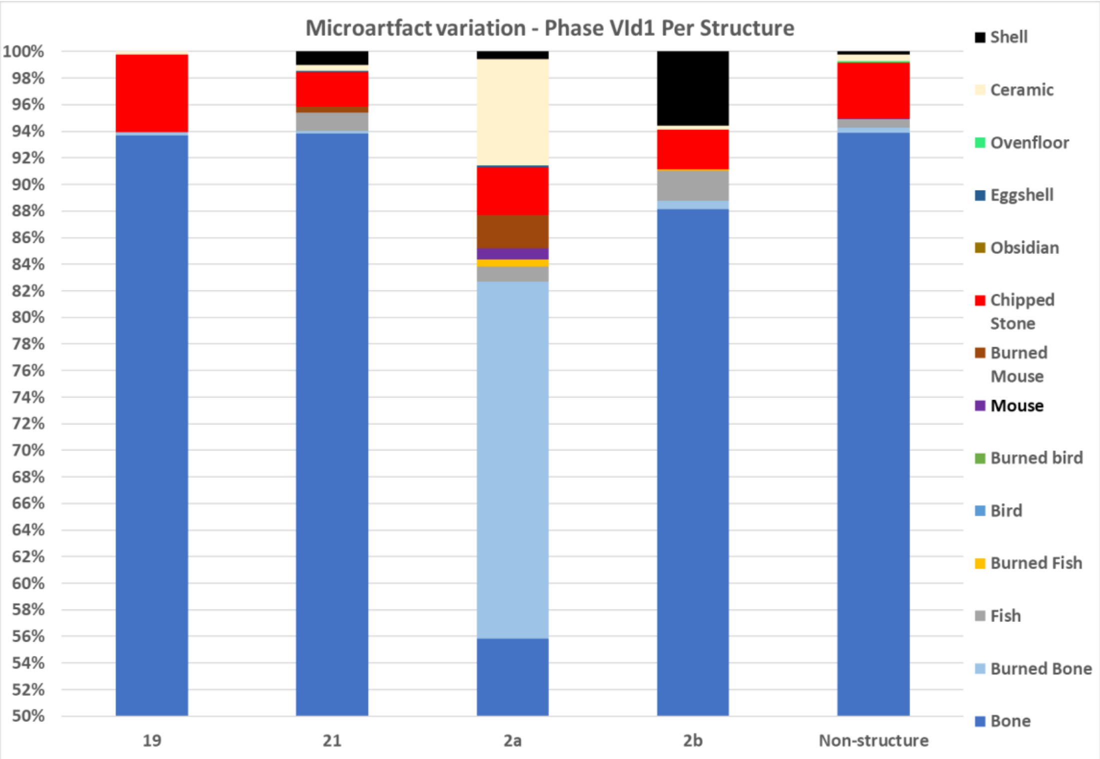



*Figure 45 - The variation and percentage of microartifact types per structure. Note that the percentage does not show a 100% stack. This is done, because otherwise variation in smaller categories would not be recognized. The remaining percentages (roughly 50%) should be ascribed to micro bone artifacts.*

The differentiation between structures can be better understood from the comparison charts displayed Figure 44 and Figure 45. Figure 45 shows the variation between types of microartifact samples within each of these structures. Most noteworthy is the low concentration of microartifacts found in Structure 19 and Structure 2a. From all contexts that were sampled, consisting only of contexts interpreted as surfaces, layers or pyrotechnic features, these had on average the highest Cleanliness Index.

The high concentration of MDA particles per liter found in Structure 21 is also noteworthy, about 42 particles per liter, only a bit lower than contexts not affiliated with indoor contexts. For Structure 21, this can be related to the high amount of bone macroartifacts found on the well-preserved house floor of Structure 21. It should be noted that a large amount of burned micro bone artifacts were also found within this structure, but they belonged to the collapse layer of this structure and were therefore excluded from this analysis.

A similar pattern of a higher concentration of burned bone can be seen from the Structure 2a floors, only in Structure 2a they were not related to the collapse contexts, but to surfaces. Additionally, the high quantity of micro ceramics found on the same floors is a noteworthy pattern. The corresponding concentrations of both micro- and macroartifacts found in the aforementioned structures is interesting. There is a relatively high concentration of micro ceramic material found in Structure 2a, roughly 10% of the total amount of microartifacts. The patterns that we see in Structure 2a, but also in the earlier mentioned Structure 21 are interesting because places that show high concentrations of micro and macroartifacts were in earlier conducted experimental research sometimes referred to as *primary* or *de facto* refuse areas. In this way, we can indicate places that exhibit more unique patterns of activity. This difference in use is further supported by the presence of several different other microartifact types, such as the small concentrations of mice, burned mice and fish, of which the latter was also present in Structure 2b and 21.

To gain a better perspective of where high and low values of microartifact samples might be clustered, a statistical technique was applied. As was done earlier for the average sherd weight, a similar method was tried on the microartifact samples of phase VId1. The result of this analysis is shown in Figure 46, which demonstrates that

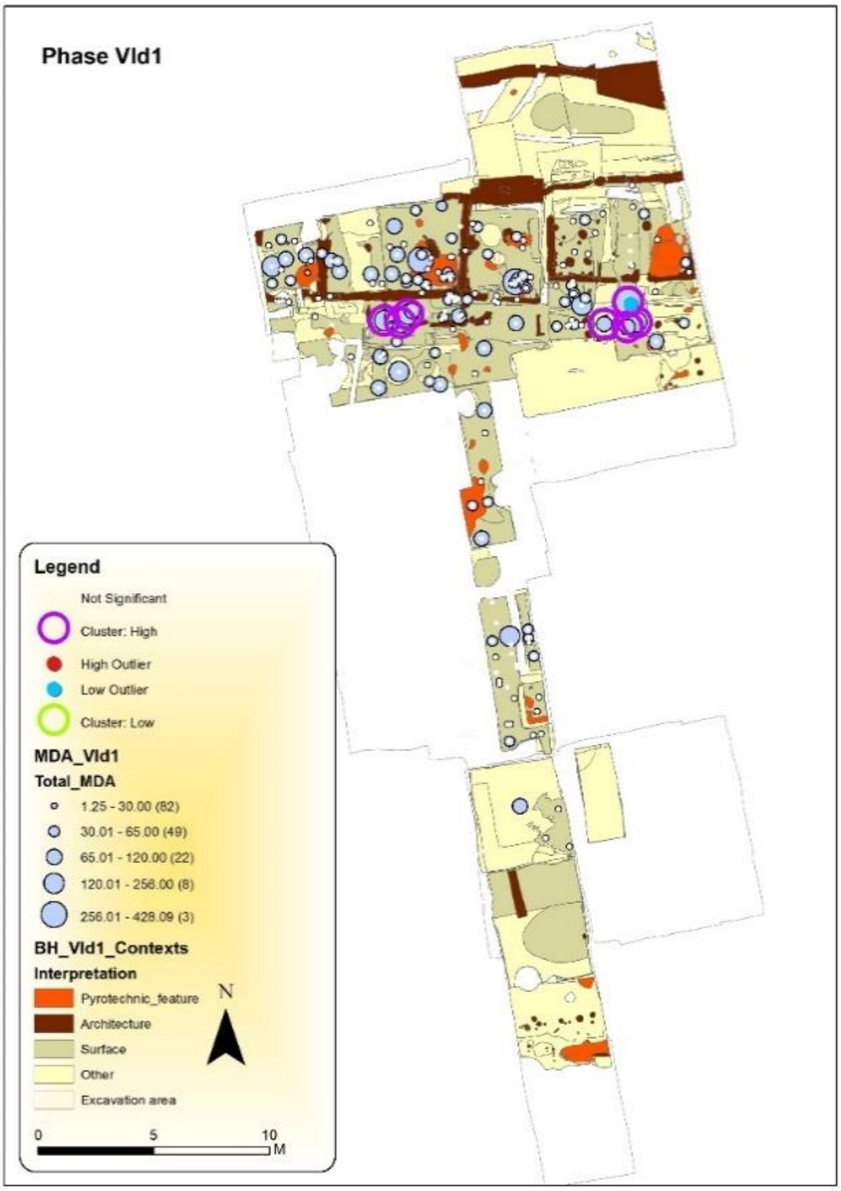
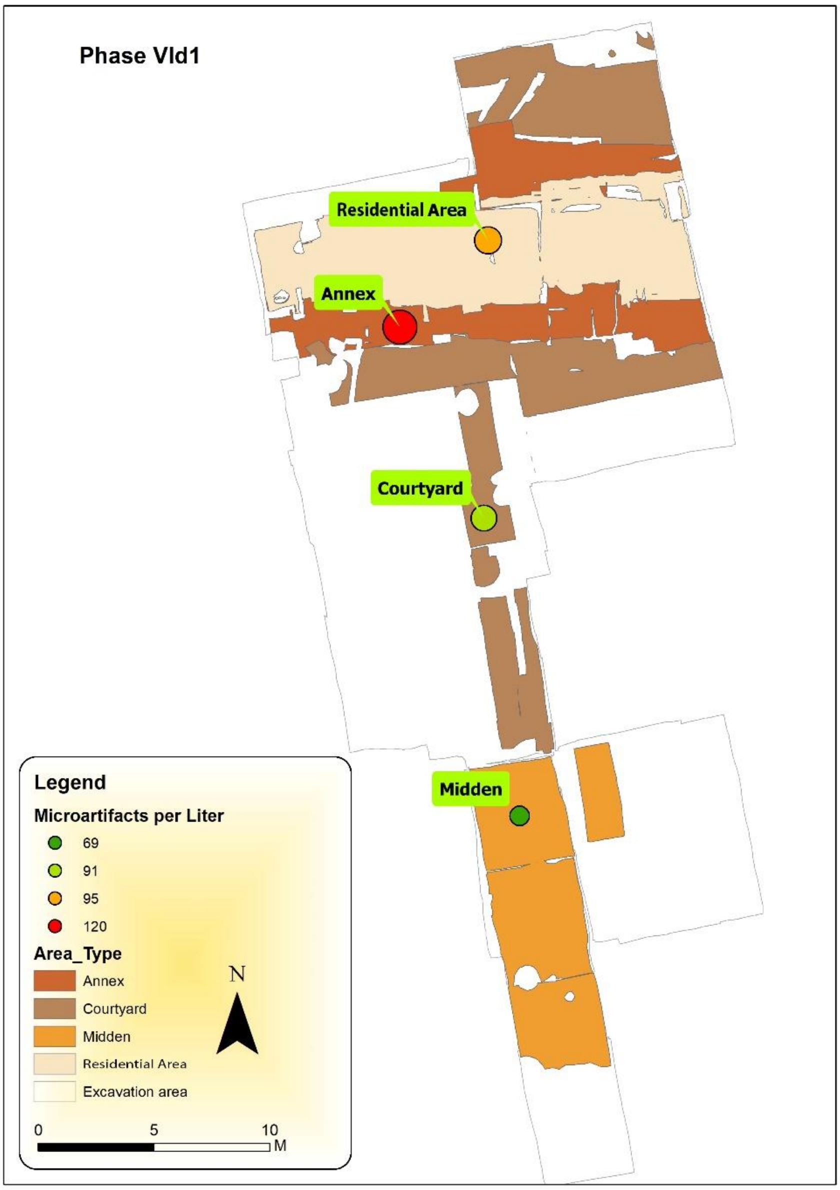



*Figure 46 - Displays possible high and low clusters within the dataset. Additionally, it also depicts high and low outliers. The high clusters are colored pink. The blue symbols represent the amount of microartifacts per liter. The size is proportionate to the number of artifacts. In this analysis, no low clusters were detected.*

there is a high cluster of microartifacts samples in the annexes (light-pink color), before the entrances of Structure 2b and 19. Possible motives for this cluster will be discussed in next chapter, however, it is interesting to see that both of the clusters fall within the annexes of the structures, at areas that might reflect the entrances of Structures 2b and 19.

Summarizing the MDA samples per activity area in the settlement shows a similar pattern to what was mentioned earlier.  Namely, the highest amount of micro-




samples per liter can be found in the annexes. According to Figure 47 shows about 120

*Figure 47 - Settlement area overview of cleanliness index for phase VId1.*

artifacts per liter. Second to the annexes come the residential areas of the settlement. The number of artifacts is lower on average in the courtyard and the midden area. In the midden area, only 60 artifacts per liter were found, half the amount of the microartifacts found in the annexes per liter.

### *5.2.3. Phase VId1 Summary*

In this summary, the most important patterns mentioned in previous analyses will be briefly summarized. In the analyses, the 4 main sectors of phase VId1 of Barcın Höyük; a residential area, annex, courtyard, and midden were compared. By understanding the variation between the areas, a better understanding of the material per sector is investigated. Figure 48 shows a summary of all sectors for phase VId1. Additionally, contextual and more detailed analyses in variation have proven to be valuable as well and will be briefly summarized as well. In the next chapter, this will also be combined with a theoretical discussion and interpretation.

To sum the most significant patterns of this phase: (1) The annexes and area with structures have a higher ASW overall than the outdoor areas, showing less fragmentation overall. (2) The microartifacts per liter is higher in the residential areas during this phase. The highest number of objects also resided within the structures. (3) Aside from the microartifacts per liter being high in the residential complex, one of the most striking features is the unique variety of microartifacts in Structure 2a. In this building, mice, burned mice, fish, burned fish, burned bones and ceramic were found all together. This assemblage of micro debris makes it unique compared to other structures in this phase. (4) Structure 21 and 2b yielded the highest concentration of microartifacts within the structures, more than double compared to the other structures (about 45 particles per liter). This is without the overlying collapse layer which yielded even more microartifacts. Several possible reasons for the “dirtier” areas will be explored in the next chapter. (5) The number of sherds that show no abrasion seems highest in the residential area as well, however only by a small number. (6) The ASW pre-dating and post-dating the fire in the residential area was roughly the same, with an average of about 30 grams per sherd. This is interesting, considering it is not what one would expect from a sudden abandoned burned phase. Given this result, a stronger inference can be made that the ASW found in the structures is in fact from activity, rather than have happened by a post-depositional event. This will also be discussed in the next chapter.

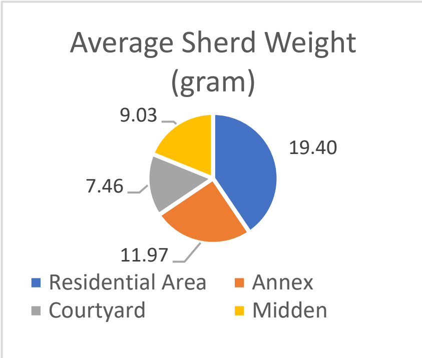



*Figure 48 -Summary of analysis data for phase VId1.*

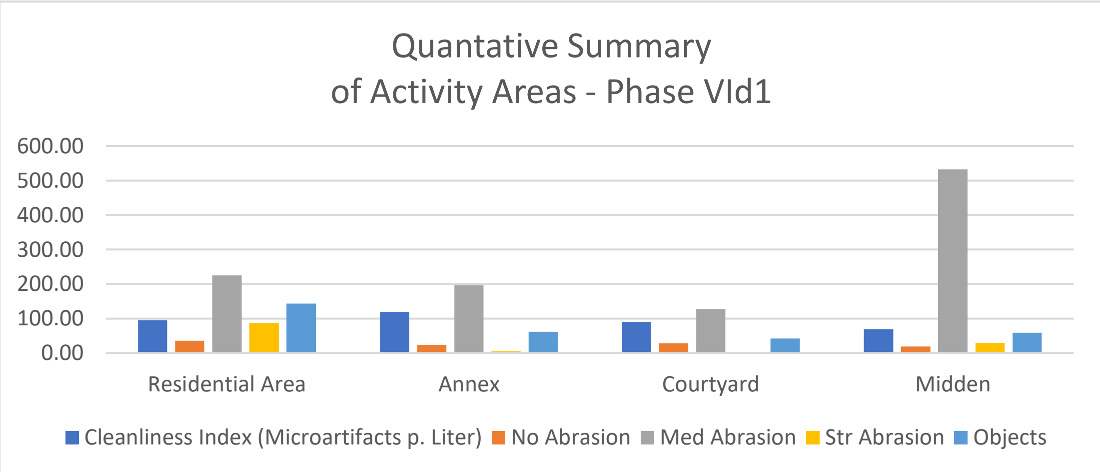



*Table 5 - Showing summary values of the analyses conducted for phase VId1.*

| | **ASW** | **MDA** | **Abrasion** (count) | | | **Objects** |
|---|---|---|---|---|---|---|
| **Area Type** | **Average Sherd Weight** (gram) | **MDA (Per** Liter) | **No Abrasion** | **Medium Abrasion** | **Strong Abrasion** | (Count) |
| **Residential Area** | 19.40 | 95.42 | 36 | 225 | 87 | 143 |
| **Annex** | 11.97 | 119.51 | 24 | 197 | 5 | 62 |
| **Courtyard** | 7.46 | 90.67 | 28 | 128 | 1 | 42 |
| **Midden** | 9.03 | 69.00 | 19 | 533 | 29 | 59 |

## 5.3. Phase VId2, 3 and VIc

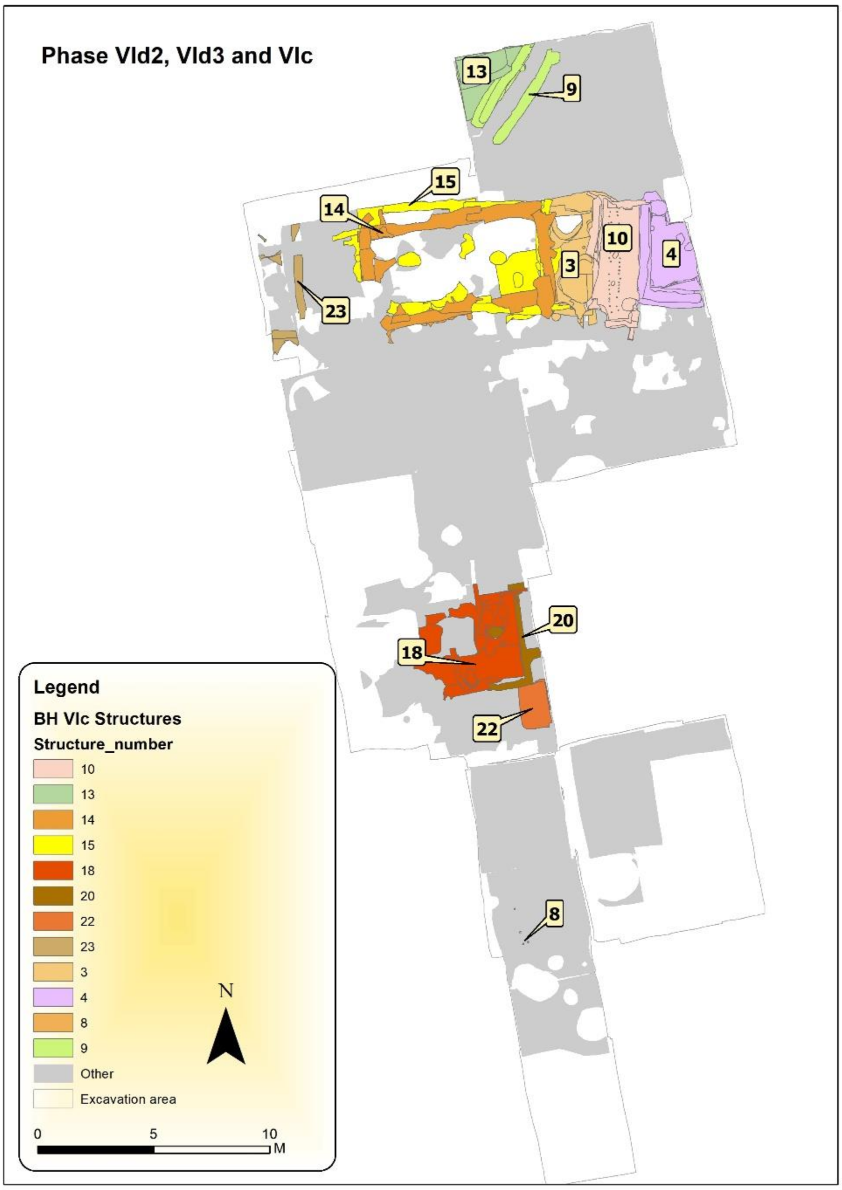



*Figure 49 - Labelled illustration of the structures analyzed as part of this thesis and discussed in the text.*

*5.3.1. Macro-Artifacts*

5.3.1.1. <u>Average Sherd Weight – VId2, 3 and VIc</u>

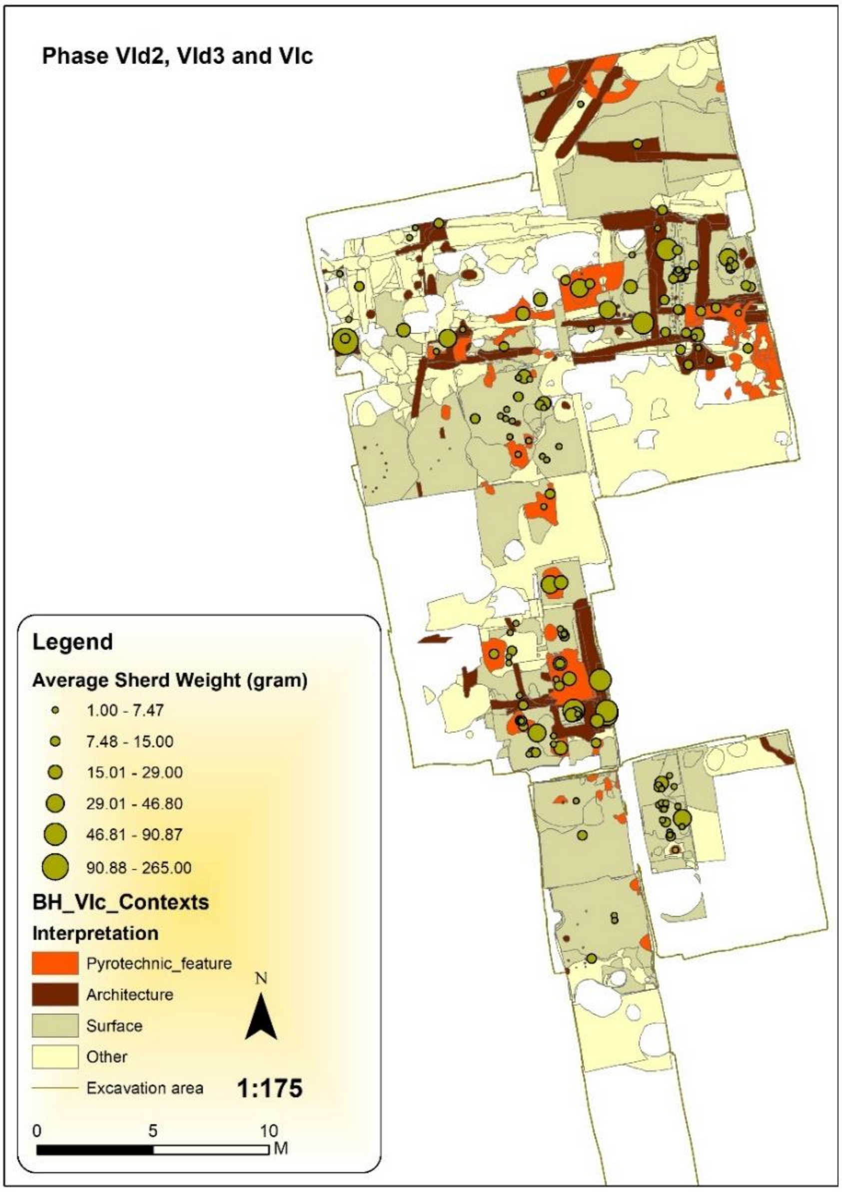



*Figure 50 - Distribution of Average Sherd Weight (gram) distribution of ceramics for phase VIc.*

Figure 50 shows the spatial distribution of the ceramic average sherd weight. The circles are proportionate to the average weight of the sherds, larger circles indicating heavier sherds on average per locus. The ceramics used in this analysis are only coming from certain contexts.[23] Considering the distribution of points, it is clear that most contexts containing ceramics were found in the Central and Southern residential area.[24] However, most sherds were found in the Southern courtyard area, 1525 sherds in total, in a smaller number of contexts (Figure 52). This is the result of dense deposits containing more fragments, which were found in the southern part. In the northern courtyard area, east of Structure 13 and 9 a relatively small number of pottery fragments was found.

The contexts containing the lightest average ceramics, indicating a higher degree of fragmentation, were found in the Northern residential area, and the Northern, Central and Southern courtyard (Figure 51 and Figure 52). The main residential area and Southern residential area yielded the heaviest average sherds. Interestingly, these are also the areas that most likely contained *in situ* finds or better-preserved deposits. The area just south of Structure 4, in the courtyard area, is composed of slightly more fragmented sherds, which might indicate there was a sort of annex. The contexts in

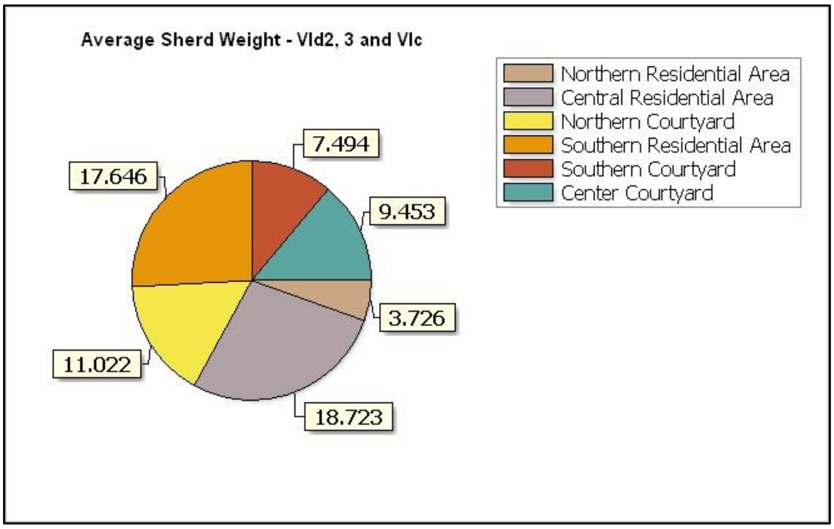



*Figure 51 -Pie chart showing the Average Sherd Weight of different settlement areas in grams.*

[23] Similar to previous phases, data is only taken from contexts that were identified as pyrotechnic features, surfaces, layers or collapse (Collapse is not present in this phase).
[24] It should be noted that the figure does not mention the quantity of sherds, although a fragmented area, with a lower average sherd weight is likely to contain a higher number of smaller sherds of sherds.

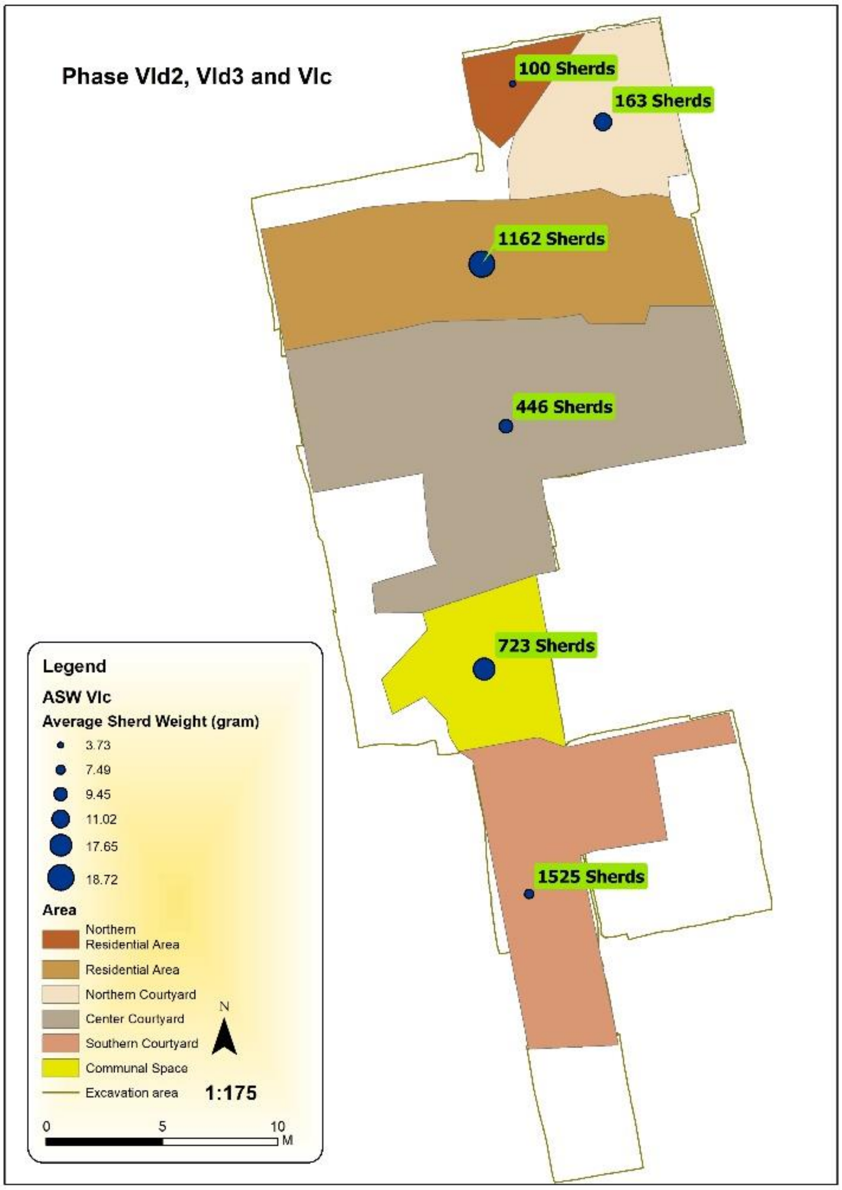
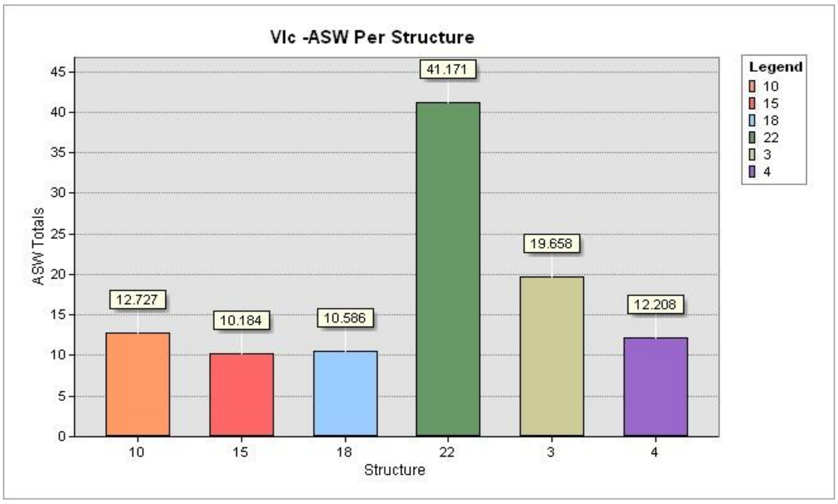



*Figure 52 - Average Sherd Weight (gram) per settlement area of Phase VId2, 3 and VIc.*

L12, the so-called; Southern residential area, seem to have a higher variety in average sherd weight per locus. Overall, the distributions show that the Central and Southern residential area, contain the highest average weight.

Figure 53 shows the distribution of the average sherd weight and the total number of sherds per structure. The chart shows that the ASW in Structure 22 was highest, at almost 40 grams per sherd. structure 22, the semi-subterranean structure, was based on 39 pieces of pottery. This indicates the pottery was relatively complete and not trampled or fragmented much. The ASW from sherds related to Structure 18, the white outdoor surfaces in L12, consisted of a similar weight compared to those of the residential complex, at about 11 grams per sherd. The sherds in Structure 10 and 4 averages at about 13 grams per sherd, whereas sherds in Structure 3 are a bit heavier at 20 grams on average.

Comparing the areas, the most significant pattern found is that on average the average sherd weight found in the areas with structures is much higher compared with structures found in the courtyard areas. In total, the courtyards yielded 2179 sherds.



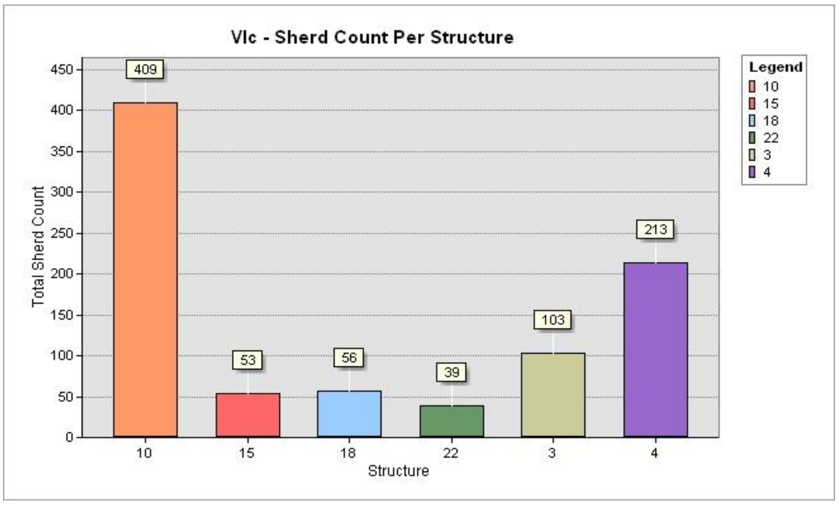




*Figure 53 – (Top) Average Sherd Weight per structure, and in purple representing the total number of ceramics. (Bottom) Sherd count per structure.*

The average sherd weight for these areas together was about 9 grams (Table 6). A very fragmented state of sherds was also observed in phase VId1.

5.3.1.2. Abrasion

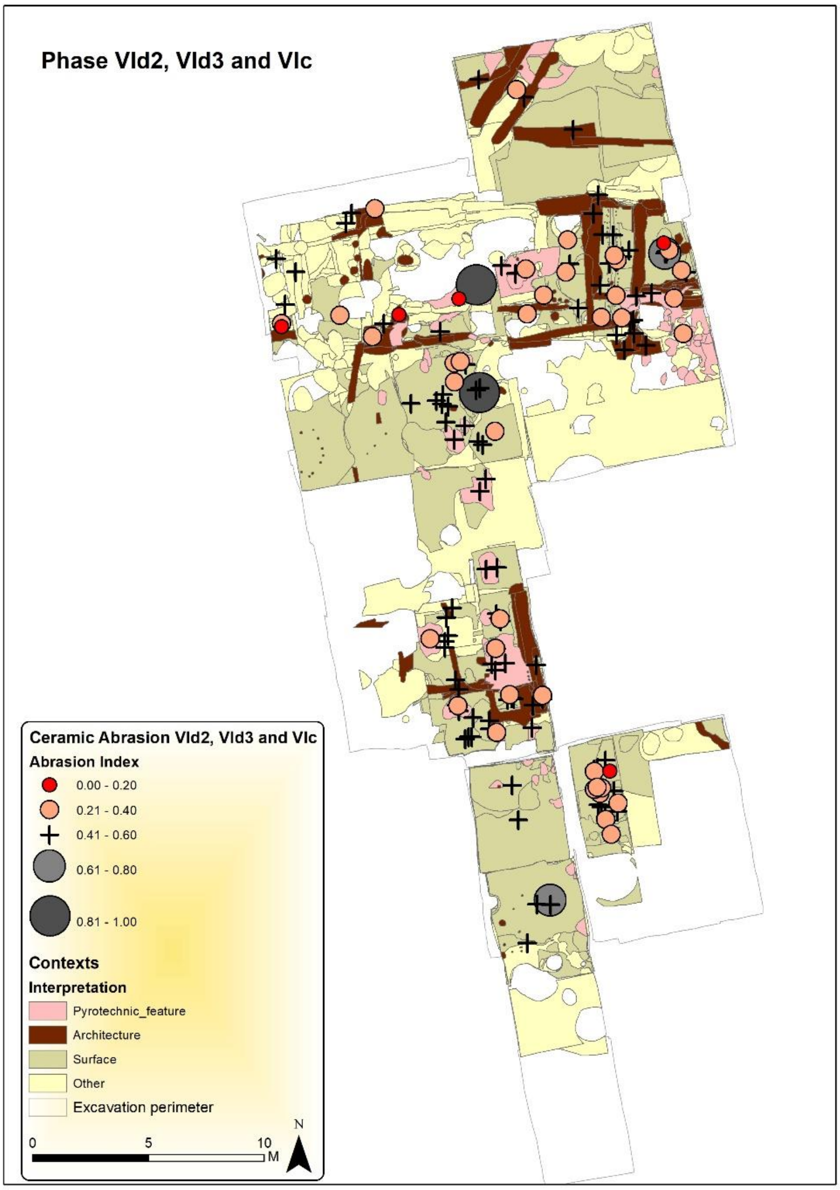



*Figure 54 - Distribution of abrasion data for phase VId2, VId3 and VIc. (top) North part of the trench (bottom) South part of the trench. The colors and sizes represent the calculated Abrasion Index. A high index value (1,00, dark color and larger size), indicates a locus that only consists of heavily abraded sherds. A low value (0.00, red and smaller sized) accounts for the opposite, a locus with a relatively high concentration of non-abraded sherd fragments. For loci containing index scores around the middle, a cross symbol was used.*

In terms of the Abrasion Index, some interesting patterns can be seen when residential and courtyard areas are compared. Figure 54 illustrates all areas of the excavation. Considering the northern part of the excavation, we see that there is a high number of

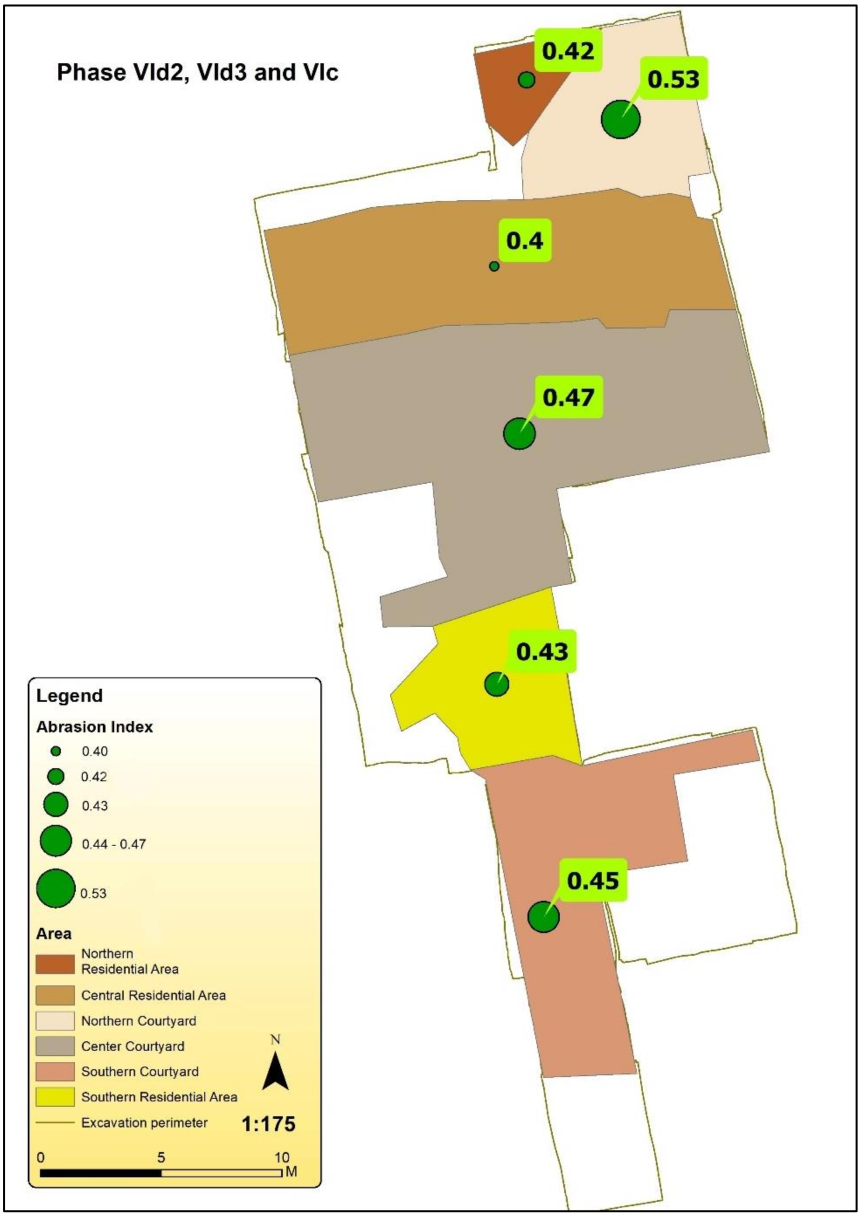



*Figure 55 - Aggregated view of the abrasion per settlement area for phase VIc.*

contexts containing sherds that do not show traces of abrasion located in Structures 10 and 4 (see also Figure 56). Additionally, several are also found on the surfaces associated with Structure 15. Combining the data gathered about the ASW of Structure 4 and 10 with the abrasion data, it can be inferred that the sherds in these structures' repertoire are not so fragmented and show little sign to no sign of abrasion. This lower abrasion number is a very clear pattern, separating the central residential area, and in situ contexts, from other areas in the site.

The southern part of the excavation is more ambiguous overall. Many of the contexts appear to be containing mixed deposits. This is especially the case for the contexts in L12, the Southern residential area. The large number of sherds found in M13, also are mostly mixed contexts, but slightly more contexts with light weathered sherds were found.

Figure 55, which aggregates the data per settlement sector, also shows a large number of mixed contexts in the northern and central courtyards. Only the southern courtyard shows a different variation. However, most striking is the relatively high number of non-abraded sherds found in the residential area. In total 1282 sherds were analyzed, of which 242 sherds did not show signs of abrasion.

The distribution of abraded and non-abraded sherds in the residential areas is represented in Figure 56, which shows that the ceramics from Structures 14, 15, 3 and 4 have a higher percentage of non-abraded sherds in their assemblage. These structures all belong to the central area where structures were found. Structure 10, however, forms an exception with a slightly lower number of non-weathered sherds. The so-called

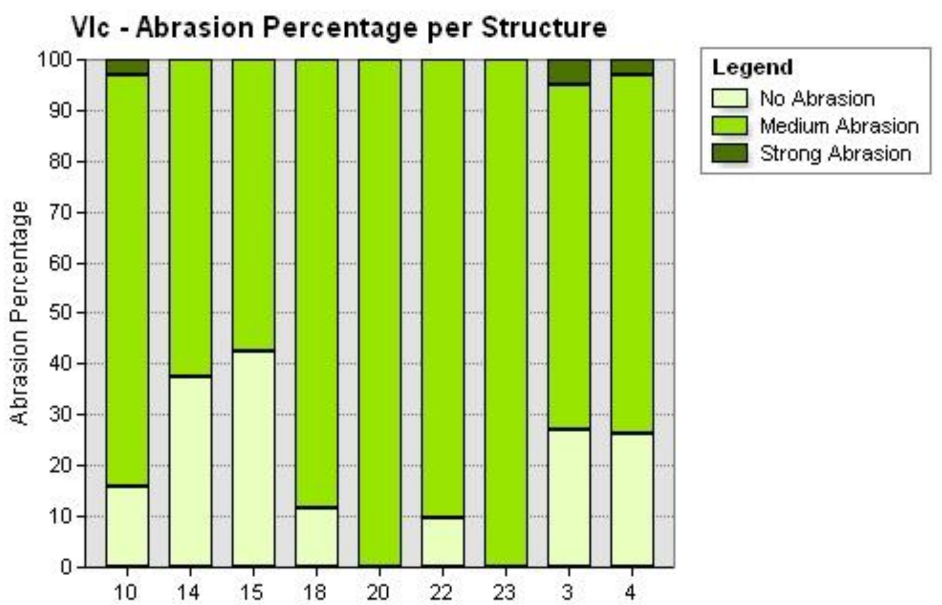


*Figure 56 - Abrasion of ceramics per domestic area for phase VIc.*

Southern residential area has a lower number of non-abraded sherds, which is also an interesting pattern.

5.3.1.3. Objects

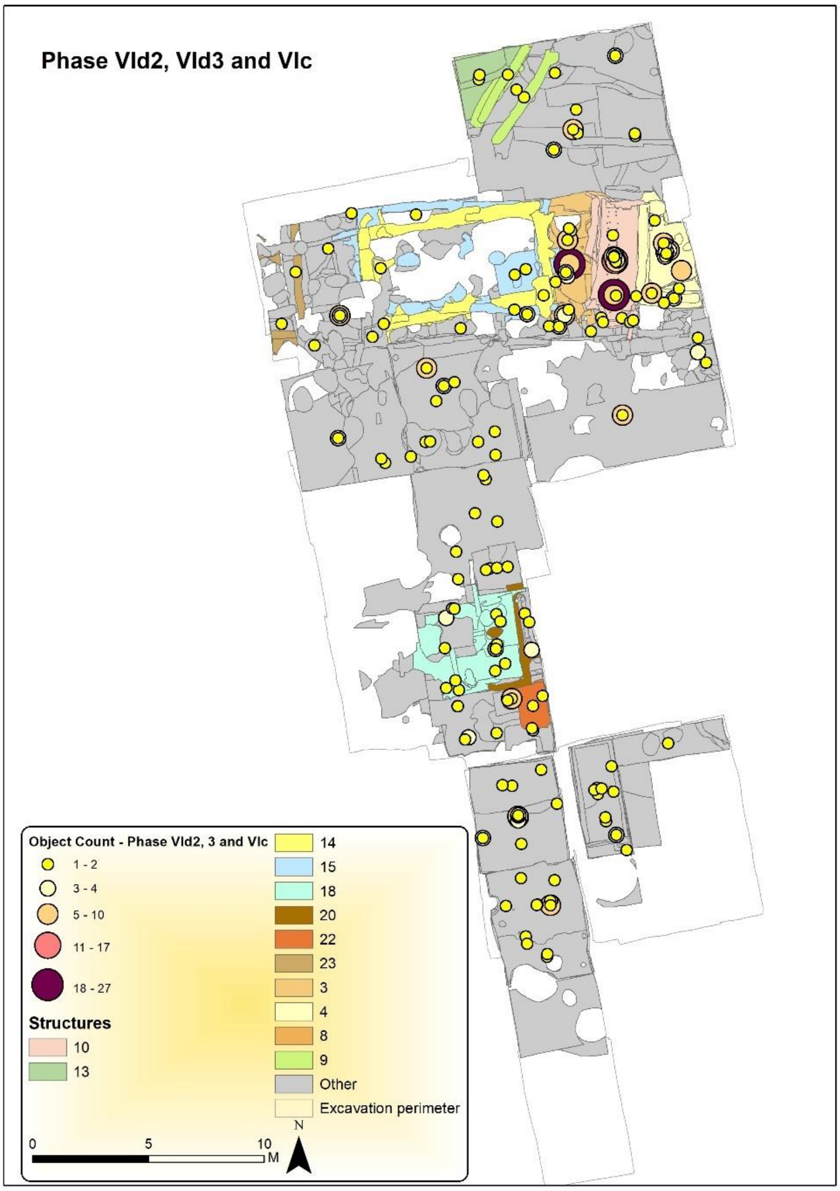



*Figure 57 - Distribution of object densities for phase VId2, VId3 and VIc, depicted per locus.*

The following section compares the overall distribution of objects across the site for phase VIc. Figure 57 shows the distribution of objects as points that are based on individual loci. Comparing the distribution in this way, it allows us to see the density of objects for each context. Structure 3, 10 and 4 located in the residential area of the site yielded the highest concentration of contexts containing objects. Additionally, most of the other high-density contexts were found in the same structures and in the northern courtyard, which was likely used as the living space during the occupation of these structures.

The central courtyard, southern courtyard, and Southern residential area show a more dispersed pattern of object distribution with many contexts containing only one or two objects. Only in Trench L13, south part of the settlement, several surfaces each containing more than 10 objects were found. These, however, could not directly be related to any structures or other living function. Quoting the excavator's remark while excavating seems to fit a possible hypothesis best: "A layer that consists of a few unofficial surfaces that were probably created by walking on it. The burned areas indicate that this area was used a lot for activities that needed fire…".[25] Trench L12, the Southern residential area, does not contain contexts with a high concentration of objects as well. In this light, it seems that L13, the area just south of the Southern residential area shared a similar function in line with the Southern residential area, trench L12. However, structures were either destroyed by later activities or non-existent in this area during VIc.

Aggregating the objects per living sector makes the distribution of objects even more apparent (Figure 58). The concentration of objects found in the residential area is far greater compared with the other areas. The small number of objects found in the Southern residential area is surprising since generally more objects were found within or nearby structures. The fact that this area contrasts with the residential complex north of the excavation in terms of object count, does make it clear that there were, possibly

[25] Taken from Barcın Höyük's main database, from locus 131 from trench L13.

functional, differences between the two areas. This is interesting, considering the function of the Southern residential area is still uncertain. The ASW and sherd count was high, indicating pottery was used much in this area.

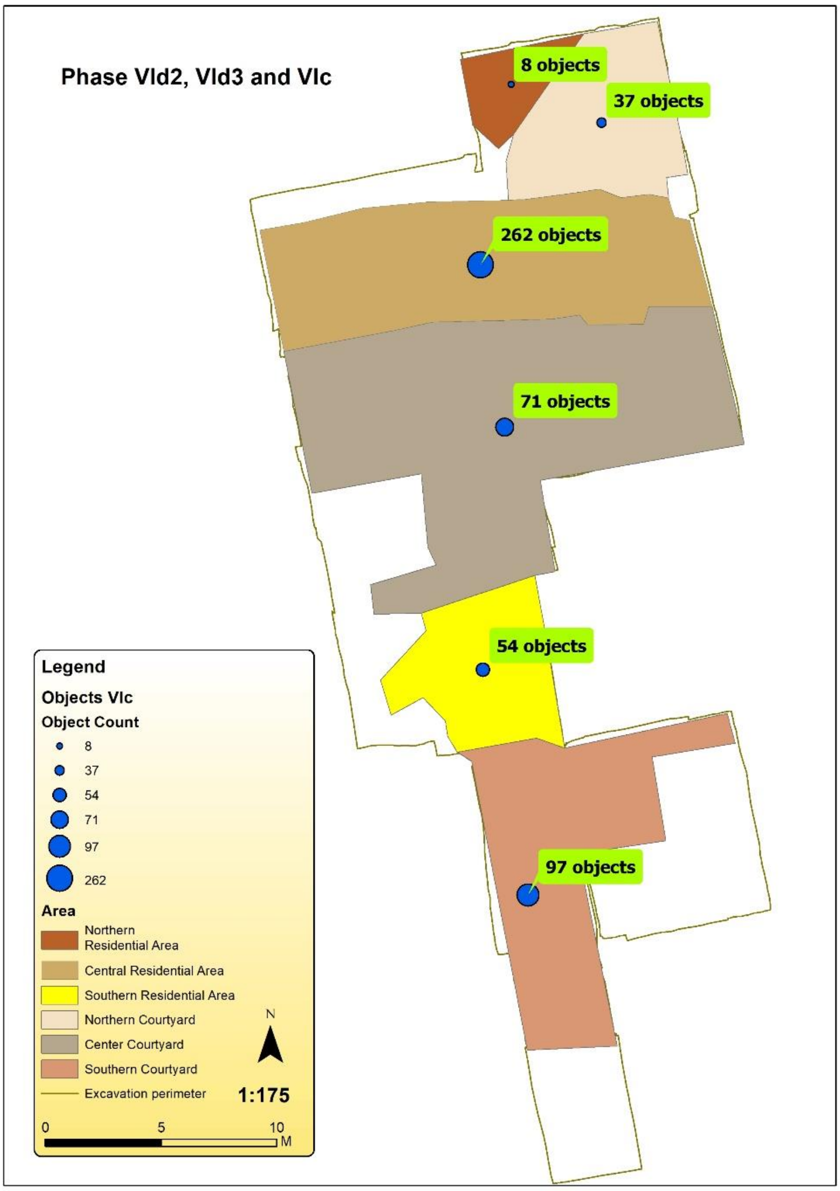



*Figure 58 - Aggregated view of the object density per settlement sector for phase VId2, VId3 and VIc combined.*

### *5.3.2. Microartifacts*

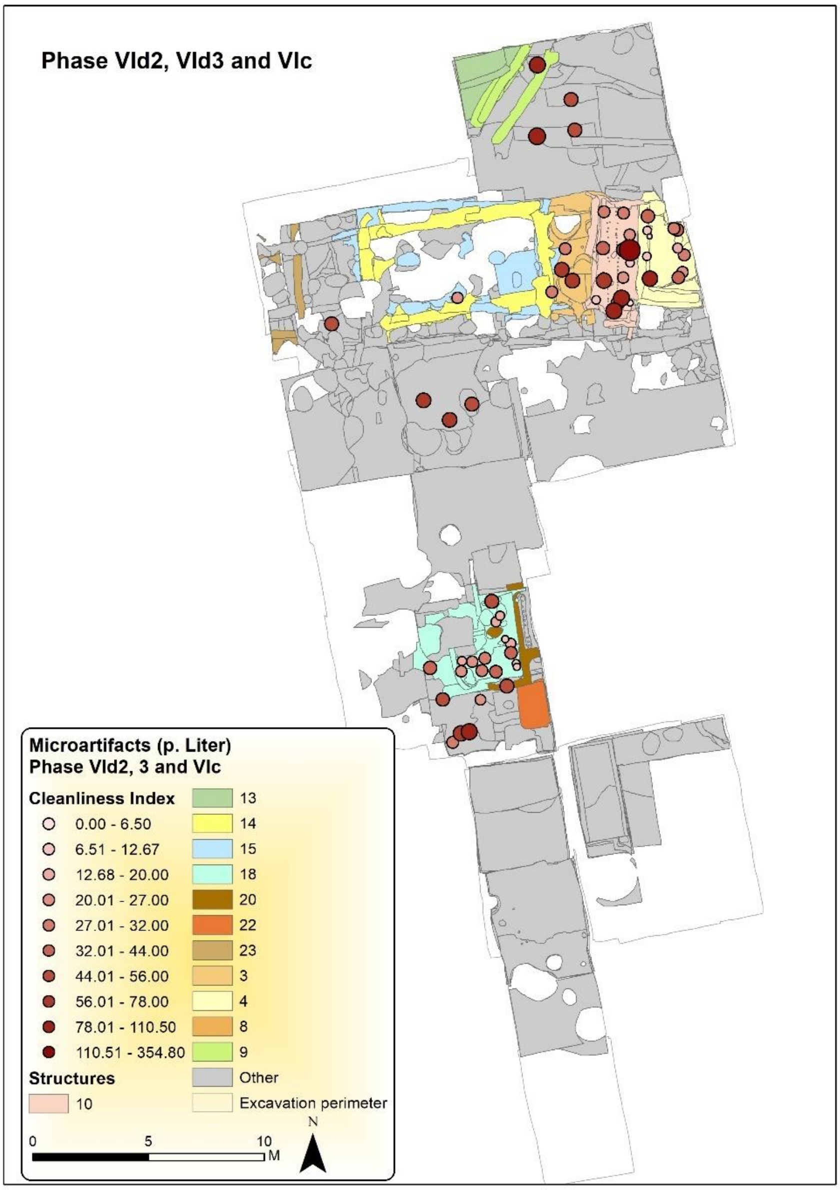



*Figure 59 -Distribution of microartifact concentrations of Phase VId2, VId3 and VIc. The larger, dark red points represent a high concentration of Microartifacts per liter, smaller light red circles represent low concentrations.*

The microartifacts were taken into account by looking at their distribution in cleanliness. The distribution of cleanliness was analyzed per locus, but also per living sector. In Figure 59, the cleanliness of micro artifacts was analyzed. Only the samples which were taken from surfaces, pyrotechnic features or layers were considered. Therefore, most of the samples were taken in the residential complex and Southern residential area, these contained the most preserved suitable contexts. In the Southern residential area, a majority of the samples comes from Structure 18, which was composed of several clear white surfaces that allowed careful recording. Structure 22 did not yield any samples.[26]

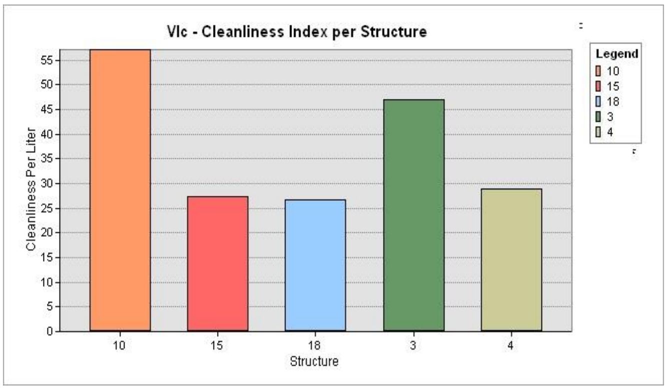



*Figure 60 - Bar graph illustrating the "cleanliness index" per sampled structure. A higher bar means that there were more microartifacts per liter and indicates a "dirtier" area.*

The spatial distribution of the cleanliness index in the residential complex shows that more "dirty" contexts were in Structures 3 and 10. Structure 4, most East in the row of houses, appears to have slightly cleaner contexts. This differentiation of cleanliness is more clearly depicted in Figure 60. The chart shows that Structure 10 contains overall the dirtiest contexts per liter, followed by Structure 3 and 4 which contained about 25 artifacts per liter. The distribution in the Southern residential area, Structure 18, appears to be overall cleaner, similar to Structures 3 and 4. As mentioned earlier, the majority of the micro refuse analysis was conducted on the white surfaces of Structure 18.

In terms of the microartifact variation, phase VIc also revealed some surprising results (Figure 61). Most significant is a large amount of micro mice bone found in Structure 10 and a smaller amount found in Structure 3. Their presence within the structures, assuming they are not modern, shows that mice were part of the settlement and might indicate more things, both for the functionality as well as the construction of the buildings. Chapter 6 will discuss this in more detail. An additional pattern observed within the structures of is the increasing amount of microchipped stone artifacts in the

[26] Possible this is one structure that still needs to be analyzed in future research. There is remains a small number of samples still to be analyzed.

indoor areas. Especially Structures 10, 3 and 4 seem to have a higher concentration of chipped stone debris. In earlier periods, concentrations such as this were not recorded,

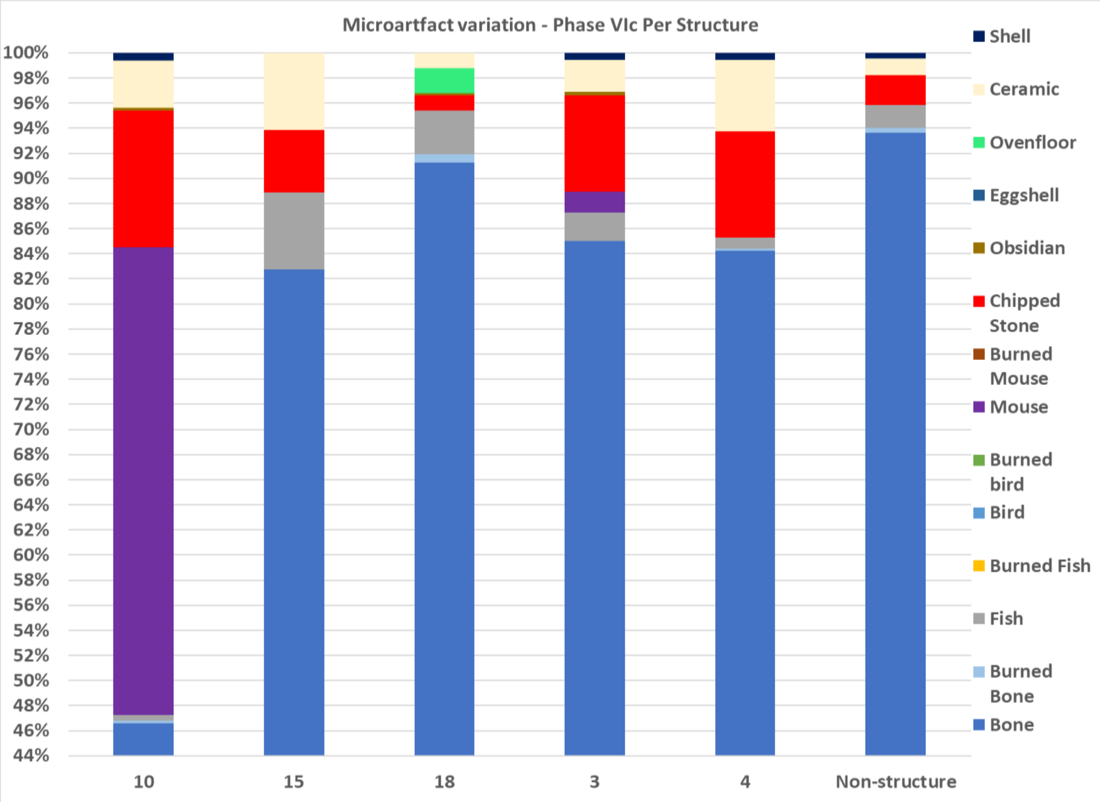



*Figure 61 - Microartifact variation per structure, for phase VId2, VId3 and VIc in percentage of the whole. The colors in the legend represent the distinctive microartifact types. Note that the lower 44% are not shown, these should be ascribed to the type micro bone.*

perhaps indicating a shift in the use of the indoor areas.

Consolidating the micro refuse data per living area revealed some surprising results (Figure 62). The dirtiest contexts were in the northern residential complex. The sample size of this area, however, is very small, and the samples taken were not directly related to structures. The same can be said for the observations in the middle courtyard area (Figure 62). Overall, the cleanest contexts are found in the Southern residential area, followed by the central courtyard. The residential complex yielded 54 artifacts per liter which is a bit above average. Especially if the samples of the northern residential complex are disregarded or combined with the main area with structures. Therefore, the relatively dirty contexts in this area are interesting.

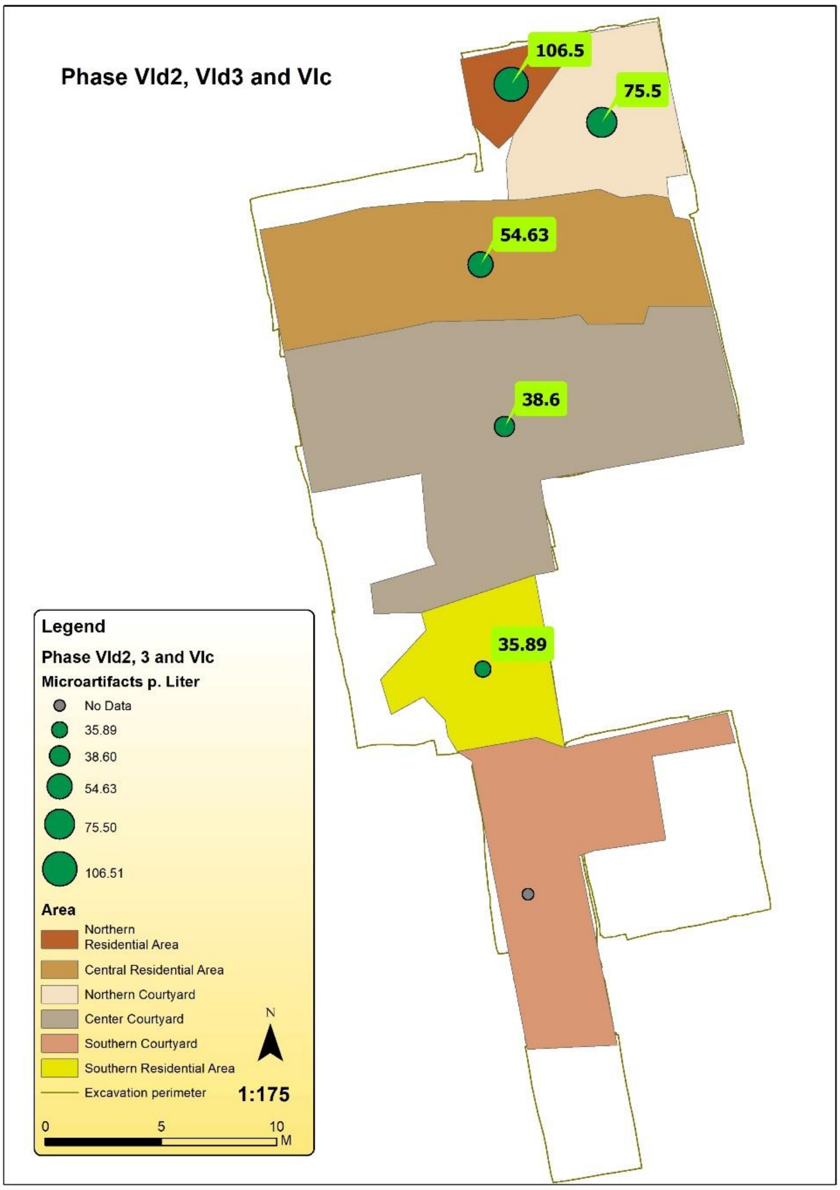



*Figure 62 - Cleanliness index, aggregated per settlement area for phase VId2, VId3 and VIc.*

### *5.3.3. Phase VIc Summary*

In this final section, the results of VIc the most significant results are shortly highlighted. In this section, the average sherd weight and abrasion of ceramics, the density of objects and the total number of micro artifacts were compared. Evaluating these 4 strings of data presents a distribution of samples that give a better perspective of the material culture of several spaces within the settlement.

The most interesting results found during this phase were: (1) The clear differences between the residential complex and with the Southern residential area. The average sherd weight of the residential complex, Structures 3, 4, and 10, was comparable with Structure 18 of the Southern residential area. However, there is a higher number of non-weathered sherds found in the residential complex. (2) In terms of variation within the residential complex, there are some differences. Structures 3, 4 and 10 contained a higher concentration of whole objects. This is not surprising, considering the exposed primary surfaces related to the structures. Structure 4, easternmost of the row, is cleaner in terms of micro artifacts compared with Structures 3 and 10, located west of it. However, the average sherd weight and abrasion of ceramics appear to be similar within the houses. (3) The cleanliness index indicates the Southern residential area, to be the cleanest overall area, in terms of micro artifacts per liter. (4) Also, the cleanliness index shows dirtier spaces in the northern courtyard, which also yielded some outdoor surfaces and possible was an annex of Structures 3, 4 and 10. (5) The microartifact variation shows the presence of micro bones in Structure 10 and

Lastly, in Table 6 the distinctive areas are compared but all courtyards and residential areas are combined. Similar to previous analyses, it is clear that the Southern residential area shows the cleanest contexts based on micro artifacts per liter. The courtyards have the lightest average sherd weight overall, below 10 grams per sherd. The residential complex contains the greatest number of whole objects, followed by the combined, northern, central, and southern courtyard. In terms of sherd abrasion, mixed abrasion is highest we saw in all phases, but a relatively higher number of sherds without signs of abrasion was found in the residential complex area.

*Table 6 - Summarized data of all analysis categories for VId2, VId3, and VIc, in table form.*

| | MDA | Abrasion (Percentage) | | | Objects | ASW |
|---|---|---|---|---|---|---|
| **Area Type** | **MDA (Per Liter)** | **No Abrasion** | **Med Abrasion** | **Strong Abrasion** | **Objects Count** | **Average Sherd Weight (Gram)** |
| Southern residential area | 36 | 8.94 | 89.95 | 1.11 | 54 | 13.55 |
| Courtyard | 59 | 6.78 | 92.39 | 0.83 | 205 | 9.32 |
| Residential Area | 56 | 17.77 | 79.38 | 2.85 | 270 | 14.62 |

# Chapter 6: Intra-settlement spatial analysis: Interpretation and Discussion

In this research, Barcın Höyük was examined via several different proxies to understand daily practices of use and spaces of abandonment within the settlement. These proxies can be classified under the following categories: “average sherd weight of macro ceramics”, “abrasion of macro ceramics, “concentration of objects” and “cleanliness index and variation in microartifacts.” The answer to the question of how spaces within the settlement were used or abandoned does not solely derive from the data concerning the differentiation of architectural features. Including the material assemblage into the interpretative process provides a better understanding of the spatial organizational history of the settlement. Ultimately, this leads to the construction of a better understanding concerning neolithization processes on a settlement scale and can place the site in a larger regional context.

This chapter aims to make the data, presented in the previous chapter more meaningful. The interpretations made in this chapter will not be presented in chronological order, as often similarities and differences between phases are equally important. Instead, the chapter will first discuss the data differences between settlement areas, for example, differences between the artifact assemblage of residential complexes, annexes, courtyards, etc., as was presented in the previous chapter. A more in-depth analysis of the domestic built areas will be made in this section. Because it is often in these contexts that we are able to pinpoint traces that might refer to actual activities or daily practices, rather than a more general form of use versus abandonment.

## 6.1. Use related practices

### *6.1.1. Differences in activity between settlement areas*

Earlier research had shown that the Neolithic occupation of Barcın Höyük discussed here from ca. 6600-6300 cal. BC could be considered as a continuous, gradual process without a hiatus. The continuity in settlement organization, in the research referred to as residential areas, courtyards, and midden areas illustrate a well-established knowledge of the occupants of use of space and a continuity of building traditions. As the Excavators state, "The spatial stability indicates a corresponding continuity in the intra-community social relations. Overall, all the evidence points to the conclusion that we see an organized, structured way of living together at Barcın Höyük…" (Gerritsen and Özbal 2016). These spaces perhaps remain ambiguous, but the buildings on the settlement and the spaces that are in relationship with them held meaning for the people that occupied them, and produced "habitus—'systems of durable, transposable dispositions' that direct the actions of people through which structures are reproduced" (Düring 2005, 6, Bourdieu 1977, 9). In this way, the spatial continuity forms the ideal case study to combine with a spatial analysis of the artifact assemblage, as it might reveal more about the strategies people used to organize their settlement.

For such analyses, a continuous tradition in material artifacts, especially for macroartifacts such as ceramics, is significant. A gradual development of the pottery assemblage, with only slight changes in composition, is preferred for a non-biased comparison of material assemblages. In order for an average sherd weight analysis or the study of the abrasion of sherds, the composition of the material should be roughly similar across areas and phases. According to the excavators of the site, Barcın Höyük had a more gradual development of material culture, in which the development of the ceramic tradition was particularly well studied (See: Gerritsen, Özbal, and Thissen 2013b).[27] The biggest change in terms of ceramic production occurred between phase VIe and VId1, but even this transition might not have caused major changes in the proxies, such as the Average Sherd Weight, Abrasion Index or Object count. processes.

It is not until phase VIb of the Neolithic occupation of the site that the residential complexes shift in a completely different orientation (see chapter 3). Up until that phase, the residential complexes remained in a west to east orientation in the northern part of the excavation. For Structures 2a, 2b and 21, the entrance was found on the south side of the structure, and it is likely that this was also the case for the other two structures, as well as for Structures 10, 3, and 4 of phase VId 2, 3, and VIc. In VId1, several benches and other architectural features were found abutting the residential complexes, making it appear that the annex had a special function within the settlement. On the north side of the structures, a boundary wall was found that could be dated to phase VId1. The entrances gave access to the large central courtyard of the settlement. For phase VIe and Phase VId 2, 3, and VIc, this situation does not appear to have changed. Likewise, the midden area on the south side of the settlement, at the lowest part of the mound, seems to have been on the same location in phase VIe and VId1. In phase VId2, 3, and VIc, however, it is uncertain how this area was used, a midden area seemed unlikely due to the pyrotechnic features and several other non-architectural contexts found in this area.

Barcın Höyük's macro- and microartifacts for the courtyard show a distinct pattern. In all phases that contained sufficient ceramic artifact assemblages for cross-examination, the courtyards contained lower concentrations of pottery sherds and had

[27] See Literature from Laurens Thissen, the ceramic specialist, for a more detailed discussion on the early pottery types found at Barcın

a lower average sherd weight. Both phase VId1 and phase VId2, 3, and VIc show this fragmentation in the courtyard areas (see Figure 37 and Figure 52). One of the most often inferred reasons for fragmentation is the higher foot traffic of the area, which might well be the case for the courtyard areas over longer periods of time. Additionally, fragmentation and abrasion can be a sign of post-depositional disturbance following abandonment. Fluvial or aeolian processes can in this case also transport and fragment material even further. Complementary to this is the observation that the courtyards overall yielded less "objects" than seen in other areas of the site, especially when residential and midden areas are contrasted (see Figure 42 and Figure 58). For the courtyard areas, we cannot compare this with the microartifact data directly because of the large difference between contexts that were researched, leading to an overall sampling bias. Nevertheless, although it is difficult to garner direct inferences based on the average sherd weight, it does illustrate a distinctive difference with interior spaces of the site.

Comparing the indoor or residential areas between phases also reveals some interesting patterns. Both VId1 and the joined VId2, 3, and VIc phase, show a high average sherd weight within the structures (see Figure 37 and Figure 52). Fowler suggests that a high completeness value, which in essence amounts to a lower amount of fragmentation, indicates less post-depositional disturbance (Fowler 2011, 153). In addition to the high number of "objects" found in most of the structures during both phases, it can be suggested that the internal spaces formed the primary activity areas for most of the site's occupation. For phase VIe, however, the low total amount of macroartifacts does not qualify for such interpretation. Only a total of 19 sherds were recorded within the structures. Interestingly, the low number of microartifacts found on the house floors of Structures 24 and 25, the buildings of the earliest phase, also contrasts with the average microartifact amounts found on the house floors of later phases. In these later phases, house interiors were on average dirtier than outside areas, whereas in VIe, they were cleaner. Possible reasons why interior areas of VIe structures were relatively clean and the others dirtier will be discussed in the next section.

In addition to the interpretation that interior spaces formed the primary activity areas, it is also noteworthy to point out that annex areas appear to have had an important function in daily life. This pattern is most apparent in phase VId1. In phase VId1, several bench-like features and outdoor surface contexts abutting structures were analyzed, containing both macro and microartifacts. In terms of both average sherd weight and high concentrations of objects and microartifacts, it shows that this area was used actively by the residents and was most intimately connected to the household (see Figure 37 and Figure 47). For the joint phase VId2, 3, and VIc period, this is more difficult to establish. The pyrotechnic features found just south of Structures 10, 3, and 4 suggest there was activity as well, but macro and microartifact analysis do not seem to show such patterns (see Figure 50 and Figure 59). Only a slight increase in the number of daily use objects might be indications of increased activity (Figure 57).

The appearance of new features in trench L12 in the VIc phase, Structures 18, 20, and 22, which were referred to as the Southern residential area, reflect a change in settlement organization. This shift most likely also had social and practical implications, perhaps making the direct annexes less necessary; we do not find the same patterns of activity here, as we saw in earlier phases. This area, which was separated from the central courtyard by a clay-based embankment, yielded ceramic artifacts and microartifacts that showed no features distinctive from the residential area, located to the north. Only Structure 22 consisted of a very high average sherd weight, due to six vessels which were found inside this building (see Figure 53). The pottery specialist argued that there were traces that were used for cooking, but the structure itself does not seem to be spacious enough to have functioned as a living area (Gerritsen and Özbal 2016, 204). The microartifact analysis examined in this research can be of complementary value to this interpretation, due to the relatively high amount of micro fish bones found on the surfaces of Structures 18, in the vicinity of Structure 22. Likewise, traces of micro oven floors and lithics were found on the same surfaces (see Figure 60 and Figure 61).

To conclude, through a detailed consideration of the macro and microartifact distributions, this section has analyzed the activity areas within the settlement. From a settlement organization perspective, we can argue that the remains of the earliest occupation, phase VIe, appear to be distinctive from phases VId1 and VId2, 3, and VIc. For phase VIe, however, this developmental interpretation should be taken with care, as the absence of ceramic material and the fact that not all areas of the excavation were removed to the VIe level might give us a slightly biased spatial view of this period. Nevertheless, the argument can be made that the discussed areas had had well-defined and distinct artifact assemblages across the site, as is also suggested by the excavators for the spatial organization of the settlement (Gerritsen and Özbal 2016, 205)

In the later examined phases, phase VId1 and VId2, 3, and VIc, the higher concentrations of pottery within the structures and the "dirtier" floors in terms of microartifacts indicate that there is more activity happening within the built environments and near the annexes of the buildings than in outside areas. Courtyards were lower in artifact concentrations, and ceramics were more fragmented in these spaces. Comparing differences between VId1 and VId2, 3, and VIc, it also suggests that the built environment and annexes were more extensively used in the earlier phases, and later some activities shifted to the Southern residential area. This area must have meant that some significant changes in terms of social rules and daily practices took place. Comparing the indoor results has also enabled a better perspective of this shift in indoor practices (see Figure 67 and Figure 64). We must underline here that such changes in activities likely point to larger structural and societal changes. If the social behavior is the added conglomerate of smaller micro activities, as argued by Bourdieu (Bourdieu 1977, 1984), then such shifts in the use of space must be considered significant.

### *6.1.2. Practices and activity within interior spaces.*

The analysis of the artifact assemblage was not limited to the analysis of settlement areas. The use of GIS to geographically locate and analyze the material spatially

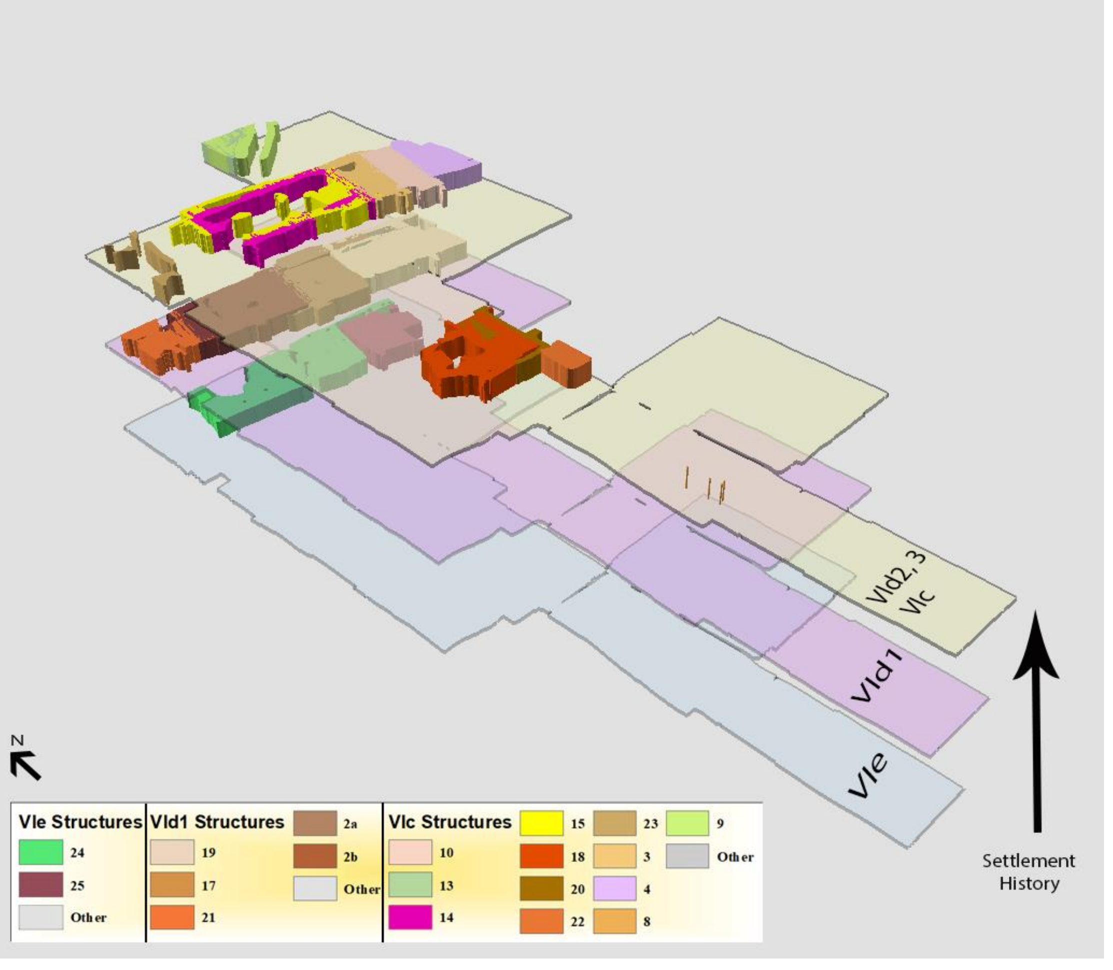



*Figure 63 – 3d representation of the Barcın Höyük structures according to their stratified sequence per phase, as discussed in this thesis.*

enabled the comparison of interior spaces as well. Figure 63 shows not only that the habitation areas and the location of the structures were continuously located on the same location, but also that Barcın's early Neolithic individual buildings were occupied or rebuilt on a similar place, with comparable orientations, dimensions, and construction. This will be shortly elaborated upon, before turning to the discussion of practices related to use and activity within structures. "Use" practices are subdivided below into "Maintenance" and "Production" related activities. However, these divisions should be considered arbitrary, as often multiple possibilities can be considered for understanding which activities occurred within the same space.

6.1.2.1. The significance of building continuity of structures

The building continuity of Barcın Höyük is briefly mentioned to show that the following interpretations do not necessarily represent a single period of time in the life-history of a building. Instead, they focus on the proportional differences between the structures. By doing so, such analyses gain a better overview of the whole household area and can assess the significance of each individual building. As discussed in the first section of Chapter 2, buildings are the outcome of social practices and structure the daily life of its inhabitants (Düring 2005, 6-7).

Building continuity presents itself for example at Structures 2a and 2b from phase VId1, which predate Structures 14 and 15 from phase VId2, 3, and VIc (Figure 63). They remain following a similar east-west orientation, located in the northwestern part of the settlement. Unfortunately, for a detailed material analysis, Structure 14 and 15 proved to be not very valuable, as most of the interior surfaces and associated floors were destroyed by later pit digging activities. The excavators also noted that it seemed likely that the other houses in phase VIc, Structure 10, 3, and 4, were occupied for longer periods of time but did not appear to be rebuilt as often as the previous example. Structures 10, 3, and 4 from phase VIc predate phase VId1's Structure 19, geographically underlying former structures. Phase VIe's occupational structures, Structure 24 and 25, the earliest found at the site, are also constructed in a similar orientation and are spatially underlying parts of Structures 2a, 2b, and 19 of phase VId1. In sum, the structures from each phase overlie those from preceding phases. Keeping this in mind, we can better understand the life history and processes that went on inside the house, discussed in the next section.

#### 6.1.2.2. Maintenance and Production related practices

Roughly speaking, maintenance practices are activities that contribute to the sustainability of an area or, in this case, an interior space. Among microartifact analyses conducted in other studies, one of the most common examples is the daily cleaning of house floors in order to maintain the interior living spaces. Many have attempted to recreate what happens after a floor is swept clean and how it affects the microparticles, especially related to flint knapping activities (i.e. Clark 1986, Sherwood, Simek, and Polhemus 1995a). According to Sherwood and colleagues larger particles (above 2mm), are more prone to move, and only the smaller ones remain (Sherwood, Simek, and Polhemus 1995b, 452). This indicates that maintenance activities can cause microartifacts to spread over a larger territory than that defined by its initial deposition. This is especially important to consider when one particular surface is spatially examined. In this thesis, however, the cleanliness index (microartifacts per liter) was calculated over a multitude of surfaces belonging to the life history of a structure. Additionally, this index does not focus on a size distribution of microartifacts but instead takes the whole assemblage into consideration. By doing so, differences between areas were examined.

Practices related to “production” are also discussed in this analysis. These are activities contributing to the production, refinement, or processing of material goods. For example, flint knapping, which was mentioned earlier, is a well-studied example of a production related practice (i.e. Fladmark 1982, Cameron and Tomka 1993, Dunnell and Stein 1989). As all practices are mostly occurring on the interior part of the settlements, it seemed best to discuss these practices together, as they are all daily practices that have common occurrence within the household. One could argue that subsistence practices should be treated separately as well. I would agree fully with this argument but considering that the spatial analyses in this thesis focused mainly on the spatial distribution of macro ceramics and variation in microartifacts, this research would not do this question justice. In my opinion, additional proxies such as botanical remains, sediment chemistry, and isotope analysis are more effective criteria to study subsistence-related practices. Nevertheless, as chance would have it, the microartifact variation of buildings did reveal some possible subsistence-related practices.

In phase VIe, the microartifact assemblage of the interior spaces illustrated a clear distinctive pattern, contrasting with the outdoor area (see Figure 27). Several suggestions for this low cleanliness index can be inferred. One of the possibilities can be related to a strategy of maintenance but, to gain a better perspective, other explanations must be discussed. First, since there was a lower concentration of objects and ceramics within the residential areas in general, as ceramics were rare in the first stages of the settlement, yielding lower amounts of microartifacts is natural. However, this alone remains insufficient as an explanation. If this were the case, why would the areas abutting the interior spaces be dirtier? Perhaps, we could also argue that the material composition within the floors was constructed of other material, containing less “background” microartifacts from the construction early on. In this case, the material might have consisted of less “mixed” deposits, as was pointed out by both Cessford and Shillito for the Çatahöyük case-study (Shillito 2017, 243). In this case, it cannot be considered an *in situ* activity but can be a reason for microartifact variation (Cessford 2003). However, the difference in material composition of floors might just as well be regarded as a change in practice, as finding new source material for the construction may also be considered as an active intention of the agent or household.

Lastly, there is the possibility that Structures 24 and 25’s clean interior surfaces were the results of maintenance practices. Although inferring the low cleanliness index was the result of daily cleaning practices is difficult to prove, they do seem to fit well with the assumed perimeter of the structures, although these could not be clearly established.  surrounding the building perimeter. The microartifacts from the surface contexts consisted mainly of bones, including traces of fish, oven floor in Structure 25 and micro-shell remains in Structure 24 and 25. Most surprising is the relatively high counts of lithic debris, comprising roughly 5% of the total assemblage. Considering this variation, and assuming these microartifacts belong to interior surfaces, it might be used to shed light on the productive and subsistence practices of the earliest phase of the settlement.  Nevertheless, even with this variation in artifact types, it remains difficult to interpret what might be the cause of the overall low cleanliness index in phase VIe.

In phase VId1, the differences in terms of variation between structures could be better understood by combining the macro- and microartifact distribution. By looking at the microartifact variation between structures (Figure 66), it seems the structures have a more defined spatial organization and might have served slightly different functions. However, by basing this on an average variation of microartifact per liter for the entire building sequence, it should be noted that these structures might have had multiple functions during their life-history. However, as also acknowledged earlier in this thesis, the aim of this analysis is not to understand individual building histories, but rather the intra-settlement variation of building and spaces over multiple phases of the settlement.

The bottom chart of Figure 66 shows the variation of microartifacts types per structure, the top image represents the microartifacts per liter for each structure. The top image shows that Structures 19 and 2a were very clean, compared to Structure 21

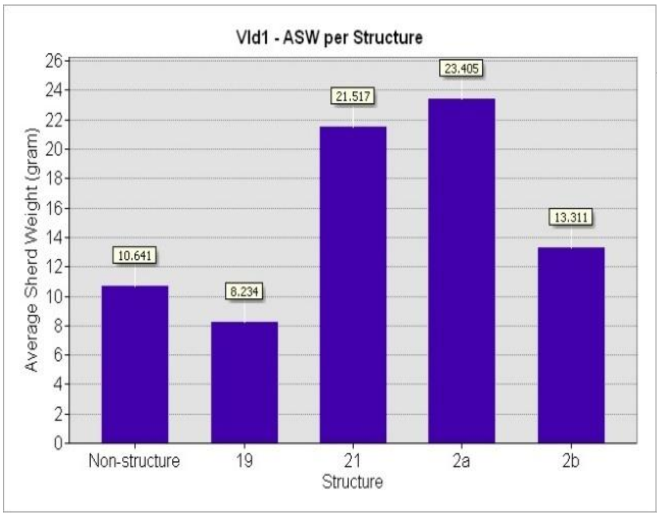



*Figure 64 -Variation in Average Sherd Weight between buildings of Phase VId1*

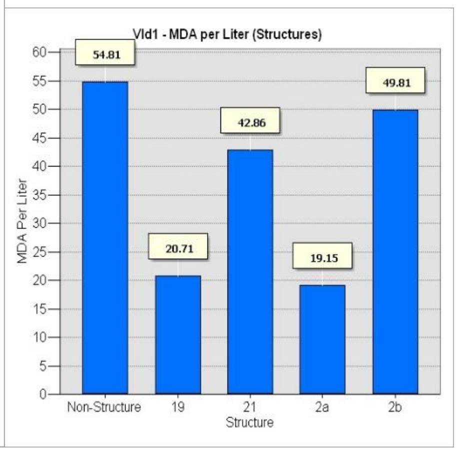



*Figure 65 - Chart shows the total amount of MDA samples per liter for each of the structures of Phase VId1.*

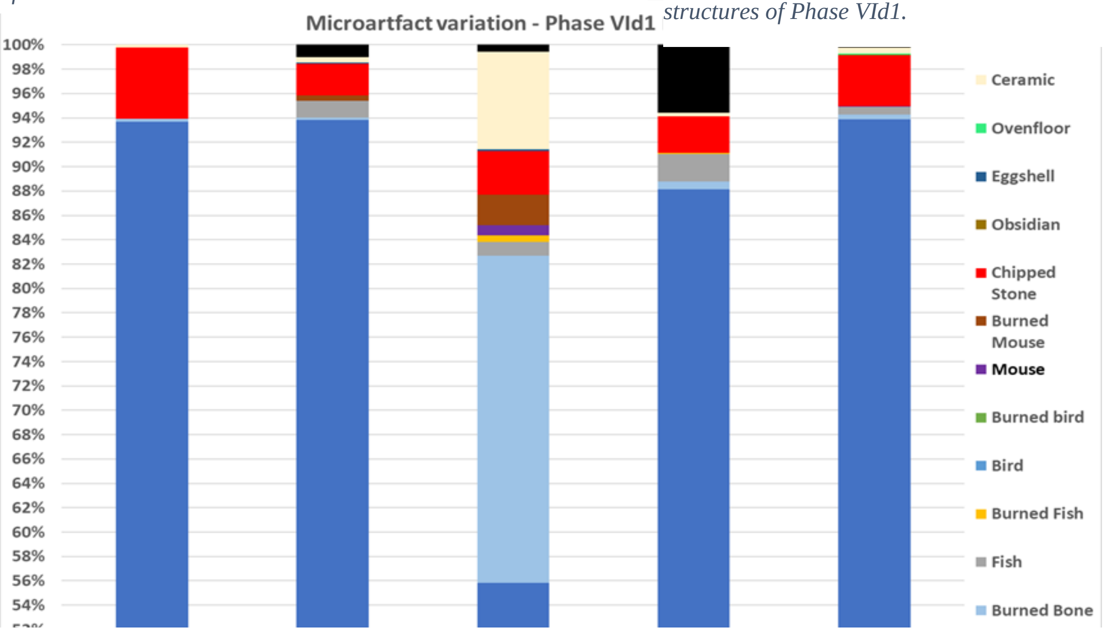



*Figure 66 - The variation in Microartifacts compared to the total amount per VId1 structure. Note that only not the full 100% stack is shown, the remaining stack should be ascribed to micro bone artifacts.*

and 2b. The latter two structures have contexts that are comparable with non-building contexts. In terms of average sherd weight, 2a and 21 proved to contain the heaviest sherds on average, whereas Structure 2b and 19 were more fragmented (Figure 64). The higher concentration of objects within the structures is also an obvious observation that during this period, phase VId1, the houses seem to have been the main activity areas of the settlement.

In terms of microartifact variation in microartifacts, structure 2a showed the richest variety of artifact types within its assemblage (Figure 65). The interior floors contained a small amount of shell, 10% micro ceramic material,[28] 26% burned bone,[29] burned mouse bones, "regular" mouse bones, a tiny eggshell deposit, 3% micro chipped stones and some micro fish bones. This is particularly interesting, because such rich assemblage of microartifacts was not found in any structure of this period, or other Neolithic phase analyzed in this thesis. The fact that a number of installations and storage places, of which one contained a cache of lentils makes this space even more intriguing (Özbal et al. 2015, Gerritsen and Özbal 2016). In addition, the high average sherd weight and the concentration of objects found within, indicate that the remains witnessed low post-depositional disturbance. Combining these multiple proxies of evidence, one could argue that the investigation of the material assemblage has added another layer of understanding to this structure. Regardless of its exact function(s), the rich material assemblage suggests that subsistence and cooking related practices seem likely to have taken place within this structure, at least during the end of its occupational

[28] In this structure 2a the micro- and macroartifacts do seem to correlate well. In Hull's and Sherwood et al's research, this area would most probably be referred to as a *de facto or primary refuse* area (Hull 1987, Sherwood, Simek, and Polhemus 1995b). The microartifacts may be a clue to the amount of trampling a surface has undergone, with smaller sherds perhaps indicative of greater foot traffic (Rosen 1989, 565).

[29] Note that the collapse contexts were excluded from this analysis, making sure that the burned material was not the result of later depositional processes. Nevertheless, the high amount of burned bone might still be related to the sudden abandonment of the structure.

history. Most likely more so compared to the other structures. Considering the presence of both burned and unburned mouse bones, we can be fairly certain that at least the burned ones represent remains from the time of the fire. This gives us a further understanding that mice were active within the settlement during these times, and that people had to maintain their daily life and structure it accordingly. For example, for storage-related functions, one would have to take the mice into consideration.[30]

The other structures in the row of houses are also interesting, each seems to have a different variation in microartifacts and distinctive macroartifacts assemblage. Structure 19 yields the most homogeneous variety of microartifact types, even when compared with outdoor spaces. The presence of fish bones and shell in the other structures of VId1 and the complete absence of them within Structure 19 is surprising, and the fact that Structures 2a and 19 have the lowest cleanliness index is of equal significance, which may suggest that this area was not used for food-related practices, but this claim cannot be ascertained. Additionally, it's very low average sherd weight, further distinguishes this structure from the rest of phase VId1's structures (see Figure 33).

Other possible maintenance practices in the residential area of phase VId1 were observed by using the Anselin Moran I statistical analysis (see Figure 34), which identified two high clusters of macro ceramic artifacts located in the annexes. These clusters identify areas that contained less fragmented pottery. One of these concentrations was found in front of the assumed entrance of Structure 21, the other one in the entrance of and northwest corner of Structure 2a. Although difficult to prove, it might be entertained that the clusters at the building entrances of these two structures

[30] This observation is based on personal communications with R. Özbal and A. Galik.

show that these are areas sweeping or cleaning, or *secondary* refuse, after being disposed of the structures themselves. However, considering the high average sherd weight, it is difficult to infer a real distinctive pattern.

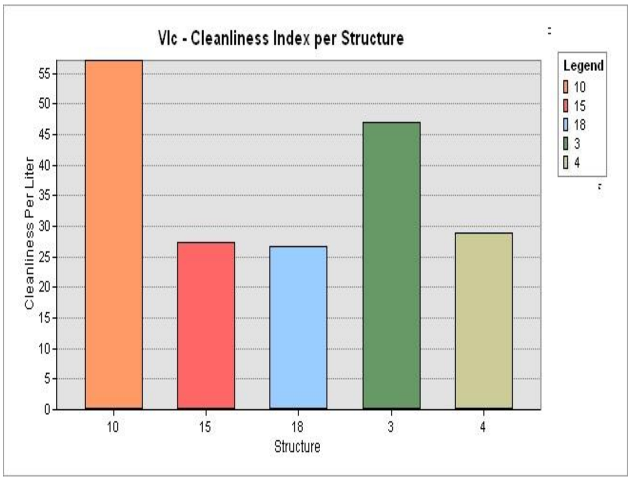


*Figure 68 - Bar graph illustrating the "cleanliness index" per sampled structure. Higher means more microartifacts per liter and a "dirtier" area.*

In phase VIc, we can compare the residential complex of structures with the structures which were defined in the Southern residential area, at the south side of the excavation. In the residential complex, Structures 10, 3, 15, and 14 can be compared. Structures 14 and 15, however, are difficult to interpret because only a few surfaces survived the pit digging activities of later phases (See Figure 63 for an overview). Nevertheless, in terms of microartifact variety, Structures 10, 4, and 3 show the very interesting increase

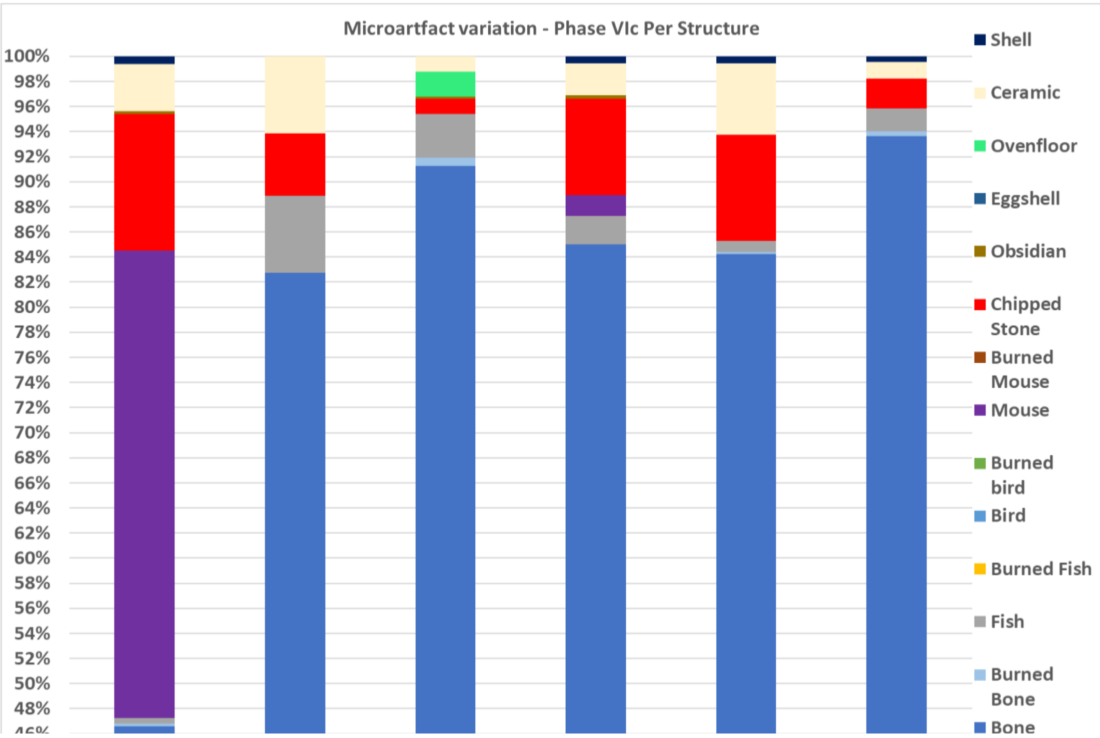


*Figure 67 - The variation in Microartifacts compared to the total amount per VId2, 3 and VIc structures. Note that only not the full 100% stack is shown, the remaining stack should be ascribed to micro bone artifacts.*

in micro-chipped stone presence (Figure 67). Structure 10 seems to have the highest ratio, followed by Structures 3 and 4. Compared with the Southern residential area comprising only Structure 18, this is a high overall percentage. Additionally, it is also higher than we saw in previous phases, potentially indicating that chipped stone related practices were concentrated in the interior spaces during this period. Nevertheless, the difference between the ratios of Structure 18 and others is noteworthy, further indicating that it was gradually exploited and used in a more organized manner, perhaps in accordance with social rules and differences in practices.

For Structure 10 a very high concentration of mice bone caused a strange variation in the data. Since these mouse bones are not partly burned, as in Structures 21 and 2a of the previous phase, they possible represent a modern phenomenon. However, the discovery of another small concentration of mouse bones in Structure 3 (located directly east of Structure 10) argues against this but still cannot disqualify that it was a modern sample. However, if the bones are indeed Neolithic in date, some observations can be made: the rooms may potentially have attracted mice because they were used to store organic materials like grains. The concentration of pottery in Structure 10, which is more than double that of Structures 3 and 4, would support such a claim. The high rate of fragmentation of the sherds from this structure makes it unlikely that it was used for storage. Moreover, it is likely that pottery was not preferred for grain storage as their restricted sizes could only hold limited amounts.[31] However, a more detailed assessment of the pottery shapes combined with this new information would perhaps reveal more about the function of this building. Additionally, the presence of mouse bones might also indicate a raised house floor, under which they

[31] Personal communication Fokke Gerritsen (July 2018).

lived and scavenged for food. Such a construction seems likely for Structure 21 and 2a in phase VId1, as floorboard impressions were actually excavated, but whether this was the case for Structure 10 remains to be ascertained (Figure 69).

The Southern residential area in trench L12, Structures 18, 20, and 22, were examined in this research as well. The microartifact analyses of the surface contexts of Structure 18 yielded a relatively high variety of fish bones as well as small traces of oven floor which can be related to the pyrotechnic features discovered here (Figure 67). Structure 18 yielded no architectural features but was rather composed of several white surfaces. Earlier, it was also suggested that this area might have functioned as a sort of annex for the only partially excavated Structure 20. The high average sherd weight and vessels with traces of cooking, found in Structure 22, complemented by the relatively high amount of micro fish bones, contribute to the suggestion this area might have had a different function. Additionally, the cleanliness index for this area is low, suggesting the area was maintained to some degree (Figure 68).

*Figure 69 – Recovered floorboard expressions of structure 2a (Gerritsen, Özbal, and Thissen 2013a, 104).*

## 6.2. Case-specific formation processes at Barcın Höyük

Apart from looking at areas which show signs of activity or practices of use, processes of post-depositional formation processes and discard areas deserve study. This section focuses on several cases-studies in which these collective abandonment processes have played a role. It should be noted that processes of abandonment proved to be somewhat more challenging to identify. In the first instance, this has to do with the chosen proxies, as microartifacts are better equipped to study activity areas, as Ullah and others have suggested, than processes of abandonment (Ullah, Duffy, and Banning 2015, Ullah, Parker, and Foster 2012). Nevertheless, in many cases, the abrasion and fragmentation of ceramics in specific contexts allow some inferences concerning depositional processes.

In this thesis, the emphasis was not directed at understanding *how* areas were abandoned or whether they intentionality played a role in the abandonment process, as in other studies (i.e. Kent 1993, Cameron and Tomka 1993, Nelson and Schachner 2002, Chapman 1999, Clare et al. 2008, Tringham 2013). Instead, these processes were used to understand the life-history and post-depositional processes of artifacts and whether they might have altered the material record, affecting *primary* contexts. For example, the fragmentation of ceramics was used not only to analyze activity areas but also to see whether an artifact was left to the elements for a long period of time. Schiffer and Skibo were among the first to research the effects of abrasion of ceramic artifacts (Schiffer and Skibo 1989). Ultimately, such study enables better inferences regarding whether the artifacts are considered *primary, secondary refuse* or of another depositional nature.

The midden area in phase VIe, located in the south of the settlement, proved an interesting case study for abandonment processes (see Figure 21 and Figure 22). Fowler, who studied the effects of ceramic discard in settlement contexts extensively at an Early Iron Age site in South Africa, argues that a high completeness index, roughly similar to a high average sherd weight, can be considered to refer to objects that had little post-depositional disturbance after *secondary refuse*, discarded into a midden area. A midden area can consist of relatively large, non-fragmented sherds as well as smaller fragmented ceramic material. Depending on the contexts surrounding the midden area, for example, fire-pits or other features, this might change. Mostly, Fowler argues that fragmentation occurs due to human activity (Fowler 2011, 160-161). Schiffer and Skibo, who used experimental archaeology to determine rates of abrasion of ceramics, also argued that the abrader, the material making contact with the artifact, influenced fragmentation and abrasion. The midden area in phase VIe showed a relatively high ASW and high concentration in this area. Additionally, the microartifact analysis also showed that the dirtiest samples were in the midden area, perhaps as a result of fragmentation of deterioration. However, comparison with other areas is difficult in this phase, as there are very few ceramic macroartifacts found within the residential area during this period. A high concentration for microartifacts does not necessarily refer to the process of abandonment, rendering it difficult to make inferences for the outdoor areas of phase VIe.

The most promising results for abandonment processes, at least for certain spaces, come from phase VId1. The most noteworthy process is the unchanged difference in ASW between pre and post-burning (Figure 36). This refers to the sherds found in Structure 2a that indicate that there was no distinct difference between the *in situ* floors that were used during the burned period and the one used previously.

Ultimately, this suggests that the abandonment of the structure and discard of material did not directly affect the fragmentation of the ceramic assemblage. In this way, it can be inferred that the high average sherd weight that was found on the pre-burned contexts of the structure was most likely the result of activity, rather than a process of abandonment. Additionally, a contextual analysis examining the ceramics enclosed in the burned collapse layer of the structures of phase VId1 was conducted (Figure 36). The variation in abrasion was very high in these contexts, indicating that where ceramics are deposited in is indeed significant. On average, the sherds within this context had much higher average abrasion compared to other contexts perhaps because of the texture and porosity of the collapsed materials which could have contributed to the friction (Figure 39) (Schiffer and Skibo 1989).

The study of abrasion contributes little to the understanding of use or activity with one exception. The residential complexes of VIc showed a much higher number of sherds lacking abrasion, corresponding well with primary, activity areas such as interior spaces (see Figure 56). The abrasion of sherds found in Structures 14, 15, 10, 3, and 4 all had this spatial pattern. However, Structure 10 yielded a slightly lower of non-abraded sherds than the other buildings. This is interesting, given that the concentration of sherds found in Structure 10 was much higher than the other buildings (Figure 53). This makes Structure 10 again an interesting case-study to examine pottery forms, as also its pattern of abrasion is distinct from other buildings. Because these sherds reflect a collection of processes that happened over time, they cannot directly be related to *in situ* remains. However, they do strengthen the idea that looking at the abrasion of sherds, can, in fact, contribute to the understanding of place.

As a whole, the spatial analysis of ceramic abrasion for all researched phases comparing the rate of abrasion with the fragmentation of sherds and the contexts in which the abraded artifacts were found has proven to be of additional value in the interpretive process. Ultimately, it gave a better understanding of the artifact assemblage as a whole, leading to strengthened interpretations of use practices in the domestic areas. In particular, it has been valuable in the separation between *primary* and *secondary* depositional places, distinguishing domestic, midden, and other outdoor areas as a result.

### 6.3. Concluding remarks and summary of interpretations

To understand use related practices, the domestic, built areas of the settlement and its immediate surroundings were the most significant spaces to analyze. In all three phases, the domestic area shows a distinctive pattern in outdoor areas such as the courtyard and the middens, indicating these areas were the primary activity spaces for the residents of Barcın Höyük. The open courtyard with more fragmented, trampled, and secondary material perhaps indicates continued use throughout all analyzed phases. Nevertheless, changes in the artifact assemblage did occur within the structures.

Comparing the structures from VIe to the ones found in VId1 and later, we can see that the interior spaces become more complex, especially regarding varieties in microartifact assemblages between structures. The microartifacts were most promising in discovering different assemblages between houses, proving effective in both phase VId1 and in later phase VIc, 2, and 3. One of the best spaces in which we see a very distinct and rich microartifact assemblage is considered Structure 2a. The presence of a variety of organic and other microartifacts, the primary contexts in which it was found all support the idea that this structure had more of a domestic and cooking related function compared to other areas. This analysis has shown that it is often not concentrations found within spaces that is significant, but variation between structures can be just as important. This is the case in Structure 19, a space that already had a very distinct appearance because of its large red surface, a common pattern seen in other Neolithic sites located in central and western Anatolia. Samples from these surfaces were very homogeneous, yielding only microlithic remains. In contrast with houses 2a, 2b, and 21 this is very minimal and leads one to believe that this structure did not have a similar function, at least for some duration of its life history. This may be in line with red-floored structures. Often for sites in Anatolia archaeologists have argued that such buildings carry a special purpose and may have housed a different array of activities than the remaining domestic ones (Çilingiroğlu, Çevik, and Çilingiroğlu 2012, 149, Özbaşaran et al. 2012, 161, Esin and Harmankaya 2007, 263-264, Mellaart 1961, 71, Özbal and Gerritsen 2015, 35)

Another notable difference between buildings is seen on the north side of the excavation, between building number 10 and the other houses in phase VId2, 3, and C. The observation that more microlithic remains, in combination with the high concentration of heavily fragmented and non-abraded sherds as well as large concentrations of objects found in interior spaces of the north side of the settlement in VId2, 3, and VIc, strengthens the perspective that certain practices were performed in specific spaces. These changes in the settlement organization during phase VId2, 3, and VIc must have had remarkable consequences in daily life. In the Southern residential area, Structure 22 contained several large vessels with perhaps indications related to food preparation practices as suggested by ceramic specialist Laurens Thissen, together with a relatively high amount of micro fish bones in this area, might be indicative for a different function for this area as well. On the whole, it seems that there is more separation of practices in this phase, which possibly resulted in a more organized, socially constructed daily life within the settlement.

In terms of abandonment and formation processes, the burning event of phase VId1, ending the life-history of a row of houses suddenly, proved an excellent example to study the effects of fragmentation and abrasion of post-depositional contexts. This shed new light on the question what could happen to micro and macroartifacts in the event of a burning, and hence also strengthened the idea that the deposits in the VId1 houses were of a primary nature, rather than caused by formation processes. In phase VId2, 3, and VIc, the spatial distribution of non-abraded sherds seems to correspond with the residential contexts in which they are found. This strengthens the understanding of primary refuse related depositions, that are more often found within the built environment of the settlement.

Comparing life at Neolithic Barcın Höyük, the excavators argue that life at this settlement was similar in many ways to that at Ilıpınar, Menteşe, or Aktopraklık, rather than traditions of pre-Neolithic communities such as the Ağaçlı group. The building continuity, use of space, and artifact assemblages together make clear that there was an early understanding of structured and organized village life right from the beginning. The study of the macro- and microartifacts contribute to this understanding of village life and indicate that spaces became more organized and specialized, based on the interior and annexes and the newly raised spaces during its later occupation.

# Chapter 7: Conclusion

To conclude this research, the question which should be answered is this: did multiproxy analysis and use of GIS lead to a better understanding of Barcın Höyük's history of use and abandonment? This thesis has argued that it did. To illustrate in the way it has contributed to our current understanding of the site, I provide here some background. From my point of view, a detailed assessment of the archaeological material and applying a bottom-up perspective has complemented earlier research and interpretations of the excavators. Studying Barcın Höyük’s distinct settlement areas and interior spaces have contributed to the understanding of the Neolithization process of the site, as also summarized in chapter 6.3. The insights gained in Barcın’s household history as a result of this thesis can be used for future comparative studies focusing on a similar time period and region.

During this research' process, I gained experience with the difficulty of defining the "agent" or related short-term processes based on the micro and macroartifacts which reside in the archaeological record. As archaeologists, we are continuously dealing with a large contrast in scale. We excavate the smallest units of the household, the material itself (sometimes down to the elemental and isotopic composition) and try to understand short-term practices and long-term settlement trends occurring in certain contexts. In these interpretative processes, the selection of analogies, experimental archaeology, statistical analyses, etc., all contribute to the insights we gain in understanding the archaeological record; narrowing it down to the smallest social unit, however, proved difficult. Nevertheless, by looking at the variation between structures and spaces, using multiple different proxies of data, this research achieved much by building upon an existing understanding of the settlement. I was able to show that indoor and outdoor spaces were used differently and that given locations were reserved for certain activities. This adds much to our understanding of Neolithic village life and brings us closer to our interpretation of households at this time.

This research could not have been carried out without Barcın Höyük's early adoption of GIS. It has made the visualization and accessibility of this huge complex database more manageable, as it would not have been feasible with any other archiving tool. This research has shown me that the strength of GIS lies in its ability to handle a large number of different datasets, for example, artifacts, and in its aptitude to relate spatial and non-spatial information. In this way, complex stratigraphical data can be accessed through a simple SQL query, instead of spending hours on counting and searching through paper or file-based data. It allows the user to make easier relations between spatial contexts, artifacts and match qualitative and quantitative data.

Düring describes a metaphor for how old and modern projects are generally considered. He states "older projects have produced macro-scale coarse-grained pictures that are frustratingly vague when zooming in on details. By contrast, the modern excavations often provide a high-resolution image, but the extent of the image is generally very small. By combining the two types of data a reconstruction can be made that is more sound than one based on either of the two sources in isolation" (Düring 2006, 12). In other words, even within excavations we can distinguish intensive and extensive studies aimed at understanding the site from different viewpoints. In my opinion, GIS is the ideal tool to bridge these forms of research methods. GIS has the ability to handle large spatial datasets in a variety of ways, but it can remain detailed enough for relatively large-scale research, typical for current excavations. Ultimately, careful interpretation is still needed to gain a better understanding of past societies.

However, GIS also has its limitations and it is important to understand these when it comes to archaeological interpretations. The first limitation is that GIS in itself does not have to be objective, as Witcher (1999) stated. Similar to cartography, data can be displayed in a biased or manipulative way. This can be considered both an advantage and a disadvantage. When not used with care, it can certainly lead to biased, generalized, simplistic depictions of past households or other datasets. However, when approached correctly its functionality to display multiple perceptions and its ability to cross-reference different proxies of data on exact geographical locations can also present a valuable tool for the interpretive process of an excavation

Archaeology is a large academic field often rooted in anthropology. Thus, the past agents and their social environments require fine-grained analyses. This examination should include trying to better understand the agent, often studied in this thesis at the level of the household, the larger social and productive unit in which agents participate (Hodder 2000, 23-24, Wilk and Rathje 1982, McKie, Bowlby, and Gregory 1999, Byrd 2002). However, GIS, and spatial analysis in particular, remains somewhat insufficient to decode the role of individuals or groups and need to be combined with other factors and analyses. Nevertheless, we can argue that GIS can help researchers to understand the data that can give clues about past human practices. For example, daily practices, such as cooking or production of certain essential items were introduced and shaped around the inhabitants or agents. As done in this thesis, managing, analyzing, and visualizing the data concerning these daily practices via GIS can significantly help researchers to interpret ways in which agents, whether households or groups, may have shaped these activities. In the following decades, other digital technologies such as Virtual Reality can complement the interpretation, and in this way contribute to the anthropological aspects of archaeology as well.

This thesis has contributed to the study of intra-settlement spaces by examining the indoor and outdoor areas of Barcın Höyük. By doing so, it presented a dynamic contrast between use practices and disruptive and formative processes, making the artifact assemblage meaningful and representative for the household in which it was found. This study of artifacts has revealed more information about how spaces were organized and possibly also how social structures were formed.[32] In future analyses, hopefully this data can be of complementary and comparative value to others, using this research to construct a comprehensive understanding of the neolithization processes on a settlement and regional scale, or to gain a better understanding of how GIS can be employed to study processes of use and abandonment to gain insight into social structures and their complexities.

## 7.1. Future research

Several avenues of future research that could be meaningful as extensions of this project are listed here. Additional proxies of interpretation could be added to strengthen the overall results, especially for the residential areas. For example, sediment chemistry analysis and micromorphological results for Structure 2a would almost certainly help to reveal this structure's interesting life-history. This would be an interesting case study, as it can also be compared on a regional scale with other studies that attempted to address, for example, the intentionality of house burning during the Neolithic period. When trying to interpret this potential event, as Shillito (2017) also mentions, radiocarbon data can be essential in such a study as it requires a very detailed analysis of surfaces and house floors. In this way, the time before the burning can be better distinguished from the abandonment and the burned layers that sealed the house.

[32] Chapter 6.3 offers concluding remarks and a summary of the interpretations made in this thesis. Concluding remarks and summary of interpretations

Additional GIS analyses, for example, space-time analysis,[33] can then be applied to study the sequence of events in a more detailed and sophisticated manner.

In terms of larger intra-settlement spatial studies aimed at understanding variation between spaces and phases within a settlement, the aforementioned methods are often too time-consuming and expensive, and, given the uncertainty of outcome, might not be worthwhile to pursue. At Barcın Höyük, the relational spatial database, linking loci (excavation units) with other excavation data has proven to be a very effective tool for examining the spatial distribution of artifacts across the site and relating it to larger spatial units, such as buildings. Nevertheless, careful selection of material categories, which should be aimed at giving a proportional and even distribution, was needed. For example, microartifacts were examined by particles per liter, the total amount of sherds was divided by their weight, etc. This illustrates how these intra-settlement analyses depend on carefully planned methodologies, configured early in the excavation phase and can contribute to later analyses.

Advancements in GIS today, such as the continuous development and increasing support for 3D GIS, combined with improvements in digital recording methods, such as photogrammetry, allows for volumetric recording of archaeological contexts (i.e. Roosevelt et al. 2015). Ultimately, having an interface that can support this 3D data and spatial analysis tools that can handle volumetric records of contexts, can lead to a more sophisticated study of the material. One of the biggest advantages of such an approach is that biases in terms of artifact densities and concentrations can be overcome and quantitative data and assessments become more meaningful. Concentrations of artifacts can in such instance be compared by dividing it by the

[33] http://pro.arcgis.com/en/pro-app/tool-reference/spatial-statistics/space-time-analysis.htm

volume of the contexts in which it was found, giving a proportional spatial distribution of the archaeological record. In my point of view, this opens new possibilities in the way studies of macro- and microartifact analyses can be compared within their excavation contexts. As the household is ultimately comprised of these contexts and material, it will also lead to new quantifying methods to define the household as a social and productive unit as a result.

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## Appendix

All data used in this thesis will be made available later at the Data Archiving and Networked Services (DANS): https://dans.knaw.nl/.